# Quality of Service for WLR, MPF and GEA: Statement

## Statement on quality of service remedies

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**STATEMENT**

Publication Date: 28 March 2018

# About this document

This document sets out our decisions for regulating the quality of Openreach's wholesale services that are used by telecommunications providers to provide retail broadband and telephone services to customers and businesses. Most retail providers of broadband and telephone services in the UK (excluding the Hull Area) rely on access to Openreach's network for the delivery of these services.

The decisions we set out here form part of two formal reviews, namely the Wholesale Local Access and the Narrowband market reviews. These two market reviews set out a number of decisions for regulating the wholesale markets for services that use fixed connections to provide broadband and telephone services.

The regulations we set out in this document are intended to strengthen and build on quality of service measures we introduced in 2014, and will come into effect from 1 April 2018.

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## Section



## Annex

# 1. Executive summary

1.1 Broadband is increasingly important to homes and businesses. We are all more reliant than ever on the internet for day-to-day transactions, education, work and entertainment.

1.2 Coverage and take-up of high-speed services have increased with average connection speeds more than doubling over three years from 17.8 Mbit/s to 36.2 Mbit/s. Residential data usage has risen by 36% year-on-year to 132 Gb in part driven by the growth of over-the-top (OTT) services such as Netflix and Amazon Prime[1], and 66% of residential consumers believe their households would struggle to function without broadband.[2] Small and medium sized companies, as well as the smaller branch offices of larger organisations, are increasingly adopting cloud-based services, where many of their critical services (e.g. Microsoft Office 365 and Skype for business) are hosted by third parties on computers in data centres. The broadband connections that companies use to access these services are therefore critical.

1.3 Most UK consumers receive their home phone and broadband from companies that use the BT access network operated by Openreach to supply broadband services. In our Review of Digital Communications, we said we wanted to reduce the reliance on Openreach by encouraging the deployment of competing full-fibre networks. We believe that network competition is the best means of delivering the quality of service that consumers require. We expect competing full-fibre networks to deliver vastly improved services in terms of speed and reliability and that this will drive improvements in Openreach's own service performance.

1.4 However, we recognise that deployment of new full-fibre networks take time and while they are being established there is an ongoing need to regulate the quality of service on Openreach's network to support the existing competition based on access to Openreach's existing access network.

1.5 We are therefore implementing measures that will improve the reliability of the Openreach network, and give telecoms providers and their customers greater certainty that Openreach's performance will meet their needs.

1.6 We will raise the standards we first applied to Openreach in 2014, requiring more services to be installed promptly and repairs completed when consumers expect them. We have also introduced a further standard to ensure the vast majority of repairs are completed within a reasonable timeframe. In addition, these standards will now also cover broadband delivered over Openreach's fibre-to-the street cabinet (FTTC) to reflect market developments which have seen consumers increasingly adopt the superfast broadband

[1] Ofcom, 2017. *The Communications Market Report - United Kingdom*, Section 4. Data to June 2016 https://www.ofcom.org.uk/__data/assets/pdf_file/0017/105074/cmr-2017-uk.pdf

[2] Jigsaw Research, 2017. Automatic compensation: Consumer experience of provisioning delays, loss of service and missed appointments: Presentation of quantitative findings, Slide 16. https://www.ofcom.org.uk/__data/assets/pdf_file/0026/98711/automatic-compensation-jigsaw-report.pdf.

services offered by the market. Openreach's own FTTC services are now available to over 27m premises and the number of customers with superfast connections is projected to exceed standard broadband connections in the period covered by this review.[3]

### Key decisions

The measures in this review require that by 2020/21 for voice and broadband services, Openreach should:

- complete 88% of fault repairs within one to two working days of being notified, compared with 80% today;
- complete 97% of repairs no later than five working days after the date promised;
- provide an appointment for 90% of new line installations within 10 working days of being notified, compared to 80% within 12 days currently;
- install 95% of connections on the date agreed between Openreach and the telecoms provider, up from 90% today; and
- reduce the amount it charges for its services to account for improvements in the reliability of its network.

1.7 These requirements are complemented by our steps to ensure broadband and landline users are automatically compensated when their needs are not met.[4] We are also providing detailed information that enables phone and broadband customers to compare how different providers perform, which helps inform people who are shopping around for a new service.[5] The actions we are taking should lead to stronger competition and better services for consumers, and represent an important part of our strategy to improve service quality for consumers.[6]

1.8 The delivery of communications services is complex, and requires a focus on quality and commitment to continuous improvement throughout the industry. In addition to the measures set out in this review, we expect all industry participants to continue to collaborate on improving their processes to benefit UK consumers.

[3] Openreach. *Superfast Fibre*. https://www.homeandbusiness.openreach.co.uk/fibre-broadband/superfast-broadband?utm_campaign=portalreferral&utm_medium=splashpage&utm_source=superfast+broadband+link [accessed 07/02/2018].
[4] Ofcom, 2017. *Automatic Compensation – Protecting consumers from service quality problems – Statement*. https://www.ofcom.org.uk/__data/assets/pdf_file/0026/107693/Statement-automatic-compensation.pdf.
[5] Ofcom, 2017. *Comparing Service Quality – The performance of broadband, landline and mobile providers in 2016 – statement.* https://www.ofcom.org.uk/__data/assets/pdf_file/0012/100605/comparing-service-quality-report.pdf.
[6] Ofcom, 2016. *Making communications work for everyone – Initial conclusions from the Strategic Review of Digital Communications*. https://www.ofcom.org.uk/__data/assets/pdf_file/0016/50416/dcr-statement.pdf.

# Our decisions

## Background

1.9 This review looks at voice and broadband services, including FTTC, offered by Openreach in both the Wholesale Fixed Analogue Exchange Line (WFAEL) and Wholesale Local Access (WLA) markets.

1.10 Our Narrowband Market Review (NMR; for WFAEL) and WLA Market Review have found BT to have Significant Market Power (SMP) in its relevant markets.[7][8] This means the incentives for BT to provide high quality, value-for-money services are weaker than if there was effective wholesale competition. In both reviews, we decided that it was necessary for Ofcom to set out quality of service standards.

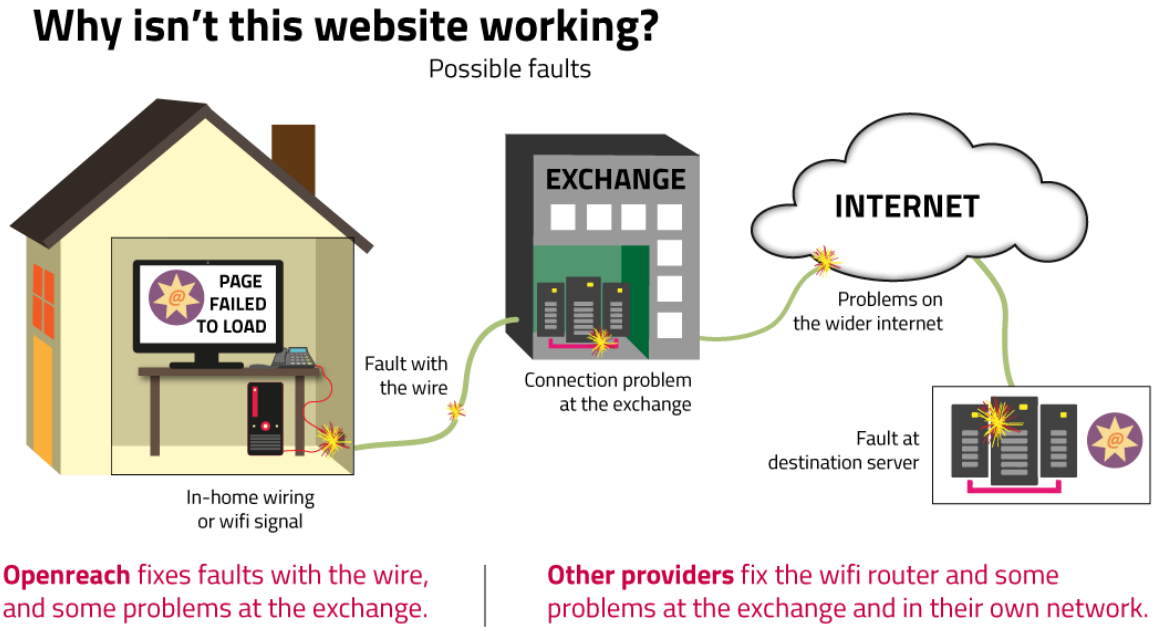
1.11 We have decided to impose binding quality standards on BT for installing and repairing voice and broadband services (whether provided over its copper or FTTC network) throughout the UK, excluding the Hull Area.

## Repair of faulty services

1.12 Responsibility for the quality of communications services on Openreach's network is shared by multiple parties. While Openreach is responsible for most of the network, it does not sell retail services to end consumers. It is telecoms providers such as Sky, TalkTalk and BT's own retail divisions that buy wholesale services from Openreach and package these up in order to retail services to consumers. The performance of broadband services, for example, is dependent on numerous factors, including: the customer's own home wiring; the customer's router; the Openreach network; the telecoms provider's choice of service level agreement (SLA)[9]; and telecoms provider's own equipment, operational processes and systems. To improve customer experience, Openreach and telecoms providers must work together to determine where and why problems arise, and to resolve them promptly.

[7] Ofcom, 2017. *Narrowband Market Review: Statement*. https://www.ofcom.org.uk/__data/assets/pdf_file/0020/108353/final-statement-narrowband-market-review.pdf.
[8] Ofcom, 2018. *Wholesale Local Access – Statement*. https://www.ofcom.org.uk/consultations-and-statements/category-1/wholesale-local-access-market-review
[9] A Service Level Agreement (SLA) is a contractual commitment provided by Openreach to telecoms providers about service standards.

**Figure 1.1**




1.13 Openreach's performance is critical to this process. Over the course of this review, we have determined what we understand to be the current operational limits of Openreach's ability to repair faults within one or two days. We have decided to set standards for fault repair closer to this limit. This means that by 2020/21 Openreach will have to repair faults within one or two working days 88% of the time, compared to 80% at present.

1.14 We are also concerned about those customers who fall outside this standard. We have decided to impose an additional standard on Openreach meaning 97% of customers should have their fault repaired within a further five working days.

1.15 These new standards will require Openreach to make changes to its operations over a period of time, so we have set out standards for each year from now to the final standard in 2020/21.

**Table 1.2 Standards for Openreach's fault repair performance within SLA for WLR, MPF and GEA-FTTC (excluding adjustment for *force majeure*[10])**

| | Current standard | First year (2018/19) | Second year (2019/20) | Third year (2020/21) |
|---|---|---|---|---|
| Repair completion within SLA timescale | 80% | 83% | 86% | 88% |
| Repair completion within SLA timescales + 5 working days | N/A | 95% | 96% | 97% |

[10] A fixed allowance of 3% on repair standards to take account of events such as severe storms and flooding which are beyond Openreach's reasonable control.

## Installation of new services

1.16 New phone and broadband services are typically installed in ten to 12 days, if there is no need for Openreach to visit the customer.[11]

1.17 However, approximately one third of new services ordered from Openreach require an appointment between the Openreach technician and the customer. These requests for service generally take between 12 to 16 working days to complete. Longer installation times are sometimes at a customer's request, for example when moving home or changing contract. However, the availability of Openreach engineers can also be a limiting factor. We currently require Openreach to offer telecoms providers an appointment for their customer within 12 working days 80% of the time. We have decided to tighten this standard to appointments being offered within ten working days 90% of the time by 2020/21.

1.18 In addition to prompt delivery, customers want to be sure services will be installed when they have been promised. When Openreach misses an installation date, this can cause both costs and frustration to customers and telecoms providers. We have decided to tighten the standard for installations that meet their promised installation date, from 90% to 95% in 2020/21.

1.19 Openreach is currently offering appointments within 12 days in 90% of cases, and completes approximately 92% of installations on time. As essential improvements are made we want to ensure installation performance does not deteriorate. We have therefore set installation standards to maintain the current performance level for the first two years, with an increase in the third year.

**Table 1.3 Standards for Openreach's installation performance for WLR, MPF and GEA-FTTC (excluding adjustment for *force majeure*[12])**

| | Current level | First year (2018/19) | Second year (2019/20) | Third year (2020/21) |
|---|---|---|---|---|
| Installations to be completed by the committed date | 90% | 92% | 92% | 95% |
| Number of working days offered for installation appointments | 12 | 12 | 12 | 10 |
| Frequency with which regulated installation appointment date must be offered | 80% | 90% | 90% | 90% |

[11] This includes the effect of a mandatory cooling off period of ten days for customers who are switching telecoms provider.
[12] A fixed allowance of 1% on installation standards to take account of events which are beyond Openreach's reasonable control.

## Improving Network Reliability

1.20 The reliability of the Openreach network is essential to many landline and broadband customers. Every fault that occurs leads to some consumer harm, and this can be minimised by reducing the network fault rate. As part of this review, we have analysed Openreach's fault data and plans for investment in fault prevention.

1.21 The output from this analysis is a forecast of network fault rates. This includes our views on improved reliability as FTTC services mature, as well as Openreach's plans to improve network reliability more broadly.

1.22 Our forecast is used in the Charge Control of the 2018 WLA Market Review (see Volume 2), published in parallel with this review, and reduces rental costs to telecoms providers over time attributable to fault repair, as fewer faults occur and the cost of repairs falls. We believe this strengthens the financial incentive for Openreach to reduce the level of faults, and makes clear our expectations for the balance between prices, quality and reliability.

## Monitoring Openreach compliance and performance

1.23 Some customers experience extended delays for installations or repairs and, in those cases, the reasons for delay can be complex. A common reason for delays to installations is when services are being delivered to new premises or civil works are required to provide a working line. We want to ensure Openreach focuses on these difficult cases, and we want to improve our own understanding of the causes of these long delays. Openreach will therefore be required to provide us with a regular report on repairs that take over 30 days and installations that take over 120 days.

1.24 In addition, we have, with minor amendments, retained our requirements on Openreach to provide performance data in the form of mandatory Key Performance Indicators, a subset of which it must make public on its website.

## Costs of our regulation

1.25 We have assessed the costs of these tougher standards using our own model of Openreach operations, as well as a model developed by Openreach. The associated increase in cost is offset by the reduction in costs through the improvements we expect in network reliability.

1.26 Overall, we expect the effect of our interventions through this review to lead to lower costs for telecoms providers.

**Table 1.4 Cost impact of our decisions (2020/21 annual per line)**

| | Cost increase due to regulatory standards | Cost saving from improved reliability |
|---|---|---|
| MPF SML1 | £1.91 | £2.54 |
| GEA 40/10 SML2 | £0.70 | £0.54 |

# 2. Background

## Introduction

2.1 Ofcom recently published its decisions on the wholesale narrowband market in the 2017 Narrowband Market Review Statement (2017 NMR Statement), and in parallel with this document has published its decisions on the wholesale local access (WLA) market in the 2018 Wholesale Local Access Market Review Statement (2018 WLA Statement). In those statements we found that BT continues to have significant market power (SMP) in the wholesale fixed analogue exchange line (WFAEL) and wholesale local access markets in the UK (excluding the Hull Area). To address that market power we imposed on BT several obligations, including the requirement for it to provide telecoms providers with access to BT's networks and services. We also identified concerns in relation to BT's quality of service (QoS) in these markets, and put forward regulation to enable us to set appropriate quality of service standards to ensure that BT (via Openreach[13]) delivers fair, reasonable and timely network access. We have therefore decided on direction-making powers that allow us to set quality standards and reporting requirements for services in these markets.

2.2 This statement sets out our decisions for regulated quality standards to be imposed on BT in these markets to address its SMP, as well as transparency obligations on BT in relation to its performance in these markets. We also explain what other steps we consider Openreach and other telecoms providers can take to improve customers' experience of the broadband and voice services they use.

2.3 This section provides context to our decisions, including an overview of the current quality of service regulation that applies to BT and a brief overview of our work in related areas. We conclude with the regulatory framework and summary of the structure of this statement.

## Openreach quality of service

2.4 The installation of telecoms services requires multiple parties to coordinate their activities, although, for the most part, this is invisible to customers. From the customer perspective, a range of factors determine the 'quality' of a fixed telecoms service. For example, customers expect an 'always on' connection at consistent speeds (in the case of broadband), and without loss of service. If the service develops a defect, the customer's

[13] Openreach installs and maintains different types of connections to BT's network on behalf of telecoms providers but does not have an operational presence in Northern Ireland where BT Northern Ireland Networks acts as the delivery agent for Openreach and BT Wholesale & Ventures. Openreach was created as a functionally separate division of BT Group in 2005. BT gave legally binding undertakings to us to provide telecoms providers with equality of access to the parts of BT's network least likely to be subject to competition. BT has committed to further reforms to Openreach. It will become a distinct company with its own staff, management, strategy and purpose to serve all its customers equally. See Ofcom, 2017. *Delivering a more independent Openreach. Statement on releasing the BT Undertakings pursuant to section 154 Enterprise Act 2002*. https://www.ofcom.org.uk/__data/assets/pdf_file/0020/104474/delivering-independent-openreach.pdf. While Openreach does not operate in Northern Ireland, for simplicity we refer to Openreach throughout as the operator of BT's network.

experience of a telecoms provider's call centre can also affect their view of the quality of the service they receive.

2.5 When a problem occurs, customers often do not know where it originates, or whether the root cause lies with their retail provider or a third party. For example, a customer's experience of fixed broadband can be affected by factors ranging from demand on servers outside the UK, to problems in their telecoms provider's network, to the local access network (e.g. Openreach's fibre/copper network), or to in-home wiring and Wi-Fi equipment.

2.6 Most telecoms providers (except Virgin Media and telecoms providers in the Hull Area) rely on the access network owned by BT and operated by Openreach, to deliver their services to end users' premises. For this reason, Openreach and its engineers have a significant impact on the quality of service that customers using its network experience. For the purposes of this statement we focus on two key facets of Openreach's quality of service:

- Repair – when a fault originates in Openreach's fixed access network, telecoms providers must engage with Openreach and arrange for it to undertake a repair. The likelihood of a fault occurring is, in part, determined by how Openreach maintains its network.
- Installation – retail telecoms providers require the involvement of Openreach engineers to provide services, for example to install new lines to the customer's premises, or to switch the customer from one provider to another.

2.7 Our quality of service remedies relate to Openreach's performance in repairing faults and installing new lines. In this statement, we also consider Openreach's historical and planned investment in the quality of its network and the implications for fault rates in the future, as well as steps telecoms providers (including Openreach) are taking to improve network diagnostics when service problems occur.

## What we mean by repairs

2.8 Customers may experience faults with their communications services from time to time. A number of these faults can be resolved directly by customers' telecoms providers, but in many cases the telecoms provider will need to arrange for Openreach to visit the customer to resolve the fault. The wholesale services purchased by telecoms providers for the delivery of telephone and broadband services to their customers come with an associated 'service maintenance level' (also referred to as SML, or care level). The SML selected by the telecoms provider sets the contractual time period by which Openreach should repair faults.

2.9 When renting a wholesale access line to a telecoms provider, Openreach offers several SMLs at different price points. Essentially, a shorter contractual time period means a more expensive annual rental price. The five care levels Openreach currently offers are:

- SML1: Fault clear by 23:59 day after next, Monday to Friday, excluding public and bank holidays;
- SML2: Fault clear by 23:59 next day, Monday to Saturday, excluding public and bank holidays;

- Business 2 Plus: Prioritised on the day, fault clear by 23:59 next day, Monday to Saturday, excluding public and bank holidays;
- SML3: Report by 13:00, fault clear by 23:59 same day. Report after 13:00, fault clear by 12:59 next day, seven days a week, including public and bank holidays; and
- SML4: Fault clear within six hours, any time of day, any day of the year.[14]

2.10 Telecoms providers can choose SMLs for the services they offer their customers. The great majority of connections for an access service are provided at SML1 and 2, therefore our QoS regulation to date has focused on these particular care levels.

2.11 In the event that defects reported by customers do not appear as faults on the Openreach network when initial diagnostic tests are carried out by Openreach, telecoms providers may request an out-of-tariff service from Openreach known as Special Fault Investigation (SFI[15]) or Broadband Boost (BBB[16]). Openreach will only levy a charge for these services if the fault is found outside its own domain. These repairs are not included within the scope of the current repair standards.

## What we mean by installations

2.12 Residential and business customers order fixed telephone and/or broadband services from telecoms providers when:

- choosing to switch from one telecoms provider to another;
- moving from one property or premises to another (where the new property or premises may or may not have an existing network connection);
- choosing a new service or package of services (for example, upgrading from current generation to superfast broadband); or
- a combination of the above.

2.13 To supply the services ordered by customers, telecoms providers may place orders with Openreach to install types of fixed line access services which suit their business operations and enable them to deliver the services their customers want. For example, a telecoms provider might be providing its customer with fixed telephone and standard broadband services over a copper line rented from Openreach but using its own electronic equipment rather than BT's. If the customer later wants a superfast broadband service, the telecoms provider could choose to supply this by renting a fibre access service from Openreach and arranging with it to have this connection installed for the customer.

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[14] Openreach, *Fact Sheet: Service Maintenance Levels*. https://www.openreach.co.uk/orpg/home/products/serviceproducts/serviceharmonisation/serviceharmonisation/downloads/SML_fact_sheet_web_vers_phme_61163_2011_09.pdf [accessed 26 January 2018].

[15] SFI, or SFI2, is a chargeable investigation product that attempts to identify and resolve problems affecting Digital Subscriber Line (DSL) services. They can be initiated by a telecoms provider when an MPF or SMPF service is apparently working within the LLU contractual specification of SIN349 and is testing OK on Openreach line test systems, but there might be a problem with the telecoms provider's Asymmetric Digital Subscriber Line (ADSL) or Symmetric Digital Subscriber Line (SDSL) service.

[16] An Openreach chargeable service that aims to improve the speed, quality and reliability of a telecoms provider's customer's broadband connection. The service offers an engineering option that covers the customer's, telecoms provider's and Openreach's network to investigate and attempt to resolve issues that may impact the customer's DSL service. Additional variants for superfast broadband services are also available.

2.14 The main wholesale fixed access line services which many telecoms providers rent from Openreach to provide telephone and broadband services to customers are:

- Wholesale Line Rental (WLR), which allows telecoms providers to rent telephone lines on wholesale terms from BT, and resell the lines to customers, providing a single bill that covers both line rental and, when combined with a wholesale calls product, voice calls;
- Metallic Path Facility (MPF), which allows telecoms providers to rent copper access lines on wholesale terms from BT, and connect the lines to their own electronic equipment to offer voice and broadband services to customers; and
- Generic Ethernet Access (GEA), BT's wholesale product providing telecoms providers with access to BT's fibre networks (FTTC[17] and FTTP[18]) to supply higher speed broadband services.

2.15 For each of the above, we recognise that industry and Openreach use many different terms to describe order types such as new provides, transfers, and migrations, or order types which reflect the existence or state of any line to the premises to be served, for example new lines, start of stopped lines, and working line takeovers.

2.16 We refer to all orders for network access as 'installations' in this document. However, we do not consider separate or subsequent orders to carry out related work, such as to change or modify the features or service levels associated with the network access provided, to be installations for the purposes of this document.

## Regulation of Openreach's quality of service to date

2.17 The quality standards and reporting requirements currently in place were set in the 2014 Fixed Access Market Reviews Statement (2014 FAMR Statement[19]), and updated in our October and November 2016 Directions and Consents (the 2016 Directions and Consents) relating to the quality standards and Key Performance Indicators (KPIs) imposed in the 2014 FAMR Statement.[20] These decisions are described below.

### 2014 FAMR

2.18 In the 2014 FAMR Ofcom undertook a review of matters relating to quality of service delivered by BT (through Openreach) in the supply of regulated wholesale fixed access

[17] Fibre to the cabinet.
[18] Fibre to the premises.
[19] Ofcom, 2016. *Quality of Service for WLR and MPF - Directions and Consents relating to the minimum standards and KPIs imposed in the 2014 Fixed Access Market Reviews*. https://www.ofcom.org.uk/__data/assets/pdf_file/0032/92678/20161017-QoS-Statement_Non-confidential.pdf.
[20] Ofcom, 2016. *Quality of Service direction for WLR – Direction setting further minimum standards for WLR provisions under the SMP conditions imposed in the 2014 Fixed Access Market Reviews*. https://www.ofcom.org.uk/__data/assets/pdf_file/0016/94300/Further-QoS-Statement.pdf.

services (which included the WFAEL, wholesale ISDN30[21], and wholesale ISDN2[22] markets).[23] We determined that over several years, from 2009, there had been a decline in Openreach's performance, particularly in relation to fault repairs and installation of WLR and MPF services. We also concluded that the prevailing regulatory and contractual framework had not been sufficient to prevent material detriment to downstream competition in the fixed access markets, arising out of BT's SMP.

### Quality of service standards for WLR and MPF

2.19 As a result of the observed decline in BT's performance, we took steps to incentivise better service quality outcomes. Specifically, we imposed on BT new SMP obligations, including setting service quality standards covering installation and repair for WLR and MPF, the main copper-based access services.[24] In doing so, we were mindful of the potential for unintended consequences and of the need to be cautious in introducing such SMP regulation for the first time.

2.20 We set QoS standards on how quickly Openreach offered an appointment for engineering visits for installations and on the proportion of installations completed by the contractually agreed date (committed date), each with a fixed 1% allowance for Local 'Matters Beyond Our (BT's) Reasonable Control' ('MBORC') events.[25]

2.21 In terms of repair, at the time of the FAMR, the majority of WLR lines provided by Openreach were associated with a service maintenance level 1 (SML1) repair service level agreement (SLA) – typically a 'two-day' repair. Meanwhile, the majority of MPF lines were provided at SML2 – i.e. a 'one-day' repair.[26] We decided it was appropriate to align our regulation to these product/SML combinations and set a QoS standard on the proportion of repairs completed within the contractual SLAs, with a fixed 3% allowance for Local MBORC events (often referred to as *force majeure*).

2.22 The installation and repair standards increased over the three-year, forward-look period of the 2014 FAMR, as summarised by Table 2.1 below:

[21] ISDN30: A digital narrowband access service supporting up to 30 64 Kbit/s channels, which is used most commonly to provide multiple telephone lines to larger businesses.
[22] ISDN2: A digital narrowband access service for businesses which provides two 'channels' at 64 Kbit/s each.
[23] Ofcom, 2014. *Fixed Access Market Reviews*. https://www.ofcom.org.uk/phones-telecoms-and-internet/information-for-industry/telecoms-competition-regulation/narrowband-broadband-fixed/fixed-access-market-reviews-2014.
[24] We imposed these annual standards in each of BT's geographic regions (East Anglia, London, North East, North Wales & North Midlands, Northern Ireland, Scotland, South East, South Wales and South Midlands, and Wessex).
[25] MBORC means a *force majeure* event that releases Openreach from the liability to make any payment under the corresponding SLG. We also allowed BT to make use of what are referred to as 'High Level MBORC' declarations within the performance calculations for up to two regions per year.
[26] Telecoms providers may purchase different repair packages for their wholesale inputs ranging from a 'two-day' repair (SML1) to a 'six-hour' repair (SML4)).

**Table 2.1 Openreach quality standards for WLR and MPF services**

| QoS standard | First year (2014/15) | Second year (2015/16) | Third year (2016/17) |
|---|---|---|---|
| 12-day provision appointment availability | 55% (54%) | 68% (67%) | 80% (79%) |
| Installation completion by Committed Date | 90% (89%) | 90% (89%) | 90% (89%) |
| Repair completion within SLA timescales | 70% (67%) | 75% (72%) | 80% (77%) |

*Source: Ofcom*[27]

### Quality of service standards for GEA

2.23 In the 2014 FAMR, we did not introduce quality standards for GEA services. At the time, the take up of GEA services was low and we focused on what we considered to be the key access services purchased by telecoms providers at that time.[28]

### Key performance indicator (KPI) reporting requirements

2.24 In addition to QoS standards for WLR and MPF, the 2014 FAMR directed BT to report a set of KPIs for WLR, ISDN30, ISDN2, MPF, SMPF[29] and GEA (FTTC and FTTP). This decision increased the range and granularity of the KPIs that BT is required to report to Ofcom and to industry, thereby allowing us to monitor Openreach's performance more closely and, if necessary, respond to any trends.[30]

## 2016 Directions and Consents

2.25 In our 2016 Directions and Consents, we implemented new standards based on the repair of WLR and MPF faults subject to each of SML1 and 2. This was in response to the decision of a number of telecoms providers to change the SML associated with their purchase of WLR or MPF. Without intervention, this would have resulted in a significant proportion of total WLR and MPF lines falling outside the repair standards implemented in our 2014 FAMR Statement. To ensure that appropriate standards continued to apply in these markets, we therefore introduced a single standard for each of the two care levels that covers both MPF and WLR.

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[27] Note: percentages reflect standards excluding and/ (including) fixed allowances for force majeure (Local MBORCs).
[28] 2014 FAMR, Volume 1, paragraphs 11.66 to 11.71.
[29] Shared Metallic Path Facility (SMPF) is the provision of access to the copper wires from the customer's premises to a BT MDF that allows a competing provider to provide the customer with broadband services, while BT continues to provide the customer with conventional narrowband communications.
[30] A subset of these KPIs (specifically in relation to the installation of new lines, repair of faults, and late installations and fault repairs) must be published with unrestricted access on a BT Group website every three months, within 14 working days of the end of that three-month period. See: https://www.homeandbusiness.openreach.co.uk/our-performance/regulated-kpis [accessed 26 January].

2.26 In addition, we removed the expiry dates for all WLR and MPF standards obligations and replaced these with an ongoing obligation to ensure that the standards remain in force until a new market review decision is published or until they are revoked, whichever is first. The 2016 Directions and Consents also amended some of the existing KPI requirements applying to MPF.

## 2016 Strategic Review

2.27 In 2016 we published our Strategic Review of Digital Communications (2016 Strategic Review), which set out our strategy for delivering a step change in quality of service in the light of the rising expectations of customers and businesses. Regarding Openreach's service quality, we explained that we have had to intervene more actively over time because Openreach is subject to limited competitive pressure at the wholesale level.

2.28 We stated that we intended to take steps to drive a step change in Openreach's service performance, including to:

- set standards at a level designed to ensure effective competition – so that Openreach's service performance meets the needs of customers and businesses – rather than at a level intended only to return performance to historical levels. Over time we expect to apply standards that rise significantly;
- specify standards that protect customers from being left without service for extended periods (i.e. standards that control long tails of incomplete orders); and
- apply standards to cover new aspects of service where we have concerns.

## 2017 NMR and 2018 WLA Statements: SMP conditions for quality of service standards for WLR, MPF and GEA

2.29 In the 2017 NMR Statement and 2018 WLA Statement that we have published alongside this report, we set out our findings that BT has SMP in the markets for:

- the supply of wholesale local access at a fixed location in the United Kingdom excluding the Hull Area; and
- wholesale fixed analogue exchange line services in the United Kingdom excluding the Hull Area.[31]

2.30 The different wholesale access services that form part of the WLA and WFAEL markets are purchased by telecoms providers to deliver voice and broadband services to customers. The quality of these services therefore forms an important part of the customer experience of communications services over the Openreach network and is an influence on the effectiveness of competition between telecoms providers.

[31] The Narrowband Market Review also found BT had SMP in the wholesale ISDN30 and ISDN2 markets in the UK excluding the Hull Area.

2.31 We refer to these markets together as 'the wholesale fixed access markets' unless specified otherwise. In these statements, we decided to impose a set of SMP remedies which, amongst other things, require BT to:

- provide general and specific forms of wholesale network access such as WLR, Local Loop Unbundling (LLU[32]) and Virtual Unbundled Local Access (VULA[33]);
- provide network access on non-discriminatory terms and prices (in particular on an equivalence of inputs (EOI[34]) basis); and
- to publish Reference Offers which set out the terms and conditions of network access, including service level agreements (SLAs) and service level guarantees (SLGs[35]).

2.32 We also identified the concern that, absent regulation, BT does not have the right incentives to continuously deliver an adequate level of service quality in relation to network access. We set out our view that inadequate quality of service delivered by BT has the potential to undermine the effective functioning of the network access remedy to the detriment of both consumers and downstream competition. Issues with quality of service also have the potential to adversely affect telecoms providers and the intensity of competition in the retail market by, among other things, discouraging switching. Along with the remedies listed above, we therefore decided to set SMP conditions requiring BT to comply with all such QoS standards and reporting requirements as Ofcom may from time to time direct in relation to the wholesale fixed access markets.

## March 2017 QoS Consultation and September 2017 QoS Further Consultation

2.33 In March 2017 we proposed tougher quality of service obligations on Openreach that would require it to repair more network faults, and install more new connections, on time.[36]

2.34 We proposed that Openreach should be subject to quality of service standards for fault repairs and installations in respect of all the main phone and broadband services used in homes and businesses, including FTTC broadband. The main proposals were that by 2021:

- Openreach must complete 93% of fault repairs within one or two working days, depending on the service level the telecoms provider chooses. This is an increase on the current requirement of 80%.
- Connections should be installed on the date agreed between Openreach and the telecoms provider on 95% of occasions, up from 90% now.

[32] To meet this obligation Openreach provides two types of LLU service, MPF and SMPF.
[33] To meet this obligation Openreach provides GEA services.
[34] EOI means that Openreach must provide exactly the same products and services to all telecoms providers (including its own downstream divisions) on the same timescales, terms and conditions (including price and service levels), by means of the same systems and processes and by providing the same information.
[35] Service Level Guarantees (SLGs) specify the level of compensation that the telecoms provider would be entitled to should the service not be provided to the quality specified in the SLA.
[36] Ofcom, 2017. *Quality of Service for WLR, MPF and GEA - Consultation on proposed quality of service remedies*. https://www.ofcom.org.uk/__data/assets/pdf_file/0033/99645/QoS-WLR-MPF-GEA.pdf.

- In cases where an engineer visit is needed to install a new connection:
  - Openreach must provide an appointment for installations within ten working days of being notified (currently 12 working days); and
  - Openreach must offer a ten-working day appointment date 90% of the time rather than the current 80%.

2.35 We calculated that the resource uplift required to meet these standards would be 8%. We also proposed to incorporate Openreach's plans to reduce the occurrence of faults on its network in our fault rate forecast. We explained that this forecast plays an important part when we set wholesale pricing controls, as set out in the 2017 WLA Consultation.

2.36 In September 2017 we published a further consultation, which included modifications to our March proposals based on new evidence provided by Openreach.[37] The main revisions were that:

- Openreach should be required to complete repairs within the SLA timeframe on 83% of occasions within first year, increasing to 86% in the second year and 88% in the third year. This is an increase from the current level of 80%;
- the resource uplift required by Openreach to achieve the revised standards should range between 9-14%, with a base case of 11%; and
- we forecast a smaller reduction in faults rates over the market review period relative to our March 2017 proposal, following our analysis of evidence provided by Openreach, which indicated that our original proposals had overestimated the likely reduction in fault rates over the next few years.

## Other Ofcom projects on quality of service in fixed telecoms

2.37 In addition to the proposals described above, Ofcom is pursuing two other quality-related projects as described briefly below.

### Automatic compensation

2.38 Electronic communications are becoming an increasingly essential part of people's lives, and when things go wrong customers suffer harm. We are concerned that the market is not delivering sufficient protection to customers for failure in the quality of service that they receive.

2.39 On 10 November 2017 we published a statement on Automatic Compensation. In the report we concluded that telecoms providers should pay compensation automatically to customers when things go wrong with their landline and/or broadband services, including delayed repair when a customer experiences a complete loss of service, a delay in the activation of a service, and missed engineer appointments.[38] The statement is relevant for

[37] Ofcom, 2017. *Quality of Service Consultation for WLR, MPF and GEA – Further consultation on proposed quality of service remedies.* https://www.ofcom.org.uk/__data/assets/pdf_file/0012/106311/consultation-quality-service-wlr-mpf-gea.pdf.
[38] Ofcom, 2017. *Automatic Compensation: Protecting consumers from quality of service problems – Statement*. https://www.ofcom.org.uk/__data/assets/pdf_file/0026/107693/Statement-automatic-compensation.pdf.

residential customers, as well as for some microbusinesses that use residential services. The measures will come into effect in April 2019.

2.40 Rather than impose formal regulation, we decided to accept the industry scheme put forward by BT, Sky, Virgin, TalkTalk and Zen Internet. We concluded that the industry scheme met our objectives and the requirements of a fair and effective automatic compensation scheme. In particular, the automatic compensation payments that consumers will receive will create incentives on providers to improve the service quality they deliver.

2.41 Our decision on automatic compensation depends on the industry scheme being implemented on time and operated effectively. Therefore, we plan to monitor the development and implementation of the scheme, and review it after it has been in place for 12 months. If we find that it is not meeting our objectives, we will consider formal regulatory action.

## Comparing Service Quality

2.42 Our first annual Comparing Service Quality report was published on 12 April 2017.[39] The report enables voice and broadband customers to compare how different providers perform against a number of service quality dimensions such as answering customer calls, satisfaction with complaints handling and with the reliability of their services. The data draws on consumer research, complaints figures, and data obtained directly from providers.

2.43 By publishing an annual report with provider-specific performance metrics, our objective is to:

- equip consumers and small and medium enterprises (SMEs) with information to help them make more informed decisions; and
- give providers an additional incentive to improve their overall service quality.

2.44 The report received positive feedback from stakeholders. We are engaging with consumer groups about how we can better communicate the information in the next report, which will be published this spring.

2.45 We are currently not able to publish some service quality metrics that we believe would be useful for consumers (for example, fault resolution times) because providers do not collect the information in a way that allows for meaningful comparison. In future, we plan to use new powers conferred by the Digital Economy Act to ensure that providers collect information in a way that will allow more aspects of their performance to be directly compared.

[39] Ofcom, 2017. *Comparing Service Quality: The performance of broadband, landline and mobile providers in 2016 - Statement*. https://www.ofcom.org.uk/__data/assets/pdf_file/0012/100605/comparing-service-quality-report.pdf.

## Regulatory framework

2.46 This statement sets out our decisions to make specific directions under the SMP conditions that we have decided to impose as part of our 2017 NMR and 2018 WLA Market Review in order to address BT's SMP position. Ofcom's duties and powers in relation to the carrying out of market reviews and the analytical framework that it applies are set out in 2017 NMR Statement Section 2 and Annexes 6 and 7 and the 2018 WLA Statement Volume 1, Section 2 and Annexes 1 and 2.

2.47 We notified the European Commission (Commission), BEREC and other national regulatory authorities of our final proposals for our market analysis and remedies on 23 February 2018, as required under Article 7 of the Framework Directive. The Commission issued a request for information on 5 March, to which we responded on 8 March.

2.48 We received the Commission decision providing no comments on our notification in accordance with Article 7(3) of the Framework Directive on 23 March 2018.[40]

## Impact Assessment and Equality Impact Assessment

2.49 The analysis presented in the March and September 2017 QoS consultations constitutes an impact assessment as defined in section 7 of the Communications Act 2003 (the Act).

2.50 Impact assessments provide a valuable way of assessing the options for regulation and showing why the chosen option was preferred. They form part of best practice policy-making. This is reflected in section 7 of the Act, which means that, generally, we have to carry out impact assessments in cases where our conclusions would be likely to have a significant effect on businesses or the general public, or where there is a major change in Ofcom's activities. However, as a matter of policy Ofcom is committed to carrying out impact assessments in relation to the great majority of our policy decisions.[41]

2.51 Ofcom is required by statute to assess the potential impact of all our functions, policies, projects and practices on race, disability and gender equality. Equality Impact Assessments (EIAs) also assist us in making sure that we are meeting our principle duty of furthering the interests of citizens and consumers regardless of their background or identity. Annex 8 of the 2017 NMR Statement and Annex 3 of the 2018 WLA Statement set out our EIAs in relation to our remedies.

## Structure of this statement

2.52 This statement begins by outlining our approach to QoS remedies (Section 3), which describes how we have identified the scope of our regulation and the analytical approach we have taken in reaching our decisions. We then provide:

[40] The Commission's letter is published here: https://www.ofcom.org.uk/consultations-and-statements/category-1/wholesale-local-access-market-review.
[41] For further information, see Ofcom, 2005. *Better Policy Making: Ofcom's approach to Impact Assessment*. https://www.ofcom.org.uk/__data/assets/pdf_file/0026/57194/better_policy_making.pdf.

- an overview of market developments and our decisions in relation to fault rates (Section 4);
- decisions for regulating BT's service performance for repairs (Sections 5 and 6);
- decisions for regulating BT's service performance for installations (Section 7);
- decisions relating to SLGs (Section 8)
- transparency obligations we have decided to impose (Section 9);
- our analysis of the costs of the quality standards we are imposing (Section 10); and
- our conclusions on remedies and legal tests (Section 11).

2.53 In addition, throughout this document we rely on information presented in the following Annexes:

- we provide a detailed review of Openreach service performance (Annex 1);
- we set out our decisions for forecast fault rates (Annex 2); and
- we describe our approach to estimating the impact on Openreach resources of requiring higher service standards (Annex 3).

2.54 The Directions setting out the specific requirements that we are imposing on BT are included in Annex 4.

2.55 We have developed, in collaboration with our external advisors Analysys Mason, a Resource Performance Model that estimates the installation and repair performance for a given size of field engineering force and installation and repair workload. This model is available on request. Further details of the model and the computing environment required to run it may be found in Annex 3.

# 3. Approach to regulating quality of service

3.1 In this section, we explain why it is necessary to regulate Openreach's quality of service for wholesale fixed voice and broadband services. We then outline our approach to regulating quality, which is reflected in the remaining sections of this document.

3.2 Below we set out our considerations on each of these aspects, detailing our proposals in the March 2017 QoS Consultation and September 2017 QoS Further Consultation, stakeholder responses and our further analysis and conclusions.

## Summary of our decisions

3.3 Having taken account of stakeholders' responses, we have decided:

- to use quality standards as our main tool for regulating Openreach's quality of service, alongside other measures including SLAs, SLGs, and transparency obligations;
- to apply quality standards to installation and repair times of WLR, MPF and GEA-FTTC services; and
- in setting the level of the quality standards, to take into account the following considerations: (i) impact on customers and competition, with a focus on providing certainty; (ii) Openreach's operational capabilities; and (iii) costs to customers and the telecoms providers who consume Openreach's wholesale services.

## The need to regulate for quality of service

### Our proposals

3.4 We have found that BT has Significant Market Power (SMP) in the wholesale fixed and local access markets (WFAEL and WLA). One of the consequences of this is that, absent regulation, it may not provide the quality of service that customers require. Inadequate Openreach quality of service can also undermine the effective functioning of the network access remedy due to the negative impacts on retail competition. Therefore, in our March and September consultations we considered that regulation is needed to deliver the quality of service customers require and ensure that the network access remedy facilitates effective downstream competition.

### Stakeholder responses

3.5 TalkTalk supported our proposal to regulate Openreach's quality of service performance.[42]

[42] TalkTalk response to the March 2017 QoS Consultation, paragraphs 2.0 to 2.6. https://www.ofcom.org.uk/__data/assets/pdf_file/0015/105117/TalkTalk.pdf.

3.6 Sky and Verizon considered that there had been little meaningful improvement in Openreach's quality of service since the 2014 FAMR. They argued that significant improvements are required.[43][44]

3.7 Vodafone argued that mechanisms to improve Openreach's quality of service, will need "to continue for a full decade before good practice becomes common place". Vodafone further argued that Openreach's failure to invest in its network means that only incremental improvements have been achieved over the past control period, with Openreach meeting the standards rather than demonstrating any appetite to exceed them.[45]

3.8 Verizon suggested that Ofcom should continually look at quality of service for other new and existing BT products. It noted that consumers' and telecoms providers' expectations are high and BT must deliver.[46]

3.9 Openreach considered that we should place more emphasis on the impact telecoms providers have on their customers and on Openreach. It argued that telecoms providers need to invest in key areas to deliver improvements, and that to incentivise this, Ofcom should set quality standards for telecoms providers. These should be adhered to in the provision and repair of services, using the latest diagnostic capabilities, the existing network for provision and the adoption of best practice processes.[47]

## Our considerations and decisions

3.10 In our 2016 Strategic Review, we set out our strategy to encourage the growth of competing full-fibre networks in order to reduce the reliance on BT for the provision of wholesale services. In competitive markets the ability of customers to switch providers creates a signal for operators to choose a cost-quality trade-off that will suit telecoms providers and their customers. In the medium term we expect the development of such networks to spur innovation and provide the incentives for all operators to deliver high quality services.

3.11 We recognise that the development of competing networks will take time, and in our 2017 NMR Statement and 2018 WLA Statement we have found that BT has SMP in the wholesale fixed access markets. This means that it is unlikely to receive market signals from switching, and lacks incentives to innovate and deliver the quality of service customers require. In addition, there is the potential for discrimination if Openreach were to provide BT's downstream divisions with better quality of service than it provides to other (non-BT Group) telecoms providers. In those reviews we have decided that it is necessary to regulate access to BT's network to address the potential problems arising from SMP. The

[43] Sky response to the March 2017 QoS Consultation, paragraphs 112 to 116. https://www.ofcom.org.uk/__data/assets/pdf_file/0014/105116/Sky.pdf.
[44] Verizon response to the March 2017 QoS Consultation, paragraph 7. https://www.ofcom.org.uk/__data/assets/pdf_file/0017/105119/Verizon.pdf.
[45] Vodafone response to the March 2017 QoS Consultation, paragraphs 15.1 to 15.3. https://www.ofcom.org.uk/__data/assets/pdf_file/0010/105121/Vodafone.pdf.
[46] Verizon response to the March 2017 QoS Consultation, paragraph 9.
[47] Openreach response to the March 2017 QoS Consultation, paragraph 78. https://www.ofcom.org.uk/__data/assets/pdf_file/0013/105115/Openreach.pdf.

measures we impose include requiring BT to provide access to its network to other telecoms providers, and setting standards for the quality of service it provides.

3.12 As set out in our March 2017 QoS Consultation and September 2017 QoS Further Consultation, the negative effects on customers of inadequate quality of service delivered by Openreach could include a greater number of faults, slow resolution of those faults and frustration resulting from long delays to the installation of fixed broadband and voice services.

3.13 Inadequate Openreach quality of service also has the potential to undermine the effective functioning of the network access remedy due to the negative impacts on retail competition by, among other things, affecting switching behaviour. For example, long or uncertain waiting times for a installation or repair may discourage switching with consequent implications for retail competition. Therefore we consider that regulation of quality of service is needed to deliver the quality customers require and ensure that the network access remedy facilitates effective downstream competition.

3.14 In 2014 we set quality standards for Openreach for the first time, as we recognised that transparency measures and the existing regime of service commitments and penalty payments (SLAs/SLGs) alone were not enough to ensure that Openreach's QoS performance met the needs of industry and consumers.

3.15 Since 2014, Openreach's quality of service has met the regulatory standards, resulting in a steady improvement and stabilisation in performance for voice and broadband services. However, this performance does not suggest Openreach would continue to improve absent such regulation, particularly in relation to the repair standard for which the standards have acted as a 'service floor' (see Section 6).[48] In our view the approach of imposing quality standards has therefore been effective, and needs to be extended to accommodate rising customer needs and the widespread take up of new services such as superfast broadband (as described below).

3.16 We recognise Openreach's concern that the telecoms providers that buy its wholesale services also have a role to play in ensuring that consumers experience satisfactory quality of service. We have taken steps to improve the incentives for telecoms providers to provide high quality of service. For example, we have published information comparing the service quality of telecoms providers to help consumers be better informed, and we seek to ensure that the switching process is as easy as possible, so that there is vigorous competition between telecoms providers. The first 'Comparing Service Quality' report was well received by industry and consumer stakeholders, and its breadth and impact are likely to increase in the future. We consider the Digital Economy Act provides scope to require telecoms providers to hold comparable data, which we hope will increase the value of the report in the future.

3.17 We also believe that consumers should be adequately compensated when telecoms providers do not provide adequate quality of service. The voluntary agreements by industry to implement automatic compensation mean that telecoms providers will have a

[48] 2017 NMR Statement, Section 10 and 2018 WLA Statement, Section 7.

stronger direct incentive to improve their quality of service in the future, particularly where their equipment or services are the cause of service loss.

3.18 However, because telecoms providers do not have SMP in the WFAEL and WLA markets, we cannot set standards through SMP conditions as we do for Openreach. Customers can choose between telecoms providers, and there is greater scope to switch provider if they are dissatisfied with the level of service quality they experience than is the case with telecoms providers buying Openeach's wholesale services.

# Tools for regulating Openreach quality of service

## Our proposals

3.19 We proposed to continue using three tools to encourage Openreach to provide an appropriate level of quality of service. These are transparency measures, SLAs/SLGs and quality standards. Transparency measures, such as KPIs, make it easier to identify discrimination and monitor compliance with the standards. They can also help us to identify emerging issues during the review period. SLGs ensure that telecoms providers receive compensation for individual Openreach failures, while quality standards provide a higher degree of certainty over the aggregate level of service that Openreach will achieve. Given that Openreach has not performed significantly beyond the quality standards set in 2014 in relation to repair in particular, and given the importance we attach to certainty in providing quality services, we proposed to use quality standards as our primary tool for improving Openreach quality of service.

## Stakeholder responses

3.20 Verizon, TalkTalk, UKCTA and Openreach supported our proposal to continue the combined use of the three tools (transparency, SLAs/SLGs SMP conditions and quality standards) to improve Openreach's quality of service.[49] Verizon suggested that standards would only be effective with monitoring, oversight, enforcement and SLAs/SLGs.[50] BT Group supported Ofcom's approach to improving Openreach's quality of service through service standards (and allowing for funding through appropriately set charge controls).[51]

3.21 Openreach said that it was disappointed with the emphasis in the March 2017 QoS Consultation regarding the risk of it failing to deliver beyond the standards. It said that it did not regard the quality standards as a ceiling and provided examples of when it had exceeded standards.[52] Openreach outlined measures that it had taken to improve quality of

[49] Verizon response to the March 2017 QoS Consultation, paragraph 8; TalkTalk response to the March 2017 QoS Consultation, paragraph 2.5; UKCTA response to the March 2017 QoS Consultation, paragraph 4. https://www.ofcom.org.uk/__data/assets/pdf_file/0016/105118/UKCTA.pdf; Openreach response to the March 2017 QoS Consultation, paragraph 70.
[50] Verizon response to the March 2017 QoS Consultation, paragraph 8.
[51] BT Group response to the March 2017 QoS Consultation, paragraph 2.54. https://www.ofcom.org.uk/__data/assets/pdf_file/0010/105112/BT.pdf.
[52] Openreach response to the March 2017 QoS Consultation, paragraph 79.

service, including its Better Service, Broader Coverage and Faster Speeds programme, which it said are improving service levels.[53]

## Our considerations and decisions

3.22 We have decided to maintain the approach of using three tools to encourage Openreach to provide an appropriate level of quality of service: transparency measures, SLAs/SLGs and regulatory quality standards. Below, we set out our approach to using each of these tools in the market review period.

### Transparency measures

3.23 As set out in our 2018 WLA Statement, as a vertically integrated operator, BT has the ability and incentive (absent effective regulation) to favour its own retail businesses by offering better terms which would give it a competitive advantage over other telecoms providers and have a material adverse effect on competition. This discrimination could take the form of variations in quality of service, for example Openreach could repair faults for BT Consumer more quickly than for external telecoms providers. Transparency measures, such as the obligation to disclose detailed KPIs, can help ensure that network access is provided on non-discriminatory terms by making it easier to identify such discrimination.

3.24 The disclosure of detailed KPI data to Ofcom also allows us to monitor important aspects of Openreach's service closely and observe trends in performance over time. This means we can assess performance for the services and quality aspects that will be subject to the quality standards, which are discussed below. We can also monitor performance for services and quality aspects outside the scope of the quality standards, encouraging Openreach to focus on delivering high quality on a wide range of features (not only those covered by standards). This means we can detect potential concerns early and react quickly by, for example, using direction making powers to set additional regulation.

3.25 In the 2014 FAMR, we required Openreach to provide Ofcom with specified KPIs and to publicly disclose a subset of those that are not considered commercially sensitive and/or confidential to Openreach. The reporting of KPIs to Ofcom helps avoid differences in service quality between providers that rely on the same Openreach wholesale services. Public disclosure also helps provide transparency by allowing all interested parties to understand the underlying service that telecoms providers are receiving.

3.26 While KPIs can be used to resolve information asymmetries and to observe trends in performance, on their own they are unlikely to be sufficient to prevent a dominant operator from exploiting its SMP by, for example, providing inadequate quality of service. Therefore, we also consider other regulatory measures are also necessary.

### SLAs and SLGs

3.27 SLAs set out Openreach's commitment to provide services to an agreed quality, for example the target time to undertake a repair or installation. SLGs specify the level of

[53] Openreach response to the March 2017 QoS Consultation, paragraphs 73 to 74.

compensation that the telecoms provider would be entitled to should the service not be provided to the quality specified in the SLA, for example if delivery of the service was late. They are intended to reflect a pre-estimate of the average costs to a telecoms provider of breaches of the quality obligations specified in the SLAs.

3.28 We require Openreach to provide SLAs and SLGs against specific service characteristics for WLR, MPF and GEA in the relevant Reference Offers (as set out in the 2018 WLA Statement[54] and 2017 NMR Statement[55]). The terms of the SLAs and level of SLGs are subject to industry negotiation, as set out in Section 8, but can be influenced by regulation.

Compensation caps

3.29 In this review, we have re-considered our policy in relation to whether compensation payable under BT's contracts for providing regulated wholesale network access services should be capped. In this section we set out our approach to considering the removal of compensation caps, with detailed consideration of stakeholder views and our analysis and decisions set out in Section 8.

3.30 We previously considered this question in some detail in 2008 when we looked at whether Openreach SLAs and SLGs were set appropriately to ensure that Openreach has the incentive to install and repair services promptly.[56] The commercial practice for suppliers to limit their exposure by capping the amount of compensation that they would contractually be obliged to pay in the event of service failure is common. However, some commercial contracts include open-ended arrangements (for example where the practical risk of accruing large liabilities is relatively low and readily manageable by the supplier). We have approached the issue of capping compensation in different ways in the past and maintain the conclusion we reached in 2008, that it is not appropriate to adopt a general principle about the appropriateness of compensation caps but to consider the particular circumstances of each case.

3.31 In this review of the key wholesale services, which underpin the mass market supply of fixed voice and broadband services, we consider that the justification for retaining caps on compensation is weak. The incentives for Openreach to install or repair services diminish once the cap is reached, leaving a small but still significant number of customers vulnerable to very long delays. The fact that compensation ceases once the cap is reached is also unlikely to reflect telecoms providers' losses accurately, which might be expected to continue increasing until the service failure is rectified. For these reasons, and the further consideration given to this issue in Section 8, we have decided to remove SLG compensation caps.

[54] 2018 WLA Statement, Volume 1, Section 6.
[55] 2017 NMR Statement, Section 8.
[56] Ofcom, 2008. *Service level guarantees: incentivising performance – Statement and Directions*. https://www.ofcom.org.uk/__data/assets/pdf_file/0020/33617/statement.pdf.

Retail automatic compensation

3.32 Prior to 2014, we relied on SLAs and SLGs (in addition to the regulatory obligations of transparency measures and 'Equivalence of Inputs' (EOI)) to ensure Openreach provided adequate quality of service. However, in the 2014 FAMR we decided that these measures on their own did not provide Openreach with sufficient incentives to maintain adequate levels of quality. We said that, given the cost of maintaining a workforce to meet reasonable contingency levels, it was not apparent that SLG payments could be set at a level that would, on their own, ensure appropriate service standards.[57]

3.33 In the coming review period, telecoms providers will introduce automatic compensation for customers that experience service failures associated with broadband and voice installation and repairs (automatic compensation). We expect that, in due course, Openreach's SLGs will also need to cover the costs to telecoms providers of paying higher compensation due to Openreach network failures.

3.34 Automatic compensation could influence Openreach's incentives to provide better quality for two reasons. First, if SLG payments increase then the financial penalties to Openreach of not meeting its SLAs will be higher. In addition, BT Group level incentives to provide high-quality service should increase, as low quality on the Openreach network would feed through to automatic compensation being paid by BT's retail divisions.

3.35 At this stage, there is some uncertainty associated with the impact of automatic compensation on SLGs, given that the scheme has a 15-month implementation period[58] and the detailed terms will subject to an OTA2 led negotiation process. However, for the purpose of setting the charge control we have estimated the impact of automatic compensation on SLGs and have included it in our forecast of efficient costs during the review period. Annex 13 of the 2018 WLA Statement details our approach to estimating SLG costs.[59]

## Quality standards

3.36 Whereas SLGs oblige Openreach to pay compensation to telecoms providers at the individual activity level (for example, for each repair or installation where Openreach has not met the SLA), quality standards apply to Openreach's performance at the aggregate level over a defined period with the aim of ensuring that quality is maintained at a sufficient level to prevent material detriment to competition and customers.

3.37 In the 2014 FAMR Statement, we concluded that such standards were necessary to bring about improvements in Openreach's quality of service to safeguard against the network access remedy being undermined. Openreach risked exposure to significant financial penalties and reputational damage if it failed to meet the standards. As described above, in the period 2014 to 2017 these have been effective in stabilising Openreach's quality

[57] 2014 FAMR Statement, Volume 1, paragraphs 11.32 to 36.
[58] 2017 Automatic Compensation Statement, paragraph 1.10.
[59] In practice SLG costs are affected by multiple factors, for example while automatic compensation will increase Openreach payments, improved reliability and the impact of the higher standards we are imposing will reduce the frequency with which SLGs are paid.

performance. However, we also anticipated that Openreach would significantly exceed the standards, but in the case of repairs, this did not happen.

3.38 We welcome Openreach's current initiatives aimed at delivering better consumer outcomes and acknowledge that it has exceeded the standards set in 2014 in certain instances. For example, Openreach has consistently exceeded the on time installations standards for WLR and MPF services over the last few years (see Annex 1, Figure A1.12). However, the cases where Openreach has materially exceeded standards are the exception rather than the rule. For instance, FTTC has not been performing to the same level as WLR and MPF SMLs 1 and 2 for the past year (see Annex 1, Figure A1.55 compared to Figure A1.54). Moreover, Openreach's repairs performance was significantly lower before the 2014 standards were introduced, especially in 2012-13 for WLR, MPF and SMPF.

3.39 We believe that quality standards are needed because SLGs and transparency measures on their own have proved to have a limited effect in providing Openreach with incentives to deliver good performance. Openreach has limited incentives to perform over the level of the standard set, and although it outperforms some of the standards, our experience on repair indicates that Openreach can treat the standard as a target for performance, rather than a "floor" that is met in all cases and significantly exceeded in many. This means that unless we increase standards, based on previous performance, we consider Openreach is unlikely to improve its quality of service to a level that meets the rising needs of telecoms providers and consumers. As discussed above, our automatic compensation regime may increase Openreach's incentives to outperform the standards in the longer term, but there is still uncertainty about this.

3.40 A further benefit of quality standards is that if they are set at a sufficiently demanding level they give telecoms providers certainty about the level of quality they can expect from Openreach. This contrasts with the SLA/SLG regime, which provides compensation if a specific installation or repair is not dealt with in a timely manner, but gives little assurance to telecoms providers over what will actually be achieved on average. We believe that certainty over the speed of repairs and installations plays an important role in the functioning of retail competition. It allows telecoms providers to plan their strategies for delivering retail services and to differentiate their services effectively. We consider the role of certainty further when we consider the appropriate level of standards below.

### Conclusion on tools to regulate Openreach quality of service

3.41 Transparency measures, SLAs/SLGs and quality standards serve different purposes but work in a complementary way. Quality standards provide a high degree of certainty over the aggregate level of service Openreach will achieve, and have proven effective at raising standards. Transparency measures including KPIs help us monitor compliance with these standards, and SLGs will provide compensation for individual Openreach service failures.

3.42 However, given that Openreach has not performed significantly beyond the quality standards we set in 2014 in relation to repair and, given the importance we attach to certainty in providing quality, we have decided to place more weight on the role of standards in considering the balance between standards and other regulatory measures.

3.43 We will therefore use quality standards as our primary tool for driving Openreach performance improvement.

# Services covered by the standards

## Our proposals

3.44 We proposed that quality standards should apply to GEA-FTTC services as well as to WLR and MPF services. This reflected the fact that GEA has now developed into a mass market service, and is therefore likely to have an important impact on the customer experience and the functioning of retail competition.

## Stakeholder responses

3.45 Sky, TalkTalk, Vodafone and Openreach supported Ofcom's proposal to extend quality standards to GEA-FTTC for the first time[60], with Vodafone further arguing that quality standards should extend to FTTP, as well as WLR, MPF and FTTC.[61]

3.46 [✂] proposed that SMPF services should be included in quality of service remedies for repair and provision of WLA products.[62] [✂] said that they would welcome a standardisation of quality of service across all Openreach products.[63]

## Our considerations and decisions

3.47 In the 2014 FAMR we applied quality standards to WLR and MPF services, but did not apply them to Openreach's GEA-FTTC services. This was mainly because WLR and MPF services had been the focus of the concerns raised at the time and, because these copper-only based services were the highest volume services, we concluded that they were likely to have the greatest impact on competition and customers.

3.48 GEA-FTTC has now developed into a mass market service. The total number of GEA-FTTC lines is now 9.1m (up from 3.23m at the start of the 2014 FAMR reporting period), and we understand that the installation and maintenance of these lines will be a key driver of engineering resource for Openreach over the next review period. Therefore, the quality of service delivered by Openreach for GEA services is now likely to have a significantly greater impact on the customer experience and will play an important role in the functioning of retail competition.

3.49 GEA is currently available in two variants: FTTC and FTTP. The majority of GEA lines are FTTC, with about 2% of GEA lines using FTTP at the end of 2017. Given the low volumes of FTTP, we have decided to only apply QoS standards to the FTTC variant of GEA. Furthermore, it is not yet clear whether the same standards would apply for FTTP in

[60] Sky response to the March 2017 QoS Consultation, paragraph 117; TalkTalk response to the March 2017 QoS Consultation, paragraph 2.6; Openreach response to the March 2017 QoS Consultation, paragraph 70.
[61] Vodafone Annex response to the March 2017 QoS Consultation, page 39. https://www.ofcom.org.uk/__data/assets/pdf_file/0009/105120/Vodafone-annex-1-Legal-Instruments.pdf.
[62] [✂]
[63] [✂]

relation to both installation and repair times due to the different technology used for these services. Due to these concerns we do not think it is appropriate at this stage to apply quality of service standards to FTTP services. However, we will continue to monitor FTTP performance with KPIs, and will use our direction making powers to intervene if we consider it necessary.

3.50 We have therefore decided that the quality standards for the next three years should apply to GEA-FTTC services as well as to WLR and MPF services. We consider that these obligations are consistent with our legal duties, noting that WLR, MPF and GEA-FTTC are key services supporting network access.

3.51 [✂] proposed that we apply quality standards to SMPF services. We do not consider this would be appropriate given the forecasted consumption of SMPF lines is low, and as it would be inconsistent with our approach of progressively deregulating this product.[64]

## Features covered by the standards

### Our proposals

3.52 The loss of service when a fault occurs has the potential to cause considerable harm to customers and telecoms providers' businesses. Faults can have a significant impact on consumers and competition, and this harm is a function both of the fault rate and time taken to rectify the issue. We proposed to continue to set standards on repair times, as our research suggests that they have proven effective in raising Openreach's performance on repair times and are easily measurable. We also proposed to continue to set standards on the timeliness of installations. However, we proposed not to impose a further standard specifically on fault rates, as we believed that the standards for repairs, and the inclusion of the effect of Openreach's planned investment in Fault Volume Reduction (FVR) in the charge control, will provide a strong incentive for Openreach to reduce the overall level of faults in the absence of a specific standard. We also identified a number of practical challenges to applying an effective standard on fault rates.

### Stakeholder responses

3.53 Stakeholders were largely in favour of our proposals to implement a minimum standard on repair times and installations.[65] However, regarding installations, Vodafone suggested that engineer availability should be subject to QoS targets, since missed or delayed engineer appointments directly impact on a telecoms providers' ability to provide a good quality of service.[66] Vodafone also said that it, "would be useful to further scrutinise the correlation

[64] Our approach to de-regulating SMPF services is covered in further detail in the 2018 WLA Statement, in Section 6 on Specific Access Remedies.
[65] See Sections 6 and 7 for further details.
[66] Vodafone Annex response to the March 2017 QoS Consultation, page 39.

between appointments being (1) available, (2) attended and (3) installed right first time with the attainment objective to install a service on time."[67]

3.54 Some stakeholders expressed concerns that we did not propose to introduce a quality standard for fault rates. Sky and Verizon were both of the view that Openreach has significantly underinvested in its network, which had led to high fault rates[68], that in turn has a significant impact on consumers and other telecoms providers.[69]

3.55 Stakeholders were concerned that fault rates cause reputational risk, and made it difficult for retail competitors to manage customer expectations.[70] For this reason, they argued that a standard on faults is needed because of the impact of faults on competition. Sky argued that high fault rates benefit BT Consumer as it has the largest retail customer base, and therefore benefits from reduced switching brought about by poor quality of service.[71]

3.56 Several stakeholders considered that more needed to be done to improve the fault rate. Vodafone noted that Ofcom had identified that consumers remain dissatisfied with the level of service provided, and continue to look to BT to take substantial steps to ramp up its plans to improve fault resolution.[72] TalkTalk noted that the best customer experience is through not having a fault at all, rather than one that is repaired quickly, making it logical to have a specific fault rate standard.[73] It stated that Openreach cannot be relied upon to prioritise better quality by reducing faults without specific regulation.[74]

3.57 Responses were varied as to whether a higher repair standard would sufficiently incentivise fault reduction. Sky said that Ofcom's proposed minimum service levels for provisioning and repair would not be stretching enough to drive down fault rates.[75] TalkTalk argued that setting higher quality standards for repair times might encourage lower fault levels to some degree, but that evidence in the 2017 WLA Consultation suggests that the repair time standards has a weak impact on fault levels.[76] Conversely, Openreach argued that disproportionately demanding standards may force them to sacrifice their FVR programme.[77]

3.58 TalkTalk further stressed that charge controls alone would not be enough to incentivise Openreach to deliver on its FVR programme, arguing that the assumptions that Ofcom uses to set prices do not affect the incentives that BT has once that price is set, and that a

[67] Vodafone response to the March 2017 QoS Consultation, page 58.
[68] Sky response to the March 2017 QoS Consultation, paragraph A6.4.
[69] Verizon response to the March 2017 QoS Consultation, paragraph 11.
[70] Verizon response to the March 2017 QoS Consultation, paragraph 11; Sky response to the September 2017 Consultation, paragraph A6.1.
[71] Sky response to the March 2017 QoS Consultation, paragraph A6.5.
[72] Vodafone response to the March 2017 QoS Consultation, page 53.
[73] TalkTalk response to the March 2017 QoS Consultation, paragraph 3.1.
[74] TalkTalk response to the March 2017 QoS Consultation, paragraph 3.1.
[75] Sky response to the March 2017 QoS Consultation, paragraph 118.
[76] TalkTalk response to the March 2017 QoS Consultation, paragraph 3.1.
[77] Openreach response to the March 2017 Consultation, paragraph 80.

quality standard regulation on fault rates is necessary to ensure Openreach follows through. [78]

3.59 Sky was concerned that we did not explain what would trigger Ofcom to direct an improvement in fault rates and that any such action would be too slow to prevent the consumer harm caused by elevated fault rates.[79]

3.60 Some stakeholders suggested that we should apply standards to other features, such as particular types of faults and engineer availability. For instance, Sky commented that our proposed standards do not address the underlying cause of the faults that cause the most harm to consumers and competition (repeat faults, dead on arrivals or 'DoAs' and early life failures or 'ELFs').[80] It considered that Ofcom should introduce new standards for these types of faults, or that we amend the current standards by incorporating specific allowances for DoAs and ELFs.[81] On the subject of repeat faults, an individual argued that we should introduce a penalty arrangement for frequent faults to encourage Openreach to get to the root of the problem rather than just applying a quick fix. He suggested that more than two faults per annum is unsatisfactory and that there should be some rather sharp increase in penalties for further faults.[82]

3.61 Regarding the technical difficulties around introducing a fault rate, Verizon agreed with us that a specific fault rate measure is hard to achieve. It encouraged Ofcom to be more bold and innovative in trying to encourage Openreach to invest in its network and suggested that we consider a review of Openreach's fault reduction initiatives.[83] Meanwhile, TalkTalk disagreed with our reasoning on the implementation barriers to introducing a quality standard on fault rates. TalkTalk considered it unnecessary to assess Openreach's investment, as Ofcom could make assumptions based on trends, and draw information from Openreach's plans. Furthermore, it argued that we could measure Openreach's performance using the SIN349 tests, and address issues like weather through setting a long compliance period and considering exceptions.[84]

## Our considerations and decisions

### Impact of delayed repairs and faults

3.62 As highlighted in several Ofcom studies, broadband services are increasingly viewed as a necessity by consumers and businesses. For instance, the 2016 Jigsaw focus group research found that many consumers and businesses view broadband as central to their home and work lives. This is further illustrated by a separate Jigsaw survey conducted in 2017 which found that 66% of residential consumers believe their households would struggle to

[78] TalkTalk response to the March 2017 Consultation, paragraphs 2.2 to 2.6.
[79] Sky response to the March 2017 QoS Consultation, paragraph 121.
[80] Sky response to the March 2017 QoS Consultation, paragraphs 118 to 119.
[81] Sky response to the March 2017 QoS Consultation, paragraph 122.
[82] Individual response to the March 2017 QoS Consultation.
https://www.ofcom.org.uk/__data/assets/pdf_file/0012/105114/Isherwood,-Mr-M..pdf.
[83] Verizon response to the March 2017 QoS Consultation, paragraph 12.
[84] TalkTalk response to the March 2017 QoS Consultation, paragraph 3.2.

function without broadband and another 23% stating that they could only function without it for a limited period.[85]

3.63 This suggests the loss of service when a fault occurs and is ongoing has the potential to cause considerable harm. For customers, there can be a range of harmful effects that differ depending on the precise nature of a fault. The possible types of harm are detailed in our statement on retail automatic compensation and include:[86]

- Denied use of a communication service;
- Wasted or impaired time;
- Disruption in a customer's activity schedule;
- Time and effort spent to rectify the failure; and
- Stress and anxiety.

3.64 In our statement on automatic compensation, telecoms providers (BT, Sky, TalkTalk, Virgin Media and Zen Internet) put forward a scheme that would, amongst other things, compensate customers with £8 per day for loss of service caused by either Openreach or the telecoms provider.[87] We concluded that the scheme met our requirements for a fair and effective automatic compensation scheme.

3.65 Unresolved faults can also lead to harm due to the impact on telecoms providers' businesses. This harm can include the costs to telecoms providers of liaising with and compensating customers when a fault occurs. In addition, faults have the potential to undermine a telecoms provider's brand image and reputation for reliability. Telecoms providers have highlighted the key role of reliability in meeting their customers' expectations. For example, BT Consumer has carried out research which suggests customers expect broadband/ internet services that 'always work'.[88] In addition, Sky considers that reliability and service are key needs and pain points that affect customers' brand choice.[89]

3.66 Such harm may result from faults on the Openreach network, as well as from faults on the telecoms providers' own networks. Some customers may incorrectly attribute Openreach service issues to telecoms providers because the delineation between the responsibilities of telecoms providers and Openreach may not be obvious.

3.67 Openreach network faults also have the potential to harm retail competition due to their effects on switching. As shown in the 2017 Jigsaw survey (slides 18 and 76), when choosing a broadband provider, reliability was the third most important factor for residential

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[85] Jigsaw Research, 2016. *Quality of Service in telecoms: Residential consumer and SME experiences of quality of service in fixed line, broadband and mobile telecoms*, page 13. https://www.ofcom.org.uk/__data/assets/pdf_file/0025/78370/jigsaw_quality_of_service_in_telecoms.pdf and Jigsaw Research, 2017. *Automatic compensation: Consumer experience of provisioning delays, loss of service and missed appointments: Presentation of quantitative findings*, Slide 16. https://www.ofcom.org.uk/__data/assets/pdf_file/0026/98711/automatic-compensation-jigsaw-report.pdf.

[86] Ofcom, 2017. Automatic Compensation Statement, Section 4.

[87] Ofcom, 2017. Automatic Compensation Statement, paragraph 1.7, page 2.

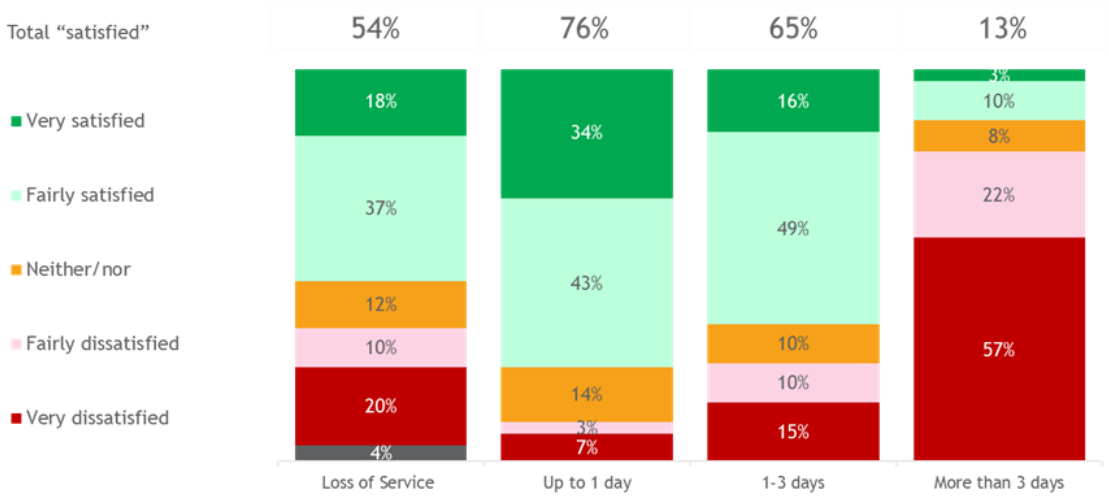
[88] BT Group presentation received by Ofcom on 16 November 2015, "Customer Demand and our Fibre Strategy – GPLC(14)68", Slide 11, received in Openreach response dated 16 November 2015 to 1st WBA s.135 notice.

[89] Sky presentation of 9th June 2016, "Ofcom QoS Meeting", Slide 4.

customers (after price and broadband speed) and was the second most important factor after price for small and medium sized enterprises (SMEs).[90] Harm to retail competition may occur if customers who have experienced an Openreach fault decide to switch based on the mistaken belief that the fault would not have occurred with another telecoms provider, i.e. it may lead to customers choosing the services that do not best meet their needs, and impose losses on telecoms providers over which they have no control.

3.68 The harm from faults is a function both of fault rate and the length of time taken to restore service (i.e. the repair time). This is supported by the 2017 Jigsaw survey which indicated that, although overall the majority (54%) of customers who had a loss of service were satisfied with their telecoms providers' ability to resolve the problem, dissatisfaction increased considerably as the length of time to restore service increased. This is shown in Figure 3.1 below, where around 10% of respondents said that they were dissatisfied with their service being restored up to one day after first notifying their provider. This figure rose to 79% when the service took more than three days after notifying the provider for it to be restored.[91]

**Figure 3.1 Satisfaction with provider ability to resolve loss of service, by how long it took for your service to be restored after first notifying the provider**




*Source: Jigsaw* [92]

3.69 The survey evidence indicates that there is some willingness to pay for faster repair times than the times that are currently being provided. The 2017 Jigsaw survey found that 44% of residential customers said they were willing to pay a one-off payment of £5 to have service restored in one day instead of two days.[93] However, the evidence also suggests a broad range of preferences among customers, with some customers being willing to accept a

[90] https://www.ofcom.org.uk/__data/assets/pdf_file/0026/98711/automatic-compensation-jigsaw-report.pdf.
[91] These findings are consistent with the 2016 Jigsaw focus group research which found that how long it takes to resolve QoS issues has a major bearing on customers' overall perceptions of the experience (2016 Jigsaw Research, Section 4.2).
[92] 2017 Jigsaw Research, Slide 36. F6 Overall, how satisfied or dissatisfied were you with the length of time it took your provider to resolve your loss of service for your (service), using the following scale? The 4% under loss of service refers to those that have responded "don't know" or "not applicable".
[93] 2017 Jigsaw Research, Slide 124.

lower bill in return for a slower repair time. For example, the 2017 Jigsaw survey found that 50% of residential customers are willing to accept a repair within three days (instead of two days) for £5 off the next bill.[94]

### Installation issues and timescales

3.70 In terms of installations, issues such as prolonged lead times and missed or postponed engineer appointments have the potential to result in negative experiences for consumers. These range from annoyance due to delays to more serious emotional consequences and disruption when customers are left without working services and/or when they need to get directly involved in sorting out issues (for example, by contacting their telecoms provider to reschedule an engineer visit).[95]

3.71 Problems during the installation process can also have negative effects on telecoms providers and competition. For example, in response to our 2016 Strategic Review, telecoms providers highlighted the concern that lengthy Openreach installations can result in customers being reluctant to switch providers and consequently not purchasing services that best meet their needs. For example, Sky argued that lengthy installations can result in customers cancelling switches that are already in progress, choosing not to switch when informed of provisioning lead times, or being deterred from initiating a switch due to a previous bad experience.[96]

3.72 The 2017 Jigsaw survey (slide 121) indicates that most residential customers consider a wait of up to seven days for an installation appointment to be reasonable and a wait of ten days or more to be unacceptable.[97] These findings suggest that, when installations take ten days or more, dissatisfaction is higher and more customers may reconsider their switching decisions, for example abandoning their switch altogether or deciding to switch to another provider.

3.73 The consumer research we have conducted indicates that some customers would be willing to pay to receive a faster installation – the 2017 Jigsaw survey[98] found that 36% of customers would pay £5 more to receive an installation within ten days rather than within 12 days. However, as with repair times, other customers are more price sensitive with a similar proportion (41%) stating they would accept an installation within 14 days instead of 12 in return for £5 off their next bill.

### Conclusions on quality features subject to standards

3.74 We set out below why we are imposing standards on repair times and installations to improve Openreach's performance. Additionally, we assess the arguments raised by respondents around setting standards on fault rates and other service quality measures.

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[94] 2017 Jigsaw Research, Slide 124.
[95] 2016 Jigsaw Research, Section 5.1.
[96] Sky first response to 2016 Strategic Review, paragraphs 46 to 49. https://www.ofcom.org.uk/__data/assets/pdf_file/0024/52287/sky.pdf.
[97] 2017 Jigsaw Research. https://www.ofcom.org.uk/__data/assets/pdf_file/0026/98711/automatic-compensation-jigsaw-report.pdf
[98] 2017 Jigsaw Research, Slide 122.

Standard on repair times

3.75 The discussion above highlights the importance of repair times to customers and telecoms providers. Repair standards have proven effective in raising Openreach's performance on repair times. They also have the advantage of being easily measurable – it is clear to industry and to Ofcom what constitutes success and failure, and there are precedents to follow when assessing the costs to Openreach of increasing performance. Moreover, we believe that a standard on repair times is, in practice, likely to create an incentive for Openreach to avoid faults. We therefore consider it appropriate to continue to set a standard on repair times and we note that stakeholders agreed with our approach (see Section 6).

Standard on installations

3.76 We consider it appropriate to continue to set standards that support timely installations. In practice, this involves setting two sets of standards, the first on the availability of engineer appointments, for when an appointment between an Openreach engineer and the end customer is required to complete an installation (the First Available Appointment Date, or FAD, standard).

3.77 Second, it is important that Openreach delivers on its promised installation date. For this reason, we are also setting a standard on how often Openreach delivers installation on the agreed date (the delivery by CCD standard).

3.78 We note that setting these two standards effectively constrains Openreach engineer availability as they have to perform adequately in both making appointments available and ensuring that an engineer attends the appointment in order to meet such standards.

3.79 With regard to Vodafone's suggestion that we look at the correlation between "appointments being (1) available, (2) attended and (3) installed right first time", we agree with its overarching concern that working services are installed on time. However, we believe that the approach proposed in March and September to improve installation certainty and the availability of timely appointments, and to create the right incentives to reduce the occurance of faults (including DoAs), achieves this aim.

3.80 We note that stakeholders generally agreed with our approach (see Section 7). The evidence above suggests that customers' experience of the installation process is a key consideration when making switching decisions. Standards on installations can therefore help support the network access remedy by providing telecoms providers with the certainty they need to communicate effectively with their customers and provide services within timescales that meet their needs.

Fault prevention

3.81 As noted above and emphasised in stakeholder submissions, overall harm from faults is clearly a function of fault rate as well as repair time, so the fault rate is an important issue for consumers and competition as well as repair times.

3.82 Our starting point for considering whether to apply a standard on fault rates is to think about the effect of the standard on repair times. Given our competition concerns relating to network access, even with a control on fault rates, we would need regulation that protects customers from waiting for an excessive time for Openreach to repair faults when they do occur. We have considered whether an additional standard on fault rates is appropriate, or whether the repair time standard is sufficient.

3.83 We then consider the extent to which the inclusion of Openreach's FVR in the charge control will provide further incentive for Openreach to reduce its fault rates. We have also reviewed the practical challenges to applying an effective standard on fault rates. We consider each of these topics in turn below.

3.84 Meeting the standard for repair times requires Openreach to have sufficient resources to repair faults, even during peak times, within its agreed timescales. This creates a link between the resources that Openreach spends hiring engineers to fix faults and the cost of reducing the number of faults that occur on its network. In other words, there is an incentive on Openreach to reduce fault rates because it increases the likelihood it will meet and exceed repair standards and provides scope for cost savings. Therefore, increasing the standard for repair time should increase the incentive for Openreach to reduce its fault rates.

3.85 TalkTalk said that it is not apparent that Openreach had an incentive to reduce the number of faults that occur on its network during the last charge control period while standards on repair times were in place, given that fault rates did not in fact reduce. However, the standards on repair times imposed in this review are closer to Openreach's operational limit. This means that the incremental cost of repairing additional faults to a performance in line with the standards will increase over this review period absent improvements in fault rates. For example, assuming Openreach's repair costs increase by around 14% to meet the 88% standard implies that Openreach would benefit from an additional [✂] per annum savings from its FVR initiative (compared to an 80% repair standard).

**Table 3.2 Estimate of FVR cost savings at different repair standard levels in 2020/21**

| Repair standard | 80% | 88% |
|---|---|---|
| Cost per repair (£) | 119.49 | 136.34 |
| Annual repair costs (£m) | 361 | 411 |
| Repair costs with [✂]% (14% to 17%) FVR (£m) | [✂] | [✂] |
| Gross FVR cost saving[99] (£m) | [✂] | [✂] |

*Source: 2017 WLA charge control model*

*3.86* Indeed, we note that the anticipation of higher standards in the future may already have heightened Openreach's focus on fault prevention. We indicated in our 2016 Strategic Review that higher standards may be necessary, and subsequently Openreach initiated its 'network health' programme, which aims to reduce its annual fault rate of 11% by at least 10%, i.e. to less than 9.9%. In this regard, we note that in a 2016 BT Group Operating Committee paper it stated that the network health programme aimed to [✂] (see March 2017 QoS Consultation, Section 4 for further details).[100]

3.87 Openreach has now started implementing its FVR programme which aims to reduce the level of faults. We have analysed its plan, including the effect we expect to see on fault rates during the control period, and have included the reduced fault rate and savings due to reduced maintenance costs in our charge control. These charge control assumptions signal the level of fault reduction we expect Openreach to achieve over the review period and will act as a benchmark to determine whether Openreach has achieved these objectives. We also believe that Openreach will be motivated to invest in its network to reduce the number of faults, to ensure that its operational costs are at or below our forecast of costs used to set the charge control.

3.88 Some stakeholders have suggested that setting a charge control is not a sufficient incentive to ensure that Openreach delivers its fault reduction programme. We recognise the general point that the assumptions that we use to set price controls never guarantee that Openreach will behave as we forecast. However, we think that the higher repair standards, combined with the inclusion of the reduced fault rate in the charge control and our approach to taking the FVR plan as a benchmark, create a strong incentive for Openreach to continue its focus on network maintenance.

3.89 We have also considered the practical challenges to applying a control on faults, and the extent to which these impact on the effectiveness of a separate faults remedy. We recognise that fault rates in Openreach's network can be exacerbated by lack of investment, although we note that fault rates can also be impacted by factors outside of Openreach's control. For example, faults are more likely to occur during poor weather. This

[99] Gross FVR cost saving does not include FVR implementation costs. We have excluded these from this comparison as we have assumed FVR implementation costs would be the same regardless of the level of the repair standards.
[100] [✂] provided to Ofcom in Openreach response dated 16 September 2016 to the 4th QoS s.135 notice.

suggests that it might be necessary to set the levels of fault standards using wide ranges and potentially include a broad *force majeure* allowance.

3.90 In addition, when Openreach invests in preventative maintenance there can be a time delay between the point of investment and a reduction in faults, which can be of an uncertain duration. Taking account of this uncertainty could also require a fault standard that is conservative. This would be of particular concern to us considering that historically Openreach has seen repair standards as a target rather than a minimum, as mentioned earlier. These factors could limit the ability of such regulation to encourage Openreach to reduce faults to a satisfactory level.

3.91 Regarding measuring compliance with a fault standard, stakeholders have argued that we could measure Openreach's performance on fault rates using the SIN349 tests.[101] However, Openreach's remote line tests include factors broader than SIN349, and the Pair Quality Test at the customer's premises can also be used to determine whether there is a network fault. Furthermore, we expect Openreach testing and its customers' diagnostic capability to improve with further exploitation of service layer data (see Section 4). In contrast, for on time repair there is a clear delineation of Openreach's obligations once a fault has been detected. This is set out in the SLAs which have been used as the basis for standards since 2014.

3.92 Finally, as we discuss in Annex 2, determining the source of faults where services are carried on a common bearer (for example MPF + FTTC) requires an exercise of judgement. This uncertainty over whether a fault lies with a bearer service such as WLR or MPF, or the overlay service (for example GEA-FTTC) is relevant to the deployment of new, innovative services. The fault rates of mature services and in-life fault rates in general tend to be lower and more stable than the early life fault rates for new services. We have to balance carefully the benefits of a regulatory standard for fault rates for mature bearer services, against any potential for such a standard to discourage Openreach investment in new services, such as G.fast, which may have high fault rates in the early stages of their deployment, and be subject to the uncertainty of whether a fault lies with the overlay service or the bearer.

3.93 In the light of the reasons set out above, we have decided not to impose a standard on fault rates. This is because we do not currently think it is necessary or proportionate to do so in addition to the on time repair standards that we consider necessary to address the competition concerns relating to network access. We have taken into account that, partly due to proposed tightening of repair standards, Openreach has renewed its focus on fault prevention and is taking action to improve consumer outcomes in this regard.

3.94 Our decision in relation to fault rates was finely balanced, and we will review our approach in the future if Openreach fails to meet our expectations. The FVR programme provides us with a benchmark, which in the first instance gives us metrics as to whether Openreach is able to deliver on its promises.

[101] TalkTalk response to the March 2017 QoS Consultation, paragraph 3.2.

3.95 In relation to setting a 'trigger' to intervene specifically on fault rates as Sky suggested, we do not consider this appropriate at this stage. As noted above, insufficient incentive to reduce fault rates is not the only reason fault rates could increase. For example, service innovation can also have an impact on fault rates. Therefore, were we to observe trends in fault rates which concerned us, we would need first to consider whether that was indicative of lack of an appropriate incentive for the SMP provider, or some other cause, before intervening. We do not agree with Sky's argument that intervention would be too slow in such circumstances; our approach of providing for directions under SMP conditions allows reasonably prompt, but proportionate, intervention between market reviews.

3.96 We plan to monitor fault rates through KPIs during the Charge Control period and we have applied SMP conditions in this review that give us direction-making powers that would allow us to consult on new standards if it was appropriate.

Other quality of service measures

3.97 We recognise stakeholders' concerns that certain types of faults that cause early or repeated disruption (such as repeat faults, DoAs and ELFs) have the potential to cause different kinds of harm to competition and consumers compared to in-life faults, and we have considered Sky's comment that Ofcom should introduce a regulatory standard for DoAs and ELFs.

3.98 We have looked at the repeat fault rate, and have KPIs that monitor both in-tariff and out-of-tariff percentage of repeat faults (see Section 4 and Annex 1, A1.74). We have found that the fault rate is roughly stable and shows no discernable trend. Therefore, we do not consider there to be a problem with repeat faults that we need to address. If industry are concerned about the repeat fault rate, we would recommend that they raise it with the OTA2 in the first instance.

3.99 We have considered the evidence regarding DoAs and ELFs in detail in Annex 2, and have found that such faults are particularly high for FTTC services, for which telecoms providers are mostly choosing to install using a PCP-only[102] Openreach installation product. As described in Annex 2, we expect that improvements to installation outcomes for this product are possible and we therefore expect these types of faults to decrease for FTTC over the review period. We note that the OTA2 is overseeing industry discussions on DoAs and ELFs for GEA-FTTC, where these types of faults are notably high (see Annex 1, Figures A1.32 and A1.40) and we encourage this dialogue to continue.

3.100 The timeliness of repair of ELFs and DoAs is regulated through our repair standards, and the occurrence of this type of fault should be constrained by the cost of repair in a similar fashion to the overall fault rate (see above). Our preference is to avoid further complex regulation where possible. For example, it may not be appropriate to put in place measures that take account of all the different circumstances that can arise. Additionally, we are mindful that while Openreach has an important role to play, other telecoms providers are also important in relation to quality of service such as where industry and Openreach can

[102] Primary Cross Connection Point – A street cabinet (or equivalent facility) located between the customer's premises and BT's local serving exchanges, which serves as an intermediate point of aggregation for BT's copper network.

work together to improve installation procedures to improve installation outcomes, as appears to be the case for PCP-only installations. We therefore do not think it is appropriate to introduce a specific standard for DoA and ELF rates.

3.101 We have also considered Sky's suggestion that we augment the delivery by CCD standard by requiring the line to continue to be working over the subsequent 8 or 28 days as a way of constraining DoAs and ELFs by including them in the installation standard. However, the current CCD standard serves an important function in ensuring that Openreach delivers on its commitment to install by a given date. Given that DoAs and ELFs could be influenced by new product roll-out issues, or changes in industry procedures for installations, the inclusion of DoAs and ELFs in the delivery by CCD standard could reduce the effectiveness of that standard by making it more complex to monitor and subject to debate regarding the responsibility for achieving the standard. We therefore do not think that this approach is appropriate at this time.

3.102 We note above that missed appointments, for both installations and repairs can lead to poor customer experiences, and recognise Vodafone's suggestion that engineer availability should be subject to QoS targets. However, Openreach's performance regarding missed appointments is improving, as described in Annex 1. Since June 2016 the level of missed appointments for installations has been more consistent than it has previously, with WLR dropping considerably at the start of 2017 (see Annex 1, Figure A1.21). Correspondingly, the level of missed appointments for repairs has been consistently lower than it has been for the previous two years (see Annex 1, Figure A1.66). The disclosure of KPIs allows us to monitor Openreach's ongoing performance, and there is also currently a missed appointment SLG, which goes some way to incentivising Openreach to meet our standards on engineering appointments.[103]

3.103 Missed appointments for installations and repairs are also constrained by our existing standards. Regarding 'on time' installation delivery (delivery by CCD), failure to install on the agreed day due to a missed appointment would contribute to a failure of that standard. Similarly, a missed repair appointment could also contribute to failure of the repair standard.

3.104 Furthermore, we have recently accepted an industry agreement to introduce auto-compensation payment for missed appointments.[104] As well as directly compensating consumers for some of the detriment, we anticipate that this will make the SLG a stronger incentive. Therefore, we do not think that further regulation is required.

### Summary of scope of quality standards

3.105 Based on the above, we have decided that our quality standards should apply to repair and installations times of WLR, MPF and GEA-FTTC services.

[103] For information, industry negotiated increases to the SLGs in 2013 and 2015. On 1 August 2013 the Openreach Missed Appointment SLG moved from £40 to £45 and the Aborted Visit charge moved from £85 to £90. Following this, on 2 March 2015 the Missed Appointment SLG moved from £45 to £56.
[104] Ofcom, 2017. Automatic Compensation Statement, paragraph 5.89.

# The appropriate levels of the quality standards

## Our proposals

3.106 We proposed to set higher standards on repair and installation times in this review, which would provide direct benefits to consumers and telecoms providers because both parties will spend fewer days waiting for a repair or installation.

3.107 In setting the exact standard, we proposed to take into account:

- the benefits to telecoms providers and competition, including the proposal that it was important that Openreach meets any target repair or installation time in a very high proportion of cases, and that a standard of at least 90% is necessary to provide telecoms providers with a sufficient degree of certainty;
- Openreach's operational capabilities; and
- the costs involved in raising standards.

## Stakeholder responses

3.108 TalkTalk agreed that we should increase quality standard targets on repairs and provisions.[105] Vodafone suggested that there needs to be a cohesive strategy between competition policy and consumer policy teams, as the latter's automatic compensation proposals reflect far higher service standards compared to the former's SMP conditions.[106]

3.109 BT Group noted that where service regulation drives additional costs, which are then reflected in higher Openreach charges, these should align with end-customers' willingness to pay, allowing the costs to be reflected in competitive retail prices.[107]

## Our considerations and decisions

3.110 Our regulatory objective is to improve the quality of service provided by Openreach, reflecting the increasing importance of broadband services to consumers and businesses (demonstrated by the evidence above). We think this needs to be reflected in the quality standards that we set, as these are our primary tool for driving improvements, and we are not confident that SLGs alone will incentivise performance beyond the current level of performance.

3.111 We have therefore decided to set higher standards in this review. This develops with the approach we adopted in 2014, where we set quality standards for the first time and Openreach needed to improve its quality from a very low base. We reflected the operational challenges of improving quality of service in the levels set at the time.

3.112 In setting the level of the standards in Sections 5, 6, and 7, as well as our assessment of the overall impact of our standards in Section 11, we have decided to take account of three

[105] TalkTalk response to the March 2017 QoS Consultation, paragraph 1.1.
[106] Vodafone response to the March 2017 QoS Consultation, page 50.
[107] BT Group response to the March 2017 QoS Consultation, paragraph 4.15.

factors: the benefits to telecoms providers and competition; Openreach's operational capabilities; and the costs involved in raising standards, as detailed below.

### Benefits to customers and telecoms providers

3.113 Setting higher standards on repairs and installation times provides direct benefits to consumers and telecoms providers because both parties spend fewer days waiting for a repair or an installation. In addition, as set out above and in Section 5, we believe that more challenging repair standards are likely to lead to stronger incentives on Openreach to reduce faults, which will in turn lead to further benefits to telecoms providers and customers.

3.114 We outlined evidence on the extent of these benefits above. We recognise that it is difficult to measure such benefits precisely, particularly given the limitations of survey evidence and the forward-looking nature of the review. However, the range of qualitative and quantitative evidence provides us with a broad understanding of the importance of service quality.

3.115 Vodafone stated that our automatic compensation proposals reflect higher service standards than the SMP conditions set out here, and has suggested that the two should be coordinated. In response, we note that automatic compensation has a different objective to wholesale regulation, in that it addresses consumer harm. By comparison, the quality standards at the wholesale level are aimed at addressing BT's SMP, and therefore the remedy we impose must be proportionate.

3.116 Quality standards also provide more certainty over the level of service that will be received from Openreach. Having a sufficient degree of certainty over the speed of repairs and installations is important in the functioning of retail competition. It allows telecoms providers to plan their strategies for delivering retail services. For example, in terms of installations, TalkTalk has stressed the importance of Openreach quality of service being good enough to allow TalkTalk "to deliver a high quality of service at all times and take measurements to ensure that we always meet this standard".[108] This in turn provides benefits for consumers.

3.117 We think that it is important that Openreach meets any target repair or installation time in a very high proportion of cases. Therefore, our starting point is that a standard of close to 90% is necessary to provide telecoms providers with a sufficient degree of certainty. At levels below this, Openreach can miss the target set - by a potentially large extent - more than one in ten times that it provides a service and we do not consider this to represent fair, reasonable and timely network access.

### Openreach's operational capabilities

3.118 We have also considered Openreach's technical capabilities to make improvements and the time it will take to achieve them. It is unlikely to be economically efficient or even practically possible for Openreach to meet its SLAs 100% of the time. This is because

[108] Meeting between TalkTalk and Ofcom on Quality of Service, dated 19 November 2015, Riverside House.

certain jobs require complex civil engineering work and can only be done within the SLA at very high cost, if at all.

3.119 We have decided to set standards that are stretching enough to drive Openreach to make improvements, but that are not so high that they are unachievable. We have also considered the additional engineering resources Openreach may need to recruit, and the time required for Openreach to achieve those staffing levels and for the newly recruited or retrained engineers to become competent. This is particularly relevant in our decision on the period over which the quality standards will increase.

### Costs to customers and telecoms providers

3.120 We would be concerned if higher quality standards led to materially higher prices for customers as our evidence indicates that value for money is an important factor for many customers. For instance, the 2017 Jigsaw survey indicates that price, as well as quality of service, is an important factor for customers when choosing a telecoms provider for broadband services.

3.121 However, the 2017 Jigsaw survey also showed there was a wide range of preferences among consumers, with some willing to pay a premium for faster repairs and installations and others being more price sensitive (as set out above).

3.122 We agree that higher charges, resulting from the additional costs of regulation, should align with end-customers' willingness to pay. This explains why one of our considerations was the costs to customers and telecoms providers. Telecoms providers have a choice over the standard of quality they purchase from Openreach. In particular, in relation to repairs, Openreach supplies services with differing SLA commitments on repair times (referred to as 'service maintenance levels' or 'SMLs'). This means that telecoms providers can select the price/quality trade off most appropriate to their customers.

3.123 Thus, while we want to ensure that our regulatory measures do not impose unavoidable costs on telecoms providers and customers that are out of line with the benefits they receive, telecoms providers should be free to choose the standards they require for their consumers themselves. However, we believe that telecoms providers require a high degree of certainty over the quality they receive if they are to make a meaningful choice between different service levels. We believe that the best way to provide them with this certainty is by setting quality standards which require Openreach to meet a target level of quality a high proportion of times.

# 4. The customer experience of network reliability

4.1 In this section, we review Openreach's fault and repair activities. First, we consider Openreach's in-tariff fault rates, including a summary of our approach to forecasting Openreach's fault rate absent any plans for investment in preventative maintenance and network reliability.

4.2 We then consider how to encourage Openreach's investment in network reliability by (a) providing a summary of Openreach's planned investment in FVR; and (b) detailing our approach to incorporating the outcomes of this investment in our fault rate forecast.

4.3 Finally, we provide an update on industry developments which should enable faults to be identified more easily with remote diagnostic tests.

## Summary of our decisions

4.4 Faults play an important role in customers' experience of broadband and voice services. The higher the incidence of faults, the more Openreach must spend to maintain the network. This, in turn, has the potential to lead to higher prices, as the cost of repairing faults is included in the charge controls for MPF and GEA.

4.5 We want to ensure that Openreach follows through with its planned investment in preventative maintenance. To achieve this, we are:

- setting higher quality standards for fault repair times, which in turn should provide stronger incentives for Openreach to invest in preventative maintenance to reduce the occurrence of faults, as set out in Section 3; and
- incorporating Openreach's planned investments to reduce fault occurrence in our fault rate forecast, which is an input to our charge controls.

4.6 We take account of the costs of Openreach's preventative maintenance investment plans in our charge control models as part of the 2018 WLA Statement.[109] In summary we have concluded that:

- our approach of forecasting capex on the basis of an ongoing network with a steady state adjustment will provide Openreach with a sufficient allowance of capital costs over the course of the control period to fund Openreach's planned investment in preventative maintenance. Therefore, no additional capex allowance is needed; and
- Openreach's FVR programme also requires additional opex. We consider it reasonable that our opex forecast will include this expenditure and note that this is captured by

[109] 2018 WLA Statement, Annex 13, A13.32-A13.39.

updating our base year costs to 2016/17 (i.e. the first full year of the FVR programme).[110]

4.7 In this section, we also recognise the progress being made by the OTA2 and industry regarding implementing improved approaches to testing and diagnosing faults when they occur.

# Openreach fault and repair activities

4.8 We measure the frequency of faults, and the reliability of the Openreach network, through a fault rate. In broad terms, the measured Openreach fault rate is the total incidence of service affecting issues that are repaired in-tariff, as a proportion of the average number of customer lines per year. Issues that are in-tariff are those that are repaired by Openreach with no additional charge. Broadly speaking, this is when a line fails to meet Openreach's remote testing standards (including but not limited to SIN349 for copper services, and SIN498 for GEA-FTTC) or tests conducted by the Openreach technician at the customer premises.[111] Openreach charges telecoms providers for its repair activities related to out-of-tariff issues where Openreach is unable to detect a fault on its network.

4.9 In order to get a complete picture of Openreach's contribution to customers' experience of network reliability we review Openreach's fault rate below (in-tariff faults), and the incidence of out-of-tariff activities in Annex 1.

## Openreach's fault rates

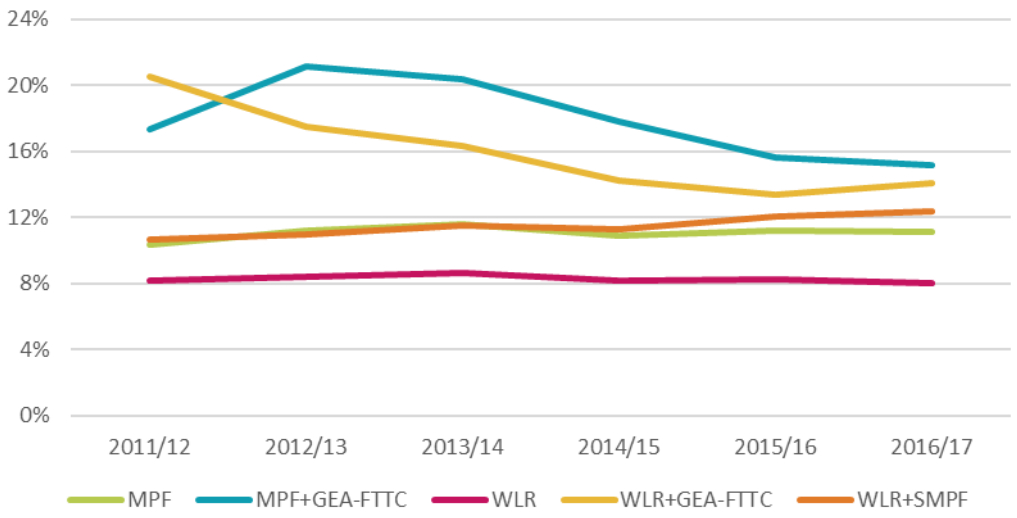
4.10 Following a further information request to Openreach[112], we have refreshed the data set used in the March 2017 QoS Consultation and the September 2017 QoS Further Consultation to cover an additional 12 months. In this Statement we have updated the base year of our fault rate forecasts analysis to 2016/17.

4.11 In Annex 1, we look at Openreach's historical in-tariff fault rate performance. In Annex 2, we discuss in detail the in-tariff fault rate trends and the various factors that are contributing to these trends. The key findings are summarised below.

4.12 In Figure 4.1 below we show the recent trends in Openreach's in-tariff fault rate for the main services it provides for voice and broadband. GEA-FTTC and SMPF are 'overlay' services, which means they are not used on a standalone basis but rather together with a physical line such as MPF or WLR (the bearer service) so we show the fault rate for the combined services (i.e. MPF+GEA-FTTC, WLR+GEA-FTTC, and WLR+SMPF).

[110] Capex (capital expenditure) is related to acquiring and retaining the physical assets used to provide the services that run over the network, whereas Opex (operating expenditure) is related to the ongoing day-to-day functioning of the business, including the costs incurred in operating and maintaining the physical assets.
[111] Suppliers Information Note 349, Issue 2.5, August 2015. http://www.sinet.bt.com/sinet/SINs/pdf/349v2p5.pdf. Suppliers Information Note 498, Issue 7.3, January 2017. http://www.sinet.bt.com/sinet/sins/pdf/498v7p3.pdf.
[112] Openreach response dated 15 August 2017 to the 9th QoS s.135 notice.

**Figure 4.1 Annual Openreach fault rates, for each service type (proportion of lines experiencing a fault each year)**




*Source: Ofcom analysis of BT data*[113]

4.13 In-tariff fault rates for lines carrying standard broadband services (i.e. MPF and WLR+SMPF) have remained broadly stable at around 11% to 12% per year. Fault rates for lines that do not carry broadband services (i.e. WLR) are somewhat lower at 8%.

4.14 The fault rates for GEA-FTTC over both WLR and MPF bearers are higher but show a significant decline, which we attribute to the growing maturity of the service. Sometimes, in the early stages of deployment of a new service, there is a higher fault rate as new processes and expertise bed in. In particular, new services can experience higher rates of 'early life failures' or 'ELF rates' than mature services (see below).

4.15 These fault rates mean that on average customers experience an in-tariff fault approximately:

a) Once every 8 to 9 years for lines carrying standard broadband services;

b) Once every 12 years for WLR lines that do not have a broadband service; and

c) Once every 7 years for lines carrying superfast broadband services.

4.16 On the balance of available evidence, we believe the overall fault rates for lines that do not carry broadband services (i.e. WLR) and lines carrying copper broadband services (i.e. MPF and WLR+SMPF) will not substantially change over the market review period.

4.17 In contrast to the flat overall fault rates for voice and copper broadband services, our analysis in Annex 1 shows that for GEA-FTTC services there is a significant reduction in in-life fault rates (see Figure A1.49). Both the Dead on Arrival (or 'DoAs', which are faults that occur within eight days of installation) and Early Life Failure (or 'ELFs', which are faults that occur within 28 or 30 days of installation) rates for MPF-GEA-FTTC have risen over the last

[113] Data submitted in Openreach responses dated 5 and 7 March 2014 to the 6th FAMR QoS s.135 notice, Openreach response dated 25 May 2016 to the 2nd QoS s.135 notice and Openreach response dated 15 August 2017 to the 9th QoS s.135 notice. See Figure A1.30, Annex 1.

four years following an initial significant increase, while the WLR+GEA-FTTC rates fluctuate within a narrow range.

4.18 Looking into the major contributions to the above DoA and ELF rate observations, we observe the following:

a) the major contributor to the observed rise in DoA and ELF rates for MPF+GEA-FTTC is faults attributed to the PCP[114];

b) the MPF+GEA-FTTC DoA and ELF rates are much closer to the rates of WLR+GEA-FTTC when faults attributed to the PCP are removed[115];

c) MPF+GEA-FTTC services have a higher DoA rate for faults attributed to the PCP than the other services;

d) GEA-FTTC services over both MPF and WLR bearers have a higher ELF rate for faults attributed to the PCP than WLR, MPF and WLR+SMPF, but MPF+GEA-FTTC is substantially higher than WLR+GEA-FTTC; and

e) there are differing DoA and ELF rates but similar in life fault rates between telecoms providers.

4.19 These observations suggest that increasing reliance on PCP-only installs has led to higher DoA and ELF rates, and that mature services demonstrate lower DoA and ELF rates. Differences in DoA and ELF rates between GEA-FTTC services sold on MPF and WLR bearers, as well as between telecoms providers, indicate that there are ways of using the PCP-only installation service that can lead to better outcomes for some telecoms providers than are currently being experienced.

4.20 Over time, we expect industry to continue to trend towards best in class PCP-only installation processes as well as making ongoing improvements. This will translate into an improvement in the DoA and ELF rates for GEA-FTTC services. As a result, we believe, on the balance of available evidence, that the overall fault rates for GEA-FTTC services will continue to reduce.

4.21 We recognised in the March 2017 QoS Consultation that we are unable to derive reliable fault rate forecasts for GEA-FTTC services directly from the measured data we have obtained due to these services not yet being mature and therefore exhibiting significant changes over time with no definite convergence to specific values.

4.22 Therefore, we derive fault rate forecasts from the network components involved in delivering GEA-FTTC related services and their likely fault rates based on delivering other, more mature, services to determine fault rates for the GEA-FTTC services.

[114] Primary Cross Connection Point – This is the local street cabinet in which cables extending out to local distribution points are aggregated and connected to larger copper and fibre optic cables to move the voice and broadband signals to and from the local exchange. The number of connections managed in a PCP depends on the number of end user premises in an area, but is usually several hundred lines.

[115] When an Openreach engineer clears a fault, they attribute the fault to the part of the network that caused the fault. In this case, those faults which the engineer cleared and attributed to the PCP were removed to derive the DOA and ELF rates.

4.23 In Table 4.2 below, we show the resulting expected fault rates for the copper and GEA-FTTC services in the final year of the charge control period, as well as the linear glide path for the intervening years.

**Table 4.2 Forecast fault rates for copper and GEA-FTTC services over the period of the charge control absent Openreach's FVR programme**[116]

| | Base Year 2016/2017 | Year 1 2018/2019 | Year 2 2019/2020 | Year 3 2020/2021 |
|---|---|---|---|---|
| WLR | 8.0% | [✂]% (7% - 8%) | [✂]% (7% - 8%) | [✂]% (6% - 7%) |
| MPF | 11.1% | [✂]% (10% - 11%) | [✂]% (9% - 10%) | [✂]% (9% - 10%) |
| WLR+SMPF | 12.4% | [✂]% (11% - 12%) | [✂]% (10% - 11%) | [✂]% (10% - 11%) |
| WLR+GEA-FTTC | 14.1% | [✂]% (12% - 13%) | [✂]% (11% - 12%) | [✂]% (11% - 12%) |
| MPF+GEA-FTTC | 15.1% | [✂]% (13% - 14%) | [✂]% (12% - 13%) | [✂]% (11% - 12%) |

*Source: Ofcom analysis of Openreach data*

4.24 We set out a more detailed analysis of the fault rates, and forecasts for the forward look market review period in Annex 2.

## Encouraging Openreach's investment in preventative maintenance

4.25 This section sets out our considerations and decisions relating to incorporating Openreach's planned investment in preventative maintenance into our fault rate forecast. We provide an overview of our proposals, stakeholder responses, and our reasoning and decisions. For detailed consideration of our methodology for calculating the fault rate forecast see Annex 2.

### Our proposals

4.26 In our March 2017 QoS Consultation, we observed that during the period 2011/12 to 2015/16, Openreach capex had been lower than the level required to replace the assets that have reached the end of their useful life (based on the depreciation reported in BT's regulatory financial accounts).[117] We said that due to this prolonged period of reduced total

[116] Table A2.1, Annex 2.
[117] See Table 4.5 in the March 2017 QoS Consultation.

capital expenditure by Openreach, there was a risk that network reliability may diminish because of any future underinvestment.[118]

4.27 However, we explained that Openreach had a plan to increase its spending on preventative maintenance during the period of the market review. We proposed that higher quality standards on repair times should act as an incentive for Openreach to keep to its plan to reduce the level of faults on its network. We also proposed to reduce our forecast fault rate that is used in the charge control to calculate the cost of maintaining the network (repairing faults) in line with Openreach's preventative maintenance plan.[119] We did not propose to include the cost of the plan in the charge control because we considered that the steady state adjustment used in the charge control should be sufficient.

4.28 We noted that Openreach's preventative maintenance plan was set out as the aggregate effect of its investment across all services. As we needed to identify the effect of investment on each service in order to calculate our charge controls, we proposed to disaggregate the Openreach preventative maintenance plan across services on a pro rata basis. We explain the fault forecasting methodology that we proposed in March in detail in Annex 2.

4.29 In March we asked stakeholders:

> Do you agree with our proposal to incorporate the anticipated lower fault rate in the charge control, and not to allow a specific adjustment for the related capital expenditure?

4.30 In our September 2017 QoS Further Consultation, in light of Openreach's response to our March consultation, we set out how we proposed to take account of Openreach's actual preventative maintenance plan.[120] We considered our approach to taking account of Openreach's investment in our charge control modelling in our September 2017 WLA Consultation.[121]

4.31 In September, we asked stakeholders:

[118] We also observed that during this period Openreach incurred higher opex than we forecast. This suggests that Openreach may have been incurring additional opex in order to maintain equipment that is old and becoming heavily depreciated.
[119] We proposed to reduce our forecast for the benefits of FVR by reducing the fault volume in 2020/21 by [✂]% (22% to 25%).
[120] We proposed to reduce our forecast for the benefits of FVR by reducing the fault volume in 2020/21 by [✂]% (15% to 18%).
[121] Ofcom, 2017. *Wholesale Local Access Market Review – Further consultation on proposed charge control for wholesale standard and superfast broadband*, paragraphs 3.81 to 3.86. https://www.ofcom.org.uk/__data/assets/pdf_file/0023/106448/Proposed-charge-control-for-wholesale-standard-and-superfast-broadband.pdf.

Do you agree with our forecast as modified from our March proposals?

## Stakeholder responses

### Our approach to including the effect of preventative maintenance in our fault forecasts

4.32 UKCTA agreed with our methodology of forecasting fault rates over the charge control period.[122] Verizon agreed with our forecasting of a reduction in fault volumes.[123] Vodafone said we were correct to use Openreach's "general network health" programme on lower fault rates to inform policy proposals.[124] [✂] agreed with the forecast fault rates.[125]

4.33 Verizon argued that Ofcom should review Openreach's initiatives for fault reduction in greater detail to see if they are adequate and reasonable.[126]

4.34 Sky argued that the Openreach investment plan does not go far enough, as Ofcom had predicted it would reduce the fault rate for superfast broadband to just below 10%, and the fault rate for WLR to just over 7%, which it said exceeded 2009 levels.[127]

4.35 Vodafone argued that Ofcom should give additional consideration to the cost benefits of Openreach investing the £105 million per annum, which Vodafone calculated as being presently earmarked to provide the pass-through payments to support the automatic compensation regime. Vodafone considered that a supplementary investment in network health and repair processes at this level for a number of years would transform Openreach's repair service performance.[128]

4.36 In addition to identifying that we had used Openreach's "aspirational" plan, as opposed to its actual FVR plan, Openreach set out 13 key challenges which it had identified to its investment in network health, including both practical issues associated with deploying this level of resource, and fault rate "headwinds" that could reduce the net benefits that Openreach could deliver.[129] Regarding the fault rate "headwinds", Openreach was concerned that the rise in demand for FTTC self-install could increase early life failures, and that network interventions associated with the roll out of FTTC and NGA2 could also drive increased fault rates in other services.[130]

### Incentive to reduce fault rate

4.37 TalkTalk argued that the proposed quality of service remedies and approach to including Openreach's FVR plan in the charge control would not be sufficient to incentivise

[122] UKCTA response to the March 2017 QoS Consultation, paragraph 21.
[123] Verizon response to the March 2017 QoS Consultation, paragraph 11.
[124] Vodafone response to the March 2017 QoS Consultation, page 53.
[125] [✂]
[126] Verizon response to the March 2017 QoS Consultation, paragraph 12.
[127] Sky response to the March 2017 QoS Consultation, A6.7.
[128] Vodafone response to the March 2017 QoS Consultation, page 53.
[129] Openreach response to the March 2017 QoS Consultation, paragraphs 112 to 126.
[130] Openreach response to Match 2017 QoS Consultation, paragraphs 124 to 126.

Openreach to improve its investment in fault prevention.[131] Sky was concerned that we did not explain what would trigger Ofcom to direct an improvement in fault rates, and that any such action would be too slow to prevent the consumer harm caused by elevated fault rates.[132]

4.38 Openreach argued that the proposal to increase repair standards would reduce its ability to execute its investment plan, stating that, "every percentage point that is added to the [quality standards] will reduce our ability to execute FVR because it will require us to divert resource from FVR to bolster our day-to-day repair activities and performance".[133] In order to avoid what it considers as a conflict between the quality of service standards and its investment plan, Openreach said that it is "front loading" FVR specific recruitment in 2017/18. It proposed adjustments to the glidepaths for both the FVR plan and the repair standards to reflect the link between these areas of its work.[134]

### Responses to the September further consultation

4.39 Openreach agreed that network fault rate forecasts should be based on planned levels of investment in its FVR programme rather than an "aspirational" view, and welcomed the fact that Ofcom had modified its outlook to take this into account. They also agreed that our method of disaggregating services was reasonable.[135]

4.40 Openreach went on to say it was unclear why Ofcom believes that the fault rate uplift for FTTC on MPF will reduce so significantly across the charge control period compared with FTTC on WLR. It expected that any fault rate reduction over time would be in line with the more gradual decline for FTTC on WLR. Openreach agreed that there is a fault rate reduction benefit as services mature, but said the evidence shows that much of this benefit has already been achieved and is therefore accounted for in its run rate and within its forecast.

4.41 Vodafone said that Ofcom does not address the level of faults that would arise if:

a) BT had invested as intended in the preceding period on preventative network health improvement measures; and

b) an adequate proportion of the network was regarded to have been efficiently upgraded to FTTP, which might have reduced the level of faults experienced.[136]

4.42 UKCTA argued that we should revert to the March proposals for the forecast fault rate. It argued that BT has failed to invest in FTTP at scale, which UKCTA claim has a lower fault

[131] TalkTalk response to the March 2017 QoS Consultation, paragraph 3.1.
[132] Sky response to the March 2017 QoS Consultation, paragraph 121.
[133] Openreach response to the March 2017 QoS Consultation, paragraph 89.
[134] Openreach response to the March 2017 QoS Consultation, paragraph 89.
[135] Openreach response to the September 2017 QoS Further Consultation, paragraphs 67 to 71. https://www.ofcom.org.uk/__data/assets/pdf_file/0023/108095/Openreach.pdf.
[136] Vodafone response to the September 2017 QoS Further Consultation, page 20. https://www.ofcom.org.uk/__data/assets/pdf_file/0021/108093/Vodafone.pdf.

rate, and says that it is unacceptable that consumers' service charges should increase in the context of this under investment.[137]

4.43 [✂] said there is a lack of granularity in detail on the differences between Openreach's latest FVR plan and the one used to inform Ofcom's forecasts in the March 2017 QoS Consultation.[138]

4.44 Sky said they could not comment on Ofcom's revised forecasts due to the material redactions in Section 5 of our September 2017 QoS Further Consultation.[139]

### Charge control related responses to the March and September 2017 QoS consultations

4.45 In responding to both the March and September 2017 QoS consultations, some stakeholders commented on our approach to considering the costs associated with Openreach's FVR plan in the charge control, including our assessment of the capex and opex components of these costs, and the extent to which these costs should be included in the charge control. We have described these responses in the 2018 WLA Statement, along with our related considerations and decisions.

## Our considerations and decisions

4.46 We are encouraged that Openreach has committed to a plan to reduce fault occurrence, and hence fault rates, on its copper network. Since the March 2017 QoS Consultation, Openreach has increased its spending on FVR in line with its plan, such that its FVR capex has increased from the average of around [✂] per year between 2011/12 and 2015/16, to [✂] per year in the period 2016/17.[140]

4.47 We note that some stakeholders were concerned about the information that we received from Openreach regarding its investment in preventative maintenance, including UKCTA's suggestion that we revert to the original plan. However, absent other sources of information, we are reliant on Openreach's view of the improvements in reliability that are feasible for a given level of investment.

4.48 In December 2017, we asked Openreach under our formal information gathering powers to confirm that its investment plans remain the same as set out in response to the March consultation. In its response, Openreach confirmed that the plan we used in our September 2017 QoS Further Consultation remains correct. It is therefore appropriate to continue to base our charge control assumptions on the expected outcomes of this plan.

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[137] UKCTA response to response to the September 2017 QoS Further Consultation, paragraphs 10 and 14. https://www.ofcom.org.uk/__data/assets/pdf_file/0019/108091/UKCTA.pdf.

[138] [✂]

[139] Sky response to the September 2017 QoS Further Consultation, paragraph A1.7. https://www.ofcom.org.uk/__data/assets/pdf_file/0026/108089/Sky.pdf.

[140] FVR capex between 2011/12 and 2015/16 from management account information provided by BT to Ofcom on 5 February 2016. 2015-16 estimated, other figures actual expenditure; FVR capex for 2016/17 provided in Openreach response dated 9 June 2017 to 7th QoS s.135 notice and confirmed in Openreach response dated 4 January 2018 to 43rd WLA charge control s.135 notice.

We also provide our responses to stakeholders' broader concerns around the validity of the information used to calculate the charge control in the 2018 WLA Statement.[141]

4.49 We have considered Openreach's comments regarding GEA-FTTC fault rates, particularly the effects of the PCP Self Install service, and address these comments in Annex 2 where we set out our view on the overall fault rate trends of GEA-FTTC services, by considering the effect that ELFs and in-life faults will have on the overall fault rate going forward.

4.50 Regarding Openreach's list of key challenges to implementing its investment plan that it set out in response to the March 2017 QoS Consultation, we assume that, given the plan represents Openreach's view of the impact of its investment, it takes into account the listed practical challenges to implementing the plan.

4.51 Regarding the specific factors Openreach identified that might cause faults to rise in the future (its "headwinds" concerns), our methodology for forecasting fault rates absent FVR is set out by service, and separately forecasts the expected trends for in-life faults and early life faults. This means that our fault rate forecasting methodology already includes a consideration of the impact of ELFs on GEA-FTTC fault rates. Regarding GEA-FTTC fault rates, we consider that faults will reduce over time for PCP-only installations for the reasons set out above and as described in Annex 2. With regard to Openreach's concern over fault rates rising when it intervenes in its network to deploy new services, we have not observed such an impact from the roll-out of new services on existing mature services in the detailed fault data we have analysed, which covers the period of deployment of Openreach's GEA-FTTC service (see Annex 1).

4.52 As described in Section 3, we believe that the inclusion of the effects of the Openreach investment plan in the charge control will provide a useful benchmark against which to judge the outcomes of Openreach's investment. As such, we have explained why we do not consider that an additional standard on fault rates in appropriate at this time. We have also described in Section 3 why we believe that this approach, in conjunction with higher repair standards, is a proportionate way of ensuring that Openreach remains incentivised to continue with appropriate investment in network health.

4.53 We have set out the details of how we have applied the methodology consulted on in September to the updated fault rate data in Annex 2, including what account we can take of investment in the previous review period, and of assumptions regarding the roll out of GEA-FTTP in the context of forecasting fault rates.

4.54 In its response, Vodafone suggested an alternate forecasting approach of determining the level of faults had BT invested more on preventative network health improvements and an adequate proportion of the network had been upgraded to FTTP.[142]

4.55 We do not have, at this stage, a basis on which to include in the charge control forecasts the effects on faults of a hypothetical preventative network health improvement programme that would have occurred historically, and further, what might have occurred

[141] 2018 WLA Market Review Statement, Section 4
[142] Vodafone response to the September 2017 WLA Consultation, page 20. https://www.ofcom.org.uk/__data/assets/pdf_file/0021/108093/Vodafone.pdf.

had GEA-FTTP been rolled out across a larger proportion of the network. As set out in Volume 2, Section 2 of the 2018 WLA Statement, we are setting charges based on the efficient ongoing costs of providing MPF services over a copper network and GEA services over a fibre to the cabinet (FTTC) overlay network. When modelling the opex required to deal with faults, we have aimed to set the fault rate at the level it would have been if Openreach had invested the capex we allowed it in the last charge control. We consider that Openreach's current plans give us a way to proxy this level of faults and we have therefore used the fault level that Openreach believes it will reach after the completion of its FVR programme. In summary, the final fault rates for use in the charge control are given in the two tables below.

**Table 4.3 Forecast overall fault rates for combined and individual services over period of charge control including Ofcom's interpretation of effects of FVR programme**

| | Base Year 2016/2017 | Year 1 2018/2019 | Year 2 2019/2020 | Year 3 2020/2021 |
|---|---|---|---|---|
| WLR | 8.0% | [✂]% (7% - 8%) | [✂]% (7% - 8%) | [✂]% (6% - 7%) |
| MPF | 11.1% | [✂]% (10% - 11%) | [✂]% (9% - 10%) | [✂]% (9% - 10%) |
| WLR+SMPF | 12.4% | [✂]% (11% - 12%) | [✂]% (10% - 11%) | [✂]% (10% - 11%) |
| SMPF | 4.4% | [✂]% (4% - 5%) | [✂]% (3% - 4%) | [✂]% (3% - 4%) |

*Source: Ofcom analysis of Openreach data*[143]

**Table 4.4 Proposed glidepath for GEA-FTTC service fault rates including effect of FVR programme**

| Charge control period | Base Year 2016/2017 | Year 1 2018/2019 | Year 2 2019/2020 | Year 3 2020/2021 |
|---|---|---|---|---|
| WLR+GEA-FTTC | 14.1% | [✂]% (12% - 13%) | [✂]% (11% - 12%) | [✂]% (11% - 12%) |
| MPF+GEA-FTTC | 15.1% | [✂]% (13% - 14%) | [✂]% (12% - 13%) | [✂]% (11% - 12%) |

*Source: Ofcom analysis of Openreach data*[144]

[143] Table A2.15, Annex 2.
[144] Table A2.23, Annex 2.

## Developments in testing and diagnostics

4.56 Openreach's exchange-based copper line test systems are currently the primary tools for diagnosing faults in Openreach's copper access network. Openreach maintains copper lines to a technical specification called SIN349 which reflects the capabilities of its exchange-based line test systems.[145] While these tools generally work well, they were originally designed to detect faults that affect voice services. There are inherent limitations to the basic electrical tests performed by this type of line test system, which prevent them from reliably detecting certain line and customer wiring conditions that can impair broadband performance.[146]

4.57 In our March 2017 QoS Consultation, we found that recent developments may significantly improve Openreach's ability (and, by extension, that of telecoms providers) to diagnose certain line impairments and customer wiring issues, which are sometimes addressed as out-of-tariff repairs remotely. We explained that new capabilities are being developed which should further improve Openreach's diagnostic accuracy when they are fully incorporated into Openreach and telecoms providers' diagnostic processes, including:

- GEA service layer diagnostic tools: Openreach has developed diagnostic tools that use sophisticated data processing techniques to analyse service level data extracted from Openreach's GEA broadband systems (such as synchronisation rates) to assess the performance of individual lines. These tools enable Openreach to benchmark the performance of individual broadband connections to determine whether they are performing to their full potential, and to detect the presence (but generally not the precise location) of certain line conditions that impair broadband performance.
- MPF and SMPF service level diagnostic tools: Openreach has also worked with other large telecoms providers to develop service layer diagnostic tools for MPF and SMPF services. Under the 'big data' initiative, telecoms providers supply Openreach with service layer data from their broadband systems, which Openreach then processes to provide diagnostic information about the performance of individual lines (similar to the GEA tools above).

4.58 Given the potential benefits for customers, we thought there was a strong case for Openreach and telecoms providers to continue with these developments and to integrate them fully into operational processes to realise their potential. We asked the OTA2 to provide such assistance as is required. We intended to monitor progress and consider informal or formal intervention if customer benefits have not been realised.

4.59 We asked stakeholders:

[145] Suppliers Information Note 349 Issue 2.5 August 2015.

[146] Customer's wiring refers to wiring within a customer's premises beyond Openreach's network termination point. It belongs to the customer and is not part of the service provided by Openreach. Conditions that impair broadband performance include high resistance joints, imbalanced cable pairs and bridge taps (an un-terminated length of cable connected to a copper line). The customer wiring conditions include bridge taps and bell wire issues.

Do you agree with our assessment of the role better diagnostics could play in improving fault resolution for both telecoms providers and customers, and how should these improvements be realised?

## Stakeholder views

4.60 Stakeholders were broadly supportive of our comments regarding the implementation of new test and diagnostic approaches, but made the following comments.

### SIN349 is not always fit for purpose

4.61 There is general agreement among stakeholders that the current SIN349 test is not a sufficient measure of line performance in relation to broadband services. Sky noted that Openreach's binary classification of a line test being either OK or not OK (LTOK/LTNOK classification) makes no allowance for two essential performance measures, namely the speed and stability of the line.[147] Vodafone similarly argued that SIN349 was not sufficient, and that a line could meet the SIN349 test requirements for a line to be deemed to be OK, but still be unable to support broadband.[148]

4.62 Openreach also saw limitations with the SIN349 test. It suggested that better diagnostics would play a role in improving fault resolution for end customers and telecoms providers. Openreach also stressed that end-to-end service delivery is the joint responsibility of Openreach and telecoms providers.[149]

### In-tariff versus out-of-tariff services are a concern

4.63 Telecoms providers raised concerns about the expanding levels of out-of-tariff services due to reliance on the SIN349 test. Vodafone suggested that the repair standard needs to be supported by a test capable of identifying faults relating to both voice and broadband services. It felt that SIN349 was not sufficient, and that not properly resolving broadband faults had led to the extensive use of out-of-tariff services.[150]

4.64 [✂] agreed with our assessment and particularly welcomed developments that will result in repair activities being carried out in-tariff.[151]

4.65 TalkTalk argued that Ofcom should set the price for 'Special Fault Investigation (SFI2) services for out-of-tariff faults at incremental costs until a new test standard is in place. It argued that Openreach should not profit from 'line test OK' (LTOK) faults.[152]

[147] Sky response to the March 2017 QoS Consultation, paragraph A6.46.
[148] Vodafone response to the March 2017 QoS Consultation, page 54.
[149] Openreach response to the March 2017 QoS Consultation, paragraph 130.
[150] Vodafone response to the March 2017 QoS Consultation, page 53.
[151] [✂]
[152] TalkTalk response to the March 2017 QoS Consultation, paragraph 4.11.

4.66 Openreach, however, expressed concerns that LTOK faults put pressure on Openreach engineers, and that consumers can suffer when telecoms providers are reluctant to incur charges.[153]

### New focus is on collaboration and better diagnostics

4.67 Telecoms providers and Openreach acknowledged the importance of collaboration for developing improved approaches to testing lines. Openreach agreed that better diagnostics will play a role in improving fault resolution for end customers and telecoms providers.[154]

4.68 TalkTalk said it was already working with other telecoms providers to address broadband speed and stability, and urged Ofcom and the OTA2 to support this process.[155] Sky noted that it and TalkTalk may submit a Statement of Requirements (SoR) to Openreach, requesting that Openreach develop a new, future-proof diagnostic test for broadband.[156]

4.69 Sky remained concerned, however, that BT will not have an incentive to develop a new diagnostic test quickly, given that it may increase the number of in-tariff repairs that Openreach is required to perform. Therefore, Sky suggested that, if Openreach delays commercial negotiations through the OTA2 process, Ofcom should remain ready and willing to intervene. TalkTalk also suggested a role for Ofcom, arguing that we should consider changes to charges mid-market review after the standard was agreed.[157]

4.70 Openreach stressed that end-to-end broadband service delivery is the joint responsibility of Openreach and telecoms providers. It supported combining traditional testing with Big Data analytics, increasingly using Big Data to improve remote diagnostic capabilities and better target preventative maintenance. Openreach argued that a collaborative approach with industry was essential, for example on Big Data and in the Industry Test and Diagnostics Forum. Openreach suggested that industry should move collaboratively to more proactive service assurance, improved service layer diagnostics and early service layer applications (using speed and stability indicators).[158]

4.71 Openreach highlighted its own efforts, including testing real time "Trimetrics" to reduce repeat faults and using service level data to requalify LTOK faults. It indicated that it would soon trial baselining and neighbour data applications, and pointed out that it was upgrading the copper test infrastructure. It also highlighted the importance of improvements in/via the overnight routine test, NGA improvements, Single End Line Test (SELT), Copper Integrated Demand Testing (CIPT) and Hand Held testing capabilities.[159]

[153] Openreach response to the March 2017 QoS Consultation, paragraph 133.
[154] Openreach response to the March 2017 QoS Consultation, paragraph 129.
[155] TalkTalk response to the March 2017 QoS Consultation, paragraphs 4.10 and 4.12.
[156] Sky response to the March 2017 QoS Consultation, paragraph A6.49.
[157] Sky response to the March 2017 QoS Consultation, paragraph A6.49.
[158] Openreach response to the March 2017 QoS Consultation, paragraph 130.
[159] Openreach response to the March 2017 QoS Consultation, paragraphs 141 to 149.

## Further discussion with the OTA2

4.72 Following the close of the consultation period, we consulted with the OTA2 regarding its engagement in testing and diagnostics. The OTA2 expects that the ongoing work it is leading, with participation by Openreach, telecoms providers and industry bodies, will have made some significant improvements by the next market review (expected in three years' time). The OTA2 also expects that all parties involved should benefit from the outcome of this work, creating a further incentive for and increasing the likelihood of its success.

## Our conclusions

4.73 As described above, we understand that Openreach's current technologies for testing lines have limitations, particularly regarding the line performance necessary to support broadband services. However, our approach to regulation, including the application of the repair standard, is based on current industry practices to ensure that they are based on robust and measurable outcomes.

4.74 We agree with stakeholders that industry is best placed to design and implement improvements to testing practices, and are encouraged that industry, facilitated by the OTA2, appears to be on track to make significant improvements to tests and diagnostic procedures during this charge control period. We note that TalkTalk has recently submitted a SoR requesting that Openreach develop a new, future-proof diagnostic test for broadband. If Openreach's behaviour with respect to considering well-developed proposals from its customers is not consistent with the Commitments (or the Undertakings whilst they remain in force), its customers can raise concerns either with the OTA2, the Openreach Board Audit Risk and Compliance Committee (OBARCC), or directly with the Openreach Monitoring Unit (OMU) at Ofcom.[160]

4.75 Regarding TalkTalk's request that SFIs be priced at incremental costs, we have considered our regulatory approach to SFIs amongst other ancillary products in the 2018 WLA Statement.[161]

4.76 We expect that improvements to test and diagnostic practices could have a real impact on consumers' experience of requesting repairs to their services, as well as improving the way that telecoms providers and Openreach are able to determine the best approach to repairing faults and line impairment. We consider that industry and Openreach are best placed to consider, in the first instance, any implications that new approaches to testing and diagnostics might have for whether faults are considered to be in-tariff or out-of-tariff.

[160] See the following: Ofcom, 2017. *Delivering a more independent Openreach.* (https://www.ofcom.org.uk/__data/assets/pdf_file/0020/104474/delivering-independent-openreach.pdf); Openreach. *The Commitments of BT Plc and Openreach Limited to Ofcom* (https://www.btplc.com/UKDigitalFuture/Agreed/CommitmentsofBTPlcandOpenreachLimitedtoOfcom.pdf); The Equality of Access Board (http://www.btplc.com/Thegroup/Ourcompany/Theboard/Boardcommittees/EqualityofAccessBoard/EqualityofAccessBoard.htm), and the contact email address for the Openreach Monitoring Unit at Ofcom OMU@ofcom.org.uk.
[161] 2018 WLA Statement, Annex 23.

We therefore continue to support the OTA2's work on this issue with wider industry collaboration.

# 5. Regulating BT's service performance for repairs

5.1 This section sets out *ex ante* quality of service (QoS) remedies relating to fault repair over the Wholesale Local Access (WLA) market review period.[162] It draws on our approach to QoS regulation set out in Section 3 and on our review of Openreach's recent repair performance in Annex 1, as well as stakeholder responses to our March and September 2017 QoS Consultations.[163]

5.2 In this section, we first consider the repair times against which to apply standards i.e. what we mean by repair 'on time'. We then consider standards for those repairs that miss the on time standard. Finally, we set out our position on how the standards we are imposing should be structured and how compliance with the standards should be measured, including their geographic application and exemptions for *force majeure*.

5.3 As described in Section 10, we consider that the decisions set out in this section contribute to the fulfilment of our statutory duties and satisfy the relevant legal tests. In reaching these decisions, we have also taken into account our regulatory experience from previous market reviews, recent developments in these markets (based on information provided by Openreach and its customers, and on consumer research we have commissioned), and also expected developments over the course of the three-year review period.

## Summary of our decisions

5.4 In the 2017 NMR Statement and 2018 WLA Statement we have imposed SMP conditions requiring BT to comply with such quality of service requirements as we direct from time to time for WLR, MPF and GEA-FTTC.

5.5 In relation to quality of service for repair, we have decided to impose the following requirements for quality standards for the proportion of repairs that BT must complete within SLA timescales (on time), and those it must complete within 5 days of the SLA timescale:

- Repair standards should apply to SMLs 1 and 2[164];
- Repairs at SML1 and 2 that miss their SLA should be repaired within 5 working days of the SLA 97% of the time by 2020/21;
- Compliance for both on time repair and repair within SLA + 5 days will be assessed on the aggregate performance of WLR, MPF and GEA-FTTC services, separately for SMLs 1 and 2, on an annual basis;

[162] Our decisions as to the level of the on time repair standards are set out in Section 6.
[163] March 2017 QoS Consultation. https://www.ofcom.org.uk/__data/assets/pdf_file/0033/99645/QoS-WLR-MPF-GEA.pdf. September 2017 QoS Further Consultation. https://www.ofcom.org.uk/__data/assets/pdf_file/0012/106311/consultation-quality-service-wlr-mpf-gea.pdf.
[164] SML1: Fault clear by 23:59 day after next, Monday to Friday, excluding public and bank holidays. SML2: Fault clear by 23:59 next day, Monday to Saturday, excluding public and bank holidays.

- Compliance for on time repair will be assessed on a regional basis, while compliance for repair within SLA + 5 days will be measured on a national basis;
- Repair on time will include a 3% fixed allowance for *force majeure* (known as Local MBORCS – Matters Beyond Our (BT's) Reasonable Control[165]); and exemptions for High Level MBORCs for two regions in each year for periods of up to eight weeks per incident[166]; and
- Repair within SLA + 5 days will include an exemption for High Level MBORCs only.

5.6 Our decisions in relation to the level of the on time repair standard are set out in Section 6.

# The repair times against which the standards should be set

## Our proposals

5.7 In our March 2017 QoS Consultation we proposed to continue to apply quality standards to the repair of services on time by reference to the repairs times specified in SLAs relating to SMLs 1 and 2. We then asked:

> Do you agree with our proposals to set standards on repairs delivered to SMLs 1 and 2 timescales? Please provide reasons and evidence in support of your views.

## Stakeholder responses

5.8 Respondents generally supported our proposal that quality standards should continue to apply to SMLs 1 and 2; however, a number of stakeholders considered that regulation should also apply to other SMLs currently offered by Openreach.

5.9 [✂] acknowledged that the vast majority of WLR and MPF circuits are consumed at SML1 or SML2, but remained concerned that business users on SMLs 3 and 4 were not covered by a specific standard.[167] It said this could be an issue, particularly if Openreach encounters a "service crisis".[168] Meanwhile, Vodafone said, as a purchaser of services at SML1, SML2, Business 2 Plus[169], and SML4, that standards (and KPIs) should apply to repairs across the spectrum of SMLs.[170]

5.10 Further, Openreach itself noted that Business 2 Plus (SML2.5) accounted for around 2.4m business lines (as of April 2017) and has the same SLA/SLG timescale as SML2. Openreach

[165] Examples of Local MBORCs include criminal, intentional, or negligent damage to the network.
[166] Examples of High Level MBORCS include incidents affecting over 2,000 lines, incidents which are/are likely to become the subject of regional or national media interest, and anything likely to have a significant impact on the BT and/or Openreach brand.
[167] SML3: Report by 13:00, fault clear by 23:59 same day. Report after 13:00, fault clear by 12:59 next day, seven days a week, including public and bank holidays). SML4: Fault clear within six hours, any time of day, any day of the year).
[168] [✂]
[169] Business 2 Plus: Prioritised on the day, fault clear by 23:59 next day, Monday to Saturday, excluding public and bank holidays.
[170] Vodafone response to the March 2017 QoS Consultation, page 55.

considered that Business 2 Plus should be included within the definition of the SML2 standard to capture more of the customer base.[171]

5.11 In response to our September 2017 QoS Further Consultation, [✂] considered that our view that most customers would be satisfied with repairs completed within three calendar days disregards business customers' requirements, particularly at the SME and small office/home office (SOHO) end of the market.[172] [✂] expressed its hope that Ofcom would monitor the performance of SMLs 3 and 4, and sought proposals on what measures we would take should a degradation in higher level SMLs be observed.[173]

## Our considerations and decisions

5.12 We note the agreement of stakeholders with our proposal to continue to apply repair on time standards to repair completion times in the SLAs for SMLs 1 and 2 (i.e. within one or two working days from the day after the fault was reported). Most WLR, MPF and GEA-FTTC services are currently consumed by telecoms providers at these two SMLs and we do not expect this to change over the forward-looking review period. We consider that continuing to apply repair on time standards to SMLs 1 and 2 remains an appropriate and proportionate way to ensure that telecoms providers can rely on timely repairs to the WLR, MPF and GEA-FTTC network access services, which they typically purchase from Openreach to provide most customers with their phone and broadband services.

5.13 The repair times for SMLs 1 and 2 supplied by Openreach are broadly aligned with our latest understanding of customers' expectations for the timely repair of their services. Our 2017 consumer research indicated that most customers felt that it would be reasonable to wait up to three calendar days for their broadband service to be restored.[174] While we recognise that quicker repair times are always preferable, it is important to strike a balance given that reducing repair times is likely to impact on Openreach's costs and consequently on retail prices. We consider that regulation focused on the completion of repairs within a one to two day timeframe is consistent with this finding of generally acceptable outcomes for most consumers, taking into account the balance with acceptable retail prices.[175]

5.14 We note [✂] comments about the faster repair requirements of business customers particularly SMEs and SOHOs. We included SMEs and SOHOs in our 2017 consumer research, which confirmed somewhat lower levels of satisfaction (49%) with service restoration within one to three days than residential consumers (65%). We recognise that a proportion of customers value faster repair more highly than others, and may be willing to pay for it, and that this proportion is likely to be higher in the SME and SOHO community, given their daily business use of services, than for residential consumers. However, we need to strike a balance between repair times and costs across all customers and, we

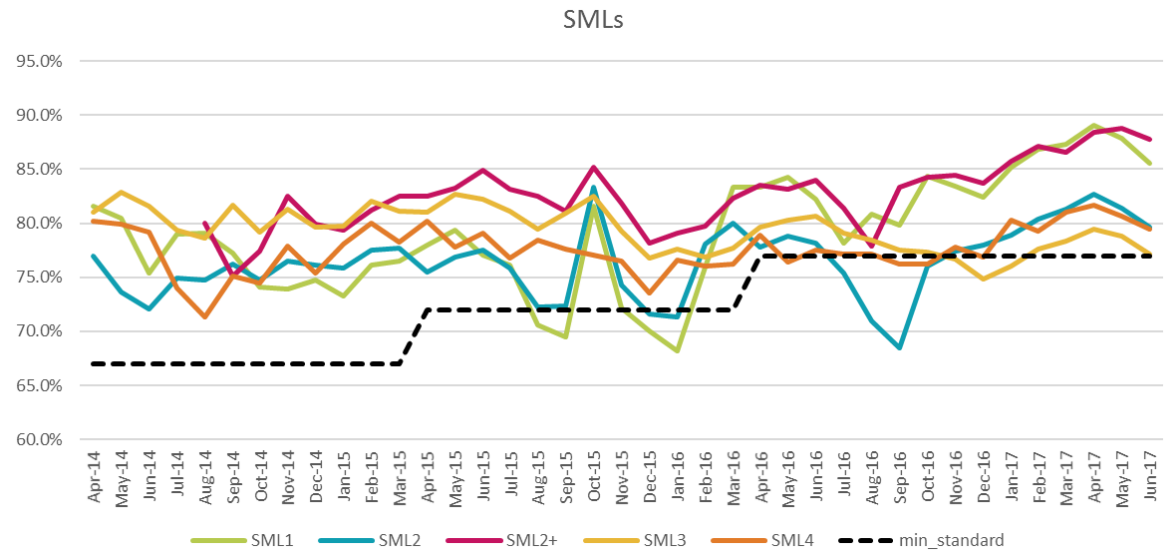
[171] Openreach response to the March 2017 QoS Consultation, paragraph 157.
[172] [✂]
[173] [✂]
[174] 2017 Jigsaw Research, Slide 36.
[175] Jigsaw's research indicates that consumers have a limited willingness to pay for higher quality and value price highly.

consider repair times for SML 1 and 2 broadly align with customer expectations, as described above.

5.15 We have considered the impact we expect our regulation to have on businesses or other consumers who pay more for higher service levels, which promise faster repair services, and whether it would be proportionate to extend regulation to these.

5.16 Openreach's WLR, MPF and GEA-FTTC services are available at higher SMLs (Business 2 Plus, and SML 3 and 4) that offer faster repair times at more expensive price points. We agree that some customers value these premium SMLs. Historical performance data shows that the performance of these premium service levels has been similar to and broadly more stable than SMLs 1 and 2, as shown in Figure 5.1. We infer from this that Openreach has had adequate incentives to maintain the performance of higher service levels at an appropriate level to maintain the value of these services.

**Figure 5.1 UK Monthly percentage of faults restored on time for WLR, MPF, SMPF and GEA-FTTC services, by service maintenance level**




*Source: Ofcom analysis of BT data*[176]

5.17 This aligns with our expectations, in that if Openreach fails to meet the SLA for higher SMLs to a degree that is not commensurate with the higher price point, customers have the option to trade down to SML2 (or even SML1), and will do so. As such, regulation of SML 1 and 2 limits Openreach's scope to reduce performance in relation to other SMLs. In addition, the SLGs payable are service level specific, and therefore higher at the higher SMLs. Therefore, the risk of downward substitution, and the higher level of SLGs for higher SMLs, should continue to provide Openreach with the appropriate commercial incentives to provide and maintain a good service at the higher SMLs.

[176] Data submitted in: Openreach responses dated 5 and 7 March 2014 to the 6th FAMR QoS s.135 notice; Openreach response dated 25 May 2016 to the 2nd QoS s.135 notice; and, Openreach response dated 15 August 2017 to the 9th QoS s.135 notice.

5.18 We consider that it is not necessary, based on evidence at this time, to extend our QoS regulation by applying on time repair performance standards to SMLs Business 2 plus, 3 and 4, and we have therefore decided not to do so. We will, however, keep Openreach's performance under review through our ongoing monitoring activity, for example to ensure that the quality of premium service levels is not degraded by Openreach's focus on meeting our quality standards for SMLs 1 and 2.

# Standards for repairs completed five working days over SLA

## Our proposals

5.19 In our March 2017 QoS Consultation we stated that an important aim of our regulation is to ensure that Openreach is focused on repairing faults, even where it has failed to meet the contracted timescales. We proposed new QoS standards for the proportion of repairs completed five working days after the time promised in its SLAs. Table 5.2 below summarises the levels we proposed to set over the forward-looking review period.

**Table 5.2 Proposed quality standards for repairs completed at + 5 working days (WLR, MPF and GEA-FTTC)**

| QoS standard applicable to UK as a whole | Current level | First year (2018/19) | Second year (2019/20) | Third year (2020/21) |
|---|---|---|---|---|
| Repair completion within SLA + 5 working days | N/A | 95% | 96% | 97% |

*Source: Ofcom*

5.20 We proposed assessing compliance for the relevant services (WLR, MPF and GEA-FTTC) at SMLs 1 and 2 separately. We proposed assessing compliance at the UK level (in contrast to the repair on time standards, which apply regionally). In measuring compliance, we proposed that we would provide exemptions for High Level MBORC declarations in up to two regions each year subject to a limit of eight weeks per declaration. However, we did not consider it appropriate to apply a fixed allowance for *force majeure*. We asked stakeholders:

Do you agree with our proposal to set new standards for repairs completed five working days over SLA for SMLs 1 and 2? Please provide reasons and evidence in support of your views.

## Stakeholder responses

5.21 [✂], Sky, TalkTalk, UKCTA, and Verizon supported our proposal.[177] Sky considered our proposal an "important corollary" to higher on time repair standards[178], while UKCTA considered a 97% standard at five working days over SLA could help to address the issue of the long tail of late repairs.[179] Verizon said the 97% standard, in addition to the removal of the 60-day cap on SLG payments for late repairs, would help to address the repair tail as well as "the ability for Openreach to take deliberate decisions to focus on matters still within SLAs to the detriment of those matters already failing against SLA".[180] [✂] welcomed the proposal, but requested that it also be implemented for higher care levels.[181]

5.22 Openreach disagreed with our proposal for a new quality standard at five working days over SLA[182] as it did not believe that the evidence supported further intervention.[183] However, Openreach also stated that, if we were to implement the new standard, 97% represented a reasonable, yet sufficiently challenging, final year target.[184]

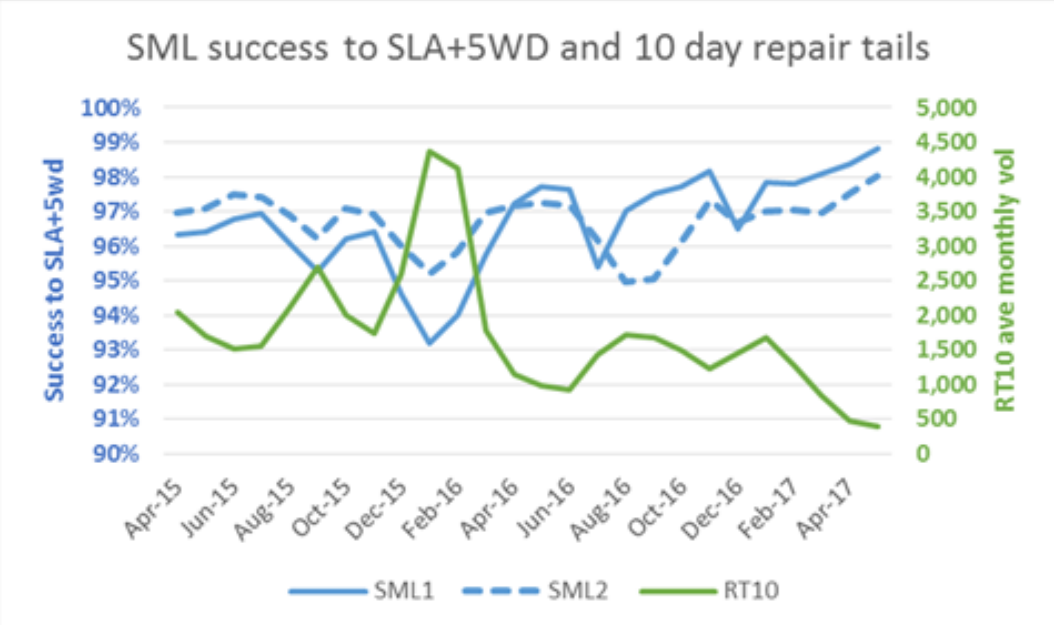
## Our considerations and decisions

5.23 An important aim of our regulation is to improve certainty of repair performance for all customers and to ensure that Openreach is appropriately incentivised to clear faults that it has failed to repair within SLA timeframes.

5.24 In considering whether we should apply a standard on Openreach's performance at SLA + 5 days, we have taken into account evidence regarding Openreach's performance during that time frame. Openreach submitted information on its performance on repair tails and we reproduce Figure 17 of its response to our March 2017 QoS Consultation in Figure 5.3 below. This shows a period of deteriorating performance in terms of both the proportion of repairs completed within SLA + 5 working days, and the number of repair jobs outstanding at 10 days (RT10 in Figure 5.3) in the period leading up to the start of 2016, followed by an improvement thereafter.

[177] [✂]; Sky response to the March 2017 QoS Consultation, paragraph A6.10; TalkTalk response to the March 2017 QoS Consultation, paragraph 4; UKCTA response to the March 2017 Consultation, paragraph 7; Verizon response to the March 2017 QoS Consultation, paragraph 15.
[178] Sky response to the March 2017 QoS Consultation, paragraph A6.10.
[179] UKCTA response to the March 2017 Consultation, paragraph 7.
[180] Verizon response to the March 2017 QoS Consultation, paragraph 15.
[181] [✂]
[182] Openreach reiterated its view in response to our September 2017 QoS Further Consultation, paragraph 15.
[183] Openreach response to the March 2017 QoS Consultation, paragraph 154.
[184] Openreach response to the March 2017 QoS Consultation, paragraph 164.

**Figure 5.3 Openreach repair tails performance**




*Source: Figure 17 of Openreach's response to our March 2017 QoS Consultation*

5.25 We imposed increasing performance standards on Openreach for completing repairs on time (with standards increasing from 2014/15 through to 2016/17). While we welcome the recent improvement in performance and Openreach's current management commitment to delivering improved service in respect of repair work which exceeds its SLAs, we are concerned that the higher on time repair standards we are imposing, as described in Section 6, could lead to long delays for those repairs not completed within SLA timeframes, as occurred in 2015/16. Therefore, we do not accept Openreach's argument that setting standards on repairs completed over SLA is not justified.

5.26 A standard at SLA plus five days would constrain Openreach performance on delayed repairs to no more than six working days (including Saturday) for SML2, and no more than seven working days (excluding Saturday) for SML1. We also take note of most stakeholders' support for a standard on late repairs. For these reasons we have decided that it is appropriate to set QoS standards at five working days beyond the time set out in the SLA.

5.27 In determining an appropriate level for the standard in 2020/21, we have considered Openreach's historical performance for repairs that are completed five working days after its agreed SLA timescales. Openreach's most recent performance is above 97% which is broadly reflective of recent performance, as shown in Table 5.4.[185]

[185] WLR, MPF, and GEA-FTTC for both SMLs 1 and 2. See Annex 1 for distribution curves for these three services combined.

**Table 5.4 UK-wide repair performance at SLA + 5 days (%)**

| | 2011/12 | 2012/13 | 2013/14 | 2014/15 | 2015/16 | 2016/17 |
|---|---|---|---|---|---|---|
| SML1 | 97.2% | 95.5% | 95.0% | 96.4% | 95.7% | 97.5% |
| SML2[186] | 97.8% | 96.3% | 96.2% | 97.7% | 97.4% | 97.2% |

*Source: Ofcom analysis of BT data*[187]

5.28 Given this historical performance has achieved 97%, we consider this to be a reasonable target for the final year of our controls. Stakeholders (including Openreach) considered the setting of the level for repair performance at SLA + 5 working days at 97% in the final year of the review period was appropriate.

5.29 In setting the levels for repair tails for each year of the market review period, we have taken into account the more challenging service performance standards we have imposed on Openreach for on time repair. We also note that this is the first time we have set an additional repair standard, and that there may be a complex interaction between this repair standard relating to delayed repairs and the on time repair standard. We anticipate that Openreach will need time to adjust its business processes to meet both of these repair standards. We note that it has achieved at least 95% for each of the service levels over the last six years. Consequently, we have decided to introduce a glidepath to the 97% standard of 95% in the first year, and 96% in the second year. We consider this strikes an appropriate balance between protecting telecoms providers and their customers from an undue deterioration in performance, while remaining operationally achievable for Openreach and hence is proportionate.

## Structuring the standards for on time and late repairs

### Our proposals

5.30 In our March 2017 QoS Consultation we proposed to set the same standard for services offered at SMLs 1 and 2 (i.e. Openreach's compliance with our standards would be assessed by considering the aggregate performance of WLR, MPF and GEA-FTTC services offered at SML2 in one measure, and WLR and MPF services offered at SML1 in aggregate in a second measure). We asked:

[186] These figures are different to the corresponding figures for total fault repairs in Table 5.7 in Section 5 of the March 2017 QoS Consultation, due to more detailed information about GEA-FTTP fault repairs being available during the analysis. Where previously generic NGA fault repairs were being classified as GEA-FTTC fault repairs, now a number of these NGA fault repairs are able to be classified as GEA-FTTP fault repairs and hence are excluded from these volumes.
[187] Data submitted in: Openreach responses dated 5 and 7 March 2014 to the 6th FAMR QoS s.135 notice; Openreach response dated 25 May 2016 to the 2nd QoS s.135 notice; Openreach response dated 13 January 2017 to the 5th QoS s.135 notice; and, Openreach response dated 15 August 2017 to the 9th QoS s.135 notice.

Do you agree with our proposed structure for the QoS standards? Please provide reasons and evidence in support of your views.

## Stakeholder responses

5.31 Openreach, [✂] and TalkTalk agreed with our proposal to assess compliance with the QoS standards by measuring performance across WLR, MPF and GEA-FTTC, but separately for each SML.[188]

5.32 Vodafone disagreed, arguing that our proposal to impose a single standard that would be separately applied to each of SMLs 1 and 2 for on time repair, would mean that the average consumer using Openreach SML1 would contribute more to the cost of quality whilst seeing no improvement at all over the period.[189] Vodafone said we should set different standards for each of the SMLs, to reduce regulatory gaming and impose suitably "tough" standards.[190]

5.33 Verizon considered that the standards should be assessed by technology, i.e. copper versus fibre, as this would provide greater transparency and may help to inform commercial decision-making.[191]

## Our considerations and decisions

5.34 For the reasons set out in Section 3, we have decided, as proposed, that our regulatory standards should continue to apply to WLR and MPF (but not SMPF) and be extended to include GEA-FTTC (but not GEA-FTTP).

5.35 Our proposals for structuring our standards followed the approach we took in the 2016 Direction and Consents, in which we first structured the standards to apply to the aggregate of WLR and MPF by service level (see Section 2). This was in response to substantive changes in the SML packages purchased by telecoms providers from Openreach. We concluded that applying quality standards at a given SML for all the relevant wholesale network access services would provide for a more stable framework for quality of service regulation.

5.36 We recognise (as we observed in our March 2017 QoS Consultation) that imposing a single QoS standard on repairs delivered to each of SMLs 1 and 2, does not guarantee that the performance of each of WLR, MPF and GEA-FTTC would meet our standard. However, we do not consider there is a material risk that Openreach could use its position of SMP to distort downstream competition by engaging in non-price discriminatory conduct between different services, by reducing the quality of service performance for some services in favour of others. This is due to the following reasons:

[188] Openreach response to the March 2017 QoS Consultation, paragraph 156; response to the March 2017 QoS Consultation, page 7; TalkTalk response to the March 2017 QoS Consultation, paragraph 4.3.
[189] Vodafone response to the September 2017 QoS Further Consultation, pages 2 and 11.
[190] Vodafone response to the September 2017 QoS Further Consultation, page 2.
[191] Verizon response to the March 2017 QoS Consultation, paragraph 18.

i) BT is subject to SMP remedies in relation to non-price discriminatory conduct, which would cover differentiating the quality of service it provides.[192]

ii) The structure of Openreach's service delivery operation does not readily lend itself to such discrimination. We do not consider that BT could readily organise its operations in such a way as to increase the level of service for one service to such an extent that it could materially disadvantage operators consuming other network access services.

iii) We actively monitor Openreach's performance at a detailed level (supported by the ongoing delivery of monthly KPIs for each service variant), which would identify such discrimination if it arose and we would take further action as necessary.[193]

5.37 We have considered whether there would be benefits to setting standards by technology (i.e. copper vs. fibre). However, we do not consider this to be appropriate in light of the arguments set out above, regarding the risk of discrimination, which apply equally to discrimination between copper and fibre services as to discrimination between WLR and MPF services. We have therefore decided to apply the standards to the aggregate of WLR, MPF and GEA-FTTC by service level.

5.38 In designing our standards, we have also considered whether it is appropriate to set the same standards for SML1 and 2. We recognise that consumers have heterogenous needs, which may be met by having a choice over the price and quality of the services they buy. We consider it important that telecoms providers, in choosing the service level to offer their customers have certainty regarding the performance Openreach will offer, and are comparing services on an equivalent basis. Setting different standards for each service level could erode the differentiation between the service levels and undermine the range of choices available. For this reason, we have decided to set the same standard for each service level.

5.39 As described in Section 10, we separately estimate the resource uplift required to meet our revised standards for SMLs 1 and 2. While SML1 requires 11.8% additional resources, SML2 requires 16.4%. This differential is due to the relative difficulty in achieving the standards at a higher service level. For this reason, we disagree with Vodafone's concern that by applying the same standards to SML1 and 2 there might be a cross subsidisation effect from telecoms providers that predominantly purchase SML1 in favour of those that purchase SML2, as we apply separate resource uplifts to each service level.

5.40 For the reasons set out above we consider that our approach for structuring the quality standards by service level is appropriate and proportionate and have decided to proceed on this basis.

[192] The requirement not to discriminate unduly is covered by Condition 3 of the NMR SMP Conditions and Condition 4 of the WLA SMP Conditions; and the requirement to provide services on an EOI basis is covered by Condition 4 of the NMR SMP Conditions and Condition 5 of the WLA SMP Conditions.

[193] See Section 9 for our decisions on BT's transparency obligations for both installations and repairs.

# Annual compliance periods and geographic application

## Our proposals

5.41 In our March 2017 QoS Consultation, we proposed that compliance with the repairs standards should be assessed annually by each of BT's ten regions. We asked:

> Do you agree with our proposed compliance periods and geographic applications of the repair standards? Please provide reasons and evidence in support of your views.

## Stakeholder responses

### Annual compliance

5.42 Respondents supported our proposed 12-month compliance periods for the repair quality standards. Openreach considered that a compliance period of one year allows for the impact of any poor weather in one half of the year to be mitigated in the other, and that any reduction to this time period would lead to an increase in its costs.[194]

### Geographic application

5.43 Openreach and TalkTalk both agreed with our proposals to assess the on time repair standards at the regional level and the + 5 days standards at the UK level.[195] Openreach added that in the event that it changes its regional operational structure, it did not believe that this needed to be reflected in the QoS standards.[196]

5.44 [✂] considered that the geographic applications of the repair standards appear sensible and should prevent gaming of the figures by over-achieving in some regions at the expense of others.[197] Similarly, Verizon stated that our proposals are practical and would ensure that regional specificities do not impact upon quality of service.[198]

## Our considerations and decisions

### Annual compliance

5.45 While we consider it is desirable for Openreach to achieve a consistent level of service over time, there are typically periods in each year when conditions are more challenging. By setting standards on an annual basis Openreach can balance periods of high repair demand with periods of low demand, for example where weather is benign, and plan its resources efficiently. We also note that stakeholders broadly support our proposals for the time period over which compliance with the repair standards will be measured.

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[194] Openreach response to the March 2017 QoS Consultation, paragraph 225.
[195] Openreach response to the March 2017 QoS Consultation, paragraphs 226 and 228.
[196] For example Openreach's splitting of Wessex into two GM regions. Openreach response to the March 2017 QoS Consultation, paragraph 227.
[197] [✂]
[198] Verizon response to the March 2017 QoS Consultation, paragraph 18.

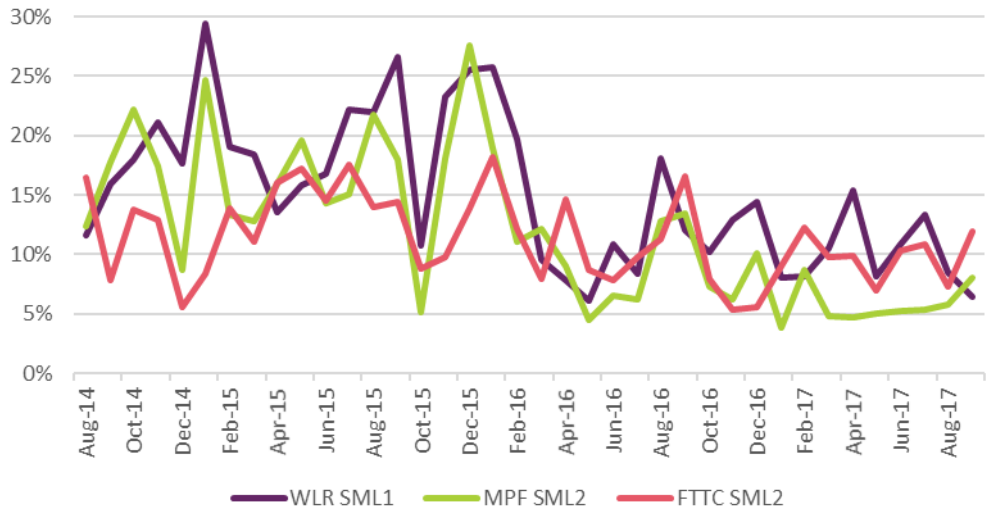
5.46 For these reasons we consider that assessing compliance annually is the most appropriate approach. The first assessment period for the repair standards will be 12 months beginning 1 April 2018. Subsequent periods will begin 1 April 2019 and 1 April 2020, respectively and the final year standards will remain in force until superceded or revoked. Imposing the standards in this way also aligns our QoS remedies with the WLA market review and charge control periods.

### Geographic application

5.47 It is important that the standards for installations apply in sufficient granularity to ensure performance is reasonably consistent throughout the country to support effective competition and consistent outcomes for consumers. A single, national target could also increase the risk that performance in some regions might be sacrificed due to potentially different challenges involved in meeting the target in different regions, or due to different competitive considerations. On the other hand, we are mindful that applying standards to a very large number of areas could increase the cost and complexity of BT's compliance, and affect the statistical reliability of reported results.

5.48 As shown by Figure 5.5 below, Openreach's monthly on time repair performance[199] often varies considerably between the highest and lowest performing regions. The average differential figure since August 2014 is 13%, but the performance difference has exceeded 25% in some months. Hence, we are concerned that a national standard for on time repair could be met by Openreach performing well in some areas of the UK, but allowing performance to degrade in other regions.

**Figure 5.5 Performance difference between the highest and lowest performing regions in the UK, for WLR, MPF, and GEA-FTTC**




*Source: Ofcom mandatory non-discrimination KPIs*

5.49 As described above, in our March consultation we proposed to measure compliance with the on time repair standards for SMLs 1 and 2 by reference to each of BT's ten operational

[199] For WLR, MPF, and GEA-FTTC.

regions to ensure consistent performance throughout the country, and we note that respondents broadly supported our proposal.

5.50 We also consider that applying regional standards reduces the risk of discrimination between regions, including where the mix of services varies from region to region, and is consistent with Ofcom's statutory duty to have regard, in performing our functions, to the interests of persons in different parts of the UK.

5.51 We have also, however, been mindful of the possibility that applying standards on too granular a basis could increase the cost and complexity of BT's compliance, and affect the statistical reliability of the reported results. We have determined, balancing the advantages and disadvantages of greater granularity, that the repair within SLA standards for SMLs 1 and 2 repairs should apply to each of BT's ten regions, and consider they will ensure a good level of quality for customers across the UK without imposing disproportionate requirements on BT, and that this is consistent with Ofcom's duties to each of the UK nations under the Act. We have therefore decided to apply the on time repair standard regionally.

5.52 We have also considered whether it is appropriate to apply the SLA + 5 days standard on a national or regional basis. In light of our decision to measure on time repair performance regionally, which would require Openreach to adequately resource all areas, we do not expect there to be much opportunity (or incentive) for Openreach to significantly vary performance outcomes by geography at five working days over SLA. While some inter- and intra-region variations may occur, we consider that this is likely to be because of regional differences, for example based on geography, in the prevalence of more difficult repair jobs (for example those involving civil engineering work or requiring specialist skills or equipment). Consequently, it is proportionate for us to afford Openreach a degree of operational flexibility in meeting the target. We consider that the application of the on time repair standard regionally and the SLA + 5 days standard nationally represents the appropriate balance between ensuring the consistency of standards across the UK and imposing a proportionate set of requirements on BT that does not unduly affect its ability to meet the quality standards.

## Inclusion of *force majeure* in the standards

### Our proposals

5.53 In our March 2017 QoS Consultation, we proposed to include a 3% allowance for *force majeure* and High Level exemptions in up to two regions per year, for up to eight weeks per event for the on time repair standards. For the standard for SLA + 5 days we proposed to allow the same High Level exemption, but not include a fixed allowance. We asked:

Do you agree with our proposal to continue to make an allowance for *force majeure* in the repair QoS standards? Do you agree with our proposals to use 3% as the Local MBORC allowance and to retain exemptions for High Level events? Please provide reasons and evidence in support of your views.

## Stakeholder responses

5.54 Respondents to our March 2017 QoS Consultation were generally in agreement with the principle of allowances for MBORCs and supported our proposal to continue to incorporate MBORCs in our QoS standards. However, there were different opinions regarding the level of the fixed allowance that we should include in the on time repair standards.

5.55 Verizon and UKCTA considered 3% to be overly generous and potentially open to abuse, and argued it should be reduced to 2 to 2.5%.[200] Similarly, TalkTalk believed that a 3% allowance was too generous and should not apply across the market review period, regardless of weather conditions. TalkTalk suggested that Ofcom phase in a reduction of the allowance to 1% over the three-year period.[201]

5.56 Openreach argued that a higher MBORC allowance would be more appropriate given historical data which suggests that faults subject to MBORCs as a percentage of total faults exceeded 5% in 2012/13.[202] Should we retain the current 3% allowance, Openreach considered that the restriction on declaring High Level MBORCs in two regions should be removed with exemptions made on a case-by-case basis.[203]

5.57 Responding to our September 2017 QoS Further Consultation, Sky and TalkTalk noted that the proposed fixed allowance has been set by reference to the conditions of 2011/12.[204] Sky said we should refresh our analysis using more recent data.[205] TalkTalk, meanwhile, suggested that we consider basing the allowance on an average figure.[206]

5.58 Openreach stated that it believed the current approach to applying MBORC allowances, specifically restricting High Level MBORCs to two regions for up to eight weeks per event, is not aligned to the underlying reasons for having an MBORC regime.[207]

5.59 In addition, several respondents considered that we should review the general allowance to ensure that MBORC claims are transparent and scrutinised, and proposed that Ofcom introduce rules for the number and duration of MBORCs.

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[200] Verizon response to the March 2017 QoS Consultation, paragraph 14; UKCTA response to the March 2017 QoS Consultation, paragraph 6.
[201] TalkTalk response to the March 2017 QoS Consultation, paragraph 4.8.
[202] Openreach response to the March 2017 QoS Consultation, paragraph 229.
[203] Openreach response to the March 2017 QoS Consultation, paragraph 234.
[204] Sky response to the September 2017 QoS Further Consultation, paragraph 6.24. TalkTalk response to the September 2017 QoS Further Consultation, paragraph 2.4.
https://www.ofcom.org.uk/__data/assets/pdf_file/0018/108090/TalkTalk.pdf.
[205] Sky response to the September 2017 QoS Further Consultation, paragraph 6.24.
[206] TalkTalk response to the September 2017 QoS Further Consultation, paragraph 2.4.
[207] Openreach response to the March 2017 QoS Consultation, paragraph 13.

## Our considerations and decisions

5.60 Within any given year *force majeure* type events, outside of Openreach's direct control, can occur in any region and may cause Openreach to fail its repair targets. These can include, among other things, extreme weather events and criminal or negligent damage to the Openreach network by third parties. We need to take account of the fact that there is a risk of *force majeure* events of such a magnitude for which no preparation by Openreach would be sufficient.

5.61 We have considered making allowances for such events that are outside Openreach's control when assessing compliance with the QoS standards. This could either be done on a 'case by case' basis or by setting fixed allowances. The advantage of a case by case approach is that the effect should reflect the actual impact of MBORC events on Openreach's performance. However, a risk of allowing case by case exemptions is that it could provide an incentive for Openreach to declare excessive MBORCs and to 'abuse' the MBORC regime. Such a regime would create a significant regulatory burden to review cases and ensure such abuse did not occur, and could slow-down subsequent calculations of SLGs.

5.62 The alternative approach, to set a fixed allowance for MBORCs, would need to be based on historical information regarding the scale of such events. In order to be effective, such an allowance would need to be set such that there would be little remaining scope for Openreach to claim extraordinary events in excess of the allowance when we are assessing compliance with the standards. By setting the allowance in this way, the incentives for Openreach to over-declare MBORCs would be effectively removed. However, it also means that the MBORC allowance is likely to be in excess of Openreach's actual exposure to such events in most years.

5.63 Because a fixed allowance reduces the regulatory burden and reduces Openreach's incentives to game the regime, while also providing transparency regarding the level and rationale for the allowances, we have decided that we will include a fixed allowance for MBORCs in relation to the on time repair standard.

5.64 We note that several respondents broadly agreed on the appropriateness of the principle of allowances for MBORCs, however some were concerned that such an allowance may incentivise Openreach to systematically underperform against the standard. In general, we expect Openreach to be able to at least meet the standards we have set, and therefore outperform the MBORC adjusted standards in the absence of exceptional circumstances. Should Openreach fail the standards we would need to assess the circumstances pertinent to the failure in our assessment of compliance. Previous years' performance could indicate whether adequate resources had been employed to meet the standards historically.

5.65 In 2014 we undertook a comprehensive study of events that resulted in late repairs, including extreme weather events, and decided to allow for two types of MBORC events: Local MBORCs (a fixed allowance) and High Level MBORCs (a time limited exemption for two regions). We set out our consideration of both types of MBORCs and stakeholders' views in turn below.

### Fixed allowance for local MBORCs

5.66 We have reviewed the historical rates of MBORC declarations which were associated with a failure against the SLA as a guide for whether a fixed allowance should be included within the on time repair standards, and, if so, what an appropriate level would be.

5.67 We have observed a significant fall in the proportion of MBORCs after 2013/14, which we consider to be due to a combination of benign weather and Openreach improving its recovery response. Table 5.6 presents the volume and proportion of fault repairs that exceeded the SLA which were impacted by local MBORCs.

**Table 5.6 Fault repairs exceeding the SLA impacted by local MBORCs[208]**

| | 2013/14 | 2014/15 | 2015/16 | 2016/17 |
|---|---|---|---|---|
| Total fault repairs[209] | 3,621,914 | 3,699,788 | 3,883,471 | 3,958,207 |
| Total fault repairs that missed SLA which were impacted by MBORC | 291,679 | 56,769 | 62,737 | 65,196 |
| % of faults repairs that missed SLA which were impacted by MBORC | 8.1% | 1.5% | 1.6% | 1.6% |

*Source: Ofcom analysis of BT data[210]*

5.68 In light of this data covering the period of our previous quality standards, we do not consider that there is evidence of abuse of the system for declaring MBORCs, nor of other inappropriate use of MBORC declarations by Openreach (for example an artificial inflation of MBORC levels via tactical declarations). Further, we consider that information on MBORC use is available to telecoms providers on Openreach's customer portal. That said, if stakeholders believe they have evidence of MBORC misapplication, we recommend they engage with the OTA2 in the first instance.[211]

5.69 The analysis conducted as part of the 2014 FAMR regarding MBORC events included consideration of periods of particularly poor weather (in particular 2011/12), in which we

[208] We note that the percentage of fault repairs impacted by MBORC that missed the SLA calculated here for 2013/14 is larger than the corresponding calculation in the 2014 FAMR due to the use of filtered volumes for total fault repairs.
[209] These figures are different to the corresponding figures for total fault repairs in Table A6.47 in Annex 6 of the March 2017 QoS Consultation due to more detailed information about GEA-FTTP fault repairs being available during the analysis. Where previously generic NGA fault repairs were being classified as GEA-FTTC fault repairs, now a number of these NGA fault repairs have been classified as GEA-FTTP fault repairs and hence are excluded from these volumes.
[210] Data submitted in: Openreach responses dated 5 and 7 March 2014 to the 6th FAMR QoS s.135 notice; Openreach response dated 25 May 2016 to the 2nd QoS s.135 notice; Openreach response dated 9 December 2016 to the 4th QoS s.135 notice; Openreach response dated 7 July 2017 to the 8th QoS s.135 notice; Openreach response dated 15 August 2017 to the 9th QoS s.135 notice.
[211] Stakeholders would also have the option to make a formal complaint to Ofcom and we would then decide whether or not to open an investigation under our statutory powers.

found that, excluding High Level MBORCs events, the average MBORC effect on faults was between 3% and 4%.[212]

5.70 In this review, we have considered including a fixed 3% *force majeure* allowance for the on time repair standard to provide certainty to Openreach that more significant numbers of weather-related events should not have an unintended consequence on its ability to meet its regulatory obligations.

5.71 We do not consider it appropriate to include a greater allowance than 3% in the context of Openreach's recent performance as shown in Table 5.6, and in particular our observation that there has been a significant reduction in the proportion of fault repairs exceeding SLAs which were impacted by MBORCs: from 8.1% in 2013/14 to 1.6% in 2016/17. To that end, we consider that increasing the fixed *force majeure* allowance for the on time repair standards would neither be necessary nor justified at this stage.

5.72 On the other hand, we do not consider that reducing the fixed allowance or imposing a glidepath down to 1% would be appropriate as this would not provide sufficient allowance in light of recent performance. The allowance should be sufficient to take into account the potential for weather events to affect a large number of lines simultaneously and to significantly disrupt operations over the period of this market review, in excess of recent experience. This suggests that a 3% allowance would be sufficient to mitigate the risk of Openreach failing the standards for reasons genuinely outside its control.

5.73 Therefore, we have decided to include a 3% fixed MBORC allowance for the on time repair standard. We consider that this allowance will provide an incentive for BT to reduce the impact of MBORC overall, as in any given year it will be held accountable for all failures (excluding any High Level exemptions as discussed below).

### Exemptions for High Level MBORCs

5.74 With respect to exemptions for High Level MBORCs, we consider it necessary to take account of the effect and variability of major incidents, such as floods or storms, which may disproportionately impact a specific geographic area. In the 2014 FAMR, we allowed Openreach a time-limited exemption in any two areas of the UK per year for late repairs due to High Level MBORC events.[213] This was intended to allow for the fact that in any given year, particular regions may suffer from much more extreme weather than the UK average.

5.75 To apply for High Level MBORC exceptions during compliance assessment, Openreach is required to provide Ofcom with details of the event together with the justification for the length of the declaration. Therefore, we consider that there is already an adequate degree of oversight of High Level MBORC declarations which would not suggest further Ofcom intervention is needed to ensure that industry has confidence in the process. Also, the KPIs

[212] 2014 FAMR Statement, Section 11.

[213] This is limited to a maximum of eight weeks in a year in a given geographic region, and Openreach could use the exemption in no more than two regions. Work undertaken for Ofcom by Cartesian for the purposes of the 2014 FAMR showed that the highest average period for a Senior Operations Manager (SOM) area to be impacted by an individual MBORC event in 2012 and 2013 was 58 days.

(set out in Section 9) will provide us and Openreach's customers with regular data on installations and repairs affected by MBORC which miss their Committed Date or SLA.

5.76 We disagree with Openreach's suggestion that the restriction to two regions should be removed with declarations made on a case-by-case basis. In our view there is a risk that Openreach may err towards declaring High Level MBORCs in marginal circumstances, and this could undermine the standards we are imposing. Thus far Openreach has been able to meet the standards over the FAMR period without needing to rely on High Level MBORC declarations.

5.77 Therefore, we have decided to allow High Level MBORC exemptions in up to two regions per year, for up to eight weeks per event. Because we cannot predict which regions may be impacted by such events from one year to the next, we consider it appropriate to allow for flexibility as to which two regions per year Openreach may apply the High Level MBORC allowance (should it be necessary to apply it at all).

### MBORC exemptions for the SLA + 5 days repair standard

5.78 We consider that localised, small-scale events are relatively less likely to have an impact on Openreach's performance against the SLA + 5 days standard. This is because the compliance with this standard is assessed nationally on an annual basis. Any local events are unlikely to have a significant impact on the UK wide annual performance. For this reason, we have decided not to include a fixed allowance in this standard.

5.79 However, it is not clear whether exceptional regional events could have an impact on compliance with this standard. For this reason, we have decided to grant the same exceptions for High Level MBORCs as apply for the on time repair standard.

### Monitoring Openreach's MBORC declarations

5.80 Given stakeholder concerns regarding the transparency of the MBORC regime for the repair standards, in this review we have made changes to the KPIs we require BT to report on its MBORC declarations. We have introduced a new requirement for BT to report estimates of the split between High Level and Local MBORC on an annual basis, as described in Section 9. We have also retained the requirement for BT to report KPIs that track MBORC declarations on a monthly basis. This should limit the scope for Openreach to 'abuse' the MBORC regime, because we will be able to see any unusual patterns in MBORC declarations which might suggest that it is using MBORC declarations to mask lower repair performance in any region.

# 6. Regulating BT's "on time" repair performance

6.1 Further to our decisions on service performance for repairs set out in Section 5, this section explains our reasoning and decisions on setting levels for the proportion of repairs that BT must complete 'on time' (that is within relevant service level agreements or SLAs) over the period 2018 to 2021.

6.2 In this section we set out our considerations and decisions regarding the on time repair standard. We first consider Openreach's operational capabilities. Then we consider the level for fault repairs completed on time. Finally, we consider the levels for fault repairs completed on time between 2018 and 2021 (the 'glidepath').

6.3 As described in Section 10, we consider that the decisions set out in this section contribute to the fulfilment of our statutory duties and satisfy the relevant legal tests. In reaching these decisions, we have also taken into account our regulatory experience from previous market reviews, recent developments in these markets (based on information provided by Openreach and its customers, and on consumer research we have commissioned), and also expected developments over the course of the three-year review period.

## Summary of decisions

6.4 Openreach offers different service maintenance levels (SMLs) to its customers which commit Openreach (through its SLAs) to different lead times for repairing faults.[214]

6.5 In this section, we refer to faults repaired within the relevant SLA time period as 'on time' repairs. We have decided to set standards on the proportion of faults Openreach repairs on time to each of SMLs 1 and 2, measured across WLR, MPF and FTTC-GEA services in aggregate as shown in Table 6.1.

**Table 6.1 Standards for Openreach's WLR, MPF and GEA-FTTC on time repair performance**

| | Current level | First year (2018/19) | Second year (2019/20) | Third year (2020/21) |
|---|---|---|---|---|
| On time repair completion | 80% | 83% | 86% | 88% |
| (Adjusted standard for *force majeure*) | (77%) | (80%) | (83%) | (85%) |

*Source: Ofcom*

[214] Details regarding SLA can be found in the service level and fixed compensation schedules to Openreach's relevant contracts for the provision of WLR, MPF and GEA-FTTC network access services. See Openreach, Local Loop Unbundling Contract Information. https://www.openreach.co.uk/orpg/home/products/llu/contracts/contracts.do [accessed 24 January 2018]; for details regarding SMLs see *Fact Sheet: Service Maintenance Levels.* https://www.ciz-openreach.co.uk/Business/content/90/Service-Maintenance-Levels-fact-sheet [accessed 13 December 2017].

# Openreach's operational capabilities

## Our proposals

6.6 In our March 2017 QoS Consultation we explained that, in determining the levels of proposed repair standards, we considered several factors, including Openreach's operational capabilities. We acknowledged that Openreach could not meet all of its service commitments all of the time as the resolution to some faults may be complex. We said it would be disproportionate to set a regulatory standard at a level higher than that which is operationally achievable. Understanding the likely limits of Openreach's operational capabilities within the forward-looking review period is therefore a key consideration in setting standards for Openreach's fault repair performance.

6.7 In developing our initial proposals for setting repair standards in March 2017, we requested information from Openreach about the operational limits to its ability to repair services on time.[215] Based on our analysis of Openreach information, we estimated Openreach's upper bound of capability to be around 96.6% by the end of the review period.[216] In response to our March 2017 QoS Consultation, Openreach provided us with new evidence that related directly to the reasons for failure against the SLAs including its view on whether those failures could reasonably be eliminated within the forward looking review period.

6.8 In our September 2017 QoS Further Consultation, we set out the findings of our review of operational limitations and our analysis of this new evidence from Openreach. We provisionally concluded that the maximum achievable on time repair performance had the potential to rise to 89.3% over the course of the review period. Openreach's evidence indicated that further improvements to its operational limit for on time repairs were also feasible, highlighting two business processes that could be improved. These were in relation to 'Reject Clear' and the proportion of faults for which an appointment is made with the customer, both of which are explained in detail later in this section.[217][218]

6.9 In our September consultation we proposed that addressing these issues was not, in the first instance, a matter of regulation, but rather something for industry to resolve, and therefore we did not include any changes to these processes in our assessment of Openreach's operational limits.

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[215] i.e. the practical upper limit on repairing faults accepting that certain circumstances are encountered in reality that cannot reasonably be dealt with at the time, which is sometimes called the 'glass ceiling'.
[216] Averaged over SML1 and SML2.
[217] 'Reject Clear': this is a WLR and GEA-FTTC specific process (it does not apply to MPF) whereby a telecoms provider can reject Openreach's resolution of a fault (within 48 hours) and, if they do, the time elapsed against the SLA is measured from the point the original fault was raised. Openreach proposed that either the Reject Clear process should be disapplied from the WLR and GEA services, bringing them in line with MPF, or that the SLA 'clock' should be reset (so time elapsed against the SLA runs from the point of notification of the rejection of Openreach's resolution only).
[218] Increased proportion of faults appointed: Openreach argued that some faults cannot be resolved in one visit as the initial diagnostic tests indicate a fault outside the home, but the attending technician determines that access to the customer's premises is required. Access may not be feasible where there is no prior appointment, and therefore the SLA may not be met.

6.10 We asked:

> Do you agree with our revised position on Openreach's operational capabilities for on time repair? Please provide reasons and evidence in support of your views.

## Stakeholder responses

6.11 [✂] welcomed the more granular data on SLA failure provided by Openreach, but questioned its applicability as a measure of Openreach's efficiency. [✂] remarked that Openreach's recruitment of more engineers had not delivered any noticeable improvement in repair to SLA over the last four years and that improvements in multi-skilling and fault diagnostics should raise any operational limits. [✂] questioned Openreach's regional operational limits. It accepted that rurality might affect engineering efficiency, but said that the variances in the regional performance did not appear wholly related to geography. [✂] did agree with us over certain Openreach identified process improvements which we viewed as requiring industry discussion and agreement.[219]

6.12 Sky also did not agree with our revised proposals for on time repairs, and called on us to reject Openreach's operational limits analysis for service levels. It argued that we had removed an incentive on Openreach to improve its own diagnostic tests and fault resolution by accepting that Openreach could not improve its operational performance by a further 2% (over the limit we proposed).[220]

6.13 TalkTalk recognised that it was appropriate for us to take account of new evidence about Openreach's operational capabilities. In arguing its case for setting a standard for repair above 88%, TalkTalk claimed that Openreach could complete some of the more difficult repairs (that are above its 'glass ceiling') within the SLA period particularly for SML 1. It suggested that almost half of the 'glass ceiling' repairs exceed the SLA due to the need for civil engineering. Whilst such jobs may on average take several days, TalkTalk argued that there must be a proportion of simpler cases which can be completed within the relevant SLA period.[221] Vodafone also considered it relevant to conduct separate operational limits analysis for each SML to further inform a view on Openreach's ability to repair within each relevant SLA timeframe.[222]

6.14 Where Openreach has not been able to access the customer premises, Vodafone considered it reasonable that the repair SLA 'clock' should be paused if the telecoms provider informs Openreach that the fault has not be satisfactorily resolved (Reject Clear) until a customer appointment can be scheduled.[223] We assume Vodafone's intent with this suggestion is that this approach would effectively remove from the operational limits analysis one cause of Openreach's SLA failure, thereby increasing the calculated operational limit.

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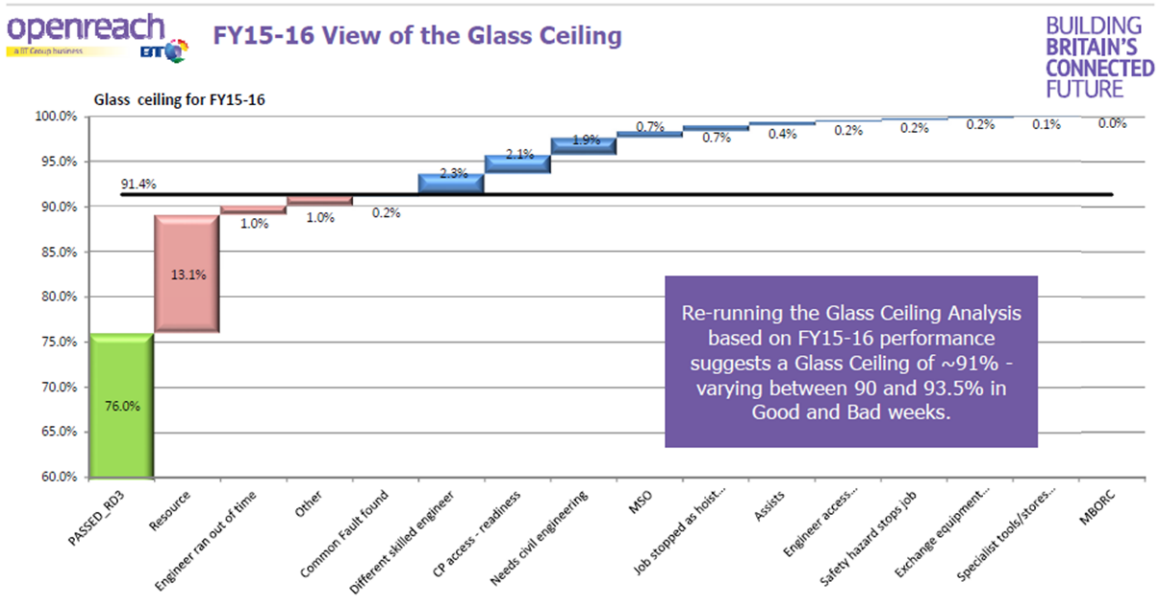
[219] [✂]
[220] Sky response to the September 2017 QoS Further Consultation, paragraphs A1.1 to A1.2.
[221] TalkTalk response to the September 2017 QoS Further Consultation, paragraphs 2.3 to 2.4.
[222] Vodafone response to the September 2017 QoS Further Consultation, page 17.
[223] Vodafone response to the September 2017 QoS Further Consultation, page 17.

6.15 In relation to those faults which are not repaired on time because an Openreach engineer requires access to the customer's premises, but no appointment has been requested in advance by the telecoms provider, Vodafone stated that it would be delighted to work with Openreach if a proportionate solution were to be proposed (i.e. something that would not require all repairs to be 'appointed' as this would mean that all customers would have to make themselves available for all repairs). Noting our provisional conclusion that the operational limit was 89.3%, Vodafone considered that we should require Openreach to repeat its operational limits analysis for the latest 12-month period (October 2016 to 2017).[224]

6.16 UKCTA thought we had been "lenient" in our analysis of Openreach's operational capabilities.[225] We based our assessment on Openreach's information about the incidence of 'on the day' fault repair failures (i.e. something going wrong while its engineers are working on repair jobs) in 2015/16. This information is shown in Figure 6.2 below (note the operational limit is called 'glass ceiling' in this figure).

**Figure 6.2 Openreach pre-March 2017 consultation view of the repair glass ceiling (2015/16)**




*Source: Openreach* [226]

6.17 While Openreach acknowledged that there was some scope for it to make improvements (i.e. some of the reasons why repairs are not completed on the day could be addressed and removed), at the time of our March 2017 QoS Consultation it had not provided us with any detail about the extent of these improvements. We therefore relied on our own estimates of the potential scope for improvements in making our initial proposals.

6.18 As illustrated in Figure 6.2 above by the red bars[227], Openreach considered that 15.3% of the on the day failures were mostly due to factors within its control, primarily the

[224] Vodafone response to the September 2017 QoS Further Consultation, page 17.
[225] UKCTA response to the September 2017 QoS Further Consultation, paragraph 12.
[226] Figure 5.6 on page 54 of our March 2017 QoS Consultation.
[227] The items: Resource, Engineer ran out of time, Other, and Common fault found.

availability of field engineering resources. Based on this information, we considered that, with additional resources alone, and without changes to working practices, it would be operationally feasible for Openreach to achieve an on time repair performance of over 90%. We also noted that on the day failures did not translate directly to SLA performance; for example, because it would be possible to complete some repairs on a further attempt within the SLA timescales (either later the same day, or on the following day in the case of SML1 repairs). We therefore considered that the upper bound of performance against SLA would be higher than that for on the day performance.

6.19 Further, we considered that there were incremental improvements that Openreach could make to current processes (such as engineer multi-skilling, better fault diagnostics, and wider availability of specialist equipment) over the three-year market review period such that it would be able to achieve an even higher operational limit. Factoring in our own estimates for the realisation of these process improvements, our analysis indicated that the upper bound of on time repair performance could reach 96.6% by the end of the review period (2020/21). We proposed to use this upper bound in setting the repair standard.

## Our considerations and decisions

6.20 We set out here our analysis and assessment of Openreach's operational capabilities. First we review our analysis of Openreach's operational capabilities as set out in the September 2017 QoS Further Consultation, then we set out our conclusions, taking account of the stakeholder responses outlined above.

### Our analysis of Openreach's operational capabilities in the September consultation

National Operational Capabilities

6.21 Together with its response to our March 2017 QoS Consultation, Openreach provided new analysis of failures against its repair SLAs, which it considered gave a more accurate view of the operational limits to its repair performance compared to the previous 'reasons for failure on the day' analysis. Openreach's new analysis additionally differed from the previous analysis in the following ways:

- it considered all events and visits that take place from the point of receiving a fault report to the point of fault clearance, whereas its previous analysis just looked at what happened on the first engineering visit;
- it split customer-caused issues between: (i) faults for which an engineer visit to a customer's premises was arranged ('appointed faults'); and (ii) faults for which such an engineer visit was not arranged ('non-appointed faults') but, after carrying out testing of the network, the engineer determined that access to the customer's premises would be required to restore service[228];

[228] Referred to in Openreach's revised analysis as 'CP access/readiness' issues.

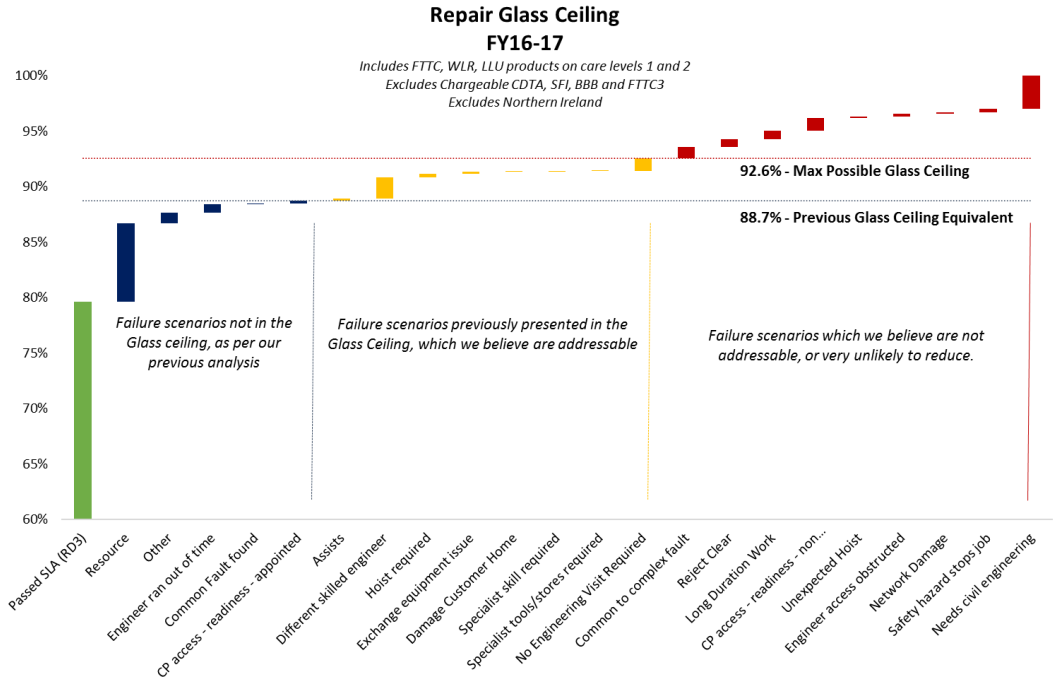
- it carried out a more detailed examination of the proportion of jobs that fail and why, and revised its view on how failure scenarios (such as long duration or complex faults, or the need for a hoist) contribute to operational limitations; and
- it considered situations where jobs fail against multiple criteria, identifying the primary barrier for resolution against a specified order of precedence.[229]

6.22 In light of these changes, Openreach's appraisal of its operational capabilities first mapped the stages a fault report goes through (by looking at all activities required to clear a fault) in order to make the best assessment of the operational limit of its performance, including engineering visits and third party interactions.[230] It then identified the primary cause of failure to clear each fault report, which involved allocating each repair job to a single failure scenario (even though some repairs take longer for more than one reason). Next, Openreach presented the results in a 'waterfall' format for ease of explanation.[231]

6.23 Figure 6.3 below shows the new waterfall chart reflecting Openreach's revised analysis of repair SLA failures in 2016/17. Openreach put the current operational limit to performance at 88.7% nationally. Openreach also divided the failure categories into two groups: those that are to some extent within Openreach's power to influence[232]; and those that are either not addressable or very unlikely to reduce.[233] On this basis, Openreach estimated the theoretical upper bound to its repair performance to be 92.6%. Openreach did not believe it was practical to eliminate all failures in the partially addressable category completely, nor, in its view, would doing so represent value for money. Openreach therefore argued that, nationally, the practical operational limit to performance lies within the range 88.7% to 92.6%.

[229] This impacts Openreach's operational limits analysis, as resolving one cause of failure might not result in a successful repair as there might be a further cause of failure.
[230] For example, sometimes Openreach will need to need to obtain agreement from landowners, local authorities, or highway authorities to carry out its work.
[231] As they did previously. See Figure 6.2.
[232] 'Amber failure scenarios' include the need for a different skilled engineer, a hoist, or specialist tools.
[233] 'Red failure scenarios' include engineer access being obstructed or network damage.

**Figure 6.3 Openreach revised view of the repair glass ceiling (national level for 2016/17[234])**




*Source: Openreach*[235]

6.24 While Openreach did not consider it possible to raise the operational limit to the level we proposed for regulating its repair performance in our March 2017 QoS Consultation, it agreed with our view that several key areas of failures are at least partly addressable through operational and process improvements. As shown in Table 6.4 below, Openreach quantified what improvements (both planned and potential) it estimated could be made to current operational limitations either by itself or through agreement with telecoms providers. Openreach estimated the lower bound to its operational capabilities could rise to 90.8% (nationally), if it made improvements to factors it could influence. Any further upward shifts would require action from telecoms providers.

[234] Excluding Northern Ireland.
[235] Openreach response to the March 2017 QoS Consultation, Figure 22.

**Table 6.4 Openreach estimates of addressability of repair glass ceiling components**

| | 2016/17 | Post Openreach improvement | Post industry changes |
|---|---|---|---|
| Amber scenarios – to some extent within Openreach's ability to influence | 2.63% | 1.37% | 1.37% |
| Red scenarios – outside of Openreach's reasonable control | 4.02% | 4.02% | 2.61% |
| Glass ceiling | 11.3%<br>(88.7%) | 9.2%<br>(90.8%) | 7.4-7.8%<br>(92.2-92.6%) |

*Source: Openreach*[236]

6.25 Openreach's evaluation included two structural changes to operational processes and the repair SLA measures (red scenarios) that it said would together raise its operational capabilities by around 2%:

- SLAs could exempt instances where Openreach fails to complete a repair because it requires access to the customers premises, but the telecoms provider has not made an appointment to ensure that the end customer is present to provide access.[237] Currently, repairs can take longer than the SLA period for this reason and are not exempted from SLA failure.
- The SLA lead times could be extended where telecoms providers reject an Openreach fault 'clear' within a 48-hour window, should the end customer advise the telecoms provider that the fault has not been resolved to their satisfaction. This is known as a 'Reject Clear' and is available for WLA and GEA (but not MPF) services. Openreach suggested either disapplying Reject Clear from the WLR and GEA services, or resetting the SLA 'clock' when Openreach receives a Reject Clear from a telecoms provider alongside valid notes and proof of dialogue with the customer.

6.26 Including the two suggestions described above, Openreach considered that its operational limit could be 92.2% nationally.

6.27 In our September consultation we took the view that we could not include in our assessment of Openreach's operational limit the benefits Openreach attributed to addressing Reject Clear and the appointing of more fault visits. Consequently, we proposed the national operational limit should be 90.8%.

Regional operational capabilities

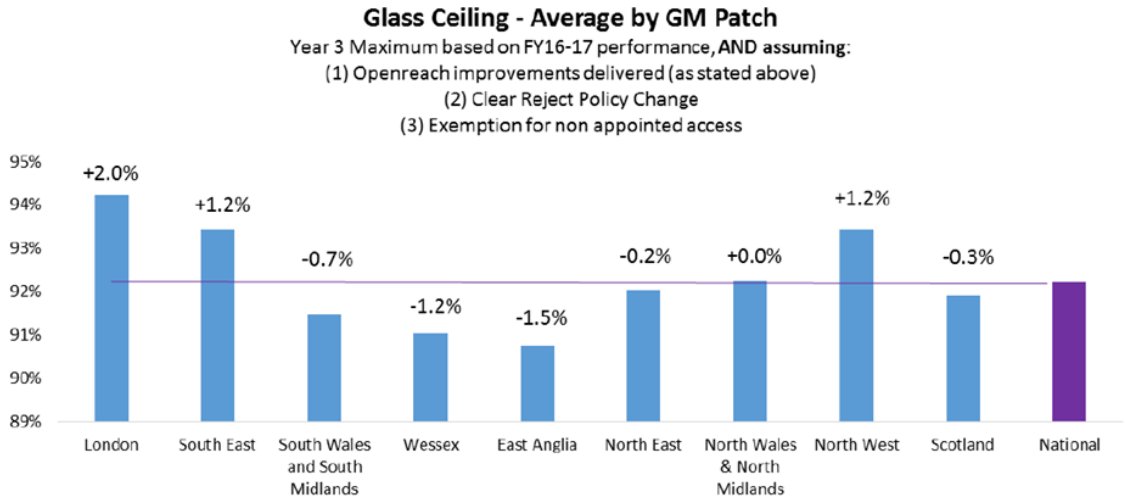
6.28 The proportion of repair jobs which exceed Openreach's SLAs, and the reasons why they do so, is not the same everywhere (mainly because of geographical differences).

[236] Openreach response to the March 2017 QoS Consultation, Table 9.
[237] For example, the engineer finds he or she needs to inspect the master socket (or test from it) or to isolate the customer's internal wiring and equipment.

Openreach therefore also provided its analysis on the variation between the repair performance limits for each region against the national level (see Figure 6.5). Based on data from 2016/17, and including the two changes discussed above, Openreach said that the maximum achievable performance for the most challenging region was 1.5% below the national level of 92.2%.

6.29 Regional operational limits are relevant for our on time repair standard because we proposed that the repair standards must be met in each of BT's ten UK geographic regions. Openreach considered that the glass ceiling should be lowered to account for this and that 90.7% reflected its highest operationally achievable level of repair performance for a repair standard which must be met in each region.

**Figure 6.5 Openreach revised view of the glass ceiling (regional level)**




*Source: Openreach*[238]

6.30 Given our regulation sets a single standard that Openreach must meet in each and every region, we considered it necessary in our September consultation to take account of the worst performing region to set a proportionate standard. We therefore proposed that a standard set at the regional level should be considered against a regional operational limit of 89.3%.

### Our conclusions regarding Openreach's operational capabilities

6.31 In reaching a view on Openreach's operational capabilities for the purpose of setting the on time repair standard, we have considered the evidence that Openreach has submitted regarding these limits, as well as stakeholder responses to both our March and September consultations.

6.32 As we set out in our September 2017 QoS Further Consultation, our view is that Openreach's new analysis has features which represent improvements both on its own position prior to March 2017, and our initial approach as set out in our March 2017 QoS Consultation. For example, the new analysis of operational capabilities directly identifies

[238] Openreach response to the March 2017 QoS Consultation, Figure 23.

the reasons for failure against the SLA rather than estimating this from assessing the reasons why a repair attempt failed 'on the day' which may or may not result in SLA failure. This provides an improved estimate of the operational limit in SLA failure terms. The analysis is also more detailed in exposing additional failure categories such as Reject Clear.

6.33 Further, Openreach's new analysis shows every SLA failure over 2016/17, rather than relying on a sample within a single year as used before.[239] We have used the analysis provided by Openreach of repair SLA failures over the financial year 2016/17, as shown in Figures 6.3 and 6.5 above, to inform our view on setting the levels for our repair standards consistent with our broader adoption of 2016/17 as our 'base year' in this market review.

6.34 We note Vodafone's view that we should require Openreach to update its operational limits analysis for the period October 2016 to October 2017 coinciding with an improvement in repair performance it had observed during this period. We have not required Openreach to provide us with this information as we do not consider this would further inform our view as to the extent of operational limitations. Where actual performance is less than the operational limit, any improvements are not necessarily suggestive of changes in the operational limit itself.

6.35 To support the validity of its new analysis, Openreach provided us with worked examples, systems maps, and the query codes that it had used to interrogate its systems and identify relevant faults to undertake the revised glass ceiling analysis. We also conducted some due diligence to test the information presented by Openreach as well as examining engineer records and practices to further validate the results of Openreach's analysis. To do so, we obtained from Openreach a random sample of 25 repair jobs from a larger data set to examine how this information was used to classify a job failing the SLA, to understand the contribution of failures to their operational capabilities, and to assess the integrity of the methodology.

6.36 We note that some stakeholders wanted us to undertake a more extensive due diligence exercise. While we agree that a more extensive exercise could be undertaken, the purpose of our limited random sampling was not to conduct an audit of statistical significance. Rather we sought to assess in detail a small number of randomly selected actual engineering records for repairs which failed the SLA to confirm the methodology Openreach claimed it had applied in its analysis.

6.37 Several stakeholders questioned the setting of our repair on time standards taking account of the lowest performing region. [✂] noted that variances in Openreach's assessment of operational constraints against the national average was not simply down to geography. Three regions which are less rural than Scotland (which [✂] expected to show the largest differential due to rurality impacting engineering efficiency) performed worse than Scotland. [✂] questioned the reduction of the 'glass ceiling' absent further analysis as to such under-performance.[240]

[239] Openreach additionally analysed all SLA failures over 2014/15 and 2015/16.
[240] [✂]

6.38 In our September 2017 QoS Consultation, we noted that there were various reasons (not just geography) as to why the proportion of repair jobs which exceed Openreach's SMLs 1 and 2 timeframes are not the same everywhere. The variation in operational limits by region relative to the national average (shown in Figure 6.5 above) is derived using the same methodology as that used in Figure 6.3, applied on a regional basis. We have examined a comparative analysis provided by Openreach between the annual performance over 2016/17 of the 'best' and 'worst' regions which it provided to us under our information gathering powers.[241] This analysis showed that the biggest differences between the two regions was the propensity for repairs to be complex, for example requiring civils, traffic management, and cabling and jointing. These variances in failure scenarios are highest in the un-addressable or unlikely to be addressable category of failure scenarios (red categories in Figure 6.3), with far less variation in those scenarios which are addressable to some extent. Therefore, we consider it unlikely that further detailed regional analysis would improve the accuracy of the current analysis regarding regional operational limits or, as a consequence, our judgement as to setting the level of repair on time standards to be applied on a regional basis.

6.39 We note TalkTalk's comment that almost half of the repairs which fail the SLA are due to the need for civil engineering which might, on average, take several days, but assumes that some simpler cases can be completed within the SLA. This may well be the case, however the operational limits analysis is concerned with the reasons that repairs fail to meet the SLA timeframes, and therefore only considers those tasks which have already failed the SLA. We have confirmed with Openreach that for each of the percentages, the numerator is the number of jobs that failed SLA for the primary reason stated, across all relevant services; and the denominator is the total number of repair jobs in the period for all relevant services. Openreach further confirmed the relevant services to be GEA-FTTC, WLR MPF, and SMPF in-tariff faults on SML 1 and 2 only.[242]

6.40 Having reviewed Openreach's submission and evidence on its operational capabilities, and stakeholders' responses to our consultations, we consider that we have been able to arrive at a reasonable estimate of operational constraints. Compared with the original analysis set out in the March 2017 QoS consultation, the new approach removes the need to make an adjustment for on the day failures in order to estimate failures against the SLA, and has a more rigorous approach to assessing why a job failed its SLA.

6.41 We therefore consider that, without further process improvements, Openreach's achievable on time repair performance can rise to at least 89.3% over the course of the review period.

Further improvements to Openreach's operational capabilities

6.42 We have considered Openreach's proposals that the operational limits could be improved by addressing issues associated with non-appointed faults and the Reject Clear process. Considering first issues associated with non-appointed fault repairs, in our September 2017

[241] Openreach slide-deck titled *Repair Glass Ceiling, Refreshed Analysis* from Openreach response dated 15 August 2017 to the 9th QoS s.135 notice.
[242] Excluding Northern Ireland.

QoS Further Consultation, we acknowledged that appointing a greater proportion of faults could provide some efficiency benefits for Openreach and therefore increase its operational capabilities. However, this needs to be balanced against the inconvenience to consumers who would be required to arrange unnecessary appointments (for example, because the fault can be fixed without access to their home or business). Openreach submitted in its response to our March 2017 QoS Consultation that telecoms providers have resisted its efforts to appoint more orders and are happy to forego greater on time success if it avoids increasing the inconvenience faced by their customers.[243] [244]

6.43 We consider that there is the potential, with better testing and diagnostics, and stronger cooperation between Openreach and telecoms providers, for Openreach to make some improvements to achieving repair SLAs if repair jobs include visit appointments where there is a high probability that this is necessary in order to resolve the fault. However, we do not consider it appropriate to raise our estimate of the limits of Openreach's operational capabilities to incorporate its suggestions relating to customer-caused failures on non-appointed faults. In our view, industry is best placed in the first instance to discuss and agree upon a resolution to this issue.

6.44 Regarding issues associated with the Reject Clear process, as we set out in our September 2017 QoS Further Consultation, this process only relates to WLR and GEA-FTTC (including where GEA-FTTC is used with MPF). It is our understanding that this is an alternative to telecoms providers raising a repeat fault within a 48-hour window of Openreach clearing a fault. We agree that it is inappropriate for Openreach to fail the SLA if telecoms providers reject fault clears that have passed Openreach's line tests without evidence of an unresolved issue. However, Openreach has not provided evidence that telecoms providers inappropriately use Reject Clears.

6.45 Due to the absence of Reject Clears for MPF, we would also be concerned if the impact on Openreach's SLA performance caused it to prioritise WLR and GEA-FTTC repairs over those for MPF, however we have not found evidence to suggest differential outcomes for consumers due to the Reject Clear process.[245] As with non-appointed faults, it remains for industry to agree on any process changes that may be needed.

6.46 Sky agreed with Ofcom that failures arising from non-appointed faults and Reject Clear should not be excluded when calculating on time repairs.[246] However, it argued that these causes of failure could be eliminated in the review period such that performance should be approximately 2% higher than proposed over the period.[247] In particular, it said that failures

[243] Openreach response to the March 2017 QoS Consultation, paragraph 173.
[244] Openreach proposed to telecoms providers to appoint three of the borderline diagnoses where it believed there was a 40-50% probability of access being required – i.e. below the 50% probability on which it will typically appoint orders. This proposal would have generated an additional 1,400 appointments per week (across industry), increasing the percentage of faults that have failed SIN349 that are appointed from 20% to 23%.
[245] We hypothesized that if Openreach's behavior were influenced by Reject Clear it would prioritise WLR and GEA-FTTC to the beginning of the day, to allow some flexibility to address those tasks if they were rejected. The results of our analysis provide no suggestion that Clear Reject affects the time of the fault being repaired.
[246] Sky response to the September 2017 QoS Further Consultation, paragraph 6.17.
[247] Sky response to the September 2017 QoS Further Consultation, paragraph 6.13.

relating to non-appointed faults arose principally from ineffective diagnostic tools used by Openreach, rather than reluctance by telecoms providers to schedule appointments.[248]

6.47 We have not seen evidence that Openreach lacks incentives to develop better diagnostic tools capable of a higher degree of certainty as to whether access to the customer premises is necessary or not to clear the fault. We recognise diagnosis is relevant but improvements will require collaboration between Openreach and telecoms providers. We do not speculate on the effect of service improvements through better diagnostics in setting these standards, but we consider that setting standards close to the operational limit strengthens the incentive for Openreach to improve its operational limit, and thereby reduce the cost of meeting the new standards. We discuss developments in relation to testing and diagnostics further in Section 4.

6.48 Therefore, we have not included the assumption that there will be improvements in our operational limit analysis due to changes in appointing of faults or the Reject Clear process. We encourage industry to engage on these matters and note that most stakeholders including Openreach support this. We note and agree with Openreach's call for the OTA2 to continue to facilitate industry discussions aimed at exploring options and reaching agreement on mutually beneficial solutions.

6.49 For the purposes of our decision on the appropriate level of the standards, we have therefore taken Openreach's maximum achievable on time repair performance to be 89.3% over the course of the review period. We the consider that this has implications for the level at which we should set quality of service standards for repairs, as discussed below.

## Setting the level for fault repairs completed on time

### Our proposals

6.50 We highlighted in our 2016 Strategic Review that improvements were needed to ensure all phone and broadband companies provide the service quality that customers expect.[249] In this context, in our March 2017 QoS Consultation, we proposed to set higher standards for fault repair. In proposing the standard, we considered the benefits to customers and telecoms providers, Openreach's operational constraints and the costs to customers and telecoms providers.[250]

6.51 We derived a range of options within a lower bound of 90% and an upper bound of 96.6% excluding any allowances for *force majeure*, and proposed that a repair standard of 93% was appropriate. These proposed levels were based, in particular, on information we obtained from Openreach about operational constraints as discussed above. We subsequently received new evidence from Openreach on its operational constraints, which

[248] Sky response to the September 2017 QoS Further Consultation, paragraphs 6.18 to 6.19.
[249] Ofcom, 2016. *Initial conclusions from the Strategic Review of Digital Communications.* https://www.ofcom.org.uk/__data/assets/pdf_file/0016/50416/dcr-statement.pdf..
[250] March 2017 QoS Consultation, paragraphs 3.51 to 3.63.

we carefully assessed as set out in our September 2017 QoS Further Consultation. This is also discussed above.

6.52 In the light of our revised conclusion that Openreach's maximum achievable on time repair performance had the potential to rise to 89.3% over the 2018 to 2021 period (not 96.6% as we initially proposed), we reassessed the same three factors to propose revised levels and set these out in our September 2017 QoS Consultation. We proposed a revised repair standard for WLR, MPF and GEA-FTTC of 88% (excluding allowances for *force majeure*).

6.53 We asked:

> Do you agree with the proposed levels of the repair standards? Please provide reasons and evidence in support of your views.

## Stakeholder responses

6.54 Having considered our initial proposal was too low in light of *force majeure* allowances[251], [✂] did not agree with our lower revised standard. It did not consider that an improvement of just over 8% over three years was acceptable, or that a standard of 88% was sufficiently stretching. [✂] considered that Openreach had shown no inclination to improve performance, pointing to little or no improvement since 2011. It said that further analysis should be carried out as to the age of the copper assets that Openreach was overlaying with high bandwidth services such as FTTC exposing more faults. [✂] also argued that our proposals disregarded the requirements of business customers. It considered that regulation should be extended to avoid businesses being discriminated against due to the focus on quality of service regulation for residential consumers. [✂] considered that we should include the higher SMLs which businesses consume in our repair on time standards and that the Openreach wholesale fixed network access service Shared Metallic Path Facility (SMPF) should be included within our quality of service regulation which [✂] considered a critical product for businesses.[252]

6.55 Sky said that we should increase requirements to take into account that Openreach's national operational capability is 1.5% greater than that in its worst performing region and that a 2% improvement could be achieved in Year 3 if Openreach rolled out effective fault diagnostics and got its repairs right first time.[253]

6.56 Whilst recognising the case for setting the fault repair standard below that originally proposed, TalkTalk said that the revised standard was not stretching and could reasonably be set higher. It suggested a national aggregate repair standard of around 89.5%. It gave several reasons for this:

- the standard was based on the worst performing region (East Anglia) which would not be stretching for other regions;

[251] [✂]
[252] [✂]
[253] Sky response to the September 2017 QoS Further Consultation, paragraph A1.3.

- the standard was substantially below the operational limit of 90.8%; and
- Openreach could complete some more difficult repairs (above its 'glass ceiling') within the SLA period, particularly at SML 1.[254]

6.57 Similarly, UKCTA said it was unclear why Ofcom had proposed an 88% standard for on time fault repairs given that Openreach's own analysis suggested an operational limit above 89%.[255]

6.58 Based on its analysis, Vodafone argued we should impose separate regulatory standards for on time repair for the distinct SMLs offered by Openreach which were similar to the levels in our original March 2017 proposals (i.e. 93%) for SML1 and our revised proposals (i.e. 88%) in respect of SML2.[256] Vodafone's proposed repair standards and glidepaths are reproduced in Table 6.6 below.

**Table 6.6 Vodafone's proposals for repair within SLA standards by SML**

| Openreach SML | Present Standard | Present average performance | Y1 Standard | Y2 Standard | Y3 Standard |
|---|---|---|---|---|---|
| SML 2 (one-day repair) | 80% (77%) | 84% | 83% (80%) | 86% (83%) | 88% (85%) |
| SML 1 (two-day repair) | 80% (77%) | 88% | 90% (87%) | 90% (87%) | 93% (90%) |
| SML 3 | 80% (77%) | 84% | 83% (80%) | 86% (83%) | 88% (85%) |
| SML 4 | 80% (77%) | 84% | 83% (80%) | 86% (83%) | 88% (85%) |

*Source: Vodafone*

6.59 Vodafone identified higher performance levels at SML1 compared to SML2 and argued that our measures for the period of the market review should recognise this fact and support their ongoing attainment.[257]

6.60 Openreach believed that that the revised standard was appropriate. In the context of our wider package of measures, Openreach viewed the proposed level of the repair standard as contributing to a significant improvement in the level of service customers will receive. It argued that, taken together, the task for Openreach to meet all of our quality standards

[254] TalkTalk response to the September 2017 QoS Further Consultation, paragraphs 2.4 to 2.5.
[255] UKCTA response to the September 2017 QoS Further Consultation, paragraph 12.
[256] Vodafone response to the September 2017 QoS Further Consultation, pages 14 to 16.
[257] Vodafone response to the September 2017 QoS Further Consultation, page 18.

for WLR, MPF and GEA-FTTC would require re-engineering of its operational delivery structures and significant investment in resources, training, processes and systems.[258]

6.61 The CWU considered that standards should be set to be achievable across all regions and that, notwithstanding regional variances in operational limits, network topology and availability, geography and customer mix, a national standard is a prerequisite for Openreach's customers. It agreed with the reduction in the level for the repair standard noting that even this represented a significant improvement over the current repair standard which would be very challenging for its members to achieve. It considered that following a sustained programme of investment and a better view on the future mix of fibre provision, an on time repair standard of 93% (as proposed by us in the March 2017 QoS Consultation) could be considered at the end of the 2018-2021 period.[259]

6.62 Verizon responded to our March 2017 QoS Consultation only. It said it was pleased that we proposed to increase the fault repair standard to 93% by 2021 although said it was unclear why BT had an allowance of 7% given the SLAs of 1 to 2 days to complete repairs.[260]

## Our considerations and decisions

6.63 The choice of the appropriate level for on time repair (i.e. within SLA) involves an exercise of regulatory judgement in balancing the factors identified. Having decided that it is necessary and appropriate to impose standards for review on the relevant services, the options open to us are to set repair within SLA standards at a level somewhere in the range between the current 80% requirement and our view of the upper limits on Openreach's performance (89.3%).

6.64 In our September 2017 QoS Further Consultation, we proposed a repair within SLA standard for WLR, MPF, and GEA FTTC of 88% (prior to making deductions to allow for MBORC events).[261] We considered that, taking into account our operational constraints analysis, 88% is as close to our belief that performance should be at least 90% as we are reasonably able to set for each region over the next three-year review period.

6.65 As set out in Section 3, in reaching a conclusion regarding the appropriate level for the on time repair standard we have considered the three factors: (i) the impact on consumers, telecoms providers, and competition; (ii) Openreach's operational capabilities; and (iii) the costs to consumers and telecoms providers.

### Impact on consumers, telecoms providers, and competition

6.66 We consider that end customers and competition benefit from a reduction in the duration of faults, and from certainty in the repair service that customers will receive. We consider that higher quality standards are needed to afford telecoms providers sufficient certainty

[258] Openreach response to the September 2017 QoS Further Consultation, paragraph 24.
[259] Communication Workers Union (CWU), Wales and Marches Region (BTC) response to the September 2017 QoS Further Consultation, page 3. https://www.ofcom.org.uk/__data/assets/pdf_file/0022/108094/CWU.pdf.
[260] Verizon response to the March 2017 QoS Consultation, paragraph 13.
[261] MBORC: Matters beyond our (BT's) reasonable control. A *force majeure* clause in Openreach's contacts.

and confidence regarding the wholesale services they are purchasing from Openreach. The higher the level of repair performance Openreach can consistently achieve, the better the outcomes for consumers, telecoms providers, and competition.

6.67 Our research suggested that most customers would be satisfied with repairs completed within three calendar days, which broadly aligns with the contractual timescales for SMLs 1 and 2.[262] Increasing the percentage of on time completions against these SLA targets would result in a greater proportion of consumers receiving repairs within a timeframe that they consider acceptable, thereby closing the gap between expectations and actual performance.

6.68 In our view certainty also has benefits for downstream competition. As we set out in Section 5 consumer needs are heterogenous. Certainty that Openreach will deliver as promised will allow telecoms providers to differentiate their retail offerings at combinations of price and quality to meet those heterogenous needs.

6.69 We also consider that setting challenging standards on the timeliness of fault repair incentivises BT to take action to prevent network faults from occurring in the first place (for example by investing in proactive maintenance of its network). Quality standards substantially above current levels will mean that BT has the incentive to meet the targets in the most efficient way, including cost savings via reducing faults on its network (see Section 3). In turn, investment in network reliability should benefit both telecoms providers and customers (see Section 4). We consider that an 88% standard will result in benefits for competition and customers in the form of greater certainty and improved repair times.

### Operational capabilities

6.70 In determining the levels of the proposed standards, we reconsidered the factors which may limit Openreach's ability to resolve faults within the timescales for SMLs 1 and 2. In light of Openreach's forecast operational capabilities (which we expect to reach 89.3% by 2020/21 as described above), we have considered whether 88% is an achievable standard by the end of the review period. In our view Openreach can attain this level of performance within the timeframe of this market review (taking into account its need for additional engineering resources and process improvements to improve its operational limit over this period) without giving rise to excessive costs for consumers (see below).

6.71 We have also considered whether setting the standard at 89% would be operationally feasible, as this would provide marginally more certainty to telecoms providers. We note that such a target is technically below the operational limit estimated by Openreach's analysis, however we would be concerned that such a limit could risk imposing a standard that Openreach is unable to meet (to the extent that there is any uncertainty in the operational limit). It would also give rise to significantly higher costs, because the resource

[262] 2017 Jigsaw Research. https://www.ofcom.org.uk/__data/assets/pdf_file/0026/98711/automatic-compensation-jigsaw-report.pdf.

uplift required to meet a standard increases rapidly as the standard approaches the operational limit (see Annex 3).

6.72 In light of the above considerations, we consider 88% to be an operationally achievable target for SMLs 1 and 2. Some stakeholders suggested that we set a higher standard for SML1, reflecting the higher operational limit for this service level, which would result in different quality standards for SMLs 1 and 2. Our view is that setting different standards risks undermining the differentiation between these two care levels because a lower standard would apply to the higher care level and vice versa. This may reduce the potential for this remedy to support competition on the basis of quality at the retail level. We further consider that setting standards at different levels might also be counter to our aim of improving industry certainty regarding Openreach's repair performance (see Section 5 for further considerations regarding the design of the quality standards on a regional and service level basis). We have therefore decided that an 88% standard will apply to fault repairs for each of SMLs 1 and 2.

6.73 Several stakeholders questioned why we had proposed a repair standard of 88% notwithstanding that Openreach had indicated that its 'glass ceiling' of operational capability was above 90%. However, Openreach only considered a 90% or higher operational limit to be feasible if two industry processes (discussed above) were addressed, and we have decided these are not in the first instance a matter for regulation. Hence our assessment of operational capability needs to be made in the absence of these potential improvements.

### Costs to telecoms providers and consumers

6.74 Setting higher standards will necessitate an improvement in performance over the market review. However, we recognise that repairing a greater proportion of faults within contracted timeframes at SMLs 1 and 2 (to now include GEA FTTC) will require Openreach to increase its available engineer resources. We need to balance higher quality of service standards with the risk of materially higher retail prices as our evidence indicates that value for money is also an important factor for many consumers.

6.75 Since our March 2017 QoS Consultation, we have considered new evidence to estimate the resource impacts of higher quality standards. In our September 2017 QoS Further Consultation, we considered the level of Openreach resources required to achieve our proposed quality of service standards. We then set out the resource uplift impacts of our proposals to increase performance against the SLAs for SMLs 1 and 2. We used our resource uplift estimates in our charge control modelling to develop separate estimates of the costs of quality of service improvements for the services we have proposed to charge control (MPF at SML 1 through our top down model for copper services and GEA 40/10 services at SML 2 through our bottom up model for GEA services).[263]

6.76 Our assessment of the resource uplift, which has relied on comparisons between our Resource Performance Model and Openreach's Allocation Model (see Annex 3), has not

[263] 2017 WLA Consultation.

allowed us separately to identify the resource uplifts required to meet the standards we have now decided to impose for installations and repairs. We therefore consider the cost impact of our decisions in the round in Section 11, alongside our proposals to take account of lower fault rates and the consequent reduction in costs. In summary, our assessment is that the higher standards we are imposing for installation and repair lead to an increase in costs which is proportionate in the light of our objectives, including the customer and competition benefits we have described.

### Our conclusions regarding the on time repair standard

6.77 As set out above, we consider that higher standards than today will provide better outcomes for competition and ultimately consumers by increasing certainty to telecoms providers regarding Openreach's performance. A higher standard will also directly benefit consumers in terms of improved quality, but risks increasing Openreach's costs and the prices paid by consumers. The costs of the standards are set out in Section 10, and we conclude in Section 11 that these costs are modest relative to the benefits described above. We therefore conclude that the on time repair standard for 2020/21 should be 88%. While this represents a reduction from the on time repair standard proposed in March of 93%, achieving a degree of certainty of 90% or above remains Ofcom's ambition for the medium term.

## Setting levels for fault repairs completed on time between 2018 and 2021

### Our proposals

6.78 In our March consultation, we proposed a glidepath that required a modest repair performance improvement in the first year (83% over 2018/19, up from 80% now), a significant increase in the second year to 90% (2019/20) and for Openreach to achieve a standard of 93% in the final year (2020/21).[264]

6.79 We explained how our glidepath proposals allowed Openreach sufficient time to:

a) recruit and train extra technicians;

b) upskill its existing workforce;

c) carry operational improvements; and

d) make progress with its fault reduction programme.

6.80 In our revised proposals, we did not change the first year standard but considered that a near-linear increase in performance over the market review period was appropriate and achievable in light of our revised view on the levels for repair standards and the same operational factors as before (listed above).[265] We asked stakeholders:

[264] March 2017 QoS Consultation, paragraphs 5.66 to 5.69.
[265] September 2017 QoS Further Consultation, paragraph 3.38.

Do you agree with our proposed glidepath? Please provide reasons and evidence in support of your views.

## Stakeholder responses

6.81 [✂] did not agree with our proposed glidepath. In its response to our initial proposal, [✂] considered that the standard for the first year (which was unchanged in our revised glidepath proposal) was too low. It noted that Openreach's performance in 2011/12 was 77.7% excluding *force majeure* and that Openreach had more than enough time to meet a higher standard than 80% for 2018/19.[266] In relation to our revised glidepath, [✂] made reference to Openreach's own evidence that it could achieve a level of repair performance of 90.9% and it therefore expected Openreach to be able to achieve a standard of 88% by the second year.[267]

6.82 In its response to our March 2017 QoS Consultation, Sky considered that our proposed glidepath delayed essential improvements to Openreach's quality of service. In particular, it considered a standard of 83% for 2018/19 was a retrograde step given Openreach was already exceeded this for MPF at SMLs 1 and 2. Sky considered we should set a higher standard for the first year.[268] Sky also did not agree with our revised glidepath. It considered that we should increase the Year 1 and Year 2 requirements to levels commensurate with Openreach's current performance and deliver improvements over time.[269]

6.83 In its response to our initial proposal, TalkTalk also considered that a repair standard of 83% in the first year (consistent with current average fault repair performance) was not stretching and that we should set a higher requirement in the first year to ensure consumers experience repair improvements more quickly. More generally, TalkTalk said our intention to set higher quality standards was clear from the conclusion of our Strategic Review in February 2016, and it noted that Openreach has had time to plan for operational changes. TalkTalk considered that phasing beyond the first year was unnecessary and that the standards should apply in full from the second year onwards.[270]

6.84 Openreach believed the revised glidepath to be appropriate. It considered that it would enable a more operationally balanced and cost effective investment in its engineering resources to underpin improvements in the coming years.[271]

6.85 The CWU considered that a longer glidepath would be welcome to cover additional competency time whilst Openreach begins replacing its ageing workforce at scale.[272]

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[266] We assume [✂] is referring to our proposed standard for 2018/19 of 80% after an adjustment of 3% for *force majeure*, [✂].
[267] [✂]
[268] Sky response to the March 2017 QoS Consultation, paragraph A6.9, P48.
[269] Sky response to the September 2017 QoS Further Consultation, paragraph A1.4.
[270] TalkTalk response to the March 2017 QoS Consultation, paragraphs 4.2 and 4.6.
[271] Openreach response to the September 2017 QoS Further Consultation, paragraph 30.
[272] CWU response to the September 2017 QoS Further Consultation, page 3.

6.86 Verizon responded to our March 2017 QoS Consultation only. It supported the then proposed glidepath which saw the largest improvement in performance (83% to 90%) in the second year (2019/20).[273]

## Our considerations and decisions

6.87 We consider that we should set a glidepath for the on time repair standard. This would ensure that we give due account to our decision to also include GEA-FTTC for the first time in the scope of our quality of service regulation whilst, at the same time, raising the standard commensurate with the improved repair performance we have observed. A linear glidepath would address this objective, while providing continuous improvement from the current standard.

6.88 Several stakeholders believed our proposals to require that Openreach complete 83% of repairs on time over the first year (2018/19) to be too low and that the final year standard should apply from the second year (2019/20). For example, Vodafone noted that in the quarters January to March 2017 and April to June 2017 Openreach has performed above this level for SML1.[274]

6.89 We agree that in recent quarters Openreach has performed above 83% across all regions, but note that our standards apply across the whole of a year, and this level of performance has not proved sustainable in the subsequent two quarters in every region.[275]

6.90 We also recognise the importance of securing benefits for consumers as early as possible, but balance this with ensuring that Openreach has sufficient time to make cost effective investments in its engineering workforce to underpin sustainable delivery of service improvement. We have therefore concluded that a near-linear increase in performance over the course of the market review period provides a reasonable and proportionate balance between increased levels of repair performance we consider are appropriate to impose and the time required for Openreach to achieve these standards. We have decided to impose a glidepath as set out in Table 6.7.

[273] Verizon response to the March 2017 QoS Consultation, paragraphs 13 to 18.
[274] Vodafone response to September QoS Further consultation, pages 14 to 15.
[275] Openreach, Our Performance https://www.homeandbusiness.openreach.co.uk/our-performance?utm_campaign=portalreferral&utm_medium=splashpage&utm_source=ourperformancelink [accessed 07/02/2018].

**Table 6.7 The on time repair standard (excluding adjustment for *force majeure*)**

| | Current level | First year (2018/19) | Second year (2019/20) | Third year (2020/21) |
|---|---|---|---|---|
| On time repair completion | 80% | 83% | 86% | 88% |
| (Adjusted standard for *force majeure*) | (77%) | (80%) | (83%) | (85%) |

*Source: Ofcom*

# 7. Regulating BT's service performance for installations

## Introduction

7.1 This section sets out *ex ante* QoS remedies relating to installations over the WLA market review period. It draws on our approach to QoS regulation set out in Section 3 and on our review of Openreach's recent installation performance in Annex 1, and takes into account stakeholders' consultation responses.

7.2 In this section we address each of the main areas in which we proposed remedies and asked consultation questions. These are:

- quality standards for on time installations;
- quality standards for installation appointments;
- other issues in the structure of the standards including *force majeure*, regional application and aggregation of services;
- late installations; and
- newly installed lines not working.

7.3 As described further in Section 10, we consider that the decisions set out in this section fulfil our statutory duties and satisfy the relevant legal tests. In reaching these decisions, we have taken into account our regulatory experience from previous market reviews, recent developments in these markets (based on information provided by Openreach and its customers, and on consumer research we have commissioned), and also the developments we anticipate over the course of the three-year review period.

7.4 Our March 2017 QoS Consultation installations section also included proposed changes to our requirements for SLGs for installations. Our decisions and reasoning about SLGs for installations as well as repairs is set out in Section 8.

## Summary of our decisions

7.5 In the 2017 NMR Statement and 2018 WLA Statement, we have imposed SMP conditions requiring BT to comply with such quality of service requirements as we direct from time to time for WLR, MPF and GEA-FTTC.

7.6 In relation to quality of service for installations, we have decided to set QoS standards for each year to 2020/21, including allowances for *force majeure*, as summarised in Table 7.1 below.

**Table 7.1 Quality standards for WLR, MPF and GEA-FTTC installations over the 2018 to 2021 market review period**

| | Current standard | New standards | | |
|---|---|---|---|---|
| | | First year (2018/19) | Second year (2019/20) | Third year (2020/21) |
| % of installations to be completed by the committed date (Adjusted standard for *force majeure*) | 90% (89%) | 92% (91%) | 92% (91%) | 95% (94%) |
| Working days within which first date offered for installation appointments | 12 | 12 | 12 | 10 |
| Frequency with which regulated installation appointment date must be offered (Adjusted standard for *force majeure*) | 80% (79%) | 90% (89%) | 90% (89%) | 90% (89%) |

*Source: Ofcom*

7.7 Compliance with the above quality standards for installations will be assessed annually over each of ten UK geographic regions. Compliance will be measured over the combined performance across WLR, MPF and GEA-FTTC.

# Quality standards for on time installations

## Our proposals

7.8 In our March 2017 QoS Consultation we proposed to set a standard for on time installations. We proposed that:

- BT should complete 95% of all orders by the committed date in 2020/21;
- This standard should to apply to WLR, MPF and GEA-FTTC;
- This standard should apply to each of BT's operating regions separately; and
- The standard for intervening years should be determined by a glidepath.

7.9 Our proposals sought to provide Openreach with incentives to improve its aggregate annual performance in each region in completing WLR, MPF and GEA-FTTC installations on the date agreed with its customers from around 93% to above 95% by 2020/21. Our existing standard from the 2014 FAMR was 90%.

7.10 We considered that our proposals around quality of service levels and timing struck a reasonable balance between:

- seeking to promote better performance in line with our judgement as to what is reasonably achievable based on the available evidence; and
- providing Openreach with a reasonable period to make such changes to its operations as are necessary to meet this level of service improvement as well as our broader proposals for quality of service remedies.

7.11 In making these proposals, we took into account Openreach's public commitment to its customers in its September 2015 "Our Charter" to achieve an on time installations national average of 95%.[276]

7.12 In our March 2017 QoS Consultation we asked:

> Do you agree with our proposals for on time installations? Please provide reasons and evidence in support of your views.

## Stakeholder responses

### Setting an on time installation standard

7.13 Stakeholders agreed on the need for a standard for installations to be completed by the date agreed between Openreach and its telecoms provider customers, i.e. on time, although opinions varied as to the appropriate level.

7.14 TalkTalk said that, at current Openreach performance levels, significant numbers of TalkTalk standard broadband customers, around [✂] per month, experience late installations due to Openreach failures, and that a material proportion, approximately 20%, decide not to proceed in light of the delays[277]

7.15 [✂] similarly highlighted that the consumer may not differentiate between the behaviour of Openreach and that of its supplying telecoms provider in relation to installation. It said that poor installation processes and late delivery can have a significant impact on the telecoms provider's reputation.[278]

[276] Openreach, 2015. *Our Charter*. https://www.btplc.com/Sharesandperformance/Presentations/Presentations/keycompanyannouncements/downloads/OpenreachCharter.pdf (accessed 21 Jan 2018).
[277] TalkTalk response to the March 2017 QoS Consultation, [✂].
[278] [✂]

### Setting the level of the standard at 95% in the final year

7.16 Both UKCTA and Verizon welcomed the increase to 95% for installations by the committed date.[279] Sky supported an increase, but said that Ofcom's remedies for installations do not go far enough.[280]

7.17 Vodafone also argued that the target should be higher than 95% and reached more quickly, particularly as, in its view, Openreach seems to have little appetite to exceed the minimum requirement. It argued that the consumer harm from delayed installations was substantial and would deter switching behaviour.[281] Vodafone said that our proposals meant that, over the seven years 2014/15 to 2020/21, only a 5% overall improvement will have been achieved.[282] Vodafone said that it was disappointed that, while Ofcom proposed increasing the appointment availability standard by ten percentage points, we only proposed increasing the standard for on time installation by five percentage points.[283]

7.18 In contrast, Openreach argued that the proposed standard for on time installations was too high. In its response, Openreach provided tables showing the forecasting accuracy across telecoms providers for copper and fibre services.[284][285] In Openreach's view, poor forecasting makes it more difficult for Openreach to ensure it has the right amount of resource in the right areas to meet the required performance standards.

7.19 Although Openreach acknowledged its own plans for 95% on time installations achievement in its 'Our Charter' commitment to customers, it pointed out that this was a national target rather than (as in our proposal) one to be met in each individual geographic region.[286] A region by region target is more challenging than a national one in that higher performance in one region cannot offset lower performance in another.

7.20 Openreach also said that telecoms providers should collaborate with Openreach to increase provision on time success for customers, for example to improve the frequency with which telecoms providers' order the appropriate installation service at the point of sale.[287]

### Glidepath

7.21 TalkTalk, UKCTA and Verizon argued that the proposed glidepath for on time installations was not challenging enough. TalkTalk argued that a 92% target for the first two years of the review period would, "not deliver any improvements as the current blended metric across copper and fibre for on time delivery is already above 92%". It said that Ofcom should

[279] UKCTA response to the March 2017 QoS Consultation, paragraph 11; Verizon response to the March 2017 QoS Consultation, paragraph 19.
[280] Sky response to the March 2017 QoS Consultation, paragraph A6.32 and headline above paragraph A6.26.
[281] Vodafone response to the March 2017 QoS Consultation, page 57.
[282] Vodafone response to the March 2017 QoS Consultation, page 57. Emphasis in original text.
[283] Vodafone response to the March 2017 QoS Consultation, page 58.
[284] Openreach response to the March 2017 QoS Consultation, Figure 29.
[285] Openreach response to the March 2017 QoS Consultation, Figure 30.
[286] Openreach response to the March 2017 QoS Consultation, paragraph 257.
[287] Openreach response to the March 2017 QoS Consultation, paragraph 265.

increase the standard to above 92% at the start of the review period, and to 95% within two years.[288] It said that Openreach had already had sufficient time to plan for the required operational changes, given that Ofcom's DCR initial conclusions in February 2016 signalled its intention to set higher quality standards. TalkTalk therefore considered the final year standards should be reached from the second year through to the end of the review period.[289]

7.22 UKCTA also asked Ofcom to set steeper glidepaths to ensure that the benefits are seen as early as possible. It suggested increasing the second-year target to 94% or decreasing the length of the glidepath to two years.[290]

7.23 Verizon also suggested increasing the target for the second year to 94% to ensure prompt improvements in standards while allowing Openreach some time to adjust. It argued this would be consistent with our approach to repairs and said it did not entail a significant increase from current levels. Verizon also argued that Openreach has "unduly benefited from under-performance up to now so a swift target would go further to offset this benefit".[291]

7.24 [✂] questioned the setting of identical targets for years one and two, as this does not require year on year improvement. It said that the proposals meant performance in 2019/20 would only be 2% higher than current performance.[292] It had, however, "no fundamental problems" with either the starting point of 92% for the first year or the final target of 95% for the third year.[293]

## Our considerations and decisions

### Setting the target regionally

7.25 It is important that the standards for installations apply in sufficient granularity to ensure performance is reasonably consistent throughout the country to support effective competition and consistent outcomes for consumers. A single, national target could also increase the risk that performance in some regions might be sacrificed due to potentially different challenges involved in meeting the target in different regions, or due to different competitive considerations. On the other hand, we are mindful that applying standards to a very large number of areas could increase the cost and complexity of BT's compliance, and affect the statistical reliability of reported results.

7.26 We consider that setting the same standard for each region would achieve an appropriate balance between these concerns, and is consistent with Ofcom's duties to each of the UK nations under the Act. We have therefore decided to set the on time repair standard on BT's ten operating regions.

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[288] TalkTalk response to the March 2017 QoS Consultation, paragraph 4.4.
[289] TalkTalk response to the March 2017 QoS Consultation, paragraph 4.6.
[290] UKCTA response to the March 2017 QoS Consultation, paragraph 13.
[291] Verizon response to the March 2017 QoS Consultation, paragraph 21.
[292] [✂]
[293] [✂]

### Setting the level of the standard at 95% in the final year

7.27 It is our view that certainty regarding when an installation will take place supports effective retail competition and is important for consumers. The communications services offered by telecoms providers can be complex, and often require the installation of multiple services to be synchronised. Consumers are increasingly reliant on these services, and the risk of being without service can be a significant barrier to switching. Conversely, an installation delayed by Openreach can have adverse consequences for the telecoms provider either in the form of unwarranted reputational harm, or the customer cancelling installation.

7.28 The importance to customers of installing services as promised was also highlighted in research conducted by Jigsaw in February 2016. In relation to customer experiences of installations that require a visit to the premises by an engineer, respondents highlighted that time-keeping was "essential" and that installations should be completed to the original schedule agreed.[294]

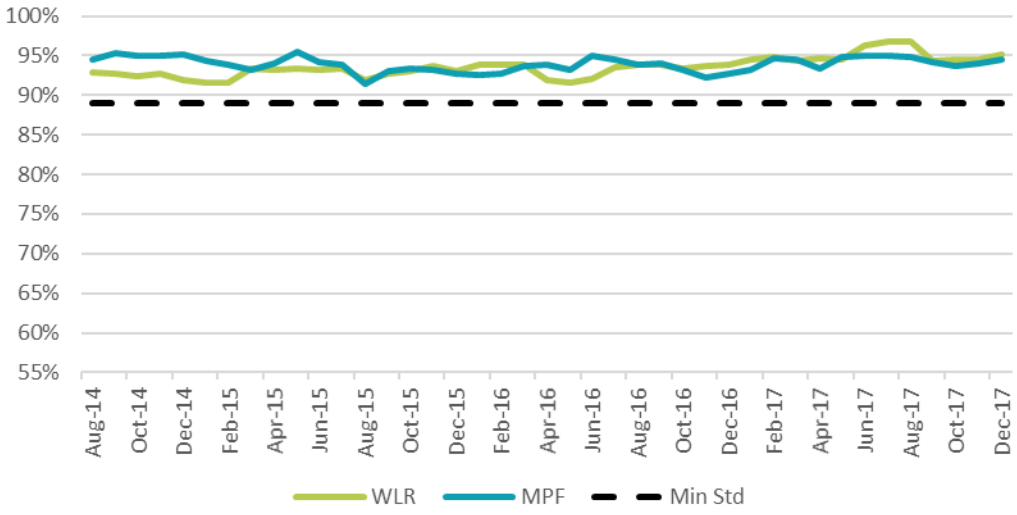
7.29 Even in the case of self-installations (i.e. where providers post a modem/router to customers who then plug it in themselves), the Jigsaw research found that customers switching broadband provider or moving premises are sometimes disappointed to discover that, having installed their new router, they cannot use it immediately because their new service will not actually be switched on for several days. We consider that giving telecoms providers greater certainty that Openreach will deliver as promised will help them to address this.

7.30 We have set out our assessment of Openreach's performance in relation to on time installations in Annex 1. This assessment looks over the period from April 2011 to December 2017.

7.31 As shown in Figure 7.2 below, Openreach has, to date, performed above the annual standard for on time WLR and MPF installations nationally which we set at 90% from April 2014 in the 2014 FAMR Statement. Our evidence suggests that performance for on time for WLR and MPF installations has remained between 90% and 95% since at least August 2012, and in recent months exceeded 95% for WLR.

[294] 2016 Jigsaw Research, page 26. https://www.ofcom.org.uk/__data/assets/pdf_file/0025/78370/jigsaw_quality_of_service_in_telecoms.pdf.

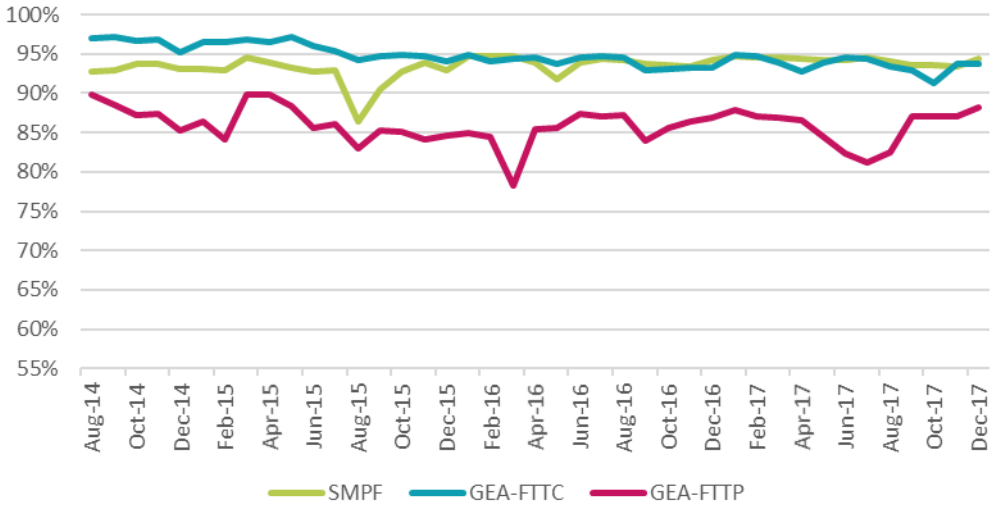
**Figure 7.2 UK WLR and MPF orders installed on time, all orders (%)**




*Source: Openreach mandatory non-discrimination KPIs*[295]

7.32 We do not currently require Openreach to achieve a specific standard in relation to on time installation for GEA-FTTC. As shown in Figure 7.3 below Openreach's performance in on time GEA-FTTC installations has been approximately 95%.

**Figure 7.3 UK SMPF and GEA orders installed on time, all orders (%)**




*Source: Openreach mandatory non-discrimination KPIs*[296]

7.33 As mentioned above, Openreach has made its own public commitments to its customers. In September 2015 it launched 'Our Charter' which *inter alia* states:

[295] Figure A1.12, Annex 1.
[296] Figure A1.13, Annex 1.

> "Our Charter summarises our commitments, the investment we're putting into our digital future and how we're raising standards to meet the demands of consumers and businesses."
>
> "Service. Our number one priority will be giving great service to customers. We'll set new standards for delivering on time and getting things right. We hold ourselves accountable to fix problems."
>
> "For Consumer and SME customers we will: Raise our service standards and reliability. We aim to do much better than the rising standards already set by Ofcom. We aim to achieve on time installations of 95% by 2017, working with our communications provider customers. We will continue to invest in innovation and network maintenance to reduce our network fault rate."

7.34 We note that Openreach has in fact fallen marginally short of this target in 2017, installing 94.8% of services on time.[297] We continue to consider that as Openreach publicly committed to a 95% target, and came close to achieving it, this remains an achievable target.

7.35 We explained in our 2014 FAMR Statement the risk that Openreach could seek to perform at the regulated standard rather than seek continually to innovate on quality and deliver improved performance in collaboration with its customers. We decided that continued regulatory intervention is merited here because we want to protect customers in all ten regions, customer expectations are rising and certainty is becoming increasingly important, and with rising repair standards there is a risk that Openreach might prioritise repairs.

7.36 In Section 3 we set out our key considerations in deciding on the levels of the standards to impose. Our starting point for determining an appropriate final year standard is to consider the lower and upper bounds to performance, as we did in the 2014 review.

7.37 Regarding an upper bound for orders installed on time, we note Openreach's "Our Charter" set 95% as its 2017 target, implying that this lies within Openreach's operational capability on a sustainable basis. We would therefore expect any upper bound of performance to exceed 95% to provide an Openreach with operational buffer to the target it proposed. The degree to which Openreach may exceed 95% is likely to depend on a wide range of factors including: demand for its range of wholesale network access services across the UK; the level, skilling, equipping, transportation and management of its resources; and the quality of Openreach's network records. We discuss the reasons why some orders are not completed on time later in this section in our assessment of late installations.

7.38 Openreach's annual performance is now approaching 95% for WLR, MPF and GEA-FTTC. However, this is a measure of performance aggregated at a national level. Performance at a regional level across services has varied between 92.5% and 96.0% over 2016/17 and 2017/18 (nine months data) for WLR and 93.0% to 96.2% for MPF. Given we are

[297] Openreach, *Our Performance – Q3 2017 Dashboard*. https://www.homeandbusiness.openreach.co.uk/our-performance/dashboard [accessed 24 January 2018].

implementing a regional standard, we consider that the appropriate lower bound should therefore be set at 92%.

7.39 Deriving performance bounds is an exercise of judgement guided by available evidence. In the light of the observed performance since our last review, and Openreach's charter, we consider that the appropriate lower and upper bounds we should have in mind in this review are 92% and greater than 95%.

7.40 Given that the upper bound to Openreach's national performance is 95% in 2017, we consider it reasonable that regional performance can exceed 95% by 2020/21.

7.41 We appreciate some stakeholders wanted a standard higher than 95%. Vodafone observed that 95% represents an increase in certainty of 5% from the current standard of 90%, whereas we proposed to increase appointment availability certainty to 90% from the current standard of 80% (i.e. a higher increase of 10%). Regarding the general request for greater certainty than 95% for on time installation, we need to be confident that the standard is achievable in each region and, for the reasons above, we are not convinced that a standard higher than 95% would achieve that aim.

7.42 Regarding the different improvements in certainty between appointment availability and installation certainty, these standards face different constraints. For certainty regarding on time installation, we are seeking improvements for this measure in the context of our assessment of the lower and upper bounds of Openreach's capability to make improvements. As described below, for appointment availability, we are seeking to strike the right balance between our intention to improve both the first available appointment period (in which we are decreasing the period from 12 days to 10 days) and the frequency of Openreach delivering against this commitment.

7.43 In light of the considerations above, we have decided to set the installation on time target at 95% for WLR, MPF and GEA-FTTC by 2020/21, and not higher than that, in order to allow for regional variations.

7.44 We recognise Openreach's concern that its performance is limited by the accuracy of the forecasting information provided by its customers, and its suggestion that Ofcom, telecoms providers, and Openreach itself collaborate to increase installation on time success for customers, for example telecoms providers' involvement to ensure the right services are ordered at point of sale. If Openreach perceives further improvements are possible through better collaboration with telecoms providers we encourage it to bring forward proposals through the OTA2.

### Glidepath

7.45 In considering the appropriate standard for the first two years of the market review period (2018/19 and 2019/20) we have decided that setting a safeguard level is appropriate to ensure there is no material deterioration of Openreach's current performance. Openreach has achieved a national performance of 94.8% of installation completion to the agreed delivery date under the existing standards at a national level in 2017. However, we are setting a quality standard at a regional level, and consider a 92% standard will be achievable in each region.

7.46 We do not consider that increasing the regulated standard from 90% to 92% will, of itself, have any material impact on Openreach's resources since this is a level of performance which Openreach is currently able to deliver in every region (albeit marginally in some and by a greater margin in others). We consider the impacts of our quality of service proposals on resources in the context of our wider work further in Section 10 and Annex 3.

7.47 As described above, Openreach has not yet performed at a level which would meet the final year standard of 95% regionally and it will need to make some changes to its operations to meet the final year of the standard. We have chosen to prioritise continuous improvement of the repair times over a small improvement in installation on time certainty in the second year, as repair does, at times, constrain Openreach's performance in relation to installations. For this reason, we have decided to set the second year of the standard at 92%.

7.48 TalkTalk maintained that Openreach should have prepared for higher standards because our DCR initial conclusions in February 2016 made it clear that Ofcom saw a role for higher quality standards. We agree that Openreach can reasonably have been expected to consider the likelihood of progressively higher standards, and recruited additional resources, or updated business processes accordingly, but we consider it to be appropriate to set glidepaths based on what is achievable from the current position until the end of the review period.

7.49 We have therefore decided to set the standard for the first two years of the market review period at 92%, increasing to 95% at the end of the three-year period.

## Quality standards for installation appointments

### Our proposals

7.50 In our March 2017 QoS Consultation we proposed a set of standards for installation appointments. We proposed that Openreach should:

- provide an appointment for installations within ten working days of being notified by 2020/21; and
- offer an appointment date within the maximum time (of ten or 12 days) 90% of the time.

7.51 We proposed to set a glidepath to reach the appointment availability standard of ten working days in the final year of the market review period, proposing a 12-day standard for the first two years.

7.52 We did not propose a glidepath for frequency of appointment availability, proposing to require Openreach to achieve the standard 90% of the time for each year.

7.53 Shorter lead times for appointments reduce the time to complete those installations which require an Openreach engineer visit. We recognise shortening the first available appointment timeframe might not have a significant impact on the average time to install appointed orders for WLR, MPF and GEA-FTTC because not all telecoms providers or their customers will want the earliest date possible. However, it would enable telecoms

providers to offer their customers earlier Openreach appointments which are more aligned with customers' expectations for reasonable installation times.[298]

7.54 We concluded that the first available appointment should not be reduced to within ten working days until 2020/21 because it provides for a period in which telecoms providers might adjust their installation processes in order to take advantage of changes Openreach will be making, and allow Openreach to adjust its operations.

7.55 In our March 2017 QoS Consultation we asked:

> Do you agree with our proposals for new timely appointment availability standards? Please provide reasons and evidence in support of your views.

## Stakeholder responses

### Frequency of Appointment Availability

7.56 Vodafone asked that we clarify the trade-off between retaining the 12-day appointment with a higher frequency of appointment availability versus a faster ten-day appointment period with lower frequency. It stated that, in the absence of this clarity, its preference would be to retain the 12-day appointment requirement for the final year of the period, but with a service floor approaching 100%. It added that appointment availability is critical to the provisioning of a service on time.[299]

### Standard for the First Available Appointment Date

7.57 TalkTalk suggested making the standard even more challenging in the final year, arguing that reducing the standard from 12 to ten working days does not go far enough. It said further improvement was achievable. Its experience has been that Openreach has performed within an average of nine to ten working days over the previous 12 months, and eight to ten working days within the previous six months.

7.58 Sky said that our proposals did not go far enough and that we should shorten lead times to eight working days (ensuring that this would not lead to any increased cost for telecoms providers). Sky shared its own provisioning data including that, over the previous 90 days, 50% of MPF orders accepted an appointed time of less than ten working days from the order date.[300]

7.59 In contrast Openreach argued that shortening the current timescales for installation appointments would provide little benefit as telecoms providers would be unlikely to utilise such appointments.[301] Openreach argued that a shorter first available date (FAD) will not on its own deliver a shorter average time to install.[302]

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[298] 2016 Jigsaw Research, Slide 121
[299] Vodafone response to the March 2017 QoS Consultation, page 58.
[300] Sky response to the March 2017 QoS Consultation, paragraph A6.35 and Figure A6.6.
[301] Openreach response to the March 2017 QoS Consultation, paragraph 273. Openreach also provided some information about telecoms provider take-up of FAD, including the data in Figure 32 of its response.
[302] Openreach response to the March 2017 QoS Consultation, paragraph 269.

7.60 Openreach also said that, while it supported shorter lead times for both copper and fibre orders to enable greater choice for customers, this would, "only deliver genuine benefit if it is part of a pan-industry initiative". Openreach suggested that to deliver effective shorter lead times, it would need improvements in telecoms providers' forecasting of demand for appointments in order to effectively match resource to demand without creating inefficiency. Openreach said that, "Ofcom should re-use the current SLG forecast safeguards to trigger exemptions for FAD [standards] (i.e. any FAD QoS failures that are associated with out-of-limits forecasts would be excluded from the formal assessment of [its] performance)".[303]

7.61 Verizon and UKCTA welcomed the reduction in the time for an appointment to ten working days.[304]

### Glidepath

7.62 TalkTalk argued that the number of working days within which a first date is offered for installation appointments should be reduced more quickly. It said Ofcom should introduce a ten-day standard in the first year of the review based on Openreach's current performance.

7.63 Sky argued that if we were to decide to retain a standard of ten working days for the final year of the review period then, to help ease the transition from 12 to ten working days, appointment availability standard for 2019/20 should be increased to 12 working days at 95%.[305]

### Other Issues

7.64 [✂] welcomed our proposal for new timely appointment availability standards, which it believed would demand a marked increase in Openreach's performance. However, it said that an appointment availability SLA should also be included in Openreach's contractual agreements with telecoms providers once the lead time is lowered to ten working days, as SLAs come into force from 12 working days for WLR, MPF, and GEA-FTTC.[306]

## Our considerations and decisions

### Frequency of Appointment Availability

7.65 Openreach's national performance since we imposed standards on appointment availability in 2014 shows that, over 2014/15, 2015/16 and 2016/17, it has been making initial appointments available within 12 working days for over 90% of WLR and MPF orders requiring an engineer visit (Figure 7.4). This significantly exceeds the 80% standard we imposed.

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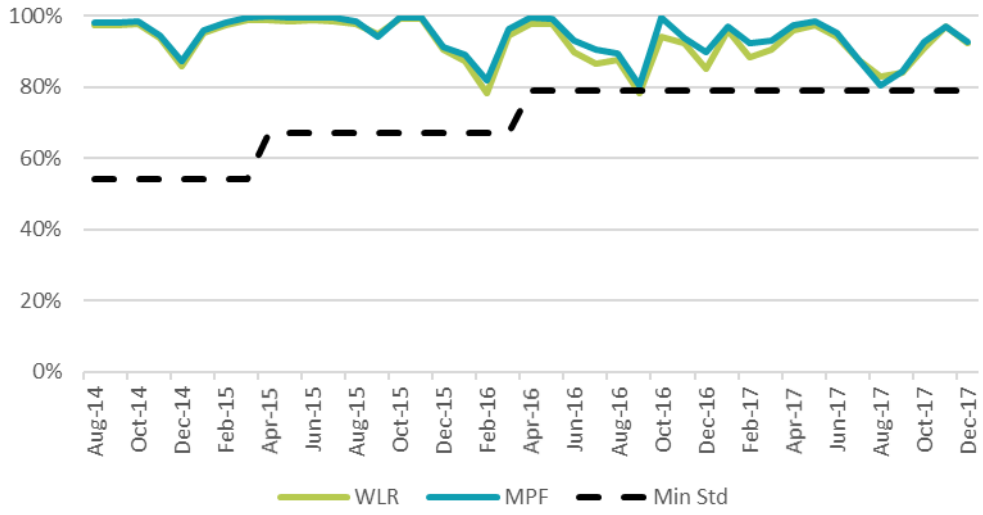
[303] Openreach response to the March 2017 QoS Consultation, paragraph 266 to 267
[304] Verizon response to the March 2017 QoS Consultation, paragraph 19; UKCTA response to the March 2017 QoS Consultation, paragraph 11.
[305] Sky response to the March 2017 QoS Consultation, paragraph A6.33, the headline above A6.33 and paragraphs A6.36 to A6.39.
[306] [✂]. The SLA is 18 working days for GEA-FTTP.

7.66 Openreach's performance in making available timely appointments for WLR orders over 2016/17 varied between 83.6% to 99.3%.

**Figure 7.4 UK 12-day appointment availability for WLR and MPF services (%)**

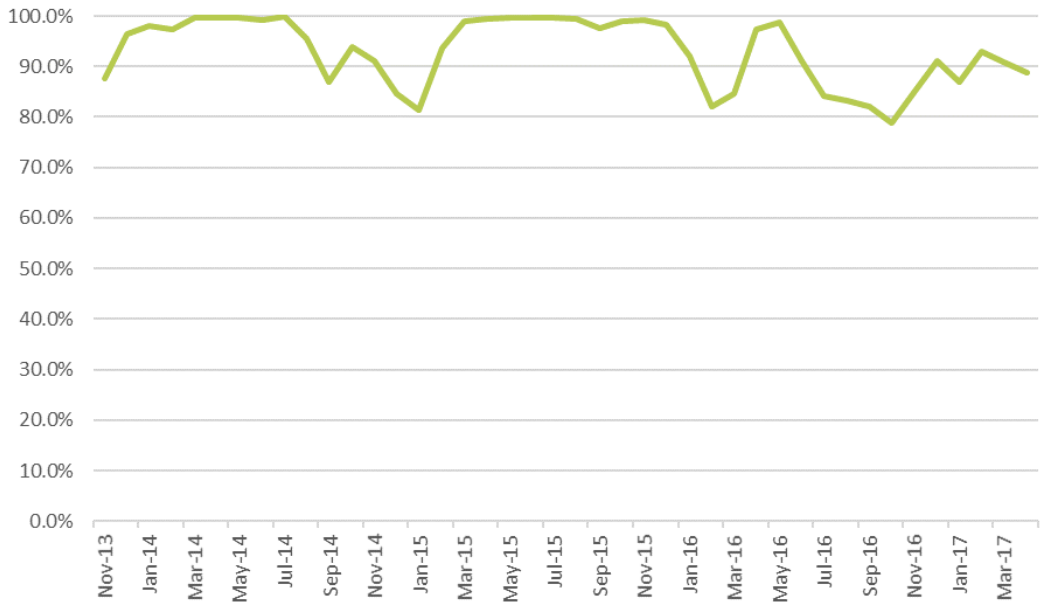



*Source: Openreach mandatory non-discrimination KPIs*[307]

7.67 We do not currently require BT to comply with a standard in relation to the availability of appointments for GEA-FTTC. The industry-negotiated SLA for GEA-FTTC appointments is also 12 working days. Data we have gathered under our statutory information gathering powers shows that GEA-FTTC performance against SLA has been above 99% for extended periods, but has also experienced some volatility as shown in Figure 7.5 below.

[307] Figure A1.10, Annex 1.

**Figure 7.5: UK 12-day appointment availability for GEA-FTTC services (%)**




*Source: Ofcom analysis of BT data*[308]

7.68 In light of Openreach's performance, it is apparent that a standard of 90%, or possibly higher is achievable in the context of a 12-day FAD standard. A standard of 90% or above would deliver improved certainty of telecoms providers and their customers.

7.69 It is important that we are confident that our full set of standards are achievable, reducing the risk that the standard set on installations, for example, will compromise Openreach's ability to meet standards on repair. An important interaction between our standards for repair and installation is that the higher we set the appointment available standards, the less scope Openreach has to respond to periods of peak demand for repair. Failing to make some allowance for Openreach to optimise efficient use of its resources across repairs and installations could lead to higher costs than are necessary to achieve our policy objectives for service quality improvements.

7.70 We further consider that, whilst Openreach's service performance at a national level is currently above 90%, there are some significant regional variations see Table 7.6 below. Thus, we have decided to require a standard of 90% for each region, which we see as more challenging than a 90% (or higher) target based on a national average.

[308] Data submitted in Openreach response dated 29 September 2017 to the 6th QoS s.135 notice.

**Table 7.6 Regional 12-day appointment availability in 2016/17, for each service and combined**

| Region | WLR | MPF | GEA-FTTC | Combined |
|---|---|---|---|---|
| East Anglia | 81.9% | 80.4% | 66.8% | 79.4% |
| London | 86.0% | 84.3% | 99.1% | 86.3% |
| North East | 92.2% | 91.6% | 92.4% | 92.0% |
| North Wales & North Midlands | 82.9% | 84.0% | 83.7% | 83.5% |
| North West | 94.4% | 93.8% | 85.1% | 94.2% |
| Northern Ireland | 99.7% | 99.6% | 99.7% | 99.7% |
| Scotland | 80.6% | 82.7% | 86.3% | 82.0% |
| South East | 94.3% | 92.5% | 90.8% | 93.2% |
| South Wales and South Midlands | 83.9% | 82.0% | 85.6% | 83.4% |
| Wessex | 88.3% | 87.9% | 94.7% | 89.1% |
| UK | 87.6% | 87.3% | 88.1% | 87.5% |

*Source: Ofcom analysis of BT data*[309]

7.71 For these reasons, and consistent with our approach set out in Section 3, we consider setting the level at 90% for each region would provide improved certainty for telecoms providers and customers. It applies a reasonable safeguard to ensure that the current level of service performance on available, timely appointments is maintained over the period of this review, while not unduly impacting Openreach's ability to achieve the other quality standards we are setting.

7.72 We do not consider that increasing the regulated level from 80% to 90% for timely appointment availability is likely to have any material impact on Openreach's resources in the first two years of the market review period because Openreach is close to meeting this level of performance regionally within existing resources.

7.73 As we set out in Section 6, our modelling of the costs of higher standards does not allow us to separately identify the costs associated with our repair and installation standards. We therefore consider the cost impact for the final year of the market review period in aggregate in Section 10. Therefore, we consider that the appropriate level of certainty should be set and maintained at 90% over the review period.

### Standard for the First Available Appointment Date

7.74 Making timely appointments available to its telecoms provider customers is an area in which Openreach has performed poorly in the past. In 2014 we imposed a requirement on BT to offer a first available engineer appointment within 12 working days of the

[309] Data submitted in Openreach response dated 29 September 2017 to the 6th QoS s.135 notice.

corresponding order being placed, in line with the contractual SLA that was in place at the time.

7.75 The evidence we have obtained in relation to telecoms providers' take up of first available appointments indicates that they select appointment dates longer than 12 working days for around 30% of their appointed WLR orders, 25% for MPF and 10% for GEA-FTTC. This is shown in Figures 7.7 to 7.9 which set out the actual take up of the first available appointments Openreach made available for individual orders for each of WLR, MPF and GEA-FTTC between 12 November 2016 and 20 December 2017. The bars in these charts show the volume of first available appointments by working day offered by Openreach, and the lines show the proportion of first available appointments taken by telecoms providers by working day. For example, Openreach offered over [✂] first available appointments on the tenth working day after those orders for WLR were placed by telecoms providers, (see Figure 7.7 below). Telecoms providers took the first available appointment offered by Openreach for just over half of those orders.

7.76 Openreach data also shows that, when it offers an installation appointment within six working days of an order being placed, fewer than 50% of these appointments are accepted. This could be due to earlier appointments being rejected by telecoms providers because they are not ready (for example their arrangements for the dispatch of home equipment takes longer than six days), or by their customers, or a combination of both. We note that the consumption of appointment slots shorter than ten working days is typically very low.

**Figure 7.7 Take up of the first available appointment for WLR**

[✂]

*Source: BT*[310]

**Figure 7.8 Take up of the first available appointment for MPF**

[✂]

*Source: BT*[311]

**Figure 7.9 Take up of first available appointment for GEA-FTTC**

[✂]

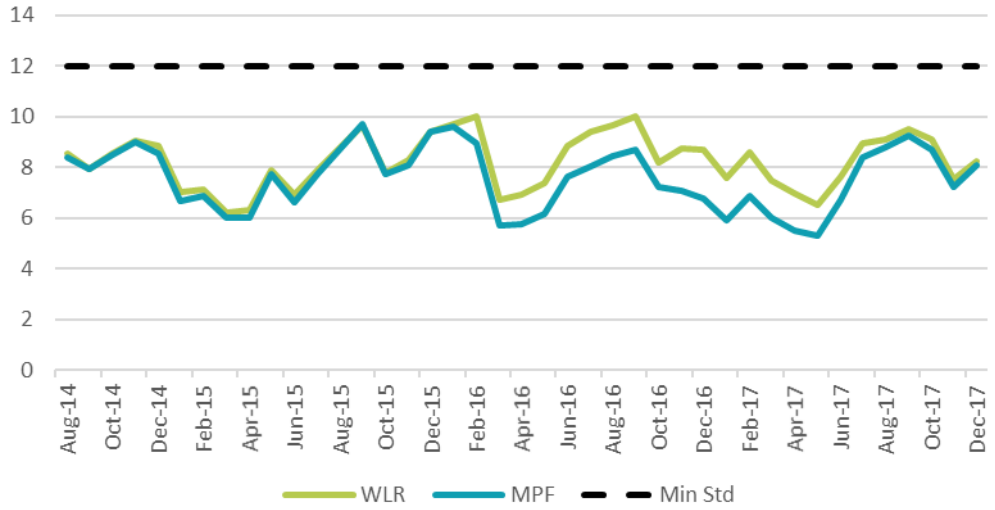
*Source: BT*[312]

7.77 Figure 7.10 below plots the monthly average first available appointment from August 2014 to December 2017. The variations apparent in the average availability performance over time are likely to reflect Openreach's practice of extending the lead time of installation appointments in periods when it is under resource pressure, particularly in the context of high levels of repair volumes. During such periods, Openreach can divert resource for short

[310] Openreach response dated 12 January 2018 to 13th QoS s.135 notice.
[311] Openreach response dated 12 January 2018 to 13th QoS s.135 notice.
[312] Openreach response dated 12 January 2018 to 13th QoS s.135 notice.

periods of time to deal with issues such as damage to its network resulting from extreme weather events.

**Figure 7.10 UK appointment availability for WLR and MPF (working days)**




*Source: Openreach mandatory non-discrimination KPIs*

7.78 Openreach's service performance in making timely appointments available for appointed orders is a key factor in the time to install these types of orders and is therefore important for competition in these markets. We recognise that telecoms providers and their customers may sometimes choose later appointments for their own convenience. However, without appointments being available from Openreach, telecoms providers cannot offer customers fast installations if they want them. Shorter appointment lead times will be more aligned with customers' rising expectations for fast delivery and better service.

7.79 We consider that ten working days strikes a reasonable balance between expectations for faster installations and likely take up of earlier appointments. It also aligns appointment availability with the ten-day customer protection lead time for customers transferring their service from one telecoms provider to another when switching.

7.80 We considered Sky and TalkTalk's arguments that the standard should be set at eight days for the final year, but were not persuaded that requiring Openreach to provide a sub-ten-day first available appointment is appropriate at present. This is primarily because we see little evidence of telecoms providers taking up appointment slots of less than ten working days. Based on the evidence of take up supplied by Openreach in Figures 7.7 to 7.9 above, reducing the first available appointment lead time from 12 to ten working days results in a relatively small fall in the proportion of take up (less than 10%). FAD consumption for MPF, for example, is at 62% for appointments offered at up to ten working days, but falls to 55% for appointments offered at up to eight days. In our view, the benefit of reducing the standard to below ten working days would be limited and could restrict Openreach's operational flexibility, which would impact on costs.

7.81 By requiring 90% of orders to be offered a date within our standard for the number of days in the FAD standard, and then reducing the number of days from 12 to ten we have sought to secure greater certainty first, and then bring down the appointing window. Should telecoms providers demonstrate that they are able to consume earlier appointments, and subject to our consumer protection measures, we will review the desirability of even earlier appointments in future reviews. We have therefore decided to set the final year appointment availability standard at ten working days.

### Glidepath

7.82 In the light of our decisions to shorten the appointment availability standard to ten working days and increase the certainty with which Openreach will offer these appointments to 90%, we have concluded that the first available appointment should not be reduced to within ten working days until 2020 because it provides for:

- a reasonable period over which other proposed policies intended to improve quality of service across industry are expected to come into effect, including automatic compensation for customers suffering poor service at the retail level and transparency of retail providers' comparable service performance;
- a period in which telecoms providers might adjust their installation processes to seek to deliver services to their customers more quickly; and
- a period in which Openreach can monitor and adjust its operations to meet changing regulatory requirements and the demands of its customers.

7.83 We considered Sky's suggestion that the frequency standard should increase to 95% for a 12-day appointment standard, before falling to 90% for a ten-day standard. However, based on our current analysis, we do not consider higher than 90% certainty for appointment availability would give Openreach sufficient operational flexibility in the context of the other standards we are setting.

### Trade-off between appointment lead time and certainty

7.84 We note the concerns raised by stakeholders, including the trade-off between the number of days in the FAD standard and the degree of certainty associated with the FAD, including Vodafone's suggestion that we impose a 12-day FAD standard with higher than 90% frequency. We recognise that these two measures are linked, however we are satisfied that increasing frequency to 90% will achieve our objectives in improving confidence regarding Openreach's appointment availability performance. Reducing the FAD to ten working days also aligns our regulation closer to consumers expectations, while taking account of the level of take-up of appointments less than ten working days after the order is placed. Our view is that our decisions strike a reasonable balance between these two measures.

7.85 Openreach's reference offer currently includes an SLA, with associated SLGs, for appointment availability within 12 days. We note [✂]'s suggestion that this SLA be aligned with the new standard once the appointment lead time is lowered to ten working days. We consider that this is a matter for industry to resolve through the OTA2's SLA and SLG

renegotiation process, which is the standard approach for such changes, and includes guidance for when it is appropriate for matters to be referred to Ofcom (see Section 8).

7.86 Openreach suggested that we should include an exemption to the FAD standard, where telecoms providers provide inaccurate forecasts. As noted by Openreach there are contractual obligations in place on its customers to provide demand forecasts including an incentive mechanism whereby unforecasted orders are not bound by its SLA and SLG terms for appointment availability.

7.87 We agree that the inclusion for forecasting exemptions in the specific case of FAD SLA and SLGs reflects the importance of forecasting for Openreach's ability to make timely appointments available, and improves the incentives for telecoms providers to provide accurate forecasts.

7.88 However, we consider that quality of service standards should be the same for all telecoms providers, and ensure a reliable service for customers. Including forecasting exemptions for specific standards could undermine the standards, as it could lead to uncertainty regarding how and when they apply. We do not think poor forecasts by one telecoms provider should affect a quality standard that is designed to achieve certainty and reliability for all telecoms providers and their customers.

7.89 In setting the standards for appointment availability we have considered evidence of Openreach's historical performance, which includes responding to unforecasted installation requests. This performance therefore includes the impact of this issue. If telecoms providers forecasting performance were to significantly deteriorate, and this affected Openreach's ability to respond to installation demand, we would encourage it to discuss this matter in the relevant industry forums, and to raise the matter, suitably evidenced, with Ofcom if it requires our intervention.

## Other issues in the structure of the standards

### Our proposals

7.90 We also set out in our March 2017 QoS Consultation how we would assess compliance with our QoS standards. The key proposals we made in March 2017 were to:

- assess compliance with our quality standards for installations on an annual basis in each of the ten UK regions;
- maintain current allowances for *force majeure* (in regard to matters beyond Openreach's control, also referred to as MBORC); and
- apply our annual quality standards for installation date certainty to the aggregate of orders for WLR, MPF and GEA-FTTC

7.91 In our March 2017 QoS Consultation we asked:

Do you agree with our proposals regarding compliance? Please provide reasons and evidence in support of your views.

## Stakeholder responses

### Assessment annually by region

7.92 Verizon agreed "that the standards should be assessed annually and should be assessed per region" to ensure practicality and "that regional specificities should not impact on quality of service".[313] [✂] agreed with proposals regarding compliance and welcomed our willingness to consider further intervention if differentials in service performance raise competition concerns.[314]

7.93 Vodafone said that it would be beneficial if Openreach added a comparison against its average performance for all telecoms providers against its performance for a specific telecoms provider in the reports it provides to them. This would help telecoms providers such as Vodafone determine if there were any reasons to suspect discrimination.[315]

7.94 Openreach agreed with the proposal to assess compliance annually over 10 regions.[316] However, it explained that, for operational reasons, it might occasionally change its regional structure to optimise operational performance (for example the recent splitting of Wessex into two regions) but did not believe that any such changes would affect its performance against the standards. It said that, where there are movements of small areas between regions, it would be appropriate to reflect the updated structure in its compliance reports.[317]

### Allowance for *force majeure* (MBORC)

7.95 Vodafone suggested changes to our definition of MBORC, for example excluding from the definition of MBORCs those events that are contractually introduced by BT but do not fall within BT's reasonable control, such as industrial action.[318]

7.96 Sky also criticised our approach of setting a fixed MBORC allowance, arguing that it affords Openreach too much discretion and insufficient scrutiny.[319]

### Measuring compliance over the combined performance across WLR, MPF and GEA-FTTC

7.97 Openreach agreed with applying standards for installation date certainty to WLR, MPF and GEA-FTTC together, which it felt aligned with Openreach's own "Our Charter", which

[313] Verizon response to the March 2017 QoS Consultation, paragraph 22.
[314] [✂]
[315] Vodafone response to the March 2017 QoS Consultation, page 58.
[316] Openreach response to the March 2017 QoS Consultation, paragraph 277.
[317] Openreach response March 2017 QoS Consultation, paragraph 277.
[318] Vodafone response to the March 2017 QoS Consultation, Annex 1, pages 33 to 36.
[319] Sky response to the March 2017 QoS Consultation, A6.40.

publicly commits to its customers to deliver 95% on time installation.[320] Verizon said that there should be an assessment by technology, i.e. copper versus fibre, to provide greater transparency.[321]

## Our considerations and decisions

### Maintaining provisions to apply our quality standards on an annual basis in each of ten UK regions

7.98 Our experience since first imposing QoS standards on Openreach in 2014 indicated that applying these standards over an annual period remained effective and appropriate. We have also assessed each of these elements in more detail in Section 5 in relation to repairs. We considered that this assessment applies, in large part, to installations too.

7.99 We understand Openreach's argument that there can be entirely legitimate reasons for Openreach to move operating units below the regional level between regions. While we appreciate the benefits of Openreach having the flexibility to manage its operations efficiently, we see that there is some risk that changes could also be motivated by artificially meeting standards, without an underlying operational improvement. We will therefore consider any such changes on their individual merits as and when Openreach propose them.

### Allowance for *force majeure* (MBORC)

7.100 We consider that it is important to set a cap on the permissible MBORC affected events that BT may exclude from the standard, as allowing BT to exclude all MBORC would not provide the appropriate incentives on BT to seek to minimise MBORC declarations both in terms of operational decision making (for example, decisions that might lead to the risk of industrial action) and decisions on future investment in network resilience.

7.101 Given this we consider it necessary to specify an allowance for MBORC. However, an MBORC allowance that is too large could decrease the effectiveness of our requirements. In reviewing BT's compliance with our current standards, we have not found it to require an additional MBORC allowance over the level we set in the 2014 FAMR. Given this allowance was set at 1% we have determined it appropriate to retain the MBORC allowance at this level for both installation on time and frequency of appointment availability. This MBORC allowance has been considered in light of historical MBORC declarations as they are currently defined, but once set the fixed allowance against the standards does not, in itself, rely on any specific definition. The definition for MBORC is included in the Openreach reference offers for the relevant services, and as such is subject to industry negotiation.[322] If this definition were to change, we could consider in any decisions regarding this standard how this change might affect the allowances we have set.

[320] Openreach response to the March 2017 QoS Consultation, paragraph 276. The Openreach Charter also included SMPF, as well as WLR, MPF and GEA-FTTC, in its 95% national average, whereas our standard does not include SMPF.
[321] Verizon response to the March 2017 QoS Consultation, paragraph 22.
[322] For example the LLU definitions of terms see *Part V Definitions*.

### Measuring compliance over the combined performance across WLR, MPF and GEA-FTTC

7.102 We have considered whether to apply installation standards to each of WLR, MPF and GEA-FTTC separately, or in aggregate. We have assessed the risk that BT could use an aggregated compliance measure to engage in discriminatory conduct based on differences in the consumption of these services between BT downstream divisions and other telecoms providers. We consider that this is unlikely for two main reasons. First, it is likely to be both difficult and costly for Openreach to configure its operations to enable it to vary its processes for different services, in part due to the prevalence of all three services in all regions.

7.103 Second, we will maintain transparency obligations on BT *inter alia* by service and by telecoms provider, such that any such discrimination in the quality of service provided in respect of one service compared to another and/or between different telecoms providers would be detectable. We would therefore be able to consider further intervention were we to be concerned that differentials in service performance raised competition concerns.

7.104 The benefits of applying the installations standards to services in aggregate are that there is a reduced regulatory burden on Openreach, and the standards are less susceptible to fluctuations in demand between services. We think that these benefits outweigh the above concerns, and therefore we have decided to impose our standards on the services in aggregate.

7.105 Regarding Vodafone's desire to have a report that would demonstrate any discrimination against its customers, we already require Openreach to provide the following to all telecoms providers:

- Each KPI averaged across all industry (all telecoms providers including BT downstream telecoms providers);
- Each KPI averaged across just BT downstream telecoms providers; and
- Each KPI specific to a telecoms provider made available on a confidential basis to that telecoms provider only and only on request by that telecoms provider.

7.106 We have therefore decided that we will measure compliance for the installation standards over the combined performance across WLR, MPF and GEA-FTTC i.e. that we will not impose quality standards separately to each of WLR, MPF and GEA-FTTC.

## Late installations

### Our proposals

7.107 We want to minimise installation delays and improve the customer experience for those consumers experiencing long delays. In our March 2017 QoS Consultation we included proposals to:

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https://www.openreach.co.uk/orpg/home/products/llu/contracts/contracts/downloads/RANF_Part_V.pdf (accessed 9 February 2018).

- address situations where installations are not provided on the date committed, which is discussed above;
- remove the SLG cap, which is currently 60 days. Stakeholder responses and our considerations and decisions relating to this proposal are set out in Section 8; and
- require Openreach to provide us with periodic reports setting out the main causes for delay to late installation orders, which is addressed in Section 9.

7.108 We also said that the OTA2 should work with Openreach and telecoms providers to explore initiatives aimed at improving the customer experience where installation orders face significant delays.

7.109 In our March 2017 QoS Consultation we asked:

> Do you agree with our proposals to minimise installation delays and improve the customer experience? Please provide reasons and evidence in support of your views.

## Stakeholder responses

7.110 Stakeholders generally supported our aim of minimising installation delays, noting their frustration about the experiences of end customers (residential and business customers), both in terms of missed appointments and other late installations.

7.111 Sky said that, in the past 12 months, the vast majority of installations requiring an Openreach engineer to attend customer premises took 10 calendar days or longer, and a significant volume (63,700) took longer than 30 days.[323] Sky also provided information about "line rental provide orders where initially contracted committed date does not match Sky's requested date" and missed appointments where Openreach engineers failed to show up.[324]

7.112 Sky argued Openreach has no regulatory constraint or incentive to provide a contractually committed date ("CCD") which matches what Sky terms its customer requested date ('CRD'), which is the date agreed between Sky and its customer and reserved in Openreach's booking system. Sky argued that this means Openreach could avoid paying SLGs for late delivery by "playing safe" and pushing out the CCD as far as possible.[325] Sky said Ofcom should introduce a new KPI which tracks this CRD against the CCD.[326]

## Our considerations and decisions

7.113 We note stakeholders' concerns and agree that it is important to consider the experience of the minority of customers whose service falls outside of our standards. We consider that our decisions in relation to the SLG cap (Section 8) and improved transparency (Section 9), in conjunction with the higher repair on time standard will sufficiently address the problem of late installations, and will provide valuable information if it becomes necessary to

[323] Sky responses to March 2017 QoS Consultation, paragraph A6.26.
[324] Sky response to the March 2017 QoS Consultation, [✂].
[325] Sky response to the March 2017 QoS Consultation, paragraph A6.31.
[326] Sky response to the March 2017 QoS Consultation, paragraph A6.32.

intervene further. We therefore do not consider that further regulation of late installations is appropriate at this stage.

7.114 We have also considered stakeholders' comments regarding missed appointments. As discussed above, missed appointments are one reason why installations are not completed on the agreed date, but are not the only reason. While the cause of Openreach missing appointments may not always be wholly within its control (for example an engineer's van breaking down while driving to the customer's home or business), missed appointments can cause telecoms providers and their customers considerable frustration, inconvenience and potentially costs.

7.115 As detailed in Annex 1, the incidence of Openreach missing appointments peaked in late 2015, particularly in relation to WLR and GEA-FTTC and to a lesser degree MPF, but reduced somewhat over the course of 2017. Openreach had publicly committed to targeting a 50% reduction in missed appointments (for both installation and repair appointments) by the end of the financial year 2016/17, and has reported on its website that this has been achieved.[327]

7.116 Our decision to require BT to complete more installation orders on time will increase Openreach's incentives to reduce missed appointments (as well as other reasons that lead to the failure of completing installations on time). We also note our decisions in the 2017 NMR Statement and 2018 WLA Statement to re-impose regulation that requires Openreach's relevant contracts to include a SLA for attending appointments and for compensation to be paid to telecoms providers where the agreed service level is not met. Additionally, as described in Section 3, the SLGs payable by Openreach to telecoms providers for missed appointments was increased in early 2015. We therefore do not consider that further regulation of missed appointments is appropriate at this time.

7.117 Finally, we have considered Sky's suggestion that we should introduce a KPI which tracks what it refers to as the CRD (the date and time it reserves on the Openreach's appointing system) against its CCD.[328] Our understanding of Sky's CRD is that it is effectively the same as the initial CCD recorded by Openreach. We understand that Openreach can only change the CCD from the initial CCD in circumstances considered to be outside of its control, for example when the customer requests a new date. For this reason, we disagree with Sky that Openreach could systematically change the CCD to its advantage.

7.118 We have imposed standards on (1) appointment availability, and (2) performance against CCD for all installations. We also monitor through KPIs various aspects of installation performance and appointment availability for appointed as well as non-appointed orders. We therefore believe we sufficiently monitor and regulate performance concerning appointments and installation performance and have decided not to introduce new KPIs to monitor the relationship between Sky's CRD and the CCD.

[327] Openreach, 2018. *Our performance – Dashboard*. https://www.homeandbusiness.openreach.co.uk/our-performance/dashboard [Accessed 24/1/18].
[328] Email from Sky to Ofcom dated 27 October 2017.

# Newly installed Openreach connections that are not working

## Our proposals

7.119 In our March 2017 QoS Consultation we proposed that industry works together on newly installed connections that are not working, facilitated by the OTA2, rather than imposing regulatory standards regarding Openreach's performance in this area. Our proposals on transparency also included a measure to monitor the level of newly installed lines not working as expected, which is considered further in Section 9.

7.120 In our March 2017 QoS Consultation we asked:

> Do you agree with our proposals for newly installed line not working? Please provide reasons and evidence in support of your views.

## Stakeholder responses

7.121 There was general agreement around the importance of newly installed lines working, with key issues raised including whether lines that fail should be marked as having failed their targets for on time installations and appointment availability, whether there should be greater penalties for faulty new lines (in comparison with missed appointments), whether faulty new lines are sufficiently covered by existing regulation, and the importance of industry collaboration (including sharing KPIs).

7.122 Vodafone argued that faulty new lines should be marked as having failed their on time installations targets until they are properly functional. It emphasised that Openreach must have the incentive to ensure its work is of both requisite speed and quality.[329]

7.123 [✂] argued that the repair of a faulty new installed line should be a priority and carry significantly heavier penalties for failure than a missed appointment. While it acknowledged that having a conversation with a customer about a deadline that had been promised but would no longer be met is "difficult", it also suggested that such a conversation would provide the customer with "the opportunity to mitigate the effect of a slipped installation date".[330]

7.124 Openreach agreed with having no further regulation for newly installed lines not working, saying these faults are covered by the other regulations and that it was working with telecoms providers to deliver improvements. Openreach's 2017/18 roadmap contains a comprehensive action plan on ELFs and DoAs.[331]

[329] Vodafone response to the March 2017 QoS Consultation, page 59. Emphasis is included in the original text.
[330] [✂]
[331] Openreach response to the March 2017 QoS Consultation, paragraphs 289 and 291. Early Life Failures - services which are not working within 28 days of installation. Dead on Arrivals - services that are not working within eight days of installation.

## Our considerations and decisions

7.125 We understand that the incidence of DoAs and ELFs for WLR and MPF installations has remained low and stable for a sustained period. However, as described in Section 4 and Annex 2, the rates of DoAs and ELFs for GEA-FTTC remain unacceptably high.

7.126 Newly installed lines not working is an issue which is monitored closely by the OTA2, and we note that BT's contracts include SLGs to compensate telecoms providers for DoAs for MPF and GEA-FTTC. As we have explained in those sections, we anticipate that industry's efforts to reduce this type of fault will be successful during this market review period, and are encouraged by the industry and the OTA2's work in this area.

7.127 We would be concerned if Openreach and industry are unable to make improvements, and we have therefore decided to introduce a separate KPI - "Percentage of orders reported as faulty within 8 days" measuring DoAs, as discussed in further detail in Section 9. In addition, we have retained our existing KPI "Percentage of orders reported as faulty", which monitors faults occurring within 28 or 30 days of completion of the installation, depending on the service. We have made it consistent across all services by setting the threshold at 30 calendar days for all services, as also explained further in Section 9.

7.128 On balance, we have decided not to impose a specific control on either ELFs or DoAs at this stage (see Sections 3 and 4).

# 8. Service level agreements and service level guarantees

8.1 In this section, we set out our decisions relating to Openreach's liability for late repairs and installations (its service level guarantees, or SLGs). We also conclude on our proposals from the March 2017 QoS Consultation regarding negotiating principles for SLAs and SLGs.

## Summary of our decisions

8.2 Having considered the impact on Openreach, telecoms providers and consumers, we have decided to remove the 60-day cap on Openreach's SLG payments. In reaching this decision, we have considered: the materiality of our concern; the appropriateness of open-ended liability, and; associated cost impact on Openreach.

## BT's liability for late installations and repairs

### Our proposals

8.3 In our March 2017 consultation, we considered the options for removing the 60-day limit on Openreach's liability of compensation for late repairs and installations, and then proposed to remove the cap. We considered that removing the cap in its entirety would maximise the benefit to competition, telecoms providers and consumers.

### Stakeholder responses

8.4 [✂], Sky, TalkTalk, UKCTA, Verizon and Vodafone agreed with our proposal to make the period over which SLGs are payable indefinite.[332] UKCTA and Verizon both agreed that removing the cap will improve the incentive for Openreach to focus on repairs and installations that have failed against SLA.[333] In addition, UKCTA suggested that the financial impact of removing the cap will be a significant spur to incentivising Openreach to improve its performance.[334] Sky said that removing the cap would be the best way of incentivising Openreach to address the problems caused by the late repairs and installations, which can disproportionately affect groups of vulnerable and disadvantaged customers.[335]

8.5 Openreach did not agree with our proposal for indefinite SLGs, arguing that the removal of the 60-day cap is neither objectively justified nor reasonably necessary.[336] It argued that

[332] [✂]; Sky response to the March 2017 QoS Consultation, paragraph A6.45; UKCTA response to the March 2017 QoS Consultation, paragraph 7; Verizon response to the March 2017 QoS Consultation, paragraph 15; Vodafone response to the March 2017 QoS Consultation, page 57.
[333] UKCTA response to the March 2017 QoS Consultation, paragraphs 7 and 12; Verizon response to the March 2017 QoS Consultation, paragraphs 15 and 20.
[334] UKCTA response to the March 2017 QoS Consultation, paragraphs 7 and 12.
[335] Sky response to the March 2017 Consultation, paragraph A6.45.
[336] Openreach response to the March 2017 Consultation, paragraph 403.

setting a cap on compensation payments is normal commercial practice[337] and, in any case, the existing contracts contain provisions that allow telecoms providers to claim for additional financial loss associated with specific breaches beyond the level of the cap contained within the SLAs.[338] Further, Openreach considered that there have not been any meaningful developments since Ofcom's 2008 decision to set a cap on SLGs that would warrant a change in approach.[339] Openreach also argued that recent improvements in performance for installations completed 90+ days late and faults repaired 30+ days late indicates that Openreach already has the incentive to manage the late installations and repairs and is doing so.[340]

## Our considerations and decisions

8.6 As described in Section 3, SLAs set out Openreach's commitment to provide services to an agreed quality, while SLGs provide for compensation to the telecoms provider should the service to them not be provided as specified in the SLAs. As well as compensating the telecoms provider, liability for SLGs for late repairs and installations can provide an incentive on Openreach to improve its performance. The period of delay for which payment is due is currently capped at a maximum of 60 days. That is, there is no additional payment for delays exceeding 60 days.

### Reasons for extending Openreach's SLG liability

8.7 As telecoms services (broadband in particular) are increasingly becoming an essential part of people's lives, prolonged periods without service could lead to significant consumer harm. Harm from being without broadband or fixed voice services does not end at 60 days, but, with the 60-day cap in place, beyond this point SLGs do not provide an incentive for Openreach to resolve outstanding faults and complete remaining installations, given its SMP. Further, the imposition of stricter regulatory standards requiring completion within SLA periods for installations and repairs could, in future, increase the incentive for Openreach to focus on new repair or installation requests at the expense of those cases that are already very late and in relation to which the SLG cap has already been exceeded.

8.8 The fact that compensation ceases once the cap is reached will also not reflect telecoms providers' losses accurately, as we would expect losses to continue until the repair has been resolved or the installation order has been completed.

8.9 We consider that fault repairs and installations that are not completed within a timely manner risk undermining the effectiveness of the repair SLAs in supporting the effectiveness of the network access remedy. In particular, instances of very late repairs or installations could cause customers to change provider even where the delay is not within the existing provider's control. As such, it is appropriate that we intervene to incentivise

[337] Openreach response to the March 2017 Consultation, paragraph 404.
[338] Openreach response to the March 2017 Consultation, paragraph 405.
[339] Openreach response to the March 2017 Consultation, paragraphs 406 and 407.
[340] Openreach response to the March 2017 Consultation, paragraphs 241 and 279.

Openreach to take action to ensure ongoing efforts to complete repairs and installations in all cases.

8.10 In 2016/17, 0.02% of all completed fault repairs took more than 60 working days over SLA to resolve. While this percentage may appear small, the figure in absolute terms equates to 61 fault repairs per month. Using information gathered under formal powers about completed installation orders over the period 2016/17, we assess that only 7,886 of installation orders were completed after the SLG cap of 60 payable days had been exceeded. However, even this small proportion still accounts for 0.1% of orders.[341] As set out in Section 7 in our assessment of late installations, these are typically orders which involve civil works to provide a network connection to the customer's home or business premises.

8.11 We note that the number of outstanding cases beyond the 60-day cap has reduced since our March consultation. However, there are still a material number of consumers waiting more than 60 days for a repair or installation to take place.

8.12 Openreach has shared with us its plans to tackle the group of repairs beyond the SLA that fall into the 'aged tail'. We welcome these plans but remain concerned that plans to deal with this issue may be deprioritised in the light of other operational initiatives, including the higher quality standards we are imposing. While in theory telecoms providers could make ad hoc claims for additional costs associated with breaches of the cap that extend beyond 60 days, in practice we have found that they are not doing this. We believe that a requirement that such payments be made proactively, as is currently the case for SLG payments up to 60 days, would help to ensure that our concerns will be addressed.

8.13 We have therefore considered two options for extending the period for which Openreach is liable to pay SLGs.

### Option 1: applying a cap longer than 60 days

8.14 Increasing the cap by a nominal figure, for example doubling the current SLG cap to 120 payable days, would reduce the number of open repair jobs at the cut-off point for the compensation cap to 8 cases per month and would reduce the number of uncompleted installations at the cut-off point for the compensation cap to 253 per month. Further, our estimates indicate that extending the cap to 120 payable days has the potential to increase annual SLG costs to BT by £[✂] (less than £100,000) for repairs, and by £[✂] (less than £1m) for installations (although the sums would be lower if, as a result of applying a longer cap, more of the “aged tail” was addressed promptly).[342] However, this nominal extension would not cover all late installations, which we believe is important given the reliance of customers on these services.

[341] We note that these figures are lower than the 2015/16 figures used in our March consultation. In March, we noted that in 2015/16 0.04% of all completed fault repairs took more than 60 working days over SLA to resolve, which in absolute terms equated to 118 fault repairs per month. Meanwhile, we assessed that during the same period, 0.1% of installation orders were completed after the SLG cap of 60 payable days had been exceeded. This accounted for 9,587 orders.
[342] [✂].

### Option 2: removing the 60-day SLG cap

8.15 Removing the current cap entirely would ensure that, in future, Openreach has incentives to complete all repairs and installations that experience delays of 60 or more days over SLA (for repairs) or the agreed delivery date (for installations). Specifically, in contrast to the status quo, there would be an ongoing financial incentive on Openreach to complete these orders under all circumstances, except where circumstances are beyond Openreach's control (*force majeure*).

8.16 Compensation caps are intended to limit liability in any given case and therefore compensate the supplied party to the level specified. We acknowledge Openreach's concern that the commercial practice for suppliers to limit their exposure by capping the amount of compensation that they would contractually be obliged to pay in the event of service failure is not uncommon. However, we note that commercial contracts can include open-ended arrangements, and the decision will depend partly on commercial considerations around the appropriate allocation of risk and the scope for the supplier to mitigate the risk by resolving the problem in question.

8.17 Set against the benefits to competition, there are also potential costs to Openreach. We would be concerned if the potential financial exposure to Openreach was particularly large when compared to the number of late repairs and installations in question. Using data obtained from BT using our statutory information gathering powers, we have estimated the increase in repair SLG costs that BT could be liable for if SLG caps for repairs were removed to be £[✂] (less than £100,000), which reflects the upper bound of the potential increase in annual costs. We have not calculated a corresponding lower bound; however, we consider that the liability to which BT would be exposed would be considerably lower than the figure stated above because of certain contractual exclusions to compensation payments (for *force majeure*). Our estimates for installations indicate that increases in SLG payments are also relatively modest, at £[✂] (less than £2.5m).[343] Again, the liability to which Openreach would be exposed could be lower due to contractual exclusions where there are periods of delay which are outside Openreach's direct control.

8.18 Openreach does not pay SLGs on faults impacted by *force majeure* events (MBORCs). Since MBORCs refer to "matters beyond our [Openreach's] reasonable control", the resolution of other faults is within Openreach's reasonable control and, as such, we do not think that removing the compensation cap would be inappropriate or otherwise disproportionate given the level of associated costs we have identified. We are aware that repairs or installations can, short of an MBORC declaration, nevertheless vary in complexity and the amount of time they take to resolve for a variety of reasons. However, there are undoubtedly degrees to which Openreach could improve its performance, even when some tasks take a greater amount of time to complete. We consider that Openreach should continue to compensate telecoms providers, reflecting its role in protracted delays

[343] Our installation estimates indicate an increase in new line rentals from about [✂] (5m to 7m) to about [✂] (6m to 8m) over the period of the charge control.

even for complex repairs and installations, until the order has been completed. We expect that this will incentivise Openreach to continue trying to improve its performance.

### Our conclusions regarding BT's liability for late installations and repairs

8.19 As described above, we are concerned that increased regulatory standards requiring completion within SLA periods for installations and repairs could increase the incentive for Openreach to focus on new repair or installation requests at the expense of those cases that are already very late. We consider that the customer detriment associated with delayed repairs and installations is particularly pertinent for the key wholesale services which underpin the mass market supply of fixed voice and/or broadband services, due to the degree to which consumers rely upon these services (see Section 3). We place particular weight on the risk of consumer harm, and the associated concerns regarding the risk to effective competition.

8.20 As described in Section 3, we maintain the conclusion we reached in 2008, that it is not appropriate to adopt a general principle as regards the appropriateness of compensation caps but to consider the particular circumstances of each case. Having regard to the level of costs identified above, and the potential improvements in the effectiveness of the SLA/SLG regime, we have decided to remove the existing 60-day cap on SLG payments, as this option best addresses these concerns under all circumstances. We have implemented this decision by way of a direction requiring BT to change the terms of its SLA and SLG contracts (see Annex 4).

## SLA and SLG negotiations

### Our proposals

8.21 In our March 2017 QoS Consultation, we proposed that the principles set out in Table 8.1 and the criteria set out in Table 8.2 below should apply to future contract negotiations between Openreach and its customers in relation to SLAs and SLGs for the supply of WLR, LLU and VULA services. These principles and criteria are the same as those set out in the 2014 FAMR Statement.

### Stakeholder responses

8.22 Most stakeholders did not comment on our proposal regarding SLA and SLG negotiations. Of those that responded, Openreach agreed with our proposals, stating that it continues to support the process put in place via our 2014 FAMR Statement in relation to negotiating SLAs and SLGs and endorses our proposals regarding the conduct of, and principles and criteria to be applied to, contractual negotiations concerning SLAs/SLGs.[344]

8.23 However, while [✂] welcomed the principles of contract negotiations concerning SLAs/SLGs and the imposition of timeframes to conclude negotiations, it argued that there

[344] Openreach response to the March 2017 QoS Consultation, paragraphs 409 to 410.

is a fundamental misunderstanding of contract negotiations and that Openreach holds contract reviews rather than negotiating contracts.[345]

## Our considerations and decisions

8.24 In our 2014 FAMR Statement we adopted contract negotiation principles and SLA/SLG assessment criteria to be applied to future industry negotiations in relation to SLAs/SLGs. These formed part of the package of measures we put in place to ensure that Openreach is responsive to its customers' requirements to provide improved quality of service in the supply of wholesale network access services (provided pursuant to our WLR, LLU and wholesale Ethernet leased line SMP remedies).

8.25 Regarding the WFAEL, wholesale ISDN30, wholesale ISDN2 and WLA markets, we believe that the same principles and criteria should remain applicable to any future contract negotiations between Openreach and its customers in relation to SLAs/SLGs relating to the supply of WLR and LLU services and should also be extended to SLA/SLG negotiations relating to the supply of VULA services. We note that Openreach and telecoms providers appear, in any event, to have adopted our principles and criteria for contract negotiations, in agreeing SLAs/SLGs.

8.26 Where all parties are negotiating from a broadly similar position of market power, commercial negotiation without the involvement of the industry regulator is the preferred method for reaching agreement on the terms of SLAs and SLGs.

8.27 In recognition of, in particular, the likely imbalance in negotiating positions as between Openreach and its customers, we have concerns about the predictability and visibility of the process that determines critical aspects of SLA and SLG terms and conditions.

8.28 While maintaining that regulatory intervention should be the last resort, we consider that there should be a defined, structured and open process for the negotiation of SLA and SLG terms and conditions, which reserve a central role for the OTA2 and set a time limit for negotiations. These principles are the same for contract reviews and the negotiation of new contracts.

8.29 We consider that the rationale for adopting principles for contract negotiation in previous reviews is likely to be applicable over the period of our current market reviews. Faced with the prospect of negotiating contractual terms and SLAs and SLGs (for example, to take account of commitments by some telecoms providers to provide automatic compensation to customers for a range of quality of service issues associated with fixed line services (such as delayed repairs), including those supplied to retail providers by Openreach at the wholesale level), a similar imbalance in negotiating positions as between Openreach and its customers is likely to arise.

8.30 Our 2017 NMR Statement and 2018 WLA Statement have concluded that BT has SMP in the WFAEL, wholesale ISDN30, wholesale ISDN2 and WLA markets, and, therefore, that telecoms providers will continue to be reliant on Openreach for the supply of services such

[345] [✂]

as WLR, MPF and GEA. Furthermore, we believe that the application of the principles and criteria below has worked well, particularly in relation to the supply of WLR, MPF and GEA services, and therefore conclude that they should continue to apply.

### Principles for the contract negotiation process and criteria for the assessment of SLA and SLG requests in relation to the supply of WLR, LLU and VULA services

8.31 The principles set out in Table 8.1 and the criteria set out in Table 8.2 apply to future contract negotiations between Openreach and its customers in relation to SLAs and SLGs for the supply of services in the WFAEL and WLA markets. These principles and criteria are the same as those set out in the 2014 FAMR Statement.

**Table 8.1 Principles for the contract negotiation process**

| | Principles |
|---|---|
| Principle 1 | The OTA2 should facilitate all negotiations to create or change an SLA/SLG and that this negotiation will allow input from all affected parties. |
| Principle 2 | The OTA2 will, using stated criteria, assess whether a request for negotiations on a new SLA/SLG or change to an existing SLA/SLG (and related contract terms) should be facilitated through this negotiation process. |
| Principle 3 | No negotiations over the content of an SLA/SLG should extend beyond 6 months, with regular reporting to Ofcom. If, in the opinion of the OTA2, negotiations cannot be successfully concluded or have not been concluded within 6 months, then the OTA2, as part of its final report to Ofcom, will set out its view on whether and on what basis Ofcom should initiate a review. |
| Principle 4 | Provision should continue according to the terms of an appropriate, pre-existing SLA/SLG until such time as a new SLA/SLG can be agreed. |

*Source: Ofcom*

Principles 1 and 2: The role of the OTA2 and practical application

8.32 We envisage that the OTA2's role will be to facilitate the negotiation process, rather than make decisions. However, we consider that there is significant scope for the OTA2 to contribute to, as well as guide and structure, the negotiation process and to assist in ensuring that parties can fully participate.

8.33 We would expect that the OTA2 would also have a key role in prioritising the issues to be considered in the process. This could mean that the OTA2 would decide that an issue is not appropriate for consideration in the process. This would not, of course, prevent any stakeholder from raising this issue as a dispute directly with Ofcom, but would ensure that what would be a resource-intensive process is used effectively.

8.34 We have decided that the initial criteria used by the OTA2 for making its assessment of SLA and SLG requests under Principle 2 are those set out in Table 8.2 below. While these

criteria may need to be adapted over time, we believe that they form a reasonable basis for decisions as to prioritising issues for review.

8.35 The criteria below are referenced in our principles.

**Table 8.2 Criteria for the assessment of SLA and SLG requests**

| | Detail |
|---|---|
| Criterion 1 | The request does not duplicate an existing request that is either being considered by the OTA2 or is under discussion within an existing industry forum. |
| Criterion 2 | The request could provide an adequate material benefit for the telecoms provider or industry and that any negative impact of the request not being addressed cannot be easily mitigated without the reasonable support of Openreach. |
| Criterion 3 | The request does not seek to address a telecoms provider deficiency that should more appropriately be addressed by the telecoms provider(s) themselves. |
| Criterion 4 | The request has adequate scale and support across industry or from those telecoms providers addressing a recognised end customer group to which the request relates. |

*Source: Ofcom*

Principle 3: Time limits for negotiation and clarifying/amending the subsequent process

8.36 We have decided that six months is an appropriate period in which to allow negotiations to take their course, where it is clear they are progressing. However, where negotiations have clearly broken down, then the OTA2 need not wait for the full six-month period to elapse before providing its report to Ofcom.

8.37 Principle 3 provides that: (i) the OTA2 will be actively reporting to Ofcom on the progress of negotiations, including setting out its view on whether and on what basis Ofcom should initiate a review; and (ii) after receiving this report, we will consider the matter on its merits. We cannot commit (in the principles) to a full investigation or to invite parties to raise disputes without considering the facts of each specific case first. While we will need to take an independent view of the issues, we will take appropriate account of the OTA2's report, which we expect will include details about the contribution of all participants, including their role in any delays to negotiations.

Principle 4: Clarifying the date when new SLAs and SLGs take effect

8.38 We consider that the 'backdating' of SLAs and SLGs may risk distorting any negotiation process. It could lead to a disproportionate focus on performance in that period and may act to discourage Openreach from engaging positively with the changes, as Openreach would not have an opportunity to modify its behaviour in response to the new targets and any compensation payments. We also consider that our principle that 'provision should continue according to the terms of an appropriate, pre-existing SLA and SLG until such time as a new SLA and SLG can be agreed' provides sufficient clarity as to the time at which the new SLA and SLG would take effect, i.e. on its agreement.

### Negotiating behaviours and references to Ofcom under the principles

8.39 We would expect all parties to any such negotiations (including Openreach) to make all reasonable efforts to exhibit the following behaviours:

- to approach negotiation of these matters with professional courtesy and an openness and willingness to consider the issues raised and any evidence presented;
- to be responsive to requests for negotiation and dialogue in a timely manner;
- to ensure that suitably empowered staff are available for meetings within a reasonable period following a request; and
- to ensure that requests for information are responded to as quickly as reasonably possible.

8.40 If Openreach does not engage in a manner we consider appropriate, then we may consider whether there is a need for additional regulatory conditions (to be imposed either as part of future market reviews or at another time) which impose a process for negotiation in such circumstances.

8.41 If an issue is referred to us under these arrangements, we will need to consider what is appropriate, including whether an issue/range of issues warrants our intervention. In addition to considering any such issues under our dispute resolution powers[346], it may also be necessary to consider whether a broader intervention might be required through, for instance, an own-initiative compliance investigation or a policy review. Any decision about intervention will be based on our assessment of the issues referred to us in the light of our duties and the broader regulatory framework. In the context of any such considerations, we would also consider any advice that the OTA2 offers in its final report, as appropriate.

8.42 In relation to the arrangements, where an issue is referred to us and we consider that it is appropriate to intervene, our starting point will be the respective proposals of each of the parties. In the first instance, we would expect to consider whether it would be appropriate, in the light of our duties and the broader regulatory framework, to choose between these proposals, rather than seek to consider other alternative options in detail. This would be intended to create the incentive for parties to set out their most reasonable final positions, rather than taking an extreme position in order to try to distort any eventual regulatory outcome in their favour. However, such an approach remains subject to the overall requirement to adopt an outcome which overall best meets our statutory duties.

[346] Ofcom, 2011. *Dispute Resolution Guidelines*. https://www.ofcom.org.uk/__data/assets/pdf_file/0020/71624/guidelines.pdf.

# 9. Transparency of BT's service performance for repairs and installations

## Our proposals

9.1 This section sets out *ex ante* QoS remedies relating to transparency over the WLA market review period. It draws on our approach to QoS regulation set out in Section 3 as well as stakeholder responses to our March and September 2017 QoS Consultations.

9.2 In this section we first set out our considerations and decisions in relation to KPIs relating to QoS standards and to monitor quality more broadly, and then for the quality report on delayed repairs and installations. A table setting out the required KPIs is provided at the end of this section.

9.3 As described in Section 11, we consider that the decisions set out in this section contribute to the fulfilment of our statutory duties and satisfy the relevant legal tests. In reaching these decisions, we have also taken into account our regulatory experience from previous market reviews, recent developments in these markets (based on information provided by Openreach and its customers, and on consumer research we have commissioned), and also expected developments over the course of the three-year review period.

## Summary of our decisions

9.4 Transparency measures such as KPIs provide a valuable tool with which to address the risks to competition and consumers arising from BT's market power. They allow us to compare Openreach's performance between BT's downstream divisions and other telecoms providers to identify any discrimination, to monitor performance against the standards we are imposing, and to identify emerging quality of service issues in a timely fashion. In addition, the requirement to collect and report information can act as a spur to Openreach to maintain a focus on its performance in those elements of its operations.

9.5 We have decided to impose a package of transparency requirements as proposed in the March consultation, with one amendment, which is to include Openreach's Business 2 Plus service maintenance level.[347] The transparency requirements fall into three broad categories:

- KPIs relating to QoS standards: we have decided to impose a requirement that BT should provide on a monthly basis KPIs relating to its performance against the standards we have decided to impose for installation and repair;
- KPIs that monitor performance more broadly: we have decided to impose requirements for KPIs regarding specific quality of service concerns; and
- A quarterly report on delayed repairs and installations.

[347] Prioritised on the day, fault clear by 23:59 next day, Monday to Saturday, excluding public and bank holidays.

# KPIs relating to QoS standards and to monitor quality more broadly

## Our proposals

9.6 Our March 2017 QoS Consultation outlined the KPIs we proposed that BT should be required to provide to Ofcom and industry in relation to specified aspects of its service delivery. In coming to our proposals, we reviewed the KPIs imposed in the 2014 FAMR in light of our proposed standards (see Sections 5, 6 and 7), including the extension of quality targets to GEA-FTTC, and the concerns identified elsewhere in our QoS review. We considered which KPIs should be retained, revised, added, or removed, and set out KPIs to monitor quality standards, quality of service more broadly, and proposed to require Openreach to provide us with a quarterly report on delayed repairs and installations.

### KPIs relating to QoS standards

9.7 A summary of the proposed KPIs relating largely to installation and repair measures subject to quality standards is set out in the table below:

**Table 9.1 Proposed KPIs relating to QoS standards (MPF, GEA-FTTC, GEA-FTTP, SMPF, and WLR)**

| KPI | SML | MPF | GEA-FTTC | GEA-FTTP | SMPF | WLR |
|---|---|---|---|---|---|---|
| Appointment availability | | Y P GM | Y P GM | Y | x | Y P GM |
| Provisioning of all orders[348] | | Y P GM | Y P GM | Y | x | Y P GM |
| Repair completion | 1 | Y P GM | Y P GM | x | x | Y P GM |
| | 2 | Y P GM | Y P GM | Y GM | Y GM | Y P GM |
| | 3 | Y GM | Y GM | Y GM | Y GM | Y GM |
| | 4 | Y GM | Y GM | Y GM | Y GM | Y GM |

*Source: Ofcom*[349]

### KPIs to monitor quality more broadly

9.8 We also proposed KPIs to capture Openreach's performance more widely. A summary is provided in the following table:

[348] Provisioning of all orders means percentage of all installations completed by the committed date.

[349] 'Y' means that BT is required to provide information under the KPI to Ofcom and industry (the precise information that must be provided to each differs in some KPIs). 'P' means that BT is required to publish this information on its website every three months. 'GM' means that the data must be disaggregated between each GM region Where the 'GM' marking is not used, BT is only required to publish KPIs in relation to the United Kingdom as a whole. 'x' means the KPI does not apply to the service indicated. 'D' or 'D+x' means regulated minimum appointment date, the committed date or the repair timescale date as applicable (or days in excess of that).

**Table 9.2 Proposed KPIs to monitor quality more broadly (MPF, GEA-FTTC, GEA-FTTP, SMPF, and WLR)**

| KPI | SML | MPF | GEA-FTTC | GEA-FTTP | SMPF | WLR |
|---|---|---|---|---|---|---|
| Average first available appointment date | | Y P | YP | Y | x | Y P |
| Percentage of orders rejected | | Y | Y | Y | x | Y |
| Provisioning of appointed orders | | Y | Y | Y | x | Y |
| Average installation time | | Y P | YP | Y | x | Y P |
| Percentage of installations affected by MBORC declarations that missed the Committed Date | | Y | Y | Y | x | Y |
| Percentage of orders reported as faulty | | Y | Y | Y | x | Y |
| Average time to restore service | 1 | Y P | Y P | x | x | Y P |
| | 2 | Y P | Y P | Y | Y | Y P |
| | 3 | Y | Y | Y | Y | Y |
| | 4 | Y | Y | Y | Y | Y |
| Percentage of repairs affected by MBORC declarations that missed the SLA | | Y | Y | Y | x | Y |
| Average time to restore service for repairs that have exceeded the SLA by more than 20 working days | 1 | Y | Y | x | x | Y |
| | 2 | Y | Y | Y | Y | Y |
| | 3 | Y | Y | Y | Y | Y |
| | 4 | Y | Y | Y | Y | Y |
| Percentage of repeat faults | | Y | Y | Y | Y | Y |
| Percentage of missed installation appointments | | | Y P | | x | Y P |
| Percentage of missed repair appointments | | | | Y P | | Y P |

*Source: Ofcom*

9.9 We asked stakeholders the following questions:

Do you agree with our proposals relating to the KPI reporting obligations set out above? Please provide reasons and evidence in support of your views.

Do you have any further comments on our proposals for transparency around Openreach's service performance? Please provide reasons and evidence in support of your views.

## Approach to setting KPIs

### Stakeholder responses

9.10 Respondents to the March 2017 Consultation broadly supported our proposed use of KPIs alongside quality standards and the SLA and SLG regime to drive improvements in Openreach's service performance. Vodafone considered that KPI reporting delivers the transparency portion (of our approach to QoS regulation), adding that it is essential that sufficient data is provided so that transparency can act as the incentive mechanism it is intended to be.[350] Similarly, Verizon considered that transparency and public scrutiny of Openreach's performance is a key measure for QoS improvements.[351]

### Our considerations and decisions

9.11 As explained in Section 3, we consider that using three tools to encourage Openreach to provide an appropriate level of quality of service is appropriate to address the competition concerns we have identified in relation to Openreach's incentives to provide a sufficient level of quality in the provision of network access. We note that most stakeholders broadly supported this approach.

9.12 We consider that the provision of KPIs on key aspects of Openreach's quality can support our network access remedies by allowing Ofcom, industry, and the wider public to monitor aspects of its service performance. The KPIs which we will use to assess performance for services subject to regulatory QoS standards are set out below. These KPIs will also allow us to monitor performance against important installation and repair service commitments up to 120 days beyond the relevant agreed date (our approach to delayed repairs and installations is covered later in this section).

## KPIs to monitor compliance with quality standards and quality more broadly

### Stakeholder responses

9.13 Vodafone disagreed with our proposal to remove KPIs for:

- the volume of orders submitted, volume of orders completed, volume of the installed base, volume of completed faults and volume of total appointed orders; and

[350] Vodafone Response to the March 2017 QoS Consultation, page 59.
[351] Verizon Response to the March 2017 QoS Consultation, paragraph 23.

- the timing of first appointment and timing of appointed orders not provisioned on time.[352]

9.14 Vodafone argued that this information is important to put overall performance in context[353] and to provide up to date information on expectations to the end customer. Vodafone also argued that measures for dialogue services availability[354] and for repair performance at the service maintenance level Business 2 Plus is important in deciding which level is best suited to their customers and product offering.[355]

9.15 Sky argued that Openreach has no regulatory obligation or incentive to provide a customer committed date (CCD) which matches, or is close to, the customer requested date (CRD). Sky requested that Ofcom introduce a new KPI which tracks the CRD against the CCD, for example, by requiring Openreach to provide the percentage of orders for which the CRD matches the CCD. In addition, Sky stated its support for any proposal to improve scrutiny of Openreach's use of MBORCs.[356]

9.16 TalkTalk considered that the fault rate should be clearly monitored through the KPIs and that it is appropriate that MBORCs continue to be monitored through specific KPIs.[357]

9.17 Openreach made several comments in relation to KPIs:

- It welcomed our proposal to remove the gateway availability KPIs, noting its stable and fairly high performance since August 2014.[358]
- Openreach noted that our consultation relates to broadband and telephone services to customers and businesses. It stated that the Business 2 Plus service accounts for around 2.4m lines and has the same maintenance level SLA as SML2. It proposed including SML Business 2 plus within the SML2 standard as this would lead to more of the customer base being captured within the regulatory minimum standard.[359] It also noted that we do not propose to include SML Business 2 plus in the KPIs, implying that we should.[360]
- In respect of MBORCs, it considered that we have not provided sufficient rationale for the proposed changes to the existing KPIs[361] and, as such, did not consider they are objectively justified, reasonably necessary, or proportionate. Openreach also argued that providing the proposed KPIs[362] would be complex, require comparing data from various sources, and, for Local MBORCs, would rely on estimates. It therefore considered that providing this information on a monthly basis would be

[352] Vodafone Response to the March 2017 QoS Consultation, pages 59 to 60.
[353] For example, where performance rises or falls in response to order volumes changes.
[354] We understand this to mean equivalence management platform (EMP) gateway availability.
[355] Vodafone Response to the March 2017 QoS Consultation, pages 59 and 60.
[356] Sky response to the March 2017 QoS Consultation, paragraphs A6.27, A6.31 to A6.32 and A6.43.
[357] TalkTalk response to the March 2017 QoS Consultation, paragraphs 3.3 and 4.7.
[358] Openreach response to the March 2017 QoS Consultation, paragraphs 299 to 301.
[359] Openreach response to the March 2017 QoS Consultation, paragraphs 157 to 158.
[360] Openreach response to the March 2017 QoS Consultation, paragraph 303.
[361] i.e. splitting data between High Level and Local MBORCs, and measure failures impacted by MBORCs as a percentage of total faults or provisions impacted by MBORCs.
[362] See proposed KPIs (viii) and (xi).

disproportionate, and that MBORC data should instead be submitted annually or at the end of the review period.[363]

- As Openreach measures repeat faults for WLR over a period of 30 calendar days and over a period of 28 calendar days for all other products, it asked that we amend our proposed KPIs to reflect this difference. Openreach also raised the fact that its repeat fault measures are based on faults reported (and not completed) within the 28 or 30 calendar day window following the completion of a previous fault, and that this is what has been reported under that KPI.[364] We presume Openreach are suggesting we change the definition of the KPI to use faults reported rather than fault repairs completed.
- Openreach also identified inconsistencies in our proposed GEA-FTTC Quality of Service Standard and KPI definitions concerning whether installation appointments include those at customer premises and those at street cabinets. Openreach suggested we should consider modifying the KPI definitions or the definition of appointment if we intend the relevant KPIs to match the appointment availability standard.[365]

### Our considerations and decisions

9.18 Transparency measures, such as the disclosure of KPIs, are useful tools to ensure that network access is provided on fair, reasonable, and non-discriminatory terms. They do so by making service performance visible and discrimination easier to detect, thereby deterring it. There is also a specific need for KPIs to monitor compliance with the quality standards, and we have decided to impose the KPIs listed below, with one amendment, which is to include Openreach's Business 2 Plus service maintenance level in the requirements for the reasons set out below.

- Appointment availability: this will allow us to monitor compliance against the standards at the service and the regional level, and will also ensure transparency in the treatment of services that fall outside of the standards.
- Provisioning of all orders: this will allow us to monitor Openreach's performance against the delivery date certainty standard on both a service basis and a regional basis, as well as monitoring installations that are completed a number of working days late.[366]
- Repair completion: this will allow us to monitor compliance against the on time repair standard at the regional level, and also ensures transparency in the treatment of service maintenance levels and services which fall outside of the standards.[367] Data should be reported for repairs completed on time and at a number of days beyond the SLA at each of SMLs 1, 2, Business 2 plus, 3, and 4.

9.19 We have decided to extend the KPIs relating to repair and service restoration to separately include the Service Maintenance Level Business 2 Plus in light of stakeholder comments. We consider that there is a risk that service maintenance levels not covered by the quality

[363] Openreach response to the March 2017 QoS Consultation, paragraphs 305 to 310.
[364] Openreach response to the March 2017 QoS Consultation, paragraphs 311 to 314.
[365] Openreach response to the March 2017 QoS Consultation, paragraphs 318 to 323.
[366] Specifically, one, two, five, 10, and 20 working days over the Committed Date.

standards could potentially suffer reduced performance should Openreach give priority to those service maintenance levels that are covered by the improved minimum quality of service standards or KPIs. Including Business 2 plus in the above KPIs will align our approach for this service level with that of SMLs 3 and 4.

9.20 We have reviewed our position on gateway availability. The KPIs we have collected show that while unscheduled outages of Openreach's gateway are rare, they do occur. Scheduled outages are more common, and overall gateway availability is typically between 94% and 99%. In our view, telecoms providers' ability to interact with Openreach systems is an essential element of providing reasonable network access. We would be concerned if unavailability of the gateway, on either a scheduled or unscheduled basis, limited this access or prevented telecoms providers from giving high quality customer service to consumers. However, we note that unscheduled outages are rare and Openreach has an incentive to provide gateway availability as SLGs are payable for unplanned outages and when planned outages exceed their planned duration. On balance, we do not think that transparency regulation is currently required to monitor gateway availability for WLR, MPF and GEA.

9.21 We have also decided to remove certain KPIs where, in our opinion, similar information is available through the numerators and denominators of the remaining and new KPIs. In some cases, there may not be an exact match, for example monthly volume instead of a daily average. However, we consider the set of new and remaining KPIs to be more consistent, facilitating better comparison between KPIs covering related matters. Alternative data to KPIs identified by Vodafone may be found as detailed in Table 9.3 below.

**Table 9.3 Alternative data for certain removed KPIs**

| Removed KPI | Alternative data |
|---|---|
| Volume of orders submitted | Denominator of Percentage of orders rejected |
| Volume of completed orders | Denominator of Percentage installation completion |
| Volume of the installed base | Denominator of Percentage of installed base reported faulty |
| Volume of completed faults | Numerator of Percentage of installed base reported faulty |
| Volume of total appointed orders | Denominator of Provisioning of appointed orders |
| Timing of first appointment | Numerators in Appointment availability |
| Timing of appointed orders not provisioned on time | Numerators in Provisioning of appointed orders. However, the measure has been changed from a daily average volume to a percentage for the month with volume data available via the numerators and denominators. |

*Source: Ofcom*

9.22 We have considered Sky's suggestion that we should introduce a new KPI which tracks the CRD against the confirmed committed date (CCD) in Section 7.

9.23 Regarding TalkTalk's suggestion that we monitor Openreach's fault rate through the KPIs, we consider that no changes are necessary as this continues to be addressed through the 'Percentage of installed base reported as faulty' KPI. This provides data on the number of faults that were repaired during the relevant month, expressed as a percentage of the number of active lines.

9.24 We consider it important to monitor MBORCs on a monthly basis to be able to detect significant trends in their use. We acknowledge Openreach's comments concerning the difficulty and potential inaccuracies arising from separating the overall MBORC volume into 'High Level MBORC' and 'Local MBORC' volumes. We have re-considered our request for this separation and concluded that we do not need such detailed information every month. However, we would like estimates of the split between High Level MBORC and Local MBORC volumes annually to enable us to better understand the volume of MBORCs that could affect the minimum quality standards in the future. We have therefore decided:

i) to revert to the FAMR 2014 MBORC related volume KPI definitions for the KPI data received every month suitably modified to reflect the wider range of service maintenance levels now being covered; and

ii) require Openreach to provide estimates of the split between High Level MBORC and Local MBORC annually in the Minimum Quality Standards Compliance Report, using estimation methods and a presentation format to be agreed with Ofcom.

9.25 We had proposed to change the measure for WLR repeat faults to a 28 calendar days basis. We are keen to encourage consistency, where possible, across the services to aid performance comparison, especially when services are delivered together as in the case for WLR+GEA-FTTC. We have therefore equalised the repeat fault definition for WLR, MPF, SMPF, GEA-FTTC and GEA-FTTP at 28 calendar days. We agree with Openreach that repeat faults should be measured on faults reported, rather than those completed. We are interested in an accurate estimate of the number of installations that fail within defined periods following completion of the installation. Using a measure based on completed faults potentially excludes a small but significant number of faults where their repair completion falls outside the defined measurement period.

9.26 Regarding the inconsistency in our definition of appointments relating to GEA-FTTC KPIs, we have concluded that appointments at the customer's premises and appointments at the street cabinet should be included for all measures relating to installation orders, except for 'Percentage of missed installation appointments'. We considered the separate measurement and reporting of KPIs relating to these two types of appointment for all KPIs. However, we rejected this approach because we are interested in performance broadly relating to installation appointments and believe the distinction between the appointment types in all relevant KPIs would add an unnecessary level of detail. However, given that our intention with KPI 'Percentage of missed installation appointments' is to monitor trends in disruption to end customers, we have decided that missed appointments at the customer's premises and missed appointments at the street cabinet are to be reported separately. To improve clarity, we also now require the missed appointment KPIs to be provided separately for each service.

9.27 For the reasons summarised above, we consider that requiring BT to continue regularly to report KPIs is appropriate and necessary so that we can closely monitor Openreach's performance in providing access to its network. Having reflected on our KPI proposals considering stakeholders' submissions, Table 9.4 at the end of this section summarises the KPIs we have decided Openreach must provide regularly for the coming market review period.

## Definitional issues

### Stakeholder responses

9.28 Vodafone said Ofcom definitions relating to this section and the associated legal instruments for services, service maintenance levels, MBORC triggers and relevant regions should not rely on BT definitions in its reference offers and associated documents. It argued BT could change the definitions to avoid regulation and possibly reduce SLG payments.[368]

9.29 Vodafone also said Ofcom's definition of a fault could be interpreted to exclude faults identified by end users and the definition only applied where the problem is "registered on the Dominant Provider's operational support system" which it claimed allowed BT to control the existence of the fault.[369]

### Our considerations and decisions

9.30 We do not agree with Vodafone's view and do not see the need to change the definitions for this statement. We believe it would be apparent to us if BT were to change any of the definitions we refer to in relation to services, service maintenance levels, MBORC triggers and relevant regions.

9.31 We will keep our transparency requirements under review to ensure they continue to meet the aims we have set out as the Narrowband and WLA markets develop over the review period.[370] Where we believe the transparency requirements no longer meet the aims we have set out we will consider modifying our KPI obligations via directions. Any proposal to add to, withdraw, or modify our KPI obligations via a direction (for example in response to the commercial launch, and material uptake, of a new wholesale product) would be subject to public consultation.

[368] Vodafone Response to the March 2017 QoS Consultation, Annex 1, pages 1, 30, 31 to 36 and 39.
[369] Vodafone Response to the March 2017 QoS Consultation, Annex 1, page 31.
[370] As noted in the Consultation, we would likely propose to require BT to report KPIs for GEA-FTTC repairs subject to SML1, split by GM area and/or publish these KPIs on a public accessible website, in the event that active connections in the relevant region exceed 100,000.

## Reporting KPIs monthly

### Stakeholder responses

9.32 Openreach considered our proposal to continue to require that BT submit KPIs for a given month within 14 working days of the end of that month provided sufficient time to "extract the data and prepare the reports". However, it considered that, from a practical perspective, it would be helpful if Ofcom could align the deadline for the publication and submission of KPIs across the Business Connectivity, Narrowband, and WLA markets.[371]

### Our considerations and decisions

9.33 We prefer to receive KPIs for all services on the same day. We retained the 14 working-day requirement in the 2017 NMR Statement published in November 2017. We also note that Openreach has said it already publishes the BCMR KPIs one day early to coincide with the copper access KPIs. We have therefore decided to continue the requirement for the delivery of KPIs within 14 working days of the relevant period over the coming review period.

## Quarterly website publication

### Stakeholder responses

9.34 In general, respondents were supportive of our proposal for the publication of a subset of QoS KPIs on a BT Group website every quarter, specifically within 14 working days of the end of the previous month. UKCTA considered that public scrutiny of Openreach's performance would incentivise quality improvements[372], while Vodafone believed that quarterly reporting would "heighten the results achieved" from Ofcom's transparency objective.[373]

9.35 Verizon also agreed that certain KPIs should be publicly available and considered that such open access may go some way to ensuring sufficient resources are employed in capturing, reporting, and monitoring the resulting performance.[374]

### Our considerations and decisions

9.36 We consider that the current obligation has improved transparency to customers and interested parties of key elements of Openreach's service performance in carrying out repairs and installations. We believe this requirement allows customers to see the performance of the service supplied by Openreach to telecoms providers and help avoid potential misconceptions about relative differences in service quality between telecoms providers who rely on the same Openreach services.

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[371] The deadline for the publication and submissions of KPIs directed by the 2016 BCMR is 15 working days after the last working day of the quarter; Openreach response to the March 2017 QoS Consultation, paragraphs 328 to 330.
[372] UKCTA response to the March 2017 QoS Consultation, paragraph 16.
[373] Vodafone response to the March 2017 QoS Consultation, page 60.
[374] Verizon response to the March 2017 QoS Consultation, paragraph 24.

9.37 We therefore consider it appropriate and necessary to require BT to continue to publish a subset of KPIs on its website (without password access) on a quarterly basis. Again, we consider 14 working days sufficient time for BT to be able to report the public KPIs. The first quarterly publication deadline will therefore be 19 July 2018.

## Geographic scope

### Stakeholder responses

9.38 Most respondents did not comment on the geographic scope of the proposed KPIs. Openreach argued that, to ensure consistency between quality standards and KPIs, the regional structure used for KPI reporting should be the same as that used for the standards.[375] Verizon stated a similar preference that KPIs should follow the form of the QoS standards set, i.e. if a standard is to be assessed regionally, then BT should be required to report KPIs split by region.[376]

### Our considerations and decisions

9.39 The 2014 FAMR considered that there was a risk of substantial variations in service delivery between different regions and hence it was important that we were able to monitor and compare key aspects of Openreach's service delivery in each area.[377]

9.40 We consider that the risk of variations in performance between regions persists over the forward-looking period of this review. Given the importance of ensuring that performance is nationally consistent, and that BT is not able to trade off quality to the detriment of customers in certain regions, we consider it is essential that BT publishes regional KPIs. As summarised in Table 9.4, we have therefore concluded that as QoS standards apply to each of the ten regions of the UK, BT must report KPIs on the same regional basis.[378]

## Service scope

### Stakeholder responses

9.41 Respondents to our March 2017 QoS Consultation generally supported our proposals to impose conditions in relation to the transparency of quality in the WLA and WFAEL markets and to set directions imposing KPIs for services delivered in those markets.

9.42 [✂], however, was concerned that limited KPIs for SMPF could lead to a deterioration in a service that it considers to be an important product in the business market. It stated that it failed to see why the same KPI reporting measures are not being applied to SMPF as compared to WLR, MPF, GEA-FTTC, and GEA-FTTP, adding that as the provisioning and

[375] Openreach response to the March 2017 QoS Consultation, paragraph 326.
[376] Verizon response to the March 2017 QoS Consultation, paragraph 23.
[377] 2014 FAMR Statement, paragraph 11.362.
[378] We note that we intend to measure compliance with the standards for repairs completed five working days over SLA on a national basis, but consider it important that we have visibility on Openreach's performance against this standard at a more granular level.

repair interfaces are the same for SMPF and MPF, the data is available for both products and it would not cause any undue overhead on Openreach to compile.[379]

### Our considerations and decisions

9.43 We consider that it remains necessary to continue to require KPIs to be broken down such that we can monitor and compare trends in Openreach's performance for individual network access services. In turn, this enables us to identify:

- emerging issues particular to certain services (for example between existing copper-based services and newer fibre-based services); and
- potential discriminatory conduct where certain telecoms providers or groups of telecoms providers (for example between BT divisions and rival providers) consume particular Openreach wholesale inputs.

9.44 We have therefore decided to require the delivery of KPIs in relation to Openreach's installation and repair performance for WLR, MPF, GEA-FTTC, and GEA-FTTP.

9.45 Regarding KPIs for SMPF services, we have taken into account the decision set out in the 2018 WLA Statement not to impose a specific access remedy on BT in the form of a requirement to offer SMPF.[380] We note that the vast majority of SMPF lines are consumed internally by BT and so while Openreach continues to provide SMPF to other parts of BT, its general obligation to provide network access on reasonable request and its no undue discrimination obligation (including EOI) mean that it will be obliged to continue to make SMPF available to other telecoms providers.[381] This includes quality of service measures as well as prices. We also noted that we are removing the network access requirements on new SMPF lines.

9.46 For this reason, consistent with our decision to deregulate SMPF, we have decided to retain only those KPIs relating to the repair of SMPF and not to impose KPIs to monitor the installation of these services.

## Numerators, denominators and KPIs for industry and BT downstream

### Stakeholder responses

9.47 Openreach cited our proposal to replace the reporting of volumes KPIs with an obligation to publish the numerators and denominators of specified KPIs. It was concerned that this, drafted in its current form, would disclose confidential information and would give BT's competitors "an unfair insight into BT's commercial activities". It stated that, under the 2014 FAMR KPI directions, it publishes some volume information for GEA-FTTP; however, as BT has 99.9% of the installed base, it does not currently provide 'the volume of the installed base' KPI to industry as this would reveal commercially sensitive BT market share information. Openreach therefore requested that we remove the proposed requirement to

[379] [✂]
[380] 2018 WLA Statement, Section 7.
[381] Openreach reports to Ofcom, 299 Ofcom Supplement, September 2017.

publish numerators and denominators for the 'percentage of installed base reported as faulty' KPI for GEA-FTTP.[382] More widely, it asked us to explicitly remove the requirement to publish to industry numerators and denominators for BT's own results, and to amend the draft legal instruments accordingly.[383] Openreach added that it was comfortable with continuing to report internal BT figures to Ofcom.[384]

9.48 Openreach also noted that we had not proposed to require the publication of numerators and denominators for the 'average time to restore service for repairs that have exceeded the Service Level Commitment by more than 20 working days' KPI (proposed KPI (xii)), and considered that it would be helpful to do so. Openreach further considered that this KPI should be expressed in working days, and not in working hours, to make it more meaningful.[385]

### Our considerations and decisions

9.49 We consider it important that KPI information covering separately the whole of industry and BT's downstream units is shared with industry. This allows for the identification of any potential discrimination in service provision between telecoms providers and, in doing so, supports the network access requirement we are imposing in the Narrowband and WLA markets.

9.50 However, we agree with Openreach that in certain instances it would not be appropriate to require KPI data to be shared with industry where that data is commercially sensitive and/or confidential, and the benefits of publication do not outweigh such sensitivities. We would be concerned if our attempts to rationalise the existing KPI list resulted in requiring BT to publish commercially sensitive information to rivals.

9.51 We have therefore decided to remove the requirement for Openreach to publish, other than to Ofcom, numerator and denominator information for:

i) KPIs relating to BT downstream units; and

ii) GEA-FTTP 'percentage of installed base reported as faulty' KPI.

9.52 Regarding proposed KPI (xii), we agree with Openreach's suggestion to publish numerators and denominators for the industry average performance to provide some context to the results. We also agree with Openreach's suggestion that this KPI is presented in working days and consider this will improve consistency with the other measures. We note that we have also added the requirement to publish numerators and denominators for other average KPI measures as well.

[382] Proposed KPI (xiv).
[383] Openreach nonetheless stated it would continue to provide these figures to Ofcom.
[384] Openreach response to the March 2017 QoS Consultation, paragraphs 315 to 317 and 324 to 325.
[385] Openreach response to the March 2017 QoS Consultation, paragraph 317.

## Future developments

### Stakeholder responses

9.53 Openreach noted our proposals extended the requirement to publish repair KPIs for GEA-FTTC to SML1 even though this service variant is not currently available to telecoms providers. It asked that we remove the proposed requirement and amend the draft legal instruments accordingly. Openreach also referred to its development of a "VULA variant known as 'single order GEA' (SOGEA)" and considered that it would be helpful if we could indicate how we expect to treat this new product in the context of the KPI obligations.[386]

### Our considerations and decisions

9.54 We agree with Openreach that it is not necessary to require BT to report KPIs for GEA-FTTC services subject to SML1. We also consider the "VULA variant known as 'single order GEA' (SOGEA)" to be a GEA-FTTC service. All KPI data arising from single order GEA should be aggregated with the appropriate GEA-FTTC KPI data.

# Transparency for delayed repairs and installations

## Our proposals

9.55 In addition to the KPIs above, we proposed to require BT to provide a standalone report on a quarterly basis on the root causes of service failures that fall outside of the proposed quality standards for installations and repairs. We noted our concern that there is currently little information available to us, industry, and customers regarding the causes of delays, and considered that this could have a negative impact on trust and confidence across the supply chain, and on competition. Our proposals sought to provide greater transparency around long term delays, enabling us to monitor why some work takes a long time to complete, which we expected would incentivise BT to address recurrent problems.

9.56 We proposed to work with Openreach to determine the form and content of the report, although our provisional view was that the report should provide information on Openreach repair and installation orders which have exceeded the SLA or Committed Date, respectively, by more than 120 working days. We considered that 120 working days would serve as an appropriate trigger for focusing on the most extreme delays but without creating an unduly burdensome reporting requirement for BT.

9.57 We asked stakeholders the following question:

[386] Openreach response to the March 2017 QoS Consultation, paragraphs 318 to 319 and 331 to 332.

Do you agree with our proposal to require BT to submit a quarterly report on late repairs and installations, and the reasons for their delay? Please provide reasons and evidence in support of your views.

## Stakeholder responses

9.58 UKCTA and Verizon welcomed Ofcom's proposal to gather more data in relation to the reasons for the delays to installations through new KPI reports. They considered that once Ofcom receives such information, we should use it to target other policy measures to tackle such delays, for example those caused by wayleaves and the negotiation of them.[387]

9.59 Openreach recognised that late repairs and installations have a negative impact on telecoms providers and end users, and agreed with our proposal to introduce enhanced transparency around delays. It also offered to work with Ofcom to agree the form and content of i) a report to enable us to monitor and understand why some orders take a long time to complete, and ii) a publicly available report aimed at telecoms providers and consumers.[388]

## Our considerations and decisions

9.60 We welcome stakeholders' agreement with our proposals for enhanced transparency regarding delayed repairs and installations. We believe that the higher standards described in Sections 5, 6 and 7 will improve Openreach's performance; however, there will be a small proportion of customers who still experience prolonged delays to their installations or repairs, and there is currently a lack of transparency around the reasons for these delays. We therefore consider that Ofcom, industry, and customers are often unable to garner a sufficient understanding of the reasons for delays, and that this information asymmetry has a negative impact on competition and consumer outcomes.

9.61 While we consider it important to improve the level of transparency, we would not want to make the production of such reports a disproportionate burden on BT. Since the March 2017 QoS Consultation we have worked with Openreach on the most appropriate form and content for the report, balancing transparency with the resources required in its production. Through our discussions with Openreach we have concluded there should be a single quarterly report made available to Ofcom, of which a subset should be made public, and a set of enhanced KPIs published each month to quantify the volumes of delayed installation and repair jobs.

9.62 We consider it appropriate to require BT to provide to Ofcom:

a) a monthly snapshot report as part of the normal monthly KPI reporting; and

b) a standalone quarterly report containing details of the root causes of delays for installation orders and repairs experiencing long term issues.

[387] UKCTA response to the March 2017 QoS Consultation, paragraph 17; Verizon response to the March 2017 QoS Consultation, paragraph 25.
[388] Openreach response to the March 2017 QoS Consultation, paragraphs 333 to 336.

9.63 The monthly 'snapshot' report should appear as a set of KPIs providing volumes separately for installation and repair, split by region and service of:

a) delayed jobs that are open at the end of the month that exceed the original target completion date by more than 30, 90 and 120 calendar days; and

b) delayed jobs that are closed during the month that exceeded the original target completion date by more than 30, 90 and 120 calendar days.

9.64 The quarterly report of delayed jobs completed during the relevant quarter should be agreed with Ofcom and include as a minimum:

a) a **Root Cause Description** section containing an explanation of the root causes identified in the following sections

b) an **Installation Order Summary** section containing the following summary charts for installation jobs completed during the relevant quarter where their completion date exceeded the CCD by more than 120 calendar days:

i) Provide order completions – All Products comparing total completions, completions within commitment, completions exceeding commitment but by no more than 120 days and completions exceeding commitment by more than 120 calendar days.

ii) Distribution of jobs by root cause

iii) Age profile of jobs - completion timing (calendar days)

iv) Regional distribution of jobs

v) Distribution of jobs by telecoms provider

vi) Distribution of copper products jobs by root cause

vii) Distribution of FTTC jobs by root cause

viii) Distribution of FTTP jobs by root cause

ix) Distribution of New-site jobs by root cause

c) an **Installation Order** section containing the following information for each installation job completed during the relevant quarter where the completion date exceeded the CCD by more than 120 calendar days:

i) Unique order identifier, for example Order number (Siebel) and/or CSS reference

ii) Region

iii) Exchange

iv) CP

v) Original commitment date

vi) Elapsed days to completion beyond original completion date

vii) Primary root cause

viii) Product

ix) Product Line

x) Complaint received (Yes or No)

d) a **Repair Summary** section containing the following summary charts for repairs completed during the relevant quarter where the completion date exceeded the contractual repair date by more than 30 calendar days:

i) Repair completions for all products comparing total repair completions, repair completions within commitment, repair completions exceeding commitment but by no more than 30 days and repair completions exceeding commitment by more than 30 days.

ii) Distribution of jobs by root cause

iii) Age profile of jobs – repair completion timing (calendar days)

iv) Regional distribution of repair completions

v) Distribution of repairs by telecoms provider

e) a **Repair** section containing the following information for each repair completed during the relevant quarter where the completion date exceeded the CCD by more than 30 calendar days:

i) Unique repair identifier, for example Order number (Siebel) and/or CSS reference

ii) Region

iii) Exchange

iv) CP

v) Service level commitment date

vi) Elapsed days to completion beyond original completion date

vii) Primary root cause

viii) Product

ix) Complaint received (Yes or No)

9.65 This report will be provided one calendar month plus 14 working days after the end of each quarter. Openreach will also publish the average of the delayed job monthly KPIs for each quarter on a BT Group website without password protection within 14 working days of the end of quarter so that it is freely and readily accessible to telecoms providers and their customers.

9.66 We believe that these reports will improve transparency regarding Openreach's performance in relation to delayed repairs and installations, and enable us to better monitor why some repairs and installations take a long time to complete. We expect this will incentivise BT to address recurrent problems, enhancing the effectiveness of our network access remedy and improving consumer outcomes.

## Summary of required KPIs

9.67 In this section, we have outlined transparency remedies aimed at monitoring performance, potential discrimination, and instances of extended delays, and which we consider are appropriate, proportionate, and necessary to complement our quality of service standards. We have decided to impose a package of transparency requirements as proposed in the March consultation, with one amendment, which is to include Openreach's Business 2 Plus service maintenance level. Together, we consider they will ensure that the network access we require BT to provide is timely and effective, and will address the competition concerns we have about quality arising out of our findings that BT holds SMP in the relevant wholesale markets.

9.68 Tables 9.4 to 9.6 below summarise our decision to direct BT to provide quality of service KPIs every month in respect of Openreach's WLR, LLU (MPF and SMPF), and GEA (FTTC and FTTP) network access services.

**Table 9.4 KPIs relating to QoS standards for MPF, GEA-FTTC, GEA-FTTP, SMPF, and WLR**

| | KPI | SML | MPF | GEA-FTTC | GEA-FTTP | SMPF | WLR |
|---|---|---|---|---|---|---|---|
| (i) | Appointment availability<br>• D<br>• D+1<br>• D+2<br>• D+5<br>• D+10<br>• D+20 | | Y P GM | Y P GM | Y | x | Y P GM |
| (ii) | Installation completion – all orders<br>• D<br>• D+1<br>• D+2<br>• D+5<br>• D+10<br>• D+20 | | Y P GM | Y P GM | Y | x | Y P GM |
| (iii) | Repair completion<br>• D<br>• D+1<br>• D+2<br>• D+5<br>• D+10<br>• D+20 | 1 | Y P GM | x | x | x | Y P GM |
| | | 2 | Y P GM | Y P GM | Y GM | Y GM | Y P GM |
| | | Business 2 Plus | x | x | x | x | Y GM |
| | | 3 | Y GM | Y GM | Y GM | Y GM | Y GM |
| | | 4 | Y GM | Y GM | Y GM | Y GM | Y GM |

*Source: Ofcom*[389]

[389] 'Y' means that BT is required to provide information under the KPI to Ofcom and industry (the precise information that must be provided to each differs in some KPIs). 'P' means that BT is required to publish this information on its website every three months. 'GM' means that the data must be disaggregated between each GM region Where the 'GM' marking is not used, BT is only required to publish KPIs in relation to the United Kingdom as a whole. 'x' means the KPI does not apply to the service indicated. 'D' or 'D+x' means regulated minimum appointment date, the committed date or the repair timescale date as applicable (or days in excess of that).

**Table 9.5 KPIs to monitor quality more broadly for MPF, GEA-FTTC, GEA-FTTP, SMPF, and WLR**

| | KPI | SML | MPF | GEA-FTTC | GEA-FTTP | SMPF | WLR |
|---|---|---|---|---|---|---|---|
| (iv) | Average first available appointment date | | Y P | YP | Y | x | Y P |
| (v) | Percentage of installation orders rejected | | Y | Y | Y | x | Y |
| (vi) | Installation completion - appointed orders[390]<br>• D<br>• D+1<br>• D+2<br>• D+5<br>• D+10<br>• D+20 | | Y | Y | Y | x | Y |
| (vii) | Average installation time – appointed orders | | Y P | YP | Y | x | Y P |
| (viii) | Average installation time – non-appointed orders | | Y P | YP | Y | x | Y P |
| (ix) | Percentage of installations affected by MBORC declarations that missed the Committed Date | | Y | Y | Y | x | Y |
| (x) | Percentage of installations reported as faulty within 8 days | | Y | Y | Y | x | Y |
| (xi) | Percentage of installation reported as faulty within 30 days | | Y | Y | Y | x | Y |
| (xii) | Average time to restore service | 1 | Y P | x | x | x | Y P |
| | | 2 | Y P | Y P | Y | Y | Y P |
| | | Business 2 Plus | x | x | x | x | Y |
| | | 3 | Y | Y | Y | Y | Y |
| | | 4 | Y | Y | Y | Y | Y |
| (xiii) | Percentage of repairs affected by MBORC declarations that missed the SLA | | Y | Y | Y | x | Y |

[390] "Installation completion – appointed orders" was previously named "Provision of appointed orders". We have decided to use "installation" instead of "provision" in the name to be consistent with the main text.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| (xiv) | Average time to restore service for repairs that have exceeded the SLA by 20 or more working days | 1 | Y | x | x | x | Y |
| | | 2 | Y | Y | Y | Y | Y |
| | | Business 2 Plus | x | x | x | x | Y |
| | | 3 | Y | Y | Y | Y | Y |
| | | 4 | Y | Y | Y | Y | Y |
| (xv) | Percentage of repeat faults | | Y | Y | Y | Y | Y |
| (xvi) | Percentage of installed based reported as faulty | | Y | Y | Y | Y | Y |
| (xvii) | Percentage of missed repair appointments | | Y P | Y P | Y | Y | Y P |
| (xviii) | Percentage of missed installation appointments at customer premises | | Y P | Y P | Y | x | Y P |
| (xix) | Percentage of missed installation appointments at street cabinet | | x | Y P | x | x | x |

*Source: Ofcom*[391]

[391] 'Y' means that BT is required to provide information under the KPI to Ofcom and industry (the precise information that must be provided to each differs in some KPIs). 'P' means that BT is required to publish this information on its website every three months. 'GM' means that the data must be disaggregated between each GM region Where the 'GM' marking is not used, BT is only required to publish KPIs in relation to the United Kingdom as a whole. 'x' means the KPI does not apply to the service indicated. 'D' or 'D+x' means regulated minimum appointment date, the committed date or the repair timescale date as applicable (or days in excess of that).

**Table 9.6 KPIs to monitor delayed repairs and installations for MPF, GEA-FTTC, GEA-FTTP, SMPF, and WLR**

| | KPI | SML | MPF | GEA-FTTC | GEA-FTTP | SMPF | WLR |
|---|---|---|---|---|---|---|---|
| (xx) | Delayed installations completed exceeding[392]<br>• 30 c-days<br>• 90 c-days<br>• 120 c-days | | Y P GM | Y P GM | Y | x | Y P GM |
| (xxi) | Delayed repairs completed exceeding<br>• 30 c-days<br>• 90 c-days<br>• 120 c-days | | Y P GM | Y P GM | Y | x | Y P GM |
| (xxii) | Delayed installations not completed exceeding<br>• 30 c-days<br>• 90 c-days<br>• 120 c-days | | Y P GM | Y P GM | Y | x | Y P GM |
| (xxiii) | Delayed repairs not completed exceeding<br>• 30 c-days<br>• 90 c-days<br>• 120 c-days | | Y P GM | Y P GM | Y | x | Y P GM |

*Source: Ofcom*[393]

9.69 We have also set out our decision for a new report on delayed repairs and installations above. This is made under the quality of service SMP conditions which we have imposed in the 2017 NMR and 2018 WLA Statements. The legal instruments setting out our notification of directions to give effect to our decisions are at Annex 4.

[392] For xxii, xxiii, xxiv and xxv, 'c-days' means calendar days beyond the committed or contracted completion date.
[393] 'Y' means that BT is required to provide information under the KPI to Ofcom and industry (the precise information that must be provided to each differs in some KPIs). 'P' means that BT is required to publish this information on its website every three months. 'GM' means that the data must be disaggregated between each GM region Where the 'GM' marking is not used, BT is only required to publish KPIs in relation to the United Kingdom as a whole. 'x' means the KPI does not apply to the service indicated. 'D' or 'D+x' means regulated minimum appointment date, the committed date or the repair timescale date as applicable (or days in excess of that).

# 10. Resourcing higher quality standards

10.1 We have set out in the preceding sections our decisions to set more demanding quality of service standards on the wholesale services Openreach offers. In this section we present our decisions relating to how the costs of these higher standards should be calculated, and what we estimate that cost impact to be.

10.2 This section is structured as follows:

- we begin by setting out our approach to resource modelling across the March 2017 QoS Consultation, and the September 2017 QoS Further Consultation;
- we then set out stakeholder responses to both consultations;
- we consider in turn the RPM and the Allocation Model, and their appropriateness for estimating the resource impact of the standards we are imposing, taking account of stakeholder responses;
- based on our assessment of the models we determine a central estimate for the resource uplift required to meet the standards; and
- finally, we estimate the differential cost impact by service level in order to quantify the impact on each of MPF at SML1 and GEA 40/10 services at SML2, which are the services we propose to charge control.

## Summary of our decisions

10.3 We have decided that:

- the Resource Performance Model (RPM) that we developed in collaboration with our advisors Analysys Mason, when properly configured, provides a reasonable estimate of the increases in Openreach resources required to meet our standards;
- the Allocation Model provided by Openreach is both sophisticated and comprehensive, but has certain limitations, and should only be used in so far as the results it generates fall within the range of results from the RPM;
- using the RPM, the range of resource uplifts required by Openreach to meet our standards is 9.1% to 14.1%;
- using the Allocation Model the resource uplift required by Openreach to meet our standards is 14.6% with a confidence interval of +/- 0.75%; and
- the appropriate cost uplift is 14.1% on average and disaggregated 11.8% for MPF SML1 and 16.4% for GEA 40/10 at SML2.

## Our proposals

10.4 An improvement in quality of service, such as quicker repair times, can increase the cost of providing the relevant wholesale access services. In the March 2017 QoS Consultation we used the outputs of the RPM we developed with our advisors Analysys Mason to estimate the resource implications of our proposals, in the context of our understanding of Openreach's operational limits at that time. We used the outputs of our RPM in

conjunction with our charge control models to estimate the cost impact of our quality of service regulation.[394]

10.5 We asked:

> In Annex 7 we set out our analysis and estimates of the resource implications of quality standards, including the assumptions and results of the Resource Performance Model that we commissioned consultants to develop. Please state whether you agree with our approach and estimates as set out in Annex 7. Please provide reasons and evidence in support of your views.

10.6 Openreach subsequently provided us with its own simulation model of its operations (the Allocation Model) which we asked Analysys Mason to audit for us. Openreach's response to the March 2017 QoS Consultation included Allocation Model results, a critique of our model[395], and a comparison of the RPM with the Allocation Model commissioned from Deloitte.[396]

10.7 In the September 2017 QoS Further Consultation we set out our initial consideration of the Allocation Model and our further consideration of the RPM, drawing on the audit findings and the responses to the March 2017 QoS Consultation. We provided updated resource estimates from the RPM which took account of the new information Openreach had submitted about its operational limits and some improvements we had made to the RPM. We also considered the relative merits of the RPM and Allocation Model drawing on Analysys Mason's comparison of the models and the Openreach and Deloitte submissions. We proposed to consider the Allocation Model outputs along-side those generated by the RPM, providing those results fell within the range determined by the RPM.

10.8 We asked:

> Do you agree with our resource uplift estimates as modified from our March proposals? Please provide reasons and evidence in support of your views.

## Stakeholder responses

10.9 The CWU said that our resource uplift estimates were too low, and that the limitations of the RPM meant it failed to account for variables such as engineer training.[397]

10.10 Openreach said the representation of its operations in the RPM was overly simplified and led us to significantly underestimate the additional resources required for higher standards. In support of this, Openreach supplied an assessment of the impact on the resource estimates of the differences between the two models and an external review of the models produced by Deloitte.

[394] March 2017 QoS Consultation, Section 8 and Annex 7.
[395] Openreach response to the March 2017 QoS Consultation, paragraphs 351 to 367.
[396] Openreach response to the March 2017 QoS Consultation, Annex 3.
[397] The CWU response to the March 2017 QoS Consultation, paragraph 16.

10.11 Openreach also provided its own model of its operations, the Allocation Model, which it argued was a more accurate simulation of its field engineering operations than the RPM because it models a broader range of factors that influence the level of resources required for field engineering activities.[398]

10.12 In response to our updated approach and estimates in the September 2017 QoS Further Consultation Openreach said it was disappointed with the provisional conclusion, based on Analysys Mason's assessment, that the Allocation Model should not be used by Ofcom to estimate resource uplifts for performance improvements. It considered the Allocation Model to be a more sophisticated, accurate and appropriate tool than the RPM. Nevertheless, Openreach agreed with our proposal to take the Allocation Model outputs into consideration and to use the Allocation Model results as the base case for our resource uplift estimates.[399]

10.13 Sky argued that we should not base our resource estimates on the Allocation Model given the serious concerns identified in the audit and what it saw as BT's long history of exploiting the information asymmetry (between BT and Ofcom) to overstate its costs. Sky considered we should base our resource estimates on the RPM which is likely to be more robust and objective, even though it might have weaknesses.[400]

10.14 TalkTalk argued there are strong reasons for not using the Allocation Model. Firstly, because Openreach had a consistent track record of providing Ofcom with information that is biased and self-serving. Secondly the Allocation Model does not reflect Openreach's operations, for example in relation to the sharing of resources across operational areas. Thirdly because the audit had found that the Allocation Model produces counter-intuitive results.[401]

10.15 UKCTA questioned why we had proposed to rely on the Allocation Model given the concerns identified in the audit and suggested that we should instead rely on the RPM in order to avoid any manipulation by Openreach.[402]

10.16 [✂] urged us to undertake further analysis of the Allocation Model in light of the audit findings, with emphasis on the operational limit since this is an input parameter to the resource modelling.[403]

# Our considerations and decisions

## Our assessment of the RPM

10.17 The RPM is a simplified simulation of Openreach's operations. A number of additional potentially relevant factors are modelled in more detail in the Allocation Model. Analyses of the extent to which these factors can explain the differences in the outputs produced by

[398] Openreach response to the March 2017 QoS Consultation, paragraphs 352 to 361.
[399] Openreach response to the September 2017 QoS Further Consultation, paragraphs 39 to 40.
[400] Sky response to the September 2017 QoS Further Consultation, paragraphs 6.25 and 1A16.
[401] TalkTalk response to the September 2017 QoS Further Consultation, paragraph 2.8.
[402] UKCTA response to the September 2017 QoS Further Consultation, paragraph 8.
[403] [✂]

the two models have been conducted by Analysys Mason, Openreach and Deloitte and are discussed in Annex 3. We have found that although the Allocation Model (discussed below) models a wider range of operational factors than the RPM, the factors not modelled in the RPM do not to materially impact the resource uplift estimates. The key determinant of the outputs of both models was found to be:

- the assumption on operational limits (which we revised as discussed in Section 6);
- loans (the treatment of resource sharing between Openreach's operational regions); and
- visit rates (the number of field engineering activities (visits) required to resolve faults).

10.18 Hence, we disagree with the views of CWU and Openreach about the RPM's limitations and have concluded that the RPM can be used to generate resource uplift estimates which are a good approximation of Openreach's operations, provided that it is configured to take account of the latest evidence concerning Openreach's operational limits and careful consideration is given to the configuration of resource sharing and visit rates. We set out our approach to resource sharing and visit rates below.

10.19 In relation to resource sharing, in response to the September 2017 QoS Further Consultation Openreach raised concerns about the RPM's assumptions in relation to loans. The RPM models two different forms of resource sharing loans of staff between Senior Operations Manager[404] (SOM) areas:

- 'adjacent sharing' (loans between adjacent SOM areas); and
- 'non-adjacent sharing' (loans between non-adjacent SOM areas).

10.20 Sharing resources with adjacent SOM areas is modelled for periods of high demand and with non-adjacent SOM areas in periods of exceptionally high demand (for example, exceptionally high fault volumes after major storms).

10.21 These loan assumptions are configurable. In our March 2017 QoS Consultation and in our September 2017 QoS Further Consultation we presented the results of various loan configurations, and noted that in our view a configuration in which both adjacent and non-adjacent loans were possible was likely to underestimate the resource uplift.

10.22 Openreach was concerned that loan assumptions might unduly reduce the level of resource uplift required for a given quality standard, and that it was not possible to understand the assumptions in the RPM.[405] We subsequently published a clarificatory note.[406] Our analysis showed that the adjacent sharing loan assumptions within the RPM are consistent with Openreach's operational practices but that the non-adjacent sharing assumptions overestimated the degree of non-adjacent sharing relative to Openreach's operational practices.

[404] Each of the 56 SOM areas modelled lies within one of the 9 Openreach regions (Northern Ireland being the tenth region, made up of a further two SOM areas.
[405] Openreach response to the September 2017 QoS Further Consultation, page 23.
[406] Ofcom, 2017. *Further Clarifications on the Ofcom Resource Performance Model*. https://www.ofcom.org.uk/__data/assets/pdf_file/0020/108704/wla-qos-clarification-note.pdf.

10.23 Regarding visit rates, we have simplified the way that these are modelled within the RPM. The RPM includes functionality to allow some repair tasks that fail on the first engineering visit to be revisited and completed within the SLA. We have chosen to set this assumption to zero, which means any task that fails on the first visit cannot be recovered within SLA. We have set the level of failures based on Openreach's assessment of its operational limits by 2020/21, which should include the impact of visit rates on Openreach's ability to meet the SLA in practice. We conclude that further adjustments in the configuration of the RPM are not necessary to account for visit rates.

10.24 We therefore conclude that the limitations of the RPM do not materially affect the reliability of the results it generates, and that the estimate of the resource uplift lies between the range we have calculated using the RPM.

## Our assessment of the Allocation Model

10.25 We found the Allocation Model to be a sophisticated bottom-up simulation that seeks to model Openreach's field operations more closely than previous models. The simulation includes operational factors that are not modelled in the RPM including variation in travel time and task time, resource availability and skilling constraints. However, the Allocation Model lacks some features of the RPM relating to the management of resources to optimise performance, including: stress response (mitigating actions taken during periods of exceptionally high demand[407]) and resource loans between SOM areas.

10.26 Analysys Mason's audit found the Allocation Model to be broadly speaking well-constructed, but also identified some problems with using it. Analysys Mason considered that it was unlikely that we could use the model, in its current form, directly or in isolation to predict resource deltas for quality of service improvements. Analysys Mason also suggested that we should treat the modelling results with caution given the sometimes counter-intuitive results and the difficulty they encountered with replicating Openreach's model outputs.[408]

10.27 In view of the audit findings, we have concluded that it would not be appropriate for us to rely solely on the Allocation Model to estimate the resource uplift for the quality standards we are imposing. The audit has identified several issues that warrant further investigation, including the sensitivity of the outputs to small input changes, the outputs that appear counter-intuitive, and the methodology used to derive the model inputs from operational data and to manipulate those inputs to reflect changes to the operational limit parameters. It was not possible to fully investigate these issues given the time and resources available to us. This was because of the complexity and slow operation of the model and because a significant proportion of the audit effort was taken up with investigating a software

[407] The Allocation Model includes 'stress response' functionality but it was not used by Openreach in most of the model runs used to support its consultation response.
[408] Analysys Mason, 2017. *WLR/LLU Charge Control 2017 Quality of Service model assessment*. Section 10. https://www.ofcom.org.uk/__data/assets/pdf_file/0013/106312/model-assessment-wlr-llu-quality-service.pdf.

problem that initially prevent Analysys Mason from replicating Openreach's modelling results.[409]

10.28 However, we do not consider it appropriate to disregard the results of the Allocation Model entirely, as suggested by Sky and TalkTalk, in that it is a sophisticated representation of Openreach operations, and provides insights into the dynamic relationship between standards and costs.

10.29 Therefore, we have decided to take account of the Allocation Model results providing they fall within the range we have determined from the RPM.

## The average resource uplift to meet higher standards

10.30 We start by estimating resource uplifts using the RPM, appropriately configured in light of our considerations above. Most importantly we have set the parameters for resource sharing to allow adjacent sharing only, in order to ensure this assumption aligns with our understanding of Openreach's operations.

10.31 We used the RPM to establish a range for the resource uplift, reflecting two approaches to how the operational limits could be modelled. We have run scenarios at a limit of 90.8%, reflecting the average operational limit across all regions after the process improvements proposed by Openreach as discussed in Section 6, and 89.3% representing the operational limit in the worst performing GM, again after taking account of potential process improvements. Whereas in the September 2017 QoS Further Consultation our range included resource estimates for various combinations of the inter-SOM loan assumptions, in line with the discussion above, our final estimates all use the local-sharing inter-SOM loan configuration. This approach gives the resource uplift range shown in Table 10.1 below.

**Table 10.1 Resource uplift range relative to 2015/16 for the 2020/2021 quality standards**

| | Operational limit 90.8%<br>Major fails: 9.2%<br>Minor fails: 0% | Operational limit 89.3%<br>Major fails: 10.7%<br>Minor fails: 0% |
|---|---|---|
| Non-adjacent sharing: off<br>Adjacent sharing: on | 9.1% | 14.1% |

*Source: Ofcom*

10.32 In response to the September 2107 QoS Further Consultation, Openreach provided additional results from its Allocation Model configured for an 88% on time repair standard in the final year of the market review period against an operational limit of 90.8%. These additional results addressed Openreach's concerns regarding the results we had proposed to use in September (which were for the model configured for a 90% repair on time

[409] With assistance from Openreach and Deloitte this problem was eventually localised to the HASHSEED parameter of the Python programming language used to build the model and which was shown not to operate reliably in the version of Python initially used by Analysys Mason. See Annex 3 for further details.

standard for the final year of the control against a 92.2% operational limit, which at that time we considered to be comparable from a resource estimation perspective.[410] We agree that it is preferable to take account of Allocation Model runs that are based on the levels we have now decided to impose.

10.33 In view of the considerable effort required for multiple national runs of the Allocation Model, we asked Analysys Mason to verify Openreach's resource estimates by performing selected runs of the Allocation Model using Openreach's input and configuration files.

10.34 We set out Openreach's results and results obtained from the Allocation Model by Analysys Mason in Annex 3. In summary these results show that the Allocation Model estimates the resource uplift to be 14.6% with a confidence interval of +/- 0.75%.

10.35 Although the two models are very different in their construction, the range that we set using the RPM, and the results of the Allocation Model (including the confidence interval around the Allocation Model results) continue to overlap. In our view this overlap in results from two different modelling approaches, independently undertaken, represents a reasonable assessment of the average resource uplift required to achieve the standards we are imposing. It reflects the results both of the RPM, with its relative simplicity and transparency, and the Allocation Model which includes additional elements but whose outputs we treat with caution, as described above.

10.36 Consistent with our consultation position, we have therefore decided that the appropriate resource uplift for our full package of quality of service standards should be determined by using the results of the Allocation Model, providing the results fall in the range determined by our RPM. We have therefore decided that the resource uplift should be at the top end of our consultation range: 14.1%.

## The resource uplifts for SMLs 1 and 2

10.37 The resource uplift estimates produced by both the RPM and the Allocation Models are based on a mix of services at SMLs 1 and 2. In the 2018 WLA Statement, we have decided to set charge controls on MPF SML1 and GEA 40/10 at SML2.[411] It is therefore necessary, for the purpose of these charge controls, to disaggregate the resource uplift into separate estimates for SMLs 1 and 2.

10.38 In the March 2017 QoS Consultation we proposed to assess the differential in resource uplift between SMLs 1 and 2 by generating two results from the RPM based on setting the mix of SML1 or SML2 to 100% (and the other to nil). We used these results to calculate the gradient between SMLs 1 and 2 in a scenario where resources are not shared between the queues for each SML.

10.39 In the September 2017 QoS Further Consultation we applied the gradient from the March 2017 QoS Consultation to our revised central estimate of the resource uplift to generate revised uplifts for each of SMLs 1 and 2. Openreach raised concerns with this approach and

[410] See Annex 3

[411] Where GEA-FTTP and GEA-FTTC services are concurrently available, BT has pricing flexibility on the price of the GEA-FTTP 40/10 variant.

recommended, should we continue to base our resource uplifts on the RPM, that we update the gradient to results based on the parameters for our revised proposals (i.e. for an 88% standard and 90.8% or 89.3% operational limit).

10.40 We concur with Openreach's recommendation, and have re-run the RPM to calculate an updated gradient between SMLs 1 and 2. The results are shown in Table 10.2 below.

**Table 10.2 Resource uplifts by Service Maintenance Level**

| | SML1 | SML2 | 50/50 Mix of SMLs 1 and 2 |
|---|---|---|---|
| Resource Uplift | 11.8% | 16.4% | 14.1% |

*Source: Ofcom*

10.41 To determine the nominal price impact on the charge controls associated with these resource uplifts, we need to apply these uplifts to the relevant repair costs in the charge control. In response to stakeholder comments, we have made amendments to our modelling of repair costs in the charge control (see Annex 13 of the 2018 WLA Statement). Key differences include our decision to model repair costs separately from other costs to ensure that the impact of QoS remedies is transparent, and to ensure that there is no double counting the benefits of Openreach's investment in reliability with our assessment of efficiency over the forward look period. We have also taken account of additional costs that are relevant to repair that were not included in our estimates in the March consultation or the September further consultation. Table 10.3 below summarises the cost increase in the charge control due to the resource uplift associated with the quality of service regulatory standards.

10.42 As described in Section 4, we have observed that our approach of increasing quality standards has increased Openreach's focus on improving quality, both in meeting the standards and more broadly across its operations. In particular, we think that it has spurred Openreach to look for ways to reduce fault rates, which should lead to a significant operating cost saving (its FVR plan). In Section 4 we set out our forecast fault rate, taking into account Openreach's FVR plan.

10.43 The effect of this reduction in faults in the charge control for MPF SML1 will be to reduce costs by £2.54 per line per year (nominal terms in 2020/21). As such, the total cost of repairing customer lines on the Openreach network, taking into account the reduction in the fault rate and the repair quality standards (£1.91 increase per line per year), is reducing by £0.63 (nominal terms in 2020/21). We expect this cost reduction at the wholesale level will be reflected in lower retail prices for customers.

10.44 A summary of the cost increases due to the quality of service regulatory standards and costs savings from improved reliability are shown in Table 10.3 for MPF SML1 and GEA 40/10 SML2.

**Table 10.3 Nominal price impact on charge controls in 2020/21**

| | Cost increase due to regulatory standards | Cost savings from improved reliability | Net effect |
|---|---|---|---|
| MPF rental SML 1 | £1.91 | £2.54 | £0.63 reduction |
| GEA 40/10 rental SML 2 | £0.70 | £0.54 | £0.16 increase |

*Source: Ofcom*

# 11. Quality of service remedies

11.1 In the preceding sections, we have detailed our decisions for quality of service remedies covering WLR, MPF, and GEA-FTTC services. These include requirements for BT that cover repair and installation performance, and transparency obligations. In each case we have set out our assessment that we are confident these requirements are operationally feasible, and that they will address the harm to competition and consumers posed by BT's SMP.

11.2 We have also set out our decisions regarding how we quantify the costs of the requirements we are imposing, and forecast improvements in network reliability in our charge control models.

11.3 In this section, we consider the effects of our requirements in aggregate and set out our consideration of how our decisions meet the necessary legal tests. We also set out our decisions and directions relating to Service Level Guarantees (SLGs).

11.4 First, we summarise our remedies and assess the package of remedies against the factors we have decided to take into account in determining appropriate levels for standards (as set out in Section 3). In summary, these factors relate to benefits to competition, consumers and telecoms providers (including performance certainty); operational feasibility for Openreach; and resource and cost implications for Openreach, and how these affect charge controlled services for customers and telecoms providers.

11.5 We then consider whether our decisions satisfy the legal tests in the Communications Act 2003 ('the Act'), and consider them in the light of the relevant EC recommendations and Body of European Regulators for Electronic Communications (BEREC) common positions.

## Assessment of our package of remedies

### Quality standards for repair and installation

11.6 In Sections 5 and 6, we set standards for BT's fault repair performance which are set out in Tables 11.1 and 11.2 below. We decided to set these standards, as in the 2014 FAMR, against the existing service level agreements that BT has in place for its two highest volume service maintenance levels, SMLs 1 and 2.

**Table 11.1 Quality standards for on time repairs (WLR, MPF and GEA-FTTC)**

| QoS standard applicable to each of the ten geographic areas | Current standard | First year (2018/19) | Second year (2019/20) | Third year (2020/21) |
|---|---|---|---|---|
| Repair completion within SLA timescales (adjusted for *force majeure*) | 80 %<br>(77%) | 83%<br>(80%) | 86%<br>(83%) | 88%<br>(85%) |

*Source: Ofcom*

**Table 11.2 Quality standards for repairs completed at + 5 working days (WLR, MPF and GEA-FTTC)**

| QoS standards applicable to UK as a whole | Current standard | First year (2018/19) | Second year (2019/20) | Third year (2020/21) |
|---|---|---|---|---|
| Repair completion within SLA + 5 days | NA | 95% | 96% | 97% |

*Source: Ofcom*

11.7 In Section 7, we set standards for BT's installation performance, which are set out in Tables 11.3 and 11.4.

**Table 11.3 Quality standards for installation date certainty (WLR, MPF and GEA-FTTC)**

| QoS standard applicable to each of the ten geographic areas | Current standard | First year (2018/19) | Second year (2019/20) | Third year (2020/21) |
|---|---|---|---|---|
| % of installations to be completed by Committed Date | 90%<br>(89%) | 92%<br>(91%) | 92%<br>(91%) | 95%<br>(94%) |

*Source: Ofcom*

**Table 11.4 Quality standards in relation to the FAD for installations requiring an engineer visit (WLR, MPF and GEA-FTTC)**

| QoS standard applicable to each of the ten geographic areas | Current standard | First year (2018/19) | Second year (2019/20) | Third year (2020/21) |
|---|---|---|---|---|
| Working days within which first date offered for installation appointments | 12 | 12 | 12 | 10 |
| Frequency with which regulated installation appointment date must be offered (adjusted for *force majeure*) | 80%<br>(79%) | 90%<br>(89%) | 90%<br>(89%) | 90%<br>(89%) |

*Source: Ofcom*

11.8 As set out in Section 3, the factors we have considered in assessing the levels at which we should set the standards are:

- the benefits to competition, customers, and telecoms providers, in particular regarding providing certainty around (i) the quality of the service telecoms providers are purchasing, and (ii) the waiting times customers will experience for an installation or repair;
- how operationally feasible it is for Openreach to achieve standards within the timeframe of the review period; and
- the resource implications, and consequent impact on costs for customers and telecoms providers.

11.9 In our September consultation, we assessed the proposed packages of remedies set out in the March consultation and modified in the September consultation against these three factors. The consultation questions regarding this assessment were broad, and relevant to the QoS remedies as a package. Understandably, respondents referred back to detailed points made on individual aspects of the proposals in response to both the March and September consultations, including those aspects with which they agreed and those where they thought changes were appropriate.

11.10 We have considered all the responses to both consultations in the preceding chapters in reaching decisions regarding the package of remedies, to the extent that they are applicable to the proposals as modified in September. We conclude our assessment against the three factors below, including a consideration of the cost implications of our proposals as set out in Section 10. Our considerations of stakeholder responses elsewhere in this document are cumulatively relevant to this assessment. For reasons of brevity, however, we have not repeated them here.

### Benefits to competition, customers, and telecoms providers

11.11 We have considered the extent to which each standard and the package as a whole benefits competition, customers, and telecoms providers, particularly by providing certainty about the quality of service Openreach will provide.

11.12 We consider that our package of remedies, taken in aggregate, will have a positive reinforcing effect. Customer confidence in high standards in one aspect of the service they buy can be eroded by poor quality in other aspects of the same service. In contrast, generally high quality in all aspects of service delivery should give customers confidence in their use of their services and in their ability to switch without fear of disruption and loss of service. Further, customers are becoming increasingly reliant on telecoms services and place greater value on them, so consumer harm at a given level of service quality will increase over time as consumer needs and expectations increase. It is therefore necessary for service quality to keep pace with consumer needs. We consider a consequence of Openreach's SMP in the WLA and WFAEL markets to be a lack of incentive for it to improve service quality.

11.13 High standards should also give telecoms providers the confidence to develop service packages that meet customer needs, without fear of damage to their brand caused by matters outside their direct control. At present, an 80% repair standard means that one in five customers will be let down if telecoms providers set expectations of next day repair. Our standards require Openreach to improve its performance such that 88% of repairs are completed on time. Although this is less than our March 2017 QoS Consultation proposal of 93%, it still represents a significant and meaningful increase in certainty regarding repair times compared with the present situation.

11.14 The 88% on time repair standard, combined with the standard that requires 97% of repairs to be completed not later than five working days after the SLA period (one or two days), means there is the potential for greater differentiation between telecoms providers in terms of the service promises they make, that are based on their own service capability, rather than constrained by Openreach.

11.15 Greater certainty over installation performance should also give telecoms providers better control over customers switching to their services, which will reduce the probability that Openreach adversely affects the important first experience a customer has with a new telecoms provider.

11.16 Requiring even higher standards at this point for repairs or installations would potentially have an impact on operational feasibility (a standard is helpful only to the extent it can reasonably be met) and costs as discussed below. It is also possible to articulate repair and installation standards that Openreach should meet in 100% of cases. However, there are complex situations which, at present, can take a long time to rectify and would lead to excessively lax standards. We have preferred to set timely standards for most customers.

11.17 Therefore, we consider that separately, and in combination, these standards appropriately address our criteria in relation to customer needs and certainty.

### Operational feasibility

11.18 In the 2014 FAMR, we set quality standards aimed at returning performance to levels that had previously been observed. In this review, we are imposing standards that are higher than BT has previously achieved, or has consistently achieved across all its geographic regions. We recognise that meeting the new standards will require BT to make changes to its operations and potentially its interactions with telecoms providers.

11.19 In Section 6, we describe how we have taken account of evidence provided by Openreach regarding operational limits to its performance, and our assessment that a final year target of 88% for on time repair is feasible. We have also set out glidepaths to reach our final year standards for both installation and repair. Our aim is to balance improvements in the service customers receive with giving BT sufficient time to make the necessary changes to its operations to deliver these requirements in an efficient and sustainable manner.

11.20 For on time repair standards we have imposed a near linear glide path rising to 88% in the third year of the review period. We recognise BT may need to increase its resources and invest in the skills and equipment of its engineers to achieve the final year target. For installations, we have set the proposed standards at a level designed to prevent deterioration in current performance while BT makes the necessary changes to its operations to achieve higher standards in the final year. We have also set the standards having regard to the improvements in operational capability we believe Openreach can achieve.

11.21 Our approach to forecasting fault rates in the accompanying charge control to the WLA market review is also relevant here. Our assessment of Openreach's investment in network reliability shows that the reduction in costs from handling fewer faults outweighs the costs of the higher standards we are imposing.

11.22 Therefore, while we recognise that Openreach will need to make changes to its operations in order to make meeting our standards feasible, we consider the combination of a more reliable network, and the glidepaths we have set, provide it with ample opportunity to do so.

### Resource implications and cost impacts

11.23 In Section 10, we have set out our decisions relating to the method by which we estimate the resource impact of our requirements on Openreach. The resource impacts for services offered at SMLs 1 and 2 inform the cost modelling undertaken as part of the charge control published alongside this review.

11.24 We have considered two alternative modelling approaches:

- the Resource Performance Model we developed with our advisors Analysys Mason, which is a relatively simple and transparent model of Openreach operations; and
- the Allocation Model, developed by Openreach, which is more sophisticated than the RPM, but considerably less transparent.

11.25 We have decided that we should rely primarily on the results of the RPM, and only take account of Allocation Model results where they fall in the range determined by the RPM.

11.26 Our approach estimates that in order to achieve the standards we are imposing, Openreach will need to employ 11.8% more resources on services offered at SML1 and 16.4% more resources on services offered at SML2

11.27 In the 2018 WLA Statement we have decided to impose charge controls on MPF services at SML1, and GEA 40/10 services at SML2. The impact on the costs of these services from our requirements is £1.91 and £0.70 per annum respectively.

11.28 We have also taken account of investments that Openreach is undertaking to improve network reliability. In our view the standards we are imposing significantly strengthen Openreach's incentives to improve reliability and therefore avoid the costs of meeting higher standards. We have set out our assessment in detail in Annex 2, and modelled the cost impact of reduced faults in a similar manner to the impact of greater resources.

11.29 This analysis shows that by 2020/21 the benefits of greater reliability are £2.54 for MPF at SML1, and £0.54 for GEA 40/10 at SML2. All the results are shown in Table 11.5 below:

**Table 11.5 Impact on unit costs per annum in 2020/21 (outputs from the charge control models for QoS standards)**

| | Cost increase due to regulatory standards | Cost savings from improved reliability | Net effect |
|---|---|---|---|
| MPF rental SML1 | £1.91 | £2.54 | £0.63 reduction |
| GEA 40/10 rental SML2 | £0.70 | £0.54 | £0.16 increase |

*Source: Ofcom*

11.30 In our view the standalone incremental cost of the standards we are imposing is modest, when compared to the significant improvement in the quality of service that customers will receive, as well as the competition benefits of improved certainty, forming less than 2.5% of the total rental charge for MPF at SML1, and less than 1.5% of GEA 40/10 at SML2. For MPF SML1 this cost is also wholly offset by the savings from greater reliability. Telecoms providers buying GEA 40/10 services on an MPF SML1 bearer will face a cost decrease of £0.47 in aggregate.

11.31 The quality standards we are imposing will require Openreach to:

i) achieve 10% more repairs on time (from 80% to 88%);

ii) limit delays of over five working days beyond SLA to no more than 3% of repairs;

iii) meet 95% of its promised dates for installations, up from 90%; and

iv) offer appointments within ten days 90% of the time.

11.32 These requirements will give telecoms providers increased certainty in the quality of service they receive from Openreach, and should allow further service differentiation to meet the disparate needs of customers. The required improvements will also better align service outcomes with customers' expectations. In our view these benefits form an appropriate trade off with the costs noted above.

# Consideration of the legal tests for imposing quality of service regulation

## Summary of our decisions

11.33 We have decided to impose the directions set out in Annex 4, in particular:

- a direction which imposes on BT, for MPF, WLR and GEA-FTTC, requirements to meet defined service standards, which increase over each of the three years of these forward-looking market reviews, in respect of:
  - completing the repair of faults within SLA timescales;
  - completing the repair of faults which exceed specified SLA timescales by a further five working days;
  - the period within which BT must offer appointments (where required) for the installation of WLR, MPF and GEA-FTTC services; and
  - completing the installation of WLR, MPF and GEA-FTTC services on the date agreed with the customer;
- directions on transparency as to quality of service (notified at Annex 9) which impose on BT, in the supply of WLR, MPF, SMPF, GEA-FTTC, and GEA-FTTP services, requirements to provide specified key performance indicators (KPIs) and specified reports; and
- directions relating to SLGs (notified at Annex 4) which impose on BT, requirements to modify the terms and conditions of its relevant contracts for the supply of WLR, MPF and GEA-FTTC services, to raise the existing caps on the number of days' compensation that may be payable in the circumstances provided for in the directions.

11.34 Below we describe our decisions in more detail, and set out our considerations for how they meet the relevant legal tests under the Act and are consistent with relevant EC recommendations and BEREC common positions.

## Our proposals

11.35 In our March 2017 QoS consultation, we considered how the remedies described above met the relevant legal tests under the Act and were consistent with relevant EC recommendations and BEREC common positions. We asked stakeholders:

> Do you agree with our proposals to direct BT to comply with performance standards regarding installations and repairs? Please provide reasons and evidence in support of your views.
>
> Do you agree with our proposals to direct BT to provide the KPIs we have specified? Please provide reasons and evidence in support of your views.

11.36 In our September 2017 QoS Further Consultation, we consulted on modifications to this package of QoS remedies, and re-assessed how the resultant package of QoS remedies met

the relevant legal tests under the Act and were consistent with relevant EC recommendations and BEREC common positions. We asked stakeholders:

> Do you agree that our proposed quality of services remedies (as revised) are objectively justifiable, not unduly discriminatory, proportionate and transparent? Please provide reasons and evidence in support of your views.

## Stakeholder responses

11.37 As in relation to the Section 3 criteria, the consultation questions were broad, asking about the QoS remedies as a package for the purposes of assessing the extent to which, taken as a whole, they meet the legal tests. Understandably, respondents referred back to detailed points made on individual aspects of the proposals in response to both the March and September consultations, including those aspects with which they agreed and those where they thought changes were appropriate.

11.38 We have considered all the responses to both consultations, to the extent that they are applicable to the proposals as modified in September, in reaching a conclusion on the extent to which, taken as a whole, the package of remedies meets the legal tests. The points of detail and our response to them are cumulatively relevant to that assessment. For reasons of brevity, however, we have not repeated here matters discussed elsewhere in this document.

## Our considerations and decisions regarding quality of service standards

### Aim and effect of the regulation

11.39 One of the consequences of BT having SMP is that it may not provide the quality of service that customers require. In competitive markets, customers' ability to switch providers signals to providers to choose a cost-quality trade-off that will suit their customers. However, in the case of the wholesale fixed access markets, Openreach is unlikely to receive such signals, as customers generally cannot switch to alternative networks. Moreover, the lack of competitive pressure may result in Openreach having little incentive to innovate to find ways of improving quality of service. In addition, there is the potential for discrimination issues if Openreach were to provide BT divisions with better quality than it provides to other (non-BT Group) telecoms providers.

11.40 The negative effects on customers of inadequate service quality delivered by Openreach include a greater number of faults, slow resolution of those faults, and frustration resulting from long delays to installations. Inadequate Openreach quality of service also has the potential to undermine the effective functioning of the network access remedy due to the negative impacts on retail competition by, among other things, affecting switching behaviour. For example, long or uncertain waiting times for a installation or repair may discourage switching with consequent implications for retail competition.

11.41 Quality standards will apply to Openreach's performance at the aggregate level over a defined period with the aim of ensuring that quality is maintained at a sufficiently high

level to prevent material detriment to competition and customers. Quality standards safeguard against the network access remedy being undermined.

11.42 A further benefit of quality standards is that if they are set at a sufficiently demanding level they give telecoms providers certainty about the level of quality they can expect from Openreach. This contrasts with the SLA/SLG regime, which provides compensation if a specific installation or repair is not dealt with in a timely manner, but gives little assurance to telecoms providers over what will actually be achieved. We believe that certainty over the speed of repairs and installations plays an important role in the functioning of retail competition and contributes to the effectiveness of the network access remedy. It allows telecoms providers to plan their strategies for delivering retail services and differentiating their services effectively.

### Our decisions regarding quality of service standards

11.43 In relation to repair standards, we have decided to impose:

- a standard requiring BT to complete 88% of repairs on time for SLAs 1 and 2 in the final year of the market review period, with a glidepath as set out in Table 6.1 in Section 6; and
- a standard requiring 97% of repairs to be completed by five working days beyond the SLA for SML1 and 2 in the final year of the market review period, as set out in Table 5.2 in Section 5.

11.44 Compliance with the two repair standards described above will be assessed by measuring the combined performance of WLR, MPF, and GEA-FTTC. We will apply the on time repair standards on a regional basis, taking account of MBORCs by way of specific allowances, and will assess BT's compliance on an annual basis, as set out in Sections 5 and 6.

11.45 With respect to the + 5 days standard, we will apply this measure on a national basis taking account of 'High Level MBORCs' (for example extreme weather events) only, and will again assess BT's compliance annually, as set out in Section 5.

11.46 In relation to installation date certainty, we will increase the current 90% standard to 95% over the market review period, as set out in Section 7.

11.47 In the case of installations requiring appointments for an engineer visits Openreach will be required to:

- provide an appointment for installations within ten working days of being notified by 2020/21; and
- offer an appointment date within the maximum time (of ten or 12 days) 90% of the time.

11.48 These installation standards are set out in Table 7.1 in Section 7.

11.49 Compliance with the two installation standards described above will be assessed by measuring the combined performance of WLR, MPF, and GEA-FTTC services. We will apply the installation standards on a regional basis, taking account of MBORCs by way of specific allowances, and will assess BT's compliance on an annual basis, as set out in Section 7.

11.50 These repair and installation standards will come into force on 1 April 2018, at the end of the ongoing compliance year for the QoS requirements currently in force.[412]

## Legal tests

11.51 Section 87(3) of the Act authorises the setting of SMP services conditions in relation to the provision of network access. Section 87(5) of the Act provides that such conditions may include provision for securing fairness and reasonableness in the way in which requests for network access are made and responded to, and for securing that the obligations contained in the conditions are complied with within the periods and at the times required by or under the conditions. In this regard, we note Article 12(1) of the Access Directive, which provides that national regulatory authorities may attach to conditions relating to network access obligations covering fairness, reasonableness and timeliness. We have set out in the 2017 NMR Statement and 2018 WLA Statement why we consider that the SMP conditions regarding quality of service meet the relevant tests set out in the Act.

11.52 Our directions for quality of service standards made pursuant to the above SMP conditions are set out in Annex 4. For the reasons set out below, we are satisfied that these directions meet the relevant tests set out in the Act.

11.53 We consider that the directions meet our duties in the Act, including our general duties under section 3 and all the Community requirements set out in section 4 of the Act. In particular, the directions are aimed at promoting competition and securing efficient and sustainable competition for the maximum benefit of consumers by ensuring that BT provides an improved level of performance in key areas of importance to its customers and to consumers.

11.54 We also consider that the directions meet the criteria in section 49(2) of the Act. In particular, they are:

- objectively justifiable, in that they aim to ensure that BT provides adequate levels of quality of service in relation to the installation and maintenance of the network access on which telecoms providers and their customers rely. For the reasons set out in this document, we consider that, to achieve this level of quality of service, it is appropriate to continue imposing quality standards and to set these at the increased levels we are proposing;
- not unduly discriminatory, as only BT and no other operator has been provisionally found to hold a position of market power in the wholesale fixed access markets;
- proportionate, in that they are targeted specifically to those areas for which regulation is required. We consider that the directions are a proportionate means of achieving the objective of ensuring an appropriate level of service in the delivery of key aspects of network access, taking into account our revised assessment of BT's operational capabilities and potential costs to customers and telecoms providers. Further, the requirements are structured to take into account the impact of events outside BT's control on its ability to meet the standards; and

[412] As per the 2016 Directions and Consents relating to the WLR and MPF quality standards and KPIs, the current compliance period for the MPF and WLR quality standards will end on 1 April 2018.

- transparent, in that it is clear that the intention of the directions is to ensure that BT maintains an appropriate level of quality of service in relation to several key aspects of importance to telecoms providers that buy these wholesale inputs and to consumers. In addition, our directions are clear in setting out the standards that we are proposing to impose.

11.55 For the reasons set out above, we consider that the quality of service performance standards directions are appropriate to address the concerns we have identified and are in line with section 49(2) of the Act.

### The BEREC common position

11.56 In making these directions we have also taken utmost account of the BEREC common position.[413] In relation to the objective of achieving a reasonable quality of access services (operational aspects), we note that the BEREC common position identifies, among other things, as best practice that national regulatory authorities (NRAs) should require SMP operators to provide a reasonable defined level of service (BP32) to address the concern that access services may not be of reasonable quality and service levels may not be comparable with those provided by the SMP operators to their own downstream businesses.

## Our considerations and decisions regarding quality of service transparency

### Aim and effect of the regulation

11.57 As set out in Section 3, BT, as a vertically integrated operator, has the ability and incentive to favour its own retail businesses by offering more favourable terms which would give it a competitive advantage over other telecoms providers and have a material adverse effect on competition. This discrimination could take the form of variations in quality of service.

11.58 Transparency measures, such as the obligation to disclose detailed KPIs, can help ensure that network access is provided on fair and reasonable terms by making it easier to identify such discrimination. The disclosure of detailed KPI data to Ofcom also allows us to monitor important aspects of Openreach's service closely and observe trends in performance over time. This means we can assess performance for the services and quality aspects that will be subject to the quality standards. We can also monitor performance for services and quality aspects outside the scope of the quality standards, encouraging Openreach to focus on delivering quality for a wide range of features (not only those covered by standards). This means we can detect potential concerns early and react quickly by, for example, using direction-making powers to set additional regulation.

[413] BEREC, 2012. *Common Position on best practice in remedies on the market for wholesale (physical) network infrastructure access (including shared or fully unbundled access) at a fixed location imposed as a consequence of a position of significant market power in the relevant market, BoR (12) 127.* www.berec.europa.eu/files/document_register_store/2012/12/20121208163628_BoR_(12)_127__BEREC__COMMON_POSITION_ON_BEST_PRACTICE_IN_REMEDIES_ON_THE_MARKET_FOR_WHOLESALE.pdf.

## Our decisions regarding transparency measures

11.59 Below we set out our decisions to make directions pursuant to the SMP conditions in the 2017 NMR Statement and the 2018 WLA Statement, requiring BT to provide transparency as to its quality of service performance and to publish certain KPIs and reports on late repairs and installations. The directions are set out at Annex 4.

11.60 We have set out our detailed proposals for transparency as to quality of service in Section 9. In the light of the quality standards proposed in Sections 5, 6 and 7 and the SMP conditions we have imposed on BT, we have outlined the KPIs BT is required to provide to Ofcom and industry in relation to specified aspects of its service delivery. We have particularly considered which KPIs should be retained, revised, added, and/or removed, to ensure that they remain fit for purpose in the light of our proposed QoS standards, the extension of regulation to GEA-FTTC, and the QoS concerns identified in this review. We consider that these new KPIs will allow us to continue effective monitoring of Openreach's installation and repair performance, and ensure that BT is not discriminating in its service performance between telecoms providers. A summary of the KPIs is set out in Section 9.

11.61 BT must provide KPIs monthly, with a subset to be published quarterly on its website. We will also require BT to provide a monthly report on service failures that fall outside our regulations. The elements of this report are described in Section 9. This report will provide greater transparency around the reasons why Openreach fails to complete some repairs and installations after a period of months. This will allow us to identify any potential areas of concern.

## Legal tests

11.62 We have set out in the 2017 NMR Statement and 2018 WLA Statement why we consider the SMP services conditions regarding quality of service meet the relevant tests set out in the Act.

11.63 For the reasons set out below, we are satisfied that the directions made pursuant to the above SMP services conditions (as notified at Annex 4) meet the relevant tests set out in the Act.

11.64 We consider that the directions we are making in the wholesale fixed access markets meet our duties under section 3, as well as all the Community requirements set out in section 4 of the Act. The directions are aimed at promoting competition and securing efficient and sustainable competition for the maximum benefit of consumers by ensuring that telecoms providers have visibility of the quality of service that BT provides to itself and to other providers. Furthermore, they provide visibility to consumers about BT's performance in the provision and maintenance of wholesale access services upon which they (and their retail telecoms providers) in many cases rely.

11.65 We also consider that the directions meet the criteria in section 49(2) of the Act. We consider that the KPI Directions are:

- objectively justifiable, in that we have identified a need for transparency to ensure appropriate monitoring of BT's performance in relation to installations and repairs and

to identify any concerning trends in relation to such performance, including any potential discrimination in the provision of network access (and to provide transparency to industry and consumers on such matters);
- not unduly discriminatory, as they are only for BT, and no other operator has been found to hold a position of SMP in the wholesale fixed access markets;
- proportionate, because they only require BT to publish the minimum information we consider is required to effectively monitor BT's quality of service performance and its compliance with the remedies we are imposing in relation to the provision of network access, its quality of service performance and non-discrimination. The KPI requirements we are imposing have been largely based on the existing requirements and, where we have made changes and additions, this has been done only to the extent necessary to address new concerns, particularly with regards to compliance with the new QoS standards we are imposing; and
- transparent, in that they are clear in their intention to ensure an appropriate level of transparency in the obligations we are imposing on BT.

11.66 For the reasons set out above, we consider that the KPI Directions are appropriate to address the concerns we have identified and are in line with section 49(2) of the Act.

### The European Commission (EC) recommendation

11.67 We have taken utmost account of the Costing and Non-discrimination Recommendation. The Costing and Non-discrimination Recommendation states that, when imposing a non-discrimination obligation under Article 10 of the Access Directive, NRAs should impose on the SMP operator the use of KPIs to monitor effectively compliance with non-discrimination obligations. It indicates that such KPIs should:

- measure performance at least in relation to the following key elements of the provision of regulated wholesale services: (a) ordering process; (b) provision of service; (c) quality of service, including faults; (d) fault repair times; and (e) migration between different regulated wholesale inputs (excluding on-off bulk migrations); and
- allow for comparison of services provided internally and externally by the SMP provider.

11.68 Moreover, the Costing and Non-discrimination Recommendation provides that NRAs should:

- take account of existing performance measures in imposing KPIs;
- ensure that KPIs are published in a manner that allows for early discovery of potential discriminatory behaviour (the Costing and Non-discrimination Recommendation recommends at least quarterly publication on the NRA's website or on the website of an independent third party designated by the NRA);
- ensure that the KPIs are regularly audited by the NRA or, alternatively, by an independent auditor; and
- where the results of the KPIs indicate that the SMP operator may not comply with its non-discrimination obligation, intervene by investigating the matter in more detail and, where necessary, enforce compliance.

11.69 We consider that our conditions are consistent with these principles. KPIs will continue to be either openly published or available to industry for review. They cover all the key elements of service provision and allow for comparison between internal and external customers. They take account of existing performance measures, and we have indicated a willingness to intervene if necessary if KPIs indicate a problem. We maintain an active programme of monitoring KPIs. We continue to consider that formalised regular audits of KPIs imposed under the SMP framework would be disproportionate, although this is something which we keep under review.

11.70 Mandatory KPIs of BT's main EOI services comparing performance of telecoms providers within BT to that for non-BT telecoms providers (and which are subject to audit checks) also form part the equivalence regime established by BT's Undertakings.[414]

### The BEREC common position

11.71 In reaching these decisions, we have also taken utmost account of the BEREC common position, particularly BP27 and BP34 in relation to the objectives of achieving transparency and a reasonable quality of access services.[415] We consider that our decisions are consistent with the best practice set out in the BEREC common position.

## Our considerations and decisions regarding BT's liability for late repairs and installations

### Aim and effect of the regulation

11.72 As described in Section 8, we are concerned that increased regulatory standards requiring completion within SLA periods for installations and repairs could increase the incentive for Openreach to focus on new repair or installation requests at the expense of those cases that are already very late. We consider that the customer detriment associated with delayed repairs and installations is particularly pertinent for the key wholesale services which underpin the mass market supply of fixed voice and/or broadband services, due to the degree to which consumers rely upon these services (see Section 3). We place particular weight on the risk of consumer harm, and the associated concerns regarding the risk to effective competition.

11.73 As described in Section 3, we maintain the conclusion we reached in 2008, that it is not appropriate to adopt a general principle as regards the appropriateness of compensation caps but to consider the particular circumstances of each case. Having regard to the level

[414] These BT Undertakings KPIs are published by BT at http://www.btplc.com/Thegroup/RegulatoryandPublicaffairs/Ourundertakings/KeyPerformanceIndicators/index.htm and are reported on in the Equality of Access Board's annual reports (see http://www.btplc.com/Thegroup/Ourcompany/Theboard/Boardcommittees/EqualityofAccessBoard/EqualityofAccessBoard.htm) [accessed 24 March 2017].

[415] BEREC, 2012. *Revised BEREC common position on best practice in remedies on the market for wholesale (physical) network infrastructure access (including shared or fully unbundled access) at a fixed location imposed as a consequence of a position of significant market power in the relevant market, BoR (12) 127*. http://www.berec.europa.eu/files/document_register_store/2012/12/20121208163628_BoR_(12)_127__BEREC__COMMON_POSITION_ON_BEST_PRACTICE_IN_REMEDIES_ON_THE_MARKET_FOR_WHOLESALE.pdf.

of costs identified above, and the potential improvements in the effectiveness of the SLA/SLG regime, we have decided to remove the existing 60-day cap on SLG payments, as this option best addresses these concerns under all circumstances.

11.74 In the 2017 NMR Statement and the 2018 WLA Statement, we have decided to impose SMP obligations requiring BT to provide network access upon reasonable request. We have also decided to require BT to comply with Ofcom's directions in relation to the provision of network access. We have decided to make a direction under these SMP conditions (see Annex 4). Particularly, for the reasons set out above and in detail in Section 8, we have decided to require BT to amend its terms and conditions in its relevant contracts for the supply of WLR, MPF and FTTC services to remove the caps on compensation for late repairs and late installations.

### Legal tests

11.75 We are satisfied that the SLG directions notified at Annex 4 meet the relevant tests set out in the Act.

11.76 First, we have considered our duties under section 3 and all the Community requirements set out in section 4 of the Act. The conditions are particularly aimed at promoting competition and securing efficient and sustainable competition for the maximum benefit of consumers by the implementation of an SLG regime that will incentivise BT to provide good quality of service to telecoms providers.

11.77 Second, section 49 of the Act requires directions to be objectively justifiable, non-discriminatory, proportionate and transparent. The directions are:

- objectively justifiable, in that they are necessary to further incentivise BT to provide improved quality of service to telecoms providers and to ensure that SLG payments remain effective while orders for repairs and installation remain incomplete;
- not unduly discriminatory, as they are imposed only on BT, and no other operator has been provisionally found to hold a position of SMP in the wholesale fixed access markets;
- proportionate, in that they ensure that appropriate compensation is paid in such a way as to incentivise BT's performance in completing repair and installation orders without exposing BT to excessively high levels of financial liability; and
- transparent, in that the directions are clear in what they are intended to achieve and in the obligations they impose on BT.

### The EC recommendation

11.78 We have taken utmost account of the Costing and Non-discrimination Recommendation.[416] In relation to our decisions, the Costing and Non-discrimination Recommendation recommends that NRAs should require SMP operators to implement SLAs alongside KPIs,

[416] EC, 2013. Commission recommendation of 11 September 2013 on consistent non-discrimination obligations and costing methodologies to promote competition and enhance the broadband investment environment, 11 September 2013, http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2013:251:0013:0032:En:PDF [accessed 14 February 2018].

which should include SLGs in the case of a breach of the SLA. We consider that the approach we have adopted is consistent with this recommendation.

### The BEREC common position

11.79 In forming our decisions, we have also taken utmost account of the BEREC common position, particularly BP33 in relation to the objective of achieving a reasonable quality of access services.[417] We therefore consider that our decisions are consistent with the best practice set out in the BEREC common position.

[417] BEREC, 2012. *BEREC common position on best practice in remedies on the market for wholesale (physical) network infrastructure access (including share or fully unbundled access) at a fixed location imposed as a consequence of a position of significant market power in the relevant market*, BoR (12) 127, 8 December 2012, http://berec.europa.eu/eng/document_register/subject_matter/berec/regulatory_best_practices/common_approaches_positions/1127-revised-berec-common-position-on-best-practice-in-remedies-on-the-market-for-wholesale-physical-network-infrastructure-access-including-shared-or-fully-unbundled-access-at-a-fixed-location-imposed-as-a-consequence-of-a-position-of-significant-market-power-in-the-relevant-market [accessed 24 March 2017].

# A1. Openreach quality of service performance

## Introduction

A1.1 In the 2014 FAMR, Ofcom imposed new SMP obligations on BT, including service quality standards covering installations and repair for WLR and MPF. In Annex 6 of the March 2017 QoS Consultation[418], we set out our analysis of Openreach's QoS performance against those standards, as well as other metrics describing Openreach's quality of service performance and its performance in the delivery of SMPF and GEA (FTTC and FTTP) services. This section describes this observed performance as well as Openreach's performance in the period since.[419]

## Sources of data

A1.2 To gain an understanding of current levels of service quality, we have relied on data relating to installations and fault repair in the Narrowband and WLA markets.[420] A description of the five section 135 notices sent to BT prior to publication of our March 2017 QoS Consultation is provided in that document.[421] In the period since, we have issued the following additional information requests to BT:

- a 6th Section 135 notice on 4 August 2017 requesting information, including a detailed list of installation orders;
- a 7th Section 135 notice on 5 June 2017 relating to Openreach's fault volume reduction (FVR) programme;
- an 8th Section 135 notice on 23 June 2017 requesting information on first available appointment dates, Openreach's FVR programme and engineering workforce, and MBORCs;
- a 9th Section 135 notice on 29 June 2017 requesting information on fault repairs and line volumes;
- a 10th Section 135 notice on 14 July 2017 requesting information on various figures and charts in Openreach's consultation response and additional underlying analysis;
- an 11th Section 135 notice on 7 September 2017 relating to SLG payments; and
- a 12th Section 135 notice on 27 October 2017 requesting information on missed and changed appointments/delivery dates.

[418] March 2017 QoS Consultation, page 159. https://www.ofcom.org.uk/__data/assets/pdf_file/0033/99645/QoS-WLR-MPF-GEA.pdf.
[419] We are conscious that performance against most of the reported measures can vary significantly from month to month. We have therefore focused most of our commentary on the overall trends rather than these short-term variations.
[420] This was in addition to the mandatory non-discrimination key performance indicators (KPIs) that Openreach report to Ofcom on a monthly basis, as imposed in the 2014 FAMR.
[421] March 2017 QoS Consultation, page 159.

# Structure of this annex

A1.3 This annex describes the evidence we have gathered and analysis we have carried out for the purposes of reviewing Openreach QoS. We have used this information and analysis to develop the decisions detailed in Sections 4 to 8, as summarised in Section 11. In this annex, we assess the following areas:

- service demand;
- Openreach's recent installation performance;
- fault rates; and
- Openreach's recent repair performance.

A1.4 We have not reported performance for ISDN30 and ISDN2 in this annex. As noted in the 2017 NMR Statement[422], based on the KPIs reported to Ofcom, Openreach's QoS in providing ISDN30 and ISDN2 over the FAMR period appears to be largely stable with no pronounced, continuous deteriorations in installation or repair performance.

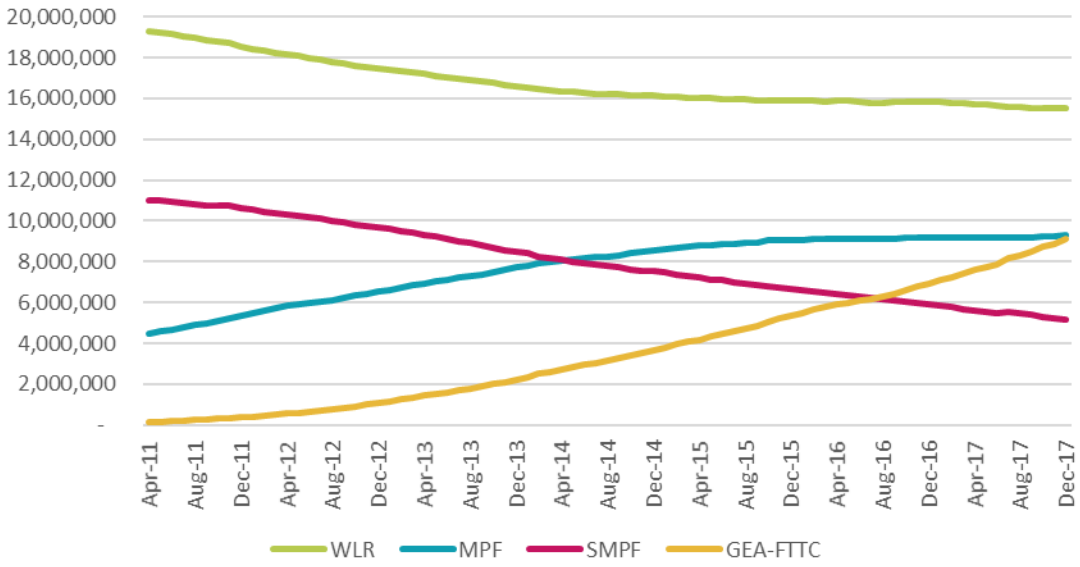
# Service demand

## Volume of lines and overlay services

A1.5 Figure A1.1 shows service volumes since April 2011 for WLR, MPF, SMPF and GEA-FTTC. The volumes of WLR and SMPF have decreased, while the volume of GEA-FTTC has increased and the volume of MPF lines has plateaued after increasing until around December 2016. Notably, GEA-FTTC, which was low at the start of this period, surpassed SMPF in volume in August 2016. GEA-FTTP lines, not shown in the chart due to their relatively low volumes, have continued to rise since the start of 2014 but remain at an extremely low level.[423]

[422] 2017 NMR Statement. https://www.ofcom.org.uk/__data/assets/pdf_file/0020/108353/final-statement-narrowband-market-review.pdf.
[423] Line volumes for GEA-FTTP were not sought in the 6th FAMR QoS s.135 notice of 3 March 2014 and, as such, are only available from January 2014.

**Figure A1.1 UK service volumes**



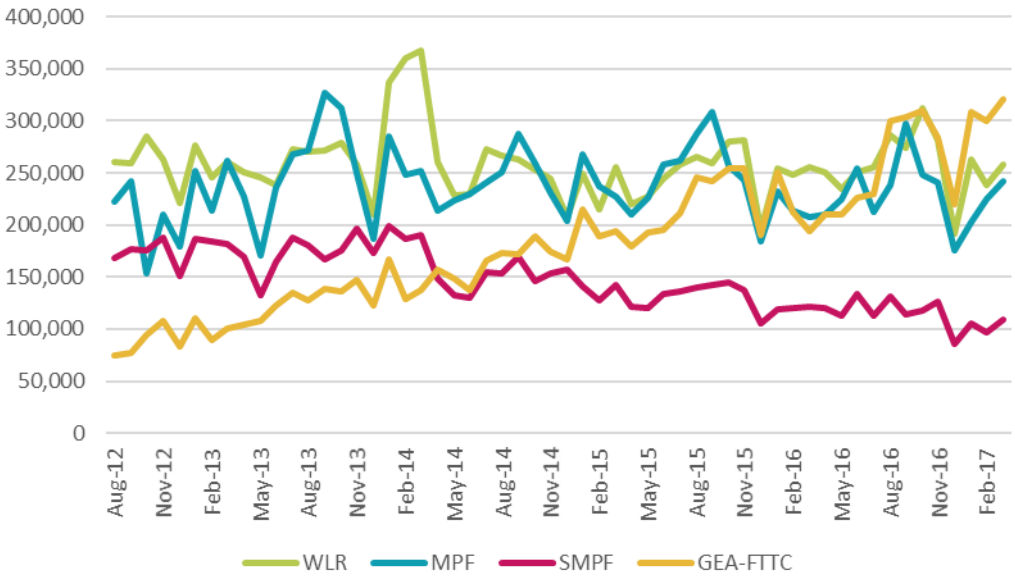

*Source: Ofcom analysis of BT data*[424]

## Volume of orders submitted

A1.6 Figure A1.2 shows the total demand for installation orders since August 2012 for WLR, MPF, SMPF and GEA-FTTC. The demand for WLR and MPF are broadly stable, the demand for SMPF has decreased over the period, and the demand for GEA-FTTC has increased over the period. The demand for GEA-FTTP, not shown in the chart due to much lower volumes relative to other services, has risen over the period from fewer than 1,000 orders to around 5,000 per month.

[424] This chart combines weekly line volumes, averaged monthly for the period April 2011 to June 2017, with monthly averages provided by Openreach in its mandatory non-discrimination KPIs for the period April 2016 to December 2017. Data submitted in Openreach responses dated 5 and 7 March 2014 to the 6th FAMR QoS s.135 notice, Openreach response dated 25 May 2016 to the 2nd QoS s.135 notice, Openreach response dated 15 August to the 9th QoS s.135 notice and Openreach mandatory non-discrimination KPIs.

**Figure A1.2 UK monthly volumes of orders submitted**



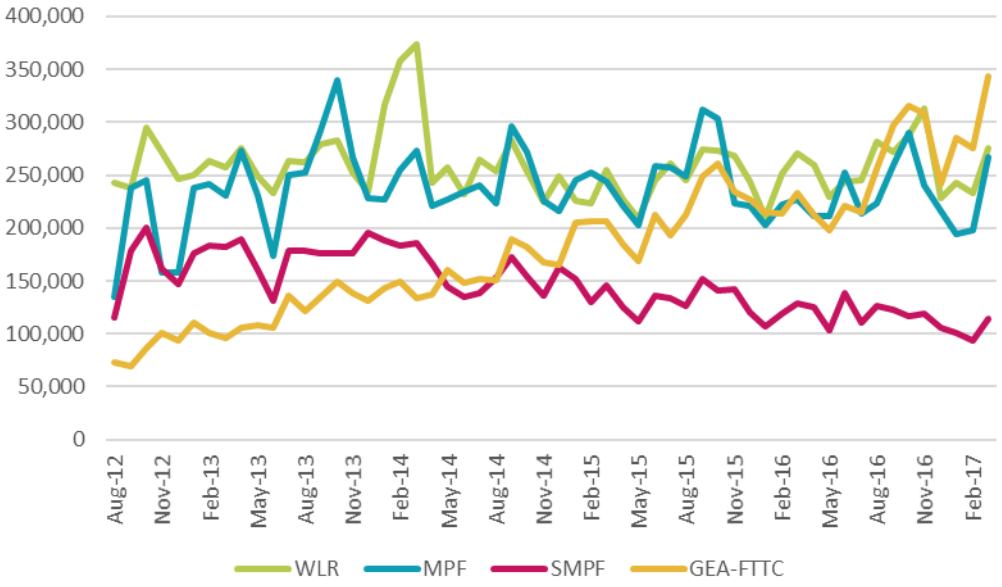

*Source: Ofcom analysis of BT data*[425]

## Volume of orders completed

A1.7 Figure A1.3 shows the monthly volumes of orders completed since August 2012 for WLR, MPF, SMPF and GEA-FTTC. Although they vary month to month, the volumes of completions remain reasonably stable over the period for WLR and MPF. SMPF has seen a decrease in the monthly volume of orders completed, whereas GEA-FTTC has seen a significant increase. Completed orders for GEA-FTTP, again not shown in the chart due to much lower volumes than the other services, has risen over the period from fewer than 1,000 completions to around 5,000 per month.

[425] Data submitted in Openreach response dated 29 September 2017 to the 6th QoS s.135 notice.

**Figure A1.3 UK monthly volumes of orders completed**




*Source: Ofcom analysis of BT data*[426]

A1.8 The annual proportion of orders completed by service to total service completions is shown in Table A1.4 below. This shows: an increase in the proportion of WLR orders; a decrease in the proportion of SMPF orders; the proportion of MPF orders being broadly stable; and the proportion of FTTC orders being stable from 2013/14 after a decrease, reflecting the trends identified in Figure A1.3.

**Table A1.4 UK annual proportional mix of orders completed**

| | 2012/13[427] | 2013/14 | 2014/15 | 2015/16 | 2016/17 |
|---|---|---|---|---|---|
| WLR | 37.5% | 33.4% | 30.5% | 29.7% | 29.8% |
| MPF | 27.0% | 30.2% | 29.8% | 28.9% | 26.6% |
| SMPF | 23.2% | 21.0% | 18.4% | 15.4% | 13.2% |
| GEA-FTTC | 12.2% | 15.4% | 21.3% | 26.0% | 30.4% |

*Source: Ofcom analysis of BT data*[428]

A1.9 There is a difference in the levels of orders submitted and completed. This is mainly due to the around 11% of orders that are cancelled by either the telecoms provider or customer, rejected by Openreach, or remain yet to be completed.[429] Installation orders may also be suspended, typically awaiting information about the order from the telecoms provider or customer. These are not included in figures and tables in this annex.

[426] Data submitted in Openreach response dated 29 September 2017 to the 6th QoS s.135 notice.
[427] This financial year includes from August 2012 onwards.
[428] Data submitted in Openreach response dated 29 September 2017 to the 6th QoS s.135 notice.
[429] We also commented on this difference in the March 2017 QoS Consultation, paragraph A6.8.

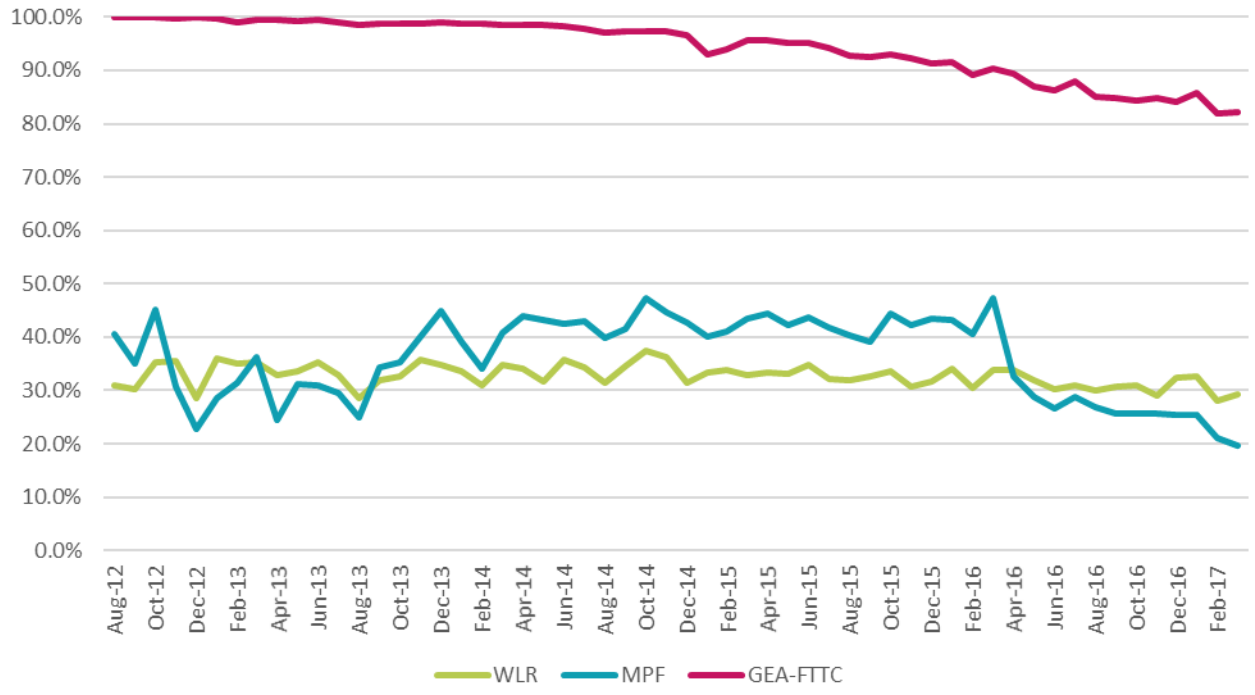
## Proportion of appointed installation orders

A1.10 Figure A1.5 shows the monthly volumes of appointed installation orders completed since August 2012 for WLR, MPF, SMPF and GEA-FTTC. Installation orders may require an engineering appointment with the customer because of the type of installation or support required, as well as whether there is an existing line at the customer's home or business premises. Orders requiring an appointment tend to have longer lead times than those that do not (see Figure A1.16), primarily due to Openreach engineer appointment availability and the need to coordinate a suitable time with the customer. Installation orders not requiring an engineering appointment (i.e. a non-appointed order) typically only require exchange 'jumpering' and/or configuration activities.

A1.11 Since August 2012, appointed WLR installation orders as a proportion of all WLR installation orders have remained steady. The proportion of appointed MPF orders has dropped since March 2016. Previously it was stable since November 2013, and lower prior to that date. The proportion of appointed GEA-FTTC orders has reduced since June 2013.

A1.12 SMPF orders are not shown in the Figure A1.5 because the proportion of appointed SMPF orders is close to zero, which shows that SMPF orders are typically non-appointed. GEA-FTTP orders are not shown as this service always requires an engineering appointment, except when a working GEA-FTTP line already exists at the premises or a line has been pre-provided.

**Figure A1.5 UK monthly proportion of appointed orders completed**

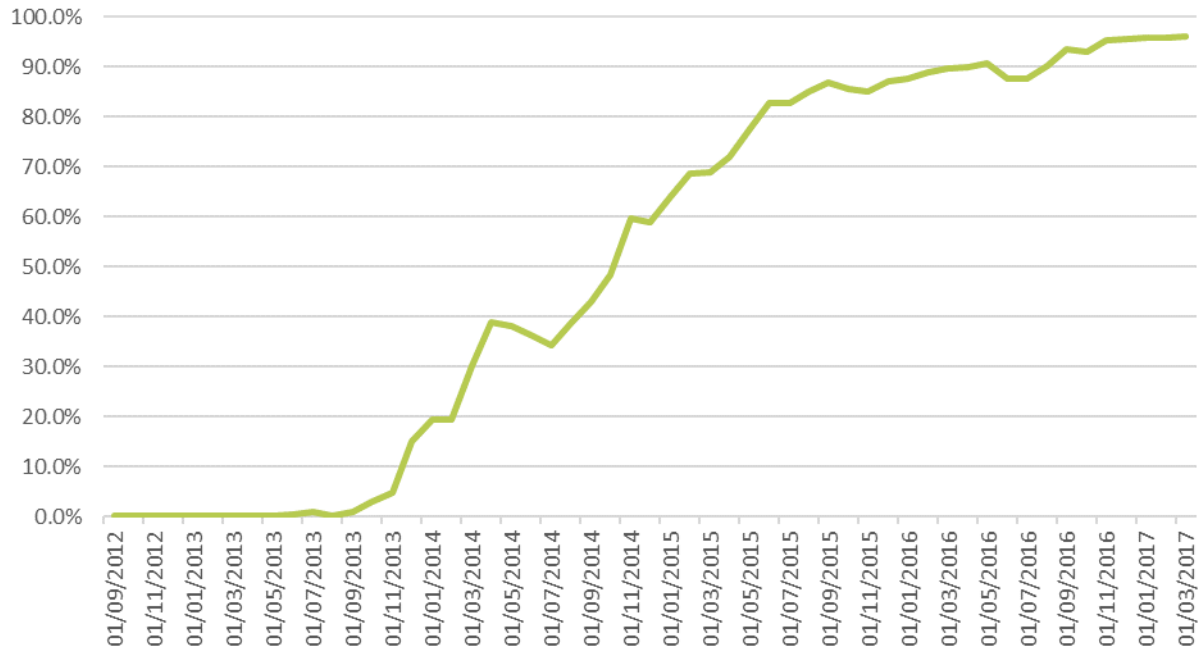



*Source: Ofcom analysis of BT data*[430]

[430] Data submitted in Openreach responses dated 19 August, 30 August and 2 September 2017 to the 3rd QoS s.135 notice and Openreach response dated 29 September 2017 to the 6th QoS s.135 notice.

A1.13 For the GEA-FTTC service, the above appointments include PCP self-installations, which only require a visit to the PCP (street cabinet), and not directly with the customer. Figure A1.6 shows, for the appointed GEA-FTTC installations, the proportion which are PCP self-installations. The proportion of GEA-FTTC orders has increased from late in 2013 until September 2016, after which the proportion has remained steady at around 95%.

**Figure A1.6 UK monthly proportion of appointed orders completed which are PCP self-installations completed, for GEA-FTTC services**




*Source: Ofcom analysis of BT data*[431]

## Installation performance for WLR, MPF, SMPF and GEA since the 2014 FAMR to date

A1.14 The following sub-sections use data from the KPIs mandated by the 2014 FAMR and data obtained under our statutory information gathering powers to provide an overview of Openreach's performance in the installation of WLR, MPF, SMPF, GEA-FTTC and GEA-FTTP in recent years, extending the time period of each measure compared to those in the March 2017 QoS Consultation.

[431] Data submitted in Openreach responses dated 19 August, 30 August and 2 September 2017 to the 3rd QoS s.135 notice and Openreach response dated 29 September 2017 to the 6th QoS s.135 notice.

## Average first available appointment dates (FADs[432])

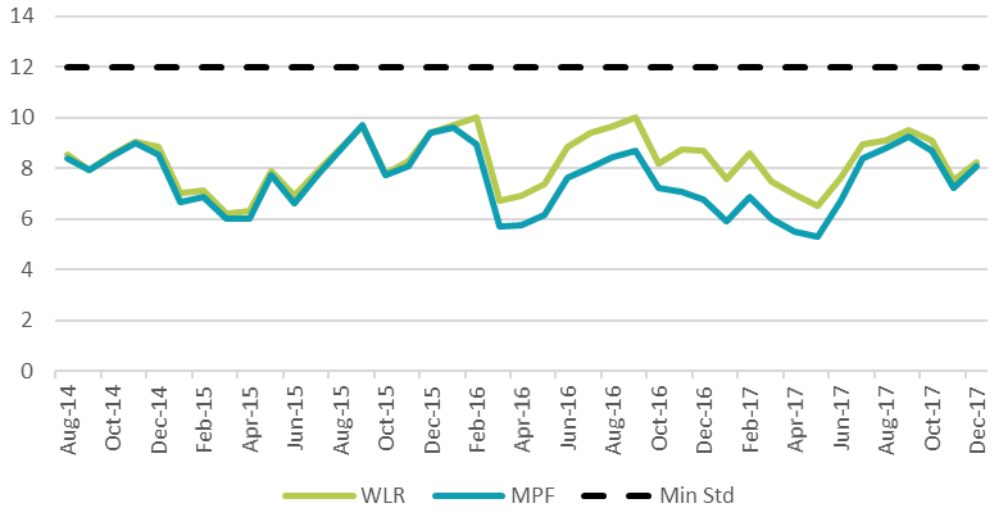
### WLR and MPF

A1.15 Openreach has industry-negotiated SLAs in place covering engineer appointment availability for WLR and MPF. These are contractual commitments that require BT to offer a telecoms provider an appointment, where one is required, within 12 working days of application.

A1.16 We observed in the March 2017 QoS Consultation[433] that data from the KPIs shows that UK monthly average FADs for WLR and MPF have not risen above the SLA in any month, peaking at ten working days. This has continued to be the case since January 2017 (see Figure A1.7 below), with an additional peak observed in September 2017. While this is a UK monthly average and FADs for individual installations may be earlier or later, we understand that a relationship exists with the percentage of UK faults repaired on time (see Figure A1.53) whereby Openreach may reduce appointment availability when repair demand is high.

A1.17 This effect is apparent during the peaks of average FADs in September 2015, January to February 2016, August 2016 and September 2017 which roughly correspond to troughs in on time repair performance[434], suggesting that Openreach utilises installation resource for fault repair work in periods of high repair demand.

**Figure A1.7 UK monthly appointment availability for WLR and MPF (working days)**



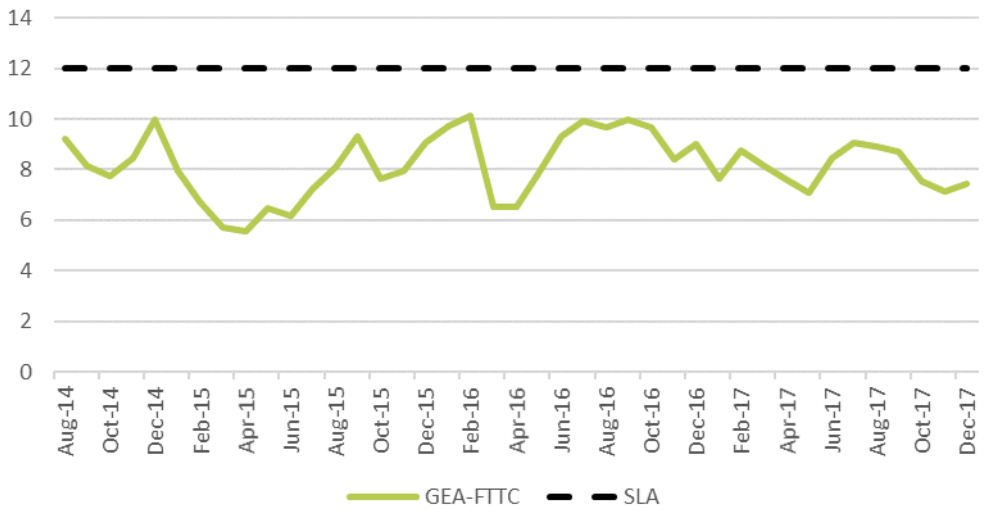

*Source: Openreach mandatory non-discrimination KPIs*

[432] FAD refers to the first appointment date which is offered by Openreach when an order is submitted. These are not necessarily accepted by the telecoms provider, in which case further appointment dates are offered until a suitable date is reached.
[433] March 2017 QoS Consultation. paragraph A6.14.
[434] Specifically, the percentage of UK faults restored on time for WLR services subject to SML1 and MPF services subject to SML2.

## SMPF and GEA

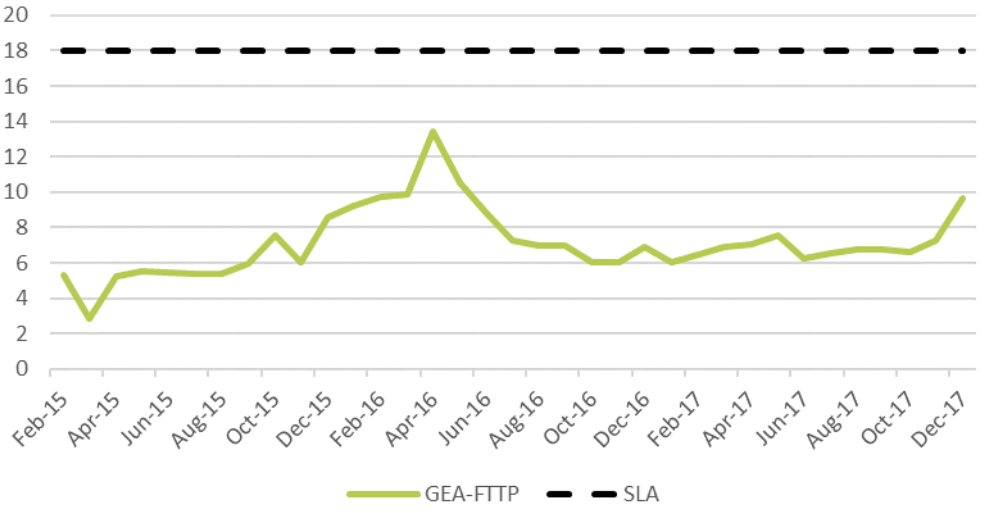
A1.18 The SLA for SMPF and GEA-FTTC is 12 working days, while the SLA for GEA-FTTP is 18 working days. As Figures A1.8 and A1.9 show, UK monthly average FADs for GEA-FTTC and GEA-FTTP installations across the reporting period have not risen above their SLAs (of 12 and 18 working days, respectively).[435]

**Figure A1.8 UK monthly appointment availability for GEA-FTTC (working days)**




*Source: Openreach mandatory non-discrimination KPIs*

**Figure A1.9 UK monthly appointment availability for GEA-FTTP (working days)**




*Source: Openreach mandatory non-discrimination KPIs*

[435] The 2014 FAMR does not require BT to submit equivalent monthly KPI data for SMPF.

## Appointment availability

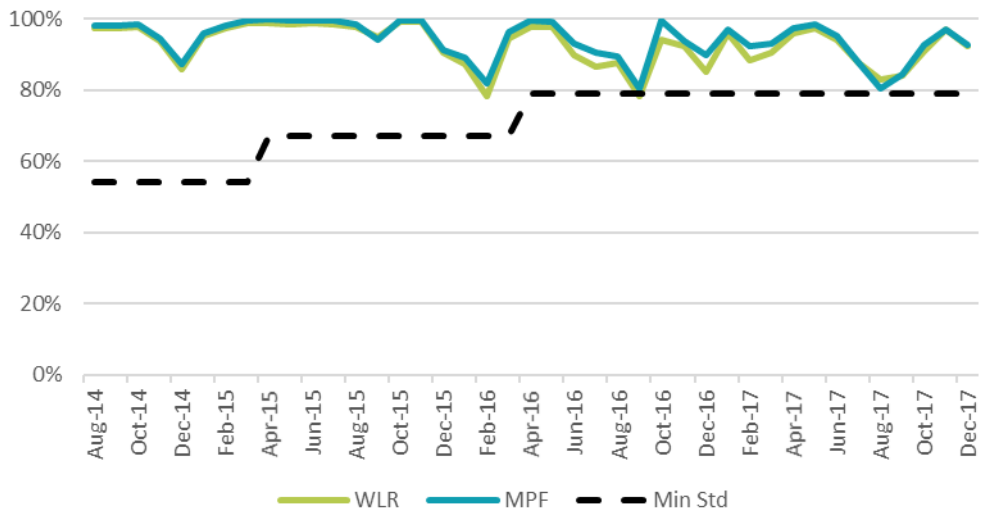
### WLR and MPF

A1.19 The 2014 FAMR requires that Openreach offers an engineer appointment, where one is required, in a certain percentage of occasions for a new WLR or MPF installation within 12 working days of the order being registered by a third party (i.e. a telecoms provider).[436] We do not have historical data for this metric as an SLA for appointment availability was not introduced until 2012; however, as stated in the 2014 FAMR, Openreach's delivery against the SLA was just 42% in 2012/13.[437]

A1.20 Compliance submissions by BT to Ofcom show that in the first three years of the current market review period Openreach met the appointment availability standards for both WLR and MPF in every region[438] excluding any allowance for High Level MBORCs. Information provided by BT shows that it has continued to meet the standards in each region during 2016/17 and 2017/18.

A1.21 Further, as shown by Figure A1.10 below, the KPIs indicate that over the reporting period[439] Openreach has performed above the regulatory standard across the UK in all months for MPF and all but one month for WLR, which exceeds the requirements of the standards as these are assessed based on average annual performance.

**Figure A1.10 UK monthly 12-day appointment availability for WLR and MPF services (%)**



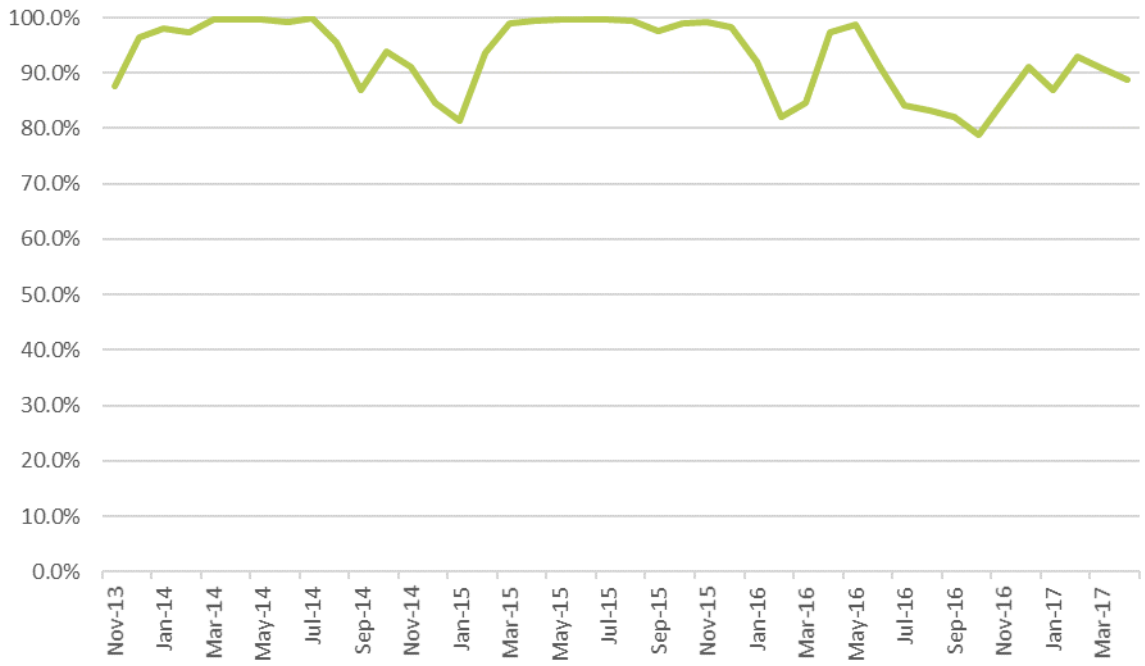

*Source: Openreach mandatory non-discrimination KPIs*

[436] In Year 3 of the current market review period, Openreach is required, for each of the 10 UK regions, to offer an appointment, where one is required, within 12 working days on 80% of occasions (with a 1% MBORC allowance). This standard has increased from 68% in Year 2 and 55% in Year 1.
[437] 2014 FAMR Statement - Annexes, Table A17.3.
https://www.ofcom.org.uk/__data/assets/pdf_file/0026/78812/annexes.pdf.
[438] The 10 regions are East Anglia, London, North East, North Wales & North Midlands, Northern Ireland, Scotland, South East, South Wales and South Midlands, and Wessex.
[439] August 2014 to present.

### SMPF and GEA

A1.22 We do not currently impose a specific obligation on BT to achieve a certain performance standard in relation to offering engineer appointments for SMPF[440] and GEA services. However, as we recognised in the March 2017 QoS Consultation[441], and as shown in Figure A1.11, GEA-FTTC performance against SLA has often been above 99% until the end of 2015, except for in the second half of 2014. Performance has been more varied since the start of 2016.

**Figure A1.11 UK monthly 12-day appointment availability for GEA-FTTC services (%)**




*Source: Ofcom analysis of BT data*[442]

## On time completion

### WLR and MPF

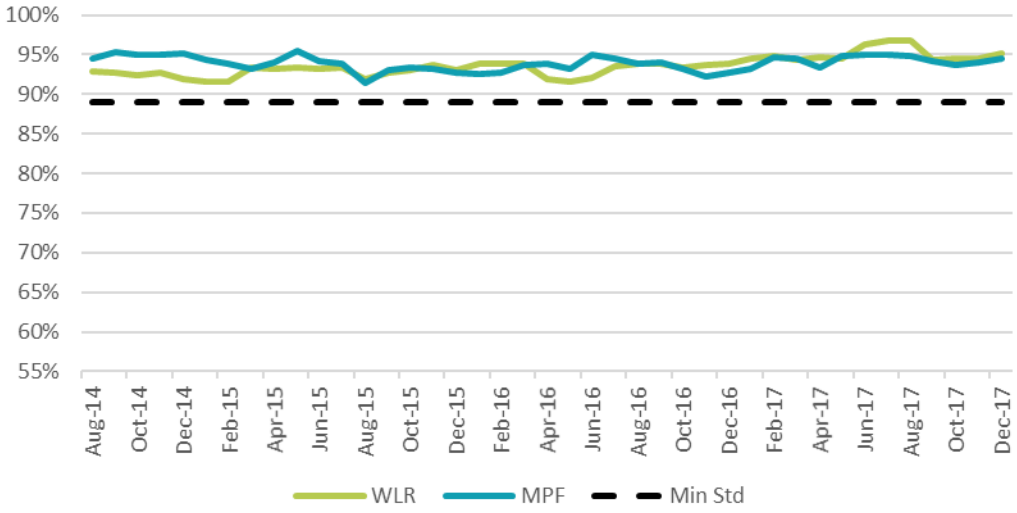
A1.23 The standards we imposed in the 2014 FAMR require Openreach to complete 89% of WLR and MPF installations on the date agreed between Openreach and the customer – i.e. the Committed Date.[443]

A1.24 Compliance submissions made to Ofcom by BT show that in the first three years of the control, Openreach met the installation by Committed Date standards for both WLR and MPF in every region. Openreach monthly reports show that it is on track to meet the standards in each region in 2017/18. As shown by Figure A1.12 below, the KPIs indicate

[440] As noted above, SMPF services typically do not require an engineering appointment.
[441] March 2017 QoS Consultation, paragraph A6.20.
[442] Data submitted in Openreach response dated 29 September 2017 to the 6th QoS s.135 notice.
[443] This is often referred to as 90% of provisions completed by the Committed Date (with a 1% MBORC allowance). The standard applies in each of Openreach's 10 regions.

that since August 2014 monthly average performance at the UK level has not once fallen below the 89% standard (which is assessed annually).

**Figure A1.12 UK monthly WLR and MPF orders installed on time, all orders (%)**

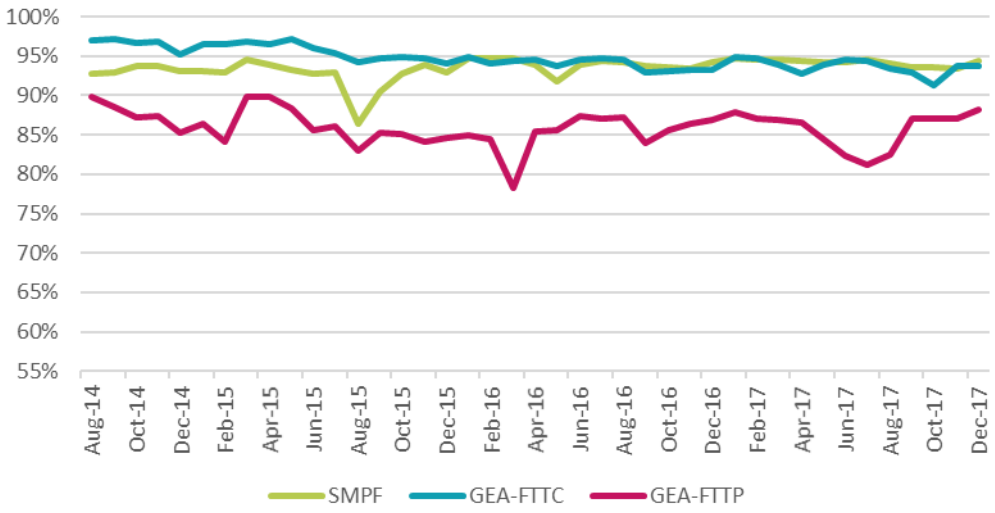



*Source: Openreach mandatory non-discrimination KPIs*

### SMPF and GEA

A1.25 We do not currently require BT to achieve a specific standard in relation to on time installation for SMPF or GEA. However, as shown in Figure A1.13 below, SMPF on time installation performance over the FAMR period has usually been 93% or above, only dropping below 90% in one month. GEA-FTTC installed by Committed Date performance has trended slightly downwards and is now just below 95%. GEA-FTTP has been more variable, ranging between 78% and 90% over the review period. Performance currently sits above the middle of that range.

**Figure A1.13 UK monthly SMPF and GEA orders installed on time, all orders (%)**




*Source: Openreach mandatory non-discrimination KPIs*

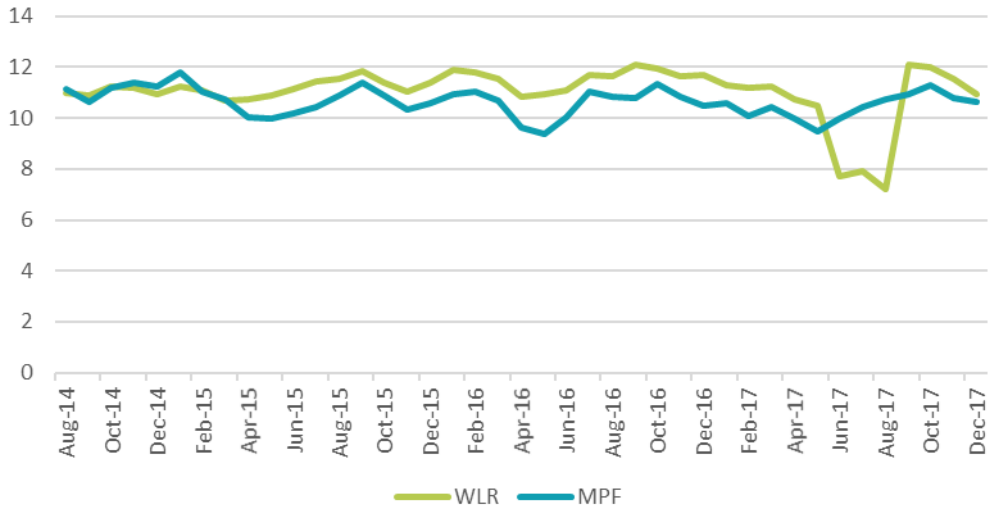
## Average installation time

### WLR and MPF

A1.26 We observed in the March 2017 QoS Consultation[444] that average time to install (ATTI) for both WLR and MPF increased from early 2012/13, driven by rising lead times for appointed installation orders peaking in January 2013, whereas non-appointed installation orders have remained fairly stable.

A1.27 Since the 2014 FAMR, average installation time for all WLR orders[445] has typically fluctuated by no more than half a day month-on-month with an average of around 11 working days, the exception to this being from June to August 2017 (see Figure A1.14).[446] Average installation time for all MPF orders has shown a similar pattern to WLR, with slightly lower average performance.

**Figure A1.14 UK monthly average installation time for WLR and MPF, all order types (working days)**




*Source: Openreach mandatory non-discrimination KPIs*

### SMPF and GEA

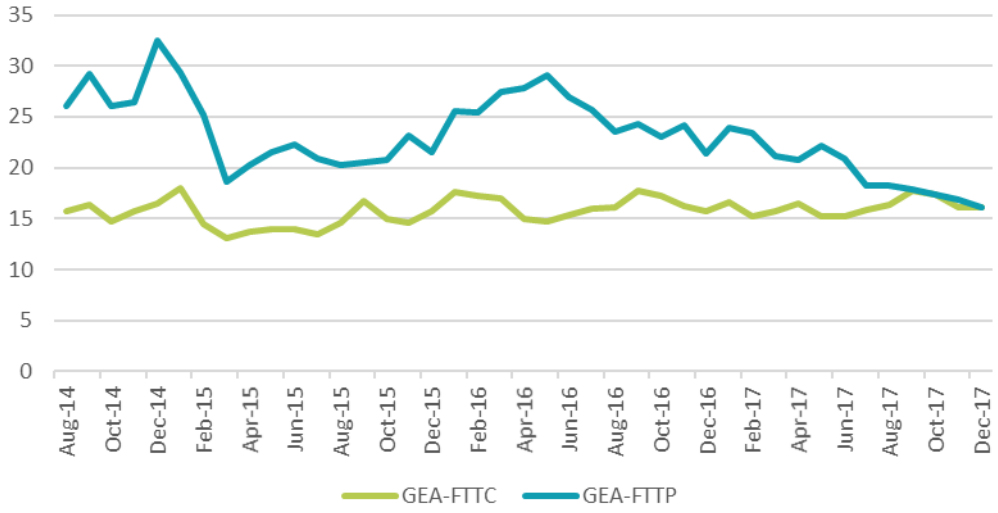
A1.28 We observed in the March 2017 QoS Consultation[447] that the ATTI for SMPF between June 2011 and March 2013 was largely stable between 8 and 9 working days with the occasional peak.[448]

A1.29 As shown in Figure A1.15, GEA-FTTC average installation time has also been largely stable with an average between 15 and 16 working days. GEA-FTTP performance has varied by a

[444] March 2017 QoS Consultation, paragraph A6.26.
[445] All orders include provisions that require an engineer visit and those that do not. This applies for all services.
[446] This was due to significant volumes of non-appointed orders with very short lead times.
[447] March 2017 QoS Consultation, paragraph A6.28.
[448] BT are not required to report KPIs on average installation time for SMPF.

greater degree month-on-month, this is likely to be due to early life issues during the introduction of GEA-FTTP.

**Figure A1.15 UK monthly average installation time for GEA, all order types (working days)**



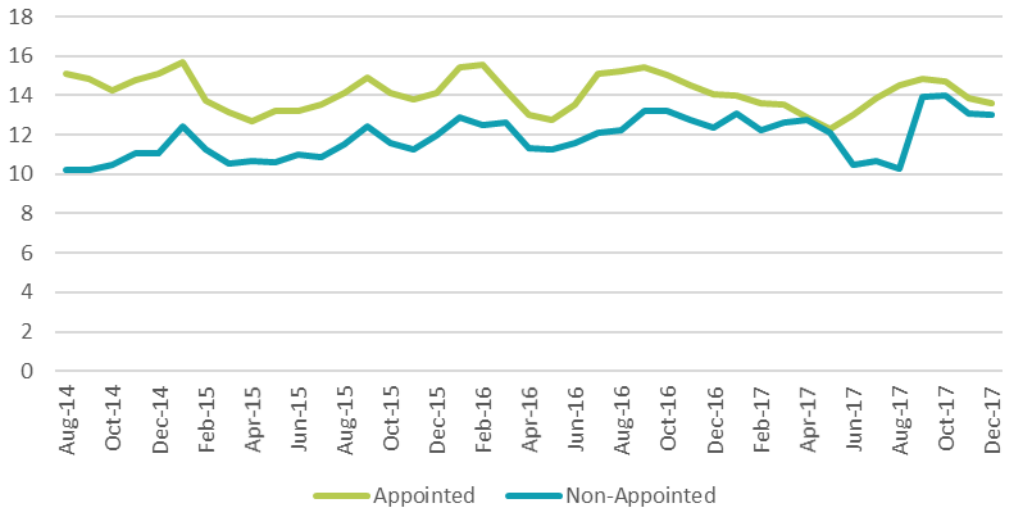

*Source: Openreach mandatory non-discrimination KPIs*[449]

## Appointed orders

A1.30 Orders where an engineer appointment is required typically have longer lead times. The primary reason for this is engineer availability and that installation appointments must be mutually convenient for the telecoms provider and customer. Figure A1.16 shows the ATTI for appointed and non-appointed orders aggregated for WLR, MPF, GEA-FTTC and GEA-FTTP.[450] There is an upward trend in ATTI for non-appointed orders which, when analysed by service, is driven by an upward trend in ATTI for GEA-FTTC.

[449] All order types for GEA includes both appointed and non-appointed installations.
[450] This metric is not reported in the KPIs for SMPF so is not included in the aggregation.

**Figure A1.16 UK monthly average installation time for appointed and non-appointed orders (working days)**




*Source: Openreach mandatory non-discrimination KPIs*[451]

## Late installation orders

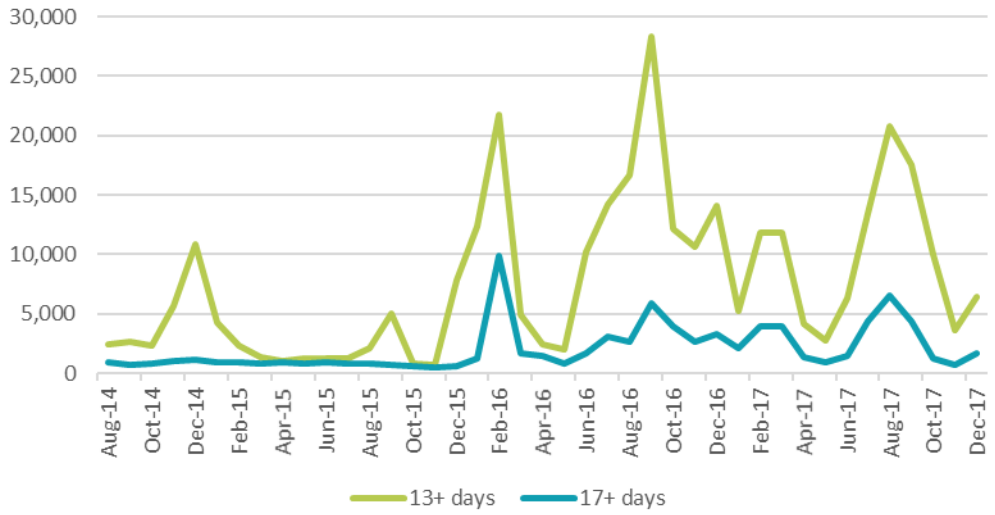
### Volume of first available appointment dates that miss the SLA

A1.31 We observed in the March 2017 QoS Consultation[452] that the KPIs show that, at the UK level, the volumes of FADs offered beyond the 12-day SLA have peaked on several occasions, but that they are also quick to return to previous levels. This is the case for both WLR and MPF and it could be due to the diversion of field resource to repair work in response to poor weather.

A1.32 The volume of FADs offered 22 working days or beyond are not shown in Figures A1.17 and A1.18 due to their low volumes compared to those appointments offered 13 or 17 working days or beyond. The number of FADs offered 22 working days or beyond from the day a customer orders their service remains low over the period for both WLR and MPF. The exception to this being a short peak in February 2016 at around 3,500 for WLR and 2,700 for MPF.

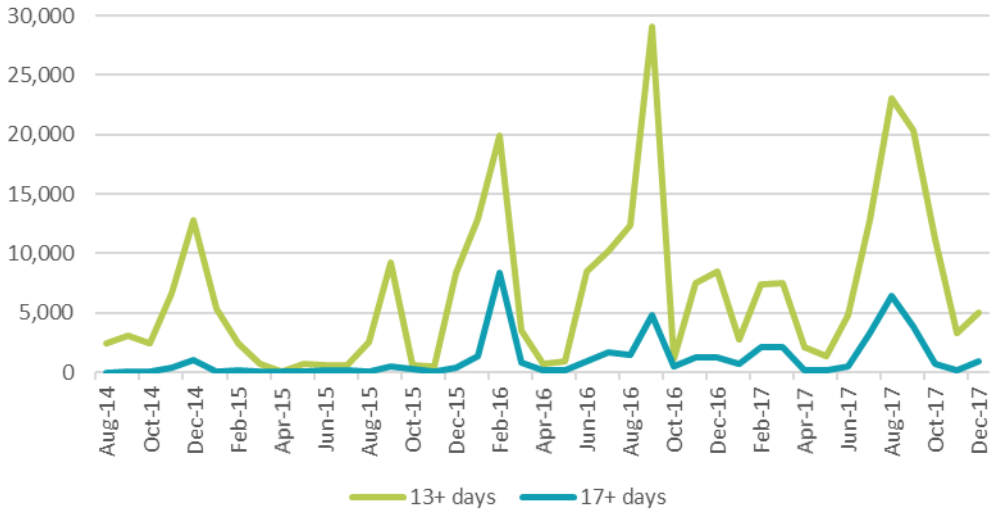
[451] Appointed orders for GEA-FTTC refer to orders appointed at the end customers' premises and exclude PCP self-installations.
[452] March 2017 QoS Consultation, paragraph A6.30.

**Figure A1.17 UK monthly appointed WLR orders with first available dates over 12 working days**




*Source: Openreach mandatory non-discrimination KPIs*

**Figure A1.18 UK monthly appointed MPF orders with first available dates over 12 working days**



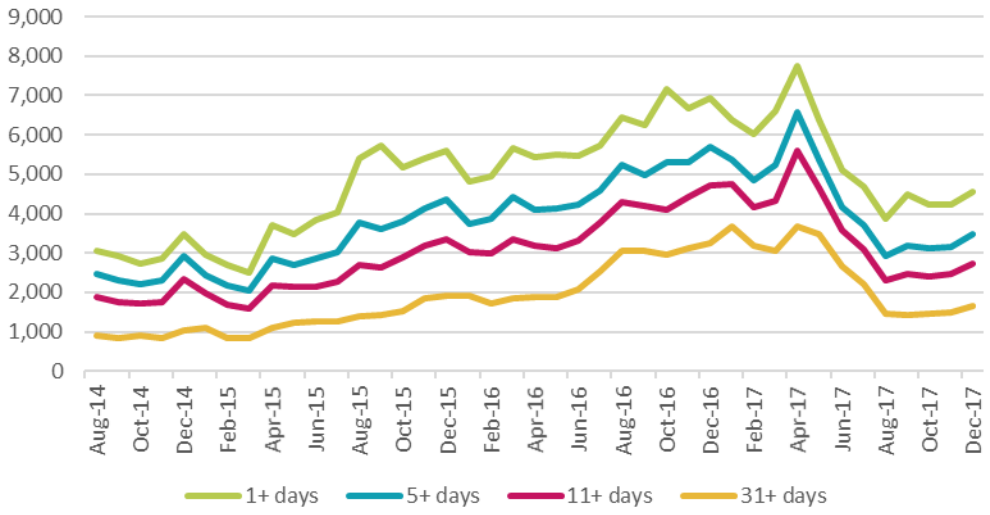

*Source: Openreach mandatory non-discrimination KPIs*

### Volume of appointed installations completed beyond the Committed Date[453]

A1.33 We observed in the March 2017 QoS Consultation that, at the UK level, the average daily number of appointed WLR orders not installed by their Committed Date had been increasing since early 2015/16.[454] As shown in Figure A1.19, the level peaked in April 2017 and has since decreased towards, but not matched, 2014/15 performance levels.

[453] This KPI makes an average of the total number of appointed orders not completed in the four time brackets for each day, which means that if an order falls into a bracket on more than one occasion (since it has not been completed for two or more days) it is counted as such in the average.
[454] March 2017 QoS Consultation, paragraph A6.32.

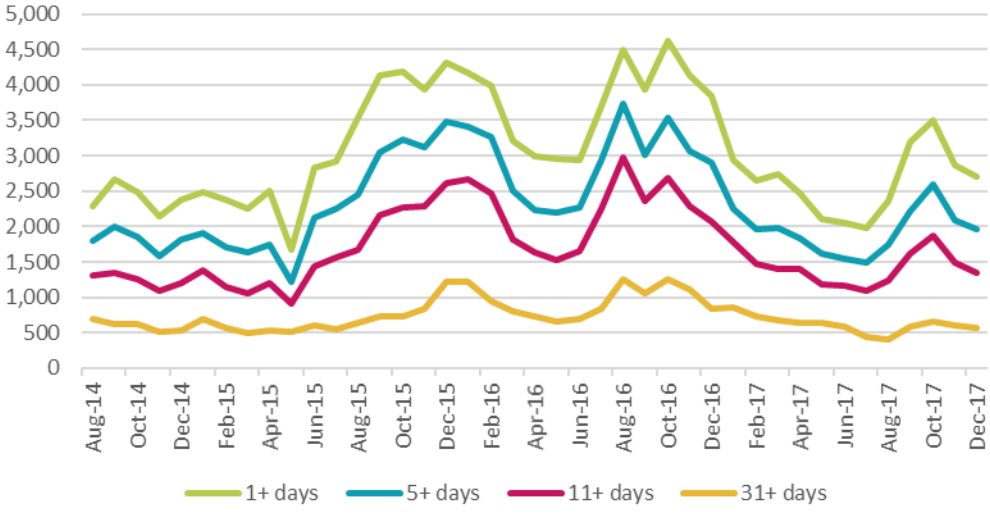
**Figure A1.19 UK average daily number of appointed WLR orders not installed on time (per month)**




*Source: Openreach mandatory non-discrimination KPIs*

A1.34 We observed in the March 2017 QoS Consultation that the levels of appointed MPF orders not installed on time were higher than at the start of the FAMR period.[455] As shown in Figure A1.20, these decreased in 2017 before rising and subsequently dropping once more towards the end of the year.

**Figure A1.20 UK average daily number of appointed MPF orders not installed on time (per month)**




*Source: Openreach mandatory non-discrimination KPIs*

[455] March 2017 QoS Consultation, paragraph A6.32.

## Other relevant installation issues

### Missed installation appointments

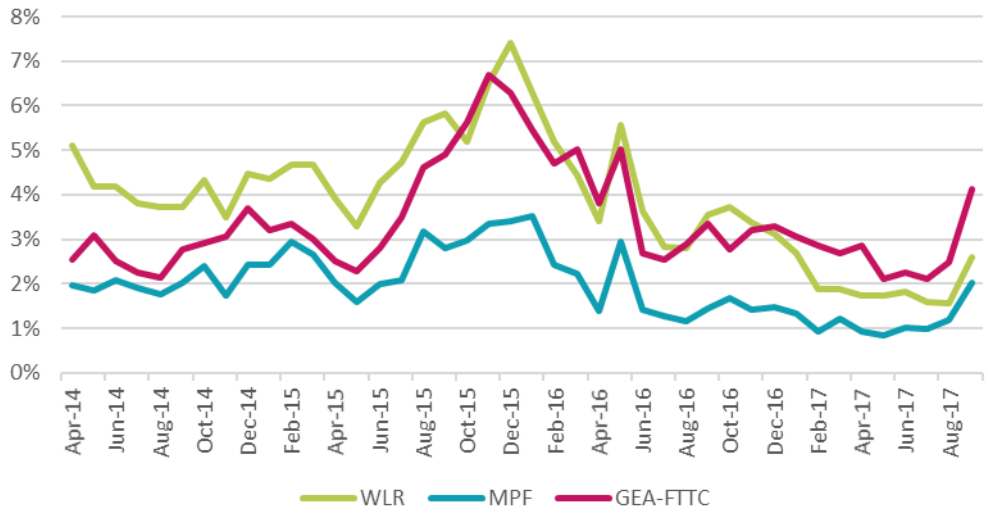
A1.35 We previously recognised in the March 2017 QoS Consultation that some stakeholders raised concerns about the number of appointments missed by Openreach engineers.[456] Data shared with Ofcom by [✂] for the period April 2014 to November 2015 indicated that missed installation appointments for MPF, GEA involving a simultaneous provide, and GEA including work undertaken at the PCP (or cabinet) had been steadily increasing between [✂] and [✂].

A1.36 However, discussions with stakeholders in June 2016 indicated that missed appointment figures declined from early 2016 and were, at the time, at much lower levels. For example, data provided informally by [✂] shows that between June 2015 and May 2016 Openreach missed 60% fewer [✂] installation appointments, on average, compared with June to November 2015.

A1.37 Our analysis of data gathered under our statutory information gathering powers shows, in Figure A1.21 below, that there was a rise in the percentages of WLR, MPF and GEA-FTTC installation appointments missed by Openreach engineers between June and December 2015. Nevertheless, this trend reversed in the 2016 calendar year for each of the three relevant services.[457]

[456] March 2017 QoS Consultation, paragraph A6.33.
[457] We also note Openreach has halved missed appointments in 2016/17, reducing them by a further 27% compared with this point last year. See: Openreach, Our Performance – Q3 2017 Dashboard. https://www.homeandbusiness.openreach.co.uk/our-performance/dashboard?utm_campaign=portalreferral&utm_medium=splashpage&utm_source=dashboardlink [accessed 12 February 2018].

**Figure A1.21 UK WLR, MPF and GEA-FTTC monthly installation appointments missed by Openreach (%)**




*Source: Ofcom analysis of BT data*[458]

## Dead on arrivals (DoAs)

A1.38 A fault reported against a service within eight days of a provisioning activity is referred to in the industry as a 'dead on arrival' fault, or DoA. Table A1.22 shows the ratio of DoAs to installations. Since August 2012, this ratio has been broadly stable at circa 3%.

**Table A1.22 The ratio of DoAs to installations, per financial year (%)**

| 2012/13[459] | 2013/14 | 2014/15 | 2015/16 | 2016/17 |
|---|---|---|---|---|
| 3.2% | 2.8% | 2.7% | 2.8% | 3.2% |

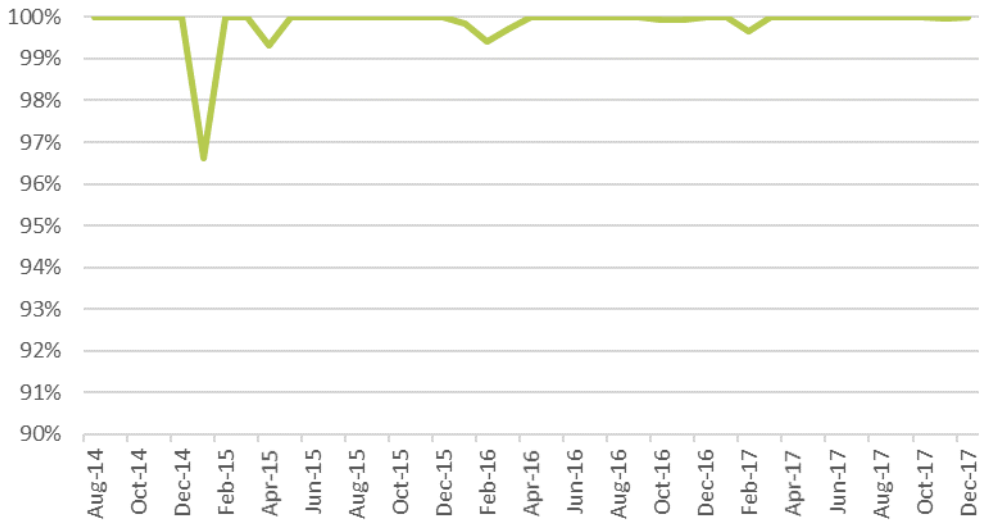
*Source: Ofcom analysis of BT data*[460]

## Gateway availability

A1.39 The KPIs indicate that Openreach ordering gateway availability (excluding scheduled outages) is typically 99-100% apart from one exception in January 2015. Factoring in scheduled outages, availability has generally been between 94% and 99% across the FAMR period.

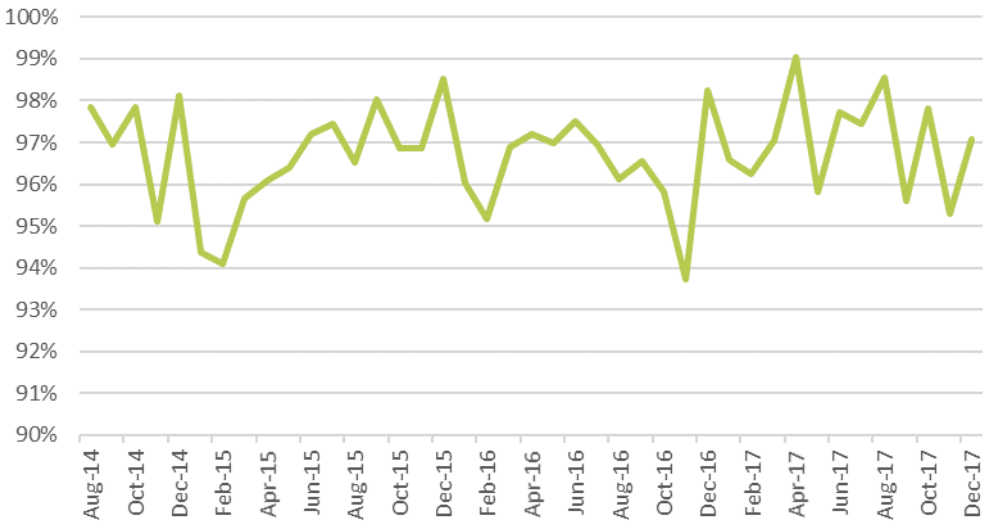
[458] Data submitted in Openreach response dated 5 February 2016 to the 1st QoS s.135 notice and updated 21 March 2017 and Openreach response dated 3 November 2017 to the 12th QoS s.135 notice.
[459] This financial year includes from August 2012 onwards.
[460] Data submitted in Openreach responses dated 5 and 7 March 2014 to the 6th FAMR QoS s.135 notice, Openreach response dated 25 May 2016 to the 2nd QoS s.135 notice, Openreach response dated 29 September 2017 to the 6th QoS s.135 notice and Openreach response dated 15 August 2017 to the 9th QoS s.135 notice.

**Figure A1.23 UK gateway availability (excluding scheduled outages, %)**




*Source: Openreach mandatory non-discrimination KPIs*

**Figure A1.24 UK gateway availability (including scheduled outages, %)**




*Source: Openreach mandatory non-discrimination KPIs*

## Fault rates

A1.40 As we recognised in the March 2017 QoS Consultation, consumers will inevitably experience faults with their communication services from time to time.[461] We use the term 'fault rate' to describe the propensity of a service to experience a fault in a given year. We measure the fault rate by dividing the number of faults on a service over the year by the number of lines in that year. For example, a fault rate of 10% translates to a line having a fault once every 10 years on average.

[461] March 2017 QoS Consultation, paragraph A6.37.

A1.41 Service outages caused by faults can lead to considerable consumer harm. For the purposes of setting regulated charges for BT's services, it is also important to consider what the future fault rate might be as faults give rise to costs, namely network maintenance costs which form a material proportion of the overall cost of services that BT is required to deliver.

A1.42 We have assessed Openreach's historical fault performance to estimate fault rates for the purposes of setting regulated charges (see Annex 2). This is done by taking all of BT's fault records for the relevant market and then estimating the rate of faults for those services subject to regulated charges. This analysis specifically includes faults related to MPF, GEA-FTTC, SMPF, and WLR, and excludes faults relating to GEA-FTTP and ISDN.

A1.43 We exclude certain activities that do not fall within the scope of the regulated or in-tariff services we proposed to charge control. As set out in the Section 4, some faults are within telecoms providers' domains and not Openreach's. In addition, some faults reported by customers may not appear as faults on the Openreach network when initial diagnostics are carried out by Openreach. In these cases, the telecoms provider might request an out-of-tariff service from Openreach known as Special Fault Investigation (SFI2[462]) or Broadband Boost (BBB).[463]

A1.44 The charges for SFI2, BBB and Superfast Visit Assure (SFVA[464]) services are not considered as in-tariff for the purposes of the WLA charge control, except where Openreach identifies that there was indeed a fault within its domain. In these cases, Openreach does not charge the telecoms provider. Where the issue initially raised by the customer was due to the telecoms provider or customer's equipment, for example, then telecoms providers are liable for the SFI, BBB or SFVA charge. Our in-tariff fault rates therefore exclude those services which incur an additional charge.

A1.45 This methodology has been used below to provide an update to the analysis in the March 2017 QoS Consultation.[465] This updated analysis of historical fault performance includes the latest whole financial year 2016/17.

A1.46 We first apply a set of filters as set out in Table A1.25 below.

[462] Special Fault Investigation is a chargeable investigation product that attempts to identify and resolve problems affecting Digital Subscriber Line (DSL) services. They can be initiated by a telecoms provider when an MPF or SMPF service is apparently working within the LLU contractual specification of SIN349 and is testing OK on Openreach line test systems, but there might be a problem with the telecoms provider's Asymmetric Digital Subscriber Line or Symmetric Digital Subscriber Line service.

[463] Broadband Boost is an Openreach chargeable service that aims to improve the speed, quality and reliability of a telecoms provider's customer's broadband line. The service offers an engineering option that covers the customer's, telecoms provider's and Openreach's network to investigate and attempt to resolve issues that may impact the customer's DSL service.

[464] Superfast Visit Assure is a chargeable service intended to enable telecoms providers to request an engineering visit to the end user's premises to investigate and, if possible, rectify issues within the end user's home environment or the local access network when the GEA service test reports "right when tested" against the line.

[465] March 2017 QoS Consultation, paragraph A6.41.

**Table A1.25 Filtering for fault rate analysis**

| Filter description | Volume of faults filtered for fault rate analysis |
|---|---|
| **Initial faults data set** | 32,915,435 |
| **Internal BT service lines** | 649,000 |
| **GEA-FTTP faults** | 35,263 |
| **ISDN faults** | 730,739 |
| **Based on clear codes (inc. SFI2/BBB)** | 14,500,479 |
| **UKNOWN, UNCLASSIFIED, and NOT APPLICABLE asset categories** | 289,297 |
| **Final subset of faults** | 16,710,657 |

*Source: Ofcom analysis of BT data*[466]

A1.47 Having applied the necessary filters, we take the final number of faults and divide it by line volumes to arrive at an annual fault rate.[467] This is calculated by dividing the total faults over a given period by the average volume of lines over the same period.

A1.48 Tables A1.26 and A1.27 show the annual volumes and proportions of BBB and SFI2 tasks where a fault was found, and are therefore included in our in-tariff faults. Effectively, these are instances where a fault in the Openreach network was detected and which consequently was not charged to the telecoms provider.

**Table A1.26 Annual volume and proportion of in-tariff faults initially identified as BBB**

| | 2011/12 | 2012/13 | 2013/14 | 2014/15 | 2015/16 | 2016/17 |
|---|---|---|---|---|---|---|
| **Total BBB** | [✂] | [✂] | [✂][468] | [✂] | [✂] | [✂] |
| **Faults after filters applied** | 18 | 22 | 54 | 90 | 216 | 285 |
| **Faults after filters applied (%)** | [✂]% | [✂]% | [✂]% | [✂]% | [✂]% | [✂]% |

*Source: Ofcom analysis of BT data*[469]

[466] Clear codes not related to the main distribution frame, exchange equipment, customer apparatus and line, optical consolidation rack fibre, Very-high-bit-rate Digital Subscriber Line cable harness, DSLAM mains power repair, NGA proactive repair (including the FTTC cabinet), fault not found local line, internal cabling and accessories, underground (exchange and distribution side) and fibre and radio in the access networks are excluded. Data submitted in Openreach responses dated 5 and 7 March 2014 to the 6th FAMR QoS s.135 notice, Openreach response dated 25 May 2016 to the 2nd QoS s.135 notice and Openreach response dated 29 June 2017 to the 9th QoS s.135 notice.

[467] This is attributed to financial years.

[468] [✂]

[469] Data submitted in Openreach responses dated 5 and 7 March 2014 to the 6th FAMR QoS s.135 notice, Openreach response dated 25 May 2016 to the 2nd QoS s.135 notice and Openreach response dated 15 August 2017 to the 9th QoS s.135 notice.

**Table A1.27 Annual volume and proportion of in-tariff faults initially identified as SFI2**

| | 2011/12 | 2012/13 | 2013/14 | 2014/15 | 2015/16 | 2016/17 |
|---|---|---|---|---|---|---|
| **Total SFI2** | 305,644 | 311,407 | 307,716 | 313,254 | 327,439 | 479,882 |
| **Faults after filters applied** | 14,899 | 20,933 | 27,304 | 31,101 | 40,523 | 64,899 |
| **Faults after filters applied (%)** | 4.9% | 6.7% | 8.9% | 9.9% | 12.4% | 13.5% |

*Source: Ofcom analysis of BT data*[470]

A1.49 Table A1.28 shows the overall proportion of out-of-tariff faults, which has been broadly stable since 2011/12 at around 45%.

**Table A1.28 Proportion of out-of-tariff fault repair activities (per annum)**

| | 2011/12 | 2012/13 | 2013/14 | 2014/15 | 2015/16 | 2016/17 |
|---|---|---|---|---|---|---|
| **Proportion of out-of-tariff faults** | 44.4% | 42.9% | 44.5% | 46.9% | 45.9% | 46.9% |

*Source: Ofcom analysis of BT data*[471]

A1.50 Table A1.29 shows the incidence of out-of-tariff activities in 2016/17, split between those where a fault was eventually identified and were fixed in-tariff, and those that were chargeable. It shows that out-of-tariff faults now constitute a significant proportion of the overall volume of fault repair activities undertaken by Openreach, ranging from [✂]% (35-40%) for WLR to [✂]% (50-55%) for WLR+GEA-FTTC.

[470] These figures are different to the corresponding figures for total fault repairs in Table A6.28 in Annex 6 of the March 2017 QoS Consultation due to more detailed information about GEA-FTTP fault repairs being available during the analysis. Where previously generic NGA fault repairs were being classified as GEA-FTTC fault repairs, now a number of these NGA fault repairs are able to be classified as GEA-FTTP fault repairs and hence are excluded from these volumes. Data submitted in Openreach responses dated 5 and 7 March 2014 to the 6th FAMR QoS s.135 notice, Openreach response dated 25 May 2017 to the 2nd QoS s.135 notice and Openreach response dated 29 June 2017 to the 9th QoS s.135 notice.

[471] Data submitted in Openreach response dated 25 May 2017 to the 2nd QoS s.135 notice and Openreach response dated 15 August 2017 to the 9th QoS s.135 notice.

**Table A1.29 Summary of fault repair activities in 2016/17 (incidence per 1,000 lines per annum)**

| Product | Faults (excluding non-chargeable out-of-tariff activities) | Non-chargeable out-of-tariff activities | Chargeable out-of-tariff activities[472] | All faults and out-of-tariff activities | Out-of-tariff activities as proportion of all faults and out-of-tariff activities |
|---|---|---|---|---|---|
| **WLR** | [✂] | [✂] | [✂] | [✂] | [✂]% |
| **MPF** | [✂] | [✂] | [✂] | [✂] | [✂]% |
| **WLR+SMPF** | [✂] | [✂] | [✂] | [✂] | [✂]% |
| **WLR+GEA-FTTC** | [✂] | [✂] | [✂] | [✂] | [✂]% |
| **MPF+GEA-FTTC** | [✂] | [✂] | [✂] | [✂] | [✂]% |

*Source: Ofcom analysis of BT data*[473]

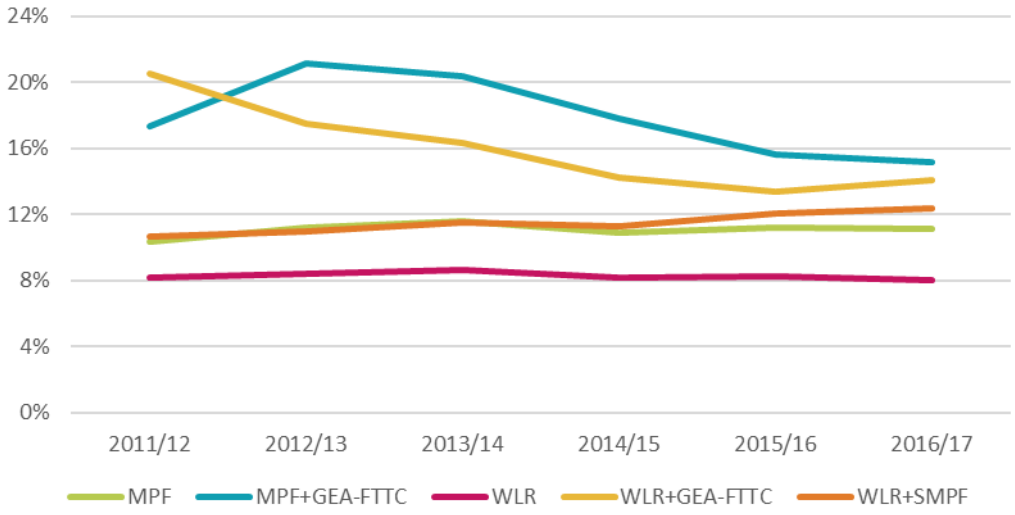
## Overall fault rates

A1.51 Openreach's fault rates are captured by their asset category, i.e. the combination of services that are active on a line. Where there are multiple services on a line (for example WLR+SMPF) we would ideally have liked to disaggregate the fault rate associated with each of the services. However, the data that Openreach's systems capture does not allow us to perform this level of analysis to a sufficient level of accuracy. We have therefore grouped services together where necessary.

A1.52 Figure A1.30 sets out the annual fault rates for each financial year from April 2011. WLR and MPF have remained at a reasonably steady rate over the period and have not deteriorated during the introduction of GEA-FTTC. Services with GEA-FTTC start the period at a higher level than copper services and decrease over the period, although the latest financial year shows a slight rise for WLR+GEA-FTTC. We previously observed a slight increasing trend for WLR+SMPF which has continued in 2016/17.

[472] SIN349 faults detected during out-of-tariff activities. Included in fault rates discussed below.
[473] Data submitted in Openreach response dated 25 May 2016 to the 2nd QoS s.135 notice and Openreach response dated 15 August 2017 to the 9th QoS s.135 notice.

**Figure A1.30 Annual overall fault rates, for each asset category (%)**

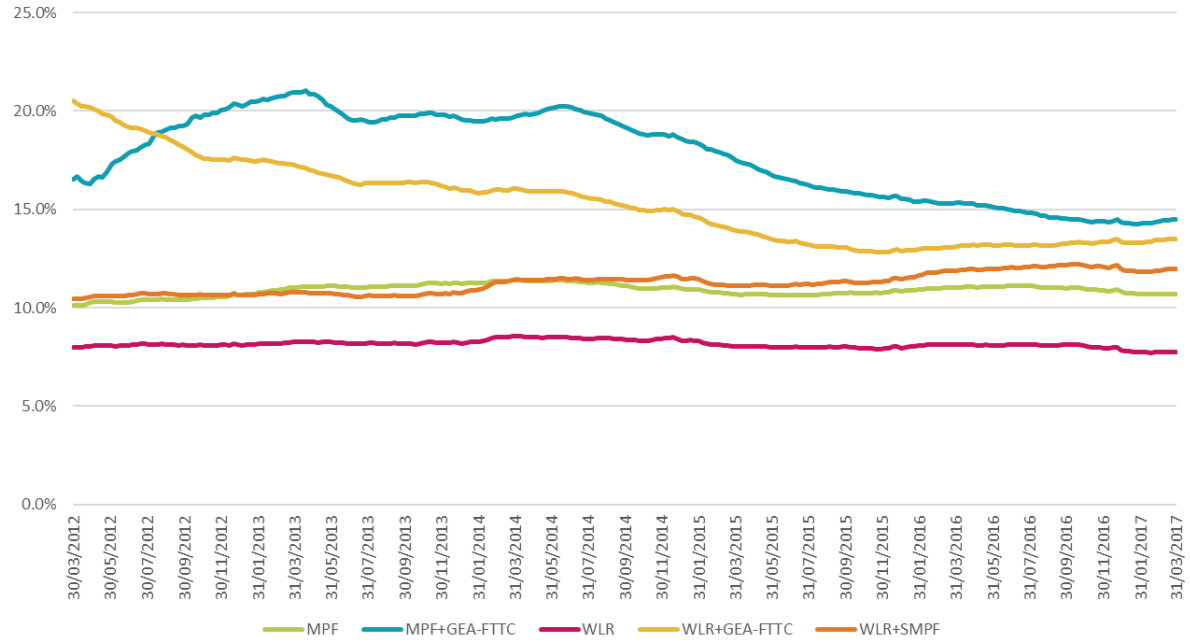



*Source: Ofcom analysis of BT data*[474]

A1.53 However, when we look at the 12-month moving average for weekly fault rates, as shown in Figure A1.31, we can see that the observed rise in the WLR+SMPF service are in fact three periods of separate flat trends. There is a small jump in the fault rate in February 2014, and a steadier rise in 2016 before plateauing. Consequently, we currently observe a flat trend in the fault rate for WLR+SMPF.

[474] Data submitted in Openreach responses dated 5 and 7 March 2014 to the 6th FAMR QoS s.135 notice, Openreach response dated 25 May 2016 to the 2nd QoS s.135 notice and Openreach response dated 15 August 2017 to the 9th QoS s.135 notice.

**Figure A1.31 12-month moving average overall fault rates, for each asset category (%)**



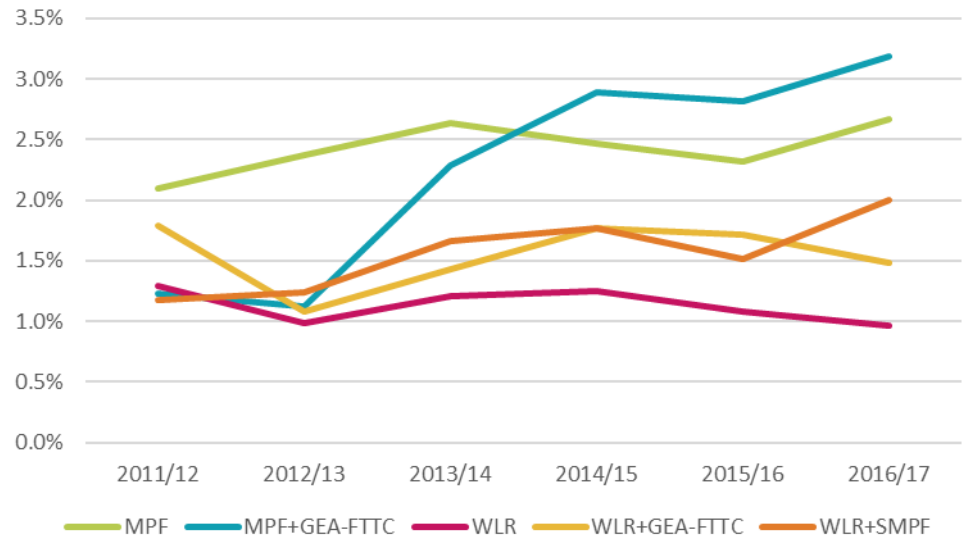

*Source: Ofcom analysis of BT data*[475]

## Dead on Arrival (DoA) fault rates

A1.54 DoA fault rates, which measure the proportion of faults occurring within 8 days of a provisioning activity, are set out in Figure A1.32 below. We observe that the WLR rate has been broadly stable at around 1%, the MPF and WLR+SMPF rates have increased slightly over the period, WLR+GEA-FTTC fluctuates between about 1% and 2%, and MPF+GEA-FTTC has seen a significant rise.

[475] This figure starts at the beginning of the 2012/13 financial year due to it being a 12-month moving average – i.e. it takes a year of overall fault rates before the moving average can begin to cover 12 months' worth of weekly fault rate values. This applies to all subsequently 12-month moving average figures as well. Data submitted in Openreach responses dated 5 and 7 March 2014 to the 6th FAMR QoS s.135 notice, Openreach response dated 25 May 2016 to the 2nd QoS s.135 notice and Openreach response dated 15 August 2017 to the 9th QoS s.135 notice.

**Figure A1.32 Annual DoA fault rates, for each asset category (%)**

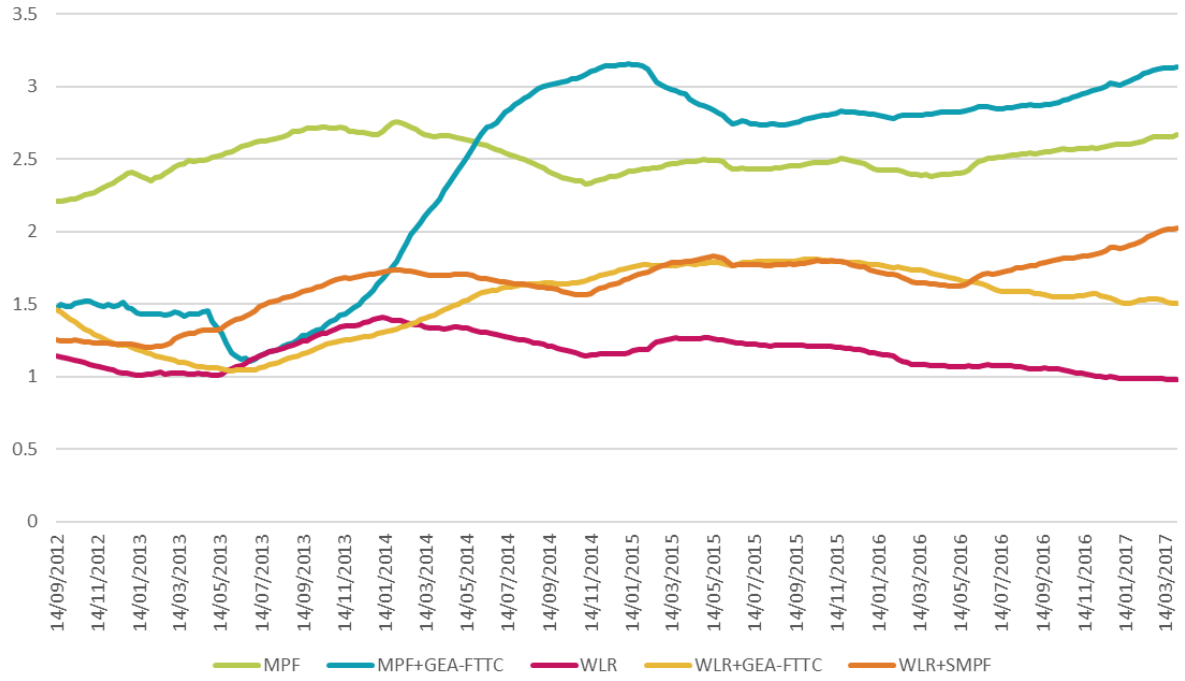



*Source: Ofcom analysis of BT data*[476]

A1.55 We have converted the annual DoA rates into a 12-month moving average to better understand the above observed trends. This is shown in Figure A1.33, showing the rise in the MPF+GEA-FTTC DoA rate occurs from the middle of 2013 until the start of 2015.

[476] Data submitted in Openreach responses dated 5 and 7 March 2014 to the 6th FAMR QoS s.135 notice, Openreach response dated 25 May 2016 to the 2nd QoS s.135 notice and Openreach response dated 15 August 2017 to the 9th QoS s.135 notice.

**Figure A1.33 12-month moving average DoA fault rates, for each asset category (%)**



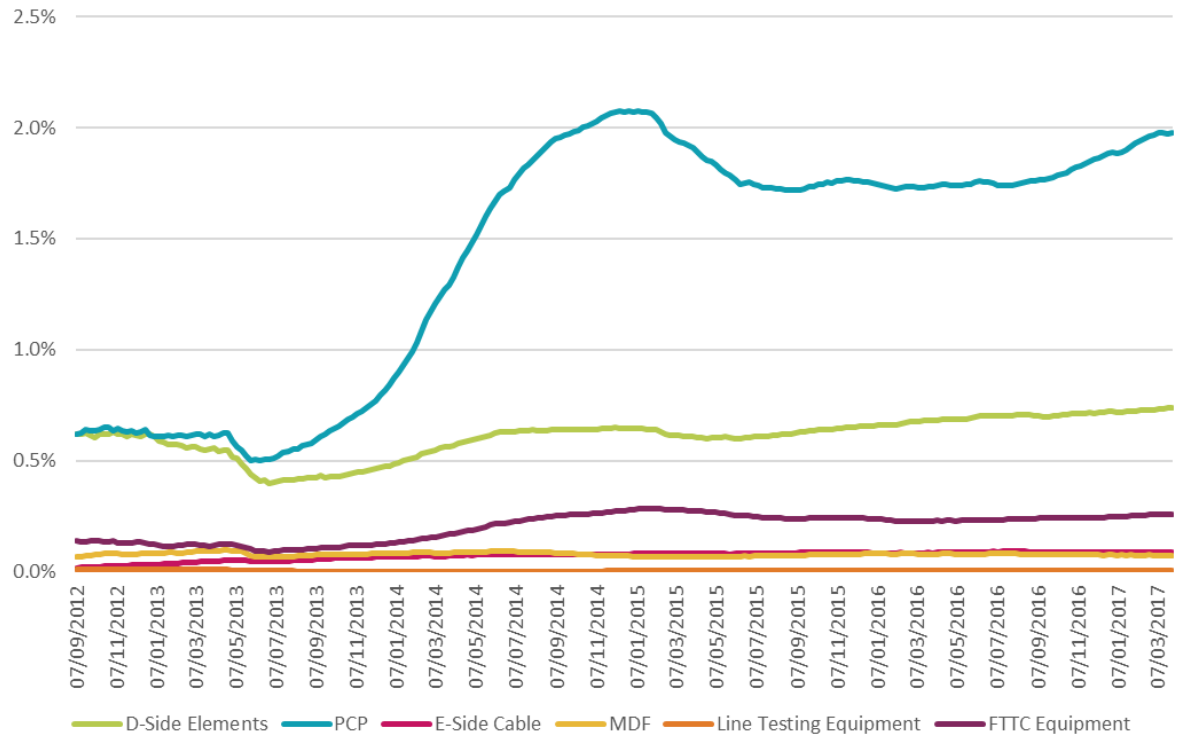

*Source: Ofcom analysis of BT data*[477]

A1.56 To look closer at the MPF+GEA-FTTC DoA rate, we have separated it into the fault rates for each of its network components. As shown in Figure A1.34 below, we observe that this rate is dominated by faults attributed to the PCP.[478]

[477] Data submitted in Openreach responses dated 5 and 7 March 2014 to the 6th FAMR QoS s.135 notice, Openreach response dated 25 May 2016 to the 2nd QoS s.135 notice and Openreach response dated 15 August 2017 to the 9th QoS s.135 notice.

[478] Fault repairs with a clear code of 81.4.

**Figure A1.34 12-month moving average DoA fault rates for the MPF+GEA-FTTC service, for each network component (%)**

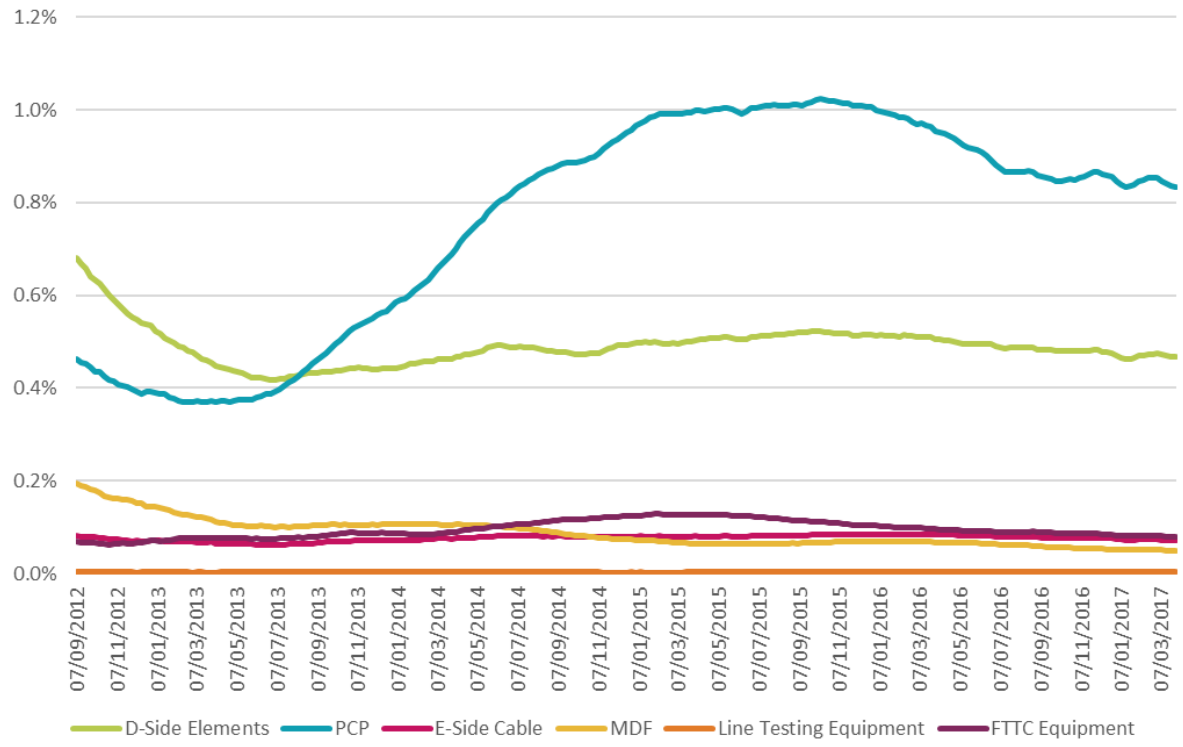



*Source: Ofcom analysis of BT data479*

A1.57 Shown in Figure A1.35 is the WLR+GEA-FTTC DoA rate separated into the fault rates for each of its network components. This rate is also dominated by faults attributed to the PCP.

[479] Data submitted in Openreach responses dated 5 and 7 March 2014 to the 6th FAMR QoS s.135 notice, Openreach response dated 25 May 2016 to the 2nd QoS s.135 notice and Openreach response dated 15 August 2017 to the 9th QoS s.135 notice.

**Figure A1.35 12-month moving average DoA fault rates for the WLR+GEA-FTTC service, for each network component**

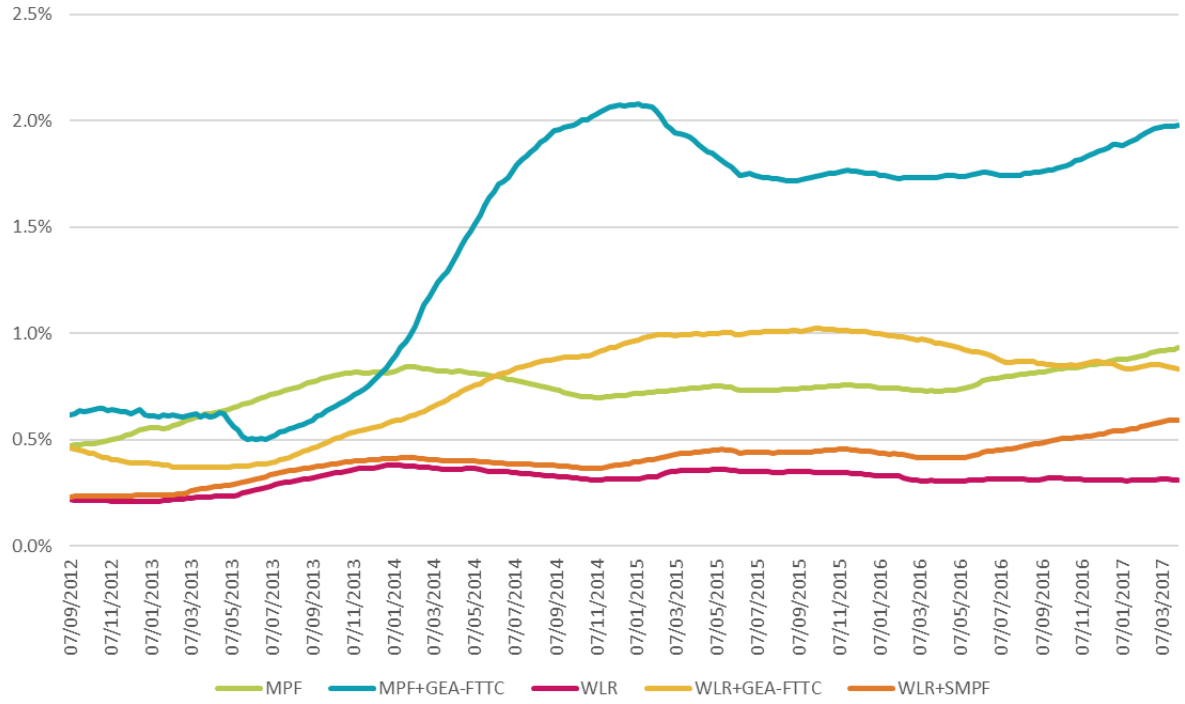



*Source: Ofcom analysis of BT data*[480]

A1.58 Looking at the DoA fault rates attributable to the PCP for each service, shown in Figure A1.36, we observe that, following its rise from mid-2013, MPF+GEA-FTTC is higher than the other services. MPF and WLR+GEA-FTTC are in the next highest range, with WLR and WLR+SMPF having the lowest DoA fault rates attributable to the PCP.

[480] Data submitted in Openreach responses dated 5 and 7 March 2014 to the 6th FAMR QoS s.135 notice, Openreach response dated 25 May 2016 to the 2nd QoS s.135 notice and Openreach response dated 15 August 2017 to the 9th QoS s.135 notice.

**Figure A1.36 12-month moving average DoA fault rates attributable to the PCP, for each asset category (%)**

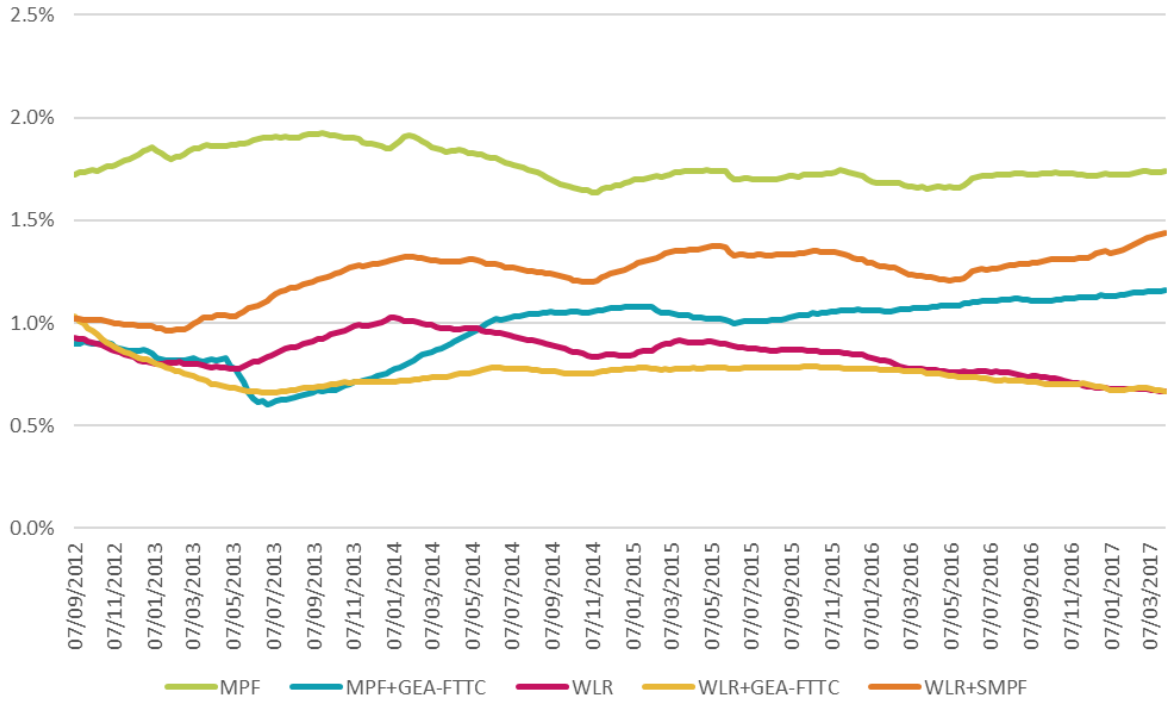



*Source: Ofcom analysis of BT data*[481]

A1.59 If we remove PCP faults, as shown in Figure A1.37 below, we observe the DoA fault rates are broadly flatter over the period when compared to Figure A1.33. We still observe a rise in MPF+GEA-FTTC, although it is significantly smaller than when PCP faults are included. WLR+SMPF also increases over the period, MPF, WLR+GEA-FTTC are reasonably stable over the period, and WLR decreases over the period.

[481] Data submitted in Openreach responses dated 5 and 7 March 2014 to the 6th FAMR QoS s.135 notice, Openreach response dated 25 May 2016 to the 2nd QoS s.135 notice and Openreach response dated 15 August 2017 to the 9th QoS s.135 notice.

**Figure A1.37 12-month moving average DoA fault rates without faults attributable to the PCP, for each asset category (%)**




*Source: Ofcom analysis of BT data*[482]

A1.60 When we separate the DoA rates for each telecoms provider for GEA-FTTC services, as shown in Figure A1.38 below, we observe that some telecoms providers experience different rates to those of other telecoms providers. This is true for both GEA-FTTC services, where we observe [✂].

**Figure A1.38 12-month moving average DoA fault rates, for GEA-FTTC services for each telecoms provider (%)**

[✂]

*Source: Ofcom analysis of BT data*[483]

A1.61 Figure A1.39 shows, for GEA-FTTC services for each telecoms provider, the failure rate for DoA faults cleared at the PCP. We observe that [✂].

[482] Data submitted in Openreach responses dated 5 and 7 March 2014 to the 6th FAMR QoS s.135 notice, Openreach response dated 25 May 2016 to the 2nd QoS s.135 notice and Openreach response dated 15 August 2017 to the 9th QoS s.135 notice.
[483] Data submitted in Openreach responses dated 5 and 7 March 2014 to the 6th FAMR QoS s.135 notice, Openreach response dated 25 May 2016 to the 2nd QoS s.135 notice and Openreach response dated 15 August 2017 to the 9th QoS s.135 notice.

**Figure A1.39 12-month moving average DoA fault rates attributable to the PCP, for GEA-FTTC services for each telecoms provider (%)**

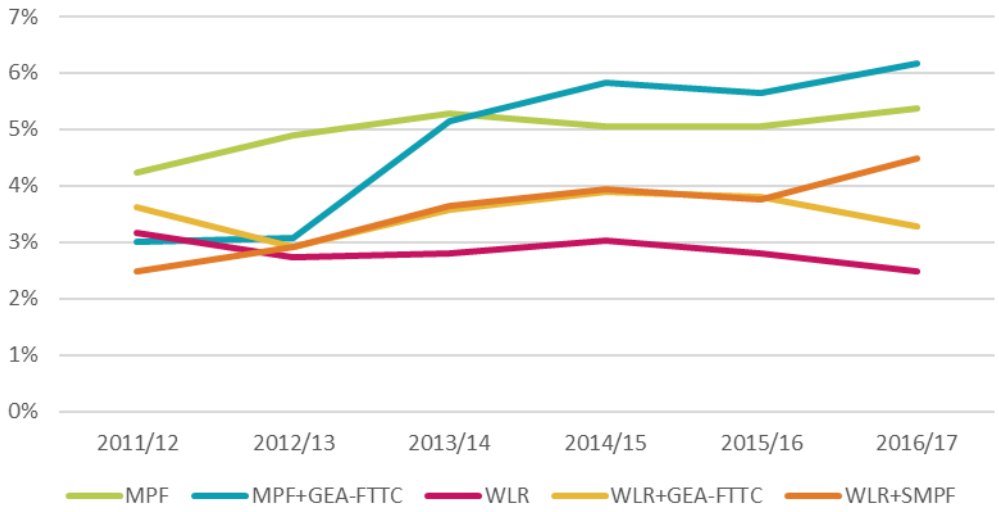
[✂]

*Source: Ofcom analysis of BT data*[484]

## Early life failure (ELF) rates

A1.62 ELF rates, which measure the proportion of faults occurring within 28 days since a provisioning activity, are set out in Figure A1.40 below. WLR and MPF vary within a narrow range over the period. WLR+SMPF and WLR+GEA-FTTC previously showed a slight increase, although in 2016/17 the former has increased while the latter has decreased. MPF+GEA-FTTC has continued its increasing ELF rate trend over the period, more than doubling from 2011/12.

**Figure A1.40 Annual early life failure rates, for each asset category (%)**



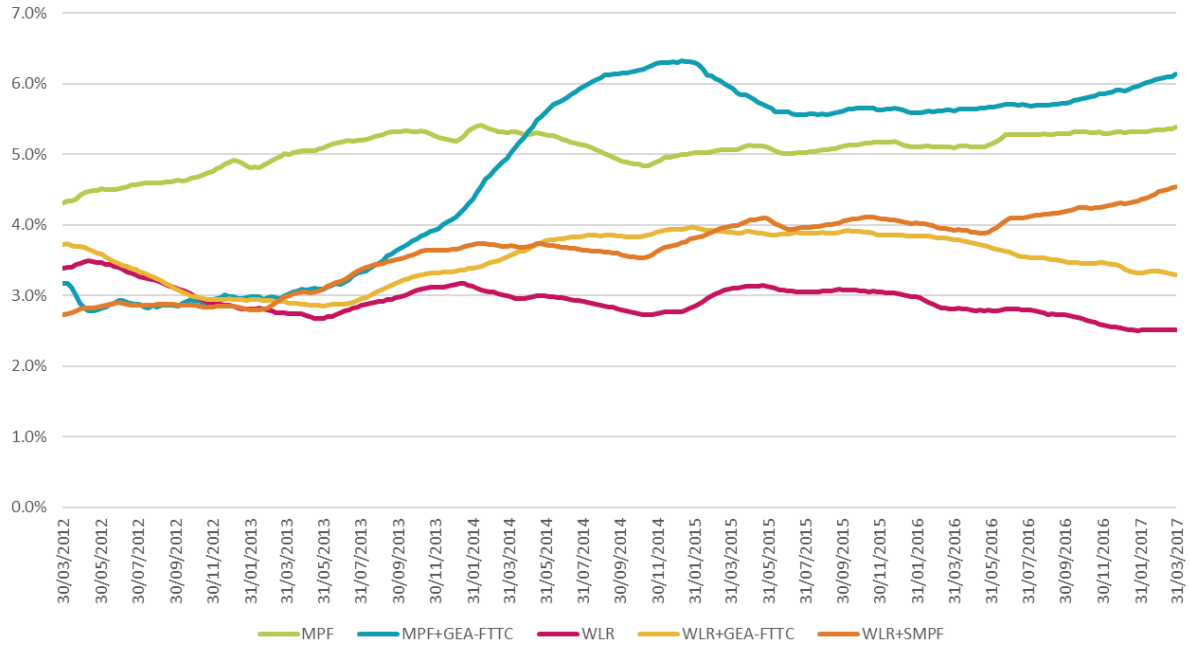

*Source: Ofcom analysis of BT data*[485]

A1.63 We have converted the annual ELF rates into a 12-month moving average to better understand the movements observed above. This is shown in Figure A1.41 below, where we observe the rise in the early life failure rate for MPF+GEA-FTTC occurs from the middle of 2013 until the start of 2015.

[484] Data submitted in Openreach responses dated 5 and 7 March 2014 to the 6th FAMR QoS s.135 notice, Openreach response dated 25 May 2016 to the 2nd QoS s.135 notice and Openreach response dated 15 August 2017 to the 9th QoS s.135 notice.

[485] Data submitted in Openreach responses dated 5 and 7 March 2014 to the 6th FAMR QoS s.135 notice, Openreach response dated 25 May 2016 to the 2nd QoS s.135 notice and Openreach response dated 15 August 2017 to the 9th QoS s.135 notice.

**Figure A1.41 12-month moving average ELF rates, for each asset category (%)**

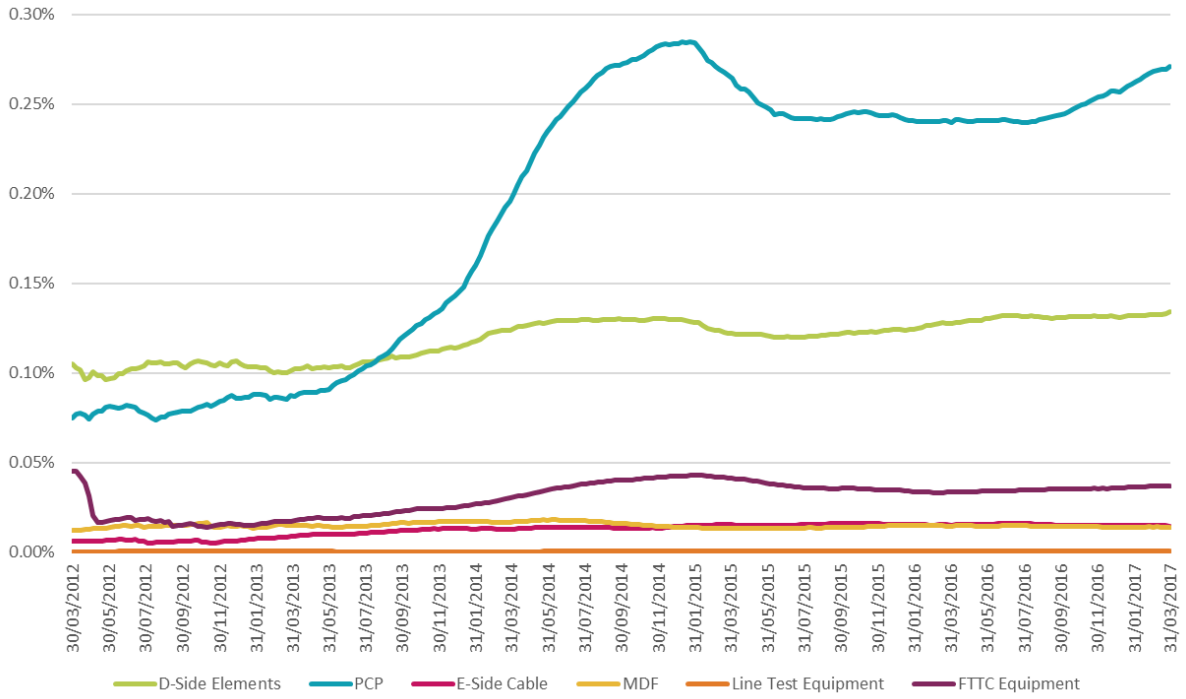



*Source: Ofcom analysis of BT data*[486]

A1.64 To look closer at the MPF+GEA-FTTC ELF rate we have separated it into the fault rates for each of its network components. As shown in Figure A1.42 below, we observe that this rate is dominated by faults attributed to the PCP.

[486] Data submitted in Openreach responses dated 5 and 7 March 2014 to the 6th FAMR QoS s.135 notice, Openreach response dated 25 May 2016 to the 2nd QoS s.135 notice and Openreach response dated 15 August 2017 to the 9th QoS s.135 notice.

**Figure A1.42 12-month moving average ELF rates for the MPF+GEA-FTTC service, for each network component (%)**

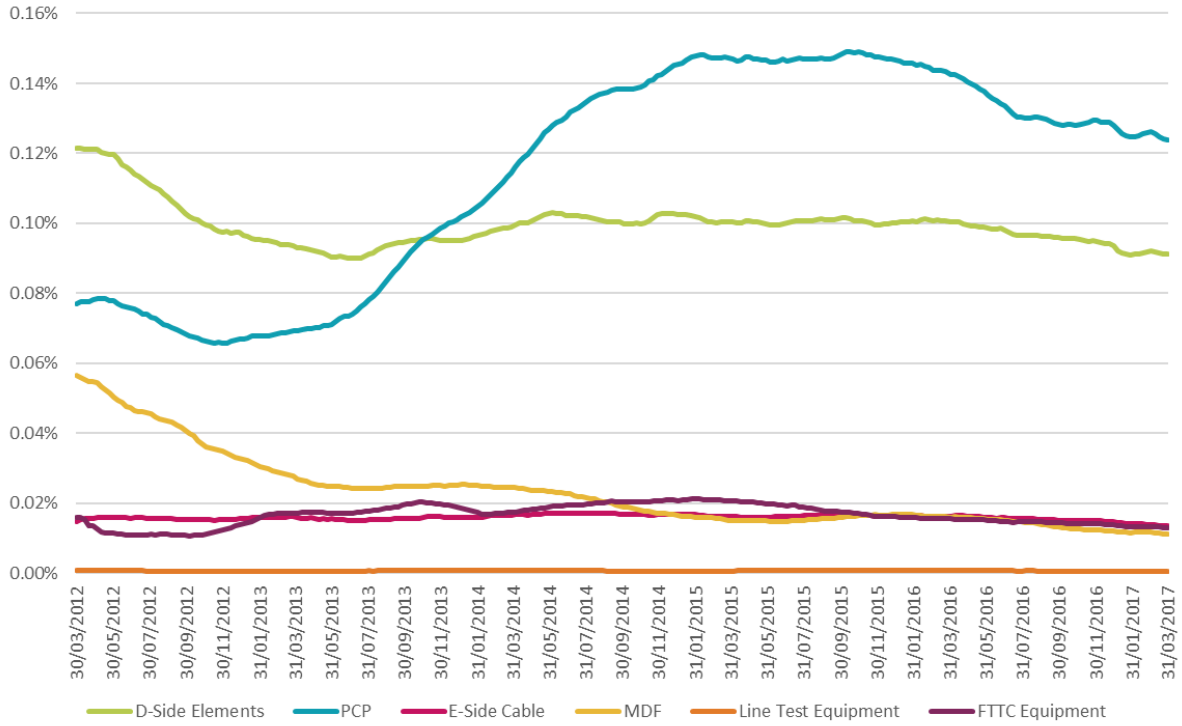



*Source: Ofcom analysis of BT data*[487]

A1.65 Shown in Figure A1.43 is the WLR+GEA-FTTC ELF rate separated into the fault rates for each of its network components. We observe this rate is also dominated by faults attributed to the PCP.

[487] Data submitted in Openreach responses dated 5 and 7 March 2014 to the 6th FAMR QoS s.135 notice, Openreach response dated 25 May 2016 to the 2nd QoS s.135 notice and Openreach response dated 15 August 2017 to the 9th QoS s.135 notice.

**Figure A1.43 12-month moving average ELF rates for the WLR+GEA-FTTC service, for each network component (%)**

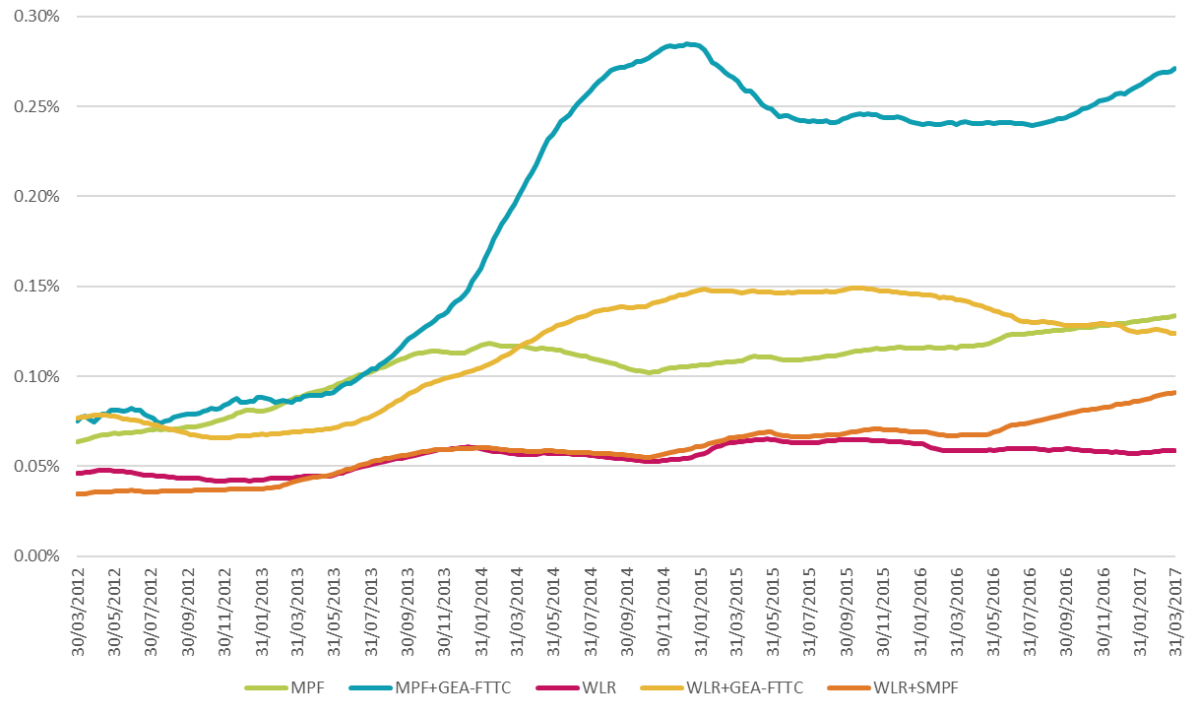



*Source: Ofcom analysis of BT data*[488]

A1.66 Looking at the ELF rates attributable to the PCP for each service, shown in Figure A1.44 below, we observe that, following its rise from mid-2013, MPF+GEA-FTTC is higher than the other services. MPF and WLR+GEA-FTTC are in the next highest range, with WLR and WLR+SMPF having the lowest ELF rates attributable to the PCP.

[488] Data submitted in Openreach responses dated 5 and 7 March 2014 to the 6th FAMR QoS s.135 notice, Openreach response dated 25 May 2016 to the 2nd QoS s.135 notice and Openreach response dated 15 August 2017 to the 9th QoS s.135 notice.

**Figure A1.44 12-month moving average ELF rates attributable to the PCP, for each asset category (%)**

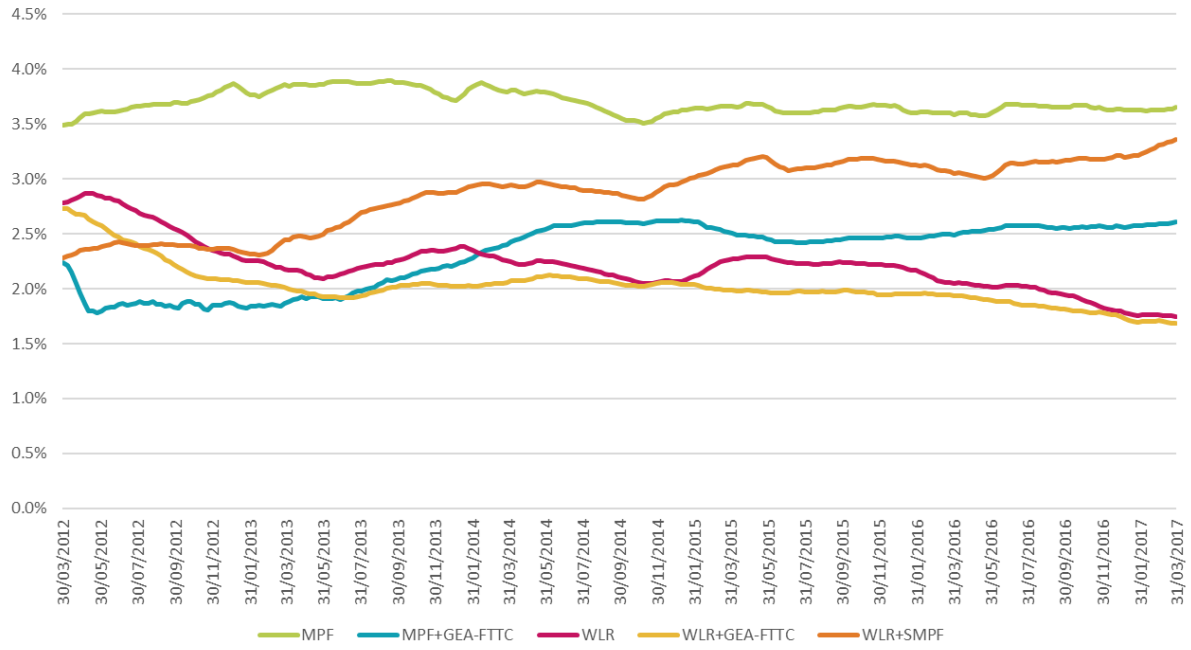



*Source: Ofcom analysis of BT data*[489]

A1.67 If we remove PCP faults, as shown in Figure A1.45 below, we observe the ELF rates are broadly flatter over the period when compared to Figure A1.41. We still observe a rise in MPF+GEA-FTTC, although it is significantly smaller than when PCP faults are included. MPF is reasonably stable, WLR+SMPF increases over the period, and WLR and WLR+GEA-FTTC both decrease over the period.

[489] Data submitted in Openreach responses dated 5 and 7 March 2014 to the 6th FAMR QoS s.135 notice, Openreach response dated 25 May 2016 to the 2nd QoS s.135 notice and Openreach response dated 15 August 2017 to the 9th QoS s.135 notice.

**Figure A1.45 12-month moving average ELF rates without faults attributable to the PCP, for each asset category (%)**




*Source: Ofcom analysis of BT data*[490]

A1.68 When we separate the ELF rates for each telecoms provider for GEA-FTTC services, as shown in Figure A1.46 below, we observe that some telecoms providers experience different rates to that of other telecoms providers. This is true for both GEA-FTTC services, where we observe [✂].

**Figure A1.46 12-month moving average ELF rates, for GEA-FTTC services for each telecoms provider (%)**

[✂]

*Source: Ofcom analysis of BT data*[491]

A1.69 Figure A1.47 shows, for GEA-FTTC services for each telecoms provider, the failure rate for non-DoA faults which were still reported as an ELF i.e. the failure rate for faults reported past eight days of a provisioning activity but within 28 days. We observe that [✂].

[490] Data submitted in Openreach responses dated 5 and 7 March 2014 to the 6th FAMR QoS s.135 notice, Openreach response dated 25 May 2016 to the 2nd QoS s.135 notice and Openreach response dated 15 August 2017 to the 9th QoS s.135 notice.
[491] Data submitted in Openreach responses dated 5 and 7 March 2014 to the 6th FAMR QoS s.135 notice, Openreach response dated 25 May 2016 to the 2nd QoS s.135 notice and Openreach response dated 15 August 2017 to the 9th QoS s.135 notice.

**Figure A1.47 12-month moving average non-DoA fault rates reported within 28 days of installation, for GEA-FTTC services for each telecoms provider (%)**

[✂]

*Source: Ofcom analysis of BT data*[492]

A1.70 Figure A1.48 shows the ELF rates attributable to the PCP for each telecoms provider for GEA-FTTC services. We observe [✂].

**Figure A1.48 12-month moving average ELF rates attributable to the PCP, for GEA-FTTC services for each telecoms provider (%)**

[✂]

*Source: Ofcom analysis of BT data*[493]

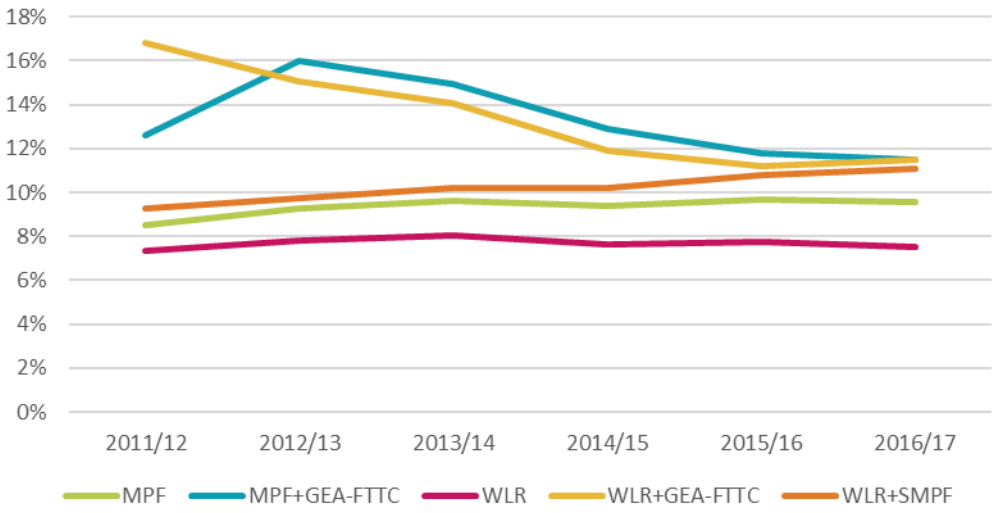
## In life fault (ILF) rates

A1.71 ILF rates, which measure the proportion of faults occurring after 28 days have elapsed since a provisioning activity, are set out in Figure A1.49 below. WLR and MPF are broadly flat, with the latter being at a higher level than the former. WLR+SMPF has continued its increasing trend in 2016/17. As in the case with overall fault rates, MPF+GEA-FTTC and WLR+GEA-FTTC began the period higher than the other asset categories but exhibit a decreasing trend.

[492] Data submitted in Openreach responses dated 5 and 7 March 2014 to the 6th FAMR QoS s.135 notice, Openreach response dated 25 May 2016 to the 2nd QoS s.135 notice and Openreach response dated 15 August 2017 to the 9th QoS s.135 notice.

[493] Data submitted in Openreach responses dated 5 and 7 March 2014 to the 6th FAMR QoS s.135 notice, Openreach response dated 25 May 2016 to the 2nd QoS s.135 notice and Openreach response dated 15 August 2017 to the 9th QoS s.135 notice.

**Figure A1.49 Annual in life failure rates, for each asset category (%)**




*Source: Ofcom analysis of BT data*[494]

A1.72 Figure A1.50 shows the 12-month moving average ILF rates for each telecoms provider for GEA-FTTC services, where we observe [✂].

**Figure A1.50 12-month moving average ILF rates, for GEA-FTTC services for each telecoms provider (%)**

[✂]

*Source: Ofcom analysis of BT data*[495]

A1.73 Figure A1.51 shows the 12-month moving average ILF rates attributable to the PCP for each telecoms provider for GEA-FTTC services, where we observe [✂].

**Figure A1.51 12-month moving average ILF rates attributable to the PCP, for GEA-FTTC services for each telecoms provider (%)**

[✂]

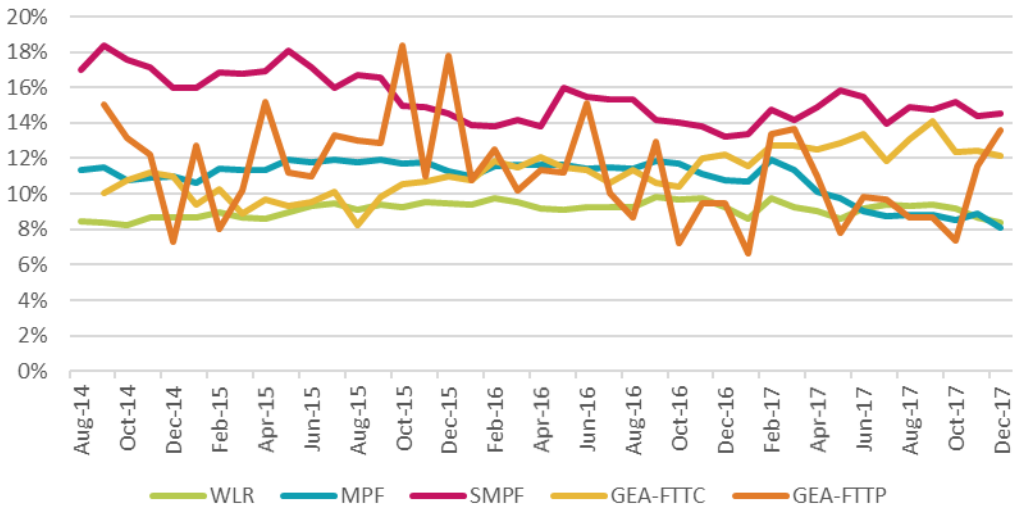
*Source: Ofcom analysis of BT data*[496]

[494] Data submitted in Openreach responses dated 5 and 7 March 2014 to the 6th FAMR QoS s.135 notice, Openreach response dated 25 May 2016 to the 2nd QoS s.135 notice and Openreach response dated 15 August 2017 to the 9th QoS s.135 notice.
[495] Data submitted in Openreach responses dated 5 and 7 March 2014 to the 6th FAMR QoS s.135 notice, Openreach response dated 25 May 2016 to the 2nd QoS s.135 notice and Openreach response dated 15 August 2017 to the 9th QoS s.135 notice.
[496] Data submitted in Openreach responses dated 5 and 7 March 2014 to the 6th FAMR QoS s.135 notice, Openreach response dated 25 May 2016 to the 2nd QoS s.135 notice and Openreach response dated 15 August 2017 to the 9th QoS s.135 notice.

## Repeat faults

A1.74 The percentage of 'repeat faults', where a fault occurs within 28 days (or 30 days depending on the service)[497] of a previously closed fault repair, is set out in Figure A1.52 below. GEA-FTTC and GEA-FTTP faults show variability over the period, with GEA-FTTC faults increasing and GEA-FTTP faults decreasing until an increase towards the end of 2017. The slight increase for WLR has continued, whereas MPF, which was broadly flat, has decreased. SMPF has continued its decreasing trend over the period, however it remains at a higher level than the other services.

**Figure A1.52 Percentage of repeat faults, per service on a monthly basis (%)**




*Source: Openreach mandatory non-discrimination KPIs*

# Repair performance for WLR, MPF, SMPF and GEA since the 2014 FAMR

## Repair data integrity

A1.75 In the March 2017 QoS Consultation[498], we discussed the utility of the repair data from different sources of evidence, including KPIs reported to Ofcom and data provided by BT to Ofcom under statutory information gathering powers. We considered both were useful, and proceeded to use data from both sources to provide an overview of BT's performance in recent years. The following sub-sections use data from both sources.

[497] The 2014 FAMR requires BT to report KPIs on faults occurring within 28 calendar days of a previously completed fault for LLU (MPF and SMPF) and GEA, and within 30 calendar days for WLR, ISDN30 and ISDN2.
[498] March 2017 QoS Consultation, paragraph A6.49.

## Repair performance against contractual timescales

### WLR and MPF

A1.76 The 2014 FAMR, following the identification of two periods in which WLR and MPF performance was of particular concern to telecoms providers, imposed service standards in relation to the repair of[499]:

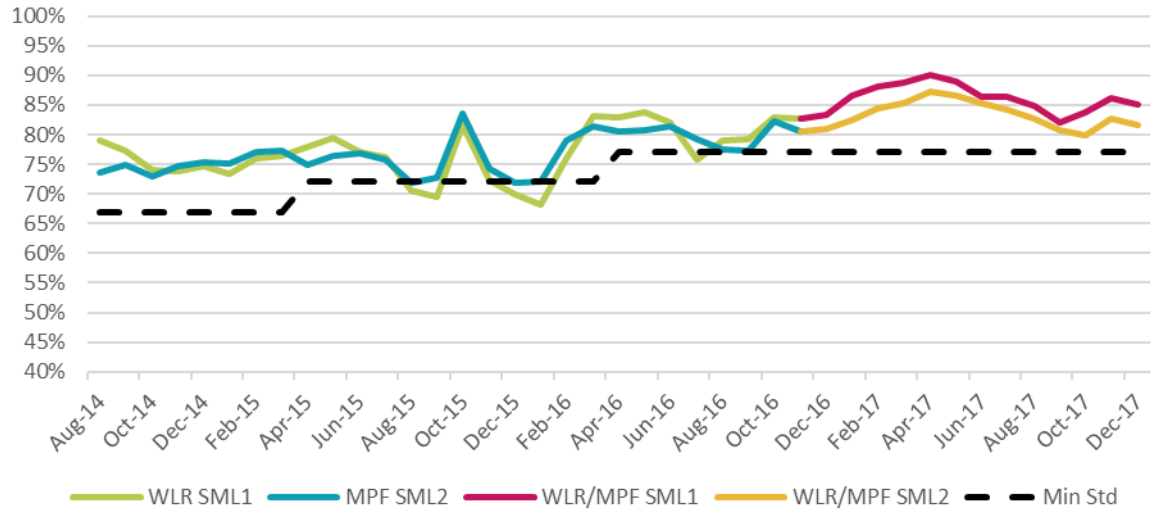
- WLR faults that are subject to SML1 by the end of the second working day after such faults have been registered with Openreach; and
- MPF faults that are subject to SML2 by the end of the next working day after such faults have been registered with Openreach.[500]

A1.77 The KPIs provided by Openreach indicate that it has met the annual FAMR repair standards in the first two years of the control in each of the 10 geographic regions and that there had been a reduction in the significant volatility in performance identified prior to April 2013. This performance (on a monthly basis) is shown at a UK level in Figure A1.53 below, including the period until November 2016 whereupon the new standards based on SML took effect[501], and the period since where both SMLs 1 and 2 have been above the level of the repair standards.

A1.78 The KPIs also indicate that UK on time repair performance for WLR and MPF at SML3 has been similar to SML1 and 2 performance over the FAMR period.

[499] Fault repair timescales are determined by the Service Maintenance Level (SML) attributable to a customer's line. SML1 typically means a 'two-day' repair timeframe, while SML2 typically means a 'one-day' repair.
[500] In light of the standards imposed in the 2014 FAMR, we have focused our review on performance at SMLs 1 and 2, and only provide commentary on higher care levels in certain cases.
[501] As discussed in Section 5 of the March 2017 QoS Consultation, our 2016 QoS directions implemented new standards that apply to repairs based only on the contract SML and not the specific service – i.e. a standard on all SML1 lines (WLR and MPF) and all SML2 lines (WLR and MPF). We will assess compliance for the new repair standards over a 17-month period running from 1 November 2016 to 31 March 2018.

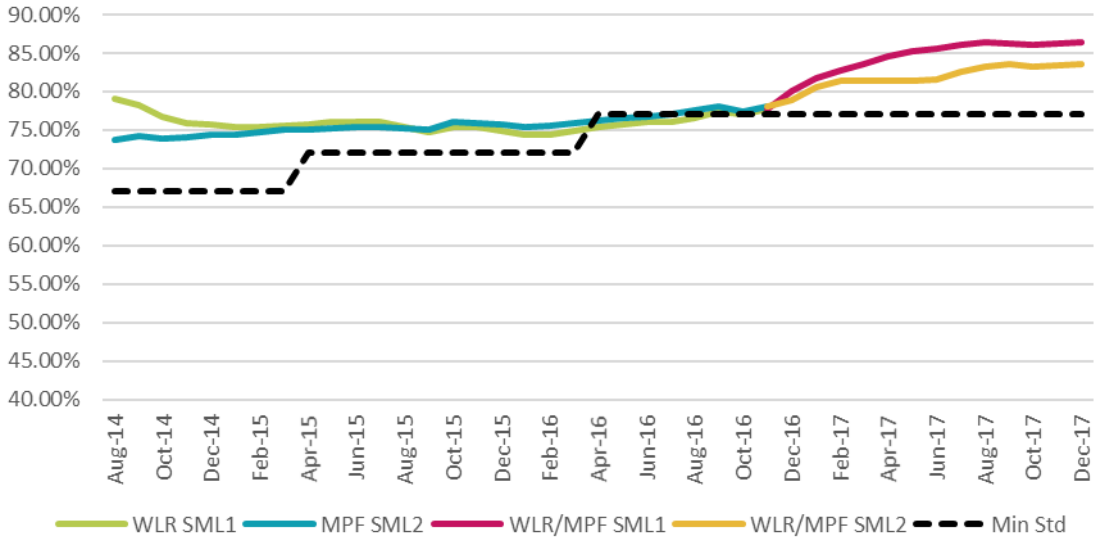
**Figure A1.53 UK faults restored on time for WLR and MPF services subject to SMLs 1 and 2, monthly (%)**




*Source: Openreach mandatory non-discrimination KPIs*

A1.79 While Figure A1.53 shows monthly performance, Figure A1.54 shows the 12-month moving average for UK faults restored on time. We observe that Openreach's performance was broadly stable at circa 75% until the standard was raised to 77% at the start of 2016/17, when performance improved. Since the change to measuring the standards based on SML, Openreach has been operating at a higher level of performance than it was previously.

**Figure A1.54 UK faults restored on time for WLR and MPF services subject to SMLs 1 and 2, 12-month moving average (%)**



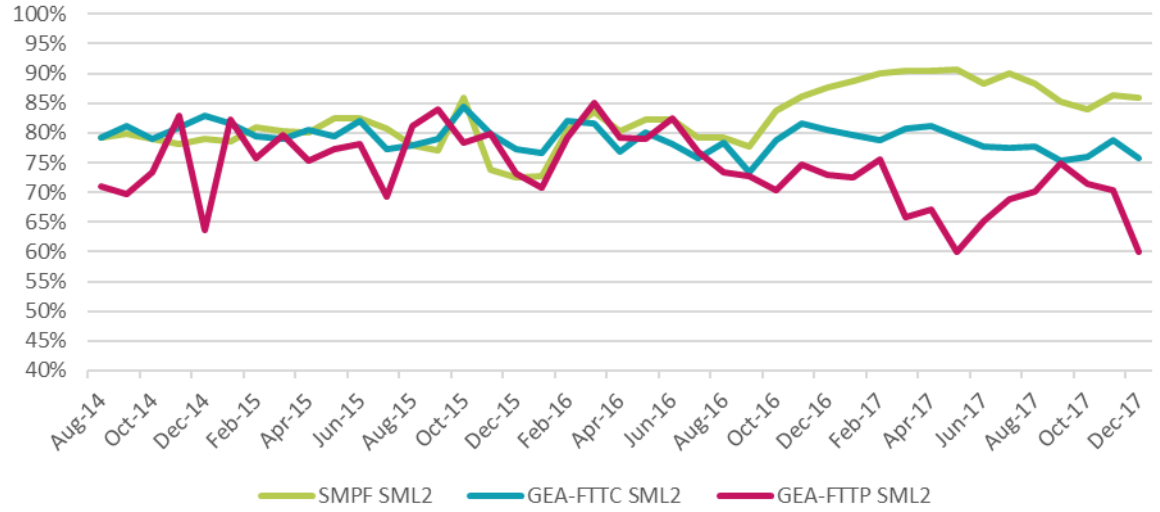

*Source: Openreach mandatory non-discrimination KPIs*

### SMPF and GEA

A1.80 As shown in Figure A1.55, in the most recent year SMPF performance at SML2 improved to a peak of around 90%.

A1.81 GEA-FTTP performance is typically more variable than GEA-FTTC. This is likely to be due to early life issues during the introduction of GEA-FTTP. We also noted that, had the 2014 FAMR applied the same level of repair standards to GEA-FTTC at SML2 as it did to WLR at SML1 and MPF at SML2, GEA-FTTC performance would have met the 2014/15 and 2015/16 repair standards in every month. Since the 2014 FAMR, GEA-FTTC at SML2 performance has remained, with slight variations, around 80%.[502]

**Figure A1.55 UK faults restored on time for SMPF and GEA services subject to SML2 (%)**




*Source: Openreach mandatory non-discrimination KPIs*

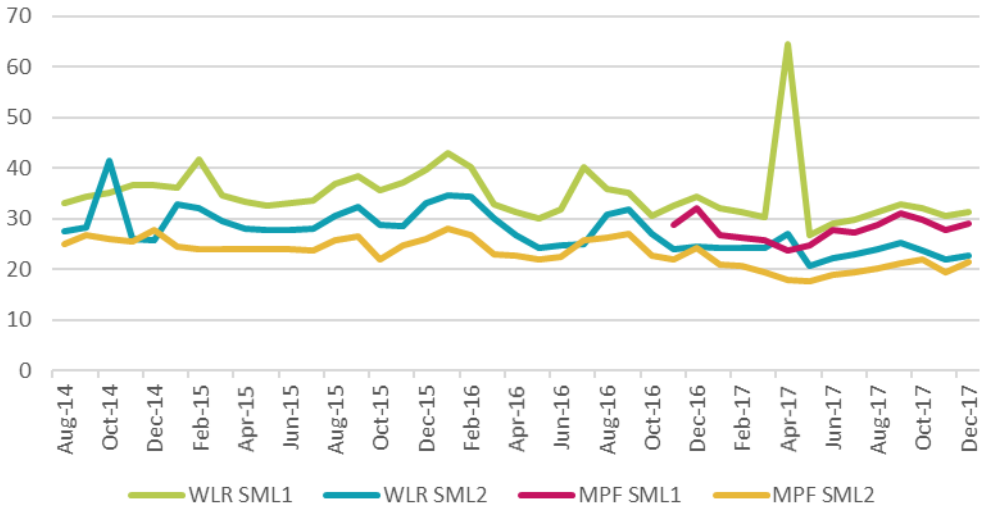
## Average time to restore service

### WLR and MPF

A1.82 As shown in Figure A1.56, average time to repair (ATTR) for WLR and MPF at SMLs 1 and 2 has stayed fairly stable since the 2014 FAMR, with the exception of a large peak for WLR SML1 in April 2017.[503]

[502] We note that since August 2014 the percentages of faults repaired on time for SMPF and GEA-FTTC at SML3 at the UK level have been similar to SML2.
[503] We note that UK ATTR for WLR and MPF at SML3 has been broadly similar to SML2, although more peaky, for most of the current review period.

**Figure A1.56 UK average time to restore service for WLR and MPF services (working hours)**

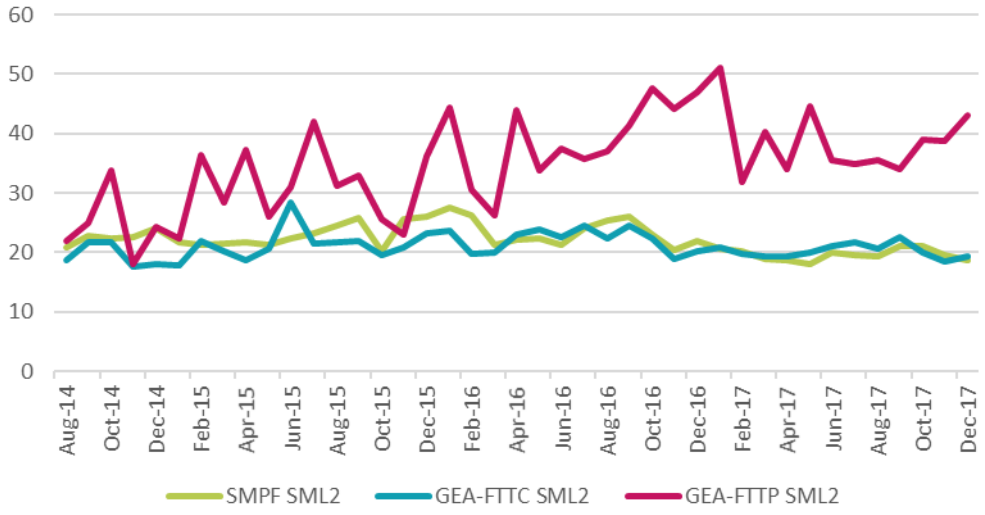



*Source: Openreach mandatory non-discrimination KPIs*

### SMPF and GEA

A1.83 As shown in Figure A1.57 below, ATTR performance for SMPF and GEA-FTTC at SML2 has remained relatively flat over the FAMR period[504]; however, GEA-FTTP has fluctuated to a greater extent and the average repair time has risen to around 35 working hours.[505]

**Figure A1.57 UK average time to restore service for SMPF and GEA services subject to SML2 (working hours)**




*Source: Openreach mandatory non-discrimination KPIs*

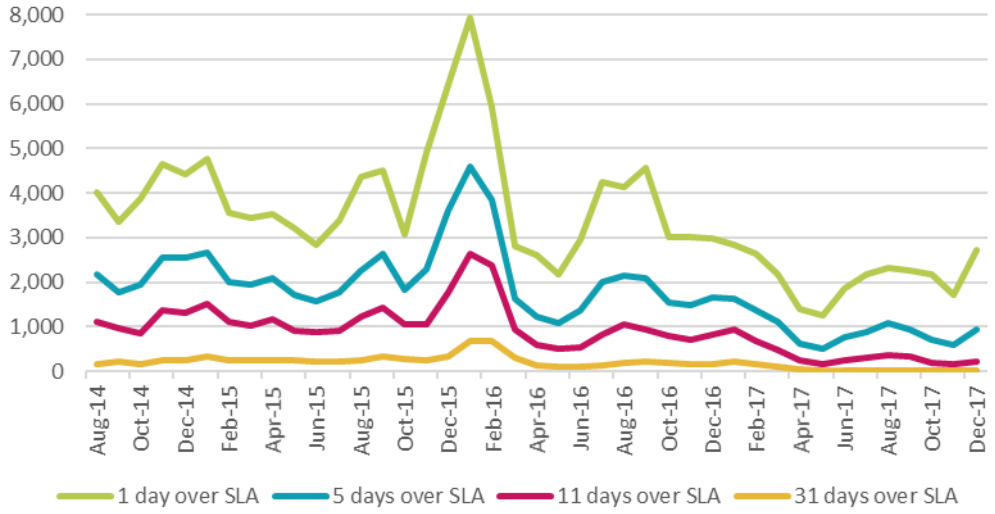
[504] We note that UK ATTR for SMPF at SML3 has been broadly similar to SML2 for most of the current review period, but GEA-FTTC average repair times at SML3 have risen with a peak of around 49 working hours.
[505] We consider that this is likely to be due to the relatively lower volumes of FTTP compared to other services.

## The tail of late fault repairs

### Faults not resolved on time

A1.84 The average daily number of WLR faults subject to SMLs 1 and 2 which missed the SLA remained fairly stable over the FAMR period, barring a couple of peaks in winter 2015/16 and summer 2016 (see Figure A1.58). We note that the average daily numbers of faults one day, five days, 11 days and 31 days late are now lower than when compared to the beginning of the review period.

**Figure A1.58 UK average daily number of WLR faults subject to SMLs 1 and 2 not resolved on time**

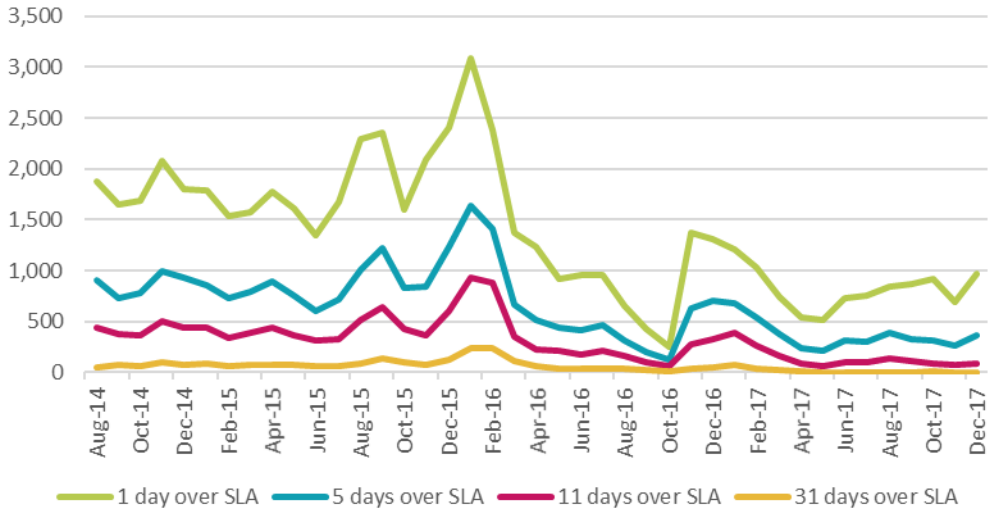



*Source: Openreach mandatory non-discrimination KPIs*

A1.85 The average daily number of MPF fault repairs subject to SML2 that were not completed within SLA followed the same pattern as WLR over the review period. As shown in Figure A1.59, this continues to be the case since, with the exception being in October 2016 where KPI volumes dropped for SML2 before SML1 volumes were reported from November 2016.[506]

[506] We note that this volumes drop was due to a number of telecoms providers moving a large proportion of their customers using MPF from SML2 to SML1.

**Figure A1.59 UK average daily number of MPF faults subject to SMLs 1 and 2 not resolved on time**



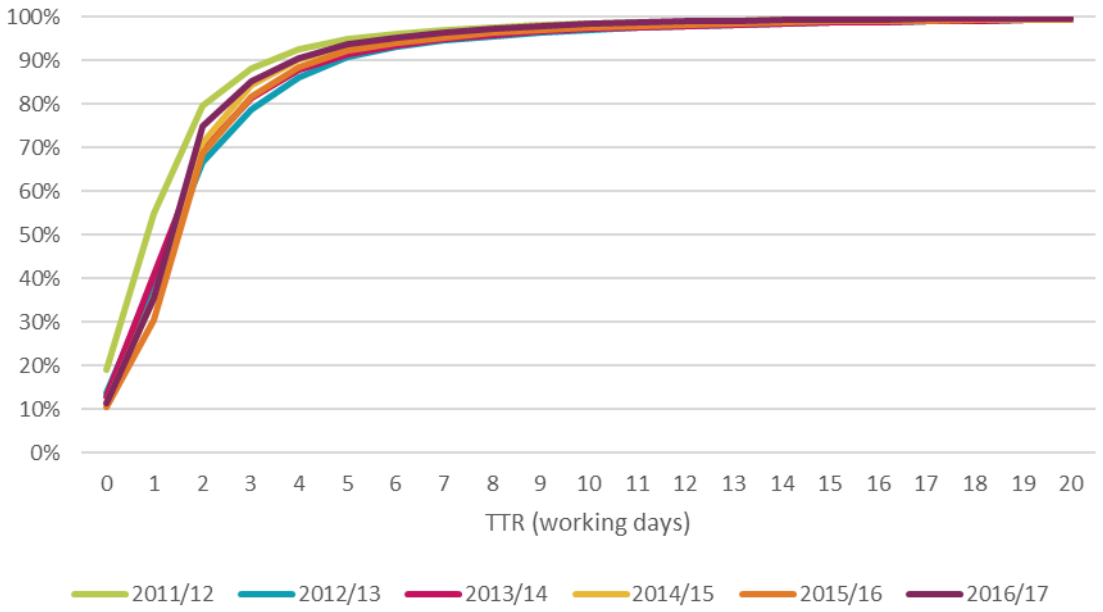

*Source: Openreach mandatory non-discrimination KPIs*

### Fault repair distributions

A1.86 We analysed the time to repair (TTR) distributions for WLR SML1 and MPF SML2 to observe the overall repair time performance. Figures A1.60 and A1.61 show these distributions with the addition of 2016/17.

A1.87 For WLR, which until mid-2016 was predominantly purchased at SML1 with a repair SLA of two working days after the fault was reported, 2011/12 was the best performing year. Overall TTR performance then declined in 2012/13 and 2013/14, before showing improvement in the following years.

**Figure A1.60 UK WLR SML1 fault repair TTR distributions, by financial year**

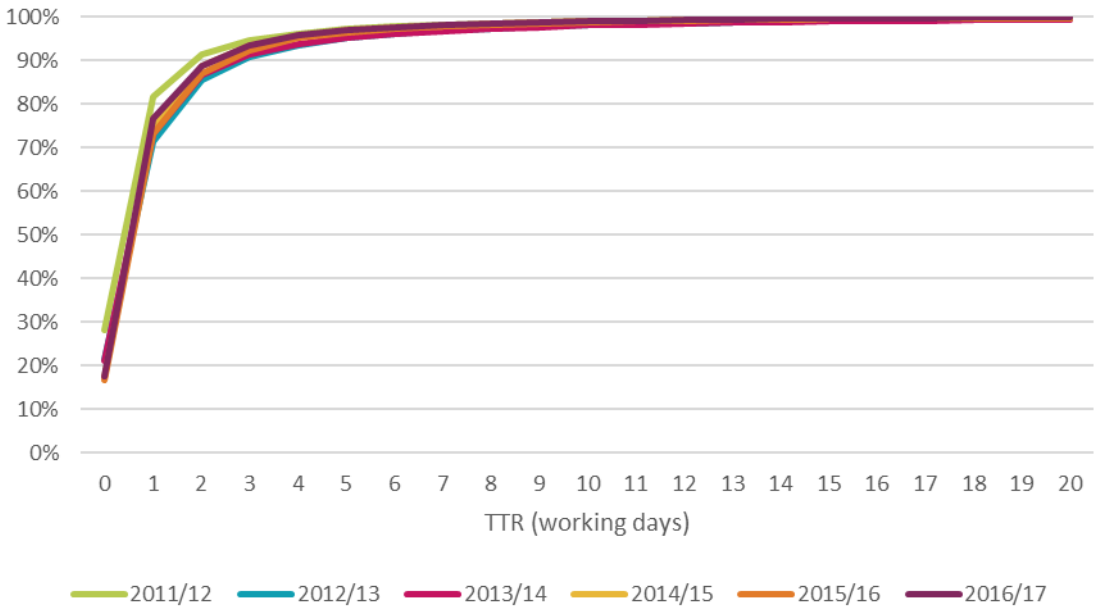



*Source: Ofcom analysis of BT data*[507]

A1.88 For MPF, which until mid-2016 was predominantly purchased at SML2 with a stricter repair SLA of end of next working day, 2011/12 was the best performing year. The following two years showed a slight performance deterioration, before subsequent improvement in in the following three years.

[507] Data submitted in Openreach responses dated 5 and 7 March 2014 to the 6th FAMR QoS s.135 notice, Openreach response dated 25 May 2016 to the 2nd QoS s.135 notice, Openreach response dated 9 December 2016 to the 4th QoS s.135 notice, Openreach response dated 13 January 2017 to the 5th QoS s.135 notice and Openreach response dated 15 August to the 9th QoS s.135 notice.

**Figure A1.61 UK MPF SML2 fault repair TTR distributions, by financial year**



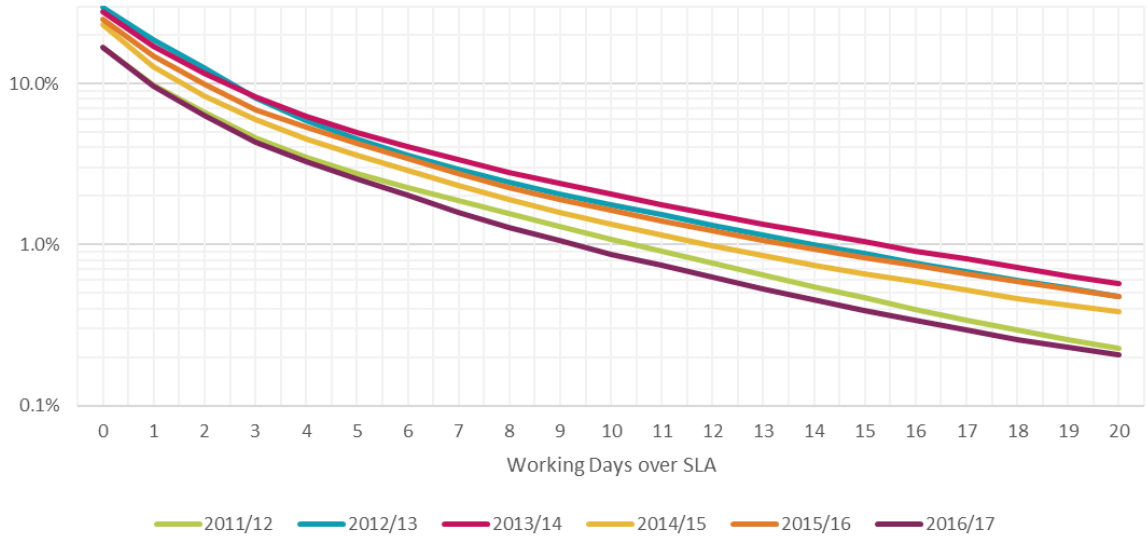

*Source: Ofcom analysis of BT data*[508]

A1.89 Although the above figures allow observation of the overall repair time distribution, they do not take into account the difference between repair SLAs and TTR. Typically, a one working day TTR for an SML2 fault and a two-working day TTR for an SML1 fault would reflect the standard repair SLAs. However, there are exceptions and in these cases the TTR does not suitably reflect SLA timescales.[509] To address this, as we did in the March 2017 QoS Consultation[510], we have constructed distributions for the number of working days over SLA that fault repairs were completed, using day zero to represent repairs completed on time.

A1.90 Figure A1.62 shows this over SLA distribution in working days for WLR, and MPF at SML1 per financial year[511], where 2011/12 and 2016/17 have the highest level of performance observed with circa 10% of repairs completed within one working day over SLA.

[508] Data submitted in Openreach responses dated 5 and 7 March 2014 to the 6th FAMR QoS s.135 notice, Openreach response dated 25 May 2016 to the 2nd QoS s.135 notice, Openreach response dated 9 December 2016 to the 4th QoS s.135 notice, Openreach response dated 13 January 2017 to the 5th QoS s.135 notice and Openreach response dated 15 August to the 9th QoS s.135 notice.
[509] These exceptions include any telecoms provider/customer delay resulting in "repair parked time", and when a customer requests an engineering appointment beyond the fault repair's standard SLA (for appointed repairs).
[510] March 2017 QoS Statement, paragraph A6.67.
[511] [✂]

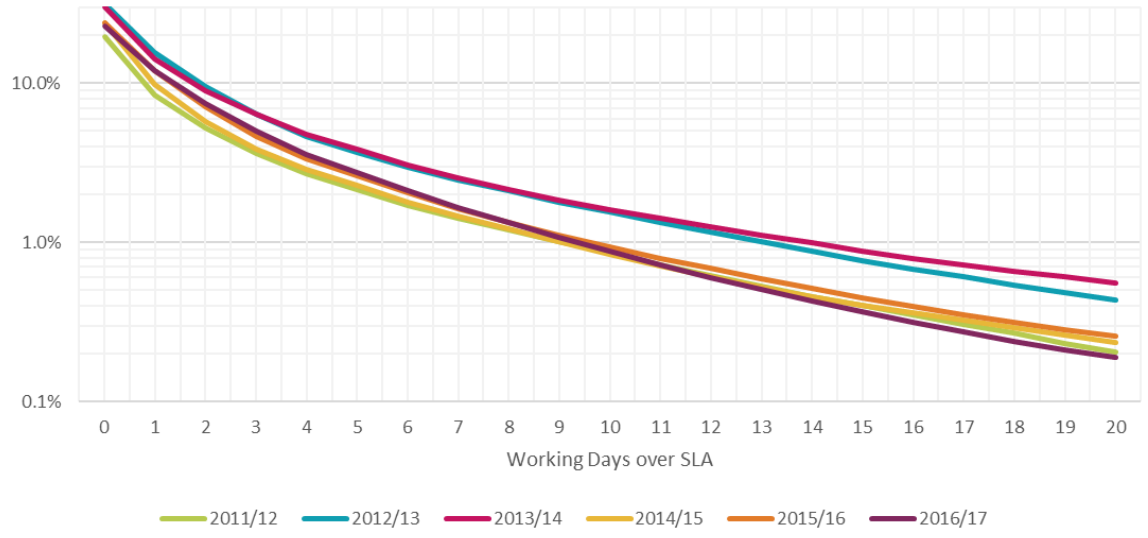
**Figure A1.62 UK SML1 fault repair over SLA distributions, by financial year**




*Source: Ofcom analysis of BT data*[512]

A1.91 Figure A1.63 shows the working days over SLA distribution for WLR, MPF and GEA-FTTC at SML2 per financial year, with 2012/13 and 2013/14 showing slightly worse performance than the remaining years.

**Figure A1.63 UK SML2 fault repair over SLA distributions, by financial year**




*Source: Ofcom analysis of BT data*[513]

[512] Data submitted in Openreach responses dated 5 and 7 March 2014 to the 6th FAMR QoS s.135 notice, Openreach response dated 25 May 2016 to the 2nd QoS s.135 notice, Openreach response dated 9 December 2016 to the 4th QoS s.135 notice, Openreach response dated 13 January 2017 to the 5th QoS s.135 notice and Openreach response dated 15 August to the 9th QoS s.135 notice.

[513] Data submitted in Openreach responses dated 5 and 7 March 2014 to the 6th FAMR QoS s.135 notice, Openreach response dated 25 May 2016 to the 2nd QoS s.135 notice, Openreach response dated 9 December 2016 to the 4th QoS s.135

## Other relevant repair issues

### *Force majeure* events

A1.92 *Force majeure* events[514] include, but are not limited to, extreme weather events and damage to the Openreach network by third parties, and have the potential to cause a fault repair to miss its SLA. In the 2014 FAMR, we decided to allow for two types of MBORC events (Local MBORCs[515] and High Level MBORCs[516]) when assessing compliance with the QoS standards.

A1.93 In the March 2017 QoS Consultation[517], we analysed the occurrences of MBORC events since the FAMR, calculating the proportion of fault repairs that exceeded SLA which were impacted by MBORCs (both Local and High Level), and observed a significant fall in this proportion after 2013/14.[518]

A1.94 Openreach has since provided us with the volume of MBORCs[519] within SLA and exceeding SLA for each region, service, and SML for 2016/17. The same analysis as described above was then performed to calculate the proportion of fault repairs that exceeded SLA which were impacted by MBORCs (both Local and High Level) for 2016/17, as shown in Table A1.64, which has remained at the same level as in 2015/16.

notice, Openreach response dated 13 January 2017 to the 5th QoS s.135 notice and Openreach response dated 15 August to the 9th QoS s.135 notice.

[514] These are often referred to as Matters Beyond Our (BT's) Reasonable Control, or MBORCs.

[515] Examples of Local MBORCs include criminal, intentional, or negligent damage to the network.

[516] Examples of High Level MBORCs include incidents affecting over 2,000 lines, incidents which are/are likely to become the subject of regional or national media interest, and anything likely to have a significant impact on the BT and/or Openreach brand.

[517] March 2017 QoS Consultation, paragraph A6.71.

[518] The decline we observe is due to a combination of poor weather in 2013/14 and benign weather since, as well as a strong effort on Openreach's behalf to improve their recovery response. As a result, MBORC declarations tend to be shorter.

[519] This refers to both Local and High Level MBORCs, although Local MBORCs within SLA were required to be calculated from those exceeding their SLA, based on an estimated factor provided by Openreach.

**Table A1.64 Proportion of fault repairs exceeding the SLA impacted by MBORCs**

| | 2013/14 | 2014/15 | 2015/16 | 2016/17 |
|---|---|---|---|---|
| **Total fault repairs[520]** | 3,621,914 | 3,699,788 | 3,883,471 | 3,958,207 |
| **Total fault repairs impacted by MBORC** | 536,015 | 131,468 | 135,622 | 171,391 |
| **% of fault repairs impacted by MBORC** | 14.8% | 3.6% | 3.5% | 4.3% |
| **Total fault repairs impacted by MBORC that missed SLA** | 291,679 | 56,769 | 62,737 | 65,196 |
| **% of fault repairs impacted by MBORC that missed SLA** | 54.4% | 43.2% | 46.3% | 38.0% |
| **% of fault repairs that missed SLA impacted by MBORC** | 8.1%[521] | 1.5% | 1.6% | 1.6% |

*Source: Ofcom analysis of BT data*[522]

A1.95 The standards imposed in the 2014 FAMR make allowances for High Level MBORCs in up to two regions per year within their compliance calculations. As we did in the March 2017 QoS Consultation[523], we have removed the High Level MBORCs exceeding the SLA in the two most impacted regions in the relevant years from the proportion of fault repairs exceeding the SLA impacted by MBORCs (bottom row of Table A1.65).

[520] These figures are different to the corresponding figures for total fault repairs in Table A6.47 in Annex 6 of the March 2017 QoS Consultation, due to more detailed information about GEA-FTTP fault repairs being available during the analysis. Where previously generic NGA fault repairs were being classified as GEA-FTTC fault repairs, now a number of these NGA fault repairs are able to be classified as GEA-FTTP fault repairs and hence are excluded from these volumes.
[521] This figure has been updated due to the above-mentioned increase in GEA-FTTP fault repair accuracy.
[522] We note that the percentage of fault repairs impacted by MBORC that missed the SLA calculated here for 2013/14 is larger than the corresponding calculation in the 2014 FAMR, due to the use of filtered volumes for total fault repairs. Data submitted in Openreach responses dated 5 and 7 March 2014 to the 6th FAMR QoS s.135 notice, Openreach response dated 25 May 2016 to the 2nd QoS s.135 notice, Openreach response dated 9 December 2016 to the 4th QoS s.135 notice, Openreach response dated 7 July 2017 to the 8th QoS s.135 notice and Openreach response dated 15 August to the 9th QoS s.135 notice.
[523] March 2017 QoS Consultation, paragraph A6.72.

**Table A1.65 Proportion of fault repairs exceeding the SLA impacted by MBORCs, excluding High Level MBORCs from the two most impacted regions**

| | 2013/14 | 2014/15 | 2015/16 | 2016/17 |
|---|---|---|---|---|
| **Total fault repairs[524]** | 3,621,914 | 3,699,788 | 3,883,471 | 3,958,207 |
| **Total fault repairs impacted by MBORC** | 322,239 | 95,218 | 85,097 | 111,676 |
| **% of fault repairs impacted by MBORC** | 8.9% | 2.6% | 2.2%[525] | 2.8% |
| **Total fault repairs impacted by MBORC that missed SLA** | 164,581 | 40,438 | 39,907 | 43,726 |
| **% of fault repairs impacted by MBORC that missed SLA** | 51.1% | 42.5% | 46.9% | 39.4% |
| **% of fault repairs that missed SLA impacted by MBORC** | 4.5% | 1.1% | 1.0% | 1.1% |

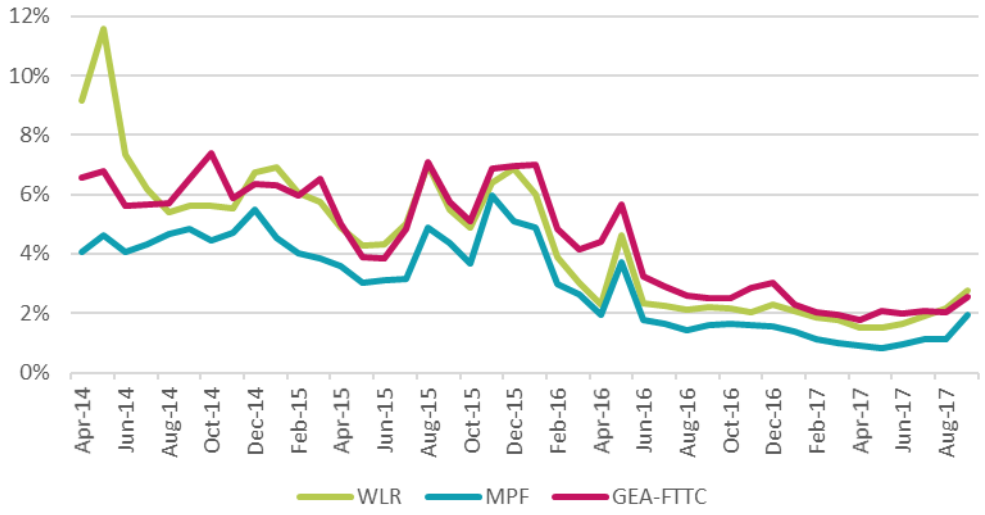
*Source: Ofcom analysis of BT data*[526]

### Missed repair appointments

A1.96 Our analysis indicates that, barring a rise in the second half of 2016, the proportions of WLR, MPF, and GEA-FTTC repair appointments missed by Openreach have remained on a general downward trend over the period shown in Figure A1.66.

[524] These figures are different to the corresponding figures for total fault repairs in Table A6.48 in Annex 6 of the March 2017 QoS Consultation, due to the above-mentioned increase in GEA-FTTP fault repair accuracy.
[525] This corresponding figure in Table A6.48 in Annex 6 of the March 2017 QoS Consultation was erroneously specified.
[526] Data submitted in Openreach responses dated 5 and 7 March 2014 to the 6th FAMR QoS s.135 notice, Openreach response dated 25 May 2016 to the 2nd QoS s.135 notice, Openreach response dated 9 December 2016 to the 4th QoS s.135 notice, Openreach response dated 7 July 2017 to the 8th QoS s.135 notice and Openreach response dated 15 August to the 9th QoS s.135 notice.

**Figure A1.66 UK WLR, MPF and GEA-FTTC repair appointments missed by Openreach (%)**




*Source: Ofcom analysis of BT data*[527]

## Assessment

A1.97 Our analysis in the 2014 FAMR indicated that Openreach's installation order and fault repair performance deteriorated between April 2008 and May 2013. The KPIs provided by Openreach since show that it has met the three QoS standards for WLR and MPF set by the 2014 FAMR in the first three years of the control for appointment availability and on time completion, and the first two years of the control for the on time repair standards. Openreach is also currently achieving the modified repair standards at SMLs 1 and 2.

A1.98 Average installation time for WLR, MPF and GEA-FTTC over the FAMR period has been fairly stable, although WLR showed a few months of quicker average installation times[528] and GEA-FTTP performance has been more variable. Similarly, average time to restore service for WLR, MPF and GEA-FTTC has held fairly constant since the FAMR with exceptions of a single month of longer average restoration time for WLR SML1 and the more varying GEA-FTTP.[529] ATTR for this service has significantly increased over the review period from around 22 working hours to 43 working hours.

A1.99 With respect to the tails in engineer appointment availability, we observe that FADs offered beyond 12 working days have tended to peak in periods of bad weather and have then subsequently returned to more normal levels. This would suggest that Openreach is now better able to flex its resources to prioritise repairs over installations when the fault intake is far greater than normal whilst at the same time ensuring that its installation queue does not get out of control. In relation to fault repairs, we observe that the average daily volumes of WLR and MPF repairs resolved beyond SLA are now lower than they were

[527] Data submitted in Openreach response dated 5 February 2016 to the 1st QoS s.135 notice and updated 21 March 2017 and Openreach response dated 3 November 2017 to the 12th QoS s.135 notice.
[528] As noted above, this was due to significant volumes of non-appointed installation orders with quicker lead times.
[529] As noted above, this is likely to be due to early life issues during the introduction of GEA-FTTP.

in August 2014. That said, the average daily volumes of late installations have risen over the FAMR period, particularly for WLR.

# A2. Forecast fault rates

## Introduction

A2.1 Poor reliability (a high rate of faults) has the potential to lead to material customer detriment for several reasons. Firstly, network reliability affects customers' experience of broadband and voice services. Secondly, it is a significant factor in the costs to telecoms providers delivering these services, and therefore the prices customers pay. Thirdly, faults also give rise to increased network maintenance costs because, when faults occur, Openreach must expend engineering resources to resolve them. Again, this can ultimately affect prices for consumers.

A2.2 A forecast of fault rates over the period of the market review is therefore both an important consideration when setting regulated charges, as we are doing for MPF Service Maintenance Level 1 (SML1) and GEA 40/10 services, and when setting standards for quality of service.

A2.3 In the March 2017 QoS Consultation we considered the fault rates for Openreach services used to provide voice and broadband, to develop a forecast for our proposed charge controls (as set out in the 2017 WLA Consultation Annexes 11 and 12), starting from a base year of 2015/16.[530] [531] In the September 2017 QoS Further Consultation, we incorporated the latest details of the fault reductions that Openreach expected to achieve based on their programme of fault prevention work (the 'Fault Volume Reduction' or 'FVR' programme).[532]

A2.4 This process began by identifying the fault rates for WLR and for WLA services (MPF, SMPF and GEA-FTTC).[533] We then looked at fault trends and took account of Openreach's FVR programme to develop a forecast of fault rates over the market review period. These forecast fault rates were used as inputs to our cost modelling.

A2.5 In this annex we outline our March 2017 QoS Consultation and September 2017 QoS Further Consultation fault rate forecasting methodologies, and set out our decisions on the final methodology. We then consider the fault rates for Openreach services using an updated base year of 2016/17, setting out our revised proposals for our forecast of Openreach's network fault rates over the period to 2020/21.

## Summary of Decisions

A2.6 We have assessed the fault rate of overlay services as the difference between the combined service fault rate (for example for WLR+SMPF) and the bearer service on its own

[530] March 2017 QoS Consultation, pages 146 to 158.
[531] Ofcom, 2017. *Wholesale Local Access Market Review – Consultation on the proposed market, market power determinations and remedies*, pages 81 to 160. https://www.ofcom.org.uk/__data/assets/pdf_file/0035/99638/Annexes1-19.pdf.
[532] September 2017 QoS Further Consultation, pages 41 to 50.
[533] Certain costs are common between MPF and SMPF (which are services in the WLA market) and WLR (which is in the Wholesale Fixed Analogue Exchange Lines market). To enable us to allocate these costs correctly, we need to forecast WLR and SMPF fault rates, even though we only propose to charge control MPF SML1 and GEA 40/10 services. In addition, GEA services may be provided over either MPF or WLR bearer services, and may exhibit differing fault rates on each bearer.

(WLR), i.e. the fault rate for SMPF is WLR+SMPF fault rate minus the WLR fault rate. This is consistent with the approach we adopted in the 2014 FAMR.

A2.7 We have decided to split faults into those related to the performance of services immediately after installation and those related to in-life performance to assess the trends in fault rates in more detail. This provides greater insight into the fault performance of GEA-FTTC where the volumes are growing rapidly.

A2.8 Our analysis shows that the WLR and MPF fault rates have not changed significantly in recent years. Therefore, without any change in approach to network reliability by Openreach, we would expect them to remain flat. We find that the fault rates for GEA-FTTC provided over both WLR and MPF are falling, albeit from a high base.

A2.9 In the March 2017 QoS Consultation, we incorporated Openreach's investment in Fault Volume Reduction (the FVR programme) into our forecasts. We proposed that the benefits of this programme would be a reduction in faults of [✂]% (22% to 25%).

A2.10 Following Openreach's response to our March 2017 QoS Consultation, in the September 2017 QoS Further Consultation we incorporated the latest view of Openreach's FVR programme. We proposed that the benefits of this programme would be a reduction in faults of [✂]% (15% to 18%).

A2.11 We have decided that the revised methodology from September remains appropriate. Consistent with our approach to charge control modelling we have updated the base year of our analysis to 2016/17, which includes the effects of the first year of Openreach's FVR programme. Our forecast for the benefits of the remainder of the FVR programme to 2020/21 is a reduction in faults of [✂]% (14% to 17%).

A2.12 The forecast fault rates of Openreach's services that result from this analysis are as set out in Table A2.1 below.

A2.13 Our forecast shows that the fault rates for all services will decrease over the market review period. There will be enduring differences between services due to the number of connections (jumpers) used, and the speed of data transmission that they offer. We expect the benefit of reducing fault rates to be partially offset by the growth in high speed broadband services, which have relatively high fault rates, leading to overall fault volumes decreasing by [✂]% (11% to 12%) in 2020/21 compared to 2016/17.

**Table A2.1 Ofcom forecast of overall fault rates for combined services including the effect of Openreach's FVR programme**

| | Base Year 2016/2017 | Year 1 2018/2019 | Year 2 2019/2020 | Year 3 2020/2021 |
|---|---|---|---|---|
| **WLR** | 8.0% | [✂]% (7% - 8%) | [✂]% (7% - 8%) | [✂]% (6% - 7%) |
| **MPF** | 11.1% | [✂]% (10% - 11%) | [✂]% (9% - 10%) | [✂]% (9% - 10%) |
| **WLR+SMPF** | 12.4% | [✂]% (11% - 12%) | [✂]% (10% - 11%) | [✂]% (10% - 11%) |
| **WLR+GEA-FTTC** | 14.1% | [✂]% (12% - 13%) | [✂]% (11% - 12%) | [✂]% (11% - 12%) |
| **MPF+GEA-FTTC** | 15.1% | [✂]% (13% - 14%) | [✂]% (12% - 13%) | [✂]% (11% - 12%) |

*Source: Ofcom analysis of BT data*[534]

# Fault Rate Forecasting Methodology

## Our proposed methodology used in the March 2017 QoS Consultation

A2.14 To derive the fault rates applicable to repair in the March 2017 QoS Consultation, we obtained and analysed an extended version of the Openreach data set of fault repairs, including line biography[535], that we first collected and analysed as part of the FAMR 2014. This data set covered the period April 2011 to March 2016.

A2.15 The faults included in this data set are identified by what Openreach terms "repair clear code". In our proposed methodology we only included clear codes we considered relevant for the purposes of our proposed charge control as shown in Table A2.2 below.[536]

[534] Data submitted in Openreach responses dated 5 March and 7 March 2014 to the 6th FAMR QoS s.135 notice, Openreach response dated 4 July 2016 to the 2nd QoS s.135 notice, Openreach responses dated 9 June and 19 June 2017 to the 7th QoS s.135 notice, Openreach response dated 15 August 2017 to the 9th QoS s.135 notice and Openreach responses dated 8 September, 13 September, 27 September, 28 September, 3 October, 4 October, 3 November and 6 November 2017, and 9 January, 23 January and 31 January 2018 to the 34th WLA CC s.135 notice.

[535] The line biography is a record for each line over time that identifies which services were using the copper line during which period.

[536] We have not included clear codes 152 and 172. Clear code 152 means right when tested (Excluding Public / Managed Payphone) visited by field staff, as these costs should be recovered through Time Related Charges. Clear code 172 means right when tested (Excluding Public / Managed Payphone) not visited, which should not result in field engineering costs.

**Table A2.2 Fault repairs identified by clear code included in charge control fault rates**

| High-Level Clear Code | Description |
|---|---|
| 4 | Main Distribution Frame |
| 5 | Exchange Equipment |
| 7 | Customer Apparatus and Line |
| 20 | OCR[537] Fibre |
| 21 | VDSL[538] Cable Harness |
| 22 | DSLAM[539] mains power repair |
| 23 | FTTC proactive repair (FTTC Cabinet) |
| 24 | FTTC proactive repair |
| 51 | Fault Not Found (FNF) Local Line |
| 60 | Internal Cabling and Accessories |
| 81 | Underground (Exchange side) |
| 82 | Underground (Distribution side) |
| 83 | Fibre and Radio in the Access Network |

*Source: Openreach*[540]

A2.16 In the 2014 FAMR, we concluded that the fault rates for individual services could not be derived accurately from the fault records created by Openreach, and found within the above-mentioned data set, when the fault was reported.[541] Where services are provided in combination, for example WLR+SMPF, the fault may be inaccurately allocated to either service. Consequently, we followed the same approach that we used in the 2014 FAMR, which is to assume the difference in fault rates (between combined services and standalone services) gives the fault rate for the overlay service (i.e. WLR+SMPF minus WLR gives SMPF).

A2.17 We used this approach in the March 2017 QoS Consultation where we derived the 2015/16 overall fault rates for individual services by subtracting the WLR and MPF only overall fault rates from the combined services to obtain fault rates for SMPF and GEA-FTTC services. These are set out in Table A2.3 below.[542]

[537] OCR stands for Optical Consolidation Rack.
[538] VDSL stands for Very-high-bit-rate Digital Subscriber Line.
[539] DSLAM stands for Digital Subscriber Line Access Multiplexer.
[540] Data submitted by BT response dated 15 August 2017 to the 9th QoS s.135 notice
[541] Telecoms providers may use combinations of Openreach's wholesale services to provide voice and broadband services (for example, superfast broadband can be delivered using two Openreach services – the copper line (WLR or MPF) and fibre to the street cabinet (GEA-FTTC)).
[542] The average of the two subtractions (WLR+GEA-FTTC) – WLR = 5.1% and (MPF+GEA-FTTC) – MPF = 4.4% was used for the GEA-FTTC value.

**Table A2.3 Overall fault rates (individual services) for 2015/16**

| Individual Services | Percentage lines faulty per year |
|---|---|
| **WLR** | 8.3% |
| **MPF** | 11.2% |
| **SMPF** | 3.7% |
| **GEA-FTTC** | 4.8% |

*Source: Ofcom analysis of BT data*[543]

A2.18 From these overall fault rates for individual services for the then base year, 2015/16, we derived an appropriate fault rate forecast by considering an appropriate fault rate trend and what adjustments may need to be made for later years.

### How we derived an appropriate fault rate forecast

A2.19 In the March 2017 QoS Consultation we explained that the total volume of faults in a period can be expressed as the sum of:

- the volume of faults that occur on newly installed services within 28 days of installation, known as early life failures (ELFs), which equal the product of the number of new connections in the period and the early life failure rate (ELFR)[544]; and
- the volume of faults that occur on a service after it has been in service for more than 28 days, known as in life faults (ILFs), which equal the product of the number of line rentals[545] and the in life fault rate (ILFR)[546] per year.

A2.20 To forecast likely longer-term trends in overall fault rates (OFRs) we considered the relative contributions from ILF and ELF rates to overall fault rates. This enabled us to assess the extent to which trends in both these types of faults could significantly affect future overall fault rates. To understand the relative contributions of ILFR versus ELFR, we used the following equation for the overall fault rate:

$$OFR = ILFR + PNC \times ELFR$$

where PNC is the Percentage of New Connections and is equal to the number of new connections divided by the number of line rentals.

[543] Based on information in Table A5.3 of the March 2017 QoS Consultation. Data submitted in Openreach responses dated 5 March and 7 March 2014 to the 6th FAMR QoS s.135 notice and Openreach response dated 4 July 2016 to the 2nd QoS s.135 notice.

[544] The ELFR, when calculated annually, is the annual volume of faults occurring within 28 days since a provisioning activity, divided by the estimated total number of provisioning activities in a year. The provisioning activities in a given week are estimated to be a quarter of the weekly early life line rentals (i.e. services up to 28 days old at the point of measurement).

[545] This is also known as working system size (WSS).

[546] The ILFR, when calculated annually, is the annual volume of faults occurring after 28 days have elapsed since a provisioning activity divided by the average weekly in life line rentals in a year.

A2.21 We assessed the varying trends for the historical OFRs, ILFRs, and ELFRs for the combined services.[547] We then set out the forecast PNC for the individual services, i.e. the forecast number of new connections divided by the forecast number of line rentals.[548] This showed, for the WLR, MPF and WLR+SMPF individual services, limited variation over the forecast period 2016/17 to 2020/21, as we had expected for mature services. For the GEA-FTTC individual service, this showed a significant fall, as we would expect for a service with an installed base that had grown rapidly and is now maturing.

A2.22 This led to our views on overall fault rate trends for both copper and fibre services.

### Our views on trends for WLR, WLR+SMPF and MPF

A2.23 In the March 2017 QoS Consultation we said that, absent Openreach's plans for investment in fault reduction, we would not expect the overall fault rates and the relative contribution of the ILFR and ELFR for the individual WLR, MPF and SMPF services (and their combinations) to change substantially over the period of the market review.

### Our views on trends for WLR+GEA-FTTC and MPF+GEA-FTTC

A2.24 For the GEA-FTTC services we observed significant reductions in the OFRs and ILFRs, a flat ELFR trend for MPF+GEA-FTTC in the previous three years following an initial significant increase, while the ELFR for WLR+GEA-FTTC was fluctuating within a narrow range. Consequently, absent consideration of Openreach's plans for investment in fault reduction, we considered that OFRs for WLR+GEA-FTTC and MPF+GEA-FTTC combined services would continue to reduce in the future.

### Fault volume reduction programme

A2.25 We recognised that a key consideration in relation to fault rate forecasts is Openreach's proposed FVR programme, which aims to reduce the volume of faults arising on copper lines through:

- [✂];
- [✂];
- [✂];
- [✂]; and
- [✂].

A2.26 We factored the expected fault rate reductions attributable to Openreach's FVR programme, shown in Table A2.4 below, into our forecast fault rates, as described in the following subsections.

[547] This is shown in Figures A6.29 to A6.31 of the March 2017 QoS Consultation.
[548] This is shown in Figure A5.1 of the March 2017 QoS Consultation.

**Table A2.4 Expected fault rate reductions attributable to Openreach's FVR programme (all services) which we factored into our forecast fault rates**

| Charge control period | 15/16 | 16/17 | 17/18 | First Year 18/19 | Second Year 19/20 | Third Year 20/21 | 21/22 | 22/23 | 23/24 |
|---|---|---|---|---|---|---|---|---|---|
| **Overall fault rate (faults per annum per 1000 lines)** | 110 | [✂] | [✂] | [✂] | [✂] | [✂] | [✂] | [✂] | [✂] |
| **Percentage reduction relative to base year** | Base Year | | | [✂]% | [✂]% | [✂]% | | | |

*Source: Ofcom analysis of BT data*[549]

### Forecast fault rates for WLR, MPF and SMPF, including FVR

A2.27 Absent consideration of Openreach's planned network investment programme, we expected no substantial change in the future WLR, MPF and WLR+SMPF fault rates. However, with Openreach's FVR programme being a specific intervention to reduce fault volumes and rates for the copper lines, we believed it reasonable to assume that it would reduce the future WLR, MPF and WLR+SMPF fault rates as shown in Table A2.4 above.

A2.28 Therefore, we expected the overall fault rates for WLR, MPF and WLR+SMPF to reduce each year in the charge control relative to the then base year fault rate (2015/16) by the percentages shown in Table A2.4 above, with the resulting proposed fault rates set out in Table A2.5 below.

[549] March 2017 QoS Consultation, Table A5.4.

**Table A2.5 Ofcom forecast of fault rates for combined services over period of charge control including Ofcom interpretation of effects of FVR programme**

| | Base Year 2015/2016 | Year 1 2018/2019 | Year 2 2019/2020 | Year 3 2020/2021 |
|---|---|---|---|---|
| **WLR** | 8.3% | [✂]% | [✂]% | [✂]% |
| **MPF** | 11.2% | [✂]% | [✂]% | [✂]% |
| **WLR+SMPF** | 12.0% | [✂]% | [✂]% | [✂]% |
| **SMPF** | 3.7% | [✂]% | [✂]% | [✂]% |

*Source: Ofcom analysis of BT data*[550]

### Forecast fault rates for GEA-FTTC

A2.29 Having recognised that the overall fault rates for the WLR+GEA-FTTC and MPF+GEA-FTTC combined services were likely to continue to fall, we determined the likely extent of this fall by first considering the network components involved in the delivery of GEA-FTTC services and their likely fault rates based on the results for other, more mature services. We also considered the contributions of the ELFR and ILFR to the overall fault rate, and their impact on our forecasts. We then considered how the measured GEA-FTTC service fault rates we obtained aligned with our expectations, explaining our choice of proposed overall fault rates where applicable.

A2.30 We derived the fault rates for various copper and PCP components for the then base year, 2015/16, when used to deliver the three mature services, i.e. WLR, MPF and WLR+SMPF. These were used to derive an expected fault rate for a network component, where we considered both the MPF and WLR+SMPF fault rates for a network component carrying broadband signals, compared to the WLR fault rates for a network component carrying just narrowband voice and/or line test signals.

A2.31 After analysing each network component and forming an expected fault rate value/range, we then compared these to the measured fault rates for each network component at the then base year: 2015/16. As noted above, absent any intervention, we expected these measured fault rates to remain stable over the market review period for WLR, MPF and SMPF. However, we did not consider it appropriate to select the measured GEA-FTTC related fault rates as the long-term rates, as we believed the relatively high fault rates observed were due to protracted introduction problems.

A2.32 We therefore considered it reasonable and proportionate to select fault rates for the key components of the GEA-FTTC services for the final year of the charge control using our estimates based on measured fault rates of mature services and those directly measured GEA-FTTC service fault rates that we considered representative of the longer-term fault rates.

[550] March 2017 QoS Consultation, Table A5.5. Data submitted in Openreach responses dated 5 March and 7 March 2014 to the 6th FAMR QoS s.135 notice and Openreach response dated 4 July 2016 to the 2nd QoS s.135 notice.

A2.33 We proposed that the fault rates for the intervening years between the then base year, 2015/16, and the final year of the charge control follow a linear glide path.

A2.34 We believed Openreach's FVR programme would, in addition to the reductions applied to arrive at the long-term fault rates, yield further reductions to the GEA-FTTC service fault rates for most network components. However, we did not believe that FVR would produce a reduction in the largely electronic and physical cabinet based GEA-FTTC equipment fault rate of [✂]%, thus we only applied the FVR programme reductions to the overall GEA-FTTC fault rate minus the FTTC equipment fault rate.

A2.35 We separated out the key constituents of the WLR+GEA-FTTC and MPF+GEA-FTTC services by subtracting the derived WLR and MPF fault rates, and then subtracting the calculated FTTC equipment fault rate to produce WLR and MPF adjustment factors. We concluded, as shown in Table A2.6 below, that by the end of the market review forward look period the GEA-FTTC service will lead to 3.4% additional faults per annum when provided over WLR, and 1.6% additional faults per annum when provided over MPF.

**Table A2.6 Proposed glide path for GEA-FTTC service fault rates including application of FVR programme**

| | Base Year 2015/2016 | Year 1 2018/2019 | Year 2 2019/2020 | Year 3 2020/2021 |
|---|---|---|---|---|
| **WLR+GEA-FTTC** | 13.3% | [✂]% | [✂]% | [✂]% |
| **MPF+GEA-FTTC** | 15.6% | [✂]% | [✂]% | [✂]% |
| **WLR** | 8.3% | [✂]% | [✂]% | [✂]% |
| **MPF** | 11.2% | [✂]% | [✂]% | [✂]% |
| **FTTC equipment** | 1.0% | [✂]% | [✂]% | [✂]% |
| **WLR addition** | 4.0% | [✂]% | [✂]% | [✂]% |
| **MPF addition** | 3.4% | [✂]% | [✂]% | [✂]% |

*Source: Ofcom analysis of BT data*[551]

## Our revised methodology used in the September 2017 QoS Further Consultation

### Further evidence concerning Openreach's FVR programme

A2.36 In its response to our March 2017 QoS Consultation, Openreach agreed with the principle of taking account of expected reductions in faults arising from the FVR programme. However, Openreach did not agree with our forecast for two main reasons:

[551] March 2017 QoS Consultation, Table A5.12. Data submitted in Openreach responses dated 5 March and 7 March 2014 to the 6th FAMR QoS s.135 notice and Openreach response dated 4 July 2016 to the 2nd QoS s.135 notice.

a) It said that its own forecast of network fault rates out to 2020/21, taking recent Openreach decisions and Openreach's observation of fault trends into account, was significantly higher than the Ofcom forecast; and

b) It said that the Ofcom forecast was largely based on an aspirational plan for fault reduction (which Openreach shared with Ofcom in July 2016) but not its actual FVR plan.

A2.37 Openreach additionally set out what it termed "13 key challenges" arising from its learnings from investment in network health relating to both practical issues with deploying significant resources and factors driving up faults which reduce the net benefits it can deliver through proactive network investment.[552]

A2.38 As outlined in the September 2017 QoS Further Consultation, we carefully reviewed Openreach's consultation response, as well as communications and information obtained under our statutory information gathering powers about Openreach's FVR plans prior to the publication of our March 2017 QoS Consultation.[553]

A2.39 We concluded that our proposed fault rate forecast in our March 2017 QoS Consultation did not correctly reflect Openreach's actual FVR programme.[554] Consequently, we proposed to modify our March 2017 fault rate forecast proposals, on the basis summarised below.

A2.40 Note that we maintained the forecast fault rates absent any adjustment for FVR from the March 2017 QoS Consultation, with the focus of the September 2017 QoS Further Consultation being on our assessment of Openreach's FVR programme itself.

### Assessment of Openreach's actual FVR plan

A2.41 In assessing Openreach's actual FVR plan[555], we found that its format is different from the one we used to inform our forecasts in the March 2017 QoS Consultation, and required a more detailed assessment before it could be applied to forecast fault rates for WLR, MPF and SMPF, and separately GEA-FTTC.[556]

A2.42 Openreach's methodology involves generating a "no investment" scenario, taking the previous year's total faults (not split by service) and adding an assessment of the increase in faults from the impact of higher bandwidth services being used on the network and of specific network interventions[557], and an underlying deterioration of the network if there is no investment. This no investment scenario is then amended to account for the gross impact of its FVR plan.

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[552] Openreach response to the March 2017 QoS Consultation, paragraphs 104 to 128.
[553] September 2017 QoS Further Consultation, Section 5, pages 41 to 50.
[554] There were a number of contributory causes for this, including a coincidence that Openreach's actual investment in 2016/17 happened to be the same as that for the same period in its aspirational plan.
[555] This is documented in an Excel workbook called WLA 7 QoS A1.xls and the worksheet entitled "Latest View", which was submitted as part of Openreach's response dated 9 June 2017 to the 7th QoS s.135 notice.
[556] Openreach confirmed that it does not forecast fault rates by service, but instead looks at network faults in aggregate.
[557] For example, preparatory work for the rollout of G.fast which is a technology that provides higher bandwidth broadband.

A2.43 The cumulative effect of this methodology gives Openreach's planned level of faults for the network over the market review period and beyond.

A2.44 We compared Openreach's methodology to our own from the March 2017 QoS Consultation. Our analysis was based on fault rates by service, as it was used to inform our charge control modelling. It was therefore necessary to convert Openreach's aggregated analysis into an assessment of the percentage impact of FVR on the fault rates of relevant services.

A2.45 Our starting point was to convert our fault rate forecasts for relevant services (proposed in March 2017) to an aggregated analysis to allow direct comparison between the two methodologies. To do this we took our forecast fault rates for each service[558], and multiplied them by our service volume forecast to derive total fault volumes for all relevant services.

A2.46 We then forecast movements in the total number of relevant faults resulting from:

a) a [✂] due to a [✂] in the number of relevant services supplied[559];

b) an increase due to the higher proportion of GEA-FTTC services, which have an inherently higher fault rate than MPF and SMPF broadband, and WLR voice only services;

c) a decrease due to our assessment that, over time, the GEA-FTTC fault rate should improve as the service matures; and

d) a decrease due to our assessment of the effects of Openreach's FVR plan.

A2.47 These cumulative effects of volume and service mix changes, maturing services and FVR gave the total level of faults for 2020/21 derived from our modelling.

A2.48 Setting out the two methods in the same format allowed us to see that the key methodological difference was that Openreach does not identify a reduction in faults as its GEA-FTTC services mature. We assumed that this effect had been incorporated into Openreach's gross effects of FVR.

A2.49 Therefore, we derived the implied net effect of FVR in Openreach's plan through the following calculation[560]:

Net Effect of FVR (Openreach) = Gross impact of FVR – Benefits of maturing services (Ofcom) – Deterioration without FVR

A2.50 This 'Net Effect of FVR' was the reduction in the volume of faults that we expect Openreach's latest plan to deliver. We converted this to a percentage by dividing it by the fault volume in our then base year (2015/16).

[558] We had already discounted faults which were not relevant for the purposes of our proposed charge control.
[559] i.e. [✂] volumes of services will lead to [✂] volumes of faults.
[560] Note that a correction to this calculation, which was published in paragraph 5.27 of our September 2017 QoS Further Consultation, was published on 12 December 2017: Ofcom, 2017. *Further clarifications on the Ofcom Resource Performance Model*, pages 3 to 4. https://www.ofcom.org.uk/__data/assets/pdf_file/0020/108704/wla-qos-clarification-note.pdf.

A2.51 As a result, we reduced our forecast for the benefits of FVR by reducing the fault rate in 2020/21 from [✂]% (22% to 25%) in our March 2017 QoS Consultation to [✂]% (15% to 18%) in our September 2017 QoS Further Consultation.

A2.52 This change to our proposal meant that, compared to the forecast in our March 2017 QoS Consultation, we did not expect faults to reduce as much, although we still expected the rate of faults to decrease substantially.

### Our September 2017 revised fault rate forecast including our interpretation of the effects of Openreach's latest FVR plans

A2.53 We updated our forecast fault rate proposals to ensure they correctly reflected Openreach's latest FVR plan.[561] These are set out in Table A2.7 below, including our proposed forecast glidepaths.

**Table A2.7 Ofcom forecast of fault rates for copper and GEA-FTTC services over the period of the charge control using Openreach's actual FVR plan and our interpretation of its effects**

| | Base Year 2015/2016 | Year 1 2018/2019 | Year 2 2019/2020 | Year 3 2020/2021 |
|---|---|---|---|---|
| **WLR** | 8.3% | [✂]% | [✂]% | [✂]% |
| **MPF** | 11.2% | [✂]% | [✂]% | [✂]% |
| **WLR+SMPF** | 12.0% | [✂]% | [✂]% | [✂]% |
| **SMPF** | 3.7% | [✂]% | [✂]% | [✂]% |
| **WLR+GEA-FTTC** | 13.3% | [✂]% | [✂]% | [✂]% |
| **MPF+GEA-FTTC** | 15.6% | [✂]% | [✂]% | [✂]% |

*Source: Ofcom analysis of BT data*[562]

## Stakeholder comments

A2.54 In our March 2017 QoS Consultation we asked stakeholders if they agreed with our fault rate forecast proposals[563], and in our September 2017 QoS Further Consultation where we revised these proposals we asked stakeholders if they agreed with our modified forecast proposals.[564] We outline stakeholder's responses to both consultations in Section 4.

## Considerations and decisions regarding our methodology

A2.55 For the revised forecasting analysis in this annex, the data set used in the March 2017 QoS Consultation and the September 2017 QoS Further Consultation was extended to cover the

[561] The details of which we confirmed using our statutory information gathering powers.
[562] September 2017 QoS Further Consultation, Table 5.7 Data submitted in Openreach responses dated 5 March and 7 March 2014 to the 6th FAMR QoS s.135 notice, Openreach response dated 4 July 2016 to the 2nd QoS s.135 notice and Openreach responses dated 9 June and 19 June 2017 to the 7th QoS s.135 notice.
[563] March 2017 QoS Consultation, Section 4, Question 4.2.
[564] September 2017 QoS Further Consultation, Section 5, Question 5.1.

period to June 2017. This has allowed us to update to a new base year of 2016/17, consistent with our charge control modelling.

A2.56 This means that the first year of Openreach's FVR programme (2016/17) is already incorporated within our forecasts with the update of the base year to 2016/17 – i.e. we consider the difference in measured fault rates from 2015/16 to 2016/17 to be due to, in part at least, the effect of Openreach's FVR programme. Consequently, we apply only the remaining years of Openreach's FVR programme to our forecast fault rates.[565]

A2.57 We have updated the analysis we performed in the March 2017 QoS Consultation to determine the fault rate forecasts absent Openreach's FVR programme using the base year 2016/17. We have applied the effect of Openreach's FVR programme using the same method as was used in the September 2017 QoS Further Consultation, resulting in revised forecasts.

# Revised fault rate forecasts

## Fault Rate Trends

A2.58 Following the methodology that we used in the March 2017 QoS Consultation, to forecast likely long-term trends in the overall fault rates we have considered the relative contributions from ILFR and ELFR to overall fault rates. We have also considered DoA failure rates which, as a subset of the ELFR, conveys the rate of failure of faults reported within eight days of a provisioning activity. This enables us to assess the extent to which the trends in these types of faults could significantly affect future overall fault rates.

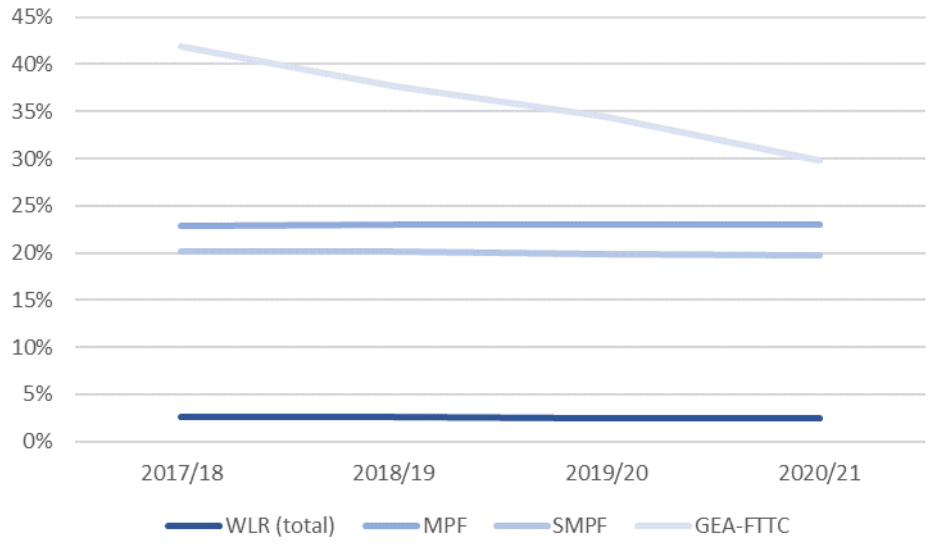
A2.59 Figures A1.30, A1.32, A1.40, and A1.49 show the trends for the historical annual overall fault rates, DoA fault rates, ELFRs, and ILFRs for the combined services. We note the following trends:

- Overall Fault Rates: WLR and MPF only are broadly flat, while the recent trend for WLR+SMPF is flat although there has been a slight increase in the annual fault rate over the last five years. There is a significant decrease in both MPF+GEA-FTTC and WLR+GEA-FTTC, although the latter has a slight increase in the latest financial year;
- DoA Failures: WLR has been broadly stable, while MPF and WLR+SMPF have increased slightly over the period, and WLR+GEA-FTTC varies within a narrow range. MPF+GEA-FTTC shows an increased DoA fault rate over the period.
- ELFs: WLR and MPF vary within a narrow range over the period, while WLR simultaneously provided with SMPF shows a slight increase over the period, and WLR+GEA-FTTC shows a decrease in the latest financial year. MPF+GEA-FTTC shows an increased ELFR over the period, more than doubling from 2011/12; and
- ILFs: as with the overall fault rates, the ILFRs for WLR and MPF are broadly flat, WLR+SMPF shows a slight rise, and MPF+GEA-FTTC and WLR+GEA-FTTC show a sharp decline, although the latter shows a slight rise in the latest financial year.

[565] i.e. the years 2017/18 to 2020/21.

A2.60 Our forecast PNC[566], shown for the individual services in Figure A2.8 below, for GEA-FTTC shows a significant fall, as we would expect for a service with an installed base that has grown rapidly and is now maturing.

**Figure A2.8 Forecast new connections as percentage of installed base (PNC or percentage of new connections)**




*Source: Ofcom analysis of BT data*[567]

### Our views on trends for WLR, WLR+SMPF and MPF

A2.61 Our views on the trends for the individual WLR, MPF and SMPF services in the March 2017 QoS Consultation were that the overall fault rates, absent Openreach's FVR programme, would not substantially change over the period of the market review. When comparing this view with the measured overall fault rates in 2016/17, as shown in Table A2.9 below, we observe that WLR and MPF have remained steady as we had expected, and although the annual overall fault rate for WLR+SMPF has increased slightly, the current trend is flat.

[566] i.e. The forecast number of new connections divided by the forecast number of line rentals.
[567] Data submitted in Openreach responses dated 8 September, 13 September, 27 September, 28 September, 3 October, 4 October, 3 November and 6 November 2017, and 9 January, 23 January and 31 January 2018 to the 34th WLA s.135 notice.

**Table A2.9 Measured overall fault rates for WLR, MPF and WLR+SMPF services, in 2015/16 and 2016/17**

| | 2015/2016 | 2016/2017 |
|---|---|---|
| **WLR** | 8.3% | 8.0% |
| **MPF** | 11.2% | 11.1% |
| **WLR+SMPF** | 12.0% | 12.4% |

*Source: Ofcom analysis of BT data*[568]

A2.62 Our forecast percentage of new connections for the services in Figure A2.8 above shows no variation over the forecast period 2017/18 to 2020/21, as we would expect for mature services.

A2.63 Consequently, absent Openreach's plans for investment in fault reduction, we consider that overall fault rates and the relative contribution of the in life and early life failure rates for these services (and their combinations) would not substantially change over the period of the market review.

### Our views on trends for WLR+GEA-FTTC and MPF+GEA-FTTC

A2.64 Our views on the trends for MPF+GEA-FTTC and WLR+GEA-FTTC services in the March 2017 QoS Consultation were that the overall fault rates would continue to reduce over the period of the market review. When comparing this view with the measured overall fault rates in 2016/17, we observe that MPF+GEA-FTTC has decreased as we had expected, although WLR+GEA-FTTC has increased slightly.

**Table A2.10 Measured overall fault rates for MPF+GEA-FTTC and WLR+GEA-FTTC services**

| | 2015/2016 | 2016/2017 |
|---|---|---|
| **WLR+GEA-FTTC** | 13.3% | 14.1% |
| **MPF+GEA-FTTC** | 15.6% | 15.1% |

*Source: Ofcom analysis of Openreach data*[569]

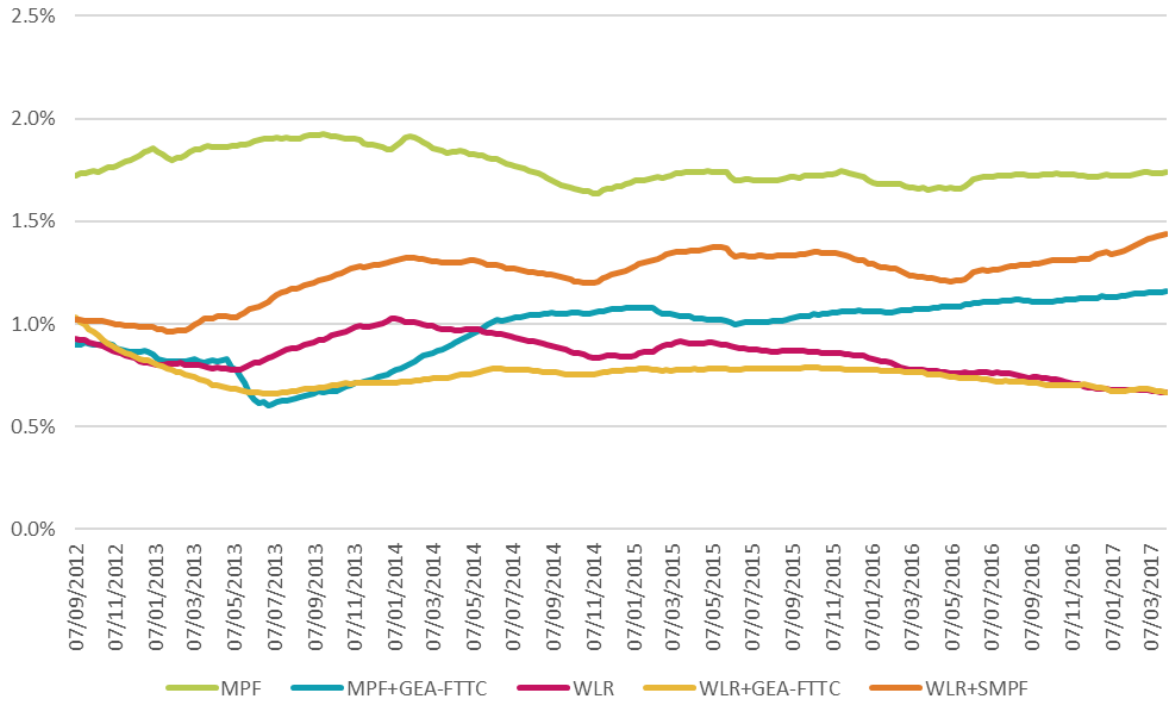
A2.65 In Figure A1.49, we observe a significant reduction in the in life fault rates. The early life failure rate trend, shown in Figure A1.40, for MPF+GEA-FTTC has risen over the last four years following an initial significant increase, while the WLR+GEA-FTTC rate fluctuates within a narrow range. This is also true for the DoA failure rate trend, shown in Figure A1.32, where MPF+GEA-FTTC has risen over the last four years, while the WLR+GEA-FTTC rate fluctuates within a narrow range.

[568] Data submitted in Openreach responses dated 5 March and 7 March 2014 to the 6th FAMR QoS s.135 notice, Openreach response dated 4 July 2016 to the 2nd QoS s.135 notice and Openreach response dated 15 August 2017 to the 9th QoS s.135 notice.

[569] Data submitted in Openreach responses dated 5 March and 7 March 2014 to the 6th FAMR QoS s.135 notice, Openreach response dated 4 July 2016 to the 2nd QoS s.135 notice and Openreach response dated 15 August 2017 to the 9th QoS s.135 notice.

A2.66 We observe in Figures A1.34 and A1.42 that, for the MPF+GEA-FTTC service, the major contributor to the rise we observe in the DoA and ELFRs are faults reported at the PCP.[570] When we compare the DoA rates and ELFRs for faults attributed to the PCP for each service, shown in Figures A1.36 and A1.44 respectively, we observe that MPF+GEA-FTTC has a higher DoA rate than the other services, and both MPF+GEA-FTTC and WLR+GEA-FTTC services have higher ELFRs than the other services.

**Figure A2.11 12-month moving average DoA fault rates without faults attributable to the PCP, for each asset category (%)**

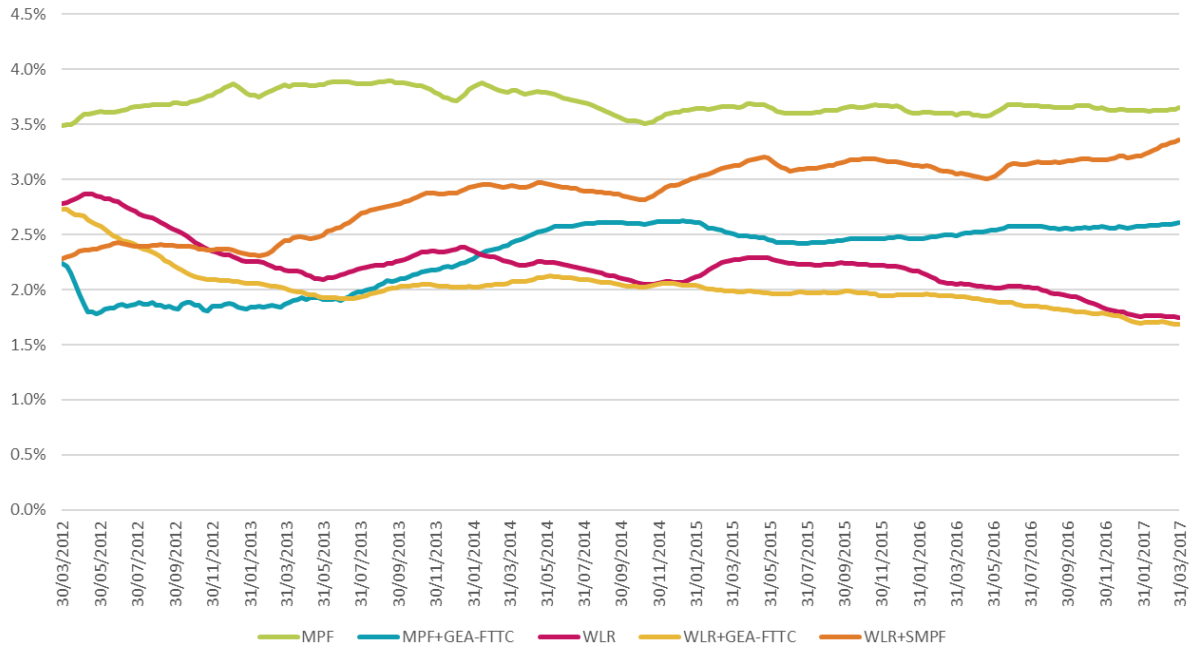



*Source: Ofcom analysis of BT data*[571]

[570] Primary Cross Connection Point.

[571] Figure A1.37 in Annex 1. Data submitted in Openreach responses dated 5 March and 7 March 2014 to the 6th FAMR QoS s.135 notice, Openreach response dated 4 July 2016 to the 2nd QoS s.135 notice and Openreach response dated 15 August 2017 to the 9th QoS s.135 notice.

**Figure A2.12 12-month moving average ELFRs without faults attributable to the PCP, for each asset category (%)**




*Source: Ofcom analysis of BT data*[572]

A2.67 We also observe, in Figures A2.11 and A2.12 above, that without faults attributed to the PCP:

a) The DoA failure rate for WLR+GEA-FTTC fluctuates within a narrow range;

b) A decrease over the period for the WLR+GEA-FTTC ELFR;

c) A much smaller rise in DoA rates and ELFRs for MPF+GEA-FTTC than when PCP faults are included; and

d) The MPF+GEA-FTTC DoA rates and ELFRs being much closer to the WLR+GEA-FTTC rates.

A2.68 A higher volume of PCP self-installations could be contributing to the rate differential we observe between the two GEA-FTTC variants which, as shown in Figure A1.6, approximately coincides with the timing of the rise for the MPF+GEA-FTTC DoA rates and ELFRs mentioned above. However, if this were the case we would then expect the DoA rates and ELFRs attributable to the PCP for GEA-FTTC services to be reasonably consistent for each telecoms provider which, as shown in Figures A1.39 and A1.48, does not appear to be the case.

A2.69 We do not believe this variance between telecoms providers is due to fault detection [✂]. A potential contributor to this differential may be varying PCP self-installation practices between telecoms providers.

[572] Figure A1.45 in Annex 1. Data submitted in Openreach responses dated 5 March and 7 March 2014 to the 6th FAMR QoS s.135 notice, Openreach response dated 4 July 2016 to the 2nd QoS s.135 notice and Openreach response dated 15 August 2017 to the 9th QoS s.135 notice.

A2.70 Taking all of this into consideration, we believe it suggests the following:

a) The DoA failure rate attributable to the PCP is high for MPF+GEA-FTTC;

b) The ELFR attributable to the PCP is high for both MPF+GEA-FTTC and WLR+GEA-FTTC;

c) The trends we observe in ELFRs for the GEA-FTTC services are being largely driven by the DoA failure rate; and

d) There is larger scope for improvement for the ELFR for MPF+GEA-FTTC than for WLR+GEA-FTTC.

A2.71 We recognise that ELFs, and therefore DoA failures, are important due to the level of consumer harm they can cause, and are in the subject of ongoing industry and OTA2 discussions.

A2.72 However, we consider the observed high DoA and ELF rates, and generally those faults attributable to the PCP, are characteristics of a new service that is yet to mature. We would expect the PCP self-installation processes to improve over the charge control period as both Openreach and telecoms providers improve their working practices.[573]

A2.73 This would translate to a material improvement in the DoA rate and ELFR for both GEA-FTTC services, with a greater improvement for MPF+GEA-FTTC compared to WLR+GEA-FTTC given the high fault rates at present. The impact of this improvement on the overall fault rate will lessen as the PNC falls, and MPF+GEA-FTTC and WLR+GEA-FTTC transition into mature services.

A2.74 Consequently, absent consideration of Openreach's plans for investment in fault reduction, we believe on the balance of the available evidence that overall fault rates will continue to reduce in the future, i.e. there will be a reduction in the fault rate for WLR+GEA-FTTC and MPF+GEA-FTTC combined services.

A2.75 In its response to our September 2017 QoS Further Consultation, Openreach said that the evidence showed that much of the benefit as products mature had already been achieved.[574] However, as discussed above it is clear that an ELFR differential exists between WLR+GEA-FTTC and MPF+GEA-FTTC, and there is scope for improvement for PCP related ELFs. We expect an improvement in PCP related ELFs, and that the observed differential will decrease, resulting in lower overall fault rates for both GEA-FTTC services.

A2.76 Openreach also said in their response that they were unclear why Ofcom believes that the fault rate uplift for FTTC on MPF will reduce so much more dramatically than FTTC on WLR.[575] Although we discuss the forecast fault rates in the 'Our revised forecast fault rates for GEA-FTTC' section below, before we determine the extent of our expected overall fault rate reduction, we would expect a bigger drop in the MPF+GEA-FTTC fault rate due to the ELFR differential identified above.

[573] Openreach have recently piloted revised installation procedures for PCP self-installations where a significant reduction in ELFs was observed.
[574] Openreach response to the September 2017 Further QoS Consultation, paragraph 71.
[575] Openreach response to the September 2017 QoS Further Consultation, paragraph 70.

## Our interpretation of Openreach's latest FVR plan for use in our fault rate forecast

A2.77 We have followed the same methodology as in the September 2017 QoS Further Consultation with an update to the base year as described above.

A2.78 As a result, we have determined that the reduction in faults from 2016/17 to 2020/21 will be [✂]% (14% to 17%), a small decrease compared to the [✂]% (15% to 18%) reduction from 2015/16 to 2020/21 in our September 2017 QoS Further Consultation.

A2.79 This small decrease reflects the overall effect of the following factors:

a) The difference between our forecast reduction in fault volumes for 2016/17 in our September 2017 QoS Further Consultation and actual fault volumes in 2016/17[576];

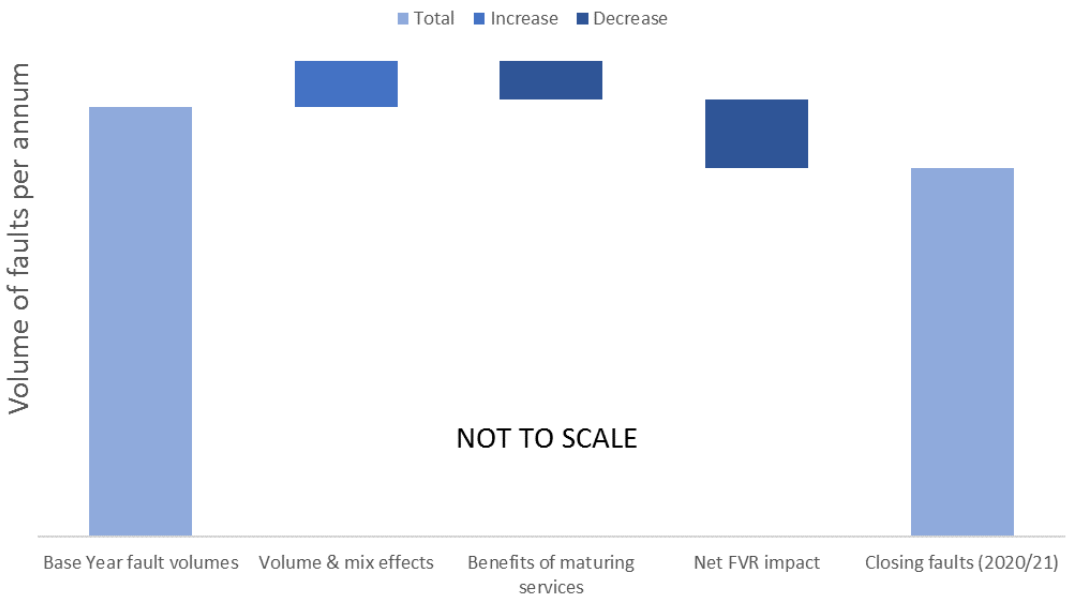
b) The difference in measured fault rates from 2015/16 to 2016/17 causing the benefits of maturing services to be smaller when compared to the corresponding forecast in our September 2017 QoS Further Consultation; and

c) The total number of faults Openreach's FVR programme is planned to reduce by 2020/21 now not including the reduction that was forecast in 2016/17.[577]

A2.80 Figure A2.13 below shows our forecast movement in faults from the then base year to the final year of the charge control in our September 2017 QoS Further Consultation, and Figure A2.14 below shows our updated forecast movements from the new base year, 2016/17.

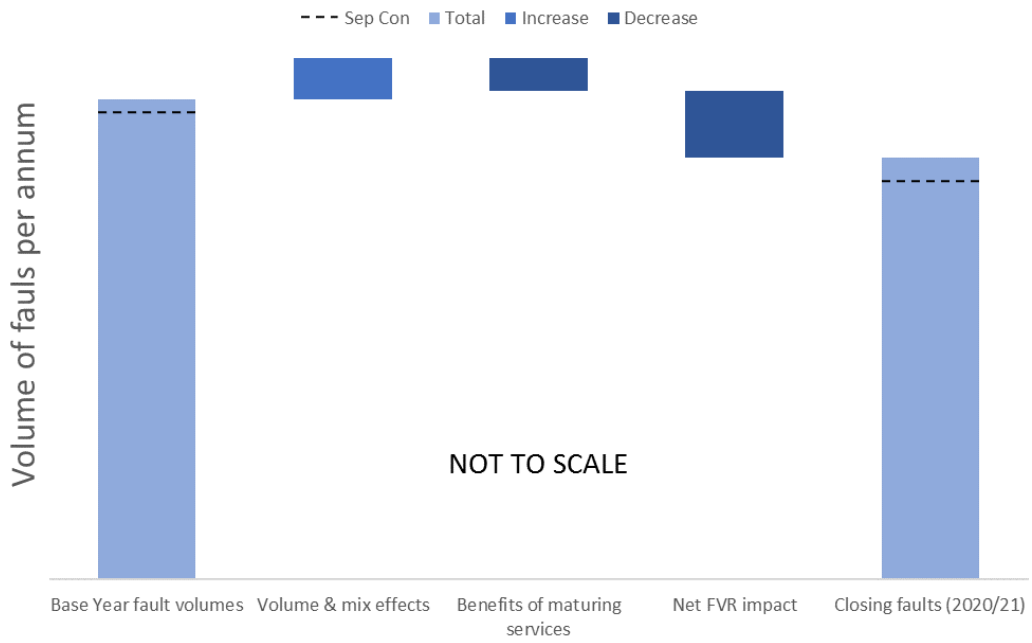
[576] The impact of FVR in this statement is smaller than the corresponding impact in the September 2017 QoS Further Consultation due to the measured overall fault rate for all services (in aggregate) increasing slightly in 2016/17, instead of decreasing as we had forecast previously.
[577] The FVR reduction that was forecast for 2016/17 is now contained within the measured fault volumes for 2016/17, as that is our new base year.

**Figure A2.13 Illustration of our September forecast movement in faults between the then base year, 2015/16, and 2020/21**




*Source: Ofcom analysis*[578]

**Figure A2.14 Illustration of our updated forecast movement in faults between the base year, 2016/17, and 2020/21**




*Source: Ofcom analysis*[579]

[578] This is a recreation of Figure 5.4 in the September 2017 QoS Further Consultation.
[579] 'Sep Con' shows the level of fault volumes for the base year and forecast fault volumes in 2020/21 from our September 2017 QoS Further Consultation.

## Our revised forecast fault rates for WLR, MPF and SMPF

A2.81 We have set out above that we expect no substantial change in the future WLR, MPF and WLR+SMPF overall fault rates absent Openreach's FVR programme. However, once this is taken into account, we consider it reasonable to assume that the FVR programme would reduce the future overall fault rates for these services.

A2.82 We expect the overall fault rates for WLR, MPF and WLR+SMPF to reduce by the final year in the charge control relative to the base year overall fault rate by the percentage shown in the previous section. The resulting forecast overall fault rates are set out in Table A2.15 below.

**Table A2.15 Ofcom forecast of overall fault rates for combined and individual services over period of charge control including Ofcom's interpretation of effects of FVR programme**

| | Base Year 2016/2017 | Year 1 2018/2019 | Year 2 2019/2020 | Year 3 2020/2021 |
|---|---|---|---|---|
| **WLR** | 8.0% | [✂]%<br>(7% - 8%) | [✂]%<br>(7% - 8%) | [✂]%<br>(6% - 7%) |
| **MPF** | 11.1% | [✂]%<br>(10% - 11%) | [✂]%<br>(9% - 10%) | [✂]%<br>(9% - 10%) |
| **WLR+SMPF** | 12.4% | [✂]%<br>(11% - 12%) | [✂]%<br>(10% - 11%) | [✂]%<br>(10% - 11%) |
| **SMPF** | 4.4% | [✂]%<br>(4% - 5%) | [✂]%<br>(3% - 4%) | [✂]%<br>(3% - 4%) |

*Source: Ofcom analysis of BT data*[580]

## Our revised forecast fault rates for GEA-FTTC

A2.83 We concluded above that the overall fault rates for GEA-FTTC combined services are likely to fall over the period of the charge control. We now present our assessment of this reduction and our overall fault rate forecasts for the GEA-FTTC related services.

A2.84 As in the March 2017 QoS Consultation, we are unable to derive reliable fault rate forecasts for GEA-FTTC related services directly from the measured data we obtained. The overall fault rates have changed significantly over time and do not obviously converge towards specific values. We believe this is because GEA-FTTC deployment is not yet mature.

[580] Data submitted in Openreach responses dated 5 March and 7 March 2014 to the 6th FAMR QoS s.135 notice, Openreach response dated 4 July 2016 to the 2nd QoS s.135 notice, Openreach responses dated 9 June and 19 June 2017 to the 7th QoS s.135 notice, Openreach response dated 15 August 2017 to the 9th QoS s.135 notice and Openreach responses dated 8 September, 13 September, 27 September, 28 September, 3 October, 4 October, 3 November and 6 November 2017, and 9 January, 23 January and 31 January 2018 to the 34th WLA s.135 notice.

A2.85 Therefore, to determine fault rates for GEA-FTTC related services in future years, we first consider the network components involved in delivering the GEA-FTTC related services and, where relevant, their likely fault rates based on delivering other, more mature services.

### Network components and their expected fault rates

A2.86 GEA-FTTC introduces additional network elements into the access network and changes how the existing copper elements of the access network are used. Consequently, we start our analysis of the expected early life and in life contributions to the overall faults rates by considering the following key network components and their use:

- the basic copper components comprising:
  - those 'd-side elements' between the copper cabinet (PCP) and the customer's network including d-side cable, drop-wire and any internal wiring for which Openreach is responsible;
  - the e-side cable between the PCP and the exchange; and
  - the main distribution frame (MDF) in the exchange which connects the copper lines (e-side cable) to exchange based equipment and the line test equipment.
- FTTC equipment which includes the active electronic equipment, the fibre backhaul cable and the tie cable (copper) between the active electronic equipment cabinet (FTTC cabinet) and the PCP; and
- connections (jumpers) in the PCP to connect the various copper line elements to the FTTC equipment (via the tie cable).

A2.87 Tables A2.16 and A2.17 below present the ELFR and ILFR, respectively, for the various copper and PCP components for the base year 2016/17 when used to deliver the three mature services, i.e. WLR, MPF and WLR+SMPF.

**Table A2.16 Measured component ELFR for mature services (2016/17)**

| | d-side elements | PCP | e-side cable | MDF | Overall[581] |
|---|---|---|---|---|---|
| **WLR** | 1.1% | 0.8% | 0.2% | 0.3% | 2.5% |
| **MPF** | 2.4% | 1.7% | 0.5% | 0.8% | 5.4% |
| **WLR+SMPF** | 2.1% | 1.2% | 0.5% | 0.8% | 4.5% |

*Source: Ofcom analysis of BT data*[582]

[581] Note that the ELFR includes an amount representing the fault rate of the line test equipment which is less than 1% of the overall failure rate.

[582] Data submitted in Openreach responses dated 5 March and 7 March 2014 to the 6th FAMR QoS s.135 notice, Openreach response dated 4 July 2016 to the 2nd QoS s.135 notice and Openreach response dated 15 August 2017 to the 9th QoS s.135 notice.

**Table A2.17 Measured component ILFR for mature services (2016/17)**

| | d-side elements | PCP | e-side cable | MDF | Overall[583] |
|---|---|---|---|---|---|
| **WLR** | 4.5% | 1.5% | 0.9% | 0.5% | 7.5% |
| **MPF** | 5.3% | 2.1% | 1.0% | 1.1% | 9.6% |
| **WLR+SMPF** | 7.1% | 1.8% | 1.2% | 1.0% | 11.1% |

*Source: Ofcom analysis of BT data*[584]

A2.88 Using these component ILFR and ELFR, combined with our forecast 2020/21 PNC, in the equation we outline above, we calculate the overall fault rates for mature services' components, shown in Table A2.18 below.

**Table A2.18 Calculated component overall fault rates for mature services (2016/17)**

| | d-side elements | PCP | e-side cable | MDF | Overall[585] |
|---|---|---|---|---|---|
| **WLR** | 4.7% | 1.7% | 1.0% | 0.6% | 8.0% |
| **MPF** | 6.0% | 2.6% | 1.2% | 1.3% | 11.1% |
| **WLR+SMPF** | 8.0% | 2.3% | 1.4% | 1.4% | 13.1% |

*Source: Ofcom analysis of Openreach data*[586]

A2.89 When we derive an expected fault rate for a network component carrying broadband signals, we consider both the MPF and the WLR+SMPF fault rates, using them to form a range when they differ. For components carrying just narrowband voice and or line test signals, we use the WLR fault rates.

Expected copper component fault rates for GEA-FTTC

A2.90 When delivering WLR only services we expect the copper components to exhibit the lowest fault rates because they are only carrying narrowband voice signals. When carrying broadband services (MPF and WLR+SMPF), we expect the same copper components to exhibit higher fault rates because the higher frequency signals associated with these services will expose additional defects compared to voice only signals. We refer to this increase in fault rate as the broadband premium.

A2.91 In addition to voice, d-side elements carry GEA-FTTC broadband. We expect the fault rate of the d-side elements to be at least the same as that when carrying MPF or SMPF

[583] Note that the ILFR includes an amount representing the fault rate of the line test equipment which is less than 1% of the overall failure rate.
[584] Data submitted in Openreach responses dated 5 March and 7 March 2014 to the 6th FAMR QoS s.135 notice, Openreach response dated 4 July 2016 to the 2nd QoS s.135 notice and Openreach response dated 15 August 2017 to the 9th QoS s.135 notice.
[585] Note that the overall fault rate includes an amount representing the fault rate of the line test equipment which is less than 1% of the overall fault rate.
[586] Data submitted in Openreach responses dated 5 March and 7 March 2014 to the 6th FAMR QoS s.135 notice, Openreach response dated 4 July 2016 to the 2nd QoS s.135 notice and Openreach response dated 15 August 2017 to the 9th QoS s.135 notice.

broadband signals. GEA-FTTC signals have a greater frequency range than standard broadband which could produce a greater fault rate. Consequently, we believe a lower bound for the d-side fault rate is given by the MPF and WLR+SMPF fault rates for this network segment and falls in the range 6.0% to 8.0%.

A2.92 E-side cable is expected to only carry narrowband signals, for example voice and line test signals, when used in conjunction with FTTC services. Hence, we expect the fault rate of the e-side cable in these situations to be the same as when it is used in WLR service delivery, which is 1.0%.

A2.93 MPF and WLR+SMPF services use twice as many MDF jumper connections as WLR services. Consequently, we expect the fault rate associated with the MDF jumpers for MPF to be at least twice that of the WLR case. When carrying standard broadband signals the fault rate could be greater because of the higher frequency signals exposing more defects. However, when used with GEA-FTTC the MPF connections at the MDF will only carry narrowband voice and line test signals. Therefore, based on the MDF fault rate of 0.6% for WLR, we expect the MDF fault rate to be 1.2% for MPF.

Expected PCP jumper connection fault rates in GEA-FTTC service delivery

A2.94 In WLR, MPF and WLR+SMPF service delivery, a single jumper in the PCP connects the copper pair within the d-side cable to the corresponding copper pair in the e-side cable. When delivering GEA-FTTC services, two jumper connectors are used, one connecting the FTTC equipment to the d-side cable and the other connecting the FTTC equipment to the e-side cable.

A2.95 We anticipate the fault rate of the e-side jumper to be the same as that for the single jumper in WLR because it only carries narrowband voice and line test signals. Given the d-side jumper carries the GEA-FTTC broadband signal, we expect its fault rate to be the same or possibly greater (because of the higher frequency range of the GEA-FTTC signal) than that of a single jumper in the MPF or WLR+SMPF service delivery case.

A2.96 Therefore, we expect the total fault rate for the jumpers to be 1.7% (e-side) plus 2.3% to 2.6% (d-side), giving a final range of 4.0% to 4.3% for both jumpers.

Expected FTTC equipment fault rates in GEA-FTTC service delivery

A2.97 We do not have measured fault rates for mature equipment that is sufficiently like the FTTC equipment to use as a basis for estimating the FTTC equipment fault rate. However, using our formal powers we obtained from Openreach the manufacturers' forecast fault rates for the components used to construct the FTTC equipment. Using these we derived a fault rate for the FTTC equipment of 1%.

Summary of expected network component fault rates for GEA-FTTC service delivery

A2.98 Table A2.19 below shows a summary of our estimate of the expected faults rates.

**Table A2.19 Expected GEA-FTTC service fault rates**

| | d-side elements | PCP | e-side cable | MDF | FTTC Equipment | Overall[587] |
|---|---|---|---|---|---|---|
| **Expected WLR+GEA-FTTC** | 6.0% - 8.0% | 4.0% - 4.3% | 1.0% | 0.6% | 1.0% | 12.5% - 14.8% |
| **Expected MPF+GEA-FTTC** | 6.0% - 8.0% | 4.0% - 4.3% | 1.0% | 1.2% | 1.0% | 13.1% - 15.4% |

*Source: Ofcom analysis of BT data*[588]

### Comparison of expected and measured GEA-FTTC related fault rates

A2.99 Although we have measured faults rates for GEA-FTTC covering the period 2011/12 to 2016/17, we think they do not represent reasonable, stable, long-term fault rate trends for the GEA-FTTC related services. In our view, they portray a service that may be suffering introduction problems that have not yet been resolved, although there are clear signs of the fault rates reducing towards the fault rates of the mature MPF and WLR+SMPF services.

A2.100 In Table A2.20 we compare the measured fault rates for the FTTC related services for the base year 2016/17 with our estimates of the expected fault rates for the FTTC related services.

[587] Note that the overall fault rate includes an amount representing the fault rate of the line test equipment which is less than 1% of the overall fault rate.

[588] Data submitted in Openreach responses dated 5 March and 7 March 2014 to the 6th FAMR QoS s.135 notice, Openreach response dated 4 July 2016 to the 2nd QoS s.135 notice and Openreach response dated 15 August 2017 to the 9th QoS s.135 notice.

**Table A2.20 Comparison of expected and measured GEA-FTTC service fault rates**

| | d-side elements | PCP | e-side cable | MDF | FTTC Equipment | Overall[589] |
|---|---|---|---|---|---|---|
| **Expected WLR+GEA-FTTC** | 6.0% - 8.0% | 4.0% - 4.3% | 1.0% | 0.6% | 1.0% | 12.5% - 14.8% |
| **Measured WLR+GEA-FTTC** | 6.8% | 4.9% | 1.1% | 0.8% | 0.5% | 14.1% |
| | | | | | | |
| **Expected MPF+GEA-FTTC** | 6.0% - 8.0% | 4.0% - 4.3% | 1.0% | 1.2% | 1.0% | 13.1% - 15.4% |
| **Measured MPF+GEA-FTTC** | 6.5% | 6.1% | 0.8% | 0.8% | 0.9% | 15.1% |

*Source: Ofcom analysis of BT data*[590]

A2.101 We observe that the measured overall fault rate for the WLR+GEA-FTTC and MPF+GEA-FTTC services are towards the upper bound of the range we estimated. Comparing the component fault rates for the MPF+GEA-FTTC case suggests this may be due to the high measured PCP fault rates, which are also high for WLR+GEA-FTTC.

A2.102 We observe that the measured e-side cable fault rate for WLR+GEA-FTTC is slightly higher than expected, and for MPF+GEA-FTTC it is lower than expected. This suggests that it is possible to achieve the lower of these two fault rates for both GEA-FTTC services.

A2.103 The measured MDF fault rates are the same for both WLR+GEA-FTTC and MPF+GEA-FTTC, with the latter being lower than we estimated. We do not have sufficient evidence to determine why this is the case, especially with MPF+GEA-FTTC having two jumpers compared to WLR+GEA-FTTC's one. While we note MPF+GEA-FTTC's potential to perform better than we estimated, we treat the measured MDF fault rates with caution as we believe the GEA-FTTC related fault rates have not yet stabilised.

A2.104 We also observe that the measured FTTC (equipment) fault rates are lower than the fault rate calculated from the manufacturers' component fault rates. We note the measured fault rate for MPF+GEA-FTTC is close to the calculated rate while the WLR+GEA-FTTC rate is roughly half the calculated rate. There are several possible reasons for this, but we do not have sufficient evidence to determine which may apply. However, we believe the GEA-

[589] Note that the overall fault rate includes an amount representing the fault rate of the line test equipment which is less than 1% of the overall fault rate.
[590] Data submitted in Openreach responses dated 5 March and 7 March 2014 to the 6th FAMR QoS s.135 notice, Openreach response dated 4 July 2016 to the 2nd QoS s.135 notice and Openreach response dated 15 August 2017 to the 9th QoS s.135 notice.

FTTC related fault rates have not yet stabilised and we consequently treat the measured FTTC equipment fault rates with caution.

### Fault rates for GEA-FTTC services for the charge control model

A2.105 We explain above that we believe the relatively high GEA-FTTC related overall fault rates currently observed are due to protracted introduction problems. We do not at this point have a basis on which to assume fault rates could be better at this stage of a deployment of new technology. Therefore, we will use the measured GEA-FTTC service fault rates for 2016/17, the base year of the charge control.

A2.106 We then need to set fault rates for the key components of the GEA-FTTC services for the final year of the charge control, assuming at this stage no further reduction arising from Openreach's FVR programme. Therefore, we need to select from the above evidence (i.e. our estimates based on measured fault rates of mature services, and the directly measured GEA-FTTC service fault rates themselves) values that we consider are representative of the longer-term fault rates that will apply at the end of the charge control.

A2.107 We do not consider it appropriate to select the measured fault rates for the GEA-FTTC services as the long-term rates because both are in the upper bound of our estimated range. We also observed that the PCP fault rates are high. Further, we determined earlier that, in our view, the GEA-FTTC service fault rates will continue to fall over the period of the charge control.

A2.108 We therefore consider that it is reasonable and proportionate to select the following fault rate values for the network components:

- 6.5% for the d-side elements because this is close to our lower limit and has been shown to be possible by the MPF+GEA-FTTC measured value;
- 4.0% for the PCP because this is achieved by the mature services;
- 0.8% for the e-side because this has shown to be possible by the MPF+GEA-FTTC measured value;
- 0.6% for the MDF when used to support WLR (in WLR+GEA-FTTC) and 1.2% for the MDF when used to support MPF (in MPF+GEA-FTTC) because the former uses one jumper while the latter uses two jumpers; and
- 1.0% for the FTTC equipment because we believe the measured values for the FTTC equipment are not yet stable and so we have used the manufacturer's calculated fault rates, which we consider provide the best view of long-term fault rates at this point.

A2.109 These choices lead to a long-term fault rates of 13.0% for WLR+GEA-FTTC and 13.6% for MPF+GEA-FTTC. The difference is due to the additional jumper at the MDF to support the MPF connectivity in the exchange. These selections are summarised in Table A2.21 below.

**Table A2.21 Summary of selected long-term fault rate values for constituent network components of GEA-FTTC services absent further reduction from the FVR programme**

| | d-side elements | PCP | e-side cable | MDF | FTTC Equipment | Overall[591] |
|---|---|---|---|---|---|---|
| **WLR+GEA-FTTC** | 6.5% | 4.0% | 0.8% | 0.6% | 1.0% | 13.0% |
| **MPF+GEA-FTTC** | 6.5% | 4.0% | 0.8% | 1.2% | 1.0% | 13.6% |

*Source: Ofcom analysis of BT data*[592]

A2.110 We believe, without the FVR programme, that the long-term fault rates in Table A2.22 should be achieved by the last year of the charge control. We further believe that the fault rates for intervening years should follow a linear glide path.

**Table A2.22 Glide path for GEA-FTTC service fault rates absent application of FVR programme**

| Charge control period | Base Year 2016/2017 | Year 1 2018/2019 | Year 2 2019/2020 | Year 3 2020/2021 |
|---|---|---|---|---|
| **WLR+GEA-FTTC** | 14.1% | 13.5% | 13.3% | 13.0% |
| **MPF+GEA-FTTC** | 15.1% | 14.4% | 14.0% | 13.6% |

*Source: Ofcom analysis of BT data*[593]

### Effect of FVR programme

A2.111 We believe Openreach's FVR programme will yield further reductions to the GEA-FTTC service overall fault rates; these are in addition to the reductions we expect above to arrive at the long-term fault rates for the GEA-FTTC services. However, we do not believe the FVR programme will produce a reduction in the largely electronic and physical cabinet based FTTC equipment fault rate of 1.0%.

A2.112 Consequently, we expect the overall fault rates for GEA-FTTC services, minus the FTTC equipment fault rate, to reduce by the final year of the charge control relative to the base year overall fault rate by the percentage shown above. The resulting forecast overall fault rates are set out in Table A2.23 below.

[591] Note that the overall fault rate is assumed to include a fault rate of circa 0.05% for the line test equipment.
[592] Data submitted in Openreach responses dated 5 March and 7 March 2014 to the 6th FAMR QoS s.135 notice, Openreach response dated 4 July 2016 to the 2nd QoS s.135 notice and Openreach response dated 15 August 2017 to the 9th QoS s.135 notice.
[593] Data submitted in Openreach responses dated 5 March and 7 March 2014 to the 6th FAMR QoS s.135 notice, Openreach response dated 4 July 2016 to the 2nd QoS s.135 notice and Openreach response dated 15 August 2017 to the 9th QoS s.135 notice.

**Table A2.23 Glide path for GEA-FTTC service fault rates including effect of FVR programme**

| Charge control period | Base Year 2016/2017 | Year 1 2018/2019 | Year 2 2019/2020 | Year 3 2020/2021 |
|---|---|---|---|---|
| **WLR+GEA-FTTC** | 14.1% | [✂]%<br>(12% - 13%) | [✂]%<br>(11% - 12%) | [✂]%<br>(11% - 12%) |
| **MPF+GEA-FTTC** | 15.1% | [✂]%<br>(13% - 14%) | [✂]%<br>(12% - 13%) | [✂]%<br>(11% - 12%) |

*Source: Ofcom analysis of BT data*[594]

### Fault rates for FTTC service major components for charge control model assuming inclusion of FVR programme

A2.113 We finally separate out the key constituents of the WLR+GEA-FTTC and MPF+GEA-FTTC services by subtracting the WLR and MPF fault rates derived earlier and then subtracting the calculated FTTC equipment fault rate to produce WLR and MPF adjustment factors. These figures need to be added to the WLR and MPF fault rates as well as the calculated FTTC equipment fault rate when calculating overall GEA-FTTC plus bearer service fault rates.

[594] Data submitted in Openreach responses dated 5 March and 7 March 2014 to the 6th FAMR QoS s.135 notice, Openreach response dated 4 July 2016 to the 2nd QoS s.135 notice, Openreach responses dated 9 June and 19 June 2017 to the 7th QoS s.135 notice, Openreach response dated 15 August 2017 to the 9th QoS s.135 notice and Openreach responses dated 8 September, 13 September, 27 September, 28 September, 3 October, 4 October, 3 November and 6 November 2017, and 9 January, 23 January and 31 January 2018 to the 34th WLA s.135 notice.

**Table A2.24 Ofcom forecasts of overall and separated fault rates for GEA-FTTC services and its key constituents assuming further reduction due to FVR programme**

| | Base Year 2016/2017 | Year 1 2018/2019 | Year 2 2019/2020 | Year 3 2020/2021 |
|---|---|---|---|---|
| **WLR+GEA-FTTC** | 14.1% | [✂]% (12% - 13%) | [✂]% (11% - 12%) | [✂]% (11% - 12%) |
| **MPF+GEA-FTTC** | 15.1% | [✂]% (13% - 14%) | [✂]% (12% - 13%) | [✂]% (11% - 12%) |
| **WLR** | 8.0% | [✂]% (7% - 8%) | [✂]% (7% - 8%) | [✂]% (6% - 7%) |
| **MPF** | 11.1% | [✂]% (10% - 11%) | [✂]% (9% - 10%) | [✂]% (9% - 10%) |
| **FTTC equipment** | 1.0% | 1.0% | 1.0% | 1.0% |
| **WLR addition** | 5.0% | [✂]% (4% - 5%) | [✂]% (3% - 4%) | [✂]% (3% - 4%) |
| **MPF addition** | 3.0% | [✂]% (2% - 3%) | [✂]% (1% - 2%) | [✂]% (1% - 2%) |

*Source: Ofcom analysis of BT data*[595]

A2.114 As shown in Table A2.24 above, there is a material difference between the WLR and MPF adjustment factors, with the former forecast [✂]% (between 2% and 3%) higher in 2020/21. This is due to a combination of: (i) the rate differential between WLR and MPF standalone services in the base year, caused by the broadband premium where copper components exhibit higher fault rates compared to voice only signals when carrying broadband services; and (ii) the rate differential between the GEA-FTTC combined services in the base year, caused in part by a higher than expected fault rate attributable to the PCP for MPF+GEA-FTTC.

A2.115 We provisionally concluded in the March 2017 QoS Consultation that by the end of the market review forward look period the GEA-FTTC service will lead to 3.4% additional faults per annum when provided over WLR, and 1.6% additional faults per annum when provided over MPF, compared to 5.0% and 4.4% respectively in the then base year, 2015/16.

A2.116 We revised this in the September 2017 QoS Further Consultation, based on the latest view of Openreach's FVR programme, to [✂]% (between 3% and 4%) additional faults per

[595] Data submitted in Openreach responses dated 5 March and 7 March 2014 to the 6th FAMR QoS s.135 notice, Openreach response dated 4 July 2016 to the 2nd QoS s.135 notice, Openreach responses dated 9 June and 19 June 2017 to the 7th QoS s.135 notice, Openreach response dated 15 August 2017 to the 9th QoS s.135 notice and Openreach responses dated 8 September, 13 September, 27 September, 28 September, 3 October, 4 October, 3 November and 6 November 2017, and 9 January, 23 January and 31 January 2018 to the 34th WLA s.135 notice.

annum when provided over WLR, and [✂]% (between 1% and 2%) additional faults per annum when provided over MPF.

A2.117 We have now revised this based on an additional financial year of data and have concluded that by the end of the market review forward look period the GEA-FTTC service will lead to [✂]% (between 4% and 5%) additional faults per annum when provided over WLR, and [✂]% (between 2% and 3%) additional faults per annum when provided over MPF, compared to [✂]% (between 5% and 6%) and [✂]% (between 3% and 4%) respectively in the base year, 2016/17.[596]

[596] These fault rate values for the addition to the bearer service fault rate includes the calculated FTTC equipment fault rate of 1.0%.

# A3. Resource implications of the quality of service standards

## Introduction

A3.1 In this annex, we set out our consideration of two resource simulation models that we have used to assess the resource implications of the performance standards we are imposing. These models are a model developed by Openreach (the Allocation Model) and a model we developed with Analysys Mason for our March 2017 QoS Consultation (the Resource Performance Model (RPM)).

A3.2 This annex is structured as follows:

- our approach to estimating the resource implications of higher quality of service standards in the March 2017 QoS Consultation;
- our description of the Allocation Model;
- our consideration of the Allocation Model;
- our description of the RPM;
- our RPM resource estimates;
- our service level differential estimates; and
- the disclosure of models and associated documents.

A3.3 We set out our final conclusions concerning the models and the resource uplifts for the quality standards in Section 10.

## Our approach to estimating the resource implications of higher quality standards

### A discrete event simulation model could be used to explore the resource implications of different quality standards

A3.4 Prior to the March 2017 QoS Consultation, we considered how best to assess the resource and cost implications of the quality of service improvements we were considering for Openreach's voice and broadband services as part of this review.

A3.5 We considered that a discrete event simulation model could be an effective tool because such models are often used to model the operation of queue based processes. With this type of model, the arrival, queuing and processing of individual events (in this case fault repairs and installation orders) are modelled using a time sequence simulation so that performance characteristics and resource requirements of the processes can be assessed.

A3.6 We considered that Openreach might be best placed to undertake such modelling as it should be better able than us to ensure that the model reflects the operational processes being modelled. In May 2016, we asked Openreach whether it could provide resource estimates for further improvements in service performance and discussed with them how best the performance improvements might be modelled given the limitations identified

with the 2013 Distribution Model (an Openreach discrete event simulation model that we used to assess the resource implications of higher quality performance in the 2014 FAMR).

A3.7 In May 2016, Openreach agreed to provide resource estimates and informed us that it had commissioned EY to develop its resource simulation model, partly in anticipation of our request. Openreach subsequently informed us that it was developing two models:

- the 2017 Distribution Model, a replica of the 2013 Distribution Model transferred to a new software platform; and
- a new model, the Allocation Model.

A3.8 The essential difference between the two models is the modelling approach. The 2017 Distribution Model uses the distribution approach to discrete event simulation. This is sometimes described as a top-down approach because the simulation is used to estimate the resources required to deliver a specified performance profile (in this case the performance profile is derived from Openreach's actual performance). In contrast, the Allocation Model adopts an approach sometimes described as a bottom-up approach because the simulation is used to estimate the performance that can be achieved with a given level of resources.

## We developed our own high-level simulation model because Openreach's models were not available in time for the March 2017 QoS Consultation

A3.9 Development of the models took longer than expected with the result that Openreach had provided only sample outputs from the 2017 Distribution Model by February 2017. Our March 2017 QoS Consultation was primarily based on the output of our own modelling because we had not had an opportunity to review Openreach's models and thus form a view on the reliability of the sample outputs.

A3.10 In view of the delay with Openreach's modelling, we used an alternative high-level resource simulation model (the RPM) developed in collaboration with Analysys Mason, to assess the impact of the QoS standards we had proposed for WLR, MPF and GEA-FTTC on Openreach's field engineering resources.

A3.11 The RPM provides a high-level simulation of Openreach's installation order and repair activities. Unlike discrete event simulation models, which simulate the execution of individual installation and repair jobs, the RPM simulates the execution of jobs in larger groups or batches, specifically the daily arrivals of new installation orders, SML1 faults and SML2 faults in each of Openreach's 56 Senior Operations Manager (SOM) areas in Great Britain. The simulation is best described as a book keeping exercise in which the evolution of jobs is modelled from arrival to completion. A more detailed description is provided in Annex 7 of the March 2017 QoS Consultation and Analysys Mason's report on the RPM.[597]

[597] Analysys Mason 2017. *Overview of the Quality-of-Service Model and its outputs for WLR/LLI Charge Control 2017.* https://www.ofcom.org.uk/__data/assets/pdf_file/0034/99646/Analysys-Mason-report.pdf.

## Openreach subsequently completed the Allocation Model and argued that it is more representative of its field operations than the RPM and the 2017 Distribution Model

A3.12 Openreach subsequently completed the Allocation Model and used outputs from the model to support its response to the March 2017 QoS Consultation.

A3.13 Openreach's view was that the Allocation Model was a more accurate simulation of its field engineering operations than the RPM because it models a broader range of factors that influence the level of resources required for field engineering activities.[598] Openreach's view was that the representation of its operations in the RPM was overly simplified and led us to significantly underestimate the additional resources required for higher standards. In support of these claims, Openreach supplied an assessment of the impact on the resource estimates of the differences between the two models[599] and an external review of the models produced by Deloitte.[600]

A3.14 Openreach also considered that the Allocation Model was more accurate and flexible than the 2013 Distribution Model, which we used to estimate the resource uplift required for the quality standards imposed in the 2014 FAMR.[601] Openreach noted that the 2013 Distribution Model gave good estimates of the resources required for marginal changes in service levels but lacked the ability to accurately assess the implications of a step change in service quality approaching the operational limit to performance. It also noted that certain aspects of the 2013 Distribution Model attracted criticism from Ofcom (such as its use of constant job durations), which Openreach agreed needed to be addressed in future modelling work.[602]

## Openreach also provided new evidence about its operational limit in its response to the March 2017 QoS Consultation

A3.15 In its response to the March 2017 QoS Consultation, Openreach also submitted new evidence about the operational limit to its field engineering repair performance, which it referred to as the 'glass ceiling' to its performance. In the September 2017 QoS Further Consultation we provisionally concluded that the revised operational limit analysis provided a more reliable view of Openreach's operational limit than the earlier operational limit analysis that we had relied upon when developing our proposal for the March 2017 QoS Consultation. This information was relevant to our assessment because the resource increments for performance improvements are likely to increase significantly as the operational limit is approached.

[598] Openreach response to the March 2017 QoS Consultation, paragraphs 352 to 361.
[599] Openreach response to the March 2017 QoS Consultation, paragraphs 351 to 367.
[600] Openreach response to the March 2017 QoS Consultation, Annex 3.
[601] Openreach response to the March 2017 QoS Consultation, paragraph 34.
[602] Openreach response to the March 2017 QoS Consultation, paragraph 357.

## We considered whether the Allocation Model could produce better resource estimates for the proposed quality improvements than our model

A3.16 Prior to the September 2017 QoS Further Consultation, we considered whether the resource estimates produced by the Allocation Model could form a suitable input to our regulatory charge control models and whether they produce better resource estimates (for the proposed quality of service improvements) than the RPM. To inform our consideration:

- we commissioned an external review of the Allocation Model by consultants Analysys Mason;
- we made some amendments to the RPM to address some of the limitations identified in response to the March 2017 QoS Consultation;
- we produced revised resource estimates using the RPM reflecting our revised proposals for service standards and the new information about Openreach's operational limit; and
- we conducted additional sensitivity tests with the RPM to explore some of the issues raised by Openreach.

## In the September 2017 QoS Further Consultation we provisionally concluded that it would not be appropriate to rely solely on the Allocation Model

A3.17 In the September 2017 QoS Further Consultation we accepted that the Allocation Model was a sophisticated bottom-up discrete event simulation that, in terms of functionality, appeared to model Openreach's field operations more closely than the 2013 Distribution Model and the RPM. However, we also set out, based on the Analysys Mason audit, that although the Allocation Model was broadly-speaking well-constructed, it had certain problems which warranted further investigation. These included the sensitivity of the outputs to small input changes, outputs that appear counter-intuitive, the methodology used to derive the model inputs from operational data, and the methodology used to manipulate the inputs to reflect changes to the glass ceiling parameters. Moreover, the complexity of the model, coupled with the considerable time required to set up the model and the long run times for simulations, prevented us from auditing the model to our satisfaction, given the time and resources available to us. This led us to conclude provisionally that it would not be appropriate to rely on the Allocation Model alone as an input to our regulatory charge control models.

## We also provisionally concluded that the resource estimates from the RPM may be broadly as representative as those from the Allocation Model

A3.18 In the September 2017 QoS Further Consultation, we also provisionally concluded that although there are significant differences in approach between the two models, most of the simplifying assumptions used in the RPM, and by implication the high-level approach to simulation, have only a marginal impact on the resource deltas for performance improvement, if at all. The differences in the resource estimates stem primarily from differences in the operational limit, visit rate and inter-SOM loan assumptions.

A3.19 In view of these findings, we provisionally concluded that resource estimates for performance improvements generated by the RPM may be broadly as representative as those produced by the Allocation Model. As it had not been possible to fully audit the Allocation Model to our satisfaction, and as the simplifying assumptions in the RPM have marginal impact, in the September 2017 QoS Further Consultation we proposed to use the resource estimates (for performance improvements) derived from the two models in conjunction.

## Respondents to the September 2017 QoS were critical of our proposal to take the resource estimates from both models into consideration

A3.20 Openreach said that it was disappointed with Analysys Mason's conclusion that the Allocation Model should not be used by Ofcom to estimate resource uplifts for performance improvements. It considered that the Allocation Model to be the more sophisticated, accurate and appropriate tool than the RPM. Nevertheless, Openreach welcomed our proposal to take the Allocation Model outputs into consideration and to use the Allocation Model results as the base case for our resource uplift estimates. Openreach considered that we should refine both models to ensure our proposed approach was fit for purpose.[603]

A3.21 Four other respondents to the September 2017 QoS Further Consultation commented on our proposal to include the outputs of the Allocation Model in our consideration of the resource uplift for the proposed quality standards:

- Sky argued that we should not base our resource estimates on the Allocation Model given the serious concerns identified in the audit and BT's long history of exploiting the information asymmetry (between BT and Ofcom) to overstate its costs. Sky considered we should base our resource estimates on the RPM which is likely to be more robust and objective, even though it may have weaknesses[604];
- TalkTalk argued there are strong reasons for not using the Allocation Model. Firstly, because Openreach had a consistent track record of providing Ofcom with information that is biased and self-serving. Secondly the Allocation Model does not reflect Openreach's operations, for example in relation to sharing of resources across operational areas. Thirdly because the audit had found that the Allocation Model produces counter-intuitive results[605];
- UKCTA questioned why we had proposed to rely on the Allocation Model given the concerns identified in the audit and suggested that we should instead rely on the RPM to avoid any manipulation by Openreach[606];
- [✂] urged us to undertake further analysis of the Allocation Model in light of the audit findings, with emphasis on the operational limit since this is an input parameter to the resource modelling.[607]

[603] Openreach response to the September 2017 QoS Further Consultation paragraphs 39 to 40.
[604] Sky response to the September 2017 QoS Further Consultation, paragraphs 6.25 and 1A16
[605] TalkTalk response to the September 2017 QoS Further Consultation, paragraph 2.8.
[606] UKCTA response to the September 2017 QoS Further Consultation, paragraph 8.
[607] [✂]

A3.22 As we discuss later in this annex and in Section 10, we remain of the view that in view of the audit findings, it would not be appropriate for us to rely solely on the Allocation Model to determine the resource uplift for performance improvements. As previously proposed we have decided to consider the Allocation Model outputs alongside those generated by the RPM, while taking account of the limitations of the RPM.

A3.23 We consider the wider concerns about the information asymmetry between BT and Ofcom and the potential relevance for our charge controls in the 2018 WLA Statement.[608]

## There were also conflicting views about the extent to which flexible working practices such as loans should be modelled

A3.24 Two respondents to the September 2017 QoS Further Consultation commented about how flexible working practices such as inter-SOM loans are modelled. The CWU argued that inter-SOM loans, overtime and emergency loans from other teams should not be included in our resource modelling for various reasons:

- Inter-SOM loans have a negative impact on Openreach's technicians and reduce productivity because technicians incur excess travelling time and are required to work in areas where they lack local knowledge. The CWU also noted that SOM areas are resourced to meet demand so there is typically not much spare capacity available for loans;
- The time of year affects the amount of overtime that can be worked, and the amount of overtime worked voluntarily varies considerably by SOM. Whilst there are mechanisms for compulsory overtime, it requires consultation with the CWU and there are limits to how long it can be applied. [✂]; and
- Although emergency resources can be borrowed from other operational units they are not trained or kitted out for Openreach work so their impact cannot be modelled with any accuracy.[609]

A3.25 Conversely, TalkTalk was concerned that neither the Allocation Model nor the RPM consider that short-term peaks in demand can be met at lower cost by flexible working practices such as overtime or contractors rather than recruiting additional staff.[610]

A3.26 Flexible working practices such as overtime and inter-SOM loans are important techniques that enable Openreach to manage short term peaks in demand such as major storm events. Moreover, our analysis indicates that the resource uplift estimates are sensitive to the assumptions made about flexible working practices, notably inter-SOM loans. Whilst there may be opportunities to increase efficiency by making further use of such techniques, there are practical considerations that limit their use as the CWU has pointed out. As we have no information about the scale of such improvements, we have sought to ensure that the RPM reflects current operational practices as far as possible.

[608] 2018 WLA Statement, Volume 2. Paragraphs 4.12 to 4.16.
[609] The CWU response to the September 2017 QoS Further Consultation, [✂].
[610] TalkTalk response to the September 2017 QoS Further Consultation, paragraph 2.9.

### We have undertaken further work to investigate the inter-SOM loan functionality of the RPM and to assess the suitability of the Allocation Model to inform our assessment

A3.27 Since the September 2017 QoS Further Consultation we have undertaken further work to assess the suitability of the Allocation Model and the RPM to inform our assessment of the resource estimates for the quality standards:

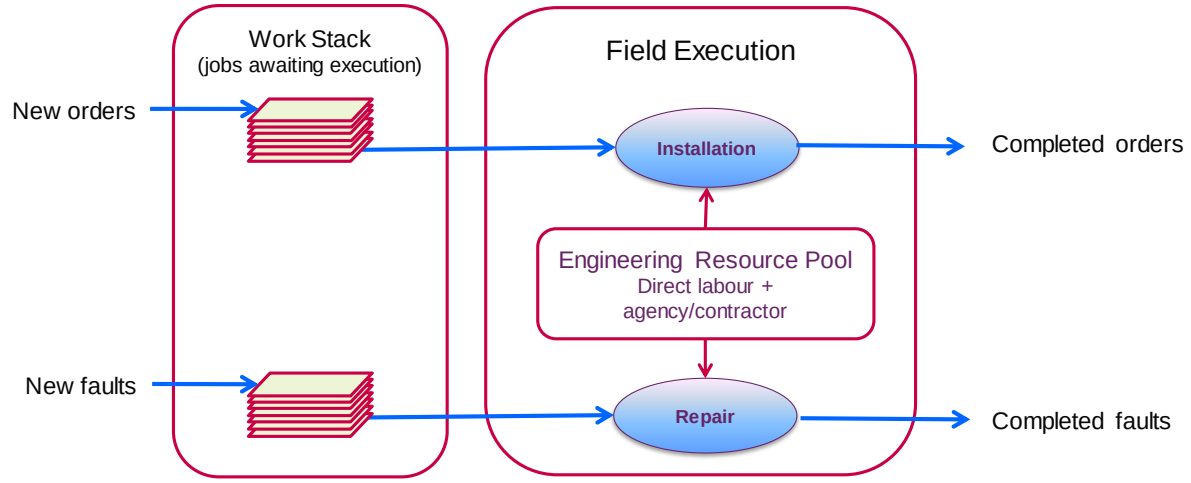
- We have carefully reviewed the responses to the September 2017 QoS Further Consultation;
- We have sought to gain a better understanding of the extent to which the inter-SOM loan functionality of the RPM reflects Openreach's operational practices by:
  - reviewing new information supplied by Openreach about the incidence of inter-SOM loans and the associated productivity loss of such loans;
  - analysing the RPM outputs to determine the incidence of inter-SOM loans modelled; and
- We asked consultants Analysys Mason to validate the Allocation Model resource estimates supplied by Openreach in its response to the September 2017 QoS Further Consultation.

A3.28 We discuss this work later in this annex.

## The relationship between demand, resources and performance

A3.29 Figure A3.1 shows a simplified process model of Openreach's field operations

**Figure A3.1 Simplified process model for Openreach**




*Source: Ofcom*

A3.30 As new installation orders and faults arrive, they are placed in a work stack awaiting execution. Work is undertaken in order of arrival and thus installation orders and faults are taken from the bottom of the work stack for field execution (subject to necessary prioritization, for example by service level).

A3.31 Appointed installation orders are controlled by means of an appointment book, which is populated with appointment slots that reflect the volume of field resources that will be made available each day for installation work. The orders are executed on the appointment date they have been allocated. In normal circumstances, sufficient resources are made available to meet installation demand. When fault rates are high, the number of appointment slots can be reduced, and resources diverted to repair work and appointment lead times are allowed to extend.

A3.32 The primary determinant of the process performance is the balance between the volume of work to be undertaken and the resources available to undertake it.

A3.33 When sufficient resources are available, it should be possible to achieve a high quality of service (i.e. to complete the majority of fault repairs and orders successfully within the agreed timescales). In practice, a small minority of faults and installation orders will not be completed successfully, for example because of errors or because some jobs are too complex to complete within the agreed timescales.

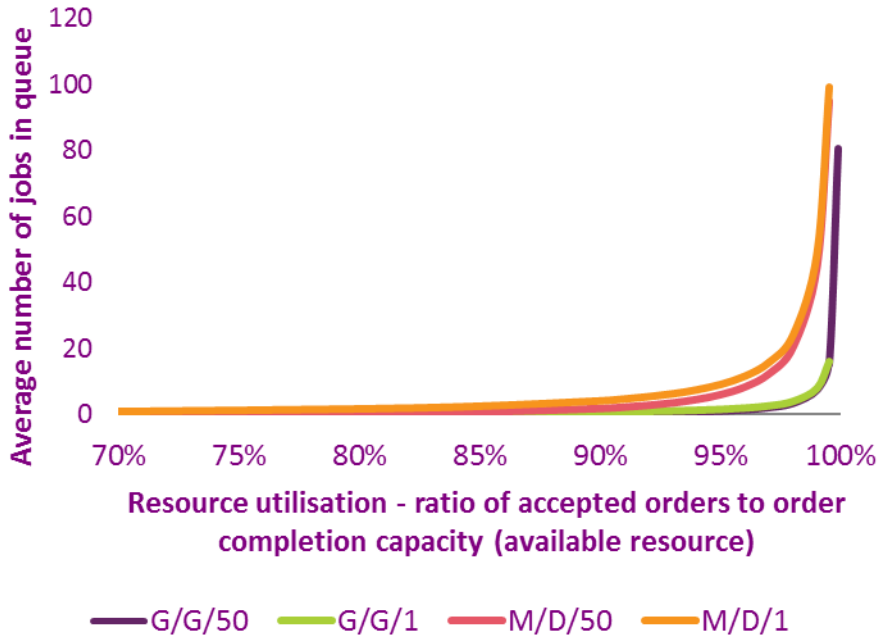
A3.34 If work volumes exceed the resources available, then performance will inevitably suffer. For example, faults will not all be repaired within the target time and installation order lead times will be extended.

A3.35 A feature of such processes is that after a period of excess demand, performance will not be fully restored until the backlog of work in the work stack has been cleared. While the backlog exists, all incoming work will spend longer than normal in the work stack waiting for resources to become available and consequently performance is impaired. This feature means that performance is highly sensitive to the level of resources available to meet demand. Performance is sensitive to resources in the following ways:

- Sensitivity to peaks in demand: the time taken to clear a backlog of work generated by a short-term peak in demand will depend on the amount of spare capacity available once demand has fallen back to normal levels. For example, if an organisation is presented with a peak of work 10% above normal for one week, after which volumes return to normal, the backlog could be cleared, and performance restored in approximately a week if the organisation has 10% spare capacity at normal volumes. However, if it has only 2% spare capacity, the backlog would take approximately five weeks to clear. In the extreme, if the organisation has no spare capacity, performance would not be restored unless demand falls below normal.
- Cumulative impact of small resource shortfalls: a small shortfall in resources relative to demand that persists over an extended period will cause the work stack to steadily increase and will consequently have a large impact on performance.

A3.36 Operational processes of this type are known generically as queuing models and have been subject to detailed theoretical study. The sensitivity of performance to the level of resources is evident in theoretical resource utilisation curves for such queuing models. Figure A3.2 below shows the theoretical relationship between resource utilisation and the average number of jobs queued for a selection of queuing models.

**Figure A3.2 Theoretical performance for a sample of queuing models**




*Source: Ofcom*[611]

A3.37 Figure A3.2 shows that the number of jobs queued rises sharply as resource utilisation passes a certain threshold (for example beyond about 95% in the examples in Figure A3.2). The number of jobs in the queue also has a direct bearing on cycle time (i.e. the overall elapsed time from the arrival of a work item to when it is completed) and therefore performance against cycle time SLAs.[612]

A3.38 Clearly, at high levels of resource utilisation the queue length (and therefore performance) will be very sensitive to small variations in resource utilisation that might arise because of variations in work volumes and resource levels.

A3.39 In the 2014 FAMR we concluded that a small increase in Openreach's resources could produce a significant improvement in Openreach's performance because we thought Openreach were operating very close to or on the steep part of the curve in Figure A3.2. Openreach has improved its performance since the 2014 FAMR Statement was published.

[611] Figure A3.2 portrays the theoretical performance for queuing systems consisting of a single queue served by one or 50 servers (k=1 or 50). The G/G/k curves assume a generalised probability distribution for both inter-arrival time (the time between jobs arriving) and service time (the time taken to execute jobs). In the G/G/k case the distribution of queue length and associated statistics (mean, variance, etc.) are insensitive to the probability distribution of the inter-arrival time and service time. The curves are theoretical approximations as exact solutions are not available in most cases (see Dennis E. Blumenfeld, Operations Research Calculations Handbook, second edition, CRC Press, 2012). The G/G/k curves are for an arrival coefficient of variation (CV) of 0.4 and a service CV of 0.05, values derived from the resource and volume data obtained under our statutory powers. Coefficient of variation is the standard deviation divided by the mean of the sample data. The M/D/k curves assume an exponential inter arrival time distribution (Poisson arrival process) and a constant service time.

[612] In a single server scenario, a queue length of 16 jobs indicates a cycle time equivalent to the time taken by the server to complete 16 jobs in the queue plus the time taken to service the job in the server (for example, if the server completes 4 jobs per day, the cycle time would be 4.25 days to complete the 17 jobs).

## Practical considerations in analysing Openreach's performance

A3.40 In practice, Openreach operates many work queues for installation orders and faults (reflecting the geographic areas and range of differently skilled engineers required). The observed national performance reflects the overall average achievement for the full group of queues rather than an individual queue as in the theoretical example above.

A3.41 Further, the demand patterns faced by Openreach are also more complex and vary from day to day as well as seasonally and from region to region.

A3.42 Openreach also has a significant amount of flexibility to manage its resources to meet demand. For example:

- Periods of low demand can be used to reduce or eliminate backlogs built up in periods of high demand, provided resources are not reduced in line with the demand reductions. Sustaining resource levels can also be used to keep installation order and fault repair lead times low under normal circumstances, making performance more resilient to peaks of demand;
- Preventative maintenance work can be undertaken in periods of low demand to fully utilise staff not immediately required for installation order and fault repair work. Preventative maintenance should reduce fault volumes;
- The level of resources available for fault repair can be increased during periods of high demand by:
  - redeploying staff from preventative maintenance activities;
  - using overtime;
  - moving staff from areas with low demand to areas with high demand;
  - temporarily extending installation order appointment lead times within the range permitted by the SLA so that it is possible to redeploy field staff to fault repair activities;
  - using contractors; and
  - recruiting additional staff.

A3.43 Given this flexibility we would expect performance to be somewhat more resilient to variations in demand than the theoretical curve presented in Figure A3.2. We would nevertheless expect Openreach's performance to exhibit the generic characteristics of queuing models. Particularly, we would expect:

- the balance between demand and resources to be the primary determinant of Openreach's installation order and fault repair performance;
- Openreach's performance to become less resilient to peaks in demand at high levels of resource utilisation;
- a small shortfall of resources compared with demand to lead to a large drop in performance, particularly if the shortfall persisted for an extended period; and
- a small increase in resource of the order of 5 to 10% to lead to a significant improvement in performance in cases where performance has been impaired by resource shortages.

# Description of the Resource Performance Model

A3.44 We describe the RPM below. Analysys Mason have provided a more detailed description of the model as well as an overview of the original Ofcom model. Further details on both models is set out in their report, which is published alongside the March 2017 QoS Consultation.[613]

## Software and hardware environment

A3.45 The model is written in the Python computer programming language and requires a Python interpreter and associated tools to run the model. It was developed using the Spyder integrated development environment (IDE) and associated Python interpreter which can be obtained, for example, as part of the Anaconda Python package (www.continuum.io/downloads). Input and output files are in "csv" format which requires Excel or similar for pre-processing and post-processing.

A3.46 Processing speed depends on the computer hardware used. Each run (5 to 11 resource levels) typically takes one to two hours and may require more than 10 Gb of memory (RAM). Some runs may require more than 32 Gb where the queue lengths become very long due to low resource levels relative to the workload. More than 50 hours of computation would be required to reproduce all the model outputs reported in this annex.

A3.47 The model is available on request. We suggest that it is run using the same software environment.

## Purpose

A3.48 The RPM is designed to estimate the increases in field engineering resources required to deliver specified improvements to installation order and repair quality for Openreach's WLR, MPF, SMPF and GEA services. Other functions associated with installation and repair are not modelled, for example workforce management/control, fault diagnosis, exchange jumpering and repair of exchange equipment.

## Model inputs

A3.49 The main input to the model is a daily summary of installation order and fault volumes derived from a dataset of faults and installation orders obtained from Openreach under section 135 of the Act. There are also certain ancillary inputs most notably the major and minor failure assumptions discussed below.

## Simulation approach

A3.50 The RPM provides a high-level simulation of Openreach's installation order and repair activities. Unlike discrete event simulation models, such as the Allocation Model, which

[613] See *Overview of the Quality-of-Service Model and its outputs for WLR/LLU Charge Control 2017* (Analysys Mason Report) for more details. https://www.ofcom.org.uk/__data/assets/pdf_file/0034/99646/Analysys-Mason-report.pdf.

simulate the execution of individual installation and repair jobs, the RPM simulates the execution of jobs in larger groups or batches, specifically the daily arrivals of new installation orders, SML1 faults and SML2 faults in each of Openreach's 56 SOM areas in Great Britain.[614] The model is implemented as a programme using the Python 3 programming language.

A3.51 The simulation is best described as a book keeping exercise in which the evolution of jobs is modelled from arrival to completion. The main elements of the sequence are as follows:

- Daily 'arrivals' of jobs are divided into batches according to job type (installation, and fault repair SMLs 1 and 2) and then added to the back of a queue of outstanding work of the corresponding job type and SOM region;
- Each job in the batch is time-stamped with the batch arrival time. Progress of each job is subsequently tracked individually to completion;
- The available field resources (an input to the model) are allocated to each type of job according either to a fixed ratio specified as an input or using a resource balancing algorithm designed to balance the performance by job type;
- Four times daily, jobs are taken from the bottom of each queue and allocated to the available field resources allocated to the queue (i.e. it is assumed that field technicians can on average undertake four installation or fault repair jobs per day); and
- Jobs that are not successfully completed by field technicians are modelled by reference to a set of operational limit parameters specifying the proportion of jobs that fail during field execution (see below for further explanation).

A3.52 The model includes various functional elements to simulate Openreach's operational processes including:

- Functionality to model the operational limit of field engineering performance (the so called 'glass ceiling' limitations) as discussed in more detail below;
- Functionality to model the allocation of finite common resources to jobs (i.e. job scheduling) including:
  - Resource algorithms to simulate the use of a common resource pool to serve both installation and repair jobs; and
  - Sharing of resources with adjacent SOM regions in periods of high demand and with non-adjacent SOM regions in periods of exceptionally high demand (for example exceptionally high fault volumes after major storms). The inefficiencies arising such as additional travel time are also modelled.

## Model outputs

A3.53 The main output of the model is the quality performance that can be achieved with specified levels of resources. Three quality performance parameters are modelled: the proportion of fault repairs completed within the SML1 and SML2 SLAs, reported separately;

[614] Northern Ireland is excluded by the Openreach dataset of orders, and faults had less detail than elsewhere in the UK and could not therefore be modelled.

and the proportion of installation orders completed within specified target for the First Available Appointment Date (FAD).

A3.54 As with the 2013 Distribution Model, it is assumed that the FAD offered is always taken (although in practice this is often not the case). Consequently, the modelled FAD performance is synonymous with the performance against CCD. Thus, for example, a model output indicating that 80% of orders are offered a FAD within ten days also indicates that 80% of orders were completed by the CCD.

A3.55 To enable the calculation of the resources required to achieve a given level of quality performance, the model produces outputs for a range of resource levels. Where necessary the level of resources required is derived by interpolating between appropriate pairs of performance-resource results generated by the model.

A3.56 Performance is modelled at the SOM level to allow for more granular estimation of the resource requirements than in the 2013 Distribution Model. Performance is however, assessed for Openreach's nine General Manager (GM) regions (i.e. the aggregate performance of the consistent SOM areas).[615]

## Limitations of the model

A3.57 The RPM is necessarily a high-level approximation of Openreach's field engineering activities for installation orders and fault repair. In this section we briefly describe these limitations and consider how they might affect how well the model represents Openreach's actual operations. We have taken these limitations into account in formulating our proposals.

- Job queue size: it is assumed that each job type is held in a single queue per SOM area and that all field engineering resources can tackle outstanding work. In practice, it is likely that Openreach ordinarily allocates resources based on smaller geographic areas. Large queues could have the effect of averaging out local variations that might lead to resource failures (for example the volume of available resources may match the volume of work to be undertaken, but in practice those resources may be too far away to undertake it).
- Job duration: a constant duration, 2.5 hours, is assumed for every job. In practice job durations will vary. Not taking this into account could overlook variations that could on some days have a material impact on the overall number of jobs that can be completed during the day.
- Skill level of technicians: the model assumes that all technicians can undertake all types of job. In practice, not all technicians are trained or experienced to the same degree and may not be able to undertake every task. This places an additional constraint on Openreach's resources.
- Sub-optimal allocation of resources between SOM regions: the model assumes a fixed spilt of resources between SOM regions based on a weighted sum of the SOM region's fault rate and the size of the installed base as of 1 April 2011. It is possible that both

[615] Each of the 56 SOM regions modelled lies within one of the 9 GM regions (excluding Northern Ireland).

have since changed thereby making the resource allocation mechanism sub-optimal. As we discuss in more detail below, after the March 2017 QoS Consultation, we made modifications to the way in which resource uplifts are calculated by the RPM to address this limitation.

- MBORC: jobs subject to MBORC declarations are not identified in the input dataset. The modelled outputs are therefore based on a somewhat larger pool of jobs than contribute to the quality performance measures. It is unclear whether this simplification would materially affect the resource estimates for QoS improvements.
- Allocation of resources between repair and installation: the resource allocation algorithm may not always lead to optimal performance against the quality performance measures because allocations are made based on the total lengths of the queues for each job type. This mechanism does not for example take account of the volume of SML1 repair activities that would need to be completed on that day to fulfil the SLA. This simplification could therefore cause the model to overestimate the resource increase required for a specified increase in performance.
- Operational limit assumptions: we have made certain simplifying assumptions concerning the handling of operational limit jobs (i.e. jobs that are not successfully completed on first attempt for reasons other than lack of resources). As discussed in more detail below, we have divided these failures into two groups: minor fail type jobs (jobs that are reissued for a second attempt the day following the first attempt) and major fail type jobs (jobs that are delayed for 5 days before they are reissued). While these groupings draw on our analysis of Openreach's operational limit failure analysis, they may not fully replicate the range of behaviours that occur, and resources used. Moreover, as we discuss below, the model outputs are sensitive to the level at which the operational limit parameters are set.

A3.58 By way of context we note that some of the limitations discussed above were also present in the 2013 Distribution Model. In particular:

- Job queue size: larger queues were used, modelling at the GM level (9 regions) rather than SOM level (56 areas);
- Job durations: fixed job durations were also used;
- Skill level of technicians: technician skill levels were modelled, however we found that the algorithm used would lead to a systematic overestimation of resources; and
- MBORC: jobs subject to MBORC declarations were included in the resource estimates.

A3.59 Analysys Mason discussed most of the limitations introduced above in Section 4.2 of their report.[616] They concluded that overall the model provides a reasonable representation of the resourcing challenges faced by Openreach.

## Modelling of the operational limit to performance

A3.60 A small proportion of installation orders and fault repairs fail at the execution stage for reasons other than lack of resources to undertake the work. Openreach refers to these

[616] Analysys Mason, March 2017. *Overview of the Quality-of-Service Model and its outputs for WLR/LLI Charge Control 2017.*

failures as 'on-the-day' failures reflecting the fact that most failures relate to something that goes wrong while field technicians are working on jobs. Openreach considers that these failures represent a practical upper limit or 'glass ceiling' to quality performance.

A3.61 As noted above, the RPM includes functionality to model these operational constraints. This is through parameters that specify the level of on-the-day failures and how they are handled as follows[617]:

- 'Minor fail' jobs representing those jobs that are not completed successfully on the first attempt, but which can be successfully completed on a second attempt after a short delay. If there is sufficient time and resources, the model allows fault repair minor fails to be completed successfully within the SLA on the second attempt[618]; and
- 'Major fail' jobs representing the small proportion of jobs that are not completed successfully on the first attempt and which will incur a longer delay, potentially several days or even weeks to complete. The model assumes that major fail jobs are delayed for five days and will not therefore be completed within the relevant SLA.

### For the March 2017 QoS Consultation we used Openreach's on-the-day failure analysis and our own estimates of the scope for improvement

A3.62 For the March 2017 QoS Consultation, we used information obtained from Openreach about the incidence of these 'on-the-day' failures for installation orders and fault repair.[619] This failure analysis categorised failures according to the reasons for the failure. We also asked Openreach to explain what scope there may be to raise the operational limit by reducing the incidence of such failures. While Openreach acknowledged that there is scope to make improvements, it did not provide us with any information about the improvements that could be achieved. We therefore produced our own estimates concerning the scope for improvements.

### We used Openreach's revised analysis for the September 2017 QoS Further Consultation and this statement

A3.63 As discussed in more detail in Section 10, we have concluded that Openreach's revised operational limit analysis is an improvement on its earlier analysis of its operational limit. We therefore used this information to produce resource estimates from the RPM for the September 2017 QoS Further Consultation and this statement.

### Converting Openreach's operational limit figures into a format suitable for the Resource Performance Model

A3.64 The revised operational limit analysis is expressed in terms of Openreach's performance against the repair SLA measure. This format is challenging for the RPM as it requires

[617] See the March 2017 Analysys Mason report for further details concerning the provision and repair versions of the glass ceiling major and minor fails, including the values modelled.
[618] Comparable functionality is not implemented for installation orders because installation orders must be completed on the appointment date to meet the CDD SLA.
[619] *Glass Ceiling Analysis*, Openreach presentation to Ofcom 2 November 2016; Openreach, 2013. *Openreach response to service related questions in Ofcom's consultation documents*. https://www.ofcom.org.uk/__data/assets/pdf_file/0026/81557/openreach_-_quality_of_service.pdf.

operational limit parameters in terms of 'on-the-day' failures (i.e. unsuccessful field engineering activities), the format used in Openreach's previous analysis.

A3.65 Conversion from SLA failures to on-the-day failures is not straightforward because on-the-day failures classified as 'minor fails' can be successfully completed within the SLA provided that a subsequent visit can be executed within the SLA timescales. Thus, the on-the-day operational limit is a function of modelling parameters such as fault dispatch patterns as well as the corresponding SLA operational limit. Consequently, it is difficult to determine the on-the-day operational limit parameters corresponding to the SLA figures.

A3.66 In view of the uncertainty about the appropriate minor fail assumptions, we used two different approaches:

- We used an estimate produced by Analysys Mason which used information from the Allocation Model about the proportion of jobs requiring multiple visits and assumptions about fault dispatch patterns to estimate the level of on-the-day minor fails corresponding to the SLA minor fails in Openreach's updated analysis; and
- We modelled SLA minor fails as major fails.

A3.67 We explored the sensitivity of the model to these approaches for an operational limit of 90.8%. Using the first approach the estimated on-the-day minor fail rate corresponding to the 1.8% SLA minor fail rate could be between 4.8% and 6.1% (i.e. 5.5% +/- 0.65%).[620] Using the second approach we set the major fail rate at 9.2%, the sum of minor and major SLA failures after process improvements.

A3.68 Our sensitivity tests indicate that modelling all SLA minor fails as major fails produces lower resource estimates for performance improvements than using estimated values for on-the-day minor fails.[621]

## Fault repair dispatch patterns

A3.69 As discussed above, the RPM allows fault repairs classified as minor fails to be reissued and successfully completed the following day if sufficient resources are available. The distribution pattern of fault repairs therefore has the potential to influence performance. If a greater proportion of repair jobs are initially dispatched to field technicians on the day of receipt, or in the case of SML1 faults on the day after receipt, the proportion of minor fails that are successfully completed within the SLA on the second attempt will increase. We therefore compared the distribution pattern for fault repair jobs in the RPM with Openreach's fault distribution patterns.

A3.70 Table A3.3 compares the fault distribution pattern (i.e. proportion of repair tasks attempted pre-SLA and on the final day required to meet the SLA) for the RPM with Openreach's actual fault distribution pattern. We observe that the fault distribution

[620] To estimate the level of on-the-day minor fails, Analysys Mason used Openreach information about the proportion of repairs requiring two visits and their own assumptions about the proportion of such repairs that would be carried over to the following day and fail the repair SLA. The range reflects Analysys Mason's assumptions about the proportion of minor-fails that would be carried over.

[621] In the September 2017 QoS Further Consultation, we incorrectly reported that our sensitivity tests indicated that modelling all SLA minor fails as major fails produces higher resource estimates (paragraph A5.64)

patterns produced by the RPM are similar to the actual fault distribution pattern. We therefore conclude that resource estimates produced by the RPM are unlikely to be unduly influenced by differences in the assumptions we make about the pattern of fault repair dispatch and Openreach's practice in the field.

**Table A3.3 Comparison of Openreach fault repair distribution patterns with those generated by the Resource Performance Model**

| Service Maintenance Level (SML) | | 2 days before SLA target | Day before SLA target | SLA target | After SLA target |
|---|---|---|---|---|---|
| SML1 | Openreach | 14% | 37% | 36% | 13% |
| SML1 | RPM | 8% | 36% | 46% | 10% |
| SML2 | Openreach | - | 20% | 63% | 17% |
| SML2 | RPM | - | 17% | 77% | 6% |

*Source: Openreach[622] and Ofcom*

## Modifications to the RPM

A3.71 After the March 2017 QoS Consultation we amended the RPM to address two of its limitations:

- Resource distribution: a single national resource level is specified as an input to each modelling scenario. Resources are then distributed to SOM areas according to historical fault volumes and 'working system size' (the number of services in operation). As fault and installation order volumes do not necessarily follow historical patterns, there is a risk that resources may be distributed sub-optimally.
- Resource uplift calculations: the resource levels for both baseline and improved performance components of resource deltas for performance improvements are calculated on a 'worst GM' basis. For each component, a single national resource level is selected that is just sufficient to ensure that the desired level of performance is met in every GM region. This approach is likely to raise performance more than necessary in some GM regions, potentially affecting resource deltas for performance improvements.

A3.72 The amended version of the model selects resource levels (for both baseline and improved performance components of resource deltas) on an individual GM basis. GM level outputs are then aggregated using the working system size of each GM area to produce weighted average national results.

A3.73 This approach avoids the risk of raising the performance of some GMs more than necessary. Although the resource distribution algorithm is retained, selecting resource

[622] Fault distribution pattern information supplied by Openreach for the period 2 September 2016 to 25 November 2016. The values portrayed in the table represent the simple average of the WLR and MPF numbers that Openreach supplied. No allowance has been made for the relative volumes of repairs for the two services.

levels on an individual GM basis negates the impact of any sub-optimal distribution of resources. This amendment brought the RPM more closely into alignment with the Allocation Model which estimates resources for each SOM area independently. Our sensitivity tests indicate that this change tends to increase the resource deltas for performance improvements.

## The inter-SOM loan functionality of the Resource Performance Model

A3.74 As noted above, the RPM incorporates functionality to model the sharing of resources between adjacent SOM areas in periods of high demand and between non-adjacent SOM areas in periods of exceptionally high demand (for example exceptionally high fault volumes after major storms). The inefficiencies arising such as additional travel time are also modelled.[623]

A3.75 The Allocation Model does not have directly comparable functionality. Instead, resource sharing between SOM areas and GM regions is taken into account in the calibration of the model. The weekly resource shrinkage inputs are adjusted to reflect the hours worked by technicians outside their SOM area or GM region. As this adjustment reflects the hours work out-of-area, any associated inefficiency is also captured.

### Openreach and Deloitte raised concerns about the inter-SOM loan functionality in their responses to the March 2017 QoS Consultation

A3.76 Drawing on the Deloitte report, Openreach argued it was unclear whether the level of resource loans modelled in the RPM was consistent with Openreach's practices.[624]

A3.77 Deloitte noted that the loan functionality in the RPM went beyond that incorporated in the Allocation Model. It found the resource deltas produced by the RPM to be highly sensitive to the use of the inter-SOM loan functionality.[625] However, it had insufficient information about the frequency of loans modelled by the RPM to determine whether the modelling approach was accurate.[626]

A3.78 Deloitte also reviewed operational information about loans which indicated that although loans appeared to be very common, most are small with almost half relating to three or less Full Time Equivalents (FTE).[627]

A3.79 Deloitte concluded that the Allocation Model might overstate costs by not modelling loans and that in contrast, the RPM might overstate the ease and frequency of loans.[628]

### Openreach subsequently provided further details about the impact of inter-SOM loans

[623] See March 2017 Analysys Mason Report, pages 14-15, for more details.
[624] Openreach response to the March 2017 QoS Consultation, paragraph 384.
[625] Deloitte, 2017. *Quality of Service Modelling* (report by Deloitte for Openreach), page 38. (Also Annex 3 in Openreach's response to the March 2017 QoS Consultation).
https://www.ofcom.org.uk/__data/assets/pdf_file/0026/106199/Deloitte.pdf.
[626] Deloitte, 2017. *Quality of Service Modelling*, page 10.
[627] Deloitte, 2017. *Quality of Service Modelling*, page 37.
[628] Deloitte, 2017. *Quality of Service modelling*, page 10.

A3.80 Following the September 2017 QoS Further Consultation, Openreach provided us with further information about the incidence and productivity losses associated with inter-SOM loans. This showed that:

- in 2015/16 and 2016/17 inter-SOM loans accounted for approximately 2.7% of field engineering days, split roughly equally between daily loans and lodge loans (comparable to adjacent SOM loans and non-adjacent SOM loans in the RPM);
- the productivity loss associated with daily loans was 19.5% and 17.4% in 2015/16 and 2016/17 respectively; and
- the productivity loss associated with lodge loans was 39.3% and 39.8% in 2015/16 and 2016/17 respectively.[629]

A3.81 In its response to the September 2017 QoS Further Consultation, Openreach said that it had been unable to determine how well the RPM reflected operational practices since the RPM did not produce outputs specifying the incidence of inter-SOM loans. However, its analysis suggested that the RPM might overstate the impact of inter-SOM loans for several reasons[630]:

- Non-adjacent SOM loans:The non-adjacent SOM loan facility of the RPM (equivalent to Openreach's lodge-loans) would be likely to overstate the impact of such loans since they can occur daily in the RPM contrary to Openreach's operational practice.[631]
- Productivity loss: Our assumption that loaned resources would be 75% effective would understate the productivity loss associated with lodge-loans which is approximately 40% in practice and slightly overstate the productivity loss associated with daily loans which is approximately 20% in practice.[632]
- Definition of adjacent SOM areas: The methodology used to derive the 'adjacency matrix' specifying which SOM areas are adjacent to each other (and therefore able to loan staff daily) may overstate Openreach's flexibility by assuming that staff are loaned further afield daily than occurs in practice. Openreach said that its analysis indicated that the adjacency matrix permits 264 combinations of inter-SOM loans, whereas only 134 occurred in 2015/16.[633]

A3.82 Openreach also said that higher service quality standards would reduce its flexibility to loan staff in future.[634]

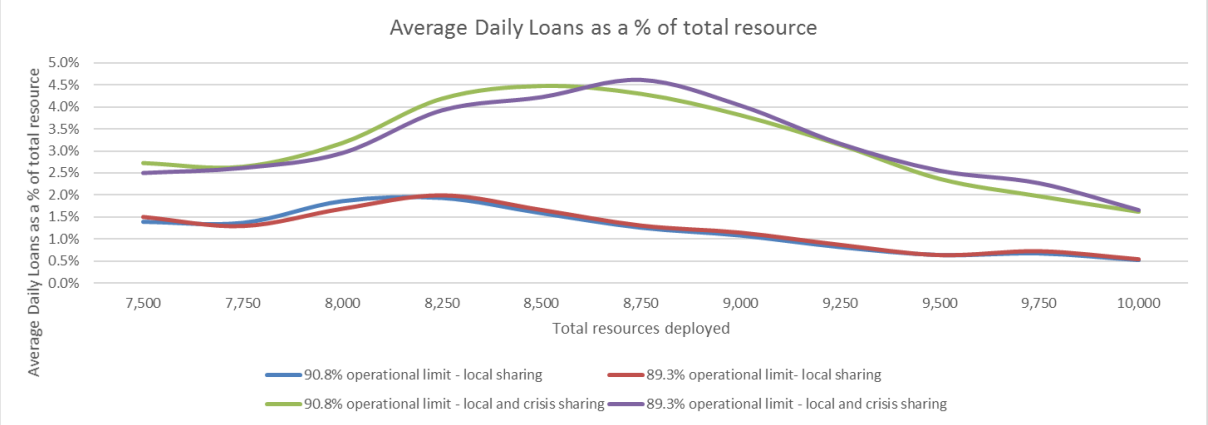
[629] Openreach presentation to Ofcom entitled *Service Delivery Loans Overview*, 24 October 2017. Openreach also included information about loans in Annex 1 of its response to the September 2017 QoS Further Consultation.
[630] Openreach response to the September 2017 QoS Further Consultation, paragraphs 41 to 43.
[631] Openreach response to the September 2017 QoS Further Consultation, paragraph 119.
[632] Openreach response to the September 2017 QoS Further Consultation, paragraph 120.
[633] Openreach response to the September 2017 QoS Further Consultation, paragraphs 121 to 126.
[634] Openreach response to the September 2017 QoS Further Consultation, paragraph 9.

### In light of Openreach's submissions we have conducted further analysis about inter-SOM loans

A3.83 In light of Openreach's submissions we conducted further analysis of the output files produced by the RPM to determine the incidence of inter-SOM loans. We reported our findings in an update published in December 2017.[635]

A3.84 Figure A3.4 below from the December update illustrates the average daily incidence of inter-SOM loans as a percentage of total resources, for a range of resources. Each line on the chart shows the level of loan activity for a combination of one of the operational limit values we specified in our consultation proposals in the September QoS Further Consultation and type of loan.

**Figure A3.4 Resource Performance Model – loan utilisation at various resource levels**




*Source: Ofcom*[636]

A3.85 Table A3.5 below shows point estimates, drawn from the analysis for Figure A3.4 above, for the average daily incidence of inter-SOM loans, by loan type for the quality standards and the operational limit values we consulted on in the September 2017 QoS Further Consultation.

[635] Ofcom, 2017. *Further Clarifications on the Ofcom Resource Performance Model*. https://www.ofcom.org.uk/__data/assets/pdf_file/0020/108704/wla-qos-clarification-note.pdf.
[636] Ofcom, 2017. *Further Clarifications on the Ofcom Resource Performance Model*, Figure 1.

**Table A3.5 Inter-SOM loans as a proportion of total field engineering resources for quality standards for 2020/21**

| | Operational limit 90.8%<br>Major fails: 9.2%<br>Minor fails: 0% | Operational limit 89.3%<br>Major fails: 10.7%<br>Minor fails: 0% |
|---|---|---|
| Non-adjacent sharing: on<br>Adjacent sharing: on | 4.4% | 4.3% |
| Non-adjacent sharing: off<br>Adjacent sharing: on | 1.3% | 1.0% |

*Source: Ofcom RPM Model*

A3.86 The incidence of inter-SOM loans modelled by the RPM at the quality standards (as shown in Table A3.5) is: higher than occurs in practice when both the adjacent and non-adjacent loan functionality of the RPM are used; and lower than occurs in practice when only the adjacent SOM loan functionality is used.

A3.87 We also considered Openreach's concerns about the adjacency matrix used to define adjacent SOM areas. The adjacency matrix is a table listing the distances between the centres of pairs of SOM areas. These distances are used only to establish which SOM areas can loan staff to each other daily. They are not intended to be representative of the journeys which loaned technicians would make as Openreach has suggested. The RPM assumes only that technicians could be loaned between adjacent SOM patches with an attendant loss of productivity to account for travel time and unfamiliarity with the loan area. As Openreach has pointed out, the adjacency matrix assumes loans occur between a larger combination of SOMs areas than occurs in practice.

**Our further analysis indicates that the adjacent SOM loan functionality is broadly representative of operational practice but the non-adjacent SOM loans functionality may overstate its influence**

A3.88 Our sensitivity tests indicate that both the adjacent SOM loan and non-adjacent SOM loan functions have a significant influence on resource estimates for performance improvements.

A3.89 Our analysis indicates that the RPM models a higher incidence of non-adjacent SOM loans than occurs in practice. It also assumes a lower productivity loss than occurs in practice, 25% compared with 40%. The RPM may therefore overstate the influence of such loans on resource deltas for performance improvements, leading the RPM to understate resource deltas for performance improvement when this functionality is used.

A3.90 The adjacent-SOM loan functionality appears to be a much better representation of Openreach's operational practices. The modelled incidence of adjacent SOM loans appears to be consistent with operational practices (at least at the resource levels required for the quality standards) and the assumed productivity loss is somewhat higher than experienced by Openreach at 25% compared with 20%. Therefore, whilst we acknowledge that the RPM

is not a perfect representation of operational practice, as Openreach loans staff between fewer combinations of SOM areas than modelled, we consider that the adjacent-SOM loan functionality is broadly representative of the influence of adjacent-SOM loans on resource deltas for performance improvements.

A3.91 In view of these conclusions we have decided to base our estimates of the resource delta for the quality standard on model outputs produced with the adjacent-SOM loan functionality only.

## RPM resource estimates

A3.92 Table A3.6 below presents a series of resource uplift estimates for the QoS standards for fault repair and installation orders as discussed in Sections 5, 6 and 7. Five modelling scenarios are presented to illustrate the sensitivity of model outputs to operational limit and inter-SOM loan settings:

- Scenario 1: uses the estimate of on-the-day repair minor failures and has inter-SOM sharing turned on;
- Scenarios 2 to 4: have repair minor fails modelled as major fails and illustrate resource uplift sensitivity to the inter-SOM sharing settings;
- Scenarios 5 and 6: have a 1.5% higher major fail rate (reflecting the differential between the national average operational limit and the worst GM) to illustrate the resource uplift sensitivity to movement in the operational limit.

**Table A3.6 Revised resource uplift estimates for the quality standards**

| | | Base Case (2015/16) | Scenario 1 | Scenario 2 | Scenario 3 | Scenario 4 | Scenario 5 | Scenario 6 |
|---|---|---|---|---|---|---|---|---|
| Fault Repair | Minor Fail | | 5.5% | 0% | 0% | 0% | 0% | 0% |
| | Major Fail | | 7.4% | 9.2% | 9.2% | 9.2% | 10.7% | 10.7% |
| Installation | Minor Fail | | 1.4% | 1.4% | 1.4% | 1.4% | 1.4% | 1.4% |
| | Major Fail | | 3.6% | 3.6% | 3.6% | 3.6% | 3.6% | 3.6% |
| Loans | Adjacent SOM | | Yes | Yes | Yes | No | No | Yes |
| | Non-adjacent SOM | | Yes | Yes | No | No | No | No |
| | Fault repair service mix (SML1/SML2) | 50/50 | 50/50 | 50/50 | 50/50 | 50/50 | 50/50 | 50/50 |
| | FAD (working days) | 12 | 10 | 10 | 10 | 10 | 10 | 10 |
| | % orders offered date (FAD) | 80% | 90% | 90% | 90% | 90% | 90% | 90% |
| | Provision by committed date (CCD) | 90% | 95% | 95% | 95% | 95% | 95% | 95% |
| | Repair performance within SLA (SML1 / SML2) | 80%/80% | 88%/88% | 88%/88% | 88%/88% | 88%/88% | 88%/88% | 88%/88% |
| | Resource uplift | - | 13.1% | 8.1% | 9.1% | 10.8% | 17.9% | 14.1% |

*Source: Ofcom*

# Description of the Allocation Model

A3.93 The Allocation Model was commissioned by Openreach to support its submissions to our consultations on QoS standards and regulatory charge controls. Openreach has also told us that it intends to use the Allocation Model as an operational planning tool.

A3.94 The model is designed to explore the relationship between field engineering resources and QoS by simulating the field engineering activities associated with the installation and repair of Openreach's main services: MPF, analogue and digital WLR, SMPF and GEA-FTTC.[637] Some other functions that support installation and repair activities are not modelled. These include exchange jumpering and network construction.

A3.95 As with the RPM, the Allocation Model measures the proportion of orders completed on the appointment date. The availability of appointments is not simulated so the FAD measure cannot be examined directly.

## Simulation approach

A3.96 The Allocation Model uses the allocations approach to discrete event simulation. The simulation is used to estimate the performance that would be achieved for a given resource level for a specified arrival pattern of jobs (i.e. repairs and installations).

A3.97 The model simulates the progress of installation orders and faults through Openreach's field operations from arrival to completion. It includes various functional elements to simulate Openreach's operational processes including:

- simulation of job arrival patterns and queuing of jobs awaiting execution;
- simulation of allocation of work to field engineering technicians based on work priority and skills required;
- simulation of individual field engineering activities including jobs requiring multiple visits and jobs where technicians require assistance from a colleague;
- simulation of variation in travel and task times;
- simulation of variation in the availability of field technicians by skill group; and
- simulation of the operational limit, or 'glass ceiling' to performance.

## Model inputs

A3.98 The main inputs to the model are distributions derived from Openreach's operational data. These include distributions relating to job volumes, technician availability, allocation of jobs to technicians and job execution. The model samples each of the distributions randomly.

A3.99 Each model run is in effect a different scenario because each simulated event uses a different combination of the input parameters selected randomly from the input distributions. As a result, the output of each model run is different, unless the pseudo-

[637] A list of the job types modelled is provided in Openreach's response to the March 2017 QoS Consultation on page 137.

random number functions[638] used to make the random selections are reset to starting values at the start of the model run.

### Model outputs

A3.100 Separate instances of the model are used to simulate each of Openreach's 56 SOM areas in Great Britain. Outputs are subsequently aggregated to produce outputs for the 9 Openreach GM regions and for Great Britain. Northern Ireland is not modelled because the input data is not available in the same format as the rest of the UK.

A3.101 The model is run with a range of resource inputs. The resource increment for a specified improvement is estimated by subtracting the resource estimate for the desired level of performance from the resource estimate for baseline performance (i.e. the performance achieved).

### Further details about the model design and operation

A3.102 The discrete event simulation is implemented in the Python programming language and uses the SimPy discrete event simulation software library. An external database is used to hold the input files and the raw output files generated by the simulations. The raw model outputs are 'post-processed' within the database using SQL scripts. Summary outputs are exported from the database to Microsoft Excel for further processing into final outputs.

A3.103 Openreach has provided a more detailed description of the Allocation Model in Annex 2 of its response to the March 2017 QoS Consultation.[639] Analysys Mason has also described the model in its report.[640]

## Our consideration of the Allocation Model

### The Allocation Model appears, overall, to model Openreach's field operations in more detail than previous models

A3.104 Openreach has sought to address concerns about the 2013 Distribution Model and the RPM by producing a sophisticated bottom-up discrete event simulation that, in terms of functionality, appears to model its field operations more closely than the other models. The simulation includes operational factors that influence the execution of jobs that are not modelled in the RPM such as variation of travel and task times, resource availability and skilling constraints. Thus, to the extent that these factors influence the resource increases for service improvements, the Allocation Model could produce more accurate results.

[638] A software function that generates numbers that approximates to a random sequence of numbers.
[639] Openreach response to the March 2017 QoS Consultation, Annex 2.
[640] Analysys Mason, September 2017. *WLR/LLU Charge Control 2017 Quality of Service model assessment*. Section 3. https://www.ofcom.org.uk/__data/assets/pdf_file/0013/106312/model-assessment-wlr-llu-quality-service.pdf.

## There are some limitations of the Allocation Model compared with the RPM

A3.105 Analysys Mason found that the Allocation Model takes a much more detailed approach to modelling the relationship between quality of service and field engineering resources compared with the RPM. Analysys Mason also noted there are several areas where the Allocation Model is less capable, or was configured less capably, than the RPM:

- Stress response: job handling limitations primarily relating to the handling of 'stress' situations (periods of exceptionally high demand) mean that the Allocation Model may not adequately manage resources to optimise performance;
- The 'stress functionality' of the Allocation Model, which degrades installation performance (including for unregulated services such as Broadband Boost) and other activities to improve repair performance was turned off in most scenarios reported by Openreach;
- Inter-SOM loans: resource handling limitations mean that inter-SOM resource loans which may improve performance are not modelled;
- Performance balancing: there is no mechanism beyond the basic job prioritisation rules to balance performance across different types of jobs (installation orders, fault repair SML1 and fault repair SML 2 etc.), meaning that resources required to achieve performance targets may be overestimated; and
- Potential modelling errors: model configuration complexity means that it is hard to guarantee that errors are not introduced in the running of the model.

## The audit found that the Allocation Model is well-constructed but also identified problems

A3.106 Analysys Mason concluded that the Allocation Model is, broadly speaking, well-constructed, notwithstanding a bug that caused a small proportion of model runs to crash. However, Analysys Mason identified certain problems that led it to consider that it is unlikely that the model, in its current form, could be used in isolation, to predict resource deltas for performance improvements. These problems were:

- the model is complex to install, configure and run due to a lack of a user interface and insufficiently detailed documentation;
- the model is complex and slow in operation, generating large amounts of data, making sensitivity analysis very slow; and
- it was unclear how some of the input parameters, notably the operational limit assumptions, were reflected in the input datasets.

A3.107 Analysys Mason was unable to reproduce Openreach's model results in detail, although this may be due in part to the way in which the model uses random numbers, which differs between the versions of Python used by Openreach and Analysys Mason.[641] Importantly, Analysys Mason found that model runs with quite similar input datasets could produce widely varying resource deltas for performance improvements. Although the results were

[641] Analysys Mason, September 2017. *WLR/LLU Charge Control 2017 Quality of Service model assessment*, Section 4.3.

not necessarily incorrect or unreliable, Analysys Mason suggested that Ofcom treat the results with caution given the sometimes counter-intuitive results and the difficulty replicating outputs.[642]

## Only Openreach commented in detail about the Allocation Model audit

A3.108 Openreach made detailed comments about the audit findings in its response to the September 2017 QoS Further Consultation. As discussed above, four other consultation respondents expressed concern about our proposal to take the outputs of the Allocation Model into consideration in view of the audit findings. They did not, however, provide more detailed comments about the audit findings.

A3.109 We discuss Openreach's comments below.

### Model complexity, slow operation and risk of configuration errors

A3.110 Openreach argued that Analysys Mason's criticisms of the Allocation Model's complexity and slow operation were unjustified. In its view, a sophisticated, highly detailed and complex model is necessary to capture the complexity of its operations. Given this, it is appropriate to sacrifice speed for an output that is more operationally correct.[643]

A3.111 Openreach acknowledged Analysys Mason's concern that the complexity of the model creates the potential for configuration errors. However, it considered that the potential for errors was limited because it had established a robust method to create and run scenarios and because it had provided comprehensive support to Analysys Mason during the audit process.[644]

A3.112 We agree in principle that a sophisticated model may be appropriate if it provides a more accurate estimate of the resource delta for performance improvements. Complexity, speed of operation and the risk of configuration errors are, however, relevant considerations in the context of the audit which informs our consideration of the suitability of the Allocation Model as an input to our assessment of the resource uplift for performance improvements.

A3.113 Our judgement is that the complexity and slow operation of the model, combined with the PYTHONHASHSEED issue discussed below, impaired Analysys Mason's ability to audit the Allocation Model, for example preventing them from fully exploring the reasons why it sometimes produced results that appeared counter-intuitive. Moreover, notwithstanding a great deal of support from Openreach, Analysys Mason were unable to exactly replicate Openreach's modelling results.

### Software bug

A3.114 In the audit report, Analysys Mason considered it undesirable for there to be a known error in the Allocation Model, even if it only occurs rarely and does not affect the model outputs.

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[642] Analysys Mason, September 2017. *WLR/LLU Charge Control 2017 Quality of Service model assessment,* Section 10.
[643] Openreach response to the September 2017 QoS Further Consultation, paragraphs 90 and 91.
[644] Openreach response to the September 2017 QoS Further Consultation, paragraph 93.

The existence of the bug somewhat undermined its confidence in the correctness of the results.[645]

A3.115 Openreach described the software bug as a rare edge case which would not affect the modelling outputs because it occurs very infrequently (only once or often not at all in a full UK run of 2240 modelling scenarios) and could be addressed by resetting the 'random seed' parameter.[646]

A3.116 We agree with Analysys Mason's conclusion. Whilst the bug may occur rarely and there is a work around, its significance is that it somewhat undermines our confidence that the potential for modelling errors is limited. Moreover, when Analysys Mason conducted additional model runs, to replicate the resource uplift estimates submitted by Openreach in its response to the September 2017 QoS Further Consultation), the bug occurred four times in a single full UK model run, four times as often as stated by Openreach. This higher incidence leads us to question whether the bug is fully understood and whether Openreach can be fully confident that it does not affect the results.

### Replicability of modelling results

A3.117 During the audit, Analysys Mason initially had some difficulty replicating Openreach's modelling results.

A3.118 Openreach noted that it had gone to some lengths to investigate this problem during the audit, re-engaging EY (who had originally developed the Allocation Model) to test the model across multiple operating environments (operating systems, machines, databases and software versions). It had demonstrated that the problem related to a Python software feature called PYTHONHASHSEED.[647] This feature had been shown not to operate reliably in version 3.6 of the Python software, initially used by Analysys Mason. Openreach's modelling results were replicable if Python Software prior to version 3.6 was used.[648]

A3.119 Openreach also provided results for a further 10 model runs (each using different PYHTONHASHSEED settings) which in its view demonstrated that the modelling results included in Openreach's response to the March 2017 QoS Consultation (with a staff skilling mix of 83% trained to undertake Underground/Broadband and Underground(UG/BBUG) activities) are within the expected range of outcomes.[649]

A3.120 We acknowledge that this problem is now well understood and that it can be avoided if version 3.4 of the Python software is used. The significance of this issue for our consideration of the Allocation Model is twofold. Firstly, a significant proportion of the audit effort was taken up with investigating this problem, and rerunning model scenarios using Python version 3.4 once the problem with Python Version 3.6 had been identified. Consequently, the time available to investigate other issues such as the derivation of key inputs and the counter-intuitive results (both discussed below) was curtailed. Secondly, the

[645] Analysys Mason, September 2017. *WLR/LLU Charge Control 2017 Quality of Service model assessment*, Section 4.4.
[646] Openreach response to the September 2017 QoS Further Consultation, paragraph 94.
[647] A parameter in Python that determines how iteration over data structures known as dictionaries is controlled.
[648] Openreach response to the September 2017 QoS Further Consultation, paragraphs 99 to 101.
[649] Openreach response to the September 2017 QoS Further Consultation, paragraph 102 and Table 6.

fact that it is unclear which configuration produces more correct results, somewhat undermines our confidence in the model outputs.

### Derivation of key input data and operational limit inputs

A3.121 Analysys Mason found that the source of key input data for the Allocation Model was not always clear. Whilst it was not necessarily incorrect, it was not always possible to understand whether it had been used as intended or indeed how the raw data had been processed to derive the model inputs. Importantly, it was not clear how the operational limit parameters had been translated into model inputs by adjusting the relevant 'category distributions'. Moreover, although the model behaved qualitatively as expected, the inputs for the actual and raised operational limit scenarios appeared almost identical and did not appear to correspond directly to the relevant operational limit figures.[650]

A3.122 Openreach argued that the accuracy of the model was enhanced by the fact that the inputs were derived from operational data at the engineering visit level. Openreach also noted it had described (to Ofcom) the extensive model calibration against operational data[651] and had also provided Analysys Mason with detailed documentation about the model inputs including the SQL scripts used to prepare the input data tables and distributions.[652]

A3.123 Openreach suggested that Analysys Mason's uncertainty about how operational limits are implemented in the Allocation Model was likely to have arisen because of the way in which operational limit inputs are translated into model inputs. For example, skilling and resources are not explicitly set in the Allocation Model and instead depend on the level of multi-skilling and resource that is configured in the input distributions.[653]

A3.124 As the quality standards under consideration are close to Openreach's operational limit we would expect performance to be sensitive to the operational limit parameters. It is apparent from the audit that this is indeed the case. A clear understanding of the operational limit parameters (how they are applied to the model and confirmation that they were set at the correct levels) is therefore an important element of our assessment of the Allocation Model.

A3.125 Openreach's response to the September 2017 QoS Further Consultation has not improved our understanding of the application of operational limit parameters to the model inputs. We therefore remain of the view that the methodology used to manipulate the input data to reflect the operational limit parameters and more generally to derive the model inputs from operational data, warrants further investigation.

### Counterintuitive results

A3.126 Analysys Mason's review of the outputs of a range of modelling scenarios suggested that there is a high level of uncertainty in the modelling outputs. It found that model runs with quite similar inputs could have widely varying results, especially when the target

[650] Analysys Mason, September 2017. *WLR/LLU Charge Control 2017 Quality of Service model assessment,* Section 4.10.
[651] *Openreach Service Demand Modelling – Allocation Model*, Openreach presentation to Ofcom 27 April 2017.
[652] Openreach response to the September 2017 QoS Further Consultation, paragraph 98.
[653] Openreach response to the September 2017 QoS Further Consultation, paragraph 98.

performance is close to the operational limit. It considered the results were hard to interpret because there were significant variations in the resource deltas from apparently small changes to the inputs. Whilst this did not necessarily mean the model results are wrong, Analysys Mason considered that Ofcom should treat the results with an appropriate level of caution.[654]

A3.127 Openreach disagreed. In its view, the differences between the high-level scenarios should not be underestimated. Openreach considered that the Allocation Model outputs reported by Analysys Mason in Figure 8.1 of the audit report were not counter-intuitive, particularly as it had concerns about the way in which Analysys Mason had applied scenario HLS203.[655] Scenario HLS77 showed that when the performance target is above the operational limit, the target is not reached even with a large resource uplift. Scenario HSL200, the 2015/16 baseline against which higher standards were measured, reflected actual performance, including the SML1 target not being met, due to the impact of the 2015/16 service mix and geographical impacts of the operational limit.[656]

A3.128 We agree with this aspect of the audit findings. Whilst the outputs reported by Analysys Mason in Figure 8.1 of the audit report may be directionally correct as Openreach suggests, the essential point is that it was not possible to fully investigate the apparently counter-intuitive results during the audit.

### Stress functionality

A3.129 Analysys Mason said it was unclear whether it was appropriate to model resource uplifts with the 'stress functionality' turned off as Openreach had chosen to do.[657]

A3.130 Openreach explained that it had not used the stress functionality for its resource uplift estimates because it degrades provisioning performance (by simulating longer appointment lead times), degrades performance for services such as broadband boost and simulates cancellation of team meetings and training which is not conducive to improving performance in the long term.[658]

A3.131 We consider that this is an aspect of the Allocation Model that warrants further investigation. Whilst there is clearly a limit to which the stress response techniques (modelled in the Allocation Model) can be used in practice without causing negative impacts elsewhere, they appear to us to be useful tools for dealing with short term peaks in demand. It is therefore not clear to us that it is appropriate not to use this functionality when modelling resource uplifts for performance improvements.

[654] Analysys Mason, September 2017. *WLR/LLU Charge Control 2017 Quality of Service model assessment*, Section 8.2.
[655] Openreach did not elaborate about its concerns about how Analysys Mason had applied scenario HLS203.
[656] Openreach response to the September 2017 QoS Further Consultation, paragraphs 110 to 111.
[657] Analysys Mason, September 2017. *WLR/LLU Charge Control 2017 Quality of Service model assessment,* Section 8.1.2.
[658] Openreach response to the September 2017 QoS Further Consultation, paragraph 104.

### Prioritisation by job type

A3.132 Analysys Mason found that the provisioning and SML1 repairs significantly outperformed SML2 repairs and that there was no mechanism in the Allocation Model to allocate more resources to SML2 repairs.[659]

A3.133 Openreach explained that the prioritisation rules in the Allocation Model reflect the operational rules which are designed to prioritise failed jobs and to keep tails (of failed jobs) to a minimum. Moreover, it is not as easy as suggested for Openreach to balance performance across job types for various operational reasons.[660]

A3.134 We think these are fair points. The resource estimates are likely to be more representative if the prioritisation rules reflect operational practice. We have not, however, been able to test whether the Allocation Model reflects operational practices in this regard.

### Overtime post-processing

A3.135 The 'raw' resource estimates produced by the Allocation Model are post-processed using an SQL script that adjusts the additional resources to ensure a more realistic level of overtime is implied. The adjustment reduces the resource delta for performance improvements. Analysys Mason concluded the adjustment potentially removed too much of the additional resource modelled and may therefore cause the resource deltas to be understated.[661]

## In view of the audit findings we have decided not to rely solely on the Allocation Model to estimate the resource uplifts for the quality standards

A3.136 In view of the audit findings and our further consideration of the Allocation Model discussed above, we have concluded that it would not be appropriate to rely on the Allocation Model alone to estimate the resource uplifts for the quality standards we are imposing. The audit has identified several issues that we consider warrant further investigation, including the sensitivity of the outputs to small input changes, the outputs that appear counter-intuitive, the methodology used to derive the model inputs from operational data and the methodology used to manipulate the inputs to reflect changes to the operational limit parameters. It was not possible to fully investigate these issues given the time and resources available to us. This was because of the complexity and slow operation of the model and because a significant proportion of the audit effort was taken up with investigating the PYTHONHASHSEED software problem that initially prevented Analysys Mason from replicating Openreach's modelling results.

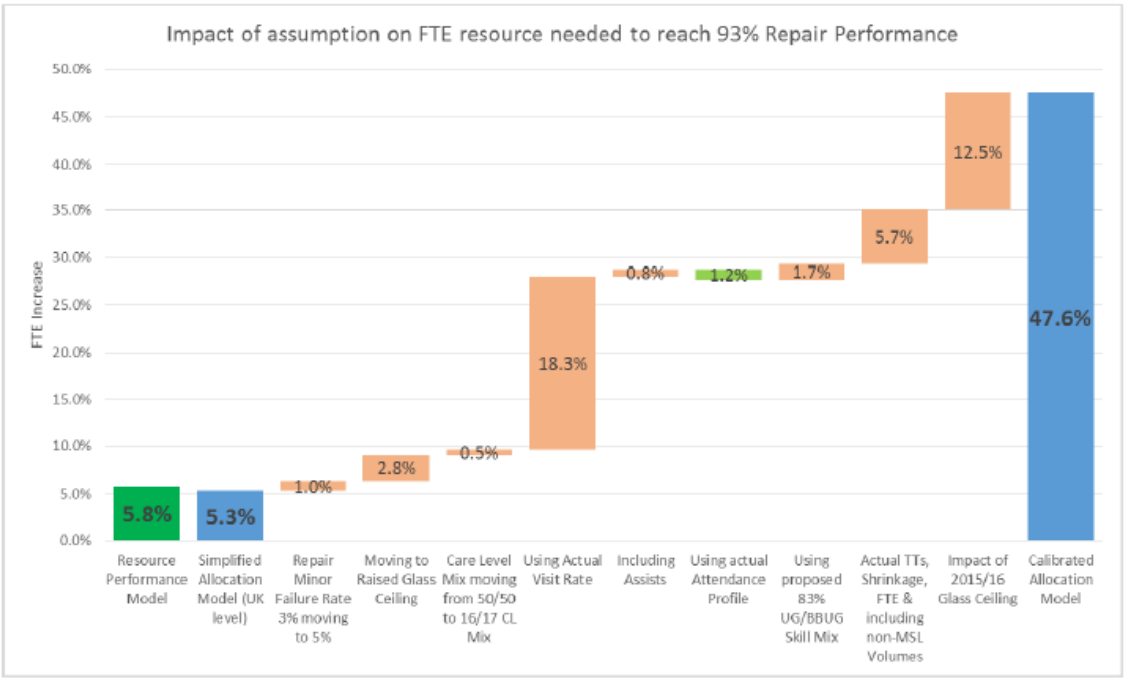
[659] Analysys Mason, September 2017. *WLR/LLU Charge Control 2017 Quality of Service model assessment*, Section 8.1.2.
[660] Openreach response to the September 2017 QoS Further Consultation, paragraphs 106 and 108 to 109.
[661] For further details of the overtime post processing adjustment refer to the September 2017 Analysys Mason Report, Section 4.1.

## Analysis of the differences between the models has provided valuable insights into the sensitivity of the results to modelling assumptions

### Openreach considered that a range of simplifying assumptions and operational limit settings used in the RPM give rise to the difference in the resource estimates for performance improvements

A3.137 As noted above, Openreach examined the differences between the Allocation Model and the RPM. Openreach conducted sensitivity tests using the Allocation Model that indicated that the Allocation Model produced similar results to the RPM when similar simplifying assumptions were applied.[662] Openreach summarised its findings in a waterfall chart, reproduced below in Figure A3.7, illustrating how the differences in the modelling approach and the operational limit assumptions give rise to the differences in the resource deltas for the proposed quality standards.

**Figure A3.7 Openreach assessment of the impact of differences between the RPM and the Allocation Model on resource deltas**




[✂ ]

*Source: Openreach*[663]

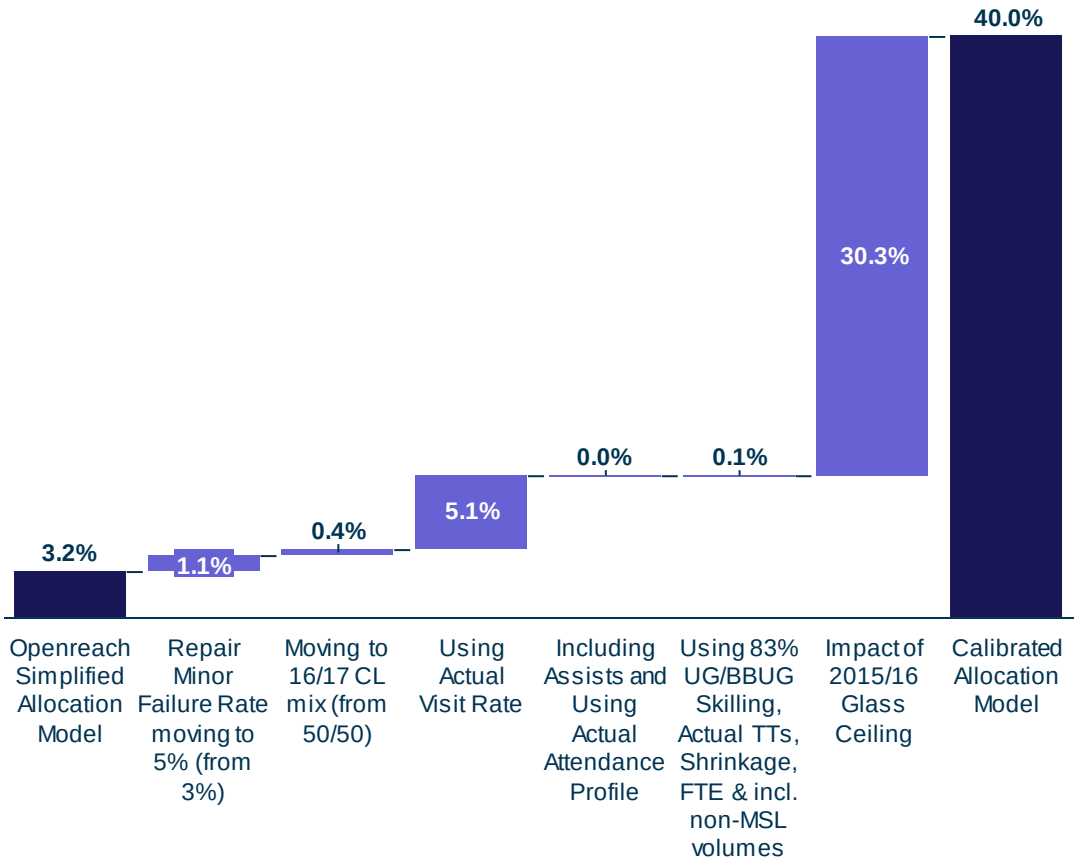
### Analysys Mason concluded that the differences in the resource estimates are due primarily to differences in the operational limit settings

A3.138 Analysys Mason identified several problems with Openreach's analysis which led it to conclude that Openreach's analysis has important limitations.[664]

[662] Openreach response to the March 2017 QoS Consultation, paragraphs 361 to 367.
[663] Openreach response to the March 2017 QoS Consultation, Figure 39.
[664] Analysys Mason, September 2017. *WLR/LLU Charge Control 2017 Quality of Service model assessment*, Section 6.2.

A3.139 Analysys Mason produced an amended version of the waterfall chart illustrating how the methodological differences and the operational limit assumptions give rise to the difference between the resource deltas generated by the RPM and the Allocation Model.

**Figure A3.8 Analysys Mason assessment of the impact of differences between the RPM and the Allocation Model on resource deltas**




*Source: Analysys Mason*[665]

A3.140 Figure A3.8 illustrates that the difference in the model outputs is attributable to a smaller number of factors than identified by Openreach, mainly the differences in the operational limit assumptions and the 'visit-rate' assumptions. The latter being the assumptions about the extent to which multiple field engineering activities are required to clear faults. These assumptions are modelled through the minor fail rate assumptions in the RPM (a component of the operational limit assumptions).[666]

A3.141 The other changes in deltas attributed to differences between the models are small relative to the variability of model outputs between model runs and accuracy limits imposed by the lack of interpolation of the model run outputs (which limits resolution to

[665] Analysys Mason, September 2017. *WLR/LLU Charge Control 2017 Quality of Service model assessment*, Figure 6.2.
[666] Minor fails are failed field engineering activities that could be successfully completed within the SLA on a subsequent attempt, if time and resources permit. In contrast, 'major fails' are faults that require work such as civil engineering that cannot be completed within SLA timescales.

one modelled step in resources).[667] This led Analysys Mason to conclude that the smaller figures quoted are not likely to be useful estimates of the impact and it can only be said that the impact of these modelling differences is comparable with the uncertainty in the model results.[668]

### Deloitte also found the operational limit assumptions to be the main contributor to the differences in the resource estimates

A3.142 As noted above, Openreach commissioned consultants Deloitte to review the Allocation Model and the RPM to investigate the differences in the methodologies, inputs and assumptions and the implications for the model results.[669]

A3.143 Deloitte found that although both models have a similar underlying approach, the RPM makes more simplifying assumptions that understate the complexity of Openreach's operations. Deloitte considered that the greater granularity of the Allocation Model comes closer to capturing the reality of resourcing and task allocation.[670]

A3.144 Deloitte also examined the reasons for the difference between the resource estimates produced by the RPM and the Allocation Model for the proposed repair standard of 93% (4.7% and up to 25% respectively). Deloitte identified six main differences in the methodology and assumptions that contributed to the difference as summarised in Table A3.9 below.

[667] For further details of the variability in model outputs refer to the September 2017 Analysys Mason Report, Section 5.
[668] Analysys Mason, September 2017. *WLR/LLU Charge Control 2017 Quality of Service model assessment,* Section 6.3.
[669] Openreach response to the March 2017 QoS Consultation, Annex 3.
[670] Deloitte, 2017. *Quality of Service Modelling*, pages 7 to 11.

**Table A3.9 Deloitte's summary table concerning the factors contributing to the differences between the model outputs**

| Area | Key finding | Contribution to the difference in the model outputs |
|---|---|---|
| Operational limit | Assuming a lower failure rate increases the maximum performance possible. Analysys Mason acknowledge that it was initially necessary to reduce fail rates in order to meet Ofcom's requested target. | High |
| Engineer skill mix | The RPM does not capture the reality of the skill mix, but this does not appear to have a significant impact on the additional resources needed to improve performance. | Low |
| Resource variability | The RPM approach would tend to reduce variance in resources and therefore costs of performance. However, the impact on outputs of this assumption is moderate. | Low |
| Task and travel time variability | While the RPM approach oversimplifies the variation in task and travel times, sensitivity testing indicates that this approach may in fact slightly overstate performance costs. | None |
| Task volume variability | Neither model allows for task assignment at the Preferred Working Area (PWA) level[671]; this suggests that both may understate the costs of performance. | None |
| Inter-SOM loans | While the Allocation Model may overstate costs by not modelling inter-SOM loans, the RPM may overstate the frequency and ease of these loans. | Medium |

*Source: Deloitte*[672]

A3.145 Deloitte found the operational limit assumptions to be the main contributor to the differences between models.[673] Except for inter-SOM loans, the other factors had little or no impact on the difference between the model outputs.

A3.146 We discuss Deloitte's findings concerning inter-SOM loans below.

#### The analyses indicate that differences are primarily due to the operational limit, visit rate and inter-SOM loan assumptions

A3.147 The analyses discussed above indicate that although there are significant differences in approach between the two models, most of the simplifying assumptions used in the RPM, and by implication the high-level approach to simulation, have only a marginal impact on the resource deltas for performance improvement, if at all. The differences between the resource estimates, discussed above, stemmed primarily from differences in the operational limit, visit rate and inter-SOM loan assumptions we used to generate our resource estimates in the March QoS Consultation (using the RPM) and the assumptions used by Openreach to generate resource estimates (using the Allocation Model) for its response to the September 2017 QoS Further Consultation.

A3.148 In view of these findings, we consider that resource estimates for performance improvements generated by the RPM may be as representative as those produced by the Allocation Model.

## Resource estimates from the Allocation Model

### Estimates presented in the September 2017 QoS Further Consultation used configuration files which appeared comparable to the proposed quality standards

A3.149 In its response to the March 2017 QoS Consultation, Openreach indicated that it could achieve a repair standard of 90%, following certain process improvements and definitional changes to the repair measures that would raise its operational limit (the glass ceiling) to 92.6%. Using the Allocation Model, Openreach calculated that it would require a resource uplift of 24.9% to achieve this standard.[674]

A3.150 In the September 2017 QoS Further Consultation, we provisionally concluded that from a resource estimation perspective, the 90% repair standard with an operational limit of 92.6%, after process improvements (as suggested by Openreach) was directly comparable to the repair standard of 88% that we proposed in the September 2017 QoS Further Consultation, using our view of the operational limit, after process improvements (90.8%). The difference between the scenarios being that under Openreach's suggestion, the repair measure would be amended to reclassify reject clear and non-appointment no-access

[671] Relatively small geographic areas in which individual technicians normally work.
[672] Deloitte, 2017. *Quality of Service Modelling*, page 11. This table is a reproduction of Deloitte's table. For clarity, we have amended references to the models and other terminology to align with the nomenclature used in this document.
[673] Deloitte, 2017. *Quality of Service Modelling*, page 11.
[674] Openreach response to the March 2017 QoS Consultation, paragraph 381 and Table 20.

failures (accounting for 1.76%) as successes, whereas we proposed not to amend the repair measures. Moreover, as noted above, Analysys Mason had some difficulty understanding how the operational limit assumptions were reflected in the input datasets supplied by Openreach for the Allocation Model. Consequently, we considered that amending the operational limit risked introducing an error. We therefore asked Analysys Mason to model 90% standard with a 92.6% operational limit since it allowed Analysys Mason to use Openreach's input files directly, avoiding the need to modify the Allocation Model input files to reflect our view of the operational limit.

A3.151 Table A3.10 below shows the resource estimates produced by Analysys Mason using the Allocation Model with Openreach's input files as discussed above. These are measured against a base case of Openreach's performance in 2016/17 which is the base year for our regulatory charge controls.

**Table A3.10 Allocation Model resource uplift estimates for the proposed quality standards (excluding MBORC)**

| | Base case | Proposed QoS standard |
|---|---|---|
| Fault repair service mix (SML1/SML2) | 16/17 actual | 16/17 actual |
| Operational limit | | Openreach raised glass ceiling |
| FAD (working days) | 12 | 10 |
| % orders completed within FAD target | 80% | 90% |
| Provision by committed date (CCD) | 90% | 95% |
| Repair performance within SLA (SML1/SML2) | 80%/80% | 90%/90%[675] |
| Resource Uplift | - | 11% +/- 0.75% |

*Source: Analysys Mason*[676]

A3.152 We specified a range for the resource uplifts, reflecting Analysys Mason's view that the model outputs should be interpreted to have a confidence interval of +/- 0.75% due to the use of resource steps[677] and the run to run variation in model outputs.[678]

[675] As discussed above, in the September 2017 QoS Further Consultation we considered that from a resource estimation perspective, this scenario was equivalent to the 88% repair standard that we proposed.
[676] Analysys Mason, September 2017. *WLR/LLU Charge Control 2017 Quality of Service model assessment*, Figure 10.1, modelling scenario HLS112.
[677] Resource levels are tested at 2% increments with the lowest resource level to achieve SML2 greater than or equal to a specified performance level being designated the resource level needed to achieve the required performance.
[678] Analysys Mason, September 2017. *WLR/LLU Charge Control 2017 Quality of Service model assessment*, Section 5.2.

## Openreach argued our resource estimates were wrong, primarily because the modelling scenario we used was not comparable to the proposed quality standards

A3.153 In its response to the September 2017 QoS Further Consultation, Openreach argued that our Allocation Model resource estimates for the proposed quality standards were an underestimate because:

- The scenario modelled (a 90% repair standard with a 92.2% operational limit) was not comparable to the proposed repair standard (an 88% repair standard with a 90.8% operational limit) because the lower level complexity of the model would cause the operational limit to affect the results differently; and
- Openreach considered that Analysys Mason may not have configured the Allocation Model correctly because our resource uplift estimates were lower than the estimates submitted by Openreach in its response to the March 2017 QoS Consultation.[679] Openreach also provided the results of 10 further model runs demonstrating that its March 2017 resource estimates were within the expected range of outcomes.[680]

A3.154 Openreach also provided resource uplift estimates for 10 "random runs" of the Allocation Model for the proposed quality standards (i.e. 88% repair standard with an operational limit of 90.8%) as summarised in Table A3.11 below. [681]

## Rather than undertake a large amount of new modelling, we have sought to verify Openreach's latest resource uplift estimates

A3.155 In view of Openreach's submission we considered that we might obtain more reliable resource uplift estimates with the Allocation Model configuration aligned with the proposed quality standards rather than the configuration used to produce the resource uplift estimates for the September 2017 QoS Further Consultation which, as discussed above, related to Openreach's earlier proposals.

A3.156 In view of the considerable effort required for multiple national runs of the Allocation Model, we asked Analysys Mason to verify Openreach's latest resource estimates by performing selected runs of the Allocation Model using Openreach's input and configuration files. We asked Analysys Mason to replicate three of Openreach's model runs, those with PYTHONHASHSEED settings of 0, 2 and 7, the latter two corresponding to the minimum and maximum resource uplifts in Openreach's results.

A3.157 Table A3.11 below shows the resource uplift estimates for the Openreach and Analysys Mason model runs.

[679] Openreach response to the September 2017 QoS Consultation, paragraph 48.
[680] Openreach response to the September 2017 QoS Further Consultation, paragraph 102 and Table 6.
[681] Openreach response to the September 2017 QoS Further Consultation, paragraph 47.

**Table A3.11 Allocation Model resource uplift estimates for the quality standards**

| PYTHON HASHSEED VALUE -> | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|
| Openreach | 14.9% | 14.5% | 13.8% | 13.8% | 14.3% | 15.1% | 15.1% | 14.7% | 14.7% | 15.2% |
| Analysys Mason for Ofcom | 13.7% | | 14.6% | | | | | 13.7% | | |

*Source: Ofcom analysis of Openreach data*[682]

A3.158 Openreach's model runs used PYTHONHASHSEED settings from 0 to 9 and a single random seed setting of 12345 for all model runs. This methodology differs from that used for Openreach's response to the March 2017 QoS Consultation which allowed the random seed to vary from run to run. We have not had time to investigate this approach in detail, but Analysys Mason advise us that it is not likely to have biased the results.

A3.159 The resource uplift estimates from Analysys Mason's model runs differ from Openreach's results, even though the random seed and PYTHONHASHSEED settings were identical. These differences may be due to residual differences between the software configurations used by Openreach and Analysys Mason and the variability from model run to model run identified by Analysys Mason.

A3.160 Table A3.12 below presents a summary of our analysis of the outputs of the two sets of model runs.

**Table A3.12 Key statistics for Allocation Model resource uplift estimates for the quality standards**

| Resource uplift estimates | Openreach (10 model runs) | Analysys Mason for Ofcom (3 model runs) |
|---|---|---|
| Average | 14.6% | 14.1% |
| Minimum | 13.8% | 13.7% |
| Maximum | 15.2% | 14.7% |
| Range | 1.3% | 0.9% |
| Standard Deviation | 0.6% | 0.45% |
| 95% Prediction Interval | 13.6% to 15.6% | 13.1% to 14.9% |

*Source: Ofcom*

[682] Openreach response to the September 2017 QoS Further Consultation, table 2.

A3.161 Table A3.12 shows that the results of Analysys Mason's three model runs are consistent with Openreach's model runs. The resource uplifts for most of Openreach's model runs and importantly the overall average for Openreach's model runs falls within the 95% prediction interval of Analysys Mason's model runs. Also, the average resource uplifts from both sets of model runs are fairly closely aligned.

A3.162 Based on this analysis we conclude that Openreach's resource uplift estimates are replicable. As Openreach results are based on more model runs than ours, we also conclude that the average resource uplift and the prediction interval of Openreach's results would be more representative than those from Analysys Mason's three model runs.

## Resource uplift estimate

A3.163 Table A3.13 presents our final Allocation Model resource uplift estimates based on the modelling results submitted by Openreach in response to the September 2017 QoS Further Consultation. These are measured against a base case of Openreach's performance in 2015/16, the base year for our regulatory charge controls.

**Table A3.13 Allocation Model resource uplift estimates for the quality standards (excluding MBORC)**

| | Base case | QoS standard |
|---|---|---|
| Fault repair service mix (SML1/SML2) | 16/17 actual | 16/17 actual |
| Operational limit (glass ceiling) | Openreach raised glass ceiling | |
| FAD (working days) | 12 | 10 |
| % orders completed within FAD target | 80% | 90% |
| Provision by committed date (CCD) | 90% | 95% |
| Repair performance within SLA (SML1/SML2) | 80%/80% | 90.8%/90.8% |
| Resource Uplift | - | 14.6% +/- 0.75% |

*Source: Ofcom, based on Openreach and Analysys Mason modelling*

A3.164 We have specified a range for the resource uplifts, reflecting Analysys Mason's view that the model outputs should be interpreted to have a confidence interval of +/- 0.75% due to the use of resource steps[683] and the run to run variation in model outputs.[684]

[683] Resource levels are tested at 2% increments with the lowest resource level to achieve SML2 greater than or equal to a specified performance level being designated the resource level needed to achieve the required performance.
[684] Analysys Mason, September 2017. *WLR/LLU Charge Control 2017 Quality of Service model assessment*, Section 5.2.

A3.165 We also note that we have identified several factors that might adversely influence the resource estimates:

- Two factors that would be likely to overestimate the resource deltas for performance improvements, namely:
  - The approach to appointment scheduling or job prioritisation in response to stress, because the stress response mechanisms are turned off in most scenarios;
  - Inter-SOM loans are not modelled directly; and
- A further factor, the overtime post-processing adjustment, that could underestimate the resource delta for performance improvements.

A3.166 Given the difficulties encountered during the audit, it was not possible to fully investigate the extent to which these factors impact the resource deltas or the extent to which they are reflective of Openreach's operational practices. We note, however, that Openreach has undertaken extensive testing and calibration and believes that the model is the best simulation of likely service outcomes they have used to date.[685] This suggests that for the actual performance results Openreach calibrated to, these factors have either a small influence on the accuracy of the results or their net influence is small.

## The service level differential

A3.167 Telecoms providers choose the service maintenance level (SML) option they want from Openreach and can switch between these options. Most telecoms providers choose either SML1 (two-day repair, Monday to Friday) or SML2 (one-day repair, Monday to Saturday).[686]

A3.168 In the 2014 FAMR we concluded that there was a difference in the resource uplift between SML1 and SML2, and that this should be reflected in setting charge controls. Stakeholders agreed with this position.[687] We refer to the difference between the resources required for each service maintenance level as the service level differential.

A3.169 The resource uplift estimates produced by the RPM and the Allocation Model reflect the overall uplift required (to meet the quality standards) for the product and service level mix that existed in 2015/16, the base year modelled. Since we are imposing charge controls on MPF at SML1 and FTTC 40/10 at SML2 we need to understand how the model outputs translate to these service maintenance levels. Moreover, in the summer of 2016 there were significant changes in the mix of SML1 and SML2 faults for WLR and MPF services because of product migrations by several large telecoms providers. We have therefore decided to make an adjustment to reflect the full annual impact of these changes.

[685] Openreach response to the March 2017 QoS Consultation, paragraph 353.
[686] Openreach offers other higher service maintenance level (SML) options but SML1 and SML2 are purchased the most.
[687] 2014 FAMR Statement, Annexes, A19.31. https://www.ofcom.org.uk/__data/assets/pdf_file/0026/78812/annexes.pdf.

## In our March 2017 QoS Consultation we used the RPM to derive 'service mix factors' to enable us to calculate the service level differential

A3.170 In the March 2017 QoS Consultation, we used the RPM to derive service maintenance level 'mix factors'. The mix factors were the slope of the linear fit trend of resource uplift estimates for service mixes of 100% SML1 / 0% SML2 and 100% SML2 / 0% SML1 faults.

A3.171 Two SML mix factors were derived from the Resource Performance Model results and are presented in Table A3.14 below, the first reflecting Openreach's performance in the base year (2015/16) and the second reflecting the quality standards proposed in the March 2017 QoS Consultation. A range was established using the same approach as that used for the resource uplift, i.e. using the 5% and 3% minor fail values. The proposed SML factors for the charge control model were taken as the mid-point in the range.

**Table A3.14 March 2017 QoS Consultation, proposed service maintenance level mix factors for charge control model**

| | Percentage change in resource for each percent change in SML mix | | |
|---|---|---|---|
| | 3% minor fail | 5% minor fail | Proposed value |
| Mix factors for 2015/16 performance | 0.0231 | 0.0265 | 0.0248 |
| Mix factors at the quality standards proposed in the March 2017 QoS Consultation | 0.0579 | 0.0767 | 0.0673 |

*Source: Ofcom*

A3.172 The mix factor is the percentage increase in resources required for 1% increase in the mix of SML2 (or conversely the reduction in resources enabled by a 1% increase in the mix of SML1). To establish the appropriate resource uplift for each care level, we started from our 50/50 care level mix estimate for the resource uplift, and increase this by 50*0.0673 to obtain an estimate for the resource uplift required for SML2 (or subtract for SML1). Table A3.15 shows the separate resource uplift estimates which we proposed in March 2017 for our charge control model.

**Table A3.15 March 2017 QoS Consultation, proposed resource uplift estimates for the charge control**

| | Resource uplift estimate |
|---|---|
| MPF SML1 | 8% resource uplift at 50/50 mix minus 50 percentage points multiplied by 0.0673 = 4.6% |
| GEA-FTTC (40/10) SML2 | 8% resource uplift at 50/50 mix plus 50 percentage points multiplied by 0.0673 = 11.4% |

*Source: Ofcom*

## In the September 2017 QoS Further Consultation we applied the service mix factors produced for the March 2017 QoS consultation to our revised resource uplift estimates

A3.173 In the September 2017 QoS Further Consultation, we considered whether we could use the Allocation Model to verify the service level differential established in the March 2017 QoS Consultation. We noted that in the audit of the Allocation Model, Analysys Mason found its results did not vary appreciably, or in the manner we would expect, for changes in service level mix. Also, Analysys Mason was not able to identify the reason for this counter-intuitive result. We therefore decided to seek further evidence to assess the validity of the Allocation Model results and their implications for our estimates.

A3.174 In the absence of an alternative method of establishing the service level differential, we decided to retain the method we adopted in March. We therefore applied the service mix factors produced for the March 2017 QoS Consultation to our revised resource uplift estimate to calculate revised service level differentials as shown in Table A3.16 below.

**Table A3.16 September 2017 QoS Further Consultation, proposed resource uplift estimates**

| | Resource uplift estimate | Lower bound of range | Upper bound of range |
|---|---|---|---|
| Average resource uplift required at 50/50 care level mix | 11.0% | 9.1% | 14.1% |
| Resource uplift for MPF SML1 | 7.6%[688] | 5.7% | 10.7% |
| Resource uplift for GEA-FTTC (40/10) SML2 | 14.4%[689] | 12.5% | 17.5% |

*Source: Ofcom*

[688] 11% resource uplift at 50/50 mix minus 50 percentage points multiplied by 0.0673 = 7.6%
[689] 11% resource uplift at 50/50 mix plus 50 percentage points multiplied by 0.0673 = 14.4%

## Openreach argued that our approach had led us to underestimate the service level differential

A3.175 Openreach was critical of our approach, arguing that it was overly simplistic to assume that the incremental cost of moving from SML1 to SML2 could be calculated by modelling national scenarios in the RPM and interpolating between them.

A3.176 Openreach disagreed with the audit finding that the Allocation Model results were counter-intuitive. In its view, the service level differential is a complex function of geography, product mix, service level mix and resourcing and must therefore be determined by accurate modelling as used in the Allocation Model, rather than with an assumed linear calculation as used by the RPM. Openreach considered that our approach had led us to underestimate the service level differential. It provided its own estimate of the service level differential based on further runs of the Allocation Model as shown in Table A3.17 below.[690]

**Table A3.17 Openreach resource uplift estimates for year 3 quality standard**

| | All SML1 | All SML2 |
|---|---|---|
| Resource uplift estimate | 9.2% | 15.9% |

*Source: Openreach*[691]

A3.177 Openreach was also concerned that we did not calculate new service mix factors using the updated RPM and had instead used the service mix factors from the March 2017 QoS Consultation to calculate revised service level differentials for the September 2017 QoS Further Consultation.[692] Openreach also said that we were incorrect to assume Saturday working for SML1 repairs as the SML1 product does not include Saturday working. Openreach's agreements with trade unions for Saturday working are based on SML2 repairs.[693]

## We have decided to use the latest version of the RPM to calculate our final estimates of the service level differential

A3.178 We have carefully considered Openreach's comments about the service level differential results produced by the Allocation Model and have also obtained further analysis from Analysys Mason.

A3.179 We remain of the view that the Allocation Mode results relating to the service level differential are not fully explained. As noted above, during the audit Analysys Mason found that the results did not vary appreciably, or in the manner we would expect for changes in service level mix. We acknowledge that the results are not necessarily incorrect, and may reflect the interaction of multiple factors as Openreach has suggested. It has not, however,

[690] Openreach response to the September 2017 QoS Further Consultation, paragraphs 58 to 61.
[691] Openreach response to the September 2017 QoS Further Consultation, Table 4.
[692] Openreach response to the September 2017 QoS Further Consultation, paragraph 57.
[693] Openreach response to the September 2017 QoS Further Consultation, paragraphs 57 and 62.

been possible for us to investigate these findings to our satisfaction. As noted above we have concluded that the complexity of the Allocation Model coupled with the considerable time required to set-up and run the model and the long run times for simulations, prevents us from auditing the Allocation Model to our satisfaction, given the time and resources available to us.

A3.180 In view of the uncertainty about the Allocation Model outputs for changes in the service level mix, we have decided not to use the Allocation Model results and to use the RPM results for our service level differential estimates.

A3.181 We agree with Openreach that our estimates should be calculated using the latest version of the RPM. We have therefore produced revised service mix factors using the methodology developed for the March 2017 QoS consultation (as described above) and the updated RPM with the configuration used to produce our resource uplift estimates.

A3.182 We have included Saturday working in the 100% SML1 scenario as we consider it credible that in the medium term Openreach will move resources currently available on a Saturday for SML2 to other days to balance its resource availability to customer needs. This is in line with its agreements with the CWU.

A3.183 Table A3.18 below shows the revised service mix factors.

**Table A3.18 Final service maintenance level mix factors**

| | Percentage change in resource for each percent change in SML mix |
|---|---|
| Lower end of consultation range (operational limit 90.8%) | 0.0002 |
| Upper end of consultation range (operational limit 89.3%) | 0.0005 |

*Source: Ofcom*

A3.184 Table A3.19 below shows the resource uplift calculation for the quality standards we are imposing.

**Table A3.19 Final resource uplift estimates for the charge control**

| | Resource uplift estimate |
|---|---|
| MPF SML1 | 14.1% resource uplift at 50/50 mix minus 50 percentage points multiplied by 0.0005 = 11.8% |
| GEA-FTTC (40/10) SML2 | 14.1% resource uplift at 50/50 mix plus 50 percentage points multiplied by 0.0005 = 16.4% |

*Source: Ofcom*

# Disclosure of models and associated documents

A3.185 In developing our policy on model disclosure, we had regard to our obligations under the Communications Act 2003 and our Framework for Disclosure of Charge Control Models. In doing so, we considered carefully the confidential nature of the cost modelling relevant to our proposals and the need to ensure appropriate transparency.

## Allocation Model

A3.186 In view of the difficulties that Analysys Mason encountered with their audit of the Allocation Model we consider that it would have been difficult for stakeholders to effectively review the Allocation Model in its current form and use it to contribute towards their consultation responses, even if Openreach were willing for us to disclose it. We did not therefore disclose the Allocation Model with the September 2017 QoS Further Consultation.

A3.187 Analysys Mason's report published alongside the September 2017 QoS Further Consultation contains a description of the Allocation Model and their assessment of the capabilities and limitations of the model.[694] Annex 2 of Openreach's response to the March 2017 QoS Consultation also includes a description of the Allocation Model.

## Resource Performance Model

A3.188 Analysys Mason's report published alongside the March 2017 QoS Consultation contained a detailed description of the RPM.[695] We also provided further details about the model in response to stakeholder queries.[696] We also made the model available to stakeholders upon request and will continue to do so.

[694] Analysys Mason, September 2017. *WLR/LLU Charge Control 2017 Quality of Service model assessment*, Section 6.3.
[695] Analysys Mason, March 2017. *Overview of the Quality-of-Service Model and its outputs for WLR/LLU Charge Control 2017*. https://www.ofcom.org.uk/__data/assets/pdf_file/0034/99646/Analysys-Mason-report.pdf.
[696] Ofcom, 2017. *Clarification on the Ofcom Resource Performance Model*. https://www.ofcom.org.uk/__data/assets/pdf_file/0022/102568/Clarifications-on-the-Ofcom-Resource-Performance-Model.pdf.

# A4. Legal Instruments

## Notification of Directions to BT under section 49 of the Communications Act 2003 and the NMR and WLA SMP Conditions

### Background

1. On 30 November 2017, OFCOM published a document entitled "*Narrowband Market Review: Statement*" (the "NMR Statement")[697]. In parallel with the publication of this Notification, OFCOM is also publishing a document titled "*Wholesale Local Access Market Review Statement*" (the "WLA Statement")[698].

2. The NMR and WLA Statements set out OFCOM's conclusion that BT has Significant Market Power ("SMP") in markets in the United Kingdom excluding the Hull Area[699] for (i) the provision of wholesale fixed analogue exchange lines, including the provision of Wholesale Analogue Line Rental services; and (ii) the provision of wholesale local access at a fixed location.

3. The NMR and WLA Statements imposed SMP conditions on BT requiring them among other things (i) to provide network access to relevant services on fair and reasonable terms[700]; (ii) not to discriminate unduly when providing network access[701]; (iii) to provide access on an equivalence of inputs basis[702]; and (iv) to comply with all such quality of service requirements as OFCOM may from time to time direct.[703]

4. Alongside the consultation processes leading to the NMR and WLA Statements, OFCOM consulted on what quality of service requirements should be imposed pursuant to the aforementioned SMP conditions. This Notification gives effect to OFCOM's conclusions in this respect.

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[697] 2017 NMR Statement. https://www.ofcom.org.uk/consultations-and-statements/category-1/narrowband-market-review.
[698] Ofcom, 2018. *Wholesale Local Access – Statement*. https://www.ofcom.org.uk/consultations-and-statements/category-1/wholesale-local-access-market-review
[699] This is the area defined as the 'Licensed Area' in the license granted on 30 November 1987 by the Secretary of State under section 7 of the Telecommunications Act 1984 to Kingston upon Hull City Council and Kingston Communication (Hull) plc, (now known as KCOM).
[700] Condition 1A of the conditions at Schedule 1 to Annex 9 of the 2017 NMR Statement (the "NMR SMP Conditions") and Condition 1 of the conditions at Schedule 1 to Annex 33 of the 2018 WLA Statement (the "WLA SMP Conditions").
[701] Condition 3 of the NMR SMP Conditions and Condition 4 of the WLA SMP Conditions.
[702] Condition 4 of the NMR SMP Conditions and Condition 5 of the WLA SMP Conditions.
[703] Condition 8 of the NMR SMP Conditions and Condition 11 of the WLA SMP Conditions.

## Directions

5. OFCOM hereby gives the following directions imposing requirements on BT (the "Directions"), in accordance with relevant provisions of the Communications Act 2003 ("the Act"):
   (a) a direction relating to quality of service in the provision of network access to WLR, MPF, and GEA services (**Direction 1**);
   (b) a direction relating to transparency and the publication of KPIs for WLR (**Direction 2**);
   (c) a direction relating to transparency and the publication of KPIs for MPF and GEA services (**Direction 3**); and
   (d) a direction relating to removal of the cap on the time period in relation to which daily compensation is available when providing network access (**Direction 4**).

## OFCOM's duties and legal tests

6. The effect of, and the reasons for giving, the Directions are set out in the statement accompanying this Notification and entitled "*Quality of service for WLR, MPF and GEA: Statement*" (the "Explanatory Statement").

7. For the reasons set out in the Explanatory Statement, OFCOM considers that, in accordance with the requirements of section 49(2) of the Act, each of the Directions is:

   (a) objectively justifiable in relation to the networks, services, facilities, apparatus or directories to which it relates;

   (b) not such as to discriminate unduly against particular persons or against a particular description of persons;

   (c) proportionate to what it is intended to achieve; and

   (d) in relation to what it is intended to achieve, transparent.

8. For the reasons set out in the Explanatory Statement, OFCOM is satisfied, in relation to each of the Directions, that it has acted in accordance with the relevant duties set out in sections 3 and 4 of the Act, and the duty to take account of European Commission recommendations for harmonisation in section 4A of the Act.

9. OFCOM has, in relation to each of the proposed Directions, considered every representation duly made to it, and the Secretary of State has not notified OFCOM of any international obligation of the United Kingdom for the purposes of section 49A(6)(b) of the Act.

10. The proposals in relation to quality of service contained proposals of EU significance for the purposes of the Act. Therefore, after making any modifications of the proposals that appeared to OFCOM to be appropriate following domestic consultation, OFCOM sent on 23 February 2018 a copy of them, and of a draft of the Explanatory Statement, to the European Commission, BEREC and the regulatory authorities of every other member state for EU consultation, in accordance with sections 48B(2) and 80B(2) of the Act. On 23 March 2018 the European Commission informed OFCOM that it had no comments on its proposals.

**Signed**

Marina Gibbs

Competition Policy Director, OFCOM

**A person duly authorised in accordance with paragraph 18 of the Schedule to the Office of Communications Act 2002**

28 March 2018

# Direction 1: Quality of service standards

## Direction

A. This Direction is made under section 49 of the Act, Condition 8 of the NMR SMP Conditions, and Condition 11 of the WLA SMP Conditions, and requires the Dominant Provider to comply with quality of service standards in relation to the provision of network access to WLR, MPF, and GEA-FTTC.

B. OFCOM hereby directs the Dominant Provider to comply with this Direction with effect from 1 April 2018.

## Quality of Service Standards

1. Except insofar as OFCOM may from time to time otherwise consent in writing, in relation to the provision of network access to WLR, MPF and GEA-FTTC under Condition 8 of the NMR SMP Conditions and Condition 11 of the WLA SMP Conditions, the following shall be the Quality of Service Standards.

### Installations

*Quality of Service Standard 1*

2. In relation to the provision of MPF, WLR and GEA-FTTC services, in aggregate, the Dominant Provider shall offer appointments, where required for the provision of those services, that are—

   (a) within 12 Working Days of a corresponding Order being placed on the Equivalence Management Platform by a Third Party in at least 89% of such instances in the First Relevant Year and the Second Relevant Year;

   (b) within 10 Working Days of a corresponding Order being placed on the Equivalence Management Platform by a Third Party in at least 89% of such instances in each Subsequent Relevant Year.

*Quality of Service Standard 2*

3. In relation to the provision of MPF, WLR and GEA-FTTC services, in aggregate, the Dominant Provider shall complete the provision of those services on the Committed Date—

   (a) in the First Relevant Year and Second Relevant Year: in at least 91% of such instances; and

   (b) in each Subsequent Relevant Year: in at least 94% of such instances.

## Fault repair

*Quality of Service Standard 3*

4. The Dominant Provider shall complete the repair of Faults that are subject to Service Maintenance Level 1 such that, in aggregate, the percentage of repairs which are completed by the end of the second Working Day after such Faults have been placed on the Equivalence Management Platform is—

   (a) greater than or equal to 80% in the First Relevant Year;

   (b) greater than or equal to 83% in the Second Relevant Year; and

   (c) greater than or equal to 85% in each Subsequent Relevant Year.

*Quality of Service Standard 4*

5. The Dominant Provider shall complete the repair of Faults that are subject to Service Maintenance Level 1 such that, in aggregate, the percentage of repairs which are completed by the end of the seventh Working Day after such Faults have been placed on the Equivalence Management platform is—

   (a) greater than or equal to 95% in the First Relevant Year;

   (b) greater than or equal to 96% in the Second Relevant Year; and

   (c) greater than or equal to 97% in each Subsequent Relevant Year.

*Quality of Service Standard 5*

6. The Dominant Provider shall complete the repair of Faults that are subject to Service Maintenance Level 2 such that, in aggregate, the percentage of repairs which are completed by the end of the next Level 2 Working Day after such Faults have been placed on the Equivalence Management Platform is—

   (a) greater than or equal to 80% in the First Relevant Year;

   (b) greater than or equal to 83% in the Second Relevant Year; and

(c) greater than or equal to 85% in each Subsequent Relevant Year.

*Quality of Service Standard 6*

7. The Dominant Provider shall complete the repair of Faults that are subject to Service Maintenance Level 2 such that, in aggregate, the percentage of repairs which are completed by the end of the sixth Working Day after such Faults have been placed on the Equivalence Management Platform is—

(a) greater than or equal to 95% in the First Relevant Year;

(b) greater than or equal to 96% in the Second Relevant Year; and

(c) greater than or equal to 97% in each Subsequent Relevant Year.

**Obligation to comply with the each of the Quality of Service Standards**

*Quality of Service Standards 1, 2, 3, and 5*

8. In each Relevant Year:

(a) in eight of the ten Relevant Regions the Dominant Provider must comply with each of Quality of Service Standards 1, 2, 3 and 5; and

(b) in the remaining two Relevant Regions the Dominant Provider must comply with each of Quality of Service Standards 1, 2, 3, and 5, except that in calculating the number of instances in which the Dominant Provider did not meet the relevant obligations, instances of failure occurring within an area that was subject to a High Level MBORC Declaration within eight weeks of the Dominant Provider making that High Level MBORC Declaration and the Fault or Order (as applicable) shall be excluded.

*Quality of Service Standards 4 and 6*

9. In each Relevant Year, the Dominant Provider must comply with each of Quality of Service Standards 4 and 6 in the UK as a whole.

10. Where the Dominant Provider relies upon the exemption in paragraph 8(b) to comply with any of Quality of Service Standards 1, 2, 3 and 5 in up to two Relevant Regions, in calculating compliance with the requirements set out in paragraph 9 for the UK as a whole, the following instances of failure shall be excluded:

- instances of failure occurring within the up to two Relevant Regions that were excluded for the purposes of assessing compliance with paragraph 8(b).

11. The Dominant Provider must record, maintain and supply to OFCOM in writing, no later than three months after the end of each Relevant Year the data necessary for OFCOM to monitor compliance by the Dominant Provider with the requirements set out in this Direction.

## Interpretation

12. For the purposes of interpreting this Direction:

(a) The following definitions shall apply:

i. **"Access Agreement"** means an agreement entered into between the Dominant Provider and a Third Party for the provision of network access;

ii. **"Committed Date"** means the date agreed between the Dominant Provider and a Third Party for an Order to become a Completed Order;

iii. "**Completed Order"** means an Order that has been provisioned and for which all other related work has been carried out;

iv. **"Dominant Provider"** means BT;

v. **"Equivalence Management Platform"** means the Dominant Provider's operational support system designed to handle the majority of transactions for equivalence of inputs and network access;

vi. **"Exchange Line"** means apparatus comprised in the Dominant Provider's Electronic Communications Network and installed for the purpose of connecting a telephone exchange run by the Dominant Provider to a Network Termination Point comprised in Network Termination and Testing Apparatus installed by the Dominant Provider for the purpose of providing electronic communications services at the premises at which the Network Termination and Testing Apparatus is located;

vii. **"Fault"** means a degradation or problem with MPF, WLR and/or GEA-FTTC (as applicable) that is identified by the Dominant Provider or a Third Party and which is registered on the Dominant Provider's operational support system;

viii. **"First Relevant Year"** means the period starting on 1 April 2018 and ending on 31 March 2019;

ix. "**FTTC**" means Fibre-to-the-Cabinet, an Electronic Communications Network consisting of optical fibre extending from the local access node to the street cabinet;

x. "**GEA**" means Generic Ethernet Access, the Dominant Provider's non-physical wholesale services providing wholesale access to higher speed broadband products;

xi. "**GEA–FTTC**" means Virtual Unbundled Local Access provided through the Dominant Provider's GEA services over its FTTC network;

xii. **"Hull Area"** means the area defined as the 'Licensed Area' in the licence granted on 30 November 1987 by the Secretary of State under section 7 of the Telecommunications Act 1984 to Kingston upon Hull City Council and Kingston Communication (Hull) plc, (now known as KCOM);

xiii. **"Level 2 Working Day"** means any day other than Sundays, public holidays or bank holidays in England and Wales, Scotland or Northern Ireland (as applicable);

xiv. **"MBORC"** means Matters Beyond Our Reasonable Control, a force majeure event under the relevant Access Agreement, the occurrence of which releases the Dominant Provider from the liability to make any payment under the corresponding Service Level Guarantee;

xv. "**MBORC Declaration**" means a declaration made by the Dominant Provider that an MBORC has occurred in relation to MPF, WLR or GEA-FTTC as applicable in a Relevant Region, including in response to both major incidents (**"High Level MBORC Declaration"**) and local incidents (**"Local MBORC Declaration"**);

xvi. **"MPF"** means Metallic Path Facilities;

xvii. **"NMR SMP Conditions"** means the SMP conditions appended to the OFCOM statement entitled "*Narrowband Market Review: Statement*" and dated 30 November 2017;

xviii. **"Order"** means a request for MPF, WLR or GEA-FTTC submitted to the Dominant Provider by a Third Party;

xix. **"Quality of Service Standards"** has the meaning given to it in paragraph 1 of this Direction;

xx. **"Relevant Region"** means the following ten regions, as defined by the Dominant Provider:

- East Anglia;
- London;
- North East;
- North Wales and North Midlands;
- North West;
- Scotland;
- South East;
- South Wales and South Midlands;
- Wessex; and
- Northern Ireland;

or other such regions as OFCOM may agree with the Dominant Provider or direct from time to time, but which cumulatively at all times cover the wholesale analogue line rental and wholesale local access markets in the UK, as applicable, excluding the Hull Area;

xxi. **"Relevant Year"** means the First Relevant Year, the Second Relevant Year or a Subsequent Relevant Year, as applicable;

xxii. **"Repair Service Level Commitment"** means the Dominant Provider's contractual commitment in contracts for the provision of WLR, MPF or GEA services, as applicable, in relation to the period within which it will achieve Restored Service from the registration of a Fault;

xxiii. "**Restored Service**" means the point at which the WLR, MPF or GEA service, as applicable, in relation to which a Fault was registered becomes available again for use by the Third Party;

xxiv. **"Second Relevant Year"** means the period starting on 1 April 2019 and ending on 31 March 2020;

xxv. **"Subsequent Relevant Year"** means the period starting on 1 April 2020 and ending on 31 March 2021, and following 31 March 2021, every 12-month period beginning on 1 April and ending on 31 March;

xxvi. **"Service Maintenance Level 1"** means the Repair Service Level Commitment specification of that name as defined by the Dominant Provider in its contracts for the provision of WLR, MPF or GEA services, as applicable, to Third Parties;

xxvii. **"Service Maintenance Level 2"** means the Repair Service Level Commitment specification of that name as defined by the Dominant Provider in its contracts for the provision of WLR, MPF or GEA services, as applicable, to Third Parties;

xxviii. **"Third Party"** means a person providing a public Electronic Communications Network or a person providing a public Electronic Communications Service;

xxix. **"WLA SMP Conditions"** means the SMP conditions appended to the OFCOM statement entitled "*Wholesale Local Access Market Review: Statement*" and dated 28 March 2018;

xxx. **"WLR"** means Wholesale Analogue Line Rental; and

xxxi. "**Working Day**" in the context of Service Maintenance Levels means the days deemed to be working days in contracts for the provision of services and in other contexts means any day other than Saturdays, Sundays, public holidays or bank holidays in England and Wales, Scotland or Northern Ireland (as applicable).

(b) Except as otherwise defined, words or expressions used shall have the same meaning as they have been ascribed in the NMR SMP Conditions and/or WLA SMP Conditions, and otherwise any word or expression as it has in the Act;

(c) Headings and titles shall be disregarded.

(d) Expressions cognate with those referred to in the Direction shall be construed accordingly.

(e) The Interpretation Act 1978 (c. 30) shall apply as if the Direction were an Act of Parliament.

# Direction 2: Transparency and publication of KPIs (WLR)

## Direction

A. This Direction is made under section 49 of the Act and Condition 8 of the NMR SMP Conditions, and requires transparency and publication of KPIs by the Dominant Provider for WLR.

B. OFCOM hereby directs the Dominant Provider to comply with this Direction with effect from 1 April 2018.

## Transparency and publication of KPIs

1. The Dominant Provider must publish to Third Party Customers the information specified in paragraphs 1, 2 and 7 of Schedule 1 to this Direction in relation to the provision of WLR, as required in paragraphs 5 or 6 below, as applicable.

2. The Dominant Provider must provide to individual Third Party Customers on request the information specified in paragraph 6 of Schedule 1 to this Direction in relation to the provision of WLR to them, as required in paragraphs 5 or 6 below, as applicable.

3. The Dominant Provider must provide to OFCOM, by means of electronic mail to such person in OFCOM as notified from time to time, the information specified in paragraph 4 of Schedule 1 to this Direction in relation to the provision of WLR, as required in paragraphs 5 or 6 below, as applicable.

4. The Dominant Provider must publish the information specified in paragraph 5 of Schedule 1 to this Direction on a publicly accessible website, which for the avoidance of doubt should not require password access.

5. With the exception of the information specified in KPIs (ix) and (xiii) of Schedule 1 to this Direction, the information required by paragraphs 1 to 3 above must be published and provided as required by the Dominant Provider on or before 21 May 2018 in respect of the previous month and, for each subsequent month, within 14 Working Days of the last Working Day of every month in respect of the previous month.

6. The information specified in KPIs (ix) and (xiii) of Schedule 1 to this Direction must be published and provided as required by the Dominant Provider on or before 20 June 2018 in respect of the month preceding the previous month and, for subsequent periods, within 14 Working Days of the last Working Day of every month in respect of the months preceding the previous month.

7. The information required by paragraph 4 above must be published as required by the Dominant Provider on or before 19 July 2018 in respect of the previous three months and, for subsequent periods, within 14 Working Days of the last Working Day of every third month in respect of the previous three months.

8. The Dominant Provider shall prepare and provide a report to OFCOM containing the information specified in Schedule 2 to this Direction relating to Delayed Installations and Repairs (the "Delayed Installations and Repairs Report"). The first Delayed Installations and Repairs Report must be provided to OFCOM by 20 August 2018 and thereafter within one month and 14 Working Days of the last Working Day of every third month.

9. The Schedules to this Direction forms part of the Direction.

10. Nothing in this Direction shall require the Dominant Provider to publish confidential information relating to its business or that of a Third Party.

## Interpretation

11. For the purposes of interpreting this Direction:

    (a) The following definitions shall apply:

        i. "**Access Agreement**" means an agreement entered into between the Dominant Provider and a Third Party for the provision of WLR;

        ii. "**Appointed Order**" means an Order that requires an appointment for an engineering visit by the Dominant Provider to the end user's premises in order to become a Completed Order;

        iii. "**Committed Order**" means an Order that has been accepted by the Dominant Provider and for which a Committed Date has been confirmed;

        iv. "**Completed Order**" means an Order that has been provisioned and for which all other related work has been carried out;

        v. "**Committed Date**" means the date agreed between the Dominant Provider and a Third Party for an Order to become a Completed Order;

        vi. "**Delayed Installation and Repair"** means an Order that has not become a Completed Order within 120 calendar days of the Committed Date or a Fault that

has not achieved a Restored Service status within 30 calendar days of identification to or by the Dominant Provider;

vii. "**Dominant Provider**" means BT;

viii. "**Equivalence Management Platform**" means the Dominant Provider's operational support system designed to handle the majority of transactions for equivalence of inputs and network access;

ix. "**Fault**" means a degradation or problem with the WLR service that is identified by the Dominant Provider or a Third Party and which has been registered on the Dominant Provider's operational support system;

x. "**Hull Area**" means the area defined as the 'Licensed Area' in the licence granted on 30 November 1987 by the Secretary of State under section 7 of the Telecommunications Act 1984 to Kingston upon Hull City Council and Kingston Communications (Hull) plc;

xi. "**Installed Base**" means the average number of WLR lines that are in use during the relevant month;

xii. "**KPI**" means key performance indicator;

xiii. "**MBORC**" means Matters Beyond Our Reasonable Control, a force majeure event under the relevant Access Agreement, the occurrence of which releases the Dominant Provider from the liability to make any payment under the corresponding Service Level Guarantee;

xiv. "**MBORC Declaration**" means a declaration made by the Dominant Provider that an MBORC has occurred in relation to WLR in a Relevant Region, including in response to both major incidents (**"High Level MBORC Declaration"**) and local incidents (**"Local MBORC Declaration"**);

xv. **"NMR SMP Conditions"** means the SMP conditions appended to the OFCOM statement entitled "*Narrowband Market Review: Statement*" and dated 30 November 2017;

xvi. **"Order**" means a request for the WLR submitted to the Dominant Provider by a Third Party;

xvii. "**Pending Order**" means an Order which has been approved by the Dominant Provider and is awaiting a Contractual Delivery Date;

xviii. "**Rejected Order**" means an Order rejected by the Dominant Provider because it is incomplete or incorrect;

xix. **"Relevant Region"** means the following ten regions, as defined by the Dominant Provider:

- East Anglia;
- London;
- North East;
- North Wales and North Midlands;
- North West;
- Scotland;
- South East;
- South Wales and South Midlands;
- Wessex; and
- Northern Ireland;

or other such regions as OFCOM may agree with the Dominant Provider or direct from time to time, but which cumulatively at all times cover the wholesale analogue line rental market in the UK, as applicable, excluding the Hull Area;

xx. "**Relevant Subscriber**" means any person who is a party to a contract with a provider of public electronic communications services for the supply of such services;

xxi. "**Repair Appointment**" means an arranged appointment in respect of a Repair that requires an engineering visit by the Dominant Provider to the end user's premises in order to become a Restored Service;

xxii. **"Repair Service Level Commitment"** means the Dominant Provider's contractual commitment in contracts for the provision of the WLR service in relation to the period within which it will achieve Restored Service from the registration of a Fault;

xxiii. "**Required First Appointment Date"** is the date on which the Dominant Provider is required to offer an installation appointment pursuant to "*Quality of Service Standard 1"* in Direction 1 (quality of service standards) made pursuant to condition 8 of the NMR SMP Conditions;

xxiv. "**Restored Service**" means the point at which the WLR service in relation to which a Fault was registered becomes available again for use by the Third Party;

xxv. "**Scheduled Outages**" means the defined periods of time notified to Third Parties in accordance with the terms of the Dominant Provider's contract for the WLR service whereby the Dominant Provider's operational support system is not available for use by Third Parties in order for the Dominant Provider to perform certain tasks including, but not limited to, routine maintenance, changing configurations, software upgrades and updating facilities and may include specific maintenance activities;

xxvi. "**Service Maintenance Level 1**" means the Repair Service Level Commitment specification of that name as defined by the Dominant Provider in its contracts for the provision of WLR to Third Parties;

xxvii. "**Service Maintenance Level 2**" means the Repair Service Level Commitment specification of that name as defined by the Dominant Provider in its contracts for the provision of the WLR to Third Parties;

xxviii. **"Service Maintenance Level Business 2 Plus"** means the Repair Service Level Commitment specification of that name as defined by the Dominant Provider in its contracts for the provision of the WLR to Third Parties;

xxix. "**Service Maintenance Level 3**" means the Repair Service Level Commitment specification of that name as defined by the Dominant Provider in its contracts for the provision of the WLR to Third Parties;

xxx. "**Service Maintenance Level 4**" means the Repair Service Level Commitment specification of that name as defined by the Dominant Provider in its contracts for the provision of the WLR to Third Parties;

xxxi. "**Third Party**" means a person providing a public electronic communications network or a person providing a public electronic communications service;

xxxii. "**Third Party Customer"** means a Third Party purchasing WLR from the Dominant Provider;

xxxiii. **"WLR"** means Wholesale Analogue Line Rental.

xxxiv. "**Working Day**" in the context of Service Maintenance Levels means the days deemed to be working days in contracts for the provision of services and in other contexts means any day other than Saturdays, Sundays, public holidays or bank holidays in England and Wales, Scotland or Northern Ireland (as applicable).

(b) Except as otherwise defined, words or expressions used shall have the same meaning as they have been ascribed in the NMR SMP Conditions, and otherwise any word or expression as it has in the Act.

(c) Headings and titles shall be disregarded.

(d) Expressions cognate with those referred to in the Direction shall be construed accordingly.

(e) The Interpretation Act 1978 (c. 30) shall apply as if the Direction were an Act of Parliament.

## Schedule 1 to Direction 2

### Obligations in relation to WLR KPIs

1. The Dominant Provider must publish to Third Party Customers the information required in all KPIs, except KPIs (xix) to (xxiii), in relation to the provision of WLR, in at least the detail outlined below:

    (a) an industry average (for the avoidance of doubt this includes provision by the Dominant Provider to itself where it does so); and

    (b) provision of such services to itself.

2. In relation to all KPIs, except KPIs (xix) to (xxiii), the Dominant Provider must also publish to Third Party Customers separate KPI results where options exist for Third Parties (excluding the Dominant Provider) to purchase different WLR services.

3. When publishing KPIs in accordance with paragraphs 1 and 2 above, the Dominant Provider must publish all KPIs for the United Kingdom as a whole. In addition, the Dominant Provider must publish the information required in all KPIs except KPIs (iv) to (xviii) split by reference to each Relevant Region.

4. The Dominant Provider must provide to OFCOM the information required in all KPIs as described in paragraphs 1 to 3 above and paragraph 7 below. This information shall be provided by electronic mail to the person from time to time designated by OFCOM. The Dominant Provider must also provide to OFCOM data relating to specific Third Parties upon request.

5. The Dominant Provider must publish information derived from the information required in KPIs(i)(a), (ii)(a), (iii)(a)(i), (iii)(b)(i), (iv), (vii), (viii), (xii)(a) and (b), (xvii), (xviii), (xx) to (xxiii), on a publicly accessible website, which for the avoidance of doubt should not require password access.

6. The Dominant Provider must provide to each Third Party Customer upon request, on a confidential basis, the information required in paragraph 1 above for that Third Party Customer.

7. Where the Dominant Provider does not provide WLR to itself, it must instead publish or provide to Third Party Customers (as required) the information required in relation to the equivalent implicit wholesale product provided by the Dominant Provider to itself in order for it to provide downstream services to end users.

8. The Dominant Provider must include numerators and denominators used to calculate any percentages or averages in the following cases:

   (a) when publishing information to Third Party Customers pursuant to paragraph 1(a) in relation to all KPIs;

   (b) when providing information to Third Party Customers pursuant to paragraph 6 in relation to all KPIs; and

   (c) when providing information to OFCOM pursuant to paragraph 4 in relation to all KPIs including, for the avoidance of doubt, on provision of services by the Dominant Provider to itself.

### KPIs relating to specific quality of service standards

**KPI (i) – Percentage first available date appointment availability**

In relation to Appointed Orders accepted on the Equivalence Management Platform in the relevant month (that is, either those placed by Third Parties and accepted by the Dominant Provider or those placed by the Dominant Provider), the percentage of such Appointed Orders for which the first available date offered by the Dominant Provider for an appointment was:

   (a) on or before the Required First Appointment Date;

   (b) within one Working Day of the Required First Appointment Date;

   (c) within two Working Days of the Required First Appointment Date;

   (d) within five Working Days of the Required First Appointment Date;

   (e) within ten Working Days of the Required First Appointment Date; and

   (f) within twenty Working Days of the Required First Appointment Date;

from the date on which the corresponding Order was placed on the Equivalence Management Platform by a Third Party.

**KPI (ii) – Percentage installation completion**

The percentage of all Completed Orders that were completed during the relevant month by:

(a) the Committed Date;

(b) one Working Day beyond the Committed Date;

(c) two Working Days beyond the Committed Date;

(d) five Working Days beyond the Committed Date;

(e) ten Working Days beyond the Committed Date; and

(f) twenty Working Days beyond the Committed Date.

**KPI (iii) – Percentage Repair completion**

(a) In respect of services subject to Service Maintenance Level 1, the percentage of Faults whereby the Dominant Provider achieved a Restored Service during the relevant month within:

(i) the Repair Service Level Commitment for Service Maintenance Level 1

(ii) one Working Day beyond the Repair Service Level Commitment for Service Maintenance Level 1;

(iii) two Working Days beyond the Repair Service Level Commitment for Service Maintenance Level 1;

(iv) five Working Days beyond the Repair Service Level Commitment for Service Maintenance Level 1;

(v) ten Working Days beyond the Repair Service Maintenance Level for Service Maintenance Level 1; and

(vi) twenty Working Days beyond the Repair Service Maintenance Level for Service Maintenance Level 1.

(b) In respect of services subject to Service Maintenance Level 2, the percentage of Faults whereby the Dominant Provider achieved a Restored Service during the relevant month within:

(i) the Repair Service Maintenance Level for Service Maintenance Level 2;

(ii) one Working Day beyond the Repair Service Maintenance Level for Service Maintenance Level 2;

(iii) two Working Days beyond the Repair Service Maintenance Level for Service Maintenance Level 2;

(iv) five Working Days beyond the Repair Service Maintenance Level for Service Maintenance Level 2;

(v) ten Working Days beyond the Repair Service Maintenance Level for Service Maintenance Level 2; and

(vi) twenty Working Days beyond the Repair Service Maintenance Level for Service Maintenance Level 2.

(c) In respect of services subject to Service Maintenance Level Business 2 Plus, the percentage of Faults whereby the Dominant Provider achieved a Restored Service during the relevant month within:

(i) the Repair Service Level Commitment for Service Maintenance Level Business 2 Plus;

(ii) one Working Day beyond the Repair Service Maintenance Level for Service Maintenance Level Business 2 Plus;

(iii) two Working Days beyond the Repair Service Maintenance Level for Service Maintenance Level Business 2 Plus;

(iv) five Working Days beyond the Repair Service Maintenance Level for Service Maintenance Level Business 2 Plus;

(v) ten Working Days beyond the Repair Service Level Commitment for Service Maintenance Level Business 2 Plus; and

(vi) twenty Working Days beyond the Repair Service Level Commitment for Service Maintenance Level Business 2 Plus.

(d) In respect of services subject to Service Maintenance Level 3, the percentage of Faults whereby the Dominant Provider achieved a Restored Service during the relevant month within:

(i) the Repair Service Maintenance Level for Service Maintenance Level 3;

(ii) one Working Day beyond the Repair Service Level Commitment for Service Maintenance Level 3;

(iii) two Working Days beyond the Repair Service Level Commitment for Service Maintenance Level 3;

(iv) five Working Days beyond the Repair Service Level Commitment for Service Maintenance Level 3;

(v) ten Working Days beyond the Repair Service Maintenance Level for Service Maintenance Level 3; and

(vi) twenty Working Days beyond the Repair Service Maintenance Level for Service Maintenance Level 3.

(e) In respect of services subject to Service Maintenance Level 4, the percentage of Faults whereby the Dominant Provider achieved a Restored Service during the relevant month within:

(i) the Repair Service Maintenance Level for Service Maintenance Level 4;

(ii) one Working Day beyond the Repair Service Maintenance Level for Service Maintenance Level 4;

(iii) two Working Days beyond the Repair Service Maintenance Level for Service Maintenance Level 4;

(iv) five Working Days beyond the Repair Service Maintenance Level for Service Maintenance Level 4;

(v) ten Working Days beyond the Repair Service Maintenance Level for Service Maintenance Level 4; and

(vi) twenty Working Days beyond the Repair Service Maintenance Level for Service Maintenance Level 4.

### KPIs to monitor quality more broadly

**KPI (iv) – Average first available appointment date**

In relation to Appointed Orders accepted on the Equivalence Management Platform in the relevant month (that is, either those placed by Third Parties and accepted by the Dominant Provider or those placed by the Dominant Provider), the average number of days (in Working Days) between the date on which the appointment was made and the first available date offered by the Dominant Provider for the corresponding appointment.

**KPI (v) – Percentage of Rejected Orders**

The percentage of Orders submitted during the relevant month that became Rejected Orders.

**KPI (vi) – Percentage of Appointed Orders becoming Completed Orders**

The percentage of Appointed Orders that became Completed Orders during the relevant month for Appointed Orders by;

(a) the Committed Date;

(b) one Working Day beyond the Committed Date;

(c) two Working Days beyond the Committed Date;

(d) five Working Days beyond the Committed Date;

(e) ten Working Days beyond the Committed Date; and

(f) twenty Working Days beyond the Committed Date.

**KPI (vii) - Average installation time (Appointed Orders)**

In relation to Appointed Orders that became Completed Orders in the relevant month, the average number of days (in Working Days) from such Orders being placed on the Equivalence Management Platform by a Third Party and such Orders becoming a Completed Order.

**KPI (viii) - Average installation time (other Orders)**

In relation to Orders that became Completed Orders in the relevant month other than Appointed Orders, the average number of days (in Working Days) from such Orders being placed on the Equivalence Management Platform by a Third Party and such Orders becoming a Completed Order.

**KPI (ix) – Percentage of Orders affected by MBORC Declarations that missed the Committed Date**

The total number of Completed Orders affected by MBORC Declarations which were not completed by the Commitment Date in the relevant month.

**KPI (x) – Percentage of Orders reported as having a Fault within eight calendar days**

The percentage of Completed Orders during the month preceding the relevant month that were reported as having a Fault within eight calendar days of the date of becoming a Completed Order.

**KPI (xi) – Percentage of Orders reported as having a Fault within 28 calendar days**

The percentage of Completed Orders during the month preceding the relevant month that were reported as having a Fault within 28 calendar days of the date of becoming a Completed Order.[704]

**KPI (xii) – Average time to restore service**

The average time (in working hours) during the relevant month for the Dominant Provider to achieve Restored Service after a Fault has been registered in relation to each of:

(a) Service Maintenance Level 1;

(b) Service Maintenance Level 2;

(c) Service Maintenance Level Business 2 Plus;

(d) Service Maintenance Level 3; and

(e) Service Maintenance Level 4.

[704] i.e. January Completed Orders having a further Fault within 28 calendar days of completion will be reported to Ofcom in March labelled as February figures, whether the further Fault occurred in January or February.

**KPI (xiii) – Percentage of Repairs affected by MBORC Declarations that missed the Repair Service Level Commitment**

The total number of Faults affected by MBORC Declarations where restored Service was not achieved within the Repair Service Level Commitment.

**KPI (xiv) – Average time to restore service for Repairs that have exceeded the Repair Service Level Commitment by more than 20 Working Days**

The average time (in working days) for the Dominant Provider to achieve Restored Service for Faults that exceeded the Repair Service Level Commitment by 20 Working Days or more in relation to each of:

(a) Service Maintenance Level 1;

(b) Service Maintenance Level 2;

(c) Service Maintenance Level Business 2 Plus;

(d) Service Maintenance Level 3; and

(e) Service Maintenance Level 4.

**KPI (xv) – Percentage of Repeat Faults**

The percentage of reported Faults that achieved Restored Service in the month preceding the relevant month where a Fault was reported within 28 calendar days of the Dominant Provider having achieved Restored Service of the previous Fault.

**KPI (xvi) – Percentage of Installed Base reported as having a Fault**

The number of Faults that achieved Restored Service during the relevant month, expressed as a percentage of the Installed Base.

**KPI (xvii) – Percentage of missed Repair Appointments**

The percentage of Repair Appointments missed by Dominant Provider engineers during the relevant month.

**KPI (xviii) – Percentage of missed Appointed Order appointments at end user premises**

The percentage of Appointed Order appointments missed by Dominant Provider engineers during the relevant month.

**KPI (xix) – Not used**[705]

**KPI (xx) – Number of delayed Orders completed**

The number of Completed Orders that were completed during the relevant month where the date each Order became a Completed Order exceeded the Committed Date by more than:

(a) 30 calendar days;

(b) 90 calendar days; and

(c) 120 calendar days.

**KPI (xxi) – Number of delayed Repairs completed**

The number of Faults that achieved Restored Service during the relevant month where the time taken for each Fault to achieve Restored Service after it has been registered exceeded the Service Level Commitment by more than:

(a) 30 calendar days;

(b) 90 calendar days; and

(c) 120 calendar days.

**KPI (xxii) – Number of delayed Orders not completed**

The number of Orders that are not Completed Orders where the date at the end of the relevant month exceeds the Committed Date for each Order by more than:

(a) 30 calendar days;

(b) 90 calendar days; and

(c) 120 calendar days.

[705] KPI (xix) deliberately left blank to maintain numbering consistency with Direction 3 (MPF/GEA).

**KPI (xxiii) – Number of delayed Repairs not completed**

The number of Faults where the date at the end of the relevant month exceeds the Service Level Commitment for each Fault by more than:

(a) 30 calendar days;

(b) 90 calendar days; and

(c) 120 calendar days.

## Schedule 2 to Direction 2

**Transparency report on long term delays to installations and repairs (the "Delayed Installations and Repairs Report")**

The Delayed Installations and Repairs Report shall contain the content specified in this Schedule 2 (as amended from time to time by OFCOM and provided in a format agreed by OFCOM):

1. Information on all Orders (i.e. installations) in the relevant quarter where the date when the Order that became a Completed Order exceeded the Committed Date by more than 120 calendar days.

2. Information on all Repairs during the relevant quarter where period from registration of the Fault to the date when the Dominant Provider achieved Restored Service exceeded the Repair Service Level Commitment by more than 30 calendar days.

3. An explanation of the root causes of the Delayed Installations and Repairs identified in the report.

4. A summary of the number of Completed Orders in the form of charts including:
   (a) comparison of (i) Completed Orders within Committed Date; (ii) Completed Orders exceeding Committed Date by no more than 120 calendar days of Order; and (iii) Completed Orders exceeding Committed Date by more than 120 calendar days;
   (b) Completed Orders split by root cause;
   (c) Completed Orders split by time to complete in excess of/ beyond the order original Committed Date;
   (d) Completed Orders split by Relevant Region;
   (e) Completed Orders split by Third Party;
   (f) copper product Completed Orders split by root cause;
   (g) FTTC Completed Orders split by root cause;
   (h) FTTP Completed Orders split by root cause;

(i) new-site Completed Orders split by root cause

5. A list of all Completed Orders containing the following information for each Completed Order:

(a) unique order identifier;

(b) Relevant Region;

(c) exchange;

(d) Third Party;

(e) original Committed Date;

(f) time to complete in excess of/ beyond the order original Committed Date;

(g) primary root cause;

(h) product;

(i) product line; and

(j) whether or not complaint received.

6. A summary of the number of Repairs in the form of charts including:

(a) comparison of (i) completed Repairs within Repair Service Level Commitment; (ii) completed Repairs exceeding Repair Service Level Commitment by no more than 30 calendar days; and (iii) completed Repairs exceeding Repair Service Level Commitment by more than 30 calendar days;

(b) completed Repairs split by root cause;

(c) completed Repairs split by time to complete repair in excess of Repair Service Level Commitment;

(d) completed Repairs split by Relevant Region;

(e) completed Repairs split by Third Party.

7. A list of Repairs containing the following information for each Repair:

(a) unique order identifier;

(b) Relevant Region;

(c) exchange;

(d) Third Party;

(e) original Repair Service Level Commitment;

(f) time to complete the Repair beyond original Repair Service Level Commitment;

(g) primary root cause;

(h) product;

(i) product line; and

(j) whether or not complaint received.

# Direction 3: Transparency and publication of KPIs (MPF, Shared Access and GEA services)

## Direction

A. This Direction is made under section 49 of the Act and Condition 11 of the WLA SMP Conditions, and requires publication of KPIs by the Dominant Provider for specified MPF, Shared Access and GEA services.

B. OFCOM hereby directs the Dominant Provider to comply with this Direction with effect from 1 April 2018.

## Transparency and publication of KPIs

1. The Dominant Provider must publish to Third Party Customers the information specified in paragraphs 1, 3 and 8 of Schedule 1 to this Direction in relation to the provision of MPF, Shared Access and GEA services, as required in paragraphs 5 or 6 below, as applicable.

2. The Dominant Provider must provide to individual Third Party Customers on request the information specified in paragraph 7 of Schedule 1 to this Direction in relation to the provision of MPF, Shared Access and GEA services to them, as required in paragraphs 5 or 6 below, as applicable.

3. The Dominant Provider must provide to OFCOM, by means of electronic mail to such person in OFCOM as notified from time to time, the information specified in paragraph 5 of Schedule 1 to this Direction in relation to the provision of MPF, Shared Access and GEA services, as required in paragraph 5 or 6 below, as applicable.

4. The Dominant Provider must publish the information specified in paragraph 6 of Schedule 1 to this Direction on a publicly accessible website, which for the avoidance of doubt should not require password access.

5. With the exception of the information specified in KPIs (ix) and (xiii) of Schedule 1 to this Direction, the information required by paragraphs 1 to 3 above must be published and provided as required by the Dominant Provider on or before 21 May 2018 in respect of the previous month and, for each subsequent month, within 14 Working Days of the last Working Day of every month in respect of the previous month.

6. The information specified in KPIs (ix) and (xiii) of Schedule 1 to this Direction must be published and provided, as required, by the Dominant Provider on or before 20 June 2018 in respect of

the month preceding the previous month and, for subsequent periods, within 14 Working Days of the last Working Day of every month in respect of the month preceding the previous month.

7. The information required by paragraph 4 above must be published as required by the Dominant Provider on or before 19 July 2018 in respect of the previous three months and, for subsequent periods, within 14 Working Days of the last Working Day of every third month in respect of the previous three months.

8. The Dominant Provider shall prepare and provide a report to OFCOM containing the information specified in Schedule 2 to this Direction relating to Delayed Installations and Repairs (the "Delayed Installations and Repairs Report"). The first Delayed Installations and Repairs Report must be provided to OFCOM by 20 August 2018 and thereafter within one month and 14 Working Days of the last Working Day of every third month.

9. The Schedules to this Direction forms part of the Direction.

10. Nothing in this Direction shall require the Dominant Provider to publish confidential information relating to its business or that of a Third Party.

## Interpretation

11. For the purposes of interpreting this Direction:

    (a) The following definitions shall apply:

        i. "**Access Agreement**" means an agreement entered into between the Dominant Provider and a Third Party for the provision of MPF, Shared Access or GEA services, as applicable;

        ii. "**Appointed Order**" means an Order that requires an appointment for an engineering visit by the Dominant Provider to the end user's premises in order to become a Completed Order;

        iii. "**Committed Order**" means an Order that has been accepted by the Dominant Provider and for which a Committed Date has been confirmed;

        iv. "**Completed Order**" means an Order that has been provisioned and for which all other related work has been carried out;

v. "**Committed Date**" means the date agreed between the Dominant Provider and a Third Party for an Order to become a Completed Order;

vi. "**Delayed Installation and Repair"** means an Order that has not become a Completed Order within 120 calendar days of the Committed Date or a Fault that has not achieved a Restored Service status within 30 calendar days of identification to or by the Dominant Provider

vii. "**Dominant Provider**" means BT;

viii. "**Equivalence Management Platform**" means the Dominant Provider's operational support system designed to handle the majority of transactions for equivalence of inputs and network access;

ix. "**Fault**" means a degradation or problem with MPF, Shared Access or GEA services, as applicable, that is identified by the Dominant Provider or a Third Party and which has been registered on the Dominant Provider's operational support system;

x. "**FTTC**" means Fibre-to-the-Cabinet, an Electronic Communications Network consisting of optical fibre extending from the local access node to the street cabinet;

xi. "**FTTP"** means Fibre-to-the-Premises, an Electronic Communications Network consisting of optical fibre extending from the local access node to the customer's premises;

xii. "**GEA**" means Generic Ethernet Access, the Dominant Provider's non-physical wholesale services providing wholesale access to higher speed broadband products;

xiii. "**GEA-FTTC"** means Virtual Unbundled Local Access provided through the Dominant Provider's GEA services over its FTTC network;

xiv. "**GEA–FTTP"** means Virtual Unbundled Local Access provided through the Dominant Provider's GEA services over its FTTP network;

xv. "**Hull Area**" means the area defined as the 'Licensed Area' in the licence granted on 30 November 1987 by the Secretary of State under section 7 of the Telecommunications Act 1984 to Kingston upon Hull City Council and Kingston Communications (Hull) plc;

xvi. "**Installed Base**" means the average number of relevant MPF, Shared Access or GEA services, as applicable, that are in use during the relevant month;

xvii. "**KPI**" means key performance indicator;

xviii. "**MBORC**" means Matters Beyond Our Reasonable Control, a force majeure event under the relevant Access Agreement, the occurrence of which releases the Dominant Provider from the liability to make any payment under the corresponding Service Level Guarantee;

xix. "**MBORC Declaration**" means a declaration made by the Dominant Provider that an MBORC has occurred in relation to MPF, Shared Access or GEA services as applicable in a Relevant Region, including in response to both major incidents (**"High Level MBORC Declaration"**) and local incidents (**"Local MBORC Declaration"**); ;

xx. **"MPF"** means Metallic Path Facilities;

xxi. "**Order**" means a request for an MPF, Shared Access or GEA service, as applicable, submitted to the Dominant Provider by a Third Party;

xxii. "**Pending Order**" means an Order which has been approved by the Dominant Provider and is awaiting a Contractual Delivery Date;

xxiii. "**Rejected Order**" means an Order rejected by the Dominant Provider because it is incomplete or incorrect;

xxiv. **"Relevant Region"** means the following ten regions, as defined by the Dominant Provider:

- East Anglia;
- London;
- North East;
- North Wales and North Midlands;
- North West;
- Scotland;
- South East;
- South Wales and South Midlands;
- Wessex; and

- Northern Ireland;

or other such regions as OFCOM may agree with the Dominant Provider or direct from time to time, but which cumulatively at all times cover the wholesale local access market in the UK, as applicable, excluding the Hull Area;

xxv. "**Relevant Subscriber**" means any person who is a party to a contract with a provider of public electronic communications services for the supply of such services;

xxvi. "**Repair Appointment**" means an arranged appointment in respect of a Repair that requires an engineering visit by the Dominant Provider to the end user's premises in order to become a Restored Service;

xxvii. **"Repair Service Level Commitment"** means the Dominant Provider's contractual commitment in contracts for the provision of WLR, MPF or GEA services, as applicable, in relation to the period within which it will achieve Restored Service from the registration of a Fault;

xxviii. "**Required First Appointment Date"** is the date on which the Dominant Provider is required to offer an installation appointment pursuant to "*Quality of Service Standard 1"* in Direction 1 (quality of service standards) made pursuant to condition 11 of the WLA SMP Conditions;

xxix. "**Restored Service**" means the point at which an MPF, Shared Access or GEA service, as applicable, in relation to which a Fault was registered becomes available again for use by the Third Party;

xxx. "**Scheduled Outages**" means the defined periods of time notified to Third Parties in accordance with the terms of the Dominant Provider's contract for an MPF, Shared Access or GEA service, as applicable, whereby the Dominant Provider's operational support system is not available for use by Third Parties in order for the Dominant Provider to perform certain tasks including, but not limited to, routine maintenance, changing configurations, software upgrades and updating facilities and may include specific maintenance activities;

xxxi. "**Service Maintenance Level 1**" means the Repair Service Level Commitment specification of that name as defined by the Dominant Provider in its contracts for the provision of MPF, Shared Access or GEA services, as applicable, to Third Parties;

xxxii. "**Service Maintenance Level 2**" means the Repair Service Level Commitment specification of that name as defined by the Dominant Provider in its contracts for the provision of MPF, Shared Access or GEA services, as applicable, to Third Parties;

xxxiii. "**Service Maintenance Level Business 2 Plus**" means the Repair Service Level Commitment specification of that name as defined by the Dominant Provider in its contracts for the provision of MPF, Shared Access or GEA services to Third Parties;

xxxiv. "**Service Maintenance Level 3**" means the Repair Service Level Commitment specification of that name as defined by the Dominant Provider in its contracts for the provision of MPF, Shared Access or GEA services, as applicable, to Third Parties;

xxxv. "**Service Maintenance Level 4**" means the Repair Service Level Commitment specification of that name as defined by the Dominant Provider in its contracts for the provision of the MPF, Shared Access or GEA services, as applicable, to Third Parties;

xxxvi. "**Street Cabinet Appointment**" means an arranged appointment in respect of an Order that requires an engineering visit by the Dominant Provider to a street cabinet rather than to the end user's premises in order to become a Completed Order;

xxxvii. "**Third Party**" means a person providing a public electronic communications network or a person providing a public electronic communications service;

xxxviii. "**Third Party Customer"** means a Third Party purchasing MPF, Shared Access or GEA services (as applicable) from the Dominant Provider;

xxxix. **"WLA SMP Conditions"** means the SMP conditions appended to the OFCOM statement entitled "*Wholesale Local Access Market Review: Statement*" and dated [DATE]; and

xl. "**Working Day**" in the context of Service Maintenance Levels means the days deemed to be working days in contracts for the provision of services and in other contexts means any day other than Saturdays, Sundays, public holidays or bank holidays in England and Wales, Scotland or Northern Ireland (as applicable).

(b) Except as otherwise defined, words or expressions used shall have the same meaning as they have been ascribed in the WLA SMP Conditions, and otherwise any word or expression as it has in the Act.

(c) Headings and titles shall be disregarded.

(d) Expressions cognate with those referred to in the Direction shall be construed accordingly.

(e) The Interpretation Act 1978 (c. 30) shall apply as if the Direction were an Act of Parliament.

## Schedule 1 to Direction 3

### Key Performance Indicators for Metallic Path Facilities, Shared Access and Generic Ethernet Access services

1. The Dominant Provider must publish to Third Party Customers the following:

   (a) the information required in all KPIs, except KPIs, (iii) (c), (xii)(c), (xix)to (xxiii), in relation to the provision of network access to MPF;

   (b) the information required in all KPIs, except KPIs (iii) (a) and (c), , (xii)(a) and (c), and (xx) to (xxiii), in relation to the provision of network access to GEA-FTTC;

   (c) the information required in all KPIs, except KPIs (iii) (a) and (c), (xii)(a) and (c), and (xix) to (xxiii), in relation to the provision of network access to GEA-FTTP;

   (d) the information required in KPIs (iii)(b), (d) and (e), (xii)(b), (d) and (e), (xiv)(b), (d) and (e), (xv), (xvi) and (xvii), in relation to the provision of network access to Shared Access services;

2. The Dominant Provider must publish the information required in paragraph 1 in at least the detail outlined below:

   (a) an industry average (for the avoidance of doubt this includes provision by the Dominant Provider to itself where it does so); and

   (b) provision of the specified services to itself.

3. Where options exist for Third Parties (excluding the Dominant Provider) to purchase different MPF, Shared Access or GEA services, the Dominant Provider must publish as the information required in paragraph 1 to Third Party Customers separately for each service.

4. When publishing KPIs in accordance with paragraphs 1 to 3, the Dominant Provider must publish all KPIs for the United Kingdom as a whole. In addition, the Dominant Provider must publish the following KPIs split by reference to each Relevant Region:

   (a) For MPF, KPIs (i) to (iii) and (xx) to (xxiii) (in each case only where there are 100,000 or more such active connections in a Relevant Region);

   (b) for GEA-FTTC, KPIs (i) to (iii) (b), (d) and (e) and (xx) to (xxiii) (in each case only where there are 100,000 or more such active connections in a Relevant Region);

(c) for Shared Access, KPIs (iii)(b), (d) and (e) and (xx) to (xxiii) (in each case only where there are 100,000 or more such active connections in a Relevant Region); and

(d) for GEA-FTTP, KPIs (iii)(b), (d) and (e) and (xx) to (xxiii) (in each case only where there are 100,000 or more such active connections in a Relevant Region).

5. The Dominant Provider must provide to OFCOM the information required in all KPIs as described in paragraphs 1 to 4 above. This information shall be provided by electronic mail to the person from time to time designated by OFCOM. The Dominant Provider must also provide to OFCOM data relating to specific Third Parties upon request.

6. The Dominant Provider must publish information derived from the following KPIs on a publicly accessible website, which for the avoidance of doubt should not require password access:

(a) For MPF, the information required in KPIs (i)(a), (ii)(a), (iii)(a)(i) and (b)(i), (iv), (vii), (viii), (xii)(a) and (b), (xvii), (xviii) and (xx) to (xxiii);

(b) For GEA-FTTC, the information required in KPIs (i)(a), (ii)(a), (iii)(b)(i), (iv), (vii), (viii), (xii)(b), and (xvii) to (xxiii);

7. The Dominant Provider must provide to each Third Party Customer upon request, on a confidential basis, the information required in paragraph 1 above for that Third Party Customer.

8. Where the Dominant Provider does not provide LLU services to itself, it must instead publish or provide to Third Party Customers (as required) the information required in relation to the equivalent implicit wholesale product provided by the Dominant Provider to itself in order for it to provide downstream services to end users.

9. The Dominant Provider must include numerators and denominators used to calculate any percentages or averages in the following cases:

(a) when publishing to Third Party Customers under paragraph 1 the information referred to in paragraph 2(a) in relation to all KPIs, except for GEA-FTTP for which no industry numerators and denominators need be provided;

(b) when providing information to Third Party Customers pursuant to paragraph 7 in relation to all KPIs; and

(c) when providing information to OFCOM pursuant to paragraph 5 in relation to all KPIs including, for the avoidance of doubt, on provision of services by the Dominant Provider to itself.

### KPIs relating to specific quality of service standards

**KPI (i) – Percentage first available date appointment availability**

In relation to Appointed Orders and Street Cabinet Appointments accepted on the Equivalence Management Platform in the relevant month (that is, either those placed by Third Parties and accepted by the Dominant Provider or those placed by the Dominant Provider), the percentage of such Appointed Orders and Street Cabinet Appointments for which the first available date offered by the Dominant Provider for an appointment was:

(a) on or before the Required First Appointment Date;

(b) within one Working Day of the Required First Appointment Date;

(c) within two Working Days of the Required First Appointment Date;

(d) within five Working Days of the Required First Appointment Date;

(e) within ten Working Days of the Required First Appointment Date; and

(f) within twenty Working Days of the Required First Appointment Date;

from the date on which the corresponding Order was placed on the Equivalence Management Platform by a Third Party.

**KPI (ii) – Percentage installation completion**

The percentage of all Completed Orders that were completed during the relevant month by;

(a) the Committed Date;

(b) one Working Day beyond the Committed Date;

(c) two Working Days beyond the Committed Date;

(d) five Working Days beyond the Committed Date;

(e) ten Working Days beyond the Committed Date; and

(f) twenty Working Days beyond the Committed Date.

**KPI (iii) – Percentage Repair completion**

(a) In respect of services subject to Service Maintenance Level 1, the percentage of Faults whereby the Dominant Provider achieved a Restored Service during the relevant month within:

(i) the Repair Service Maintenance Level for Service Maintenance Level 1

(ii) one Working Day beyond the Repair Service Maintenance Level for Service Maintenance Level 1;

(iii) two Working Days beyond the Repair Service Maintenance Level for Service Maintenance Level 1;

(iv) five Working Days beyond the Repair Service Maintenance Level for Service Maintenance Level 1;

(v) ten Working Days beyond the Repair Service Maintenance Level for Service Maintenance Level 1; and

(vi) twenty Working Days beyond the Repair Service Maintenance Level for Service Maintenance Level 1.

(b) In respect of services subject to Service Maintenance Level 2, the percentage of Faults whereby the Dominant Provider achieved a Restored Service during the relevant month within:

(i) the Repair Service Maintenance Level for Service Maintenance Level 2;

(ii) one Working Day beyond the Repair Service Maintenance Level for Service Maintenance Level 2;

(iii) two Working Days beyond the Repair Service Maintenance Level for Service Maintenance Level 2;

(iv) five Working Days beyond the Repair Service Maintenance Level for Service Maintenance Level 2;

(v) ten Working Days beyond the Repair Service Maintenance Level for Service Maintenance Level 2; and

(vi) twenty Working Days beyond the Repair Service Maintenance Level for Service Maintenance Level 2.

(c) In respect of services subject to Service Maintenance Level Business 2 Plus, the percentage of Faults whereby the Dominant Provider achieved a Restored Service during the relevant month within:

(i) the Repair Service Maintenance Level for Service Maintenance Level Business 2 Plus;

(ii) one Working Day beyond the Repair Service Maintenance Level for Service Maintenance Level Business 2 Plus;

(iii) two Working Days beyond the Repair Service Maintenance Level for Service Maintenance Level Business 2 Plus;

(iv) five Working Days beyond the Repair Service Maintenance Level for Service Maintenance Level Business 2 Plus;

(v) ten Working Days beyond the Repair Service Maintenance Level for Service Maintenance Level Business 2 Plus; and

(vi) twenty Working Days beyond the Repair Service Maintenance Level for Service Maintenance Level Business 2 Plus.

(d) In respect of services subject to Service Maintenance Level 3, the percentage of Faults whereby the Dominant Provider achieved a Restored Service during the relevant month within:

(i) the Repair Service Maintenance Level for Service Maintenance Level 3;

(ii) one Working Day beyond the Repair Service Maintenance Level for Service Maintenance Level 3;

(iii) two Working Days beyond the Repair Service Maintenance Level for Service Maintenance Level 3;

(iv) five Working Days beyond the Repair Service Maintenance Level for Service Maintenance Level 3;

(v) ten Working Days beyond the Repair Service Maintenance Level for Service Maintenance Level 3; and

(vi) twenty Working Days beyond the Repair Service Maintenance Level for Service Maintenance Level 3.

(e) In respect of services subject to Service Maintenance Level 4, the percentage of Faults whereby the Dominant Provider achieved a Restored Service during the relevant month within:

(i) the Repair Service Maintenance Level for Service Maintenance Level 4;

(ii) one Working Day beyond the Repair Service Maintenance Level for Service Maintenance Level 4;

(iii) two Working Days beyond the Repair Service Maintenance Level for Service Maintenance Level 4;

(iv) five Working Days beyond the Repair Service Maintenance Level for Service Maintenance Level 4;

(v) ten Working Days beyond the Repair Service Maintenance Level for Service Maintenance Level 4; and

(vi) twenty Working Days beyond the Repair Service Maintenance Level for Service Maintenance Level 4.

### KPIs to monitor quality more broadly

**KPI (iv) – Average first available appointment date**

In relation to Appointed Orders and Street Cabinet Appointments accepted on the Equivalence Management Platform in the relevant month (that is, either those placed by Third Parties and accepted by the Dominant Provider or those placed by the Dominant Provider), the average number of days (in Working Days) between the date on which the appointment was made and the first available date offered by the Dominant Provider for the corresponding appointment.

**KPI (v) – Percentage of Rejected Orders**

The percentage of Orders submitted during the relevant month that became Rejected Orders.

**KPI (vi) – Percentage of Appointed Orders becoming Completed Orders**

The percentage of Appointed Orders and Street Cabinet Appointments that became Completed Orders during the relevant month for Appointed Orders by;

(a) the Committed Date;

(b) one Working Day beyond the Committed Date;

(c) two Working Days beyond the Committed Date;

(d) five Working Days beyond the Committed Date;

(e) ten Working Days beyond the Committed Date; and

(f) twenty Working Days beyond the Committed Date.

**KPI (vii) - Average installation time (Appointed Orders)**

In relation to Appointed Orders and Street Cabinet Appointments that became Completed Orders in the relevant month, the average number of days (in Working Days) from such Orders being placed on the Equivalence Management Platform by a Third Party and such Orders becoming a Completed Order.

**KPI (viii) - Average installation time (other Orders)**

In relation to Orders that became Completed Orders in the relevant month other than Appointed Orders and Street Cabinet Appointments, the average number of days (in Working Days) from such

Orders being placed on the Equivalence Management Platform by a Third Party and such Orders becoming a Completed Order.

**KPI (ix) – Percentage of Orders affected by MBORC Declarations that missed the Committed Date**

The total number of Completed Orders affected by MBORC Declarations which were not completed by the Commitment Date in the relevant month.

**KPI (x) – Percentage of Orders reported as having a Fault within eight calendar days**

The percentage of Completed Orders during the month preceding the relevant month that were reported as having a Fault within eight calendar days of the date of becoming a Completed Order.

**KPI (xi) – Percentage of Orders reported as having a Fault within 28 calendar days**

The percentage of Completed Orders during the month preceding the relevant month that were reported as having a Fault within 28 calendar days of the date of becoming a Completed Order.

**KPI (xii) – Average time to restore service**

The average time (in working hours) during the relevant month for the Dominant Provider to achieve Restored Service after a Fault has been registered in relation to each of:

(a) Service Maintenance Level 1;

(b) Service Maintenance Level 2;

(c) Service Maintenance Level Business 2 Plus;

(d) Service Maintenance Level 3; and

(e) Service Maintenance Level 4.

**KPI (xiii) – Percentage of Repairs affected by MBORC Declarations that missed the Repair Service Level Commitment**

The total number of Faults affected by MBORC Declarations where restored Service was not achieved within the Repair Service Level Commitment.

**KPI (xiv) – Average time to restore service for Repairs that have exceeded the Repair Service Level Commitment by more than 20 Working Days**

The average time (in working days) for the Dominant Provider to achieve Restored Service for Faults that exceeded the Repair Service Level Commitment by 20 Working Days or more in relation to each of:

(a) Service Maintenance Level 1;

(b) Service Maintenance Level 2;

(c) Service Maintenance Level Business 2 Plus;

(d) Service Maintenance Level 3; and

(e) Service Maintenance Level 4.

**KPI (xv) – Percentage of repeat Faults**

The percentage of reported Faults that achieved Restored Service in the month preceding the relevant month where a Fault was reported within 28 calendar days of the Dominant Provider having achieved Restored Service of the previous Fault.

**KPI (xvi) – Percentage of Installed Base reported as having a Fault**

The number of Faults that achieved Restored Service during the relevant month, expressed as a percentage of the Installed Base.

**KPI (xvii) – Percentage of missed Repair Appointments**

The percentage of Repair Appointments missed by Dominant Provider engineers during the relevant month.

**KPI (xviii) – Percentage of missed Appointed Order appointments at end user premises**

The percentage of Appointed Order appointments missed by Dominant Provider engineers during the relevant month.

**KPI (xix) – Percentage of missed Street Cabinet Appointments**

The percentage of Street Cabinet Appointments missed by Dominant Provider engineers during the relevant month.

**KPI (xx) – Number of delayed Orders completed**

The number of Completed Orders that were completed during the relevant month where the date each Order became a Completed Order exceeded the Committed Date by more than:

(a) 30 calendar days;

(b) 90 calendar days; and

(c) 120 calendar days.

**KPI (xxi) – Number of delayed Repairs completed**

The number of Faults that achieved Restored Service during the relevant month where the time taken for each Fault to achieve Restored Service after it has been registered exceeded the Service Level Commitment by more than:

(a) 30 calendar days;

(b) 90 calendar days; and

(c) 120 calendar days.

**KPI (xxii) – Number of delayed Orders not completed**

The number of Orders that are not Completed Orders where the date at the end of the relevant month exceeds the Committed Date for each Order by more than:

(a) 30 calendar days;

(b) 90 calendar days; and

(c) 120 calendar days.

**KPI (xxiii) – Number of delayed Repairs not completed**

The number of Faults where the date at the end of the relevant month exceeds the Service Level Commitment for each Fault by more than:

(a) 30 calendar days;

(b) 90 calendar days; and

(c) 120 calendar days.

## Schedule 2 to Direction 3

**Transparency report on long term delays to installations and repairs (the "Delayed Installations and Repairs Report")**

The Delayed Installations and Repairs Report shall contain the content specified in this Schedule 2 (as amended from time to time by OFCOM and provided in a format agreed by OFCOM):

1. Information on all Orders (i.e. installations) in the relevant quarter where the date when the Order that became a Completed Order exceeded the Committed Date by more than 120 calendar days.

2. Information on all Repairs during the relevant quarter where period from registration of the Fault to the date when the Dominant Provider achieved Restored Service exceeded the Repair Service Level Commitment by more than 30 calendar days.

3. An explanation of the root causes of the Delayed Installations and Repairs identified in the report.

4. A summary of the number of Completed Orders in the form of charts including:
   (a) comparison of (i) Completed Orders within Committed Date; (ii) Completed Orders exceeding Committed Date by no more than 120 calendar days of Order; and (iii) Completed Orders exceeding Committed Date by more than 120 calendar days;
   (b) Completed Orders split by root cause;
   (c) Completed Orders split by time to complete in excess of/ beyond the order original Committed Date;
   (d) Completed Orders split by Relevant Region;
   (e) Completed Orders split by Third Party;
   (f) copper product Completed Orders split by root cause;
   (g) FTTC Completed Orders split by root cause;
   (h) FTTP Completed Orders split by root cause;
   (i) new-site Completed Orders split by root cause

5. A list of all Completed Orders containing the following information for each Completed Order:
   (a) unique order identifier;
   (b) Relevant Region;
   (c) exchange;
   (d) Third Party;
   (e) original Committed Date;
   (f) time to complete in excess of/ beyond the order original Committed Date;
   (g) primary root cause;
   (h) product;
   (i) product line; and
   (j) whether or not complaint received.
6. A summary of the number of Repairs in the form of charts including:
   (a) comparison of (i) completed Repairs within Repair Service Level Commitment; (ii) completed Repairs exceeding Repair Service Level Commitment by no more than 30 calendar days; and (iii) completed Repairs exceeding Repair Service Level Commitment by more than 30 calendar days;
   (b) completed Repairs split by root cause;
   (c) completed Repairs split by time to complete repair in excess of Repair Service Level Commitment;
   (d) completed Repairs split by Relevant Region;
   (e) completed Repairs split by Third Party.
7. A list of Repairs containing the following information for each Repair:
   (a) unique order identifier;
   (b) Relevant Region;

(c) exchange;

(d) Third Party;

(e) original Repair Service Level Commitment;

(f) time to complete the Repair beyond original Repair Service Level Commitment;

(g) primary root cause;

(h) product;

(i) product line; and

(j) whether or not complaint received.

# Direction 4: Provision of network access to WLR, MPF and VULA (removal of Service Level Guarantee cap)

## Direction

A. This Direction is made under sections 49 of the Act, Condition 1 of the WLA SMP Conditions, and Condition 1A of the NMR Conditions, and requires the Dominant Provider to amend its terms and conditions for the provision of network access to provide that compensation for delays in installing new lines or repairing Faults is not subject to a cap.

B. OFCOM has decided to give the following Direction with effect from 1 May 2018:

## Removal of cap

1. The Dominant Provider shall amend the terms and conditions which govern the supply of WLR so that no cap applies in relation to the period of time for which daily compensation is payable where an Order fails to become a Completed Order by the Committed Date, or a Fault fails ot become a Restored Service within the applicable Repair Service Level Commitments.

2. The Dominant Provider shall amend the terms and conditions which govern the supply of MPF and GEA-FTTC so that no cap applies in relation to the period of time for which daily compensation is payable where an Order fails to become a Completed Order by the Committed Date, or a Fault fails to become a Restored Service within the applicable Service Level Commitments.

## Interpretation

3. For the purposes of interpreting this Direction:

   (a) The following definitions shall apply:

   i. **"Committed Date"** means the date agreed between the Dominant Provider and a Third Party for an Order to become a Completed Order;

   ii. "**Completed Order"** means an Order that has been provisioned and for which all other related work has been carried out;

   iii. **"Dominant Provider"** means BT;

   iv. **"Fault"** means a degradation or problem with WLR, MPF or GEA-FTTC that is identified by the Dominant Provider or a Third Party and which is registered on the Dominant Provider's operational support system on or after 1 May 2018;

v. "**FTTC**" means Fibre-to-the-Cabinet, an Electronic Communications Network consisting of optical fibre extending from the local access node to the street cabinet;

vi. "**GEA**" means Generic Ethernet Access, the Dominant Provider's non-physical wholesale services providing wholesale access to higher speed broadband products;

vii. "**GEA – FTTC**" means Virtual Unbundled Local Access provided through the Dominant Provider's GEA services over its FTTC network;

viii. **"NMR SMP Conditions"** means the SMP conditions appended to the OFCOM statement entitled "*Narrowband Market Review: Statement*" and dated 30 November 2017;

ix. **"Order"** means a request for WLR, MPF or GEA-FTTC submitted to the Dominant Provider by a Third Party on or after 1 May 2018;

x. **"Repair Service Level Commitment"** means the Dominant Provider's contractual commitment in contracts for the provision of WLR, MPF or GEA services, as applicable, in relation to the period within which it will achieve Restored Service from the registration of a Fault;

xi. "**Restored Service**" means the point at which the WLR, MPF or GEA service, as applicable, in relation to which a Fault was registered becomes available again for use by the Third Party;

xii. **"Third Party"** means a person providing a public electronic communications network or a person providing a public electronic communications service; and

xiii. **"WLA SMP Conditions"** means the SMP conditions appended to the OFCOM statement entitled "*Wholesale Local Access Market Review: Statement*" and dated 28 March 2018;

xiv. "**WLR"** means Wholesale Analogue Line Rental.

(b) Except as otherwise defined, words or expressions used shall have the same meaning as they have been ascribed in the WLA SMP Conditions and/or NMR SMP Conditions, and otherwise any word or expression as it has in the Act.

(c) Headings and titles shall be disregarded.

(d) Expressions cognate with those referred to in the Direction shall be construed accordingly.

(e) The Interpretation Act 1978 (c. 30) shall apply as if the Direction were an Act of Parliament.

# A5. Sources of evidence

## Introduction

A5.1 We have noted throughout this statement the evidence we have relied upon in relation to our findings and how we have relied upon that evidence. This Annex lists the main sources of evidence used, including all responses to our consultations and to our formal information requests.

A5.2 While this Annex lists the main evidence we have relied upon, the list is for convenience only and is not intended to be exhaustive.

## Responses to the March 2017 QoS Consultation

A5.3 On 31 March 2017, we published a consultation (March 2017 QoS Consultation) to gather stakeholders' views on our proposals for regulating the quality of Openreach's broadband services.[706]

A5.4 Twelve stakeholders provided written responses to this consultation:

- British Telecommunications plc (BT);
- CityFibre Infrastructure Holdings plc (CityFibre);
- Communication Workers Union (CWU);
- [✂];
- Mr M Isherwood;
- Openreach;
- Sky UK Limited (Sky);
- TalkTalk Telecom Group plc (TalkTalk);
- UK Competitive Telecommunications Association (UKCTA);
- Verizon Enterprise Services (Verizon);
- Virgin Media plc (Virgin Media); and
- Vodafone Group plc (Vodafone).

A5.5 We have published non-confidential versions of the responses from the stakeholders listed above, where available. These can be found on our website.[707]

## Responses to the September 2017 QoS Further Consultation

A5.6 On 14 September 2017, we published a further consultation (September 2017 QoS Further Consultation) on our proposed changes for regulating the quality of Openreach's broadband services, following our analysis of further evidence.[708]

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[706] Ofcom, 2017. *Quality of Service for WLR, MPF and GEA - Consultation on proposed quality of service remedies*. https://www.ofcom.org.uk/__data/assets/pdf_file/0033/99645/QoS-WLR-MPF-GEA.pdf.
[707] https://www.ofcom.org.uk/consultations-and-statements/category-1/quality-of-service.
[708] Ofcom, 2017. *Quality of Service Consultation for WLR, MPF and GEA – Further consultation on proposed quality of service remedies*. https://www.ofcom.org.uk/__data/assets/pdf_file/0012/106311/consultation-quality-service-wlr-mpf-gea.pdf.

A5.7 Seven stakeholders provided written responses to this consultation:

- [✂];
- [✂];
- Openreach;
- Sky;
- TalkTalk;
- UKCTA; and
- Vodafone.

A5.8 We have published non-confidential versions of the responses from the stakeholders listed above, where available. These can be found on our website.[709]

# Information gathering using statutory powers (s.135)

## Quality of service

### Requests addressed to BT and responses received from Openreach

A5.9 6th FAMR QoS information request of 3 March 2014 regarding fault repairs, line volumes, and incidents relating to *force majeure* events (MBORCSs). Response received in two tranches on 5 March and 7 March 2014.

A5.10 Information request of 26 August 2016 regarding Openreach's network health. Response received on 16 September 2016.

A5.11 1st information request of 4 January 2016 regarding first available appointment dates (FADs), missed and changed appointments/ delivery dates, repairs which exceeded SLA timescales and provision orders which exceeded their contractual delivery date (CDD). Response received on 5 February 2016. Supplementary response received on 5 July 2016.

A5.12 2nd information request of 3 May 2016 regarding fault repairs, line volumes, and incidents relating to *force majeure* events (MBORCSs). Response received on 25 May 2016. Supplementary response received on 4 July 2016.

A5.13 3rd information request of 19 July 2016 regarding provision orders and data relating to different milestones along the provision order journey. Response received in three tranches on 19 August, 30 August and 2 September 2017.

A5.14 4th information request of 26 August 2016 regarding Openreach network health. Response received on 16 September 2016.

A5.15 4th information request of 18 November 2016 regarding fault repairs. Response received on 9 December 2016.

A5.16 5th information request of 15 December 2016 regarding SLAs and fault repairs. Response received on 13 January 2017.

[709] https://www.ofcom.org.uk/consultations-and-statements/category-2/quality-service-wlr-mpf-gea.

A5.17 6th information request of 4 August 2017 regarding installation orders. Response received on 29 September 2017.

A5.18 7th information request of 5 June 2017 regarding Openreach's fault volume reduction (FVR) programme. Response received in two tranches on 9 June and 19 June 2017.

A5.19 8th information request of 23 June 2017 regarding first available appointment dates, Openreach's FVR programme and engineering workforce, and MBORCs. Response received on 7 July 2017. Supplementary response received on 15 August 2017.

A5.20 9th information request of 29 June 2017 regarding fault repairs and line volumes. Response received on 15 August 2017.

A5.21 10th information request of 14 July 2017 regarding Openreach's consultation response. Response received on 18 July 2017.

A5.22 11th information request of 7 September 2017 regarding SLG payments. Response received on 11 September 2017.

A5.23 12th information request of 27 October 2017 regarding missed and changed appointments/delivery dates. Response received on 3 November 2017.

A5.24 13th information request of 12 January 2018 regarding take up of FADs. Response received on 12 January 2018.

A5.25 14th information request of 16 February 2018 regarding service maintenance level line volumes. Response received on 19 February 2018.

### Requests addressed to Sky and received from Sky

A5.26 Information request of 5 January 2018 regarding late installations. Response received on 18 January 2018.

## Wholesale broadband access

### Requests addressed to BT and responses received from Openreach

A5.27 1st information request of 8 October 2015 regarding the reach of BT's copper and fibre networks, its fibre investment plans, wholesale broadband service volumes and retail broadband customer numbers. Response received in four tranches on 22 October, 5 November, 6 November and 16 November 2015.

## Wholesale local access

### Requests addressed to BT and responses received from Openreach

A5.28 34th information request of 16 August 2017 regarding base year data. Response received in eleven tranches on 8 September, 13 September, 27 September, 28 September, 3 October, 4 October, 3 November and 6 November 2017, and 9 January, 23 January and 31 January 2018. Further response received on 6 February 2018.

A5.29 43rd information request of 14 December 2017 regarding efficiency, quality of service, sales of copper and GEA costs. Response received on 4 January 2018.

# Ofcom documents

## Consultations

A5.30 Ofcom, 2017. *Quality of Service for WLR, MPF and GEA - Consultation on proposed quality of service remedies*. https://www.ofcom.org.uk/__data/assets/pdf_file/0033/99645/QoS-WLR-MPF-GEA.pdf.

A5.31 Ofcom, 2017. *Quality of Service Consultation for WLR, MPF and GEA – Further consultation on proposed quality of service remedies.* https://www.ofcom.org.uk/__data/assets/pdf_file/0012/106311/consultation-quality-service-wlr-mpf-gea.pdf.

A5.32 Ofcom, 2017. *Wholesale Local Access Market Review – Consultation on the proposed market, market power determinations and remedies.* https://www.ofcom.org.uk/consultations-and-statements/category-1/wholesale-local-access-market-review.

A5.33 Ofcom, 2017. *Wholesale Local Access Market Review – Further consultation on proposed charge control for wholesale standard and superfast broadband.* https://www.ofcom.org.uk/__data/assets/pdf_file/0023/106448/Proposed-charge-control-for-wholesale-standard-and-superfast-broadband.pdf.

## Statements

A5.34 Ofcom, 2017. *Automatic Compensation: Protecting consumers from quality of service problems – Statement*. https://www.ofcom.org.uk/__data/assets/pdf_file/0026/107693/Statement-automatic-compensation.pdf.

A5.35 Ofcom, 2005. *Better Policy Making: Ofcom's approach to Impact Assessment*. https://www.ofcom.org.uk/__data/assets/pdf_file/0026/57194/better_policy_making.pdf.

A5.36 Ofcom, 2017. *Clarification on the Ofcom Resource Performance Model*. https://www.ofcom.org.uk/__data/assets/pdf_file/0022/102568/Clarifications-on-the-Ofcom-Resource-Performance-Model.pdf.

A5.37 Ofcom, 2017. *The Communications Market Report – United Kingdom*. https://www.ofcom.org.uk/__data/assets/pdf_file/0017/105074/cmr-2017-uk.pdf.

A5.38 Ofcom, 2017. *Comparing Service Quality – The performance of broadband, landline and mobile providers in 2016 – Statement*. https://www.ofcom.org.uk/__data/assets/pdf_file/0012/100605/comparing-service-quality-report.pdf.

A5.39 Ofcom, 2017. *Delivering a more independent Openreach*. https://www.ofcom.org.uk/__data/assets/pdf_file/0035/98855/Openreach-consultation-2017.pdf.

A5.40 Ofcom, 2011. *Dispute Resolution Guidelines*. https://www.ofcom.org.uk/__data/assets/pdf_file/0020/71624/guidelines.pdf.

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