Final report for Ofcom

International case studies

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Contents

The opinions expressed in this study are those of the authors and do not necessarily reflect the views of Ofcom.

1 Executive summary

Analysys Mason was engaged by Ofcom to examine approaches that have been taken to the regulation of fixed next-generation access (NGA) networks in several benchmark countries, and to understand their outcomes.

We reviewed the different regulatory interventions relating to NGA on fixed networks in seven case-study countries: Belgium, France, the Netherlands, New Zealand, Portugal, Singapore and Spain (selected in co-operation with Ofcom). We then compared and contrasted the approaches taken and the outcomes achieved in these markets, and considered the implications.

The findings from our analysis can be summarised as follows.

- Despite some commonalities, *there are material differences between the case studies, both in terms of remedies and outcomes*. This constrains our ability to draw general conclusions independent of country-specific factors.

- Incumbents have chosen a range of approaches for providing NGA coverage, with those in the case-study countries often choosing fibre to the home (FTTH). Elsewhere in Europe, such as in the UK,[1] incumbents are relying on fibre to the cabinet (FTTC). *Non-incumbent operators are building FTTH networks based on passive access, but these are geographically restricted to dense urban areas.* In addition to substantial cable-TV network coverage, often based entirely on the cable operator's own network ("end-to-end"), some countries also have parallel FTTH networks built by alternative operators using access to passive network components(such as duct access, mutualised final segment, access to in-building wiring ("verticals") or co-investment models). The economics of these deployments are such that the geographical scope of these parallel deployments is restricted to dense urban areas.

- *Active remedies have been applied in some areas.* Some countries use active remedies, often on a sub-national/local geographic basis. Through their choice of remedies, regulators have indicated that they see no need for active remedies on FTTH in areas with high levels of infrastructure-based competition (whether provided end-to-end or using passive access such as duct access or access to mutualised final segment).

- *Passive remedies remain attractive[2], although there are differences of opinion regarding technical feasibility*. Where wholesale access remedies are imposed on FTTH networks, some regulators have concluded that passive access to passive optical networks (PONs) is infeasible and have therefore imposed virtual unbundled local access (VULA) or bitstream remedies. In Singapore, however, passive access to the PON is offered (and is working well); and in New

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[1] For example, FTTC is the main NGA technology used by the incumbents in Belgium, Germany, Ireland and Italy.

[2] By observation, passive remedies were favoured by regulators as remedies for access to the copper network and they continue to be favoured by regulators for NGA where they are feasible

Zealand a residential passive product which is likely to be based on PON will be offered in 2020.

- *Different countries have taken different approaches towards the assessment of market power.* Fixed-access telecoms networks demonstrate strong economies of scale (or "economies of density") at a local level. Many of the case study countries have cable networks that compete in the retail broadband market on a near-national basis; in other countries the cable network coverage is less significant, meaning that they are less of a competitive constraint at the retail level and provide less of an incentive for NGA rollout. In the Netherlands, the question of a risk of joint dominance in the retail market has been addressed directly. Other regulators have continued to find single dominance even where cable or parallel FTTH deployments are present in some geographies; several have also imposed asymmetric SMP remedies in upstream markets on a national basis (e.g. duct access). Finally, some countries have imposed symmetric remedies to avoid building-level monopoly or oligopoly issues.

- *A very different approach is to create a single open-access provider using structural separation.* Structural separation has only been imposed in the case study markets in which the State has commissioned and funded a single FTTH network (Singapore and New Zealand). In both cases, this structural separation is operational, but it may be too early to tell whether it is a superior model to the more "traditional" regulatory approaches (whether symmetric or asymmetric) over the longer term.

- *Ultimately, there is a degree of path dependency[3] involved: the remedies chosen and the market outcomes depend on the prevailing conditions in a country*, particularly in relation to the PSTN architecture (including existence of cabinets, typical lengths of copper loops from the cabinet to the end user, and availability and quality of ducts), the geographic nature of competition (cable coverage) and housing density.

- *The use of geographically differentiated remedies reflects these local differences* in prevailing conditions, which for example affect the feasibility of sustainable infrastructure competition.

- *All markets have included quality of service measures within the regulatory interventions*. However, the detailed focus of these measures varies based on historical issues and local circumstances.

- *Several regulators have made refinements to their approach* (e.g. changing geographic boundaries, acknowledging economic constraints on roll-out, removing peak speed limits on the defined relevant market), in order to improve the effectiveness of the remedies applied.

- To date, the *broadband market shares and national-level EBITDA margins of incumbents have not fallen significantly in any of the case-study countries.*

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[3] That is to say that the influences of the past determine the situation which exists in a market today, and may also determine the future developments of the market.

We consider each of these points in more detail below.

1.1 There are material differences between the case studies, both in terms of remedies and outcomes

Each of the seven case-study countries has taken a different approach towards NGA access regulation. The approaches vary in terms of:

- whether they involve the application of passive or active remedies (and within passive, whether duct access or dark-fibre remedies are used)
- the regulatory or legislative instrument used
- the application of differentiated remedies in particular geographic areas within the same national market, or between distinct sub-national geographic markets.

Regulators have proposed to impose active remedies[4] in all case-study countries except France[5] (though in Portugal the regulation on active remedies for FTTH remains in draft format[6] and in Spain it is currently capped at 30Mbit/s). Dark-fibre remedies have been applied in three countries, including where GPON architecture has been used. Duct access is applied in four markets.

The approach taken towards regulating the market has been similarly diverse, with a legislated introduction of symmetric FTTH wholesale access to the final segment in France, wholesale cable broadband access via a finding of significant market power (SMP) in the broadcast access market in Belgium, and wholesale broadband access following a finding of a risk of joint dominance in the Netherlands. Other countries have used more standard approaches to their reviews of Market 4 and Market 5.[7]

Geographic variations in remedies have been applied in France and proposed in Spain and Portugal, whilst the other countries have applied nationwide remedies. In those countries where geographic remedies have been applied, in Spain SMP was found on a nationwide basis, with geographic variations applied in the remedies only, whilst in Portugal, a review of SMP was undertaken in the two different geographic markets identified, and remedies proposed accordingly where SMP was found. Having applied symmetric wholesale access regulation through a

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[4] Or access to such products has been guaranteed by other means e.g. contractually as part of the Government funding agreements

[5] With the exception of VDSL, where active remedies are imposed.

[6] Portugal's FTTH wholesale access regulation has been in draft form since 2012, leaving duct access as the only regulated product relevant to this discussion. It is not clear when finalised regulation will be introduced or whether it will follow the same model as the draft regulation as the market has developed significantly in this period. Spain proposed to lift the 30Mbit/s on FTTH bitstream services (NEBA) and introduce VULA in December 2014, and a final decision is expected in H2 2015.

[7] Market 4 is the market for wholesale passive infrastructure access (e.g. local loops, ducts, and poles); Market 5 is the market for wholesale fixed broadband access (e.g. "bitstream"). The numbers come from the 2007 EC Recommendation on relevant markets, 2007/879/EC. Note: under the EC's more recent Recommendation on relevant markets, the old Market 4 is roughly equivalent to the new Market 3a, whilst the old Market 5 is roughly equivalent to the new Market 3b. Given that the majority of the events outlined in this report refer to a time before this reclassification, we refer to Markets 4 and 5 throughout this report.

legislative process, ARCEP in France did not need to consider SMP per se as part of the application of its FTTH wholesale access remedies.

This suggests that there is no 'one-size-fits-all' approach which will work for all markets; rather, both the approach taken and the outcomes may be more dependent on path dependencies (including factors such as the different conditions that were present when their initial regulatory approach was defined), as outlined in Section 1.7 below.

1.2 Non-incumbent operators are building FTTH networks based on passive access, but these are geographically restricted to dense urban areas

In some countries, non-incumbent operators have been active in building FTTH networks (see Figure 1.1 below). This appears to be directly linked to the existence of passive access, for example: Portugal (duct access only), Spain (duct access only), France (duct access and dark fibre), and the Netherlands (dark fibre).
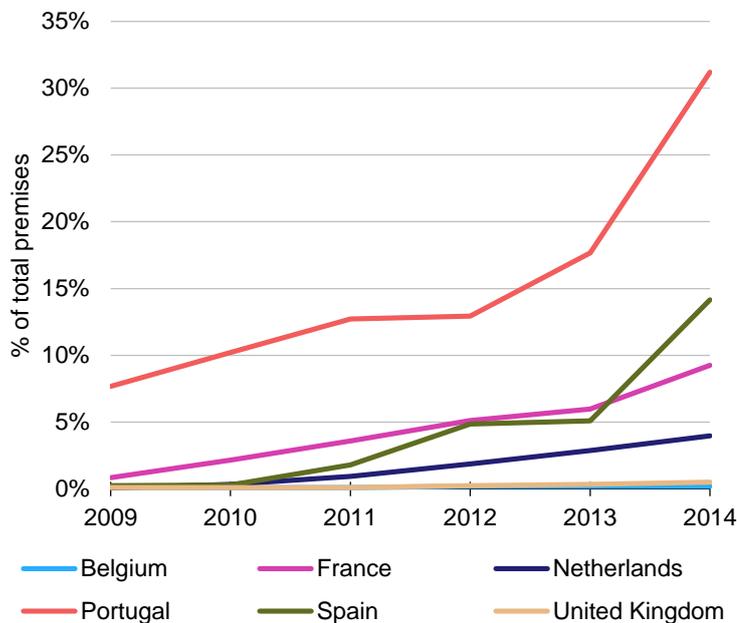
Figure 1.1: Percentage of premises passed by non-incumbent FTTH as a share of total premises [Source: Analysys Mason, 2015]

The most extensive non-incumbent deployments have been in **Portugal**, where Vodafone has been particularly active in FTTH roll-out in order to compete with both MEO's (formerly Portugal Telecom) FTTH and the cable networks. Vodafone's deployment in Portugal has been based on regulated duct and pole access, which is both of high quality and comparatively inexpensive. We understand that Vodafone plans to be able to serve almost 2 million homes (50% of total households) by the end of 2015. Some of this network coverage (450 000 homes) has been enabled by a commercial reciprocal access deal to give Vodafone access to part of MEO's FTTH network in exchange for MEO having access to the equivalent number of homes via Vodafone's network.[8]

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[8] See http://www.vodafone.com/content/index/about/about-us/policy/news-releases/vodafone-portugal-fibre-sharing.html

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In **Spain**, FTTH deployment has been undertaken by multiple parties, including Orange, Jazztel (now merged with Orange) and Vodafone. This has been enabled by high-quality, low-cost duct access and the comparatively high number of multi-dwelling units (MDUs) in Spanish cities. Roll-out of FTTH by non-incumbent operators is expected to continue throughout 2015.

In **France**, Numericable-SFR, Bouygues and Iliad have all undertaken FTTH deployment, often using regulated duct access, as well as co-investment models, in some cases joining with the incumbent, Orange.

Non-incumbent FTTH deployment in the **Netherlands** can be split between municipal schemes and commercial deployment from cable operator Caiway. Several of the early municipal FTTH deployments have since been incorporated into the commercial networks, for example Glasvezelnet Amsterdam (GNA, now 70% owned by KPN-Reggefiber) and Wiericke (acquired by Vodafone NL in 2013). Other municipal fibre schemes such as Ons Net Nuenen and Onafhankelijke Open Network Operator (OONO, acting as a wholesale provider) have remained independent. In addition, cable operator Caiway is both converting existing premises from cable to FTTH and extending its network using FTTH.

Where non-incumbent operators have been active in deploying FTTH networks, these commercial deployments have focused on high-density urban areas. Outside these areas, parallel commercial roll-out by third-party operators is rarely seen. In France, for example, 71% of FTTH premises passed so far are in high-density areas (which represent only 20% of the country). There may also be subsidised or government-led municipal fibre schemes, which primarily target commercially non-viable areas.

In the UK, non-incumbent FTTH deployments have been comparatively limited, representing fewer than 1% of all premises in 2014. This is at least partly due to the lack of availability of vacant ducts in the required locations; and the lack of access to verticals may also be relevant (although many fewer UK premises are in MDUs). Nevertheless, a few city-based deployments have been announced (including City Fibre in York), and the number of cities covered can be expected to increase.

As a general rule, FTTH networks directly overlap with existing cable networks (see Section 1.7.2 below). In addition, much of the non-incumbent FTTH overlaps with the incumbent FTTH, for example in France, 61% of FTTH homes are served by at least two infrastructure operators (see Figure 6.8 in the France case study). One major exception is in Portugal, where the recent agreement between MEO and Vodafone suggests that there were around 900 000 homes for which the two networks did not overlap.[9] With the new agreement, however, it can be assumed that there will be significant overlap between the two networks (by definition they will "overlap" in the areas where they provide mutual access).

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[9] See http://www.vodafone.com/content/index/about/about-us/policy/news-releases/vodafone-portugal-fibre-sharing.html

1.3 Active remedies have been applied in some areas

In both **Spain** and **Portugal**, the regulators have recognised that passive-only (duct access) remedies for FTTH are insufficient to enable FTTH competition in less dense areas. As a result, the regulators are looking to impose or extend active remedies in areas deemed to be non-competitive[10] for copper and cable services (39% of premises in Spain, 44% of premises in Portugal). This takes the form of bitstream in Portugal and a removal of the 30Mbit/s cap on NEBA (a form of bitstream) in Spain. Furthermore, the regulators in both countries are looking to introduce VULA nationwide, with the exception of the most competitive areas (nine cities in Spain, 17 municipalities in Portugal). However, we note that in both cases the regulation to introduce these active remedies remains in draft format. (This is more significant in Portugal, where draft regulation was prepared in 2012 but no final regulation has yet been forthcoming: in Spain, draft regulation was issued as part of a consultation in December 2014 and final regulation is expected in the second half of 2015.)

Looking at active remedies more widely:

- In **France**, Autorité de Régulation des Communications Électroniques et des Postes (ARCEP) has maintained its stance against the introduction of active remedies on FTTH, despite suggestions from the European Commission (EC) that these should be considered in less dense areas (80% of premises). Where Orange has deployed VDSL, it is obliged to provide a wholesale bitstream offer.
- There is no price regulation on the low quality (i.e. residential mass market) wholesale broadband market in the **Netherlands.**
- In **Spain**, active wholesale remedies have already been applied to fibre networks, but are capped at 30Mbit/s.
- In **Singapore**, active wholesale remedies were put in place simultaneously with passive remedies.
- In **New Zealand**, the contracts with the Local Fibre Companies (LFCs) define active products which have to be provided at specified prices.

1.4 Passive remedies remain attractive, although there are differences of opinion regarding technical feasibility

In the **Netherlands**, the FTTH network of Reggefiber is point to point (P2P) and can be unbundled.

In both **Spain** and **Portugal**, the regulators concluded that it is not currently technically feasible to unbundle Gigabit passive optical networks (GPONs), and so could not apply passive remedies to FTTH beyond the duct access already in place. Instead, both regulators have proposed VULA for

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[10] We note that in Portugal, two separate markets were defined and assessed for SMP ('competitive' and 'non-competitive', and remedies were applied accordingly; in comparison in Spain, Telefónica was found to have SMP at a national level, but the remedies proposed differ by geographic area (similar to Portugal, competitive and non-competitive areas)

GPON networks (i.e. an active remedy, but designed to give similar levels of flexibility to a passive remedy). Both regulators have stated that they will review this position at the next Market 4 review to see whether it has become technically feasible.

In **Singapore**, by contrast, passive access to the PON is offered (and is working well). It is conceivable that the approach taken in Singapore could be applied to other markets. However, the economics of having a dedicated splitter per active network operator, managed by the passive network operator, may depend to some extent on the housing density and the location of the splitters in the network. A residential passive product which is likely to be based on PON will be offered in **New Zealand** in 2020[11]. A passive product for enterprise use is already available.

1.5 Different markets countries have taken different approaches towards managing the assessment of market power

Fixed-access telecoms networks demonstrate strong economies of scale (or "economies of density") at a local level, which means that the number of potential competing parallel infrastructures which are completely independent is likely to be small. At the same time, the European electronic communications framework is based on consistency with competition law principles, drawing an equivalence between the concepts of SMP and "dominance". Cases where two operators have been found to have "joint dominance" are possible, but very rare.

If there is only one access network, offered by a single player, then SMP (asymmetric) remedies can be used to limit the ill effects of that market power in relevant markets which are susceptible to ex-ante regulation. If there are many networks, then the "invisible hand" of competition would be likely to prevent consumer harm. However, in the situation where there is an oligopoly of two networks (or perhaps two large plus a couple of very small networks), then ex-ante remedies will only be available if one operator has SMP or if there is joint dominance. As joint dominance has to date proved challenging to establish, this is a potential weakness of the framework.

The two largest networks in many of the countries studied are the cable-TV and former incumbent telephone operators. Using Netherlands and Portugal as example cases, we can see:

- following the merger of Liberty Global and Ziggo in the **Netherlands** (approved in October 2014), the market shares of the top two operators (for fixed broadband subscribers) were 44% (for Liberty Global) and 43% (for KPN) respectively.
- in **Portugal**, following the acquisition of Optimus by Zon Multimedia (now branded 'Nos') in 2013, the broadband market shares of the top two operators, MEO and Nos were 49% and 35% respectively at the end of 2014.

The question of whether the existence of an extensive cable network means that the former incumbent does not have SMP is made especially complex by the different technologies used by

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[11]   This delay was built into the contracts.

cable-TV and former incumbent networks, because it is not obvious that these networks are wholesale substitutes even if they can be used to compete in the same retail markets.

In its analysis, the ACM recognised a risk of joint dominance in the retail broadband market. However, the cable networks were excluded from the wholesale broadband market owing to the economic unfeasibility of unbundling cable in the majority of the country, as well as technical challenges. As such, KPN was found to hold SMP in the wholesale market, and wholesale access remedies were applied, including both passive access requirements (dark fibre) and active remedies (bitstream and VULA). The EC has raised serious doubts about this analysis, and although ACM's analysis was largely supported by BEREC, it has been withdrawn.

By comparison, ANACOM has sought to ensure competition through:

- symmetric vertical building access obligations
- asymmetric duct access remedies imposed on PT
- its draft SMP regulation in Market 5, which further seeks to impose VULA and bitstream remedies on PT.

However, we note that although these draft regulations in market 5 were put forward in 2012 they have not been finalised, and it is unclear whether they will in fact be introduced.

1.6 A very different approach is to create a single open-access provider using structural separation

Structural separation is the legal separation of the ownership of the network from the service providers. Structural separation has been required in two of the markets reviewed – Singapore and New Zealand. In both countries, the imposition of structural separation was one of the terms of next-generation broadband network tendering processes.

In **Singapore**, open access was a central principle of the process. A three layer structural separation was imposed, with a passive network operator ('NetCo'), an active network operator ('OpCo'), and the retail service providers. Bidders applying to become the 'NetCo' (passive network operator) had to be structurally separate from any retail service provider. Furthermore, bidders applying to become the regulated 'OpCo' (active network operator) also had to be functionally separate from any retail service provider. Structural separation between the winning bidder for the NetCo, NetLink Trust and the incumbent, Singtel, has been achieved using a trust structure. The approach can be said to have been successful given the rapid migration to FTTH by all retail service providers, the very high take-up of passive products and high retail take-up of FTTH services.

Similarly, in **New Zealand**, structural separation was a condition of the funding award process, and so Telecom New Zealand separated its previously functionally separate network assets and wholesale arm into a standalone company called Chorus. Whilst roll-out of FTTH in New Zealand

remains at a fairly early phase, high levels of retail competition may suggest that the approach has been a success to date.

Given the relatively recent transition to structural separation in these cases, it is not possible to tell whether this model will lead to superior outcomes in the long term. One concern regarding structural separation models which cannot yet be answered is whether the structurally separated entities will be capable of successfully meeting the needs of their wholesale customers over the long term, for example by:

- enabling the transition to a further evolution of access networks beyond those currently being deployed[12], the funding of which might require long-term commitments from the wholesale customers (or another round of government intervention)
- using new technologies or operating models to achieve higher degrees of efficiency over time
- making the correct trade-offs between new capabilities and efficiency.

Within our case study markets, there are no other examples of structural separation having been applied. In these other markets, NGA deployment has been primarily in the form of privately-funded commercial deployments.

1.7 Ultimately, there is a degree of path dependency involved: the remedies chosen and the outcomes depend on the prevailing conditions in a country

It is important to consider the market context When comparing and contrasting NGA roll-out and regulation across different countries. In particular, path dependencies exist based on the architecture and approach used for the underlying copper telephone network, the existence and reach of cable networks, and the density of housing. We consider each of these in turn below.

1.7.1 Incumbent deployment

A key driver of an incumbent's approach to NGA roll-out and regulation is the architecture and approach used for the underlying copper telephone network. For example, the technology that the incumbent uses for NGA (e.g. FTTH / FTTC / VDSL-CO[13]) will depend on factors such as:

- the existence of street cabinets
- the length of local loops
- whether ducts were installed (and, if so, how deeply into the network)
- the quality of ducts.

For example, because there are useful ducts in Portugal,[14] an FTTH deployment based on these ducts is feasible. In contrast, an FTTC deployment is the most obvious approach in the UK, given

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[12]   Accepting that this future transition might be over a decade away

[13]   VDSL-Central Office, VDSL DSLAMs are installed at the local exchange

[14]   In fact, 30,000km of high quality ducting all the way to the building

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that street cabinets exist and local loops are relatively short, but ducting is more limited. Similarly, in France, the availability of sewer access, the urban MDUs, and the length of the copper sub-loops has resulted in a preference for FTTH over FTTC.

The legacy incumbent network also has an impact on the options for alternative operators to deploy competitive networks. For example, where good-quality ducting exists it may be feasible for an alternative operator to deploy its own FTTH network using the ducts, whereas in other markets this is not an option.

1.7.2 Cable network coverage

A second path dependency relates to the presence and level of coverage of cable networks.

Arguably, where high-coverage cable networks exist, the other operators (including the incumbent) need to achieve high levels of NGA coverage in order to compete. However, from benchmarks for Western and Eastern Europe, North America and developed Asia (see Figure 1.2 below), it is clear that whilst some correlation exists between cable coverage and FTTx coverage it is not particularly strong, and other factors must play a very significant role.
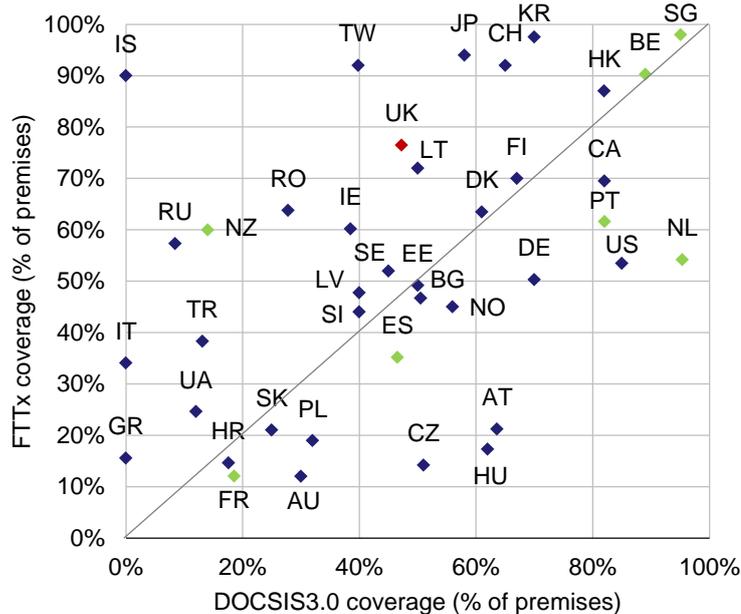
Figure 1.2: FTTx coverage against DOCSIS3.0 coverage, 2014 [Source: Analysys Mason Research,[15] June 2014]

Benchmark countries are shown in green, and the UK in red

Specifically in relation to FTTH, a much stronger correlation exists, and FTTH coverage does not commonly exceed cable coverage (see Figure 1.3). This suggests that the upper bound on deployment of both may be determined by the economics, and that where it is economic to deploy one, it is potentially equally economic to deploy the other to a similar fraction of the population (all other things being equal[16]). Furthermore, we note that the cost of upgrading analogue cable to

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[15]   Analysys Mason, *FTTx roll-out and capex worldwide: forecasts and analysis 2014–2019*.

[16]   Of course, other factors do matter. For example, the option of deploying FTTC may be one of the deterrents to FTTH.

DOCSIS3.0 is significantly lower than the cost of upgrading a copper network to FTTx (particularly FTTH). Cable is likely to have more extensive coverage today due to the fact that it was deployed in the past whereas FTTH has only recently started to be deployed. Nevertheless, there are exceptions in markets without cable networks (e.g. Iceland, Italy).
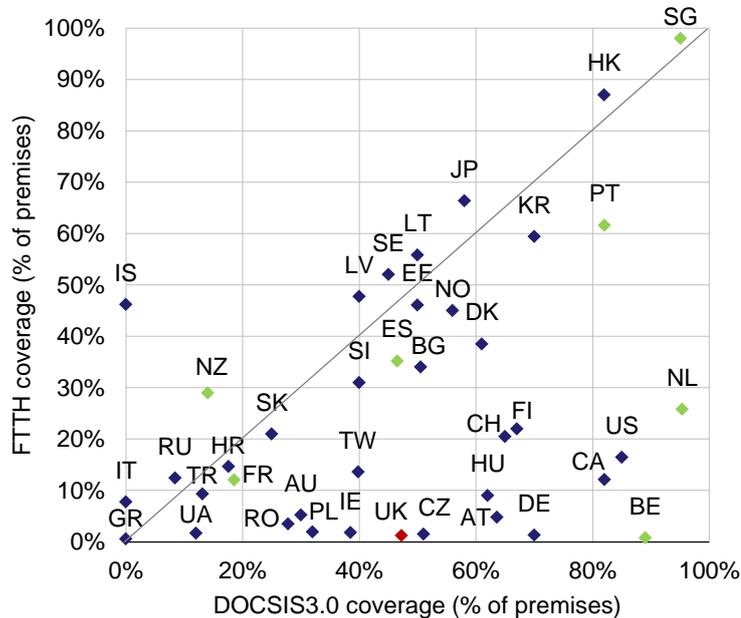

Figure 1.3: FTTH coverage against DOCSIS3.0 coverage, 2014 [Source: Analysys Mason Research,[17] June 2014]

Benchmark countries are shown in green, and the UK in red

1.7.3 Housing density

Both cable and FTTH network deployment can also be closely linked to the presence of high-density housing. Where large apartment blocks feature extensively, it is significantly more economic to deploy cable or FTTH than where the majority of housing is in single-dwelling units. In comparison, in countries such as the UK, where the majority of housing is single dwelling units, FTTH deployment is less economic.

The effect of housing density can be seen both at a national level (e.g. in Singapore, the majority of households are part of large apartments blocks), and in the form of geographic variations within a country (see Section 1.9 below for a discussion of variations in geographic remedies).

1.7.4 Examples

These factors combine to influence the approach taken to NGA roll-out – and its extent – by both incumbents and third-party operators. Market outcomes in individual countries can be explained by the combination of all of these factors (and many more), meaning that the regulatory approach may not be the most important factor driving market outcomes. Furthermore, the regulatory approach itself is driven by the underlying market conditions

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[17]   Analysys Mason, *FTTx roll-out and capex worldwide: forecasts and analysis 2014–2019.*

For example:

- In **Belgium**, where there is high cable coverage (95%) and FTTC was rolled out early to a high proportion of premises (89%) based on existing cabinets and short local loops, barely any FTTH has been deployed by either the incumbent or third-party operators.

- In comparison, in **Portugal**, which has high coverage of cable (82%) and useful ducts, FTTH roll-out has been favoured by both the incumbent and third-party operators, particularly in high-density areas (i.e. cities)

- Finally, in **France**, where cable coverage is relatively low (30%), housing density outside of the major cities is low (i.e. predominantly single-dwelling units) and copper sub-loops are relatively long, FTTH coverage has reached only 14% of premises (built by both the incumbent and third-party operators).[18]

On this basis, it appears logical that FTTC would be the primary means of NGA deployment in the UK, given the comparatively low density housing and more-limited availability of ducts (compared to say Spain and Portugal).

1.8 The use of geographically differentiated remedies reflects these local differences

In three of the case-study countries, regulators have chosen to implement different remedies for different geographic areas.

In **Spain**, Telefónica was found to have SMP in Market 4 on a national level, but the National Commission for Markets and Competition (CNMC) is proposing to implement different remedies in two different geotypes, with less-stringent regulation in nine cities that are 'fully competitive' at an infrastructure level[19], and is proposing to remove all regulation on NGA wholesale broadband access from these areas, maintaining only duct-access regulation. Outside of these nine cities, a VULA remedy is proposed. For Market 5, the CNMC split its market analysis between 'competitive' and 'uncompetitive' areas, and found Telefónica to have SMP only in 'uncompetitive' areas. For these areas, it is proposing to maintain bitstream (known as NEBA) wholesale services, removing the 30Mbit/s cap. We note that this regulation remains in draft format, with a final version expected in the second half of 2015.

In **Portugal**, ANACOM reviewed MEO's SMP in two separate geographic markets, and proposed to apply Market 4 and 5 remedies in 'non-competitive areas' and Market 4 only in 'competitive areas'. 17 municipalities were identified within competitive areas, where existing infrastructure competition meant that no regulation would be applied (aside from duct access). Nevertheless, we note that this regulation has been in draft format since 2012 and has not yet been implemented.

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[18] The late deployment of VDSL and use of VDSL-CO rather than FTTC despite the presence of cabinets is due to the detailed assessment undertaken by a panel of experts, which both delayed roll-out and dictated the type of VDSL that should be used.

[19] We note that the number of cities may increase prior to finalisation of the regulation owing to rapidly increasing FTTH roll-out

In **France**, geographic remedies were also applied based on the housing density and access means (e.g. ability to use sewers as a means of access). The remedies were applied through legislation and are symmetric (i.e. applied to whichever operator rolled out to a premises first), and as such SMP analysis was not undertaken for different geographic areas. In the highest-density areas the emphasis is on enabling co-investment at the point of roll-out, in addition to allowing passive remedies from a concentration point at the base of an apartment block. In less-dense areas co-investment is still encouraged, but passive solutions require a concentration point of at least 1000 lines or a dark-fibre backhaul service back to a suitable point of interconnection with the third-party operator.

All three countries have refined their geographic market conditions over time to better reflect competitive dynamics and/or the likelihood of investment by third-party operators.

The issues that the Spanish, Portuguese and French regulators were seeking to address are equally applicable to the UK, where both existing levels of competition and the potential for competition vary greatly between the larger towns and cities, and the rest of the country. Ofcom has previously varied its regulation of Market 5 on such a basis. In all three of the case-study markets discussed here, the regulators have sought to encourage NGA infrastructure investment by third parties in areas where this feasible/likely. There is some evidence of the success of this approach (see Section 1.1 above).

1.9 All markets have included quality of service measures within the regulatory interventions

Quality of service was not listed as a primary policy objective by any of the regulators or Governments in the case study markets reviewed.

Nevertheless, QoS measures were included in all the regulatory interventions. However, the focus in each market has been different, depending on the historical issues faced in the market, the nature of the regulated services or other market-specific concerns.

1.10 Several regulators have made refinements to their approach

Based on the case studies reviewed, we have not seen any dramatic changes in policy relating to fixed NGA regulation.[20] The majority of regulators have, however, refined their approach over time, to reflect evolving market conditions and issues identified with the initial approach.

The clearest examples of refinement can be seen in the markets where wholesale access remedies take account of geographic variations (France, Portugal, Spain). In these markets, the definition of the geographic markets has changed (often multiple times), with sub-sets of higher-level markets created in order to cater for the different circumstances and vary the remedies.

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[20]   Perhaps the most dramatic change is in New Zealand, where the political decision to proceed with the UFB programme came shortly after a major programme of cabinetisation by Telecom New Zealand. However, this was not a regulatory decision.

In Spain, new regulation has been proposed which would remove the 30Mbit/s cap on NEBA (bitstream) services and introduce VULA (noting that these changes remain in draft format).

Furthermore, in several markets, certain wholesale access obligations have been removed in areas where competition is prospectively strong enough. For example, the CNMC proposes to remove NEBA obligations in competitive areas (noting that these changes remain in draft format).

It is hard to draw any firm conclusion from Portugal, because although no changes have been made to the regulation, the failure to finalise regulation that was drafted more than three years ago suggests at least that the original proposal is not seen as the best available solution.

1.11 To date, the broadband market shares and national-level EBITDA margins of incumbents have not fallen significantly in any of the case-study countries

Trends in incumbent EBITDA margins suggest that the NGA regulation applied to date has not had a significant negative impact on the market share of incumbents (see Figure 1.4 below).
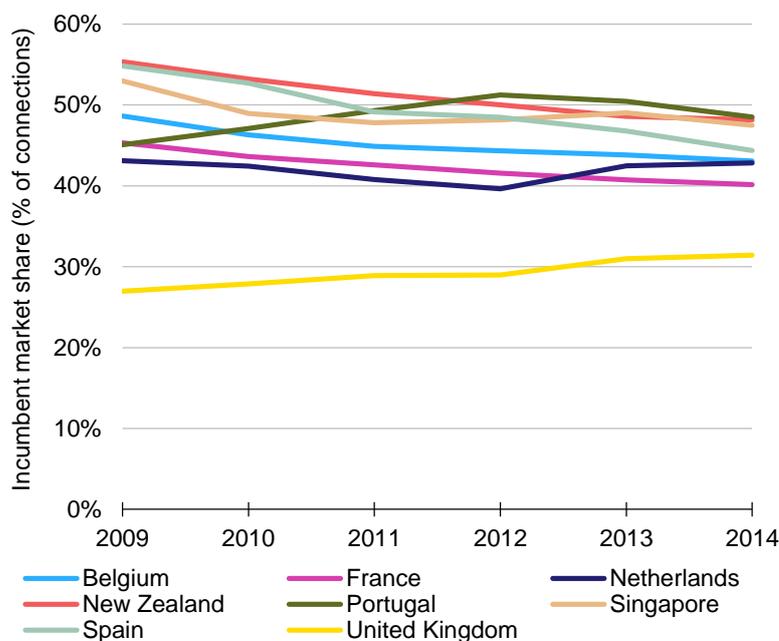
Figure 1.4: Incumbent's market share of broadband connections [Source: National regulatory authorities, Analysys Mason, 2015][21]

Moreover, NGA regulation has not had a significant negative impact on the profitability of incumbent businesses (see Figure 1.5 below).

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[21]   As a point of comparison, BT's market share of broadband subscribers in the UK was 31% at the end of 2014
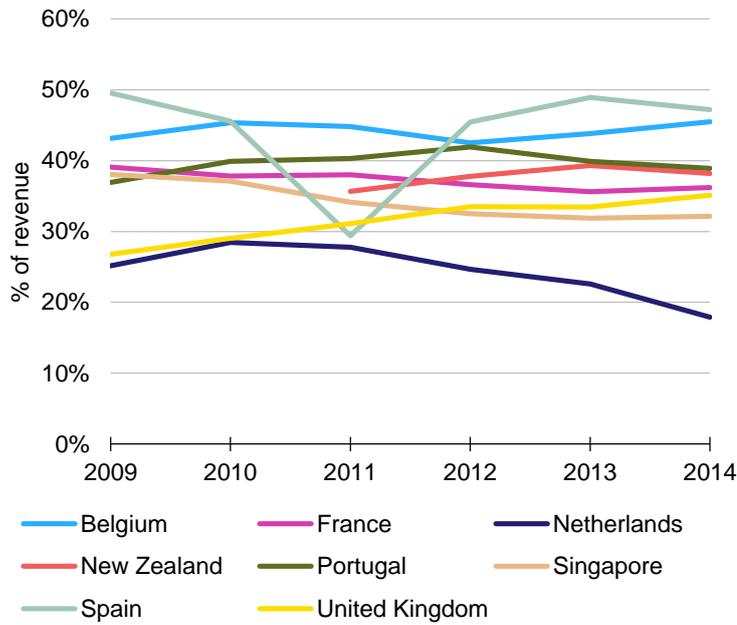
Figure 1.5: Incumbent EBITDA margins [Source: Operators' annual reports, 2015]

Note: These margins are for the operator at a national level (including mobile)[22]

Note: The dip in Telefónica's EBITDA margins in 2011 is attributable to a large-scale redundancy programme in that year

We note, however, that NGA roll-out and take-up remain at an early stage in several markets, and so the full impact of the regulation may not yet have been seen. We further note that the EBITDA margins shown above are somewhat obscured by the inclusion of the mobile businesses of the incumbent.

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[22] Figures are unavailable for the fixed-line only businesses in the majority of countries. However, the data is market-specific (i.e. the data for Orange only relates to its business in France).

2 Introduction

This is the final report of a study commissioned by Ofcom from Analysys Mason to examine approaches that have been taken to the regulation of fixed NGA networks in several benchmark countries, and to understand their outcomes.

This document presents the key results from our review of the regulatory interventions that have been taken in the following seven countries:

- Belgium (Section 5)
- France (Section 6)
- the Netherlands (Section 7)
- New Zealand (Section 8)
- Portugal (Section 9)
- Singapore (Section 10)
- Spain (Section 11).

For each case study, we first outline the market and regulatory context before the regulatory intervention was made, followed by a full description of the interventions and their outcomes in terms of their impact on service availability, take-up and competition.

Prior to this, in Section 3, we summarise and compare the interventions implemented in all seven case-study countries, considering the different approaches taken and the variations in outcome. We then consider the implications of the selected case studies for future policy options in the UK.

Finally, Annex A provides a full bibliography of the documents referenced and quoted throughout this report.

The content of this report has been developed based on a combination of secondary research and Analysys Mason's internal knowledge of the markets and regulators in question. In addition, we have undertaken brief interviews with the regulators in France, Spain and Portugal in order to better understand the rationale for the actions taken, and their future plans.

3 Comparison of benchmark countries

3.1 Introduction

At the outset of this engagement, in co-ordination with Ofcom, we selected seven markets within which to review specific regulatory interventions. Five of these are within the European Union (EU), and are therefore subject to the same regulatory framework as the UK. For comparison purposes, two non-EU markets were also selected as case-study countries.

The markets and interventions selected are presented in Figure 3.1 below.

Figure 3.1: Summary of regulatory interventions covered in the seven benchmark countries [Source: Analysys Mason, 2015]

Country	Regulatory intervention	Description
Belgium	Wholesale access to cable networks	Five cable operators in Belgium (with non-overlapping coverage) were deemed to be dominant in the retail market for the delivery of broadcasting signals and access to broadcast networks. As a result, the Belgian Institute for Postal services and Telecommunications (BIPT) introduced wholesale access remedies for both analogue and digital television services, as well as cable broadband (when purchased as part of a double-play TV + broadband package). Regulated active wholesale services and pricing have been introduced; however, retail services based on these wholesale inputs have not yet been launched in Belgium
France	NGA wholesale broadband access, based on dark fibre in the parts of the network closest to the end customer, with geographical variations	Symmetric wholesale access regulation for FTTH networks was introduced via a legislative process (rather than a market review, finding of SMP and imposition of remedies, for example). This regulation focuses on passive wholesale remedies, including dark fibre from the building back to a centralised point. The remedies applied vary by geographical area based on the population density and the building access means. The EC has generally accepted the approach, but encouraged ARCEP (the regulator) to impose active as well as passive remedies
Netherlands	SMP remedies on KPN following finding a risk of joint dominance in the retail market	The ACM found that there was a risk of joint dominance of KPN and UPC/Ziggo in the retail market for fixed Internet access. However, the regulator concluded that the cable infrastructure operated by UPC/Ziggo could not be unbundled (owing to technical and economic constraints) in the same way that KPN's copper and fibre networks are, so the wholesale market definition excluded cable and wholesale obligations were applied only to KPN. This finding has since been challenged by a "serious doubts" letter from the EC, and subsequently withdrawn by ACM, though BEREC strongly supported the ACM position.

Country	Regulatory intervention	Description
	Dark-fibre access for FTTH, active wholesale broadband access (VULA)	In previous reviews KPN was determined to be dominant in Market 4, and passive wholesale remedies were applied to its FTTH network. These included requirements to provide access back to a central network point (i.e. dark fibre). Passive remedies are not applied to the enterprise market (fibre to the office, or FTTO). In addition, sub-loop unbundling for KPN's copper network was initially imposed, and has subsequently been removed, being replaced by VULA.
New Zealand	FTTH wholesale broadband access on the national broadband network	The government of New Zealand commissioned the building of a national FTTH network (to 75% of premises) via a series of commercial contracts, which included wholesale broadband access requirements and capped pricing. Until 2020, only active wholesale access is required in the residential market (passive (dark-fibre) access is available in the business market). Passive access must be introduced for the residential market in 2020
Portugal	Draft regulation had geographical variations in NGA wholesale broadband access based on levels of competition – however, this regulation has not been implemented	ANACOM took account of the differing levels of competition across Portugal when defining competitive and non-competitive areas in three markets: fixed network passive infrastructure access, wholesale broadband access and leased-line access. For both wholesale broadband access and leased-line access, previous SMP regulations were removed from MEO in areas that were considered to be competitive, while national SMP status remained for fixed network infrastructure access. We note that the decision proposing wholesale access to the fibre network was proposed in draft format in 2012, but has not yet been finalised (or implemented). As a result there is no regulated wholesale access to fibre and competing network build is on the basis of regulated duct and pole access and access to in-building cabling.
Singapore	FTTH wholesale broadband access on the national broadband network, via active as well as passive access to a PON	The government of Singapore commissioned the building of a national FTTH network (to 100% of premises). The contract was awarded to a structurally separate 'NetCo' which was required to build and maintain the network and offer passive access products. In addition, a separate contract was awarded to an operationally separate regulated 'OpCo', which would provide active access services. Retail service providers can choose whether to build their own commercial OpCo, or to buy services from the regulated OpCo. The majority of the market has chosen to purchase passive products, and take-up of FTTH is now over 50%. The passive product is a PON dark-fibre product with splitters managed by the NetCo.
Spain	Geographical variations in NGA wholesale broadband access based on levels of competition	In its December 2014 draft regulation, the National Commission for Markets and Competition (CNMC) proposed to introduce uncapped[23] active wholesale remedies to address competition issues over FTTH networks in Markets 4 and 5. The CNMC split the country into competitive and non-competitive areas. Within the nine most competitive

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[23]   Note: wholesale bitstream services (known as NEBA) on VDSL and FTTH networks are already available, but are capped at 30Mbit/s

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Country	Regulatory intervention	Description
		cities, all FTTH access regulation was removed, with the exception of duct access and vertical building access. Within the remainder of competitive areas, VULA obligations also apply. Outside competitive areas, both traditional bitstream services (an active access product known as NEBA) and VULA must be offered

3.2 Comparison of remedies applied

In this section, we summarise and compare the remedies applied by the regulator in each of the seven case-study countries. Specifically, we consider:

- stated policy objectives
- NGA network architecture
- the use of passive remedies
- the use of active remedies
- the regulatory instruments used
- the use of geographical variations in the remedies applied
- any variation in the regulatory policy / remedies that has occurred or is planned over time
- the approach taken towards funding and, where available, investment levels in NGA.

3.2.1 Policy objectives

The two key policy objectives driving the regulation of NGA wholesale broadband access have been enabling competition and facilitating or encouraging network investment.

All regulators / governments referenced competition in their objectives, and effective competition was a primary focus. In France there was a particular focus on infrastructure-based competition, and in both Singapore and France the focus was on open access and avoidance of the blocking of competition by the first operator in a building. Both the Belgian and Portuguese regulators emphasised increased consumer choice. The ACM in the Netherlands emphasised the need for both retail and wholesale competition, seeking to achieve "*competition that is not – or is no longer – dependent on sector-specific regulation for its existence and effectiveness*". In Spain, the CNMC referred to the need for "*sustainable competition*".

Singapore and New Zealand took a very direct approach towards securing network investment, by commissioning the roll-out of FTTH networks. In comparison, in France, Portugal and the Netherlands, the focus was more on ensuring that there remained sufficient incentives for investment, while enabling competition. In Spain, in particular, there is a focus on ensuring NGA network investment by reducing the costs and barriers to network deployment and encouraging infrastructure sharing. The CNMC sought to encourage "*shared use of infrastructure and investments through voluntary agreements among operators*". In contrast, network investment was

not an objective of the cable access regulation in Belgium, which focused on enabling access to existing networks rather than to new or future networks.

The majority of regulators also commented on the need to achieve affordable retail prices. In particular, the Singaporean government was keen to ensure high levels of take-up of NGA, as well as simply enabling access.

Singapore and New Zealand focused on targeting high levels of coverage, with New Zealand focusing on early coverage of priority locations such as schools and hospitals.

Both the French and the Spanish regulators highlighted the need for consistency in regulation and competition. ARCEP emphasised the need for "*common references*" to avoid a "*geographically fragmented retail market*", while the CNMC recognised problems with inconsistency of regulation due to regional public administration bodies and sought to achieve "*clear, more consistent regulation that unifies criteria and points of interaction*".

More widely, the government of Singapore was also concerned with ensuring the competitiveness of Singapore as a country (which could be facilitated through NGA deployment and take-up).

ANACOM in Portugal also highlighted the need for encouraging innovation and ensuring service quality.

3.2.2 NGA network architecture

In order to provide context for the remedies applied, it is useful to understand the different network architectures employed in each of our case-study markets. The FTTH and FTTC/VDSL network architectures used in each market are outlined below.

FTTH network architecture

The principal architectural choice in FTTH networks is between a passive optical network (PON) and a point to point (P2P) network. In a P2P network, each served premise is connected via a dedicated fibre all the way back to the serving location (the "optical distribution frame" or ODF location). This is similar to the existing copper network. In a PON, there are one or more layers of "splitters" in the network and the fibre upstream of the splitter is shared by multiple end users.

In the majority of case-study markets, the focus has been on roll-out of FTTH using a gigabit PON (GPON) architecture. In France, the network architecture supports either PON or P2P (that is, the network is point to point from the mutualisation point to the end customer, potentially allowing the use of splitters at or above the mutualisation point) Singapore and New Zealand offer a PON with a P2P option for enterprise needs (which will be a small fraction of buildings served). In comparison, in the Netherlands, the FTTH architecture has been fully P2P to date.

Country	FTTH network architecture
Belgium	Not applicable[24]
France	Primarily GPON, with a P2P option at the point of build
Netherlands	P2P[25]
New Zealand	Primarily GPON, with a P2P option
Portugal	GPON
Singapore	Primarily GPON, with a P2P option
Spain	GPON

Figure 3.2: Summary of FTTH network architecture in each of the case-study markets [Source: Analysys Mason, 2015]

The P2P network architecture lends itself to unbundling at a more centralised point in the network, making the creation of a passive wholesale product similar to local loop unbundling (LLU) more feasible. In comparison, with a GPON, the network is shared between the splitter and the ODF: although unbundling can easily be achieved between the end user and the splitter, there would be a need for multiple splitters (one per active network operator) at each splitter location, as well as multiple fibres between the splitter and the ODF. Considering the economies of scale at the splitter level, this is likely to be challenging, as the splitter locations may serve only a few customers; there may also be space constraints at the splitter location. While several regulators have commented that it is not feasible to unbundle a GPON network, others have simply implemented this, proving that it can be done (at least for certain deployments). See Section 3.2.4 below for more details.

VDSL network architecture

The table below shows the different VDSL network architectures used in each case-study country.

Country	VDSL network architecture
Belgium	FTTC
France	VDSL-CO[26]
Netherlands	Split 55:45 between FTTC and VDSL-CO
New Zealand	FTTC
Portugal	Not applicable[27]
Singapore	Not applicable[28]
Spain	VDSL-CO

Figure 3.3: Summary of VDSL network architecture in each of the case-study markets [Source: Analysys Mason, 2015]

The significance of using FTTC rather than a VDSL-CO architecture is two-fold:

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[24]   There have been very few FTTH deployments in Belgium, and the focus of the case study is on wholesale access to cable networks.

[25]   However, it was recently announced that KPN/Reggefiber were trialling GPON. See http://tweakers.net/nieuws/101189/kpn-experimenteert-met-dsl-van-400mbit-s.html (February 2015).

[26]   However, it is anticipated that some FTTC will be deployed from 2015.

[27]   There is no VDSL in Portugal.

[28]   There is no VDSL in Singapore.

- Due to line length issues, VDSL-CO will only provide a fraction of premises with the 30Mbit/s level seen as the minimum threshold for NGA by the EC. For example, ARCEP has estimated[29] that even though some French operators have deployed VDSL-CO very rapidly, on MDFs covering 97.8% of lines in unbundled areas (and 89.3% of lines in all) this will result in approximately an additional 3M lines not currently having the option of FTTH or cable gaining the ability to receive 30Mbit/s.

- Passive network remedies for FTTC (i.e. sub-loop unbundling) are significantly more challenging in economic terms than unbundling at the MDF (LLU), which means that alternative operators have struggled to build a business case for this in many countries, although it is proceeding in some outside the list of case studies (e.g. Italy).

3.2.3 Summary of remedies

Figure 3.4 below summarises the wholesale access regulation in each of our case-study markets. In all cases except Belgium, this regulation applies to FTTH networks; in Belgium, it applies to cable regulation.

Figure 3.4: Wholesale FTTH access regulation* [Source: Analysys Mason, 2015]

Country	Remedies		Active	Symmetric / asymmetric
	Passive			
	Duct access[30]	Dark fibre		
Belgium*	✗	✗	✓	Asymmetric
France	✓	✓ *Geographical component*	✗	Symmetric for dark fibre; asymmetric for duct access
Netherlands	✗ *No ducts*	✓	✓[31]	Asymmetric
New Zealand	✗	✗ *Business offer only; no residential offer until 2020*	✓	Asymmetric
Portugal	✓	✗	✗[32]	Asymmetric
Singapore	✓	✓	✓	Asymmetric
Spain	✓	✗	✓[33]	Asymmetric

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[29] http://www.arcep.fr/fileadmin/uploads/tx_gspublication/bilan-VDSL2-101214.pdf (in French)

[30] The point of interconnection is local by definition for duct access in all cases.

[31] Fibre bitstream products are only applied to the high-quality (effectively business services) market. VULA on the VDSL network has recently been introduced (including residential services), but the reference offer has not yet been finalised pending the conclusion of the EC Phase II Investigation. This investigation relates to the EC's serious doubts over the ACM's findings of a risk of joint dominance, not to the introduction of VULA. However, given that the introduction of VULA is part of the same review process, it has also been delayed. The investigation will shortly be concluded

[32] We note that whilst draft regulation around NGA wholesale access was put submitted to the EC by ICP-ANACOM in 2012, this has never been finalised

	Geographical component[34]

*   For Belgium this refers to cable access regulation, not FTTH. There is other asymmetric regulation of Belgacom, but this is not the focus of the case study.

For further details of the passive and active remedies, as well as the regulatory instruments used and the geographical variations in remedies, refer to Sections 3.2.4 to 3.2.4 below.

3.2.4 Passive remedies

Dark fibre

FTTH passive remedies for dark fibre have been imposed in France (for some network segments), in the Netherlands and Singapore. In New Zealand a dark-fibre product is available to serve business customers only; passive access will be introduced for residential users in 2020.

Figure 3.5 below summarises the dark-fibre remedies imposed and the relevant points of interconnection for each.

Figure 3.5: Summary of dark-fibre remedies and points of interconnection [Source: Analysys Mason, 2015]

Country	Geographic / product split	Point of interconnection
France	Very dense areas: blocks of at least 12 flats or business premises, or which can be accessed via a sewer large enough to be visited by an engineer	Local: multi-fibre concentration point at the building entry point
	Very dense areas: blocks of fewer than 12 flats or business premises, or which cannot be accessed via a sewer large enough to be visited by an engineer	Local: concentration point of 100 single-fibre lines (cabinet), or in special cases (isolated buildings): multi-fibre concentration point (manhole, building façade, external terminal)
	Very dense areas: low-density pockets – areas with more than 15% of single-dwelling units and fewer than 5000 houses per square kilometre	Local: concentration point of 300 single-fibre lines
	Less dense areas (rest of country)	Local: concentration point of 1000 single-fibre lines; or, if the backhaul portion of the network is shared, the size of the concentration point can be reduced to 300 lines[35]
Netherlands	Dark fibre (access to the ODF)	Local: access at the ODF
	Dark fibre: ODF backhaul	Local: between ODF location and the

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[33]   We note that active remedies in Spain are capped at 30Mbit/s currently in Spain. Draft regulation issued in December 2014 proposes to remove this cap. Finalised regulation is expected in H2 2015

[34]   The draft regulation proposes to remove all active remedies on fibre networks for the nine most competitive cities

[35]   We note that the published reference offers from Orange and SFR include backhaul to the NRO (Node de raccordement optique), which is traditionally co-located with an MDF (i.e. in an exchange), although the number of NROs is half to a third of the number of MDFs. The point of interconnection would remain local, however.

		"underlying network of the recipient". This may be at the metro core (MC) level (196 localities) or at the "CityPoP" level (with an average of 3500 homes)[36]
New Zealand	Dark fibre (business customers only)	Local (at the ODF, which is in the Chorus Central Offices)[37]
	Backhaul (available as dark fibre or an active product)[38]	Regional (between Central Offices)[38]
Singapore	Dark fibre	Regional: nine Central Offices[39]

The French regulator, ARCEP, has particularly favoured passive remedies, in order to encourage infrastructure roll-out. The remedy imposed is based on access to a concentration point of between 100 and 1000 lines, depending on the geographic area. In less-dense areas (80% of premises in France), dark-fibre connectivity back to a more central point is required if the concentration point has fewer than 1000 lines (if the concentration point has 1000 lines or more, this is likely to be close to a location where an unbundled operator already has a presence, such as an exchange).[35] In high-density areas, by contrast, a passive backhaul product from the concentration point is not mandated; however, we understand that in many cases, third-party operators already have backhaul solutions in place (from first generation broadband). Furthermore, the provision to enable a third-party operator to co-invest prior to roll-out has resulted in the co-build of backhaul in several instances. In all areas, the point of interconnection is local.

Third-party operators can choose to deploy either a P2P or GPON network architecture. The building operator will deploy a single fibre between the concentration point and the end-user premises. The third-party operator can choose either to deploy its own splitter at the concentration point and arrange backhaul from here over a shared fibre line (for GPON architecture) or to roll out backhaul of individual fibres for each premises from its core network to the concentration point (for a P2P architecture). In addition to this, prior to build, the third-party operator can request to have a second fibre per premises deployed between the concentration point and the end-user premises (provided it co-funds the build). This would enable, for example, the provision of a TV service over fibre from one provider and a broadband service from another. Similarly to the single-fibre approach, this second fibre can be used as part of either a GPON or P2P network architecture.

The network in **Singapore** is primarily based on a PON architecture. A P2P wholesale option exists, but the price point does not enable use of this service by the mass market. Passive access (for both PON and P2P services) was a key component of the network design, and is offered alongside active products. The majority of operators have chosen to purchase passive PON

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36   See https://www.acm.nl/nl/publicaties/publicatie/14110/ACM-biedt-ontwerp-marktanalysebesluit-ontbundelde-toegang-aan-bij-Europese-Commissie/

37   "Central Office – The termination point for the LFC's Network. The Central Office is where the OLTs and/or MUXs (as applicable) are installed. Central Offices are expected to connect to at least several thousand End User premises"; see http://www.crownfibre.govt.nz/ufb-initiative/glossary/

38   See https://www.chorus.co.nz/file/48698/chorus-ufb-services-agreement-service-description-for-intra-candidate-area-backhaul-service.pdf

39   See http://www.ida.gov.sg/images/content/Infrastructure/nbn/images/pdf/Connecting_You_to_NGNBN.pdf

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products. The passive PON access includes the splitter, which is managed by the network company.

The passive wholesale product provides connectivity all the way back to the optical distribution frame (ODF), which is located in a Central Office (CO), of which there are nine in total across the country (i.e. the points of interconnection are regional).[40] The small number of COs within which retail operators must deploy equipment and interconnect may explain the high take-up of passive services in Singapore.

In **the Netherlands**, passive remedies for FTTH[41] provide access to the ODF and then from the ODF to the "underlying network of the recipient". This may be at the metro core (MC) level (196 localities) or at the "CityPoP" level (an average of 3500 homes, effectively an exchange).[42] All points of interconnection are local.

In both **Spain** and **Portugal**, the regulators have concluded that it is not (or not yet) possible to unbundle a GPON (though we note evidence to the contrary in Singapore). The Portuguese regulator has noted that once it is both technically and economically feasible, it will take potential passive remedies into consideration. However, it has not yet imposed any remedies on fibre.

In **New Zealand**, passive access is available for the enterprise market, which we understand uses P2P; the requirement to offer passive remedies for the residential market has been delayed until 1 January 2020. The current active wholesale offer for residential customers uses PON.

Duct-and-pole access, and vertical access obligations

In addition to the passive wholesale remedies outlined above, several markets have also introduced duct-and-pole access requirements (namely France, Spain, Portugal and Singapore).

It is interesting to note that in several cases this overlaps with dark-fibre products. For example, in **France**, duct access has been introduced nationwide, alongside the various dark-fibre remedies. Indeed, in the case of dense urban areas, duct access may be necessary to ensure that the third-party operator is able to deploy network from the ODF to the mutualisation point. In Singapore, duct access is also offered alongside the nationwide dark-fibre remedies (though in practice we understand that dark fibre is used).

In comparison, in **Spain** and **Portugal**, duct-and-pole access is offered with no dark fibre, and a third-party operator may choose between deploying its own network (using the incumbent's ducts and poles, or otherwise), or purchasing an active wholesale product (noting that there is no such product yet in Portugal). In Portugal, a dark-fibre remedy has been proposed only where the

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[40]   See http://www.ida.gov.sg/images/content/Infrastructure/nbn/images/pdf/Connecting_You_to_NGNBN.pdf

[41]   Note: the requirement to provide ODF-access FTTO (for enterprise customers) was subject to a number of legal proceedings and was eventually removed.

[42]   See https://www.acm.nl/nl/publicaties/publicatie/14110/ACM-biedt-ontwerp-marktanalysebesluit-ontbundelde-toegang-aan-bij-Europese-Commissie/

amount of physical space available is insufficient for a third-party operator to deploy fibre. However, this forms part of the 2012 draft measures which have not been implemented.

In Spain, France and Portugal, "vertical" access obligations are also imposed, to avoid monopolies on buildings.

In **the Netherlands**, the regulator imposes access obligations on 'associated facilities', which it notes theoretically includes access to ducts, poles and buildings. However, since fibre cables in the Netherlands were laid straight into the ground and not into ducts, in practice no such duct access is available.

We note that by definition, the point of interconnection for duct access is local, and similarly for vertical access.

3.2.5 Active remedies

Even where passive remedies have been applied, the majority of markets have also chosen to apply active wholesale remedies. The exceptions are Portugal (where FTTH wholesale access regulation has not been finalised) and France (where active remedies are only applied for VDSL; see below). Furthermore, in the Netherlands, bitstream remedies are only applied to the high-quality (effectively business services) market, and VULA remedies (applied in Market 4) are not yet finalised, being delayed by the EC's Phase II investigation into the ACM's 2015 Market 4 review.[43]

Figure 3.6 summarises the active remedies applied and the points of interconnection for each.

Figure 3.6: Summary of active remedies and points of interconnection [Source: Analysys Mason, 2015]

Country	Product	Point of interconnection
Belgium	Wholesale cable resale	N/A – resale product
France	VDSL-CO bitstream	Regional (same as for the ADSL offer)
Netherlands[44]	VULA	Likely to be local[45]
New Zealand	FTTH bitstream	Regional (one point of interconnection (PoI) per candidate area, e.g. Auckland,

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[43] This investigation relates to the EC's serious doubts over the ACM's findings of a risk of joint dominance, not to the introduction of VULA. However, given that the introduction of VULA is part of the same review process, it has also been delayed. The investigation will shortly be concluded

[44] Note: KPN was found to have SMP in the high-quality wholesale broadband access market only; within the low-quality wholesale broadband access no SMP was found, and so there are no price controls. High quality is defined as products with a contention ratio of more than 1:20, which will predominantly be used for business services. As such, the 'low-quality' market is the comparable market for this review.

[45] We have been unable to verify this, as a wholesale reference offer as not yet been developed owing to the fact the introduction of VULA is still under dispute and as such regulation has not been finalised. However, as a replacement for SDF access (i.e. sub-loop unbundling), it is likely that VULA will be provided via local points of interconnection.

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Country	Product	Point of interconnection
		of which there are 33 in total)[46]
Portugal (draft regulation)	VULA	Not available (regulation not finalised)
	FTTH bitstream	Not available (regulation not finalised)
Singapore	FTTH bitstream	National: two Central Offices (the second is for network resilience)[47]
Spain (draft regulation)	FTTH and VDSL bitstream (NEBA), above 30Mbit/s	Regional (50 regions)[48]
	VULA	Local (at the ODF, which is in a sub-set of local exchanges)
Spain (existing regulation)[49]	VDSL and FTTH bitstream (NEBA), up to 30Mbit/s	Regional (50 regions)[48]

Active wholesale services are offered to residential and business customers in **New Zealand** for a wide range of speeds and service levels. These are provided from 33 regional points of interconnection.

In **Singapore**, active remedies are available alongside passive remedies nationwide. It is notable that the majority of retail operators in Singapore have chosen to purchase passive remedies. The regulated active remedy provided by Nucleus Connect is provided from two Central Offices to ensure network resilience (i.e. in reality at a national level), for nationwide coverage.[50]

In **Spain**, currently (before the December 2014 draft regulations are finalised), active wholesale remedies apply to Telefónica's FTTH and VDSL network for speeds of up to 30Mbit/s under the NEBA reference offer. NEBA services are available from 50 regional PoIs.

In the December 2014 draft regulation,[51] two variants of active wholesale services were proposed: NEBA above 30Mbit/s (incorporating copper and fibre bitstream) and VULA. NEBA is designed to address competition issues in Market 5, whereas VULA is proposed as a remedy for competition issues in Market 4 (despite being an active remedy). It was proposed that all fibre active remedies (including the current services up to 30Mbit/s) were removed for the nine most competitive cities, and only VULA is applied in the remaining areas classified as 'competitive'. In

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[46]   "Point Of Interconnect – The place where the retail service provider's network connects to the wholesale fibre provider's network. This is in a Central Office. A feature of the UFB architecture is a single POI per candidate area, driving competition and supporting open access"; see http://www.crownfibre.govt.nz/ufb-initiative/glossary/

[47]   See http://www.ida.gov.sg/images/content/Infrastructure/nbn/images/pdf/Connecting_You_to_NGNBN.pdf and http://www.nucleusconnect.com/press-060510-NCGearsUp.php

[48]   See Annex 1, NEBA reference offer, February 2014, http://telecos.cnmc.es/documents/10138/2026311/201402_Texto_consolidado_NEBA_feb2014.pdf/9131e7f8-07b7-4e83-aa27-f5f275837808

[49]   VDSL bitstream obligations are already applied for products with speeds of up to 30Mbit/s.

[50]   See http://www.nucleusconnect.com/press-060510-NCGearsUp.php and http://www.ida.gov.sg/images/content/Infrastructure/nbn/images/pdf/Connecting_You_to_NGNBN.pdf

[51]   A final version of this regulation has not yet been published.

the remainder of the country, both NEBA and VULA obligations are applied. VULA offers will require local interconnection.

In **the Netherlands**, VULA wholesale services have recently been introduced and the finalisation of the reference offer has been delayed pending the conclusion of the EC's Phase II investigation.[52] Fibre bitstream remedies are only mandated for high-quality wholesale broadband access, which will predominantly be used for business services; KPN was not found to have SMP in low-quality wholesale broadband access, and as such no bitstream obligations were imposed. Regulation of VULA has not yet been finalised, but the PoI is likely to be at a local level, as it is seen as a direct substitute for sub-loop unbundling or LLU remedies (offered at a cabinet/exchange level).

The **Portuguese** regulator, ANACOM, proposed active remedies (VULA) and bitstream in its draft recommendations in February 2012. However, a final decision has not yet been made, and as such no wholesale access remedies for FTTH networks have been applied to date.

The main exception to the application of active remedies is **France**, where ARCEP has avoided using active remedies. The only circumstance under which active remedies are applied to FTTH is where there are already four operators purchasing passive products for a specific concentration point (leading to lack of space for an additional operator).[53] In addition, active remedies have been applied to Orange's VDSL-CO network, based on regional PoIs.

In **Belgium**, the wholesale access product imposed is a resale product, and as such does not have set points of interconnection.

We note that 'bandwidth breaks' (i.e. the application of a remedy only up to a given bandwidth) are not generally applied by regulators. The main example of such an approach is in Spain, where the existing bitstream regulation (which includes FTTH bitstream) is capped at 30Mbit/s. The draft proposals released as part of a public consultation in December 2014 proposed to remove this cap. None of the other markets considered applies bandwidth breaks. However, in the Netherlands, the wholesale broadband access market (Market 5) has been split between low quality and high quality on the basis of the contention ratio. The high-quality market (effectively that serving business customers) is subject to bitstream remedies, whilst the low-quality market (effectively, residential broadband connections) is not.

3.2.6 Regulatory instruments

Regulators in **the Netherlands**, **Spain** and **Portugal** imposed 'standard' asymmetric (SMP) regulation on the incumbent after it was found to have SMP in Markets 4 and 5. However, in

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[52] This investigation relates to the EC's serious doubts over the ACM's findings of a risk of joint dominance, not to the introduction of VULA. However, given that the introduction of VULA is part of the same review process, it has also been delayed. The investigation will shortly be concluded

[53] It is perhaps unlikely that more than four alternative operators will seek access given the fact there are only four major ISPs in France.

France, a legislative instrument (i.e. a law additional to the framework) was used to impose symmetric regulation on all FTTH network operators.

In **Belgium**, instead of finding dominance in a relevant market defined by the Commission recommendation, the BIPT created a new relevant market described as the 'retail market for the delivery of broadcasting signals and access to broadcast networks'. The five cable operators were deemed as having SMP in the new relevant market and the regulator then included broadband access within the remedies to be imposed on the cable operators on the basis of the need to offer bundled services.

Countries outside the EU (i.e. **Singapore** and **New Zealand**) did not follow this process. However, in both markets, the building of new FTTH networks was commissioned by the government, and these new networks had wholesale access regulation applied to them based on contractual arrangements. In both markets, the new networks were built and managed by wholesale-only entities, which were structurally separate from the retail business.

None of the EU regulator interventions we have considered has made use of Article 12 symmetric wholesale access remedies through the framework. In France, Spain and Portugal, symmetrical vertical access obligations have been applied using legislative instruments.

Several markets have sought to address competition challenges in Market 4 by imposing VULA (an active remedy). Spain has proposed and the Netherlands has introduced VULA services (subject to the finalisation of the EC Phase II investigation[54]), and in Spain this is to be offered alongside FTTH bitstream services (i.e. as a separate market remedy). VULA has also been proposed in Portugal (although the regulation has not yet been finalised). A parallel may be drawn between VULA (an active remedy to an SMP issue in the physical infrastructure market) and the approach taken in Belgium, where an active broadband access remedy arising from a competition issue in a different market was also used.

3.2.7 Geographical variations in the remedies imposed

In three of the markets under review – France, Spain and Portugal – the FTTH market analysis and remedies were split into different geographical regions, on the grounds that there were varying levels of existing or potential infrastructure competition.

The geographic split of the market in these three countries is shown in Figure **3.7**; the nomenclature in the column headings is based on that used in Spain and Portugal:

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[54]   This investigation relates to the EC's serious doubts over the ACM's findings of a risk of joint dominance, not to the introduction of VULA. However, given that the introduction of VULA is part of the same review process, it has also been delayed. The investigation will shortly be concluded

	Highly competitive areas *(sub-set of competitive areas)*	Competitive areas	Uncompetitive areas
France	17% of premises	20% of premises	80% of premises
Spain	9 cities	56% of premises	44% of premises
Portugal	17 municipalities	61% of premises	39% of premises

Figure 3.7: Split of premises by geographic area [Source: Analysys Mason, 2015][55]

The different remedies applied to each of the geographic areas identified are provided in Figure **3.8** below:

	Highly competitive areas *(sub-set of competitive areas)*	Competitive areas	Uncompetitive areas
France	Dark fibre	Dark fibre	Dark fibre
Spain (draft)[56]	No remedies applied	VULA only	VULA and NEBA
Portugal (draft)[57]	No remedies applied	VULA	VULA and bitstream

Figure 3.8: Fibre access and bitstream remedies applied by geographic area [Source: Analysys Mason, 2015][55]

In Spain, whilst the Market 4 and 5 reviews were undertaken at a national level (and the finding of Telefónica's SMP is at a national level), geographic variations were included in the remedies proposed.[56] The remedies proposed for FTTH have been split into three distinct markets:

- in the nine most highly competitive cities, no wholesale access remedies are applied to FTTH networks
- outside these cities, in competitive areas, VULA obligations are applied (i.e. Market 4 remedy only)
- in the rest of the country, both VULA and NEBA (bitstream) obligations are applied (Market 4 and 5 remedies).

Competitive areas were defined as areas where Telefónica's market share does not exceed 40% (based on both copper and fibre services). This represents around 56% of premises in Spain. The

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[55] For full sources please refer to the individual country case studies.

[56] Note: this regulation was not yet finalised at the time of writing (May 2015). The details quoted here are from the draft proposals in the December 2014 market consultation. A final decision is expected before the end of 2015.

[57] Note: this regulation was not yet finalised at the time of writing (May 2015).The details quoted here are from the draft proposals in 2012. It is not clear when a final decision will be made.

nine cities were defined based on the prospective scale of the competing networks' NGA coverage (10% to 20%).[58]

In France, the geographical variations in wholesale access remedies were based on the potential for infrastructure competition. The country was split into two main regions – very dense (20% of premises) and less dense (80% of premises) – and the very dense region was split into three sub-regions in recognition of the different building types and physical access options. Passive remedies were applied to all regions, but the requirements varied. In particular, within very dense areas a passive backhaul solution was not mandated, and within each region there are variations in the minimum size of the aggregation point for the passive access product.

In Portugal, for both Markets 4 and 5, a distinction was made between those areas deemed competitive (61% of premises) and non-competitive. Competitive areas were defined as areas with at least one operator using MEO's network and a cable operator with at least 60% household coverage. When considering geographical areas, ANACOM first defined the competitive and non-competitive markets at the wholesale level. It then undertook SMP analysis on these markets, and applied regulatory remedies where dominance was found. Within Market 5, FTTH bitstream access is only applied to non-competitive areas. In comparison, for Market 4, VULA obligations are nationwide with the exception of 17 municipalities in which alternative fibre network infrastructure has been deployed. In these 17 municipalities, the only NGA broadband wholesale remedy is duct-and-pole access (which is currently available through regulation that pre-dates these proposals). However, we note that none of these remedies has been applied, as ANACOM has yet to publish its final decision.

It is worth noting the comparatively high proportion of premises that are deemed to be in the middle geographic type ("competitive areas") in Spain (56%) and Portugal (61%), compared to France (20%). However, in both Spain and Portugal, a smaller sub-market of fully competitive cities or municipalities has also been defined separately (noting again that the regulation in Portugal has not been implemented).

In terms of remedies, both Spain and Portugal propose to follow a similar model of almost complete deregulation in the largest cities (leaving only duct-and-pole, and vertical access obligations), and reduced regulation in areas defined as competitive (VULA is used as a replacement for a passive remedy, which both CNMC and ANACOM state is unfeasible). In non-competitive areas, active (i.e. bitstream) remedies are proposed. In comparison, in France, passive remedies are used for all geographic areas, but the size of the concentration point to which third-party networks must connect is larger for less-dense areas, as a way of ensuring that the passive products remain economically feasible.

3.2.8 Pricing

The approaches taken towards pricing of wholesale access services vary both by country and by individual wholesale product. In this sub-section we provide a summary of the pricing approach

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[58]   This was calculated at a local exchange level, but defined based on cities to simplify the regulation.

used in each case, noting whether a reference offer exists, whether wholesale access obligations are applied symmetrically or asymmetrically, and noting the pricing methodology, as well as the detail of the approach.

Dark fibre

For dark-fibre pricing, both Singapore and New Zealand have contractual price caps on services that were agreed as part of the tender process. In comparison, the pricing in France is required to be fair, reasonable and non-discriminatory (FRND), while in the Netherlands a cost-based pricing approach is used. In November 2013, the EC encouraged the ACM in the Netherlands to move towards an FRND approach.[59] Figure 3.9 summarises these approaches.

Figure 3.9: Pricing methodologies for dark-fibre access [Source: Analysys Mason, 2015]

Country	Reference offer?	Symmetric/ asymmetric	Pricing methodology	Detail
France	✓[60]	Symmetric	FRND (cost-based)	Uncalibrated "shell" model produced, to be populated by operators in each specific case and capable of being audited by ARCEP. Incorporating non-discrimination, objectivity, relevance and efficiency
Netherlands (ODF access)	✓[61]	Asymmetric	Price control, cost-based	Multi-annual price cap based on a discounted cashflow model with an internal rate-of-return calculation methodology[62]
Netherlands (ODF backhaul)	✓[63]	Asymmetric	Price control, cost-based	Embedded direct costs (EDC) methodology with "benefits received" principle to differentiate pricing on the basis of the value of the service in the market[64]
New Zealand[65]	✓[66]	Asymmetric	Not applicable (contractual price caps set during the tender process), although the regulator can intervene if	

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[59]   See https://circabc.europa.eu/sd/a/f96d124b-3aee-4c8c-aaea-d7dd20cc4516/NL-2013-1512-1513%20Adopted_EN.pdf

[60]   Different reference offers apply to different operators in different geographic regions. For example, see http://www.orange.com/fr/content/download/3468/31507/version/8/file/offre+cablage+FTTH+horsZTD+du+30+sept+2014.pdf and http://groupe.sfr.fr/sites/default/files/contrat-dacces-aux-lignes-ftth-de-sfr-hors-ztd-contrat-v15complete.pdf

[61]   See http://www.kpn-wholesale.com/en/our-products/data-networks/physical-access/o/odf-access-(1).aspx

[62]   See https://circabc.europa.eu/sd/a/3324ec2f-b6ba-47bf-a367-cecdb8dafead/NL-2011-1278%20Acte_EN+date%20et%20nr.pdf

[63]   See http://www.kpn-wholesale.com/en/our-products/data-networks/physical-access/d/dark-fiber-(1).aspx

[64]   See https://circabc.europa.eu/sd/a/ec302add-7eda-49ae-8c59-3d734204b711/NL-2012-1407-1408%20Adopted_EN.pdf

[65]   Passive remedies applied to products for business customers only.

[66]   See, for example, original Network Infrastructure Project Agreement with Chorus: http://www.crownfibre.govt.nz/wp-content/uploads/2011/12/Network-Infrastructure-Project-Agreement-NIPA-24-May-2011.pdf; also August 2011 price list: https://www.chorus.co.nz/file/20066/chorus-ufb-services-agreement-price-list---confirmed.pdf and price caps to

			necessary	
Singapore	✓[67]	Asymmetric	Not applicable (contractual price caps set during the tender process)	

Duct access

Where it has been used, duct access has been imposed as an asymmetric (SMP) remedy, with pricing set via cost-based methodologies in all markets. Figure 3.10 summarises these approaches.

Figure 3.10: Pricing methodologies for duct access [Source: Analysys Mason, 2015]

Country	Reference offer?	Symmetric/ asymmetric	Pricing methodology	Detail
France	✓[68]	Asymmetric	Price control, cost-based	Cost-based approach applied
Portugal	✓[69]	Asymmetric	FRND with cost orientation	Cost-based approach applied [70]
Singapore	✗	Asymmetric	Cost-based	Tariff-filing requirements
Spain	✓[71]	Asymmetric	Price control, cost-based	The price per metre per month is calculated either by the cross-sectional area taken up or the operator is charged for a whole sub-duct or duct[72]

Vertical access

Because vertical building access obligations are symmetric by nature (i.e. the first operator to roll out to the building must provide access to subsequent operators), reference offers per se are not available. Instead, some regulators have favoured an FRND approach with cost orientation. For example, this is the approach used in Portugal. In Spain, the approach is FRND, but following a dispute the pricing was set based on a benchmark agreement (itself calculated using a cost-based approach); the proposed December 2014 remedies also include an asymmetrical vertical access obligation which will be cost-oriented..

2019: http://www.crownfibre.govt.nz/wp-content/uploads/2013/03/Chorus-Published-UFB-Price-Caps-Document-3-October-2012.pdf (see New Zealand case study for more recently added services etc.)

[67] See http://www.netlinktrust.com/services/interconnection-access-agreements/ico-agreement/

[68] See http://www.orange.com/fr/content/download/6244/91340/version/11/file/Offre_unique_iBLO_27f%C3%A9vrier2015.pdf

[69] See http://ptwholesale.telecom.pt/GSW/PT/Canais/ProdutosServicos/OfertasReferencia/ORAC/ORAC.htm

[70] See http://organodivigilanza.telecomitalia.it/pdf/Seminario-UfficioVigilanza-14012015.pdf

[71] See http://www.movistar.es/operadores/ServiciosRegulados/ficha/PRO_MARCo?paramPestania=soporte&posicionScroll=0l; pricing specifically can be found here: http://www.movistar.es/rpmm/estaticos/operadoras/servicios-regulados/oferta-acceso-registros-y-conductos-marco/06-precioscondicionesdefacturacion.pdf

[72] See http://www.movistar.es/rpmm/estaticos/operadoras/servicios-regulados/oferta-acceso-registros-y-conductos-marco/06-precioscondicionesdefacturacion.pdf

In France, vertical building access effectively forms part of the dark-fibre obligations (i.e. the passive remedies include the vertical building access and the connection back to the concentration point[73]).

Figure 3.11 summarises these approaches.

Figure 3.11: Pricing methodologies for vertical building access [Source: Analysys Mason, 2015]

Country	Reference offer?	Symmetric/ asymmetric	Pricing methodology	Detail
France	✓[74]	Symmetric	FRND (cost-based)	Uncalibrated "shell" model produced, to be populated by operators in each specific case and capable of being audited by ARCEP. Incorporating non-discrimination, objectivity, relevance and efficiency
Portugal	✗	Symmetric	FRND with cost orientation[75]	FRND with cost orientation: the second operator to reach the building will pay 50% of the costs incurred in the installation of the shared vertical infrastructure, the third 33% and so on
Spain	✗	Symmetric	FRND but benchmarked	The price agreement between Jazztel and Telefónica was taken as a reference, with a 15.29% premium to cover the weighted average cost of capital (WACC) and NGA risk premium[76]
Spain (proposed)	(Not yet)	Asymmetric	Cost orientation	

Active remedies

A range of pricing methodologies have been applied to active remedies across the case-study countries. In Singapore and New Zealand, similarly to dark fibre, contractual price caps on active services were set as part of the tender process. In contrast, retail-minus methodologies have been

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[73] In some cases the concentration point will be in the building, but in others it will be outside, see details in the *Dark fibre* section above.

[74] Different reference offers apply to different operators in different geographic regions, for example: http://www.orange.com/fr/content/download/3468/31507/version/8/file/offre+cablage+FTTH+horsZTD+du+30+sept+ 2014.pdf and http://groupe.sfr.fr/sites/default/files/contrat-dacces-aux-lignes-ftth-de-sfr-hors-ztd-contrat-v15complete.pdf

[75] See http://organodivigilanza.telecomitalia.it/pdf/Seminario-UfficioVigilanza-14012015.pdf, http://www.anacom.pt/streaming/analise_mercados4_5.pdf?contentId=812401&field=ATTACHED_FILE and https://circabc.europa.eu/sd/a/3a11b0d4-1198-471b-b906-c9becf99325f/Decis%C3%A3o%20ORAC.pdf

[76] See http://cnmc.es/Portals/0/Ficheros/Telecomunicaciones/Resoluciones/140618_Resoluci%C3%B3n_DTSA-692-13-Verticales-%20vPUBLICA_.pdf

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applied in Belgium and Portugal (proposed for bitstream), whilst cost-based methodologies have been applied in the Netherlands, France (on VDSL only) and Spain (copper only) and are proposed for VULA in Portugal. Figure 3.12 summarises these approaches.

Figure 3.12: Pricing methodologies for active fibre access [Source: Analysys Mason, 2015]

Country (network type)	Reference offer?	Symmetric/ asymmetric	Pricing methodology	Detail
Belgium (wholesale cable access)	✗	Asymmetric	Price control, retail-minus	The wholesale price is the retail price minus VAT, a copyright contribution, an audiovisual content promotion contribution and a local TV contribution. It also adds back avoided costs such as billing, marketing and set-top boxes[77]
France (VDSL)	✓[78],[79]	Asymmetric	Price control, cost-based	Long term incremental costs of an efficient operator (whose characteristics are comparable to those of Orange)
Netherlands (VULA)	✗[80]	Asymmetric	Price control, cost-based	Embedded direct costs/ wholesale price cap (EDC/WPC) methodology[81] (regulation not finalised)
New Zealand (FTTH bitstream)	✓[82]	Asymmetric	Not applicable (contractual price caps set during the tender process)	
Portugal (FTTH bitstream)	N/A[83]	Asymmetric	Retail minus[84]	Regulation not finalised
Portugal (VULA)	N/A[85]	Asymmetric	FRND with cost	Provide rationale to the

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[77]   See https://circabc.europa.eu/sd/a/b5b79eb4-c11d-471a-a957-2e29227bdda6/BE_2013_1511_FRCSA.pdf

[78]   See http://www.orange.com/fr/content/download/3657/33601/version/25/file/OdR+DSL+grand+public_2015-01-01.pdf

[79]   Note: Price control is not applied in areas where at least one alternative operator provides a wholesale bitstream offer (based on LLU or on alternative infrastructures such as FTTx or cable). See https://circabc.europa.eu/sd/a/0323223f-0a67-47f7-bbff-8bad998a3075/FR-2014-1602-1603%20ADOPTED_EN%20-%20PUBLIC.pdf

[80]   The introduction of VULA is still in dispute, and so regulation has not yet been finalised.

[81]   See https://www.acm.nl/nl/publicaties/publicatie/14110/ACM-biedt-ontwerp-marktanalysebesluit-ontbundelde-toegang-aan-bij-Europese-Commissie/

[82]   See, for example, original Network Infrastructure Project Agreement with Chorus: http://www.crownfibre.govt.nz/wp-content/uploads/2011/12/Network-Infrastructure-Project-Agreement-NIPA-24-May-2011.pdf; also August 2011 price list: https://www.chorus.co.nz/file/20066/chorus-ufb-services-agreement-price-list---confirmed.pdf and price caps to 2019: http://www.crownfibre.govt.nz/wp-content/uploads/2013/03/Chorus-Published-UFB-Price-Caps-Document-3-October-2012.pdf (see New Zealand case study for more recently added services etc.)

[83]   Not applicable; regulation is not yet finalised in Portugal, and so wholesale reference offers have not been developed.

[84]   See http://www.anacom.pt/streaming/mercados4_5_consulta_15022012.pdf?contentId=1116435&field=ATTACHED_FILE

[85]   Not applicable, regulation is not yet finalised in Portugal, so wholesale reference offers have not been developed

Country (network type)	Reference offer?	Symmetric/ asymmetric	Pricing methodology	Detail
			orientation	regulator for pricing, taking into account the EC statement on cost orientation[86] [87], (regulation not finalised)
Singapore (FTTH bitstream)	✓[88]	Asymmetric	Not applicable (contractual price caps set during the tender process)	
Spain (NEBA – VDSL)	✓[89]	Asymmetric	Price control, cost-based	Cost-based, including a reasonable rate of return on the cost of capital and a risk premium of 15.72%[90]
Spain (proposed VULA and proposed FTTH bitstream)	✗[91]	Asymmetric	Economic replicability test	Subject to economic replicability tests[92] (regulation not finalised)

3.2.9 Quality of service

QoS as a policy objective

Quality of service (QoS) is not listed as a high-level policy objective across the benchmark interventions, although it could be argued to be a part of other objectives. In **Portugal** it is mentioned as an objective of ANACOM in its 2004 electronic communications law;

 "*Ensure that users, including disabled users, derive maximum benefit in terms of choice, price and quality*"[93]

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[86]   The EC states that: "The price of access to the unbundled fiber loop should be cost-oriented". See: http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32010H0572&from=EN

[87]   See http://www.anacom.pt/streaming/mercados4_5_consulta_15022012.pdf?contentId=1116435&field=ATTACHED_FILE

[88]   See http://www.netlinktrust.com/services/interconnection-access-agreements/ico-agreement/

[89]   See http://telecos.cnmc.es/documents/10138/2026311/201402_Texto_consolidado_NEBA_feb2014.pdf/9131e7f8-07b7-4e83-aa27-f5f275837808 (although it should be noted that this currently excludes services with speeds of 30Mbit/s or more, as the regulation related to these services has not yet been finalised).

[90]   See http://telecos.cnmc.es/documents/10138/2026312/20140130_DT2011_739.pdf/747aab52-2235-4b36-95b3-75af4aa722dc

[91]   VULA regulation has not yet been finalised, and so a reference offer has not yet been developed.

[92]   See http://www.cnmc.es/Portals/0/Ficheros/Telecomunicaciones/Consultas_Publicas/Consultas_cnmc/20141219_ProyectoMedida.pdf

[93]   See Article 5 at: *http://www.wipo.int/edocs/lexdocs/laws/pt/pt/pt063pt.pdf*

QoS obligations imposed as part of NGA wholesale access remedies

QoS obligations are imposed as part of the regulatory remedies in every benchmark country.[94] These can be split between installation and repair timescales, and service levels for traffic. The latter only applies to active remedies. The different types of QoS requirements imposed in each case study market are shown in Figure 3.13 below.

Note: this section reviews quality of service obligations for active and dark fibre remedies as detailed in the case studies. We have not reviewed quality of service obligations for duct access and vertical access remedies more widely, nor considered VDSL remedies in Belgium (where the case study focuses on cable regulation).

Figure 3.13: Summary of QoS requirements by country [Source: Analysys Mason, 2015]

	Installation / connection timescales	Repair timescales / service availability	Service levels for traffic			Penalties specified
			Frame loss	Frame delay	Frame delay variation	
Belgium	✓	✓	✗ (a)	✗ (a)	✗ (a)	✓
France	✓ (b)	✓ (b)	N/A	N/A	N/A	✓ (a)
Netherlands	✓ (c)	✓ (c)	N/A	N/A	N/A	✓ (c)
New Zealand	✓	✓	✓	✓	✓	✓
Portugal	N/A (d)	N/A (d)	N/A	N/A	N/A	N/A
Singapore	✓	✓	✓	✓	✓	✓
Spain	✓	✓	✓	✓	✓	✓

N/A – Not applicable. Where active remedies are not imposed, service levels on traffic are not applicable. Similarly, in Portugal, where neither dark fibre nor active wholesale access regulation for NGA services have been imposed, there are no relevant QoS requirements

(a) – Specific service levels for traffic are not defined, however, the service levels offered to the customer of a third-party retail service provider should match those offered to the cable company's own customers (i.e. non-discrimination)

(b) – In France, building operators are required to provide service levels around installation and repair, as well as penalties for failure to meet these, however, the precise levels are not specified by ARCEP

(c) – In the Netherlands, QoS requirements for ODF-access have not yet been defined, however, these are required by ACM, specifically around installation and repair, with associated penalties, and are likely to be implemented in the coming months

(d) – In Portugal, the 2012 draft regulation specified installation and repair timescales as key QoS measures that would be included in any final regulation, however, the regulation has not yet been finalised

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[94]   Where remedies apply; the exception is Portugal, where there are no active or dark fibre remedies

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In **Belgium**, QoS requirements are defined for each cable company and include timescales for confirmation of receipt of request, completion of installation (including line ready for use notification) and repair timescales, with associated penalties.[95] Specific QoS for service levels on traffic are not specified, however, the principles of non-discrimination with the cable operator's own retail subscribers are applied.

In **France**, ARCEP developed draft guidelines for quality of service in December 2014, including installation and repair timescales. [96] The actual service levels, in terms of days to install and repair, were left to the individual operators to define, as well as the penalties that would be associated with failure to meet these service levels.

In the **Netherlands**, at the point of the April 2015 Market 4 analysis, specific QoS obligations had not yet been developed for KPN's ODF-access product. However, ACM requires that such QoS obligations are defined, specifically around QoS for ordering and installation, service availability and fault repair.[97] Furthermore, KPN is required to specify penalties associated with failure to meet these. Specific SLAs are likely to be developed over the coming months.

In **New Zealand**, detailed QoS obligations are included within the commercial agreements with the operators rolling out the FTTH network.[98] The SLAs include timescales for installation, service availability (fault repair), disconnection and "onboarding" of a new retail service provider. For Layer 2 (active) services, service levels for traffic are further defined, namely frame delay, frame delay variation and frame loss. Penalties are specified for each.

Because there are no regulated active or dark fibre products based on the fibre infrastructure in **Portugal**, there are no corresponding quality of service requirements. Nevertheless, considering the draft wholesale access services proposed in 2012, ANACOM specified non-discrimination, specifically naming terms of service provision and fault repair times as two key measures.[99]

In **Singapore**, NetLink Trust's Interconnection Offer (ICO) includes a series of regulated QoS requirements for dark fibre products including installation, connection and fault management timescales.[100] Penalties are defined for failure to meet each requirement. In addition, for active

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[95]   See, for example, http://www.bipt.be/public/files/fr/21023/telenet_+FR.pdf, P93

[96]   http://www.arcep.fr/fileadmin/uploads/tx_gspublication/Decision_operationnelle_FttH_.pdf, P24 and P53

[97]   See   https://www.acm.nl/nl/publicaties/publicatie/14110/ACM-biedt-ontwerp-marktanalysebesluit-ontbundelde-toegang-aan-bij-Europese-Commissie/

[98]   See for example Schedule 5 (P134) of the Chorus NIPA: http://www.crownfibre.govt.nz/wp-content/uploads/2011/12/Network-Infrastructure-Project-Agreement-NIPA-24-May-2011.pdf

[99]   See http://www.anacom.pt/streaming/mercados4_5_consulta_15022012.pdf?contentId=1116435&field=ATTACHED_FILE

[100]   See http://www.netlinktrust.com/services/interconnection-access-agreements/ico-agreement/. Details of the QoS requirements are contained within the body of the specific connection type schedule (e.g. Schedule 1 – Residential End-User Connection), and within this, in the individual process descriptions (for example Item 4: Ordering and provisioning procedure)

services, Nucleus Connect's ICO defines a series of QoS measures including jitter, latency and packet loss.[101]

In **Spain**, service levels are defined for the NEBA services within Telefónica's reference offer, including installation timescales and fault resolution timescales with association penalties for delay.[102] In addition, the reference offer lists the minimum quality levels for the frame loss, frame delay and delay variation (jitter) with penalties for failure to meet these.

Further detailed information on QoS obligations in each country may be found in the "Regulatory Interventions" section of each individual country in this report.

Monitoring of QoS

In terms of monitoring quality of service on broadband networks, the regulators in the case study markets have taken very different approaches.

In **Belgium, Netherlands, New Zealand and Portugal**, the regulators do not publish any information on broadband QoS. Interestingly, in both New Zealand[103] and Portugal,[104] broadband QoS reporting was available until 2010, but has since been discontinued.

In **Singapore**, a series of indicators are measured by a panel of testers, including download throughput, upload throughput, latency and packet loss. These are measured by operator for a series of selected plans.[105] Information is also periodically available on NetLink Trust's performance against their time to install requirements.

In **France**, seven different indicators are measured, namely: upload and download speed, latency, packet loss and performance of web browsing, video and P2P services. In order to monitor this, nodes have been installed in eight sites and a series of operators and plans covering each of the technology used (and for copper also the line lengths) have been selected. Relatively comprehensive reports with supporting data sets are published by ARCEP twice a year.[106]

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[101] See http://www.ida.gov.sg/Policies-and-Regulations/Industry-and-Licensees/Nationwide-Broadband-Network/Nucleus-Connects-Interconnection-Offer. Details of the QoS requirements are contained within the body of the specific connection type schedule (e.g. Service Schedule – Residential Per-End-User Connection)

[102] See http://telecos.cnmc.es/documents/10138/2026311/201402_Texto_consolidado_NEBA_feb2014.pdf/9131e7f8-07b7-4e83-aa27-f5f275837808, P252

[103] See http://www.comcom.govt.nz/regulated-industries/telecommunications/archive/monitoring-reports-and-studies-archive/telecommunications-monitoring-reports-archive/

[104] See http://www.anacom.pt/render.jsp?contentId=1056551#.VYQ2avlVhBd; latest report (in Portuguese) is available here http://www.anacom.pt/streaming/QoSacesso_internet_julho2010.pdf?contentId=1052807&field=ATTACHED_FILE

[105] See https://www.ida.gov.sg/applications/rbs/chart.html

[106] See http://www.arcep.fr/uploads/tx_gspublication/QoS-internet-semestre2_2014-mai2015.pdf; dataset available here: http://www.arcep.fr/index.php?id=8571&tx_gsactualite_pi1%5Buid%5D=1744&tx_gsactualite_pi1%5Bannee%5D=&tx_gsactualite_pi1%5Btheme%5D=&tx_gsactualite_pi1%5Bmotscle%5D=&tx_gsactualite_pi1%5BbackID%5D=26&cHash=b402ff4b3f44d0d1ee66194773698941

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In **Spain**, the focus is on download speeds only. A quarterly report is published on the actual compared to advertised speeds, split between the average, minimum (5th percentile) and maximum (95th percentile). Speed is measured by technology for a series of retail broadband plans.[107]

Because the approach taken and the statistics quoted by each regulator are different, it is not possible to compare these statistics across markets. However, we have included a selection of the results in the 'Outcomes of interventions' sections of each of the relevant case studies. Where statistics are not available, we have noted this.

The broadband speed statistics available at a European level relate to the take-up of broadband plans based on advertised speeds rather than the actual performance. We compare these statistics in Section 3.3.6 of this report.

3.2.10 Structural separation

Structural separation requirements have been applied in two of the markets reviewed – Singapore and New Zealand. In both countries, the imposition of structural separation was one of the terms of next-generation broadband network tendering processes.

In **Singapore**, open access was a central principle of the process, and bidders applying to become the 'NetCo' (passive network operator) had to be structurally separate from any retail service provider. Furthermore, bidders applying to become the regulated 'OpCo' (active network operator) also had to be functionally separate from any retail service provider. Structural separation between the winning bidder for the OpCo, NetLink Trust and the incumbent, Singtel, has been achieved using a trust structure. The approach can be said to have been successful given the rapid migration to FTTH by all retail service providers, the very high take-up of passive products and high retail take-up of FTTH services.

Similarly, in **New Zealand**, structural separation was a condition of the funding award process, and so Telecom New Zealand separated its previously functionally separate network assets and wholesale arm into a standalone company called Chorus. Whilst roll-out of FTTH in New Zealand remains at a fairly early phase, high levels of retail competition suggest that the approach has been a success to date.

Given the relatively recent transition to structural separation in these cases, it is not possible to tell whether this model will lead to superior outcomes in the long term. One concern regarding structural separation models which cannot yet be answered is whether the structurally separated entities will be capable of successfully meeting the needs of their wholesale customers over the long term, for example by:

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[107]   See   for   example   http://www.minetur.gob.es/telecomunicaciones/es-ES/Servicios/CalidadServicio/informes/Documents/Seguimiento_SAI_T4_14.pdf

- enabling the transition to a further evolution of access networks beyond ultra-fast, (albeit that this might be over a decade away), the funding of which might require long-term commitments from the wholesale customers (or another round of government intervention)
- using new technologies or operating models to achieve higher degrees of efficiency over time
- making the correct trade-offs between new capabilities and efficiency.

3.2.11 Approaches taken towards oligopolies

Fixed-access telecoms networks demonstrate strong economies of scale (or "economies of density") at a local level, which means that the number of potential competing parallel infrastructures which are completely independent is likely to be small. At the same time, the European electronic communications framework is based on consistency with competition law principles, drawing an equivalence between the concepts of SMP and "dominance". Cases where two operators have been found to have "joint dominance" are possible, but very rare.

If there is only one access network, offered by a single player, then SMP (asymmetric) remedies can be used to limit the ill effects of that market power in relevant markets which are susceptible to ex-ante regulation. If there are many networks, then the "invisible hand" of competition would be likely to prevent consumer harm. However, in the quite possible situation where there is an oligopoly of two networks (or two large plus a couple of very small networks), then ex-ante remedies will only be available if one operator has SMP or if there is joint dominance[108]. As joint dominance has to date proved challenging to establish, this is a potential weakness of the framework.

The two largest networks in many of the countries studied are the cable-TV and former incumbent telephone operators. For example:

- following the merger of Liberty Global and Ziggo in the **Netherlands** (approved in October 2014), the market shares of the top two operators (for fixed broadband subscribers) were 44% (for Liberty Global) and 43% (for KPN) respectively.
- in **Portugal**, following the acquisition of Optimus by Zon Multimedia (now branded 'Nos') in 2013, the broadband market shares of the top two operators, MEO and Nos were 49% and 35% respectively at the end of 2014.

The question of whether the existence of an extensive cable network means that the former incumbent does not have SMP is made especially complex by the different technologies used by cable-TV and former incumbent networks, because it is not obvious that these networks are wholesale substitutes even if they can be used to compete in the same retail markets[109].

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[108] We are not considering symmetrical, "Article 12" remedies; these do not require market power

[109] For a clear summary of the logic of the ACM analysis on this point, see: BEREC Opinion on Phase II investigation pursuant to Article 7 of Directive 2002/21/EC as amended by Directive 2009/140/EC: Case NL/2015/1727 Wholesale local access provided at a fixed location in the Netherlands 28 May 2015

In its analysis, the ACM recognised a risk of joint dominance in the retail broadband market. However, the cable networks were excluded from the wholesale broadband market owing to the economic unfeasibility of unbundling cable in the majority of the country, as well as technical challenges. As such, KPN was found to hold SMP in the wholesale market, and wholesale access remedies were applied, including both passive access requirements (dark fibre) and active remedies (bitstream and VULA). The EC has raised serious doubts about this analysis; though it was in the important parts of this analysis defended by BEREC, ACM has more recently withdrawn its notification.

By comparison, ANACOM has sought to ensure competition through:

- symmetric vertical building access obligations
- asymmetric duct access remedies imposed on PT
- its draft SMP regulation in Market 5, which further seeks to impose VULA and bitstream remedies on PT.

However, we note that although these draft regulations were put forward in 2012 they have not been finalised, and it is unclear whether they will in fact be introduced.

The higher market share of MEO makes it easier to argue for SMP in this case.

3.2.12 Policy variations

While there have been no complete policy reversals, there have been a number of policy variations in relation to NGA wholesale broadband access. These are outlined below.

Changes to geographical definitions

In **France**, the definition of high-density areas has gradually been refined based on the variations in building access within this segment. Specifically, low-density pockets in high-density areas were introduced and a separate market was defined based on blocks of fewer than 12 flats or business premises, or which cannot be accessed via a sewer large enough to be visited by an engineer.

Similarly in **Spain**, the definition of competitive and non-competitive markets changed and the concept of the nine fully competitive cities was introduced. Furthermore, we note that this is subject to further revisions before the regulation is finalised.

In **Portugal**, for Market 4 regulation, the concept of the 17 municipalities with fibre infrastructure competition was introduced (noting again that this has not been implemented).

Introduction / removal of obligations

In **Spain**, the regulator is proposing to remove a 30Mbit/s speed cap on active wholesale access (NEBA) products, effectively introducing wholesale access services of 30Mbit/s or more.

Also in Spain, the regulator proposes to remove NEBA obligations completely in competitive areas.

In **the Netherlands**, after a protracted process involving several appeals, dark-fibre remedies were removed from the enterprise segment (FTTO). The FTTO market was separately defined and KPN was judged not to hold SMP.

Also in the Netherlands, sub-loop unbundling was introduced and later removed.

In **Portugal**, ANACOM has not yet introduced the proposed measures on FTTH access, three years after its draft decision. The reasons cited are the evolution of the market since the initial review. It is unclear when wholesale access measures will be introduced, or what form they will take.

Other

In **France**, the roll-out of VDSL was initially not permitted pending the outcome of investigations into the best technical approach for rolling this out and the proportion of households for which a speed improvement could be achieved. However, once these investigations were concluded in April 2013 (with a second round in July 2014), and it was established that VDSL-CO would be appropriate in France, Orange rapidly rolled out to 17% of premises by December 2014.

In **New Zealand**, the initial approach to NGA was using FTTC. However, following an extensive roll-out of FTTC, the government commissioned an FTTH network to 75% of premises in the country, effectively overbuilding the FTTC deployment in a large part of the country.

3.2.13 Funding

Across the benchmark countries, a number of approaches have been taken to the funding of NGA broadband networks. In some instances, network roll-out has been heavily funded by the government to ensure high levels of NGA coverage within a relatively short time period. In other countries, the majority of large scale deployments have been privately funded, although in these cases state funding has often been used to extend deployment in more-rural areas. We have not discussed this "rural funding" element below.

In **Singapore**, NGA broadband (FTTH) deployment was commissioned by the government, with a state investment of approximately SGD750 million (GBP356 million[110]) in the network element. This corresponds to around SGD508 (GBP241) per premises passed, in addition to the private investment by the winning bidder, NetLink Trust.

New Zealand's FTTH deployment (the 'UFB network') was supported by the State through a series of long-term government loans. The total value of the government loans was

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[110]   Calculated using year-average exchange rates for 2010.

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NZD1.35 billion[111] (GBP690 million, or approximately GBP335 per premises passed[112]). Alongside the state funding, there have been significant levels of co-investment from private partners. Chorus estimates that its investment for 70% of the UFB network will be between NZD1.6 billion and NZD1.7 billion[113] (GBP758 million to GBP806 million).[114] On top of this, the New Zealand government recently announced its intention to extend the UFB roll-out with an additional spend of NZD210 million (GBP107 million[115]), to increase the 75% population coverage target to at least 80%.

In **France**, the majority of FTTH deployment has been privately funded by operators. In March 2015, Orange announced plans to invest more than EUR3 billion in fibre broadband expansion in France.[116] Following the merger of Numericable and SFR in 2014, the merged entity announced its intention to increase fibre network investment to double its coverage by the end of 2017.[117] Alongside these commercial networks, FTTH roll-out in more-rural areas is being undertaken through public initiative networks (PINs).

NGA network deployment in **Portugal** has been funded predominantly through private investment. In 2014, Vodafone Portugal and MEO announced plans to deploy and share privately funded fibre networks reaching 900 000 homes, through an agreement lasting 25 years.[118] In 2015, Nos announced plans to invest EUR200 million (GBP145 million[119]) to expand its fibre network, with half to be funded privately and the other half to be financed by the European Investment Bank (EIB).[120]

In **Spain**, the majority of next-generation network investment has been funded privately. Telefónica aims to cover 5.5 million homes with FTTH services by the end of 2015 for a total cost of EUR700 million (GBP597 million[121]).[122] In 2013, Orange and Vodafone agreed to roll out fibre

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[111] See http://ufb.org.nz/ufb-and-rbi-projects-ahead-of-schedule/

[112] This is based on year average 2013 exchange rates. The number of premises passed has been approximated as 75% of the total premises, in line with the stated population coverage target

[113] This includes up to NZD929 million in debt and equity financing from CFH

[114] See https://www.chorus.co.nz/chorus-provides-20m-fund-for-free-ufb-residential-installs and subsequent revisions: http://www.nzherald.co.nz/business/news/article.cfm?c_id=3&objectid=10867554, and https://nz.finance.yahoo.com/news/chorus-expects-lower-ufb-build-212100271.html

[115] This is based on year average 2014 exchange rates

[116] See http://www.fibre-systems.com/news/story/orange-plans-full-fibre-coverage-9-french-cities-2016

[117] See http://numericable-sfr.com/nous-connaitre/discover-numericable-sfr-group/about-us/11282014-1702-numericable-sfr-building-frances-fiber-mobile-superfast-broadband-leader

[118] See http://www.vodafone.com/content/index/about/about-us/policy/news-releases/vodafone-portugal-fibre-sharing.html

[119] This is based on year average 2015 exchange rates

[120] See: http://www.telecompaper.com/news/nos-to-invest-eur-200-million-to-expand-fibre-network--1086554

[121] This is based on year average 2015 exchange rates

[122] See http://www.rapidtvnews.com/2013021426369/telefonica-to-double-fibre-optic-investments.html#axzz3dQIwLYAi

to more than 50 cities by 2017, involving estimated total investment of EUR1 billion (GBP726 million[123]).[124]

In **the Netherlands**, there has been a mixture of public and private funding for NGA broadband networks. In 2010, the EIB provided EUR142.5 million (GBP121 million[125]) for Reggefiber's initial fibre roll-out, as part of a total facility of EUR285 million (GBP243 million[126]).[127] In 2012, the EIB again provided EUR125 million (GBP101 million[128]), matched by EUR125 million in funding from six commercial banks.[127] There have also been a number of partially state-funded municipal FTTH projects, including the CityNet fibre deployment in Amsterdam (now 70% owned by KPN-Reggefiber)[129] (EUR330 million total funding,[130] GBP239 million[131]), Wiericke (acquired by Vodafone NL in 2013) and Onafhankelijke Open Network Operator (OONO, acting as a wholesale provider).

The case of **Belgium** is not relevant, as the cable networks to which regulatory remedies have been applied are already in place.

By combining the total network FTTH investments for each country[132] from both public and private sources, it is possible to calculate a network capex per premises passed. This data is shown in Figure 3.14.

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[123]   This is based on year average 2015 exchange rates

[124]   See http://www.orange.com/en/content/download/22786/472355/version/4/file/Orange_DDR%2B2013_EN.pdf

[125]   This is based on year average 2010 exchange rates

[126]   *Ibid.*

[127]   See http://europa.eu/rapid/press-release_BEI-12-148_en.htm

[128]   This is based on year average 2012 exchange rates

[129]   Often referred to as Glasvezelnet Amsterdam (GNA), after the company that owns and manages the infrastructure

[130]   Source: Analysys Mason *NGA tracker* (April 2015).

[131]   This is based on year average 2015 exchange rates

[132]   This excludes New Zealand, for which data is unavailable.
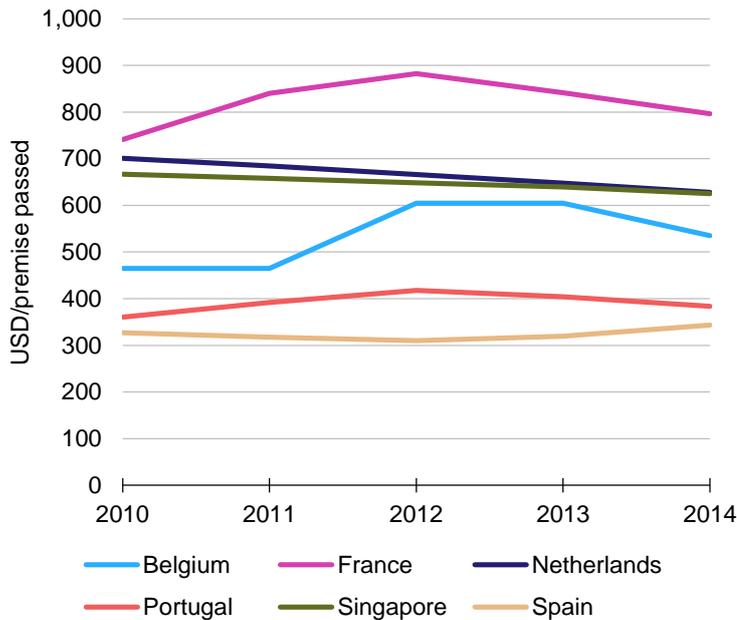
Figure 3.14: FTTH network capex per premises passed [Source: Analysys Mason Research,[133] June 2014]

It can be seen that the level of investment required to connect premises with FTTH in both Portugal and Spain is well below that of other benchmark countries, at less than USD400 per premises. This is because in both countries there is access to an extensive duct system at regulated prices, which has enabled the swift and inexpensive roll-out of higher-speed technologies. With the exception of Singapore (which has benefited from high levels of government investment), Portugal and Spain have the highest levels of FTTH coverage (see Section 3.3.1), suggesting that the low investment requirement has encouraged FTTH infrastructure build.

In contrast, the remaining countries all show a network capex per premises of at least USD530, with France at around USD800 in 2014 and the Netherlands, Belgium and Singapore at between USD530 and USD630 per premises passed.

3.3 Comparison of outcomes

Within this section, we assess whether the policy objectives stated by the government or regulator in each of the case-study countries have been achieved.

We note the limitations of attributing any direct causality between the regulatory intervention and the outcome achieved in each case, and where possible we have flagged to what extent a causal link may be drawn, and where external factors may have had a more significant influence.

Furthermore, we note that in some of the markets considered, the regulatory intervention has either not yet been finalised (e.g. Portugal) or has been implemented so recently that an assessment of outcomes cannot readily be made (e.g. Belgium). We include these countries within the numerical analysis for the sake of comparison, but do not seek to draw any conclusions on the trend in these markets specifically.

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[133]   Analysys Mason, *FTTx roll-out and capex worldwide: forecasts and analysis 2014–2019.*

In order to gauge whether the stated policy objectives have been achieved, we have identified a series of measurements and matched them to the relevant policy objective (see Figure **3.15** below).

Policy objective	Measurement
Facilitating or encouraging network investment	NGA coverage
	FTTH take-up
Enabling competition	Incumbent market share
	Average spend per user (ASPU)
	Incumbent EBITDA margins
Service quality	Broadband speeds

Figure 3.15: Summary of outcomes measured matched to policy objectives [Source: Analysys Mason, 2015]

Each measurement is considered in turn below, comparing the outcomes for different markets.

3.3.1 NGA coverage

The majority of regulators have sought to strike a balance between incentivising infrastructure investment and enabling competition through wholesale access regulation.[134] One of the indicators of the success in achieving the objectives is the level of network investment, and specifically, the level of coverage achieved in each market.

The majority of the regulatory interventions considered focus on FTTH network roll-out and access, and so below we consider the FTTH coverage levels in each market. Several interventions have also specified an objective of infrastructure-based competition, and as such, we have specifically considered non-incumbent FTTH coverage beneath this. For comparison purposes, we then provide an overview of cable coverage, following which we consider the VDSL market.

FTTH coverage

Figure 3.16 shows the level of FTTH network coverage as a percentage of premises in the seven case-study countries.

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[134] We note that this is a markedly different situation from the original copper infrastructure, where wholesale access regulation was introduced decades after the main roll-out.
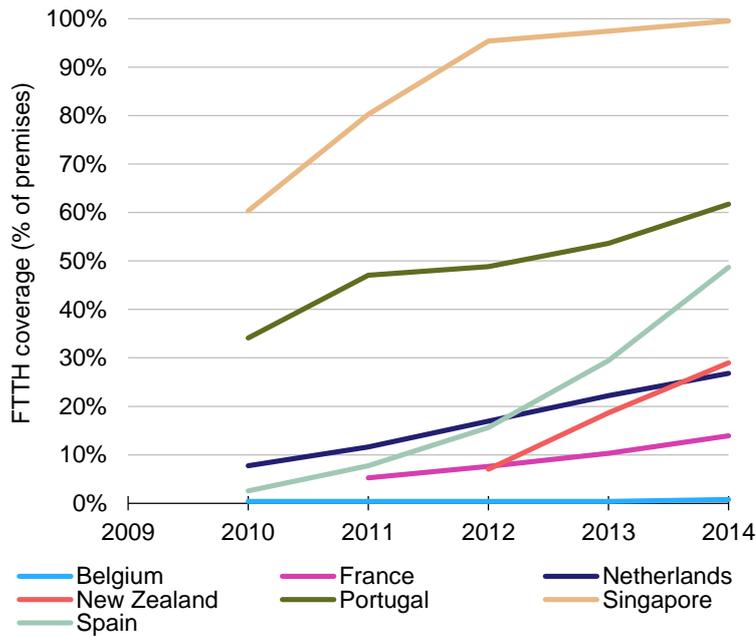
Figure 3.16: NGA coverage (FTTH) [Source: Analysys Mason Research, June 2014]

In **Singapore**, the state-commissioned FTTH roll-out has already achieved its objective of virtually 100% coverage of premises. In **New Zealand**, the partially state-funded roll-out is at an earlier stage, having reached 29% of premises by the end of 2014, and with a target to reach 75% by 2019. In both cases the government commissioned the network build based on pre-committed wholesale access obligations and price levels, linked to specific roll-out schedules. As such, the coverage levels can be directly linked to the regulatory intervention, although no inference on the competitive impact of wholesale access regulation can be drawn.

In comparison, the roll-out of FTTH in the other benchmark countries has primarily been led by private investment, resulting in very varied coverage figures. **Portugal** has achieved the highest levels of coverage (61% of premises), while coverage in **France** is only 14% of premises, and in **Belgium**, FTTH coverage is less than 1%.

In comparison, FTTH coverage in **Spain** has increased rapidly since 2012, reaching 49% of premises in 2014. We note that Telefónica has threatened to halt its FTTH network deployment should the CNMC push ahead with its proposed FTTH access obligations (removing the 30Mbit/s cap on NEBA services and introducing VULA).

The level of coverage achieved by the incumbent can be arguably linked to the retail competition in the market, which in some cases, can itself be linked back to the regulatory intervention. For example in Spain, Telefónica's coverage levels are arguably in response to competition from both cable networks and non-incumbent FTTH roll-out. A similar situation can be seen in Portugal and perhaps to a lesser extent in France (where there is less cable) and the Netherlands.

In the case of Belgium, the effectively ubiquitous coverage of cable, and Belgacom's choice and relatively early deployment of VDSL-FTTC, means that FTTH network investment has been very limited.

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Non-incumbent FTTH coverage

In some countries, non-incumbent operators have been active in building FTTH networks (see Figure 1.1 below). This appears to be directly linked to the existence of passive access, for example: Portugal (duct access only), Spain (duct access only), France (duct access and dark fibre), and the Netherlands (dark fibre).
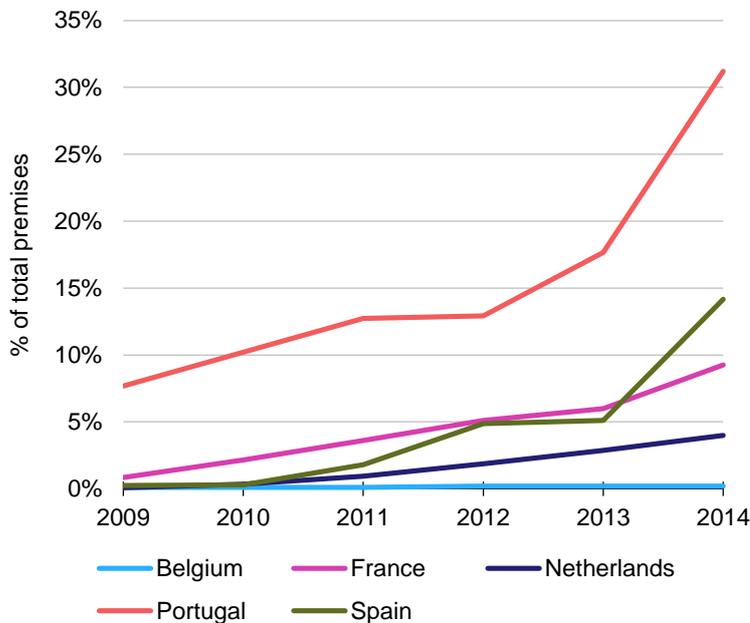

Figure 3.17: Percentage of premises passed by non-incumbent FTTH as a share of total premises [Source: Analysys Mason, 2015]

The most extensive non-incumbent deployments have been in **Portugal**, where Vodafone has been particularly active in FTTH roll-out in order to compete with both MEO's (MEO's) FTTH and the cable networks. Vodafone's deployment in Portugal has been based on regulated duct access, which is both of high quality and comparatively inexpensive. We understand that Vodafone plans to be able to serve almost 2 million homes (50% of total households) by the end of 2015. Some of this network coverage (450 000 homes) has been enabled by a commercial reciprocal access deal to give Vodafone access to part of MEO's FTTH network in exchange for MEO having access to the equivalent number of homes via Vodafone's network.[135]

In **Spain**, FTTH deployment has been undertaken by multiple parties, including Orange, Jazztel (now merged with Orange) and Vodafone. This has been enabled by high-quality, low-cost duct access and the comparatively high number of multi-dwelling units (MDUs) in Spanish cities. Roll-out of FTTH by non-incumbent operators is expected to continue throughout 2015.

In **France**, Numericable-SFR, Bouygues and Iliad have all undertaken FTTH deployment, often using regulated duct access, as well as co-investment models, in some cases joining with the incumbent, Orange.

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[135]   See http://www.vodafone.com/content/index/about/about-us/policy/news-releases/vodafone-portugal-fibre-sharing.html

Non-incumbent FTTH deployment in the **Netherlands** can be split between municipal schemes and commercial deployment from cable operator Caiway. Several of the early municipal FTTH deployments have since been incorporated into the commercial networks, for example Glasvezelnet Amsterdam (GNA, now 70% owned by KPN-Reggefiber) and Wiericke (acquired by Vodafone NL in 2013). Other municipal fibre schemes such as Ons Net Nuenen and Onafhankelijke Open Network Operator (OONO, acting as a wholesale provider) have remained independent. In addition, cable operator Caiway is both converting existing premises from cable to FTTH and extending its network using FTTH.

In all case study countries, where non-incumbent operators have been active in deploying FTTH networks, these commercial deployments have focused on high-density urban areas. . Outside these areas, parallel commercial roll-out by third-party operators is rarely seen. In France, for example, 71% of FTTH premises passed so far are in high-density areas (which represent only 20% of the country). There may also be subsidised or government-led municipal fibre schemes, which primarily target commercially non-viable areas.

Cable

In several of the markets under consideration, cable coverage is also very high. In Belgium, the Netherlands and Singapore, cable coverage is over 90% of premises, followed by Portugal at 82%. Coverage levels in France and Spain are lower at 30% and 47%, respectively. Cable networks in New Zealand are restricted to a few areas (Wellington/Kapiti, Christchurch) and do not include the largest city, Auckland; approximately 14% of all households are covered.

Figure *3.18* shows the level of cable network coverage as a percentage of premises in those case-study countries where cable networks have been deployed. It should be noted that we do not have full details on the evolution of cable coverage for New Zealand.
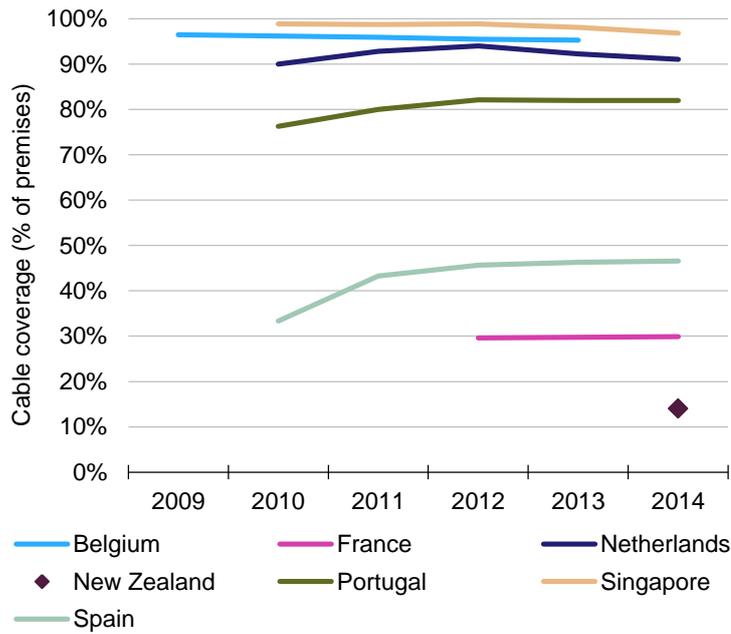
Figure 3.18: NGA coverage (cable) [Source: Analysys Mason Research,[136] June 2014]

High levels of cable coverage provide competition for incumbents and traditional unbundlers, incentivising the roll-out of FTTH or VDSL networks (see Section 1.7.2 above).

VDSL

Figure 3.19 shows the level of VDSL network coverage as a percentage of premises in the case-study countries; neither Portugal nor Singapore has deployed VDSL, instead focusing on FTTH. FTTC has been widely deployed in New Zealand, but we do not have figures on the evolution of coverage.

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[136]   Analysys Mason, *FTTx roll-out and capex worldwide: forecasts and analysis 2014–2019.*
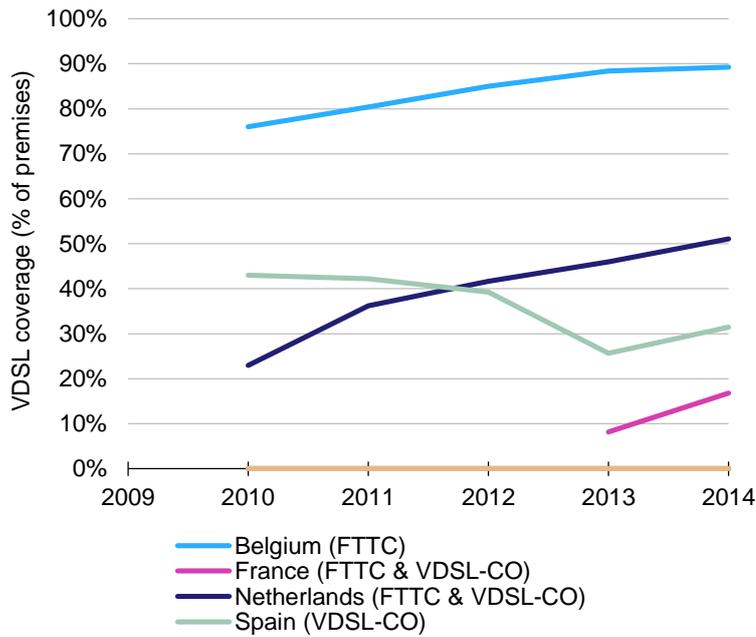
Figure 3.19: NGA coverage (VDSL) [Source: Analysys Mason Research,[137] June 2014]

VDSL-CO coverage in France has risen significantly since it first became available in 2013, and now stands at 17% of premises.

The highest levels of VDSL coverage are in Belgium, where incumbent Belgacom has deployed FTTC rather than FTTH.

In the Netherlands, KPN has deployed a mixture of technologies, including FTTC, VDSL-CO and FTTH. The level of overlap between KPN's VDSL and FTTH networks is unclear.

In Spain, VDSL-CO has been used as a stop-gap in advance of FTTH roll-out. As such, coverage levels declined as FTTH was overlaid. However, in 2014, additional VDSL roll-out exceeded the FTTH overlay rate and the total premises passed with VDSL once again increased.

3.3.2 FTTH take-up

The attractiveness and competitiveness of NGA offers can also be measured based on the take-up of the services as they become available. Figure 3.20 below shows FTTH take-up as a percentage of premises passed in each of the case-study countries.

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[137] Analysys Mason, *FTTx roll-out and capex worldwide: forecasts and analysis 2014–2019.*
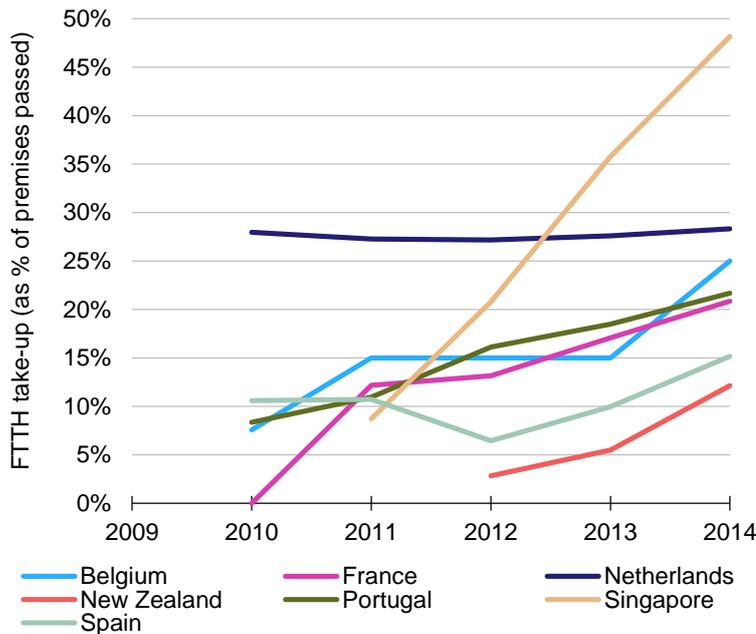
Figure 3.20: FTTH take-up as a share of premises passed [Source: Analysys Mason Research, 2015]

Despite the fairly broad range of coverage levels, take-up among the covered premises is showing similar trends in many of the countries of interest, with growth over an extended period towards levels of at least 20%. The rate of FTTH take-up in Singapore has been dramatically higher, however, with Singapore having the highest levels of take-up among the case-study countries at the end of 2014 (48% of premises). The pattern of relatively early take-up of FTTH in the Netherlands is also noteworthy.

The take-up levels observed across the benchmark markets imply that FTTH retail service pricing is affordable, at least for a reasonable proportion of the population.

While the link to regulatory policy is indirect, the various approaches to regulated access and price control have not prevented operators from achieving this encouraging level of take-up. A similar link could be made for the quality of service obligations imposed (see Section 3.2.9).

3.3.3 Incumbent market share of broadband connections

One indicator of effective competition in a retail market (enabled by wholesale access remedies) is the market share of the incumbent, which is shown in Figure 3.21 below.
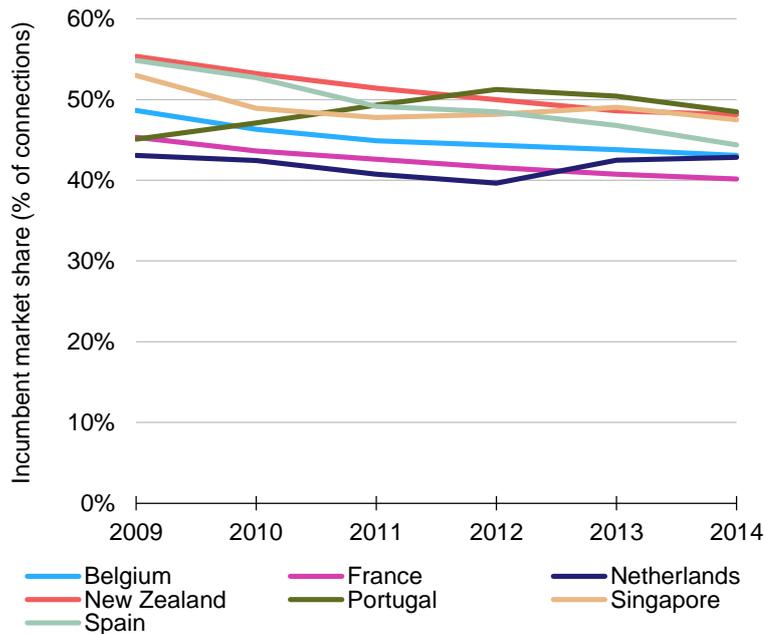
Figure 3.21: Incumbent market share of broadband connections [Source: National regulatory authorities, Analysys Mason, 2015]

It should be noted that in all case-study countries, the incumbent had 40% or more of broadband connections in 2014.

The markets under consideration have exhibited different trends in terms of the incumbent's share of broadband connections. In the three countries where the incumbent's market share exceeded 50% of connections in 2009 (**Spain**, **New Zealand** and **Singapore**), the incumbent has seen its market share decline. Similarly in **France** and **Belgium** the incumbent market share has also been in slow decline. However, these reductions cannot be simply attributed directly to the NGA intervention, as they could simply have been the continuation of a historical trend.

In contrast, MEO's market share in **Portugal** grew to 2012 before starting to decline. It is hard to attribute this change to the proposed or current regulatory stance since FTTH access regulation proposed in 2012 has not been finalised.

In **the Netherlands**, KPN successfully reversed the previous downward trend in market share in 2013, and exceeded its 2009 level by 2014.

In Spain, figures are available on operator market shares by geography, shown in Figure 3.22.
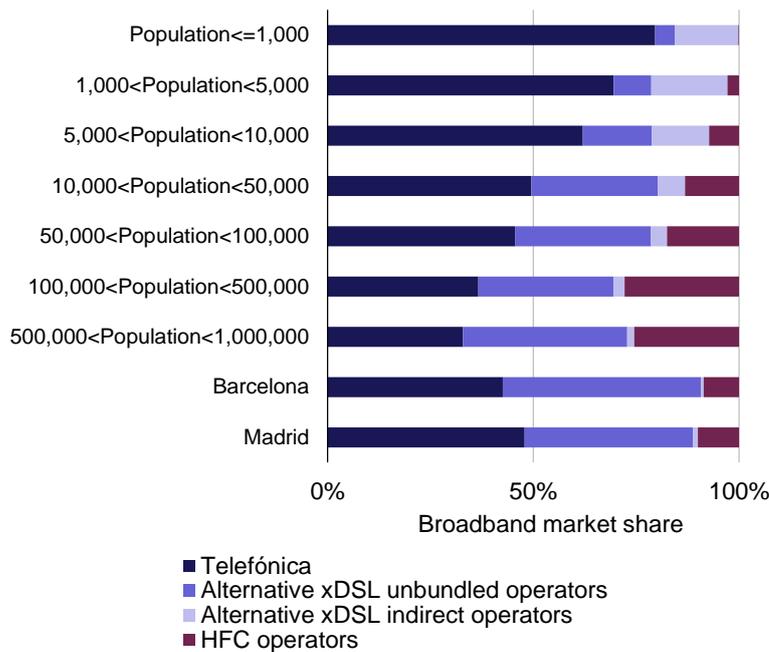
Figure 3.22: Market share of broadband by geography in Spain[138] [Source: CNMC, 2015][139]

In Spain's two largest cities Telefónica holds a market share of more than 40%, with unbundled xDSL operators holding the majority of the remaining market share. In these two cities, take-up of active wholesale products has been very low, and the cable market share is also relatively low (at approximately 10%). Away from Barcelona and Madrid, Telefónica's market share rises as the population of the area decreases, to almost 80% in the most rural segments. Similarly, active products ('alternative xDSL indirect operators') become more popular as the geography becomes more rural, peaking at 19% of connections in areas with a population of between 1000 and 5000. Conversely, unbundled xDSL and cable products are most popular in the more densely populated areas, and their market share declines as the geography becomes more rural (which is to be expected: these networks coverage will be limited in rural areas).

Telefónica's high market share in less dense areas is not necessarily directly linked to past regulation, although it does suggest that suggests that the historic bitstream products have not offered ISPs the same possibilities (whether related to pricing or service differentiation) offered by passive access products (chiefly LLU in this case).

3.3.4 Average spend per user (ASPU)

Average spend per user (ASPU) for broadband only is challenging to ascertain due to the prevalence of multi-play bundles in the markets considered. We have taken the estimates from Analysys Mason Research in order to analyse the trends, but we recognise the limitations of any attempt to attribute value to services within a bundle. The evolution of broadband ASPU in the case-study countries is shown in Figure 3.23.

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138   Includes xDSL and FTTH access

139   See: http://www.cnmc.es/Portals/0/Ficheros/Telecomunicaciones/Informes/Informes%20Anuales/2014/Informe%20Telecomunicaciones%20CNMC%202014.pdf
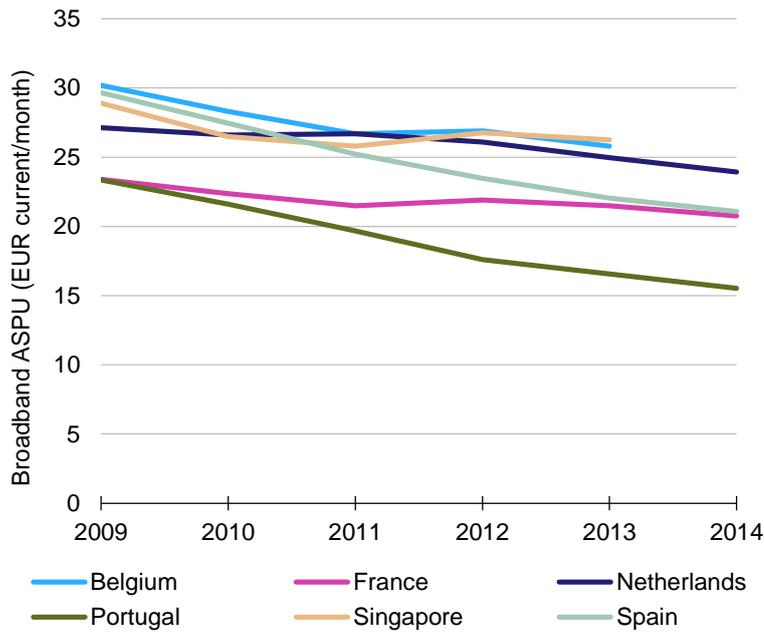
Figure 3.23: Benchmark of broadband ASPU [Source: National regulatory authorities, Analysys Mason Research, 2015]

It is clear that broadband ASPU has been falling in all countries (albeit to a lesser extent in Singapore). In Singapore, the migration to fibre appeared to enable a reversal of the downward trend in 2012, before a slight decline in 2013. Declines in France have also been more measured, but began at a lower starting point than most countries (probably due to the very aggressive LLU-based triple-play pricing of Free). The most rapid decline can be seen in Portugal, where no FTTH regulation has yet been applied; we may hypothesise that low cost levels, harsh economic conditions and competition between multiple infrastructures appear to have driven the price of broadband down.

A direct correlation between the regulatory interventions and broadband ASPU cannot be interfered, as there does not appear to have been an inflection point at the stage that the reported case study interventions were made. Nevertheless, wider competitive dynamics can be seen to be driving ASPU levels, and continued declines in most markets imply broadly competitive dynamics in the retail market.

3.3.5 Incumbent EBITDA margins

The competitive pressure being placed on a market can be assessed through the EBITDA margins of the incumbent. The figures shown in Figure 3.24 below are for the operator groups, so they include the mobile business of the incumbent, but are market-specific (i.e. Telefónica's figures are for Spain only).
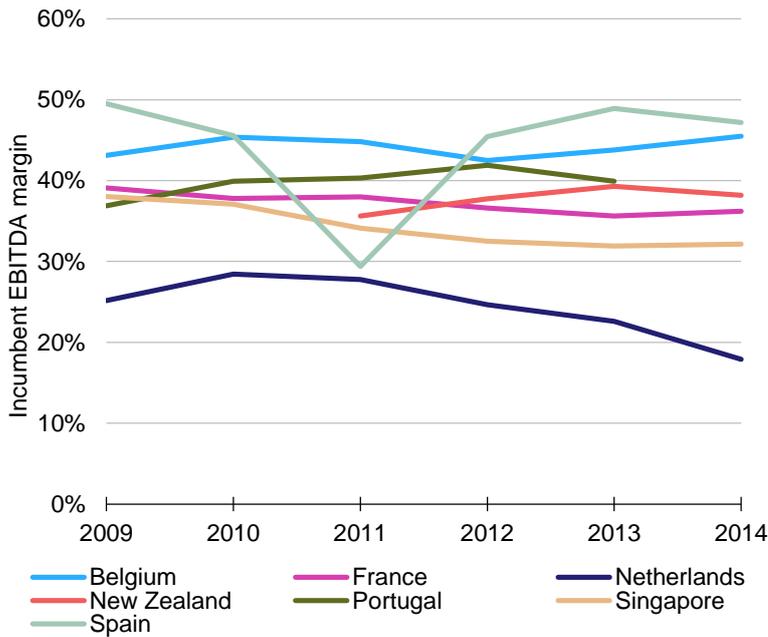
Figure 3.24: Incumbent
EBITDA margins
[Source: Operators'
annual reports, 2015]

The majority of incumbents saw a decline in EBITDA margins over the period 2009–2014, but in some cases the decline is slowing or has reversed (as is the case for Singapore France, and the Netherlands). In Belgium, an upward trend can be seen from 2013. Meanwhile, EBITDA margin levels for Telefónica in Spain have remained broadly stable, with the exception of the large-scale redundancy programme in 2011. Similarly, the EBITDA margin of Chorus in New Zealand appears relatively stable in the years for which data is available.

The absolute levels of EBITDA margin are also worth noting, with Belgium and Spain at over 45% in 2014, but KPN in the Netherlands achieving only 18% and the remainder lying between 30% and 40%. High margins should be expected for heavy infrastructure-based companies such as incumbent telecoms operators, and indeed this is the case, except for the Netherlands, which is the outlier. There is no evidence in the group EBITDA margins to suggest that NGA wholesale broadband access regulation (of any kind) has been particularly damaging to incumbent profitability.

3.3.6 Broadband speeds

One indicator of the take-up of NGA products is the speed of broadband plans to which end users subscribe. 'Speed' here refers to the advertised speed of a product, rather than the actual speed experienced. Very few regulators monitor the speeds delivered (actual compared to advertised speeds), the exceptions being France and Spain (see details in individual country case studies).

The take-up rate of higher speeds are likely to be higher in markets with both high levels of NGA coverage capable of these speeds and competitive offers for NGA products, because high price premiums for higher speeds are likely to deter use. Markets in which NGA has been widely deployed for a long time are also likely to have higher take-up rates (as shown in Figure 3.25), with take-up of NGA having grown steadily over time in most of these countries.

analysys
mason

Figure 3.25 shows the evolution of broadband connections with a speed of 30Mbit/s or more in the benchmark countries between 2011 and 2014.[140]
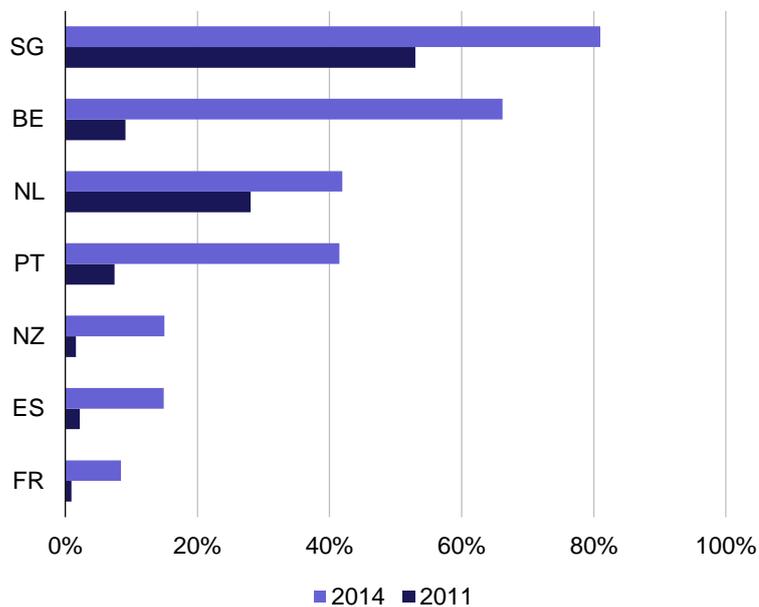

Figure 3.25: Broadband connections of 30Mbit/s or more as a proportion of total broadband connections [Source: EU Digital Agenda 2014, Ofcom ICMR,[141] Statistics New Zealand[142]]

Note: Figures are for January, except for New Zealand, where figures are for June. For Singapore, 2014 figures are in fact for 2013, and 2011 figures are for 2008

The highest take-up of connections above 30Mbit/s in 2014 can be seen in **Singapore** and **Belgium**, which have 100% and 96%[143] NGA coverage of households respectively, as well as competing cable and fibre networks[144] across the majority of the country.

A similar picture can be seen in the **Netherlands** and **Portugal**, where in both cases there is comparatively high NGA coverage and infrastructure-based competition (both between fibre and cable, as well as between competing fibre networks).

In comparison, the currently limited take-up of NGA in **France** and **New Zealand** may be explained by the lower levels of current NGA coverage (partly caused by the more-limited cable footprints, as well as the fact that deployment has occurred more recently). Similar factors may also have influenced the position in **Spain**, though in Spain cable coverage is higher than in **France** or **New Zealand**.

Considering connections of 100Mbit/s or more, the technology used plays a large role in the availability, and hence take-up, of services. Services of 100Mbit/s are possible with cable or FTTH, but not with current VDSL deployments. Markets that only have one network which is

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[140]   Between January 2011 and January 2014, with the exception of Singapore, for which the data is 2008 and 2013.

[141]   See http://stakeholders.ofcom.org.uk/binaries/research/cmr/cmr14/icmr/ICMR_2014.pdf

[142]   See http://www.stats.govt.nz/browse_for_stats/industry_sectors/information_technology_and_communications/internet-service-provider.aspx

[143]   Figure for cable coverage, however, VDSL coverage is almost as high at 89% of households

[144]   FTTH in Singapore; FTTC in Belgium

capable of offering these speeds will have a limited level of retail competition, which may deter take-up. This is evident in Figure 3.26 below.
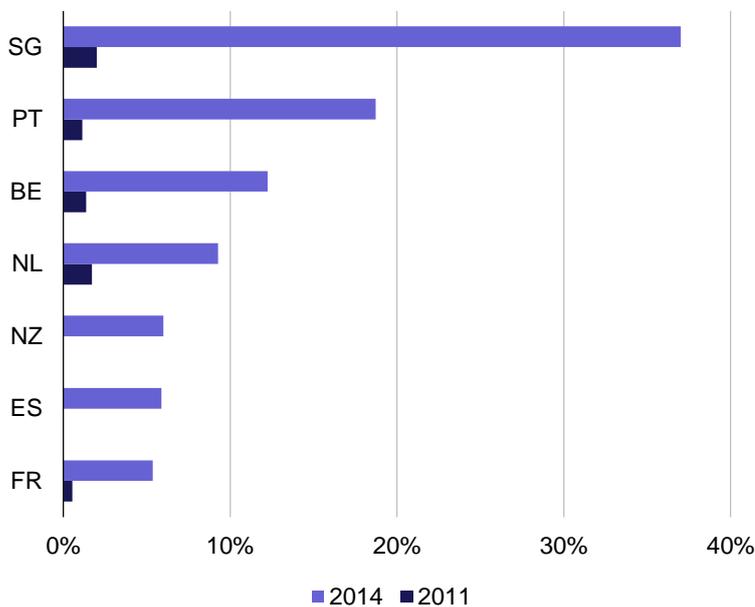

Figure 3.26: Broadband connections of 100Mbit/s or more as a proportion of total broadband connections [Source: EU Digital Agenda 2014, Ofcom ICMR,[145] Statistics New Zealand[146]]

Note: Figures are for January, except for New Zealand, where figures are for June. For Singapore, 2014 figures are in fact for 2013, and 2011 figures are for 2008

3.3.7 Summary

While there are certain common threads to the story told by the outcomes in the seven case studies, other than direct state investment directly leading to high FTTH coverage none of the specific interventions appears yet to have had a clear and directly measurable effect on the outcomes we have considered above.

This may be for a number of reasons:

• the number of interventions we have examined is small and it is possible that a larger sample is needed to enable the various impacts of different approaches to be tested
• the countries are very different, notably in the level of cable coverage, as well as having very different costs for FTTH deployment: the "path dependent" effects are also strong
• a diversity of approaches have been used in the selected countries
• many of these interventions are very recent or yet to come into effect, so it may be that a longer time is needed for any impacts to be seen.

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[145]   See http://stakeholders.ofcom.org.uk/binaries/research/cmr/cmr14/icmr/ICMR_2014.pdf

[146]   See http://www.stats.govt.nz/browse_for_stats/industry_sectors/information_technology_and_communications/internet-service-provider.aspx

4 Overview of the case studies

In Sections 5 to 11 we present the detailed case studies for our seven benchmark countries.

The case studies are structured as follows:

Context for the regulatory intervention

The context for the regulatory intervention is presented under three sub-headings:

- market environment before the regulatory intervention was made
- regulatory regime before the regulatory intervention was made
- policy objectives (behind the intervention).

The regulatory intervention itself

Our discussion of the regulatory intervention is split into several sub-sections:

- a summary of the intervention and the process for implementing it
- details of coverage obligations (where relevant to the intervention)
- details of the services provided as a result of the intervention
- pricing of the services introduced under the regulatory intervention
- any quality-of-service (QoS) obligations associated with the intervention.

Outcomes of the intervention

In order to review the outcomes of the intervention we present key market indicators over time and consider what impact the intervention has had on the historical trend, and whether the intervention has succeeded in achieving the policy objectives set out. We recognise the limitations of any such analysis in terms of attributing direct causality, and the impossibility of separating out wider market factors. Furthermore, in some instances the intervention is so recent that any impact on the market cannot yet be seen. Indeed, in some cases the intervention has not been finalised (e.g. Portugal).

The contents of this final section depend on the level of information available in each market. However, the key sub-sections include:

- NGA coverage
- broadband penetration and NGA take-up
- competition
- pricing
- profitability
- QoS.

Below we outline how each of these types of outcome can be linked back to

the regulatory intervention:

- *NGA coverage* is a key indicator of the success of regulatory remedies in incentivising infrastructure investment. In some cases the nature of the intervention has been to set a schedule for NGA coverage, based at least in part on public funding (e.g. Singapore and New Zealand), while in others NGA coverage is driven by private investment and market competition. In both cases, however, NGA coverage is a key outcome to review.

- Whilst not specific to NGA interventions, considering the level and trend in overall *broadband penetration* provides an indication of the attractiveness of offers across the market, and in effect, the level of competition (although we note that it is also driven by underlying economic and social factors, such as the age distribution of the population and affordability issues).

- *NGA take-up* is a good indicator of the attractiveness and competitiveness of NGA offers in a market. This can be considered both at a total market level and as a percentage of the premises passed by NGA (to provide a more comparable indicator).

  — Where available, we review the take-up of specific wholesale products, for example passive remedies, to understand whether the specific remedies have proved sufficiently attractive for third-party operators to adopt them

- *Competition* is firstly considered in terms of the market share of broadband subscribers. Because the NGA market is still relatively new in many countries and only limited data is available, we consider market share across broadband as a whole, not just NGA products. By reviewing the trends in overall market share we can seek to understand whether the remedies imposed have had a significant impact on competition (noting that wholesale access remedies are just one of many factors).

  — Where available, we also consider market share of NGA products specifically

- A further indicator of levels of competition in each market is the *pricing of broadband services* and/or spend per user. Where available, we have reviewed the trends in ASPU to understand whether the regulatory intervention has had an impact on the overall market trend. Elsewhere, we have reviewed retail prices to understand the current positioning of

NGA products and levels of competition between operators

- An assessment of the *profitability* (EBITDA margins) of the operators in the market also provides an indication of the level of competition in the market. This analysis is limited by the fact that the margins include the mobile operations of the operators in question; however, any significant impact of the regulatory intervention on either the SMP operator (which is the subject of the regulation) or the other operators (which should benefit from it) should be evident.

- Finally, considering the evolution of *QoS* indicates how customer experience has improved as a result of the intervention. Unfortunately, statistics relating to QoS are very limited, and different regulators report on very different aspects of QoS, which means it can be challenging to draw comparative conclusions. Nevertheless, where possible, we have commented on in-country trends.

Documents referenced and quoted in each case study are included as footnotes, and a full bibliography is included in Annex A.

5 Belgium

5.1 Summary

Within Belgium, we have considered the wholesale access regulation applied to cable networks.

The Belgian regulator, the BIPT, requires the five (non-overlapping) cable operators in Belgium to offer their analogue and digital TV as well as DOCSIS3.0 broadband services as a wholesale service for third-party operators to resell. Wholesale broadband services are only available as part of a double-play offer. The regulation is asymmetric, and the regulated pricing is based on a retail-minus calculation. As a resale offer, there is no point of interconnection per se; however, in order to achieve nationwide coverage, a third-party operator would need to set up resale agreements with all five cable operators.

Figure 5.1 below summarises the current NGA regulation in Belgium, by network type, type of remedy and geographic area, stating where the point of interconnection lies, whether the regulation is symmetric or asymmetric, and what the pricing model is.

Further details can be found in the full case study that follows.

Figure 5.1: Summary of NGA regulation in Belgium [Source: Analysys Mason, 2015]

Network type	Regulation type	Geographic application	Point of interconnection	Symmetric / asymmetric	Pricing model
Cable regulation (DOCSIS 3.0)	Resale	Five geographically distinct markets corresponding to the coverage areas of the five individual cable operators, together giving a nationwide application	N/A – resale product only	Asymmetric	Price control, retail minus. The wholesale price removes VAT, a copyright contribution, a contribution for the promotion of audiovisual content and a contribution for the funding of local TV. Avoidable costs are also added back, including billing, marketing, consumer premises equipment and a 5% return on sales. This results in a 20% discount for Coditel and a 23% discount for Telenet, Brutélé and Tecteo[147]

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[147] See https://circabc.europa.eu/sd/a/b5b79eb4-c11d-471a-a957-2e29227bdda6/BE_2013_1511_FRCSA.pdf

5.2 Market and regulatory context

5.2.1 Market environment before the regulatory intervention was made

In 2010, prior to the introduction of cable regulation, cable networks represented 45%[148] of all broadband subscribers in Belgium. With a footprint of 96% of households in Belgium, the cable networks represented a real competitor to ADSL (99% coverage).[149]

The structure of the cable market in Belgium has not changed since 2010. There are five cable operators in Belgium, operating under three retail brands (Telenet, Numericable[150] and VOO). Cable network operators Brutélé and Tecteo are both owned by VOO and provide services under the VOO brand. AIESH owns its own cable network, but does not offer retail services under the AIESH brand. Instead it sells services wholesale to Numericable (which are then sold at a retail level under the Numericable brand). Numericable also owns its own cable network, over which it sells retail services under the Numericable brand. Each operator has its own distinct geographical coverage area (see Figure 5.2 below).

In 2001, the former incumbent, Belgacom (now branded Proximus), led the fixed broadband market with a 46% share of broadband subscribers, closely followed by Telenet, the largest cable operator by subscribers with 36% of the broadband market. Beyond this, the market was very fragmented, with LLU operator BASE (owned by KPN Netherlands) holding 5%, and the other cable operators plus Mobistar and other smaller operators making up the remaining 12%.[148]

The bundling of products was very widespread. At the beginning of 2010, 54% of Internet users subscribed to a broadband offer within a bundle and 44% of Internet users had a bundle offer that included digital TV.[151]

5.2.2 Underlying regulatory regime

The Belgian Institute for Postal services and Telecommunication (BIPT) regulates the telecoms sector in Belgium.[152]

Proximus owns and operates the copper infrastructure in Belgium and is required to provide passive (LLU) and active (bitstream) wholesale products.

Belgium's cable network sector is regulated by the following regional media regulation bodies:

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[148] Analysys Mason *DataHub*, extracted May 2015.

[149] EC Broadband Coverage; see https://ec.europa.eu/digital-agenda/en/pillar-4-fast-and-ultra-fast-internet-access (for cable coverage) and TeleGeography (for DSL coverage).

[150] Formerly known as Coditel, and still referred to as Coditel by the EC and the CRC in Belgium.

[151] See https://circabc.europa.eu/sd/a/e72c7e98-23e8-4328-a61c-e46b42a06a96/BE-2011-1227-1228%20Acte_EN+date%20et%20nr-public.pdf (footnote 13, page 3)

[152] We note that the EC referred Belgium to the European Court of Justice in October 2014 for failure to guarantee the independence of its regulator, the BIPT; see http://europa.eu/rapid/press-release_IP-14-1145_en.htm. As this process is not directly relevant to this exercise, we have not reviewed this in more detail.

- the BIPT (which has additional media regulation responsibilities) – for the region Brussels-Capital
- the Conseil supérieur de l'audiovisuel (CSA) – for the bilingual French-speaking region
- the Vlaamse regulator voor de media (VRM) – for the Dutch-speaking region
- the Medienrat – for the German-speaking region.[153]

The four regulators co-ordinate their decision-making via the Conference of Electronic Communications Sector Regulators (CRC).

Regulation of wholesale access to Belgium's cable networks has been applied via the 'retail market for the delivery of broadcasting signals and access to broadcast networks', rather than the wholesale broadband access market. Furthermore, the primary goal of the regulation is to address competition in the TV market; broadband is only regulated as a service which is ancillary to TV (when bundled and not on a standalone basis).

This approach has been somewhat contentious, with significant comments in the Article 7 process and a number of legal appeals (see Section 5.3.1 below).

5.2.3 Policy objectives

Wholesale regulation of cable companies is in line with the BIPT's strategic plan to "level the playing field" and to "incentivise competition in terms of infrastructure and services in the context of convergence".[154] Its objectives include:

> *"By providing broadband and television to alternative operators at the wholesale level through competing infrastructures (cable + Belgacom network) clear infrastructure competition is created, which should lead to lower prices and a better service to the benefit of competition. As a matter of fact it is then possible for alternative operators to buy wholesale products from the cable operator or from Belgacom."[155]*

Commenting on the opening of the cable market to competition, the presidents of the four regulators concurred that it would help to reduce the prices of triple-play packages and increase the choice of suppliers for consumers.[156]

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[153] See https://circabc.europa.eu/d/d/workspace/SpacesStore/5ab26be8-e463-49a7-8a10-363a4d577be0/BE-2013-1485%20Adopted_EN.pdf

[154] BIPT's 2011 Annual Report. Available at http://www.bipt.be/public/files/en/20836/BIPT_IBPT_2011_EN.pdf

[155] BIPT's 2010 Annual Report. Available at http://www.bipt.be/public/files/en/1136/3648_en_bipt_2010_en.pdf

[156] See http://csa.be/breves/511

5.3 Regulatory interventions

5.3.1 Summary

The process of liberalising the cable market began in December 2010, when the CRC launched a consultation proposing that the cable networks should be opened up to competition.

The consultation concerned the '*retail market for the delivery of broadcasting signals and access to broadcast networks'*.[157] This market was not included in the EC's list of relevant product and service markets susceptible to ex-ante regulation, and so in order to apply ex-ante regulation the CRC had to demonstrate that the market satisfied the following three criteria:

• presence of high and non-transitory barriers to entry
• a market structure which does not tend to move towards a state of effective competition
• inability of competition law alone to remedy the failure of the market.

The CRC defined geographically distinct markets corresponding to the coverage areas of the five individual cable operators, on the premises that there was no demand and/or supply substitutability among them, as shown in Figure 5.2.
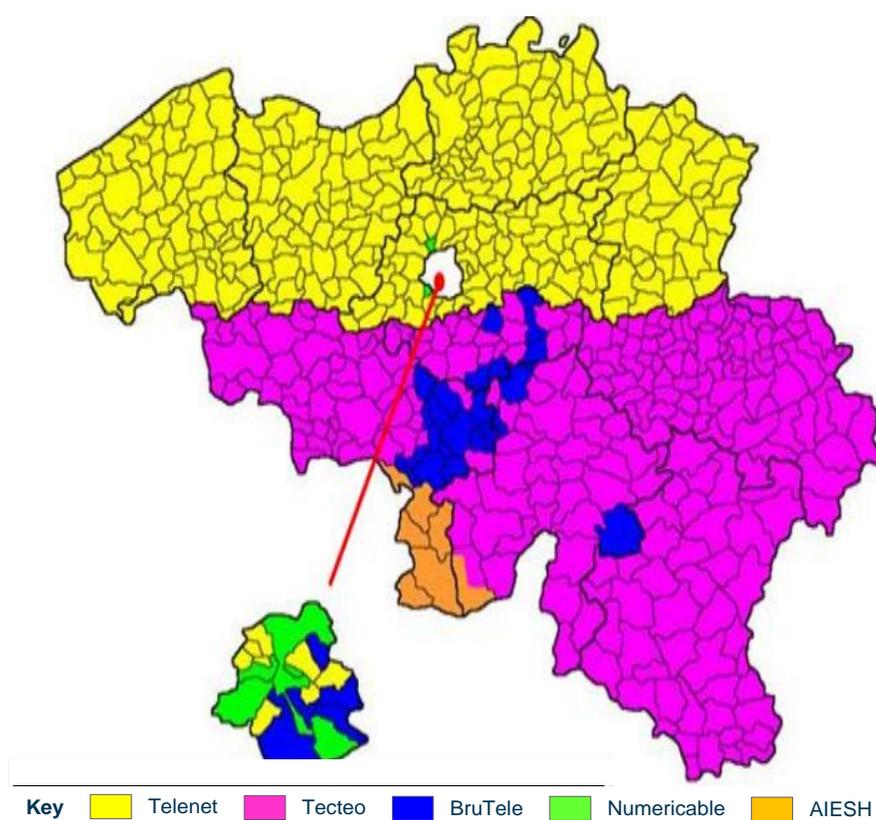

Figure 5.2: Coverage areas of cable operators [Source: BIPT][158]

Key: Telenet | Tecteo | BruTele | Numericable | AIESH

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[157] See http://www.bipt.be/fr/operateurs/telecom/marches/radiodiffusion/analyse-de-marche-radiodiffusion-televisuelle-2011/projet-de-decision-du-conseil-de-libpt-concernant-l-analyse-du-marche-radiodiffusion-televisuelle

[158] See http://www.bipt.be/fr/operateurs/telecom/marches/radiodiffusion/analyse-de-marche-radiodiffusion-televisuelle-2011/decision-de-la-conference-des-regulateurs-du-secteur-des-communications-electroniques-crc-du-1er-juillet-2011-concernant-lanalyse-du-marche-de-la-radiodiffusion-televisuelle-sur-le-territoire-de-la-region-bilingue-de-bruxelles-capitale

Each operator was designated as having significant market power in its coverage area. The reasons for this designation related to issues such as: their market share, the difficulty of duplicating their infrastructure, the high barriers to switching (resulting from the take-up of bundled offers), as well as the advantage that analogue TV can be broadcast to up to four TV sets concurrently (compared to just one or two for the competing IPTV).

The proposed remedies included:[11]

- A mandated analogue TV resale offer for all cable operators, open to any retail service provider.[159]

- Mandated access to the operator's digital-TV platform for all operators except AIESH,[160] only for those operators that use the analogue TV resale offer of the same operator. Belgacom was not initially eligible for this offer, firstly because it already marketed a digital TV retail service on its own network, and secondly because allowing it access to the cable company's offer was deemed to be a disincentive for network investment. In May 2015, the Brussels Court of Appeal annulled the exclusion of Belgacom, stating that the BIPT did not have authority to impose such an exclusion.[161]

- A mandated broadband Internet resale offer, applicable to all operators except AIESH and only open to operators which use the analogue-TV and digital-TV platform offers from the same operator. Belgacom was also initially excluded from this offer, until the recent decision of the Brussels Court of Appeal annulled this exclusion.

- A requirement for the wholesale access offers (both TV and broadband) to adhere to the principles of transparency (obligation to publish a reference offer), non-discrimination and price control.

Belgium's Competition Council supported the draft measures, on the grounds that they would help to stimulate competition for services on the cable platform, while also noting that the increasing prevalence of bundled offers would need to be assessed more thoroughly, as it could warrant the identification of a new, separate market.[162]

However, the EC made a significant number of comments, arguing that:[163]

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[159] Analogue TV obligations were maintained, due to the importance of the service in supporting multi-room solutions as well as the high proportion of analogue TV users (by the end of 2010, 41% of TV viewers in Belgium received only an analogue TV signal, 40% received both analogue and digital, and the remaining 19% received only a digital TV signal). See http://www.bipt.be/en/operators/telecommunication/Statistics/data/i-data-2013

[160] As of December 2010, AIESH did not provide a complete digital TV offer, as its network was not capable of providing bidirectional communication and interactive services.

[161] See http://www.bipt.be/fr/operateurs/ibpt/litiges/annee-2015/arret-de-la-cour-d-appel-de-bruxelles-du-13-mai-2015-relatif-aux-requetes-de-publifin-brutele-aiesh-coditel-brabant-et-belgacom-demandant-lannulation-de-quatre-decisions-de-la-conference-des-regulateurs-du-secteur-des-communications-electroniques-crc-du-1

[162] See http://www.bipt.be/fr/operateurs/telecom/marches/radiodiffusion/analyse-de-marche-radiodiffusion-televisuelle-2011/avis-du-conseil-de-la-concurrence-sur-le-projet-de-decision-de-l-ibpt-concernant-l-analyse-du-marche-de-la-radiodiffusion-televisuelle

[163] See https://circabc.europa.eu/sd/a/bced7f4e-4870-49f3-a1ec-d00bae5d2d50/BE-2011-1229%20Acte_EN+date%20et%20nr-public.pdf

- The imposition of wholesale obligations following an assessment of market failure in the retail market is insufficient. In this case, the CRC needs to conduct market analysis of the notional upstream wholesale market, before it can sufficiently justify these measures.

- The identification of the relevant retail market fails to take into account the entry of Belgacom and Alpha Networks into IPTV, as well as Mobistar's entry into digital satellite TV. Furthermore, it does not reflect the potential increase in broadcast competition arising from the requirement for Belgacom to offer multicast services to alternative operators,[164] or the impact of the proliferation of multi-play services.

- The proportionality of the broadband Internet resale obligation is questioned. Alternative operators can already compete in the multi-play services field through the mandated wholesale broadband and multicast offers of Belgacom; in addition the wholesale broadband offer of the incumbent provides more flexibility for product innovation than a broadband resale offer.

- The proportionality of the analogue TV resale obligation is questioned. The EC suggests that the importance of broadcast on multiple TV sets has been overestimated and that the suggested expectation of pricing innovation by alternative operators cannot be guaranteed, given that monthly subscription fees are regulated and that it will be more costly for smaller operators to acquire the contents rights. Finally, the inclusion of Belgacom as one of the beneficiaries of this obligation is questioned, given that its digital TV offering already covers almost all of the country.

- The analogue TV resale obligation risks empowering legacy technologies and hampering the investment in digital infrastructure and product innovation.

The EC concluded that the CRC should take utmost account of these comments as part of future reviews, but could adopt the draft measures in the meantime.

The CRC's Decision regarding the wholesale obligations on cable operators was published in July 2011,[165] and all five cable companies filed an appeal against it. By the end of 2012, the Brussels Court of Appeal had rejected all the appeals, on the grounds that the imposed obligations did not cause any serious and irreparable damage to the cable operators.[166]

This paved the way for the CRC to launch public consultations on qualitative and quantitative aspects of the cable operators' reference offers, in December 2012 and April 2013 respectively.[167]

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[164] Since July 2011, Belgacom has been mandated to provide multicast or equivalent functionality in its reference offer.

[165] See http://www.bipt.be/fr/operateurs/telecom/marches/radiodiffusion/analyse-de-marche-radiodiffusion-televisuelle-2011/decision-de-la-conference-des-regulateurs-du-secteur-des-communications-electroniques-crc-du-1er-juillet-2011-concernant-lanalyse-du-marche-de-la-radiodiffusion-televisuelle-sur-le-territoire-de-la-region-bilingue-de-bruxelles-capitale

[166] See http://www.bipt.be/fr/operateurs/press-release/52-la-cour-dappel-de-bruxelles-rejette-la-demande-de-suspension-de-brutele-tecteo-et-numericable-a-lencontre-de-louverture-du-cable

[167] See http://www.bipt.be/public/files/fr/20981/Communication+March%C3%A9+radiodiffusion+t%C3%A9l%C3%A9visuelle.pdf

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Qualitative aspects

The consultation on qualitative aspects of the reference offer began in December 2012.[168]

The proposed draft measures include specifications with regard to notification of modifications, video-on-demand services, interactivity, conditional access system, service-level agreements, key performance indicators, contract termination terms, and certification of technicians and equipment, as well as allowing some flexibility on certain technical aspects.[169]

During the consultation, the EC reiterated its concern over the proportionality of the analogue TV resale obligation. The main points made included the diminishing market share of analogue TV, as well as the potential for hindering investments in digital infrastructure.[170]

The CRC's Decision came into effect in September 2013.[171]

Quantitative aspects

The consultation on the quantitative aspects of the reference offer began in April 2013.[172]

The consultation proposed that all operators should follow a standard retail-minus costing methodology for their analogue TV, digital TV platform and broadband Internet offers. The retail price would be linked to the ARPU of each service component of each operator, and the discount applied to the wholesale tariffs would be fixed for each operator.[173] In comparison, the upfront non-recurring costs (i.e. acquisition costs) of each offer would be benchmarked against Coditel,[174] which is considered the efficient operator in this case (see the *Pricing* sub-section of Section 6.3.3 below for more details).

In its registered notifications, the EC questioned:[175]

• The appropriateness of certain assumptions of the proposed methodology. More specifically, it commented that although Coditel's non-recurring cost figures may constitute better proxies than those of other operators, these figures still need to be tested for efficiency. In addition, it commented that there is insufficient evidence to explain why the CRC could calculate the

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168   See http://www.bipt.be/fr/operateurs/telecom/marches/radiodiffusion/offres-de-reference-cablo-operateurs

169   For example, cable operators were allowed to choose one of three options for provision of the conditional access system to the alternative operator, according to the system's compatibility with their network architectures.

170   See https://circabc.europa.eu/d/d/workspace/SpacesStore/5ab26be8-e463-49a7-8a10-363a4d577be0/BE-2013-1485%20Adopted_EN.pdf

171   See http://www.bipt.be/fr/operateurs/telecom/marches/radiodiffusion/offres-de-reference-cablo-operateurs?page=1

172   See https://circabc.europa.eu/sd/a/b5b79eb4-c11d-471a-a957-2e29227bdda6/BE_2013_1511_FRCSA.pdf

173   The retail price for bundled offers (dual play) would be equal to the sum of the ARPUs of the individual components of the bundle. No comment was made for triple-play and quad-play offers.

174   Now branded Numericable.

175   See https://circabc.europa.eu/sd/a/df55ec84-606e-4e0e-bfe5-3741c07ba46e/BE-2013-1511%20Adopted_EN_fin.pdf

ARPUs relevant to single play and dual play but not those relevant to triple play or quad play.[176]

- The appropriateness and proportionality of the proposed regulatory approach. Given the fact that neither Belgacom nor any other cable operator wishing to expand its footprint has shown any interest in an analogue TV resale offer, Mobistar remains the only party that has expressed an interest so far. Given this limited level of interest, the EC urged the CRC to conduct a new market analysis, with a view to lifting any unnecessary regulation in this market.

In addition, the market for 'delivery of broadcast signals and access to broadcast networks' involves similar investment decisions to those in the market for wholesale broadband access, in relation to infrastructure roll-out and maintenance. As such, the EC urged the CRC to consider aligning the costing methodologies employed in these markets.

In its final decision,[177] which came into effect in October 2013, the CRC defended its approach of using Coditel's cost figures as a good proxy, stating that:

- OPTA in the Netherlands had previously used cost figures from UPC and Ziggo as proxies.

- The realistic nature of Coditel's figures is reinforced by the fact that the cost estimates provided by Belgacom and Mobistar during the preceding national consultation were similar to or lower than those of Coditel,[178] and in any case lower than those of the other cable operators.

- The non-recurring implementation costs cannot be estimated using the standard retail-minus methodology, since these charges are not passed through to customers, and so there are no retail prices to use as a starting point.

In May 2015, Belgium's Court of Appeal rejected a new appeal from Coditel, Tecteo and Brutélé against the cable wholesale obligations, after having reached the same conclusion for Telenet in November 2014.[179,180] In addition, the court accepted Belgacom's appeal against its exclusion from the beneficiaries of the offers of access to the digital TV platform and broadband Internet resale of cable operators (i.e. Belgacom would be allowed to purchase wholesale digital TV and broadband services from cable operators).

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[176] The rationale for CRC's exclusion of triple play is not evident; however, in reference to quad play, the regulator commented that quad play represented only a very small proportion of households and that cable operators in particular held a very small proportion of these subscribers. See footnote 100 in https://circabc.europa.eu/sd/a/b5b79eb4-c11d-471a-a957-2e29227bdda6/BE_2013_1511_FRCSA.pdf

[177] See https://circabc.europa.eu/sd/a/b5b79eb4-c11d-471a-a957-2e29227bdda6/BE_2013_1511_FRCSA.pdf

[178] These figures were used as a sense-check, but are not directly comparable to the network economics of cable operators.

[179] See http://www.bipt.be/fr/operateurs/ibpt/litiges/annee-2015/arret-de-la-cour-d-appel-de-bruxelles-du-13-mai-2015-relatif-aux-requetes-de-publifin-brutele-aiesh-coditel-brabant-et-belgacom-demandant-lannulation-de-quatre-decisions-de-la-conference-des-regulateurs-du-secteur-des-communications-electroniques-crc-du-1

[180] See http://www.bipt.be/fr/operateurs/ibpt/litiges/arret-de-la-cour-d-appel-de-bruxelles-du-12-novembre-2014-relatif-a-la-requete-de-telenet-demandant-l-annulation-de-la-decision-de-la-conference-des-regulateurs-du-secteur-des-communications-electroniques-crc-du-1-juillet-2011-concernant-l-analyse-du-marc

Following this ruling and taking into account Mobistar's complaints that high cable wholesale prices did not enable a profitable entry to the market,[181] on 27 May 2015 the CRC began a consultation[182] on the revision of the cable wholesale tariffs in order to ensure that tariffs are not affected by unrelated network costs and do not suffer unjustified variations due to changes in retail rates. The consultation includes a methodology for valuing the costs of value-added services (e.g. Wi-Fi access, second-screen solutions, email, web page hosting, content provision, other services) that should be excluded from the calculation of the retail price. In addition, it presents a new formula for calculating the wholesale discount for acquisition costs and a formula for estimating the price of the customised products available to the alternative operators.[183]

5.3.2 Features

Services provided

In order to ensure a sufficiently rich product portfolio and give alternative operators an opportunity for differentiation, the CRC requires each cable operator to make at least five of its own active offers available for wholesale,[184] plus two customisable offers at the request of the retailer.[185]

Specific wholesale reference offers are not published, because the operator seeking a wholesale service may select any five retail tariffs from the cable operator and apply the regulatory wholesale discount (outlined in Figure 5.3) to these. The customisable offers are not published by definition (i.e. they will be created separately for each specific operator which requests them).

Pricing

The reference offer prices of cable operators are to be determined using a retail-minus methodology, as described in the following formula:

*Wholesale price = (retail price – VAT – copyright contribution – contribution for the promotion of audiovisual content – contribution for the funding of local TV) * (1–M%)*

'*M*' incorporates all avoidable costs of selling services wholesale (rather than retail), including billing and bad debt, marketing, sales, customer services, costs for modems and set-top boxes, costs for installation and repair as well as a 5% return on sales.

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[181] See http://www.belga.be/fr/press-release/details-43643/?langpr=FR

[182] See http://www.bipt.be/public/files/fr/21479/Projet_de_decision_Retail_Minus_Ver_2015-06-17.pdf

[183] For the benefit of service innovation, alternative operators are allowed to make reasonable demands to the cable operators for the provision of two customised products (a product is defined as a unique combination of download speed, upload speed and download volume) that are different from the existing product offering of the cable operators.

[184] Each offer corresponds to a product with a unique combination of download speed, upload speed and data allowance.

[185] See http://www.bipt.be/public/files/fr/21023/telenet_+FR.pdf, http://www.bipt.be/public/files/fr/21022/codite_+FR.pdf and http://www.bipt.be/public/files/fr/21021/brutele_FR.pdf

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The resulting discounts are presented in the following table.

Figure 5.3: Value of wholesale discounts [Source: CSA[186]]

	Coditel	Telenet	Brutélé	Tecteo
Analogue TV	20%	30%	30%	30%
Digital and analogue TV	20%	30%	30%	30%
Dual play (analogue and digital TV plus broadband)	20%	23%	23%	23%

QoS obligations

In Belgium, a series of minimum service levels are defined within each of the individual cable company reference offers.[187] These include key processes, namely timescales for confirmation of receipt of request, completion of installation (including line ready for use notification) and repair timescales. Furthermore, penalties for any delays in the provision of service are stipulated, as a percentage of monthly rent. In addition to these, cable companies must provide reports on the network KPIs to wholesale customers on request.

A 'learning curve' was applied before which the SLAs would apply to enable the cable operators to rectify any teething problems. In addition, provisions are also made to allow exceptional circumstances under which the SLAs would be waived / timescales extended (stop-clock principle).

The BIPT emphasises the principle of non-discrimination and in addition, required that the KPIs and SLAs defined by all cable companies must be the same in order to enable third party operators to deliver a consistent quality of service nationwide.

Specific QoS for service levels on traffic are not specified, however, the principles of non-discrimination with the cable operator's own retail subscribers are applied.

5.4 Outcomes of the interventions

We note the limitations of attributing any direct causality between the regulatory intervention and the outcome achieved in each case, and where possible we have flagged to what extent a causal link may be drawn, and where external factors may have had a more significant influence.

Furthermore, we note that in Belgium specifically, the regulatory intervention has been implemented so recently that an assessment of outcomes cannot readily be made.

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[186]   See https://circabc.europa.eu/sd/a/b5b79eb4-c11d-471a-a957-2e29227bdda6/BE_2013_1511_FRCSA.pdf

[187]   See, for example, http://www.bipt.be/public/files/fr/21023/telenet_+FR.pdf, P93

5.4.1 NGA roll-out

Overall, cable networks covered 96% of households across Belgium in 2013. This compares to 89% household coverage[188] of VDSL in 2014 (out of total ADSL network coverage of 99%[189]).

These coverage levels cannot be linked back to the cable wholesale access regulation reviewed above, as the networks were already in place before the regulation was introduced.

There has been very limited FTTH deployment to date, with FTTH networks covering only 0.8% of households, as shown in Figure 5.4. Again, it should not be assumed that the wholesale cable access regulation has somehow limited FTTH deployment by the incumbent, but rather its choice to use VDSL coverage is the primary factor here.
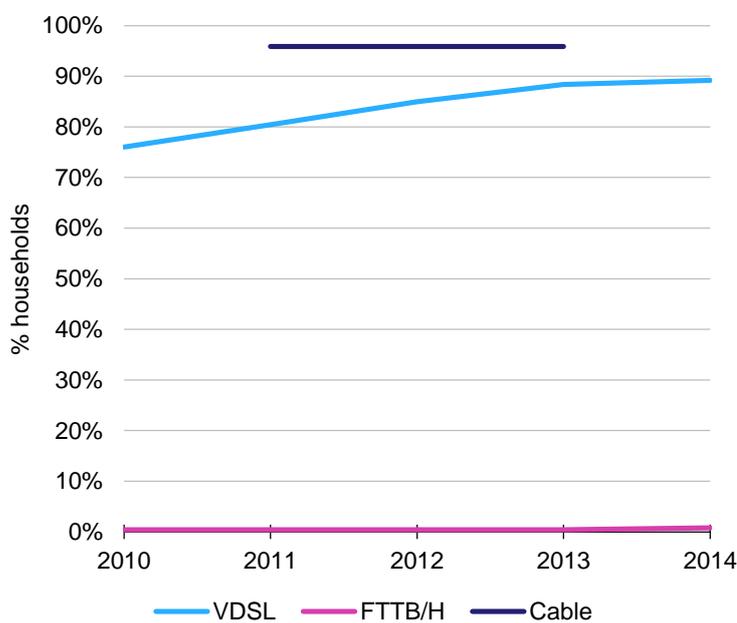

Figure 5.4: Proportion of households passed by broadband technology in Belgium [Source: EC Broadband coverage,[190] Analysys Mason Research,[191] June 2014]

5.4.2 Broadband penetration and NGA take-up

Broadband penetration of households in Belgium was 83% at the end of 2013,[192] having risen from 68% in 2009, as shown in Figure 5.5. Given that none of the operators in Belgium yet offers retail services based on the cable wholesale service, no inference can be made regarding the impact of the regulation on the penetration trends.

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[188] Note: the figures available are for premises only, however, for the purposes of the analysis we have assumed the same percentage coverage of households and premises.

[189] Extracted from TeleGeography, May 2015.

[190] See https://ec.europa.eu/digital-agenda/en/pillar-4-fast-and-ultra-fast-internet-access

[191] Analysys Mason, *FTTx roll-out and capex worldwide: forecasts and analysis 2014–2019*.

[192] Full-year data for 2014 is not yet available from the BIPT.
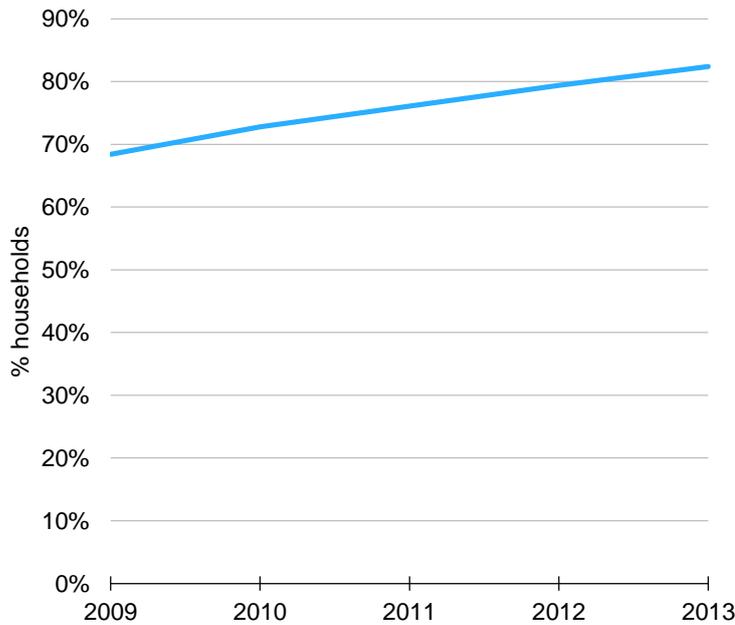
Figure 5.5: Broadband penetration of households in Belgium [Source: BIPT report: Economic situation of the telecoms sector 2013]

In terms of the market shares of competing technologies, cable became the most popular technology in 2013, achieving a 52% market share by the end of 2014. In contrast, despite VDSL being available since 2009, xDSL technologies have continued their slow decline, reaching a 47% market share by the end of 2014. The share of cable cannot be attributed to wholesale cable access obligations, as to date, there have not been any retail offers launched based on the regulated services.
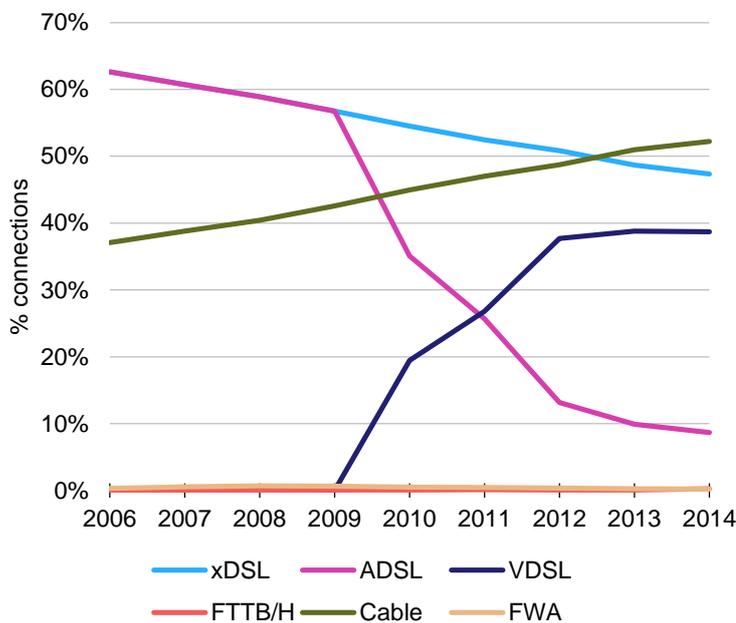

Figure 5.6: Market share of broadband connections in Belgium, by technology [Source: Analysys Mason DataHub, extracted May 2015]

5.4.3 Competition

Despite gradual erosion in its market share (declining from 48% in 2006 to 43% in 2014), Belgacom has maintained its leading position in the broadband market in Belgium. This has been

achieved through inorganic growth (acquisition of Scarlet in 2009) as well as network upgrades to enable more effective competition with cable (e.g. deployment of VDSL2, dynamic line management and vectoring).

In comparison, Telenet has been steadily increasing its market share (from 31% in 2006 to 38% in 2014), offering broadband speeds of up to 200Mbit/s.

The market share of the smaller cable operators has experienced solid growth, from 4.5% in 2006 to 14.4% in 2014, with VOO accounting for 12.9% and Numericable for 1.5%. We note that the cable operator footprints do not overlap, and so they do not compete directly with one another.[193]

Meanwhile, KPN has seen its market share decline throughout this period; in December 2014 it announced plans to withdraw from the fixed-line business,[194] before its acquisition by Telenet was announced in April 2015 (subject to regulatory approval).[195] A similar trend can be seen among other (DSL) operators.

The market share trends cannot be attributed to wholesale cable access obligations, as to date, there have not been any retail offers launched based on the regulated services.
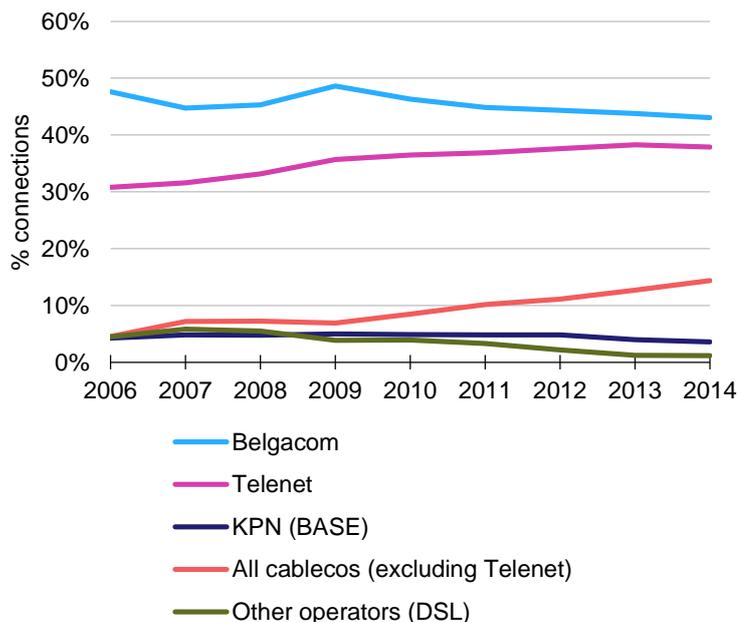

Figure 5.7: Broadband market share of connections [Source: Operator financial reports and Analysys Mason Research DataHub, extracted May 2015]

5.4.4 Pricing

The average revenue per user (ARPU) on broadband services has been in decline, falling from EUR31.80 in 2008 to EUR25.80 in 2013, as shown in Figure 5.8 below. Continued reductions can be attributed to increased competition in the industry, as well as the growing popularity of bundles (resulting in a discount on the broadband component).

The ASPU trends cannot be attributed to wholesale cable access obligations, as to date, there have not been any retail offers launched based on the regulated services.
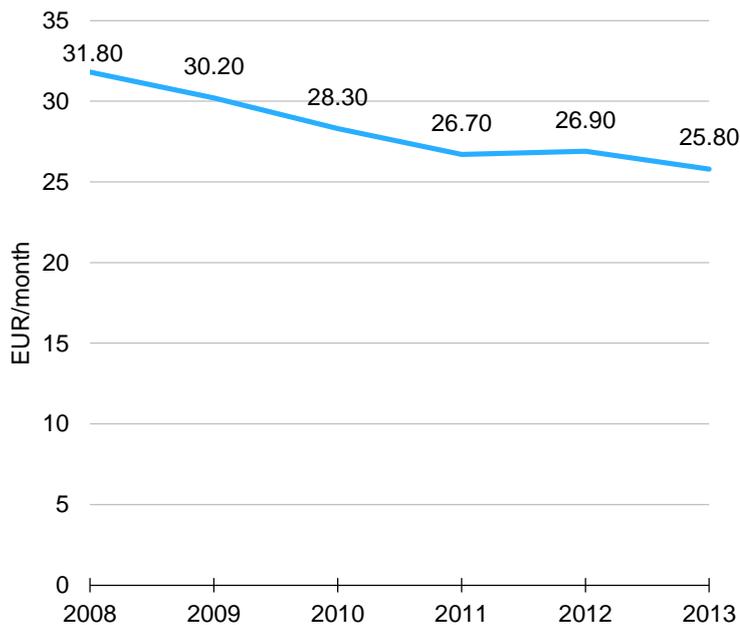

Figure 5.8: Broadband average revenue per user [Source: BIPT report: Economic situation of the telecoms sector 2013]

Figure 5.9 shows that between 2010 and 2013 the percentage of broadband connections sold in multi-play bundles rose from 67% to 81%, while the average number of revenue-generating units (RGUs) per broadband subscriber increased from 2.1 to 2.5. This proliferation of bundles means that operators profit from lower costs and a decreased churn rate and so can offer the bundled products at a discount, thus exerting downward pressure on the price of broadband.
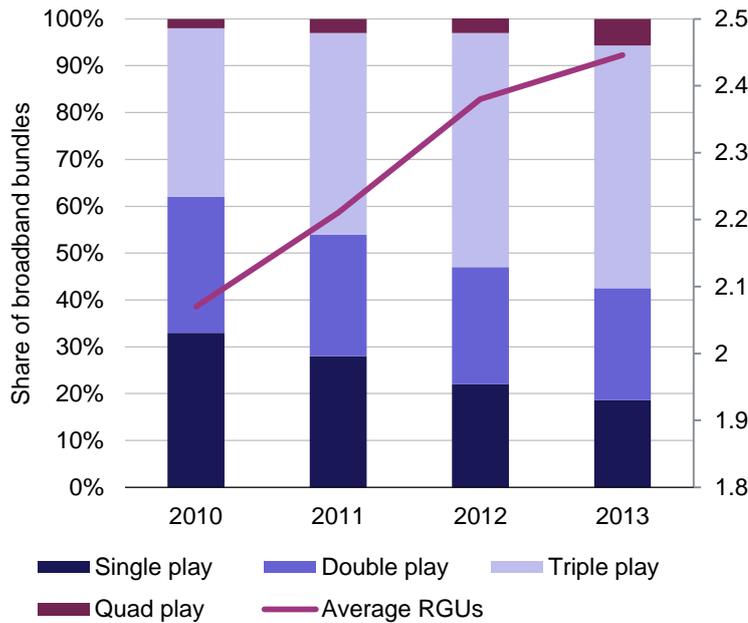
Figure 5.9: Evolution of broadband bundles [Source: Analysys Mason, BIPT, 2015]

5.4.5 Profitability

Considering the EBITDA margins of operators in Belgium (see Figure 5.10), incumbent Belgacom has managed to maintain a relatively steady EBITDA margin since 2009, despite a decline in market share. Telenet's margin has increased in line with its own market share gains, and similarly KPN's margin has fallen following significant market share losses.

It remains to be seen what impact the wholesale cable access regulation will have on the margins of Telenet and the smaller cable operators.
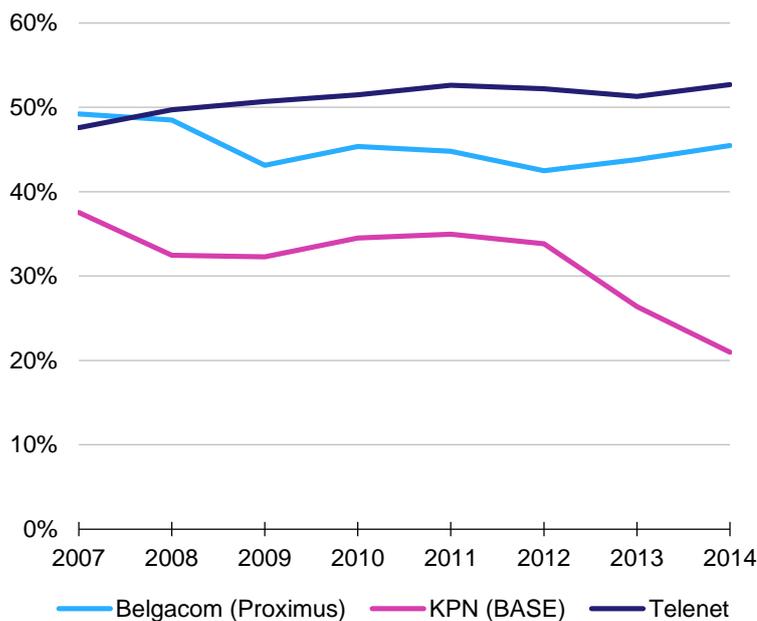

Figure 5.10: EBITDA margin by operator [Source: Operator annual reports]

All margins are at a Group level (i.e. include mobile activities), but are specific to Belgium

Margins for Belgacom are for the consumer business unit (i.e. exclude business customers)

5.4.6 Quality of service

The BIPT does not currently provide statistics on broadband service quality.

6 France

6.1 Summary

Within France, we have considered the passive and active regulation of FTTH and VDSL.

The French regulator, ARCEP, has adopted a very firm stance on the use of passive remedies for FTTH network access. Active remedies are only applied to VDSL. Remedies include duct access, vertical access and dark fibre. Dark fibre remedies are symmetric and are split by geographic area and the point of interconnection varies by geographic area, but is always at a local level (either a building, cabinet or exchange). Vertical building access is also symmetric. Duct access and VDSL-CO regulation is asymmetric (i.e. only applies to the incumbent, Orange). Pricing for symmetric remedies is commercially negotiated with an uncalibrated "shell" model provided for guidance, whilst asymmetric regulated access products are based on a published reference offer.

Figure 6.1 below summarises the current NGA regulation in France, by network type, type of remedy and geographic area, stating where the point of interconnection lies, whether the regulation is symmetric or asymmetric and what the pricing model is.

Further details can be found in the full case study that follows.

Figure 6.1: Summary of NGA regulation in France [Source: Analysys Mason, 2015]

Network type	Regulation type	Geographic application	Point of interconnection	Symmetric / asymmetric	Pricing model
FTTH regulation (GPON network)	Duct access	Nationwide	Local[196]	Asymmetric	Price control, cost-based
	Vertical access	Nationwide	Local	Symmetric	FRND (cost-based): uncalibrated "shell" model produced, to be populated by operators in each specific case and capable of being audited by ARCEP. Incorporating non-discrimination, objectivity, relevance and efficiency
	Dark fibre	Very dense areas: blocks of at least 12 flats or business premises, or which can be accessed via a sewer large enough to be visited by an engineer	Local: multi-fibre concentration point at the building entry point	Symmetric	FRND (cost-based): uncalibrated "shell" model produced, to be populated by operators in each specific case and capable of being audited by ARCEP. Incorporating non-discrimination, objectivity, relevance and efficiency
		Very dense areas: blocks of fewer than 12 flats or business premises, or which cannot be accessed via a sewer large enough to be visited by an engineer	Local: concentration point of 100 single-fibre lines (cabinet), or in special cases (isolated buildings): multi-fibre concentration point (manhole, building façade, external terminal)		
		Very dense areas: low-density pockets – areas with more than 15% of single-dwelling units and fewer than 5000 houses per square kilometre	Local: concentration point of 300 single-fibre lines		

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[196] See http://www.orange.com/fr/content/download/6244/91340/version/11/file/Offre_unique_iBLO_27f%C3%A9vrier2015.pdf

Network type	Regulation type	Geographic application	Point of interconnection	Symmetric / asymmetric	Pricing model
		Less dense areas (rest of country)	Local: concentration point of 1000 single-fibre lines, or if the backhaul portion of the network is shared, the size of the concentration point can be reduced to 300 lines		
VDSL regulation (VDSL-CO)	Bitstream	Nationwide	Regional (same as for the ADSL offer)	Asymmetric	Price control, cost-based: Long term incremental costs of an efficient operator (whose characteristics are comparable to those of Orange)[197]

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[197] Note: Price control is not applied in areas where at least one alternative operator provides a wholesale bitstream offer (based on LLU or on alternative infrastructures such as FTTx or cable).
See https://circabc.europa.eu/sd/a/0323223f-0a67-47f7-bbff-8bad998a3075/FR-2014-1602-1603%20ADOPTED_EN%20-%20PUBLIC.pdf

6.2 Market and regulatory context

6.2.1 Market environment before the regulatory intervention was made

In 2008, prior to the introduction of regulation for sharing the final segment of FTTH networks, 95% of all broadband subscribers in France used ADSL. There were only 40 000 FTTH subscribers (0.2% of the total), and most of the remaining 5% used cable broadband.

Broadband penetration stood at 65% of households; 98.4%[198] and 29%[199] of households were covered by ADSL and cable Internet, respectively.

The incumbent operator, Orange, had the largest share of broadband subscribers (47%), having increased its market share marginally since 2006. Its main competitors were Iliad and SFR, with market shares of 24% and 22%, respectively. Cable operator Numericable held around 5% of connections, whilst the remainder of the market was split among smaller operators. Numericable and SFR have now merged.

6.2.2 Underlying regulatory regime

The Autorité de Régulation des Communications Électroniques et des Postes (ARCEP) regulates the telecoms sector in France. The former incumbent, Orange, is subject to ex-ante regulation in a number of relevant markets.

As the owner and operator of the copper infrastructure in France, Orange is required to provide reference offers for both passive (LLU, full and sub-loop unbundling) and active (bitstream and naked DSL) wholesale products.

ARCEP has continued to strengthen the regulation around the wholesale broadband market in parallel with the superfast broadband regulation outlined below. In particular, it has focused on access to TV services over DSL in areas of the country without unbundling.[200]

ARCEP is strongly focused on infrastructure-based investment, with significantly weaker regulation of active (e.g. bitstream) solutions.

6.2.3 Policy objectives

The context for the regulation of wholesale superfast broadband access in France was the deployment of pockets of FTTH through a series of public and private initiatives. In contrast to the

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[198]   TeleGeography, April 2015.

[199]   Note: Numericable's cable network covered 34% of French households in 2013, but only 86% of these enabled for triple-play (i.e. capable of accessing Internet services) (Source: Numericable-SFR, Full Year 2013 KPIs and Financial Spreadsheets).

[200]   ARCEP (2014), *Draft decision on the definition of the relevant market for wholesale access to the wired local loop, on the designation of an operator with significant market power in this market and on the obligations that may be imposed on this operator.* Available at http://www.arcep.fr/uploads/tx_gspublication/projdec-adm-4-notif-mai2014.pdf

situation in the UK (where the limited FTTH deployments are largely trials undertaken by the former incumbent (BT)), in France multiple operators and public entities either owned the new FTTH networks, or had announced plans for their roll-out.

As such, by introducing regulation into this market segment, ARCEP was looking to create some sort of consistency in the wholesale access conditions, while supporting and encouraging investment in network roll-out. In June 2014, ARCEP described its objectives as follows:

> *"While regulating the copper network consisted chiefly in opening up an existing network in a market dominated by the incumbent carrier, when it comes to superfast broadband, ARCEP's objective is to facilitate the deployment and use of a new network that is currently under construction, under conditions that are sufficiently homogeneous to enable the emergence of competitive and affordably priced offers across the country."*

> And later: *"The aim is to secure the superfast broadband market's momentum by creating common references, which are essential to prevent superfast broadband rollouts being performed by a host of local operators from resulting in a geographically fragmented retail market."*[201]

In particular, ARCEP was keen to ensure that the first operator which rolled out infrastructure (referred to as the 'building operator') could not block competition for a specific set of end-user premises. An important objective for ARCEP was to enable infrastructure-based competition (i.e. through passive products), not just retail service competition (i.e. through active products).

6.3 Regulatory intervention

6.3.1 Summary

Legal framework and context

The legal framework for regulating fibre access was set out in Law no. n° 2008-776 of August 2008, on modernising the economy.[202] This use of legislation, rather than a symmetrical remedy under the framework, means that this approach was in some ways outside the European e-communications Framework. Nevertheless, ARCEP notified the EC of its proposed legislation, and commentary on this was included in the Market 4[203] and 5[204] reviews in 2008, 2011 and 2014.

In its 2008 Markets 4 and 5 review, ARCEP deemed the markets for broadband and high-speed broadband services to be substitutable. Within Market 4, it proposed to maintain the requirement

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[201] ARCEP (2014), *Background, key data and main areas of focus*. Available at
http://www.arcep.fr/uploads/tx_gspublication/supplement-rapport-2013-english-version.pdf

[202] LOI no 2008-776 du 4 août 2008 de modernisation de l'économie, *Journal Officiel de la République Française*. Available at http://www.wipo.int/edocs/lexdocs/laws/fr/fr/fr099fr.pdf

[203] Wholesale (physical) network infrastructure access at a fixed location (passive).

[204] Wholesale broadband access (active).

for France Telecom (Orange) to provide access to civil works infrastructure (originally introduced in 2005).[205] Active wholesale broadband service requirements were maintained on France Telecom's copper network, but were not imposed on the fibre network.

Within its notification to the EC, ARCEP also stated that it was looking to introduce symmetrical remedies for the sharing of in-building wiring via a Parliamentary bill, with the technical parameters to be defined by ARCEP at a later stage (see below for further details).

Given the combination of duct access and in-building access remedies, ARCEP concluded that there was no need to impose further regulation of France Telecom's fibre networks at that stage. As such, no Market 4 or Market 5 obligations were imposed on the fibre network. The EC recommended that further remedies should be considered in case the duct and in-building access remedies were insufficient.[206]

On 6 October 2009, ARCEP notified the EC of the fibre mutualisation measures and symmetrical wholesale obligations that had been introduced using legislation. In its comments in November 2009, the EC agreed with ARCEP's approach, but recommended careful monitoring so that symmetric regulation did not remain in place for longer than was justified. It further proposed consideration of asymmetric remedies once the infrastructure had been rolled out, as the infrastructure would not be overlapping.[207]

The EC did, however, raise concerns about ARCEP's approach to pricing, and on the proposal not to validate the building operators' reference offers prior to publication, the EC noted that:

> *"The Commission considers that the lack of an official endorsement of access offers prior to their publication may give raise to an undesirable lack of regulatory certainty."*[207]

It recommended that ARCEP should develop further details on pricing terms and conditions.

Following this, in 2010, ARCEP notified the EC of its proposals on in-building access outside of dense urban areas. In response, the EC repeated its request for ARCEP to provide greater guidance on pricing terms and conditions, and particularly the risk premium that would be applied.

The EC also expressed strong concerns about the proposed access and backhaul remedies. It stated that the remedies proposed by ARCEP could not be applied under Article 12 of the EU Framework Directive, as access and backhaul remedies should only be applied by a national regulatory authority (NRA) after a market review and finding of SMP, and should have regulated pricing and technical conditions. Furthermore, under Article 12, network sharing is only permitted up to the concentration point and not beyond. The EC commented:

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[205] Excluding access services provided using sewers and infrastructure of other network industries (such as gas or electricity) as well as overhead cabling.

[206] The EC's comments are available at https://circabc.europa.eu/sd/a/7e7696e1-478b-41e0-9efc-7bff6d77cbdb/FR-2008-0780-0781%20Acte_EN.pdf

[207] The EC's comments are available at https://circabc.europa.eu/sd/a/218398fc-6185-4a4a-95e3-b516143cf1f1/FR-2009-0993%20Acte_EN.pdf

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"Such an extensive use of a symmetric regulatory instrument by ARCEP may put disproportionate burden on non-SMP operators and ultimately deter investment by alternative operators."[208]

Nevertheless, in its final decision[209] ARCEP maintained the backhaul remedy, arguing that it was necessary to enable an economic case for roll-out in many areas, where the natural size of the concentration point was 300 lines.

As part of the 2011 Markets 4 and 5 review, ARCEP maintained its position on fibre access, limiting remedies to access to civil works infrastructure and in-building wiring, on the basis of the symmetrical regulation imposed via legislation on network sharing. It stated that these remedies had been successful in achieving parallel network roll-out in dense urban areas, and that it was not yet able to draw conclusions on less dense areas, due to the limited fibre network deployment. As such, ARCEP stated that it was not necessary to mandate fibre-based wholesale broadband access, although this would be closely monitored.

The EC objected to the lack of fibre-based wholesale broadband access remedies (both passive and active) on the SMP operator.[210]

"However, the Commission reiterates, in line with its previous comments, the need to establish without delay a clear and predictable SMP regulation in line with the NGA Recommendation according to which NRAs should, in principle, mandate unbundled access to the fibre loop and wholesale broadband access remedies."

When ARCEP repeated the Market 4 and 5 reviews in 2014 it maintained the majority of its conclusions and remedies, but did propose to move business wholesale broadband access services into Market 6.[211]

The EC's comments on ARCEP's analysis centred on the absence of asymmetric fibre regulation. It did not dispute ARCEP's analysis, but noted that France continued to lag behind other parts of Europe on NGA deployment (implying that the remedies may not be working), and highlighted the risk of 'market partitioning by co-investing operators'. The EC invited ARCEP to continue reviewing the situation and in particular to review whether the symmetrical remedies are sufficient outside of dense urban areas where there are no cable networks or municipal fibre networks (and where a bitstream remedy may therefore be necessary).[212]

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[208]   EC comments are available at https://circabc.europa.eu/sd/a/6ebe5eec-1573-4fd7-8ac8-bd47e645ac85/FR-2010-1144%20Acte(4)_EN+date%20et%20nr.pdf

[209]   See https://circabc.europa.eu/sd/a/3c9a4b3a-6f41-48dc-8eab-e52c3527f1e2/D%C3%A9cision%20finale%20Acc%C3%A8s%20fibre%20hors%20des%20zones%20tr%C3%A8s%20denses.pdf

[210]   The EC's comments are available at https://circabc.europa.eu/sd/a/ad7ecb2e-8c48-455f-9047-36c990470300/FR-2011-1213-1214%20Acte(5)_EN+date+nr.pdf

[211]   wholesale markets for terminating segments of leased lines and trunk segments of leased lines

[212]   The EC's comments are available at https://circabc.europa.eu/sd/a/0323223f-0a67-47f7-bbff-8bad998a3075/FR-2014-1602-1603%20ADOPTED_EN%20-%20PUBLIC.pdf

Overview of in-building access

The principles on the basis of which the framework was designed are set out in the French postal and electronic communications code, which states that:

> *"Any entity that has established or that is operating an optical fibre ultrafast broadband electronic communications line in an existing building which makes it possible to serve an end user must satisfy all reasonable requests from operators for access to said line, in view of providing electronic communications services to this end user.*
>
> *"Except in cases defined by the electronic communications and postal regulatory authority, access is to be provided under transparent and non-discriminatory conditions from a point located outside the limits of the private property, and which allows third-party operators to connect to it, under reasonable economic, technical and access conditions. Any refusal to provide this access must be justified."*[213]

The central regulatory principle to emerge from this was sharing the last segment of the fibre network, effectively pooling ('mutualisation' of) the infrastructure close to the end user, and so maintaining competitive access while avoiding the costs and challenges associated with duplication of this segment.

ARCEP made its preliminary recommendations on the implementation of sharing of the last segment on fibre networks in October 2008.[214] At that time, it raised the key themes of location of the shared access points and the nature of the wholesale access product, as well as the role of the building operator in ensuring a straightforward end-user experience and the supply of information prior to the roll-out. Significantly, ARCEP highlighted the need to consider different housing types separately in the application of wholesale access regulation.

Over the period from 2009 to 2014, ARCEP issued a series of Decisions which provided more-detailed requirements associated with different housing types. The main focus of those Decisions was on the location of the concentration point and the passive access product remedies.

There are effectively two different remedies that could be offered to a third-party operator by the 'building operator' (i.e. the operator proposing the roll-out):

- a dedicated fibre line from the concentration point to each end-user premises served by the concentration point and a distribution panel inside (or in the proximity of) the local connection point (for permanent access to the building's dwellings) – only available *ab initio* at the point of network roll-out where the requesting operator pays its share of the build costs. This enables deployment of either a point-to-multipoint (PON) or a P2P network architecture

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[213] Article L. 34-8-3 of the French postal and electronic communications code, CPCE (Code des Postes et des Communications Électroniques), which is quoted in http://www.arcep.fr/uploads/tx_gspublication/recomd-mutual-ftth-1008-eng.pdf

[214] ARCEP (2008), *Recommendations on the implementation of last drop sharing of the last part on optical fibre networks*; available at http://www.arcep.fr/uploads/tx_gspublication/recomd-mutual-ftth-1008-eng.pdf

- a shared fibre line from the concentration point to the end-user premises (for temporary access to the building's dwellings, in accordance with the subscriptions of the end users) – similar to sub-loop unbundling, available at any time, not just at roll-out.

ARCEP further specified the number of fibre lines per concentration point for each type of housing, with the aim of ensuring that deployment of infrastructure by third-party operators remains economic.

Following a topological survey commissioned by ARCEP in October 2008,[215] ARCEP split the country into different zones for the application of regulation. These zones were initially defined in 2009, and then adjusted in January 2014 to reduce the number of very high-density areas. The split of premises and wholesale access obligation by zone used by ARCEP for fibre deployment is outlined in Figure 6.2 below.

Figure 6.2: Definition of zones used by ARCEP for fibre deployment [Source: ARCEP, 2014][216]

Zone	Sub-division	Further sub-division	Dwellings (million)
Very dense	Outside low-density pockets	*Definition*: blocks of at least 12 flats or business premises, or which can be accessed via a sewer large enough to be visited by an engineer *Access obligation*: multi-fibre concentration point at the building entry point	3.2
	Outside low-density pockets	*Definition*: blocks of fewer than 12 flats or business premises, or which cannot be accessed via a sewer large enough to be visited by an engineer *Access obligation*: • general rule: concentration point of 100 single-fibre lines (cabinet) • special cases (isolated buildings): multi-fibre concentration point (manhole, building façade, external terminal)	1.5
	Low-density pockets	*Definition*: areas with more than 15% single-dwelling units and fewer than 5000 houses per square kilometre *Access obligation*: concentration point of 300 single-fibre lines, regardless of the size of the building	0.8
Less dense	–	*Definition*: rest of the country *Access obligation*: • concentration point of 1000 single-fibre lines, regardless of the size of the building • exception: a concentration point of 300 lines if the backhaul portion of the network is shared	22.7

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[215]   Full study by PMP and Quatrec available at http://www.arcep.fr/uploads/tx_gspublication/etude-topo-mutual-ftth-1008.pdf

[216]   ARCEP press release, 27 January 2014; available at http://www.arcep.fr/index.php?id=8571&L=1&tx_gsactualite_pi1%5Buid%5D=1640&tx_gsactualite_pi1%5BbackID%5D=26&cHash=8f87934a7ef7c53e5188ad1eabd34248

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We outline the regulation that was applied for each zone in more detail below.

Access conditions for very dense areas, outside low-density pockets

► *Buildings of at least 12 flats or businesses, or that can be accessed via a sewer large enough to be visited by an engineer*

In very dense areas, ARCEP reasoned that multiple operators may be willing to invest to access the same buildings. As such, ARCEP applied more stringent access obligations specifically in these areas.

The objective[217] of the approach taken by ARCEP in these areas was to enable:

- each operator to develop its own technology and differentiate on the services offered (i.e. technology agnostic)
- the operational independence of operators
- multiple connections per household where demand requires it (e.g. SMEs with a back-up provider, one IPTV provider separate from broadband)
- a simplified operator-switching process.

In these areas, third-party operators have the right to request an additional fibre to be installed from the concentration point to the end user during roll-out (e.g. to support a P2P roll-out). This effectively creates a multi-fibre concentration point at the building entry point. This right is provided on the condition that the third-party operator shares the installation costs with the building operator from the outset, and it must be requested by the third-party operator prior to the initial roll-out.

Alternatively, third-party operators can choose to purchase a shared fibre line from the concentration point to the end-user premises at any point in time, in the same way as is applied in the rest of the country.[218]

As regards passive products, these only have to be offered to a maximum of four operators, beyond which the building operator does not have to provide access at the mutualisation point, but can instead offer an active wholesale product.[219] There are four broadband operators in France with a market share of more than 4%, and so this is unlikely to act as a major constraint.

► *Buildings that cannot be accessed via a sewer large enough to be visited by an engineer*

In July 2011, ARCEP proposed a preliminary recommendation to reduce the number of high-density areas following a review process, which suggested that regulatory requirements on fibre

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217   ARCEP (2009), *Decision number 2009-1106*; available at http://www.arcep.fr/uploads/tx_gsavis/09-1106.pdf

218   *Ibid*, page 18
ARCEP (2011), *Recommendation introducing 'low density' pockets*. Available at
http://www.arcep.fr/uploads/tx_gspublication/20110614-Recommandation-petits-immeubles-ZTD-post-consultation.pdf

219   *Ibid*, page 23.

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wholesale access were inhibiting roll-out in some areas with lower levels of competition. ARCEP argued that third-party operators were not demanding dedicated fibres in street cabinets, but only where the concentration points were located inside the building.

As such, when ARCEP finalised the recommendation in January 2014, it removed the requirement for the building operator to provide an additional dedicated fibre to third-party operators (multi-fibre concentration point). Instead, only the shared fibre line from the concentration point would be offered. ARCEP further specified that this concentration point should aggregate 100 single-fibre lines. The low number reflects the limited space available in the civil engineering infrastructure (i.e. ducts) in these areas.

The regulation nevertheless continues to require a multi-fibre solution in 'special cases' of isolated buildings. In this case, the concentration point may be in a manhole, on the building façade or other external terminal.[220] This provides an alternative to the location of the multi-fibre concentration point within the building (as is the case for buildings of 12 or more flats or businesses).

Access conditions for low-density pockets

In June 2011, ARCEP introduced the concept of low-density pockets within high-density areas. This was in recognition of the fact that operators were not rolling out to smaller buildings (i.e. buildings with a single home) within high-density areas.

Consequently, ARCEP ruled that the building operator should provide access at the concentration point, and the concentration point should have at least 300 fibre lines. The building operator was not required to provide an *ab initio* co-build option for a second fibre to third-party operators.

Any buildings with 12 or more homes were excluded from the definition of low-density pockets.

Access conditions for less dense areas

In the majority of the country, ARCEP required the building operator to provide access at the concentration point, and specified that the concentration point contains at least 1000 fibre lines in order to make it economic for the third-party operator to connect to it.

This requirement was described as follows:

> *"The building operator will provide other operators with access to the lines at the concentration point, allowing them to help finance the installation from the outset or later, as well as an offer for individual line rental, in a passive form."*[221]

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[220]   More details available at http://www.arcep.fr/uploads/tx_gspublication/recomd-FttH-immeubles-moins-12-log-ZTD-janv2014.pdf, page 7.

[221]   See http://www.arcep.fr/fileadmin/reprise/dossiers/fibre/2010-1312-arcep-optical-fibre-decision-en.pdf

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As an absolute minimum, 300 lines per connection point are required. For connection points with between 300 and 1000 lines, the building operator must offer a dark-fibre backhaul service between the concentration point and its core network. This is to reduce the costs for third-party operators to connect at the concentration point.

VDSL

All of the above regulation relates to FTTH deployments. More recently, however, regulation on VDSL has also been introduced.

Before April 2013, VDSL deployment was blocked by ARCEP[222] pending the outcome of investigations into the best technical approach for rolling this out and the proportion of households for which a speed improvement could be achieved. In September 2012, ARCEP emphasised the fact that the delay in introducing VDSL was due to the need to undertake review and testing of the network disruption that could potentially be caused by VDSL roll-out.[223] In April 2013, the initial report from a committee of experts was released, proposing the roll-out of VDSL to a sub-set of lines in France.

Initially, VDSL was limited to exchange-only lines, which represented only 8.7% of all telephone lines in France.[224] Subsequently, in July 2014, this was extended to a larger portion of lines, representing 14.5% of all lines in France. The rationale for limiting the number of lines was that sufficient speed gains compared to ADSL could only be achieved on very short lines (less than 1km).[225]

Free (Iliad) was the first to roll-out a VDSL network, which it had rolled out prior to the committee's final decision and was able to 'switch on' once the go-ahead was given. Since April 2013, Orange has rolled out VDSL services rapidly, reaching 17% of households by December 2014 (see Figure 6.4 below). Sub-loop unbundling is available for all operators that are already present at the MDF.

Orange was given one month from 10 July 2014 to provide a VDSL wholesale offer (an active wholesale product).[226] At the time of writing (June 2015), all major Internet service providers (ISPs) in France offered retail VDSL services.

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[222] ARCEP's Chairman, Jean-Ludovic Silicani denied that ARCEP had the power to authorise or prohibit the technology, but had rather outsourced this role to a committee of independent experts (see Speech by Jean-Ludovic Silicani, ARCEP Chairman, when RuraliTIC symposium in Aurillac 13 September 2012, available here: http://www.arcep.fr/index.php?id=2124&L=1&tx_gsactualite_pi1%5Buid%5D=1539&tx_gsactualite_pi1%5BbackID%5D=1&cHash=b77fbe4397b4a7619fe95ce64d23d057)

[223] *Ibid.*

[224] ARCEP press release, 26 April 2014. Available at http://www.arcep.fr/index.php?id=8571&tx_gsactualite_pi1%5Buid%5D=1604&tx_gsactualite_pi1%5BbackID%5D=26&cHash=3835e6a57cd29fd37202c9a29cc08586&L=1

[225] ARCEP press release, 10 July 2014. Available at http://www.arcep.fr/index.php?id=8571&L=1&tx_gsactualite_pi1%5Buid%5D=1676&tx_gsactualite_pi1%5BbackID%5D=26&cHash=3dabf1f0ebab0c7bec0b2bbca68b80f6

[226] The reference offer is available at http://www.orange.com/fr/content/download/3657/33601/version/25/file/OdR+DSL+grand+public_2015-01-01.pdf

Whilst the majority of VDSL to date has been VDSL-CO, local authorities in France can choose to introduce subsidised cabinetisation. This can be undertaken by any party (not only Orange), however, Orange is mandated to provide those services that only it can perform (as owner of the copper local loop). This is managed through a mandated network modernisation offer which effectively this moves the DSLAM from the MDF to the cabinet. We understand that this remedy has been widely adopted by local authorities.. There are already 1000 projects, and more than 1000 projects in the pipeline (out of 90 000 cabinets in total, however, the line proportion is lower because smaller cabinets in rural areas). The architecture is such that it can be upgraded to FTTH in the future; much of the investment for the modernisation of the copper local loop is relevant for FTTH.

6.3.2 Funding

The original proposals by the French government in December 2009 to provide public funding for superfast broadband deployment failed, because operators deemed the proposed approach to be uneconomic.

In February 2013, a new national broadband plan was announced, to involve joint investment by local and central government and network operators. The proposed joint investment totalled around EUR20 billion.

The application of these funds is split between commercial and public initiative networks (PINs). Commercial zones are defined as those where operators have expressed an intention to invest, and cover 57% of the population in France. In these areas, the government will make agreements with private operators for the deployment of FTTH networks by 2020, whereby the state can specify priority areas but does not provide any direct funding. These networks are subject to ARCEP's infrastructure mutualisation requirements (as set out above).

Outside these areas, PINs will be deployed by local authorities. The national broadband plan for France allows these networks to use a combination of technologies, including FTTH, VDSL, satellite, WiMAX, Wi-Fi and LTE. Private-operator spending on these networks will be match-funded by the public sector, including a direct state subsidy of EUR3.3 billion and access to a long-maturity state loan. The public networks resulting from these investments will be open to all retail operators. In the case of FTTH services, the same passive remedies apply as for commercial FTTH networks. In reality, however, the majority of PINs to date have also offered an active wholesale product, which has proven more popular among local operators (see *Services provided* in Section 6.3.3 below).

Both commercial and public initiative networks are subject to the technical harmonisation and information disclosure requirements put in place by ARCEP.[227]

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[227]   République Française, France Très Haut Débit; see http://www.francethd.fr/comprendre-le-plan-france-tres-haut-debit/

6.3.3 Features

Services provided

► *Services provided by buildings operators – commercial deployments*

Services can be split between passive and active wholesale access products. Passive products include:

- a dedicated fibre line from the concentration point to each end-user premises served by the concentration point and a distribution panel inside (or in the proximity of) the local connection point (for permanent access to the building's dwellings) – only available *ab initio* at the point of network roll-out where the requesting operator pays its share of the build costs. This enables deployment of either a point-to-multipoint (PON) or a P2P network architecture

- a shared fibre line from the concentration point to the end-user premises (for temporary access to the building's dwellings, in accordance with the subscriptions of the end users) – similar to sub-loop unbundling, available at any time, not just at roll-out.

In addition, in less-dense areas, the building operator is required to provide a dark-fibre access service to connect the concentration point to its core network.

ARCEP has not applied asymmetric remedies for wholesale broadband access on fibre – that is, there is no requirement on Orange to provide an active FTTH product (akin to a bitstream product in an ADSL environment).

However, active products can be offered by the building operator as an alternative to the passive remedies where there are more than four operators seeking access to a building. Furthermore, commercial bitstream services over FTTH networks have been launched.[228]

While there is not a central reference interconnect offer as is the case for Orange's regulated services (such as LLU, bitstream and VDSL), all building operators are required to publish their wholesale offers on their website.[229]

► *Services provided by public initiative network operators*

Similar to the commercial deployments, operators of public initiative networks are required to publish reference offers for wholesale access to their FTTH networks.

As noted above, PIN operators are required to offer the same passive wholesale products as commercial deployments, based on access to a mutualised concentration point. However, the

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[228] These offers are referenced in the EC's comments, which are available at https://circabc.europa.eu/sd/a/0323223f-0a67-47f7-bbff-8bad998a3075/FR-2014-1602-1603%20ADOPTED_EN%20-%20PUBLIC.pdf

[229] See http://www.orange.com/fr/content/download/3468/31507/version/8/file/offre+cablage+FTTH+horsZTD+du+30+sept+2014.pdf; http://groupe.sfr.fr/sites/default/files/contrat-dacces-aux-lignes-ftth-de-sfr-hors-ztd-contrat-v15complete.pdf

majority of PINs also offer commercial bitstream products, which have proved more popular among local operators.

For example, PIN operator Covage includes both wholesale dark fibre (a passive product) and active bandwidth services within its price list.[230]

► *VDSL services*

Orange offers an active wholesale product for VDSL as part of its DSL reference offer.[231]

Pricing

Given the broad range of fibre deployments by different parties, ARCEP has opted not to set specific wholesale access pricing. Instead, it has defined principles for pricing, namely: non-discrimination, objectivity, relevance and efficiency. In effect, the building operator is required to construct a pricing model based on these principles which is capable of being audited by ARCEP.

In 2014, following requests for clarification from the market and the need to comply with European State-aid guidelines, ARCEP undertook two public consultations (in May and December) in which it proposed a generic pricing model. The initial consultation included a simple cost model capable of calculating the unit costs of NGA wholesale services for accessing mutualised networks in less-dense zones (representing the majority of all dwellings in France). This approach captures the generic structure of FTTH networks in France as defined by ARCEP, as shown in Figure 6.3 below.

Figure 6.3: Architecture of ARCEP's FTTH network and list of terms used [Source: Analysys Mason, 2015]
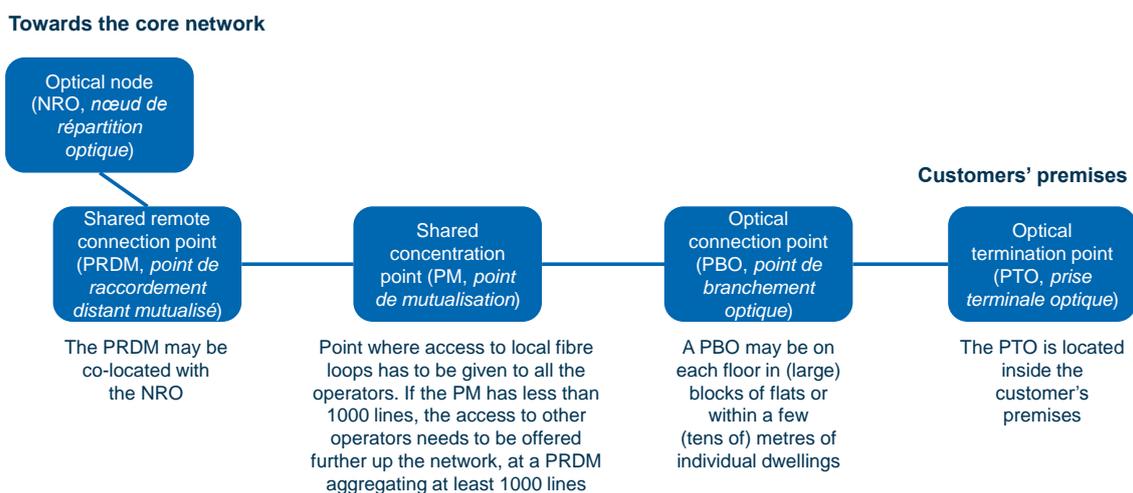
After receiving responses from operators, local authorities and also associations of local authorities, ARCEP ran a second public consultation. The model published by ARCEP is a shell with working

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230   Covage (2010), *FTTH wholesale offer*; available at
      http://www.covage.com/uploads/actualites/3696e2d9e7028757921f31ed7e8fe9302deb08a8.pdf

231   See http://www.orange.com/fr/content/download/3657/33601/version/25/file/OdR+DSL+grand+public_2015-01-01.pdf

calculations but 'dummy' (i.e. not necessarily accurate) inputs. ARCEP emphasises that in order to use the model an operator needs to specify the parameters and costs of its own deployment.

This is a significantly different approach from that taken in other countries: usually, a regulator not only builds a model in an open industry process, but it also populates and calibrates the model itself. Instead, ARCEP is providing the multiple stakeholders in France with the opportunity to populate the model themselves to fit their own business case and negotiate access prices, but using a consistent modelling approach.

The initial model focused on calculating the price from the concentration point to the customer premises (i.e. optical termination point) only. The second consultation extended the pricing tool to include sections of the network upstream from the concentration point (up to the optical connection point / branching unit). The objective of this change was to enable the calculation of separate wholesale rates for different parts of the shared network, namely:

- between the shared concentration point and the optical connection point
- between the shared remote connection point and the shared concentration point (as part of the supply of a remote access connection product, when applicable)
- between the optical connection point and the optical network terminal inside customer premises (as part of a 'service access fee' model).[232]

QoS obligations

As the precise wholesale product, technical architecture and price is not specified by ARCEP, nor is the associated QoS requirement. However, ARCEP does require the wholesale offers that are presented to the market to include service level agreements:

> *"The building operator, in its offer of access should define its contractual commitments with the relevant penalties regarding the technical availability of the information sharing services."*[233]

Further to this, in December 2014, draft guidelines were introduced, which set out in more detail the kinds of SLAs that should be included within the reference offers of the building operator.[234] The focus was on installation timescales (where ARCEP defined the processes around which SLAs should be imposed, split between new and existing lines, measured for 95% of orders over a period of one month) and repair timescales (which were left more open-ended for the building operator to define). The actual service levels, in terms of days to install and repair, were left to the individual operators to define.

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[232] ARCEP press release, 17 December 2014; available at
http://www.arcep.fr/index.php?id=8571&L=1&tx_gsactualite_pi1%5Buid%5D=1716&tx_gsactualite_pi1%5Bannee%5D=&tx_gsactualite_pi1%5Btheme%5D=&tx_gsactualite_pi1%5Bmotscle%5D=&tx_gsactualite_pi1%5BbackID%5D=26&cHash=f9fa5b0791f1cc79bab5d97fc3e70d1f

[233] ARCEP (2014), *Draft decision on operational and technical processes*; available at
http://www.arcep.fr/fileadmin/uploads/tx_gspublication/Decision_operationnelle_FttH_.pdf

[234] http://www.arcep.fr/fileadmin/uploads/tx_gspublication/Decision_operationnelle_FttH_.pdf, P24 and P53

For both installation and repair timescales, ARCEP noted that the copper installation and repair timescales should be considered, and in the case of repair, they noted that many of the faults occurring in a copper network should not occur in a fibre network (i.e. the service levels for fibre could be higher).

ARCEP also required that penalties for failure to meet these SLAs should be specified and that these should be sufficiently high to incentivise the building operator to meet the service levels defined. Again, the actual levels of these penalties were not specified by ARCEP.

Furthermore, because of the requirements to notify other operators before roll-out commences, ARCEP also outlines the requirements around information provision by operators, with an emphasis on ensuring that the information provided is consistent, sufficient and timely. As part of this, they require non-discrimination in the provision of this information.

Coverage

The national broadband plan for France aims to cover 100% of the population with next-generation broadband by 2022, of which more than 80% of homes will be eligible for FTTH.[235] 50% of the country will be covered by NGA broadband connections by 2017.[236]

In the first quarter of 2014, 45% of homes in France were already covered by broadband services offering 30Mbit/s or more, as shown in Figure 6.4 below. See Section 0.0.0 for more details on the evolution of this roll-out.

6.4 Outcomes of the interventions

We note the limitations of attributing any direct causality between the regulatory intervention and the outcome achieved in each case, and where possible we have flagged to what extent a causal link may be drawn, and where external factors may have had a more significant influence.

6.4.1 NGA roll-out

Roll-out of superfast broadband (at least 30Mbit/s) reached 46% of households in France in December 2014, at which point 27% of households had access to speeds of at least 100Mbit/s.

This was achieved through a combination of cable, FTTH and VDSL, with considerable physical network overlap among all three technologies (around 33% in the fourth quarter of 2014). The percentage of households passed by each technology is shown in Figure 6.4 below.

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[235] République Française, France Très Haut Débit; see http://www.francethd.fr/comprendre-le-plan-france-tres-haut-debit/

[236] French government press briefing, Plan France Très Haut Débit, February 2014; available at http://www.entreprises.gouv.fr/files/files/directions_services/secteurs-professionnels/economie-numerique/tres-haut-debit/plan-france-tres-haut-debit-dp-2014-02.pdf
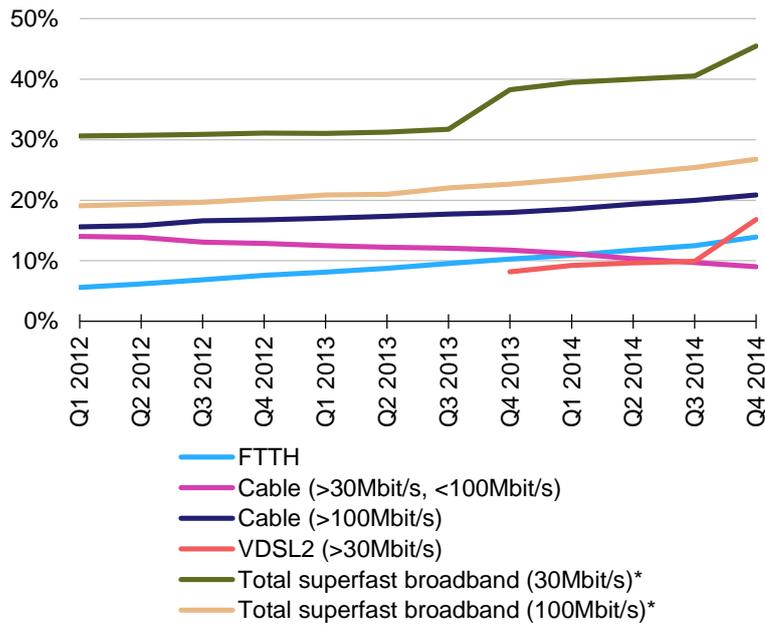
Figure 6.4: Households passed by superfast broadband in France [Source: ARCEP, 2015][237]

* Households passed by at least one technology

Note: the number of households passed by 'Cable (>30Mbit/s, <100Mbit/s)' is falling due to the upgrade to 'Cable (>100Mbit/s)'; the overall percentage of households passed by services of at least 30Mbit/s has remained stable since Q4 2011.

FTTH coverage is comparatively low in France compared to other markets. The regulatory intervention is unlikely to be the primary cause: instead external factors such as limited cable coverage and rapidly decreasing housing density outside of the very dense areas are likely to be significant.

Supporting this argument, it is interesting to note the difference in coverage across the very dense and less dense geographical markets. In the very dense geographies, FTTH covers approximately 52% of households, and cable covers approximately 92%. In contrast, FTTH covers just 5% and cable covers 16% of households in the less dense areas.

In France, only 15% of all households passed by superfast broadband to date have been reached using public initiatives, and this figure has fallen over the last two years, as shown in Figure 6.5.
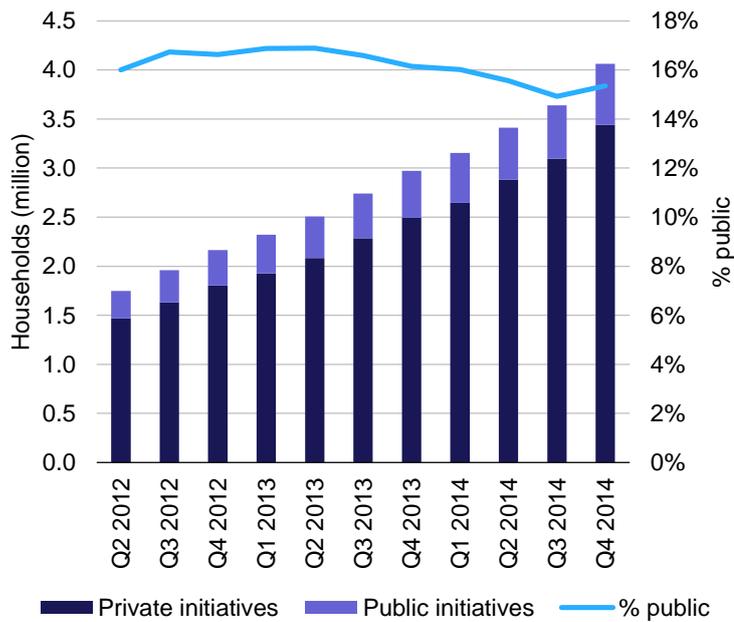

Figure 6.5: Households passed by superfast broadband split between private and public initiatives [Source: ARCEP, 2015][238]

6.4.2 Broadband penetration and NGA take-up

Broadband penetration of households in France was 89% at the end of 2014 (see Figure 6.6), which is comparatively high for Europe. The penetration trend is in line with benchmarks and does not seem to have been affected by the FTTH regulation.
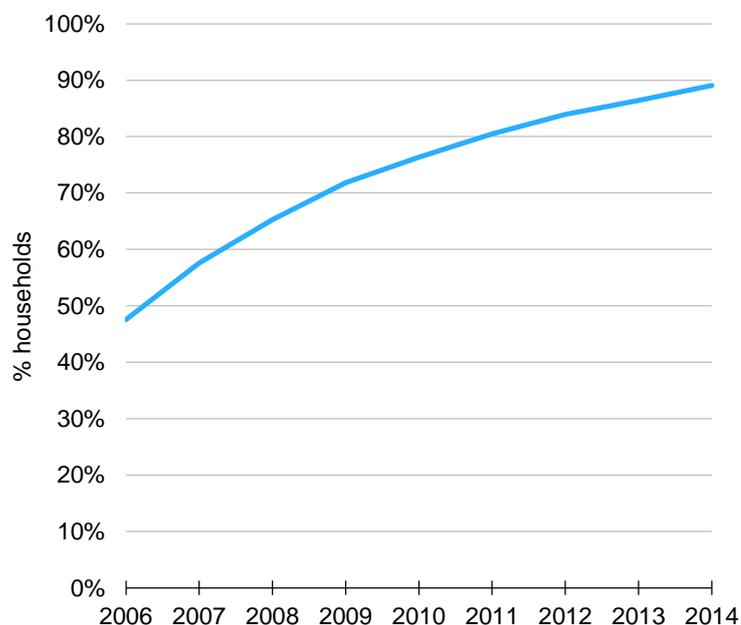

Figure 6.6: Broadband penetration of households in France [Source: ARCEP][239]

In relation to NGA take-up, FTTH subscribers as a share of premises passed reached 23% in the

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238   See http://www.arcep.fr/index.php?id=12748&L=1

239   See http://www.arcep.fr/index.php?id=12748&L=1

fourth quarter of 2014 (see Figure 6.7). This represents a relatively high take-up given the ongoing roll-out process. This can largely be explained by the fact that operators are driving FTTH take-up by offering the same prices for FTTH as VDSL,[240] or only promoting fibre Internet services.[241]

The high levels of take-up imply that attractive retail prices have been achievable.
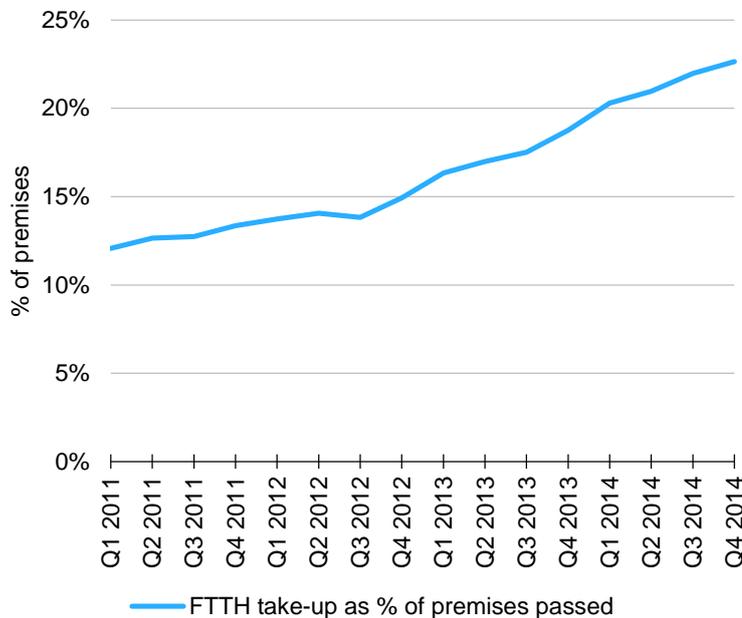

Figure 6.7: FTTH take-up as a percentage of premises passed [Source: ARCEP, 2015][242]

6.4.3 Competition

FTTH regulation in France focuses on enabling passive infrastructure access to multiple operators through mutualised infrastructure (in zones where commercial FTTH deployment is seen as feasible). Take-up of these passive infrastructure solutions is an important indicator of a) the demand for passive infrastructure access, and b) the success of the regulated wholesale access approach. By December 2014, 61% of all households passed by FTTH networks in France had two or more operators providing services using passive infrastructure products, and relatively few customers were being served using active wholesale products, as shown in Figure 6.8 and Figure 6.9 below.

This suggests that the infrastructure mutualisation policy has succeeded in supporting competition, and that there is clear market demand for passive products in preference to active products.[243]

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240   For example, Orange Livebox Zen (ADSL or VDSL) and Orange Livebox Zen fibre are charged at the same rate (prices extracted 27 May 2015).

241   As in the case of SFR-Numericable (website visited 27 May 2015).

242   See http://www.arcep.fr/index.php?id=12748&L=1

243   Note: This is similar to the case in Singapore, where all of the major operators have chosen to purchase passive infrastructure products rather than active wholesale services.
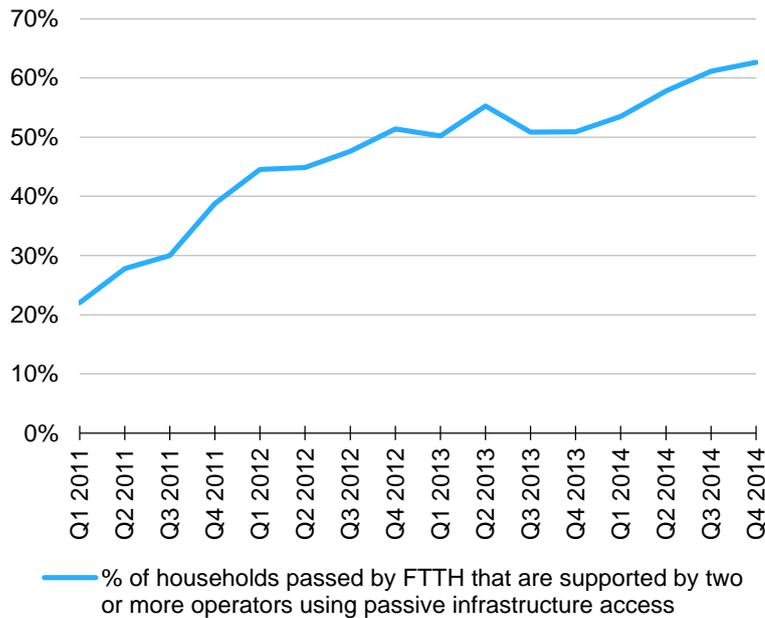
Figure 6.8: Proportion of FTTH households passed in France that are supported by two or more operators using passive infrastructure access [Source: ARCEP, 2015][244]
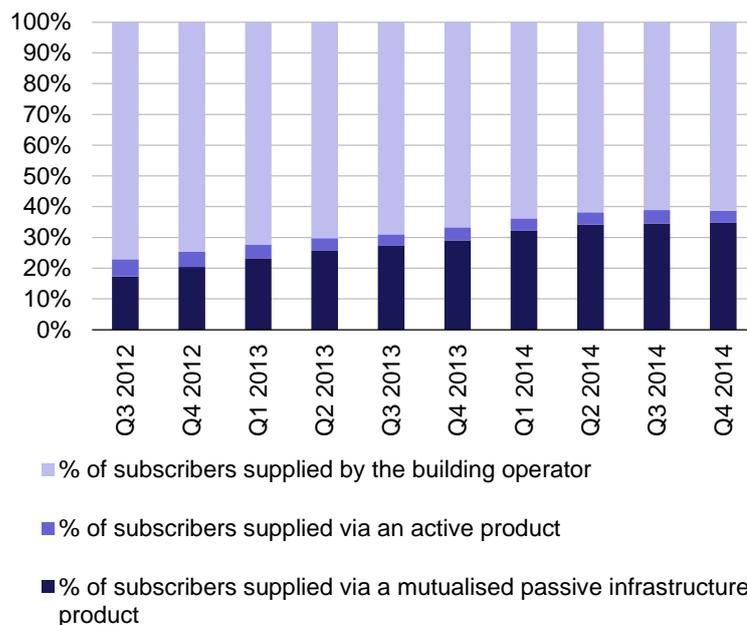

Figure 6.9: Split of FTTH subscribers by access product used [Source: ARCEP, 2015][245]

Taking this further and considering the proportion of FTTH subscribers, 35% were supported via a mutualised passive infrastructure product, and a further 4% via an active infrastructure product. Those subscribers not supported by either a passive or an active infrastructure product are supported by the 'building operator' (i.e. the first operator to roll out to that building).

As can be seen in Figure 6.9, the proportion of FTTH subscribers being supplied via a passive infrastructure product has been rising since the third quarter of 2012, albeit with a slight slow-

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[244]   See http://www.arcep.fr/index.php?id=12748&L=1

[245]   See http://www.arcep.fr/index.php?id=12748&L=1

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down in the rate of growth in 2014. This suggests that those operators purchasing passive infrastructure products are able to offer a competitive service.

All four operators are competing to offering FTTH connections. As shown in Figure 6.10 below, Orange has led the way in terms of connections to date, although SFR is also demonstrating rapid growth.
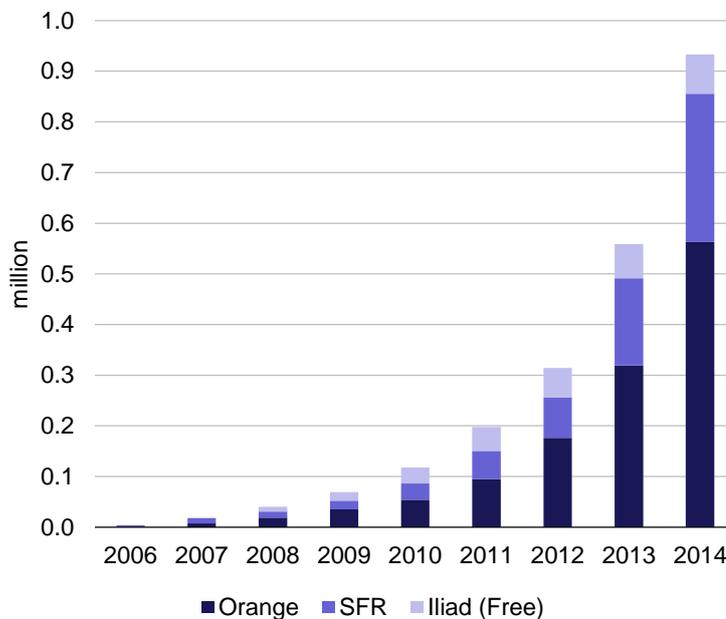

Figure 6.10: FTTH connections by operator [Source: Analysys Mason Research, 2015][246]

Note: SFR's figures are prior to the merger with Numericable; Bouygues also offers FTTH services, but no FTTH-only figures are available; for the purposes of this analysis we have excluded Numericable's cable/fibre subscribers, as the majority are cable and no split is provided.

However, it should be noted that this analysis only applies to the FTTH market (3.6% of total broadband subscribers in France in December 2014).

Considering the overall market share of broadband, Orange's market share declined by 7 percentage points between 2008 and 2014, in favour of Bouygues (see Figure 6.11 below). The market shares of the remaining operators remained broadly stable over the same period.

[246] Analysys Mason *DataHub*, extracted May 2015.
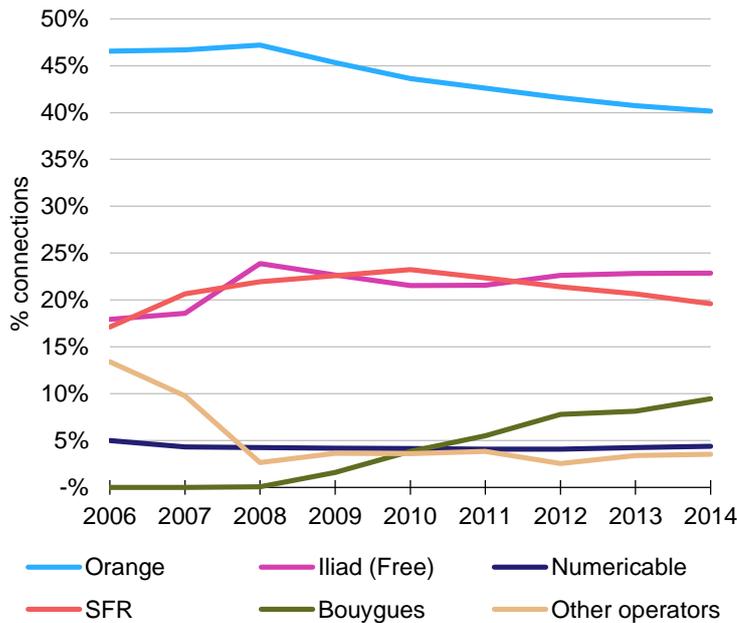
Figure 6.11: Market share of total broadband connections [Source: Analysys Mason Research, 2015][247]

Note: A merger between SFR and Numericable was approved in October 2014, giving the combined entity a market share of 24% at the end of 2014

Although Orange's share of the broadband connections market started to decline after the first FTTH wholesale access regulation was introduced, this decline cannot be directly linked to that initiative. Indeed, the wider competitive dynamics in the French market and the general disruption caused by Iliad's entry into the mobile market are likely to be more significant contributors.

Similarly, Bouygues' rapid gain in market share cannot be directly attributed to the FTTH regulation; at the end of 2014, only 15.6% of its subscribers were NGA.[248]

Nevertheless, the roll-out of FTTH networks by a large number of operators is likely to have an impact on Orange's positioning in future.

6.4.4 Pricing

The average monthly spend per user on broadband services decreased gradually over the 2008–2014 period, from EUR23.7 to EUR20.8, as shown in Figure 6.12 below. The temporary increase observed in 2012 is likely to have been due to the migration to superfast broadband services. Continued declines can be linked to increased competition in the industry, in which the FTTH regulation will play a part, but given that FTTH currently represents a small proportion of total connections, its role should not be overstated.

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[247]   Analysys Mason *DataHub*, extracted May 2015.

[248]   Bouygues 2014 Annual Report.
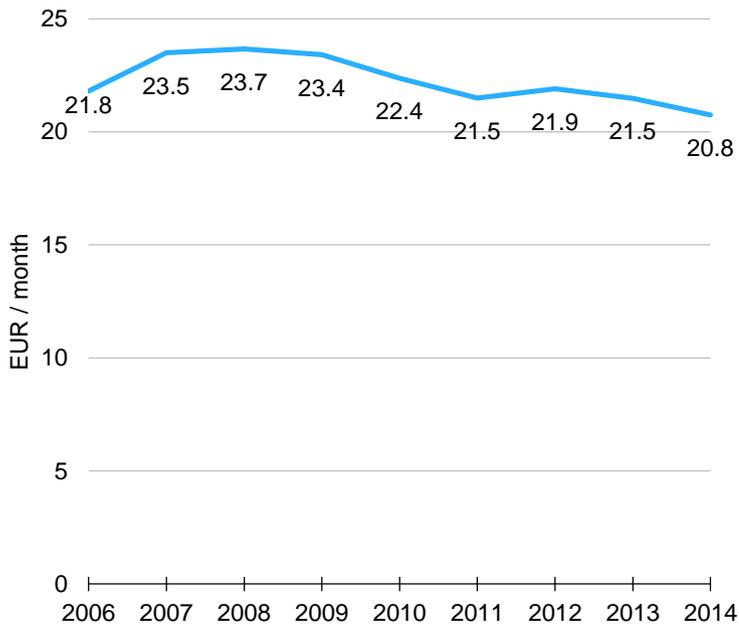
Figure 6.12: Broadband average spend per user [Source: Analysys Mason Research, 2015][249]

6.4.5 Profitability

A review of the EBITDA margins of French operators highlights a marked reduction in profitability over the last eight years, as shown in Figure 6.13 below.
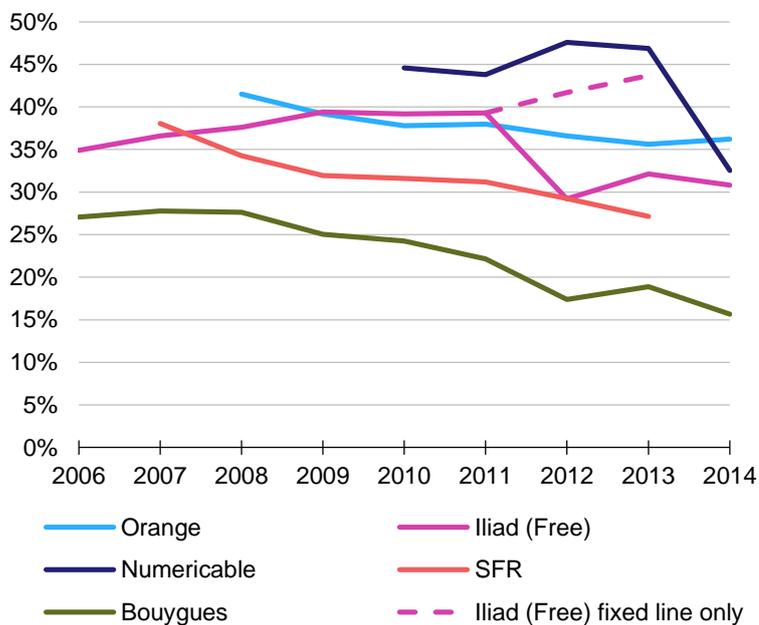
Figure 6.13: EBITDA margins of French operators (group level) [Source: Operator annual reports, extracted May 2015]

Note: unless otherwise specified these figures are for the operator group, which includes the mobile businesses of each operator. Figures are not available for the fixed-only businesses for the other operators.

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[249] Analysys Mason *DataHub*, extracted May 2015.

Orange achieved the highest levels of profitability in 2014, at 36% EBITDA margin, after falling from 42% in 2008, a relatively modest decline. Numericable historically had significantly higher EBITDA margins, but these declined steeply in 2014 following the acquisition of SFR.

Furthermore, Iliad (Free) had high and rising EBITDA margins to 2011, before the launch of its mobile services caused a sudden reduction in 2012. However, Iliad's fixed line-only EBITDA shows that the fixed-line business has in fact continued to grow in profitability, reaching 44% in 2013.

Conversely, SFR saw a rapid reduction in EBITDA margin across the period, falling from 38% in 2007 to 27% in 2013. Particularly sharp reductions in 2012 and 2013 can be attributed to the heightened mobile market competition following Iliad's entry in 2012 (and indeed a similar trend can be seen in Orange's margins).

Bouygues has the lowest margins and has seen the steepest declines, reaching only 16% in 2014. This is largely reflective of Bouygues' very aggressive pricing, which has facilitated its rapid growth in market share.

Overall, profitability trends indicate strong competition and price pressure. The higher levels of EBITDA margins achieved by Orange could indicate insufficient competition, although they may also be linked to its high market share in the fixed and mobile markets and the resultant economies of scale, as well as Orange's strong focus on high-value and business customers.

We note the limitations of reviewing EBITDA margins at an operator group level, given the impact of operators' mobile businesses. In particular, the recent dynamics in the mobile market in France are likely to have had a strong impact on group EBITDA figures. However, it should also be noted that the mobile divisions of integrated operators benefit from the investment in fibre via the self-provision of backhaul services.

6.4.6 Quality of service

Operators in France with over 100 000 fixed-line subscribers are required to publish specific QoS metrics each quarter. Seven different indicators are measured, namely: upload and download speed, latency, packet loss and performance of web browsing, video and P2P services. In order to monitor this, nodes have been installed in eight sites and a series of operators and plans covering each of the technology used (and for copper also the line lengths) have been selected. Relatively comprehensive reports with supporting data sets are published by ARCEP twice a year.[250]

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[250]   See   http://www.arcep.fr/uploads/tx_gspublication/QoS-internet-semestre2_2014-mai2015.pdf;   dataset   available
here:
http://www.arcep.fr/index.php?id=8571&tx_gsactualite_pi1%5Buid%5D=1744&tx_gsactualite_pi1%5Bannee%5D=&
tx_gsactualite_pi1%5Btheme%5D=&tx_gsactualite_pi1%5Bmotscle%5D=&tx_gsactualite_pi1%5BbackID%5D=26&
cHash=b402ff4b3f44d0d1ee66194773698941

Figure 6.14 below shows average upload and download speeds for different access technologies, as published by ARCEP. The sharp improvement in download and upload speeds for cable and FTTH technologies is in contrast to the situation for ADSL and VDSL-CO lines.
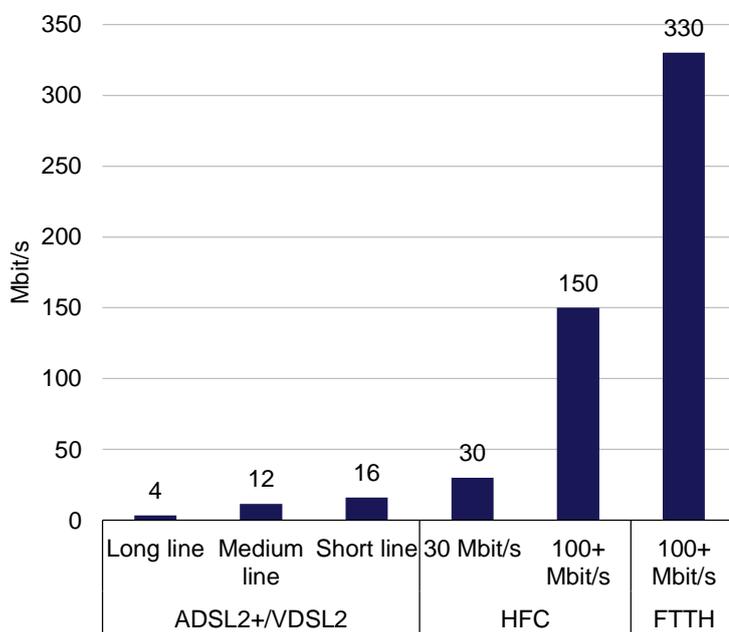

Figure 6.14: Average download speeds by technology [Source: ARCEP, 2015][251]
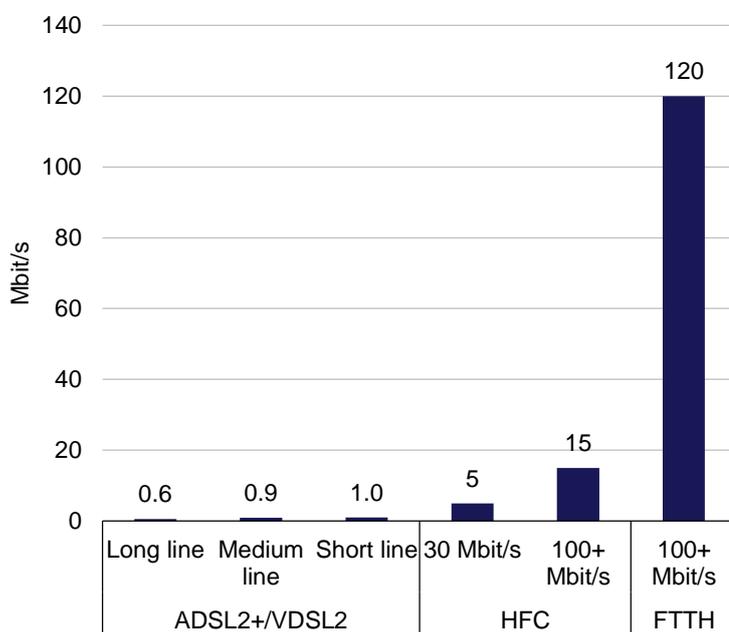


Figure 6.15: Average upload speeds by technology [Source: ARCEP, 2015][251]

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[251] See http://www.arcep.fr/uploads/tx_gspublication/QoS-internet-semestre2_2014-mai2015.pdf. Note: data has been transcribed by eye from the published charts.

7 Netherlands

7.1 Summary

Within the Netherlands, we have considered the SMP remedies proposed to be imposed on KPN following a finding of a risk of joint dominance in the retail market, as well as dark-fibre access for FTTH and active wholesale broadband access (VULA). Since we began this project, the ACM has withdrawn its notification.

The Dutch regulator, the ACM, has focused on passive remedies, historically applying both dark-fibre and SLU obligations. More recently, SLU has been replaced by VULA, as a Market 4 remedy. Fibre bitstream remedies are only applied to the high-quality wholesale broadband access market, which effectively represents business services and so is not considered in detail here. There are no geographic variations in the remedies and all regulation is asymmetric. Pricing methodologies are based on a cost-based approach, with VULA using an embedded direct cost (EDC) methodology, whilst dark-fibre ODF access uses a discounted cashflow (DCF) model. A local point of interconnection is used for passive products as well as VULA.

Figure 5.1 below summarises the current NGA regulation in the Netherlands, by network type, type of remedy and geographic area, stating where the point of interconnection lies, whether the regulation is symmetric or asymmetric and what the pricing model is.

Further details can be found in the full case study that follows.

Figure 7.1: Summary of NGA regulation in the Netherlands [Source: Analysys Mason, 2015]

Network type	Regulation type	Geographic application	Point of interconnection	Symmetric / asymmetric	Pricing model
FTTH regulation (P2P network[252])	Dark fibre (access to the ODF)	Nationwide	Local: access at the ODF	Asymmetric	Price control, cost-based: multi-annual price cap based on a discounted cashflow model with an internal rate-of-return calculation methodology[253]
	Dark fibre (ODF backhaul)	Nationwide	Local: between ODF location and the "underlying network of the recipient". This may be at the metro core level (196 localities) or at the "CityPoP" level (an average of 3500 homes)[254]	Asymmetric	Price control, cost-based: embedded direct costs (EDC) methodology with "benefits received" principle to differentiate pricing on the basis of the value of the service in the market[255]
VDSL regulation (FTTC & VDSL-CO)	VULA	Nationwide	Likely to be local[256]	Asymmetric	Price-control, cost-based: embedded direct costs/ wholesale price cap (EDC/WPC) methodology[257]

252   However, it was recently announced that KPN/Reggefiber were trialling GPON; see http://tweakers.net/nieuws/101189/kpn-experimenteert-met-dsl-van-400mbit-s.html (February 2015).

253   See https://circabc.europa.eu/sd/a/3324ec2f-b6ba-47bf-a367-cecdb8dafead/NL-2011-1278%20Acte_EN+date%20et%20nr.pdf

254   See https://www.acm.nl/nl/publicaties/publicatie/14110/ACM-biedt-ontwerp-marktanalysebesluit-ontbundelde-toegang-aan-bij-Europese-Commissie/

255   See https://circabc.europa.eu/sd/a/ec302add-7eda-49ae-8c59-3d734204b711/NL-2012-1407-1408%20Adopted_EN.pdf

256   We have been unable to verify this, as a wholesale reference offer has not yet been developed (since the introduction of VULA is still under dispute and so regulation has not been finalised). However, as a replacement for SDF, it is likely that VULA will be provided via local points of interconnection.

257   See: https://www.acm.nl/nl/publicaties/publicatie/14110/ACM-biedt-ontwerp-marktanalysebesluit-ontbundelde-toegang-aan-bij-Europese-Commissie/

7.2 Market and regulatory context

7.2.1 Market environment before the regulatory interventions were made

The fixed telecoms market in the Netherlands has historically been led by the incumbent, KPN (operator of ADSL infrastructure) and two non-overlapping cable operators, Ziggo and Liberty Global (UPC). In 2008, fibre products became commercially available for the first time after the Dutch regulator, the Netherlands Authority for Consumers and Markets (ACM),[258,259] approved the creation of Reggefiber, a joint venture between KPN and Reggeborgh, a private investment company.[260] In October 2014, a full merger was approved between KPN and Reggefiber.[261] In the same month, the EC approved the acquisition of Ziggo by UPC[262] ('UPC/Ziggo'), thus further concentrating the market.[263]

In 2014, KPN's ADSL network covered over 99% households in the Netherlands, while its VDSL network passed more than 51%.[264] Its FTTH network had around 25% coverage. Cable coverage reached 95% of premises in 2014.

At the end of 2014, broadband penetration stood at approximately 90% of households: UPC/Ziggo held a retail market share of 44%, followed by KPN at 43%; the remaining 13% was split between Online, Tele2 and other smaller operators.

7.2.2 Underlying regulatory regime

As part of the Telecoms Act of December 1998,[265] KPN was deemed to have SMP in the markets for fixed public telephony services and leased lines, providing for a review after two years. In November 2000, the regulator renewed KPN's SMP status. Since then, KPN has retained its SMP designation, and in 2012 the EC approved the ACM's finding of SMP status for KPN in the market for wholesale physical network infrastructure access (Market 4).

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[258] Telecoms regulation in the Netherlands was originally overseen by the Independent Post Telecommunications Authority (OPTA), which was formed in August 1997. In April 2013, OPTA merged with the Netherlands Competition Authority (NMa) to create the current regulatory body, the ACM. This document refers to both as "ACM"

[259] ACM decision 6397/KPN. Available at https://www.acm.nl/nl/publicaties/publicatie/2356/KPN---Reggefiber/

[260] We note that prior to this a number of community schemes had been established, e.g. Nuenen

[261] ACM case number 14.0672.24. Available at https://www.acm.nl/nl/publicaties/publicatie/13492/KPN-mag-volledige-zeggenschap-in-Reggefiber-krijgen-concentratiebesluit/

[262] EC M.7000 Liberty Global/Ziggo. Available at http://ec.europa.eu/competition/elojade/isef/case_details.cfm?proc_code=2_M_7000

[263] As a result, the Herfindahl–Hirschman index (HHI), which is a measure of market concentration, increased 12.5 percentage points in 2014.

[264] Analysys Mason Research, FTTx roll-out and capex worldwide: forecasts and analysis 2014–2019, 2015

[265] See http://www.government.nl/files/documents-and-publications/notes/2012/06/07/dutch-telecommunications-act/telecommunications-act.pdf

KPN is currently obliged to offer access to its networks through MDF (main distribution frame)-access,[266] ODF (optical distribution frame)-access[267] and VULA. These obligations include the requirements for non-discrimination, transparency and tariff regulation under a reference offer.

The ACM originally ruled in December 2008 that ODF-access FTTH and ODF-access fibre-to-the-office (FTTO) formed part of the same market as MDF-access and SDF-access copper obligations, and that KPN held SMP in both markets.[268] The FTTH and FTTO markets were later split and, following a number of legal challenges, KPN's SMP designation for ODF-access FTTO was removed in 2013.[269]

In late 2014, the ACM found that KPN and UPC/Ziggo held joint dominance in the retail fixed Internet access market, although only individual dominance was found for KPN in the related wholesale market.[270] This finding received a "serious doubts" letter and is currently being reviewed by the EC.[271]

7.2.3 Policy objectives

In its March 2015 market analysis,[272] the ACM notes that it aims to act in accordance with Article 1.3 of the Dutch Telecoms Act (TA). The 1998 Dutch TA (updated in 2002) states in Article 1.3 that:

> "*The Board shall ensure that its decisions contribute to achieving the objectives set out in Article 8(2) to (5) of Directive No. 2002/21/EC, in any case by:*
> a. *promoting competition in the provision of electronic communications networks, electronic communications services, or associated facilities, including by encouraging efficient investment in the field of infrastructure and supporting innovation;*
> b. *the development of the internal market;*
> c. *promoting the interests of end-users as regards choice, price, and quality."*

The ACM's 2008 review of the market for unbundled access[273,274] states that:

> "*The purpose of tariff regulation for unbundled fibre access is to prevent some of the competition problems that would otherwise arise where SMP is present. Preventing these competition problems fosters competition on wholesale and retail markets."*

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[266]   MDF services give passive access to third parties from the MDF to end customers over the incumbent's copper network.

[267]   ODF services give passive access to third parties from the ODF to end customers over the incumbent's fibre-optic network.

[268]   See https://www.acm.nl/nl/publicaties/publicatie/9693/Besluit-marktanalyse-ontbundelde-toegang-op-wholesale-niveau/

[269]   See http://uitspraken.rechtspraak.nl/inziendocument?id=ECLI:NL:CBB:2013:274

[270]   See https://www.acm.nl/nl/download/publicatie/?id=13466

[271]   See https://circabc.europa.eu/sd/a/78572bae-5d51-4fee-9f94-dbc4290dfc7e/NL-2015-1727%20ADOPTED_EN%20PUBLIC.pdf

[272]   See https://www.acm.nl/nl/publicaties/publicatie/14110/ACM-biedt-ontwerp-marktanalysebesluit-ontbundelde-toegang-aan-bij-Europese-Commissie/

[273]   See https://www.acm.nl/en/publications/publication/9713/Policy-rules-tariff-regulation-for-unbundled-fibre-access-/

[274]   This refers to the EC's Market 4 – Access to (physical) network infrastructure.

It continues by indicating that:

> *"The ultimate goal of the regulatory framework is to bring about a situation of enduring competition. This is competition that is not – or is no longer – dependent on sector-specific regulation for its existence and effectiveness."*

The ACM concludes that:

> *"[…] both fostering competition and encouraging investments are essential objectives in implementing tariff regulation of unbundled fibre access. As in many cases a trade-off occurs between the two objectives, the commission (ACM) will have to find the necessary balance."*

7.3 Regulatory interventions

7.3.1 Summary

The ACM characterises the market for fixed Internet access as shown in Figure 7.2.

Figure 7.2: Structure of the fixed Internet access market [Source: ACM, 2015[275]]
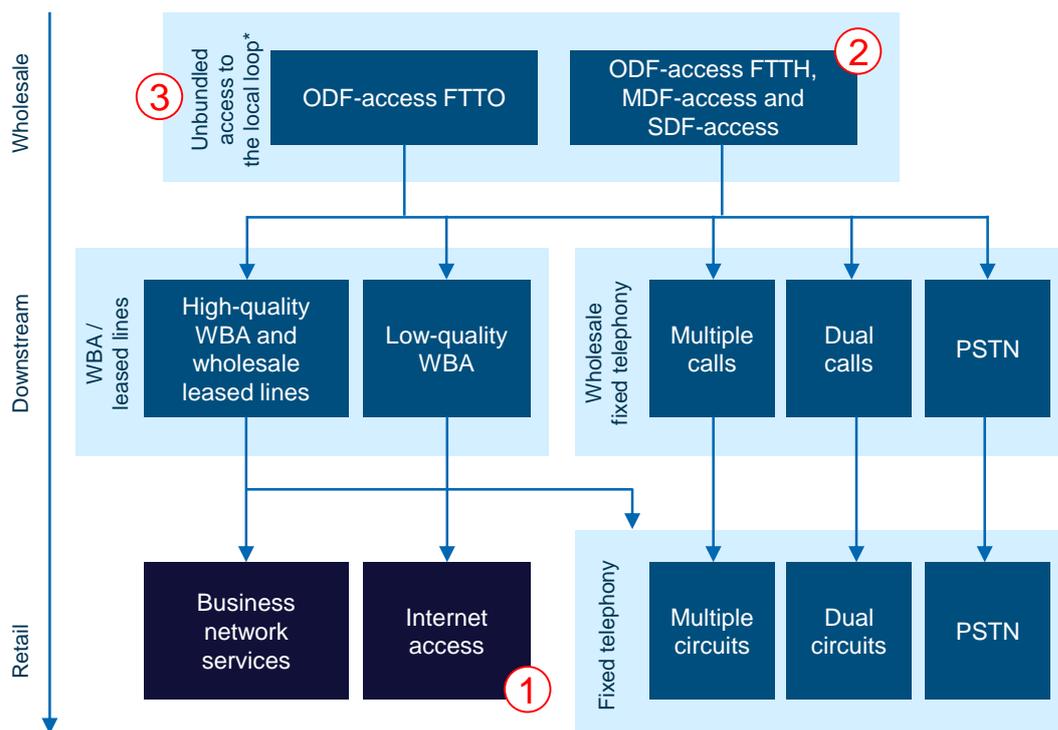
*   This refers to what the ACM describes as the market for unbundled access, or the EC's Market 4.

This section focuses on the following two areas of interest:

*   The finding of a risk of joint dominance in the retail Internet access market ((1) in Figure 7.2 above) and subsequent SMP designation of just KPN at the wholesale level ((2) in Figure 7.2)
*   ODF-access fibre at the wholesale level, both FTTH and FTTO ((3) in Figure 7.2).

Joint dominance

A summary of joint dominance regulation is shown in Figure 7.3, with further detail provided in the remainder of this section.

Figure 7.3: Summary of the recent timeline of events relevant to joint dominance regulation in the Netherlands [Source: Analysys Mason, 2015]

Date	Description
March 2002	EC issues first directive outline joint dominance (updates in July 2002, November 2009)[276]
October 2014	KPN takeover of Reggefiber and UPC takeover of Ziggo approved
October 2014	ACM draft analysis; risk of joint dominance (KPN & UPC/Ziggo) in the retail fixed Internet access market, SMP found only for KPN in the relevant wholesale market
December 2014	Consultation period ends; KPN & UPC/Ziggo object to finding of joint dominance
January 2015	The ACM updates October 2014 draft analysis; confirms obligation for VULA and revises VULA tariff regulation
March 2015	The ACM publishes updated draft maintaining a risk of joint dominance and SMP findings from October 2014 draft
April 2015	"Serious doubts" letter from EC
May 2015	BEREC opinion, largely supporting ACM
June 2015	Withdrawl of draft by ACM

In March 2002,[277] the EC outlined the conditions in which joint dominance may be found in a market. This was updated in July 2002[278] to provide more practical advice on determining joint dominance, and then again in November 2009.[279]

In its July 2002 document, the EC stated that:

> *"Two or more undertakings can be found to be in a joint dominant position within the meaning of Article 14 if, even in the absence of structural or other links between them, they operate in a market which is characterised by a lack of effective competition and in which no single undertaking has significant market power."*

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[276] Original, March 2002 (http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32002L0021&from=EN); July 2002 update (http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52002XC0711(02)&from=EN), subsequent update in November 2009 (http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32009L0140&from=EN)

[277] See http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32002L0021&from=EN

[278] See http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52002XC0711(02)&from=EN

[279] See http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32009L0140&from=EN

In its July 2002 guidelines on market analysis and the assessment of SMP, the EC highlights the analysis that NRAs should take to determine joint SMP in a market:

> *"When assessing ex-ante the likely existence or emergence of a market which is or could become conducive to collective dominance in the form of tacit coordination, NRAs, should analyse:*
>
>> *(a) whether the characteristics of the market makes it conducive to tacit coordination; and*
>>
>> *(b) whether such form of coordination is sustainable that is, (i) whether any of the oligopolists have the ability and incentive to deviate from the coordinated outcome, considering the ability and incentives of the non-deviators to retaliate; and (ii) whether buyers/ fringe competitors/potential entrants have the ability and incentive to challenge any anti-competitive coordinated outcome."*

There is a history to the analysis of tacit collusion in the Netherlands. In 2006, the ACM published a paper[280] which examined the nature of competition in duopolies and provided a number of recommendations to be applied to the communications sector in the Netherlands.

Following KPN's acquisition of Reggefiber and UPC's takeover of Ziggo, both approved in October 2014, market concentration increased.[281] Although the EC noted upon approval of the UPC/Ziggo merger that it did not expect this to increase the likelihood of tacit collusion,[282] the ACM stated that the increasing market concentration led to a need to review the SMP designation previously imposed on KPN.[283]

In October 2014, the ACM produced its draft market analysis decision on the market for unbundled access (i.e. Market 4).[283] In its analysis, the ACM considered three *retail* markets:

- fixed Internet access
- fixed telephony (single, dual and multiple circuits)
- business services.

At the retail level, the ACM deemed KPN to have *individual* SMP in the fixed telephony and business services markets. In the retail market for fixed Internet access, the ACM found KPN and UPC/Ziggo to have a risk of joint dominance if regulation were removed:

> *"This study shows that KPN and UPC/Ziggo have the incentive and the ability to reach a tacit understanding, and that there is therefore a risk that the parties reach a tacit understanding to limit competition. The ACM also concludes that to control deviations is*

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[280] See https://www.acm.nl/en/download/publication/?id=9102

[281] The extent to which the merger of non-overlapping access networks is significant in this regard is complex. The Herfindahl-Hirschman Index (HHI) increased by 12.5 percentage points in 2014, if the calculation was undertaken on a national basis; but this is overly simplistic. However, there are real effects of the merger: for example, the separate cable networks can no longer be benchmarked against each other.

[282] See http://ec.europa.eu/competition/mergers/cases/decisions/m7000_20141010_20600_4221982_EN.pdf, Paragraph 495

[283] See https://www.acm.nl/nl/download/publicatie/?id=13466

easy, that it is possible to discipline deviant behaviour, and there are no outsiders or buying power that could eliminate the risk. On that basis, the ACM concludes that there is a risk of collective SMP."

At the wholesale level, the ACM decided that the cable network of UPC/Ziggo did not constitute effective competition and was not considered to be part of the same market:

"The ACM concludes that access to cable networks is not part of the same relevant product market as MDF access, SDF access and ODF access FTTH."

This decision was reached because the unbundling of cable networks was considered uneconomic for the majority of the Netherlands, and concerns over technical infeasibility were also highlighted. Ex-ante regulations were therefore applied only to KPN in the wholesale market, despite the finding of a risk of joint dominance in the retail market. These obligations included access to the MDF, SDF and ODF FTTH (but not ODF FTTO; see the section below on ODF access to fibre), as well as VULA.

The decision was opposed by KPN and UPC/Ziggo, and both companies hired external consultancies to produce detailed responses to the draft decision findings published by the ACM.[284,285]

In its report on behalf of KPN, RBB Economics argued that the criteria laid down by the EC in its joint dominance recommendations were not met in the Dutch market. It did not seek to address the imposition of SMP on KPN (but not UPC/Ziggo) in the wholesale market. RBB Economics made the following points:

- KPN would not necessarily stop providing voluntary access if regulation were eliminated
  — the ACM failed to address the economic rationale for offering access (or not)
- the ACM is only assessing that there is *a risk* of joint dominance
  — this risk could be incredibly small but would still satisfy the regulator's wording
- the projected market shares in the absence of regulation are not substantiated sufficiently
- no geographical considerations are made
- the ACM's assessment of technological similarity between cable operators and copper/fibre is without proper foundation
- the stable duopoly situation described by the ACM is unlikely to emerge given the current market share trends and technological developments
- the ACM identifies market share as the main co-ordination mechanism[286] due to the transparency of market shares and prices, and the current 50/50 split of market share is seen as cause for concern. They argue that this is unconvincing because
  — quality differences would be difficult to alter in order to create comparable products

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[284] See https://www.acm.nl/nl/download/bijlage/?id=12298

[285] See https://www.acm.nl/nl/download/bijlage/?id=12302

[286] A co-ordination mechanism is the focus of tacit collusion (e.g. market share, prices, quality etc.), allowing both parties to see that the situation is maintained

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- — market share is likely to develop in favour of UPC/Ziggo
- — both operators are likely to gain competitive advantage from upgrading their networks
- there lacks a credible punishment mechanism.[287]

UPC/Ziggo responded to the draft findings in a similar manner.

In late January 2015, the ACM published an update to its October 2014 draft market analysis decision on the market for unbundled access.[288] This update focused on changes to MDF-access and VULA, but did not address the main concerns voiced over the finding of a risk of joint dominance.

After a five-week consultation period on the updated draft, the ACM published its final decision in March 2015.[289] The ACM maintained its original wording, finding a risk of joint dominance in the market for fixed Internet access for both KPN and UPC/Ziggo. Ten days after releasing this publication, the ACM received a Request for Information (RFI) from the EC. At the end of April 2015,[290] the EC published a "serious doubts" letter[291] stating that:

"The Commission has concerns about the analysis of competition on the retail market for consumer Internet access, and about the related question whether KPN can continue to benefit from its strong position on the relevant wholesale market when confronted by the cable operator UPC/Ziggo, whose network also serves such consumers throughout almost the entire country."

In addition, the EC voiced its concerns:

"Moreover, the Commission, at this stage, considers that the assessment carried out by the ACM of the competitive constraints exercised by the ubiquitous cable network on the copper network is not compatible with EU law, and in particular with the obligation that NRAs shall, taking utmost account of the Recommendation and the SMP Guidelines (the Guidelines), define and analyse relevant markets in accordance with national circumstances in line with the principles of competition law."

Regarding the exclusion of cable products from the wholesale market, the EC noted:

"[…] that the market definition for the purposes of assessing market power should be done prospectively (i.e. on a forward-looking basis).[292] Thus, in spite of ACM's view that there is

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[287]   A punishment mechanism allows one party to negatively affect the other should it act outside of the joint interests.

[288]   See https://www.acm.nl/nl/publicaties/publicatie/13797/Verzoek-te-reageren-op-aanpassingen-marktanalyse-Ontbundelde-toegang/

[289]   See https://www.acm.nl/nl/publicaties/publicatie/14110/ACM-biedt-ontwerp-marktanalysebesluit-ontbundelde-toegang-aan-bij-Europese-Commissie/

[290]   Note: the EC does not appear to have objected to the original draft proposals.

[291]   See http://ec.europa.eu/digital-agenda/en/news/european-commission-questions-dutch-regulators-analysis-wholesale-market-local-access-telecom

[292]   Recital 20 and 35 of the Guidelines and Recital 9 of the Recommendation on relevant markets.

currently no means to unbundle the cable network, it should have also assessed whether a cable network may support wholesale access services on the basis of virtually unbundled access in the timeframe of this market review, particularly if there was demand for such service. In fact, this seems to be the conclusion of the study by WIK Consult for ACM on this matter.[293] *Further, various types of wholesale virtual access to cable networks are or may in the timeframe of this review be considered possible in the Netherlands, also in view of developments observed in other Member States, on the basis of either ex ante regulation or other, sometimes operator-internal reasons."*

As a result, the EC opened a so-called Phase 2 investigation to determine whether the analysis of the market was carried out in accordance with the EU telecoms rules and competition law principles. The EC set out a period of two months over which it would discuss the case with the ACM, in collaboration with the Body of European Regulators of Electronic Communications (BEREC), in order to ensure compliance with EU law.

The ACM published a brief response[294] in which it expressed that it was "*very surprised by this reaction*"[295] but that it would "*look into the Commission's concerns very carefully*".

In late May, BEREC concluded its investigation, and largely supported the analysis of ACM, though it found that a finding of SMP at the retail level was not necessary to impose ex-ante regulation in the wholesale market and did not comment on the ACM assessment of the risk of joint dominance[296].

ACM subsequently withdrew its notification.

ODF-access to fibre

A summary of ODF-access to fibre regulation is shown in Figure 7.4, with further detail in the remainder of this section.

Figure 7.4: Summary of the timeline of relevant events for ODF access to fibre regulation in the Netherlands [Source: Analysys Mason, 2015]

Date	Description
December 2008	ACM draft review deems ODF-FTTH and FTTO to be in the same market as MDF access and SDF access; KPN has SMP in all
October 2009	KPN appeals against ODF-FTTO inclusion; court finds in KPN's favour and

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[293] Wik Consult (2014), *Options of wholesale access to Cable-TV networks with focus on VULA, Workshop for ACM, 9 July 2014*. The workshop slides conclude that "*DOCSIS (3.0/3.1) so far is not intended to support wholesale services in a VULA manner, but may be developed towards such features, if there is demand for it*" (slide 65).

[294] See https://www.acm.nl/en/publications/publication/14223/ACM-will-look-into-the-European-Commissions-reaction-to-its-draft-market-analysis-decision-on-unbundled-local-access/

[295] Note: The 'surprise' referenced here is understandable given that the EC does not appear to have objected to the draft measures.

[296] BEREC Opinion on Phase II investigation pursuant to Article 7 of Directive 2002/21/EC as amended by Directive 2009/140/EC: Case NL/2015/1727 Wholesale local access provided at a fixed location in the Netherlands 28 May 2015

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Date	Description
	removes FTTO obligation
February 2010	ACM publishes updated draft review, ODF-FTTO is included in original market; KPN has SMP in all
December 2011	ACM publishes review; ODF-FTTO is split off into its own market; KPN has SMP in ODF-FTTH, MDF and SDF but not in ODF-FTTO
December 2012	ACM publishes a review following concerns from EC and BEREC; KPN has SMP in ODF-FTTO (as well as in ODF-FTTH, MDF and SDF)
April 2013	KPN appeals against ODF-FTTO SMP; its appeal is rejected
December 2013	KPN is taken to court by ACM over non-conformance with ODF-FTTO obligation; the court finds in favour of KPN and the ODF-FTTO reference offer is removed
March 2015	ACM publishes an updated draft maintaining joint dominance and SMP findings from October 2014 draft; ODF-FTTO remains a separate market with no SMP and KPN retains SMP in ODF-FTTH, MDF and SDF

In December 2008, the ACM reviewed the market for wholesale physical network infrastructure access[297] (i.e. the upstream wholesale market to the 'fixed Internet access' retail market discussed above), where it defined the market as including both copper (via MDF- and SDF-access) and fibre (via ODF-access) loops. In this review, fibre access was found to include both ODF-access FTTH and ODF-access FTTO (also called "industrial", i.e. for enterprises). Since then there has been a significant amount of controversy surrounding the regulation of ODF-access FTTO, in particular with regard to its definition as part of the same market as ODF-access FTTH (also MDF-access and SDF-access (subloop)) and the designation of KPN as having SMP in FTTO. However, there has been less controversy around ODF-access FTTH, which has remained subject to ex-ante regulation since 2008.

In its 2008 market analysis, the ACM found that KPN held SMP in MDF-access, SDF-access and ODF-access FTTH and FTTO. As a result, it imposed a number of ex-ante regulatory obligations on KPN, which included access obligations, the requirement to publish a reference offer, non-discrimination obligations and cost-oriented price regulation. However, it did not impose accounting separation conditions, noting that the issue of margin squeeze was adequately dealt with by the combination of non-discrimination and price regulation.

KPN appealed against this decision to the CBb.[298] The appeal was heard in 2009 and the court revoked the inclusion of ODF-access FTTO in the market due to the lack of a properly evidenced approach in the market analysis:[299]

> "OPTA has not (sufficiently) investigated whether ODF-access (industrial) is in the same market as MDF-access, SDF-access and ODF-access FTTH. OPTA bases its conclusion that ODF-access (FTTH and FTTO) is in the same market as MDF-access and SDF-access only on an analysis of the price pressure that ODF-access FTTH exerts on MDF-access

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[297] See https://www.acm.nl/nl/publicaties/publicatie/9693/Besluit-marktanalyse-ontbundelde-toegang-op-wholesale-niveau/

[298] College van Beroep voor het bedrijfsleven – the Netherlands Trade and Industry Appeals Tribunal.

[299] See http://uitspraken.rechtspraak.nl/inziendocument?id=ECLI:NL:CBB:2009:BK1315

and SDF-access. There is nothing in the decision to suggest that OPTA has done any research on the substitution of MDF-, SDF- and ODF-access FTTH by ODF-access (industrial) or vice versa."

As a result, the original decision was annulled and the regulator was required to reach a new decision within six months, taking account of the court's decision. The original decision for MDF-, SDF- and ODF-access FTTH was upheld by the court (i.e. SMP designation and obligations for KPN).

In February 2010, the ACM published its updated draft review of the market for wholesale physical network infrastructure access.[300] In this, it maintained the inclusion of ODF-access FTTO in the product market definition. The ACM first analysed the broadband retail market, and concluded that xDSL (copper), cable and fibre all belonged in the same product market, on the basis that similar pricing between the technologies demonstrated substitutability. The ACM noted that KPN was the only party in the market with FTTH (mirroring the situation in the copper market, where KPN also had a 100% market share), but within the FTTO market there were a number of other competitors.[301] However, it concluded that KPN's FTTO market share was growing and that it still held a dominant position in this market.

The EC issued a response in March 2010.[302] In this, it noted the ACM's draft decision regarding its market definition and proposed a number of obligations to be imposed on KPN, as well as making specific mention of NGA networks:

"The Commission recalls that it is currently working towards a Recommendation on NGA remedies with the aim of ensuring a consistent regulatory approach to the roll-out of Next Generation Networks across Europe. The Commission considers it important that any regulatory intervention ensures an appropriate balance between investment incentives and the need for competition and consumer benefits. This may justify OPTA's reasoning for distinguishing price setting methodologies for FttH and FttO ODF-based access and may also lead to geographically differentiated FttO access prices on the basis of demonstrated differences in underlying costs. Nevertheless, in order to ensure a consistent regulation of access to fibre lines throughout the European Union, the Commission invites OPTA to revisit its analysis along the lines of the Recommendation on regulated access to NGA once adopted, so as to avoid undesirable divergences of regulatory approaches in the internal market."

The EC invited the ACM to 'strengthen' its position in terms of market definition, but did not object to the market analysis approach per se. Following a six-week consultation period, the final decision was published in April 2010.[303] This confirmed that the relevant market included ODF-access FTTO and that KPN held SMP in MDF-access, SDF-access and ODF-access FTTH and

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[300] See https://www.acm.nl/nl/publicaties/publicatie/9958/Ontwerp-marktanalysebesluit-ontbundelde-toegang/

[301] Competitors included Eurofiber, Ziggo, Colt, Tele2, Verizon, UPC/Priority Telecom, Delta, BT, AT&T and Bbned.

[302] EC response SG-Greffe (2010) D/4787 31/03/2010. Available at https://circabc.europa.eu/sd/a/6dec1ab5-cc8a-4038-bd1c-9a823820190e/NL-2010-1052_ACTE_EN+%20nr%20et%20date.pdf

[303] See https://www.acm.nl/nl/publicaties/publicatie/10003/Besluit-marktanalyse-ontbundelde-toegang-op-wholesaleniveau/

FTTO, on a national basis. Subsequent market revisions have focused on the inclusion of ODF-access FTTO as part of the relevant market, while copper MDF-access and ODF-access FTTH have remained regulated on a national basis to date.

In May 2011, the CBb again overturned the ACM's decision[304] to include ODF-access FTTO, on the same basis as previously – that is, there was insufficient evidence to suggest that it was a substitute for MDF-, SDF- or ODF-access FTTH. As with the court decision in 2010, only the ODF-access FTTO obligations were removed.

The ACM reassessed the market once more in October 2011. The regulator looked at the development of the fibre infrastructure and the impact that this would have on the underlying costs of ODF-access FTTO, and the ability to deliver higher-capacity and higher-quality services via MDF-access. Following its analysis, the ACM concluded that ODF-access FTTO did not belong in the same relevant market as MDF-, SDF-[305] and ODF-access FTTH and would therefore be assessed separately. The EC response from March 2012[306] noted that KPN "*will roll-out its FTTO-networks less quickly than previously expected*" and that the "*costs per unbundled access will increase*". The previous rationale for including FTTO (whereby its similar pricing made it a substitute for FTTH) was therefore no longer valid.

The newly separated FTTO market was reviewed in October 2011[307] through a draft market analysis decision, followed by a further six-week consultation period. The final decision was published in December 2011. Although KPN was found to have a significant share of the FTTO market,[308] the ACM noted that any alternative operator would still be able to benefit from the first mover's advantage. The regulator did not consider it necessary for KPN's competitors to have a network as extensive as the incumbent's in order to compete effectively, as entry on a local or regional scale would be possible. It was therefore deemed unnecessary to impose ex-ante regulation on the ODF-access FTTO market.

However, the EC had significant concerns with this finding in its response of March 2012.[306] In particular, it cited the definition of ODF-FTTO as a sub-market of the EC's Market 4 (wholesale physical infrastructure access) and the finding of no SMP for KPN as being without sufficient evidence.

The ACM carried out a further review in September 2012 to address these concerns, and published its draft decision on the ODF-FTTO market.[309] In this review, the ACM found KPN to have

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[304] See http://uitspraken.rechtspraak.nl/inziendocument?id=ECLI:NL:CBB:2011:BQ3135

[305] The ACM noted that it may not be reasonable for KPN to offer SDF-access where vectoring was employed, or where it was willing to offer suitable alternatives.

[306] EC response SG-Greffe (2012) D/4970 21/03/2012.

[307] See https://www.acm.nl/nl/publicaties/publicatie/10272/Ingetrokken-ontwerpbesluit-marktanalyse-ontbundelde-toegang-tot-zakelijke-glasvezelnetwerken-FttO/

[308] ACM considered three potential scenarios depending on KPN's share of broadband net additions, with a projected share of 45%, 65% and 80% by the end of 2014 for the three cases.

[309] See https://www.acm.nl/nl/publicaties/publicatie/10412/Ontwerpbesluit-marktanalyse-ontbundelde-toegang-tot-zakelijke-glasvezelnetwerken-FttO-2012/

nationwide SMP in the ODF-FTTO market on the basis of its market share, difficult-to-replicate infrastructure, advantages from vertical integration and barriers to entry for new market players. The final decision was published following a consultation period in December 2012.[310]

When the EC issued its response in April 2013[311] it only had comments on the price-control mechanism imposed, and not on the finding of a separate market for FTTO or SMP designation for KPN.

An appeal against the decision was once again considered by the CBb. The court ruled in April 2013[312] that the separation of the market and declaration of SMP for KPN was upheld:

> *"The board has concluded that the market for unbundled access to business fibre networks (ODF-access FTTO) is not effectively competitive and KPN has SMP in this market [...] In the absence of effective competition in the market for ODF-access FTTO and the SMP KPN's position in this market, the college shall require KPN's obligations as specified in this chapter."*

However, a further appeal was brought to the CBb,[313] in December 2013.[314] The court ruled that the FTTO market analysis was annulled, and as a result KPN immediately removed its FTTO reference offer.[315] This is the current situation.

Following the latest 2015 review of the market for wholesale physical network infrastructure access,[316] KPN retains SMP in both MDF-access and ODF-access FTTH at the national level and is subject to a number of obligations, as outlined in Section 7.3.2 below.

7.3.2 Features

Services provided

Following the designation of SMP on KPN in the MDF-access, SDF-access and ODF-access FTTH markets, the ACM imposed a number of obligations on the incumbent:

- access
- transparency
- non-discrimination

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[310] See https://www.acm.nl/nl/publicaties/publicatie/11038/Besluit-marktanalyse-ontbundelde-toegang-tot-zakelijke-glasvezelnetwerken-ODF-access-FttO-2012/

[311] EC response C(2013) 2435 22/04/2013.

[312] See http://uitspraken.rechtspraak.nl/inziendocument?id=ECLI:NL:CBB:2013:BZ8522

[313] See http://uitspraken.rechtspraak.nl/inziendocument?id=ECLI:NL:CBB:2013:274

[314] The ACM imposed a penalty on KPN on 25 October 2013 for breaching the FTTO obligations, leading to the December court case.

[315] See https://www.kpn-wholesale.com/en/our-products/data-networks/physical-access/o/odf-access-(1).aspx

[316] See https://www.acm.nl/nl/publicaties/publicatie/14110/ACM-biedt-ontwerp-marktanalysebesluit-ontbundelde-toegang-aan-bij-Europese-Commissie/

- price regulation.

These are covered in more detail below.

► *Access obligations*

The ACM notes that under Article 6a.6 of the Dutch TA, it has the right to require the SMP operator to meet reasonable requests for access to its network. The ACM stated in its 2015 review[317] that "*virtually all addresses in the Netherlands*" could be reached via MDF access, and that the majority of customers still use MDF-based lines (as opposed to fibre).

MDF-access comprises both full and shared unbundled access. KPN has announced that it plans to introduce vectoring,[318] which inhibits the ability to offer MDF-access to third parties. As a result, the ACM's 2015 review outlined that KPN may introduce vectoring where it has no existing third parties using MDF-access, and where it does, it must reach an agreement (potentially via an alternative virtual unbundling service).

The application of vectoring at the street cabinet level also removes the ability for third-party SDF-access. In earlier regulatory reviews, SDF-access (including SDF backhaul) was regulated, but in 2015 the ACM removed this obligation on the basis that virtual alternatives would offer sufficient scope for alternative operators to provide services.

Since it will become increasingly impossible for third parties to access KPN's network via MDF-access and SDF-access due to technical constraints, the ACM stated that an "*an alternative access service is needed to eliminate the competition problem*". The ACM considers that access to VULA is suitable to deal with competition problems arising from lack of access to MDF and SDF alternatives. The ACM states that KPN must meet reasonable requests to provide VULA services, subject to a set of operating criteria.[319] The pricing for VULA will be set by the ACM as noted below.

As KPN's fibre network is rolled out to provide increasing coverage of the Netherlands and consumer take-up rises, MDF-access may become obsolete in tackling competition concerns.[320] The ACM has therefore concluded that it is necessary for KPN to provide ODF-access for FTTH. The designation of SMP for the ODF-access FTTO market was removed in 2013. However, prior to this, KPN was also required to provide ODF-access for FTTO.

The ACM considers that access should also be made available to all "*associated facilities*" which enable or support access. This includes:

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[317] See https://www.acm.nl/nl/publicaties/publicatie/14110/ACM-biedt-ontwerp-marktanalysebesluit-ontbundelde-toegang-aan-bij-Europese-Commissie/

[318] Vectoring reduces interference between the twisted copper pairs so that much higher bandwidth may be achieved.

[319] That is, VULA should be decoupled, available to all bandwidths, and provide the option for customers to use their own equipment at the customer site.

[320] KPN has indicated that it plans to complete phase out MDF access in the future.

- co-location or other forms of facility sharing (including the sharing of ducts, patch cables, buildings or poles)
- open access to technical interfaces, protocols or other key technologies
- access to operational support systems or other similar software.

The EC has noted[321] that in practice this does not necessarily mean that duct access is required, since in the Netherlands fibre cabling has typically been placed directly into the ground.

ODF backhaul consists of a fibre connection between the ODF-access location and the underlying network of the third party gaining ODF access. The ACM has concluded that KPN must offer ODF backhaul access to the local network level.

► *Transparency obligations*

The ACM requires KPN to publish reference offers for access to its copper (MDF-access) and fibre (ODF-access FTTH) networks, in line with Article 6a.9 of the Dutch TA. This prevents KPN from withholding relevant information to potential wholesale customers. KPN publishes both an ODF-access FTTH reference offer and an MDF-access reference offer.[322,323]

► *Non-discrimination obligations*

The ACM requires KPN to provide non-discriminatory access, in line with Article 6a.8 of the Dutch TA. The ACM references two principles identified by the EC for ensuring non-discrimination:

- 'Equivalence of input' (EoI) – the provision of services and information to internal customers (i.e. to KPN itself) and external wholesale customers under the exact same conditions

- 'Equivalence of output' (EoO) – this principle allows for different systems and processes for internal and external wholesale customers in order for price and services to be similar downstream.

The ACM concludes that ODF-access FTTH should be governed by the EoI principle, and MDF-access and VULA by the EoO principle. Both cover the following obligations:

- equal availability of services and networks
- equal maintenance periods with respect to duration, frequency and notice periods for planned disruptions
- equal recovery times following failures

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[321] EC response SG-Greffe (2011) D/25142 21/12/2011. Available at https://circabc.europa.eu/d/d/workspace/SpacesStore/5ce2ea44-28bf-4948-b348-a02500cb128c/NL-2011-1278%20Acte_EN%2Bdate%20et%20nr.pdf.

[322] See https://www.kpn-wholesale.com/en/our-products/data-networks/physical-access/m/mdf-sdf-(1).aspx (reference offer only available with valid KPN login).

[323] See https://www.kpn-wholesale.com/en/our-products/data-networks/physical-access/o/odf-access-(1).aspx (reference offer only available with valid KPN login).

- equal ordering and delivery times
- prior announcement of new or changed services not yet available in the downstream market
- timely publication of tariff alterations, including where the services will be available.

The non-discrimination requirement also includes the prohibition of price differentiation. In particular, the following are prohibited:

- the use of selective pricing (including discounts for a selected group of wholesale customers)
- the award of long-term "loyalty" discounts to long-standing wholesale customers.

However, in some circumstances a discount can be made available subject to the ACM's approval provided it is objective, transparent and non-selective. This is designed to ensure fair competition in the downstream market.

In addition to the obligation to refrain from price differentiation, pricing which may be deemed to lead to margin erosion[324] is not permitted. This would lead to the exclusion of other players in the downstream market (in competition with KPN's retail business, which would benefit from being vertically integrated), as they would be unable to offer competitive services at the wholesale prices offered.

► *Price regulation*

The cost methodology proposed by the ACM in 2010 was the same for copper (MDF and SDF) and ODF-access FTTO, but differed for ODF-access FTTH. For the former, the ACM proposed to apply the embedded direct costs/wholesale price cap (EDC/WPC) methodology. For ODF-access FTTH it imposed a multi-annual price cap based on a discounted cashflow (DCF) model and an internal-rate-of-return (IRR) calculation methodology. The ACM determined that there was no requirement for accounting separation, stating that the issue of margin squeeze was adequately dealt with by non-discrimination obligations in combination with price regulation.

In 2011, after the separation of ODF-access FTTO into its own market, the ACM noted that it would be difficult to accurately predict the future cost base and volumes of copper technology, especially given the high presence of cable networks in the Netherlands. The ACM therefore suggested the application of a safety cap for MDF and SDF access and associated facilities, creating a degree of regulatory certainty. It maintained the earlier DCF model for ODF-access FTTH.

In the ACM's latest draft measure from March 2015, the EDC/WPC pricing mechanism was maintained for MDF copper access. VULA pricing obligations were introduced, to be priced on a bottom-up long-run incremental cost plus (BULRIC+) basis. ODF-access FTTH pricing continues to use a DCF/IRR methodology.

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[324]   Also known as "ND-5".

QoS obligations

In the Netherlands, at the point of the April 2015 Market 4 analysis, specific QoS obligations had not yet been developed for KPN's ODF-access product. However, ACM requires that such QoS obligations are defined, specifically around QoS for ordering and installation, service availability and fault repair.[325] Furthermore, KPN is required to specify penalties associated with failure to meet these. Specific SLAs are likely to be developed over the coming months.

7.4 Outcomes of the interventions

We note the limitations of attributing any direct causality between the regulatory intervention and the outcome achieved in each case, and where possible we have flagged to what extent a causal link may be drawn, and where external factors may have had a more significant influence.

7.4.1 NGA roll-out

FTTH and VDSL roll-outs in the Netherlands have continued apace over the last five years, with premises coverage growing at a CAGR of 36% and 22%, respectively, since year-end 2010 (see Figure 7.5). At the end of 2014 fibre coverage stood at 27% of total premises, with VDSL coverage just under twice this value, at 51%.[326] Cable coverage peaked at 94% in 2012, since when it has decreased by a few percentage points.[327]

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[325] See https://www.acm.nl/nl/publicaties/publicatie/14110/ACM-biedt-ontwerp-marktanalysebesluit-ontbundelde-toegang-aan-bij-Europese-Commissie/

[326] There is a small difference between the Analysys Mason data and the ACM's published figures for NGA cable and FTTB/H premises passed. Our methodology for FTTH premises passed takes account of the figures published by the fibre operators (Reggefiber/KPN, Caiway and other smaller operators). For cable, we assume that the percentage of premises passed is the same as that for households.

[327] The reduction in cable coverage can be attributed to Caiway converting cable households to FTTH.
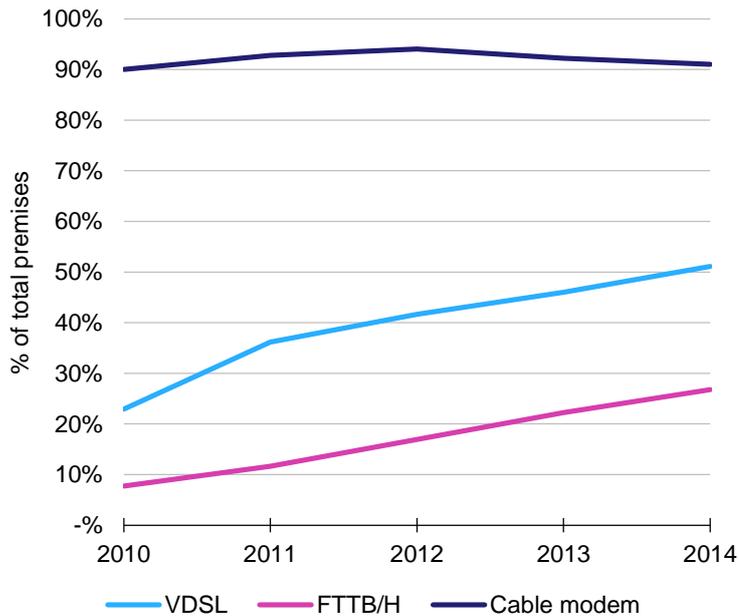
Figure 7.5: NGA premises passed as a percentage of total premises, by technology [Source: Analysys Mason Research,[328] June 2014]

FTTH deployment by KPN-Reggefiber does not appear to have been inhibited by the introduction of wholesale access remedies. Instead, it is likely to have been driven by competition from cable operators. (and independent FTTH, noting that Reggefiber came in to being independent of KPN)

Non-incumbent FTTH deployment includes that of the much smaller cable operator Caiway, which is both converting existing premises from cable to FTTH and extending its network using FTTH. This network extension may be using the dark fibre services offered by KPN.

In addition, there have been a series of municipal FTTH deployments, including Glasvezelnet Amsterdam (GNA, now 70% owned by KPN-Reggefiber), Wiericke (acquired by Vodafone NL in 2013) and Onafhankelijke Open Network Operator (OONO, acting as a wholesale provider). These networks largely predate the wholesale access and are unlikely to be linked in any way to the wholesale access remedies imposed.

Broadband penetration and NGA take-up

Broadband penetration of premises in the Netherlands reached 78% in 2014, having more or less plateaued since 2012 (see Figure 7.6 below).
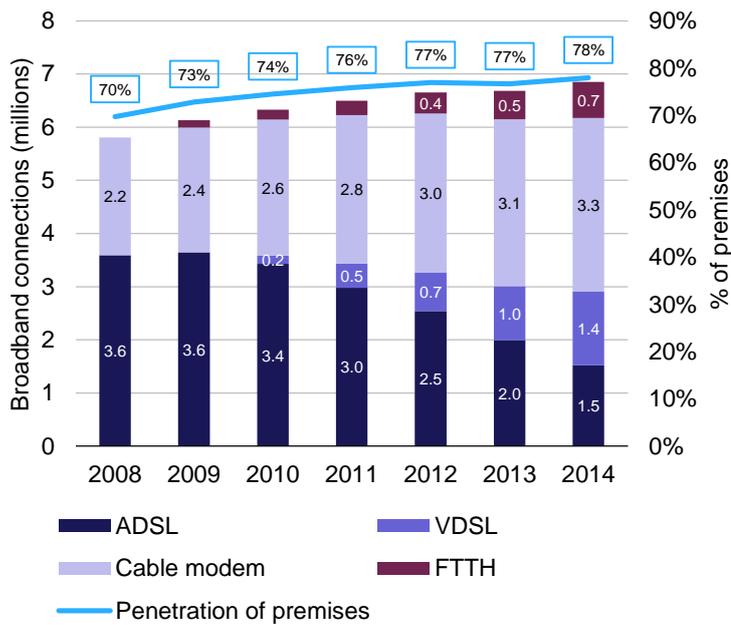

Figure 7.6: Broadband connections by technology and penetration of premises [Source: ACM,[329] Analysys Mason Research,[330] June 2014]

Despite a small change in total penetration over the last few years, there have been significant changes in the prevalence of different access technologies. ADSL subscriptions have halved since year-end 2011, falling from 3.0 million to 1.5 million in 2014. Meanwhile, VDSL is the fastest-growing access technology in the Netherlands (connections growing at a CAGR of 72.5% over the period 2010–2014) and now accounts for over 20% of total broadband subscriptions.

Cable modem had a 48% retail market share at the end of 2014; however, year-on-year growth in connections has slowed to less than 4%. FTTH reached almost 10% of broadband subscriptions in 2014. This represents 28% of premises passed, which is one of the highest levels of the case study markets.

7.4.2 Competition

In terms of market share of subscriptions, incumbent KPN was overtaken for the first time in 2014, by Liberty Group (UPC), as shown in Figure 7.7. UPC's acquisition of operator Ziggo, coupled with a small amount of organic growth, boosted its market share to 44% at the end of 2014, just ahead of KPN on 43%.

UPC's acquisition of Ziggo reduced the number of major fixed broadband players in the Netherlands from three to two. As a result, the Herfindahl–Hirschman Index (HHI)[331] jumped by 12.5 percentage points in 2014, after having remained relatively constant since 2006. As mentioned in Section 7.3.1, ACM has considered the issue of joint dominance. However, given

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[329]   The ACM's published data has been used for retail broadband connections by technology, and penetration has been calculated from this using Analysys Mason Research figures for number of premises. VDSL data comes from Analysys Mason Research, *FTTx roll-out and capex worldwide: forecasts and analysis 2014–2019*.

[330]   Analysys Mason, *FTTx roll-out and capex worldwide: forecasts and analysis 2014–2019*.

[331]   The HHI index is a measure of market concentration and is calculated as the sum of the squares of the market share of each operator (the maximum is 1.0 – i.e. one operator with 100% market share).

that the imposition of any related obligations is still subject to an EC investigation, the outcome of this review cannot yet be determined.

Outside of the top two operators (KPN and UPC/Ziggo), the market share of smaller operators has been steadily declining since 2010. As such, it does not appear that the wholesale access regulation has led to improved competition in the market.
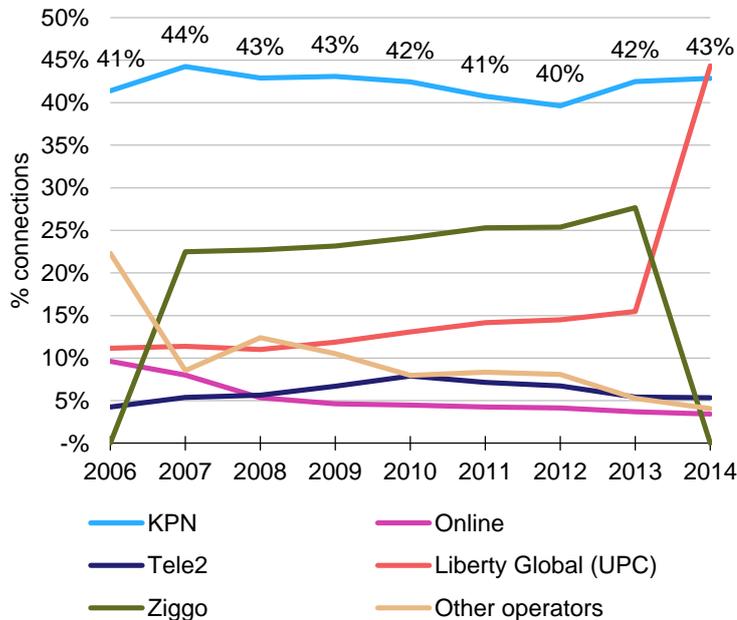
Figure 7.7: Market share of broadband connections [Source: Analysys Mason DataHub, extracted May 2015]

7.4.3 Pricing

The average spend per user (ASPU) on broadband services in the Netherlands has fallen gradually since 2009, at a CAGR of –2.1%, dipping below EUR24.50 per user per month at the end of 2014 (see Figure 7.8 below). Nevertheless, the declines are less pronounced than those seen in other case study countries, which might suggest slightly lower competitive pressures.
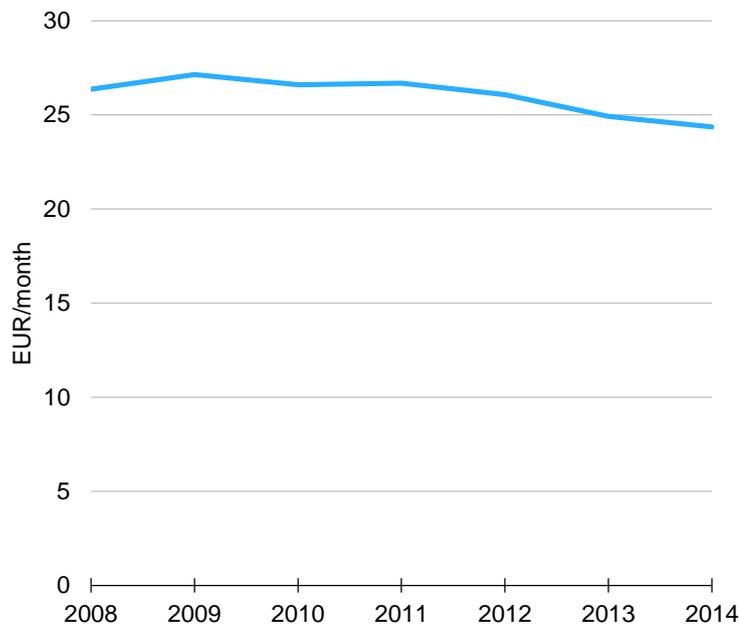
Figure 7.8: Average broadband spend per user per month [Source: Analysys Mason Research core forecasts, 2015]

7.4.4 Profitability

KPN's EBITDA margin for the consumer fixed and mobile division grew steadily between 2007 and 2010, before falling slightly in 2011 and continuing to drop thereafter, as shown in Figure 7.9. The passive fibre regulation which came into effect in 2008 does not appear to have had any clear impact.

Considering the fixed residential business only (for which statistics became available from 2011), KPN experienced a sharp decline in EBITDA margin in 2012, before the levels stabilised. In their 2012 annual report, KPN commented that this decline was caused by 'higher marketing and sales costs, higher content costs and a continued decline in higher margin traditional services', as such it does not appear to be linked to the FTTH wholesale access regulation.

The EBITDA margin of Tele2 (for fixed broadband) grew in a similar manner to that of KPN prior to 2011. Since then it has declined, likely linked to increasing retail competition and market share decline, and stood at 27.8% at the end of 2014. Tele2 Group's EBITDA margin has fallen more significantly since 2011, suggesting that the mobile section of the business has been increasingly less profitable.

In contrast, Ziggo's EBITDA margin was both significantly higher and more stable, at approximately 55%, before it merged with Liberty Global (UPC) in 2014. This can be attributed to its growing market share and the generally higher profitability of cable networks compared to their copper counterparts.

Declining EBITDA margins outside of cable company, Ziggo, suggest greater competitive pressures than implied in the ASPU levels. However, a direct link to wholesale access regulation is not evident.
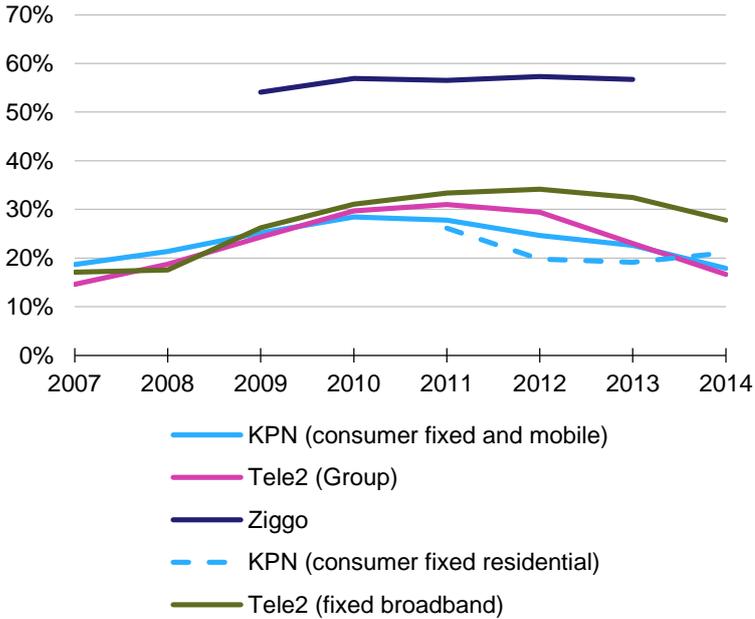
Figure 7.9: EBITDA margins of major operators in the Netherlands [Source: Operator annual reports, 2015]

7.4.5 Quality of service

The ACM does not provide statistics on broadband service quality.

8 New Zealand

8.1 Summary

Within New Zealand, we have considered FTTH wholesale broadband access on the national broadband network.[332]

The New Zealand government commissioned an FTTH national broadband network to cover 75% of premises in New Zealand, based on a series of commercial contracts. Wholesale access to this network was built into the tender process, and both the services and pricing (including price evolution) are included in the commercial contracts of the four suppliers.[333] For residential premises, active wholesale access remedies are applied based on regional PoIs. A passive remedy is available for business customers, with a local PoI. However, a backhaul service is also available to connect the local PoIs, and may be purchased as an active or passive service.

Figure 8.1 below summarises the current NGA regulation in the New Zealand, by network type, type of remedy and geographic area, stating where the point of interconnection lies, whether the regulation is symmetric or asymmetric and what the pricing model is.

Further details can be found in the full case study that follows.

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[332]   Note: we have not reviewed the wholesale broadband access arrangements for Chorus' VDSL network

[333]   However, we note that the regulator retains the right to intervene on pricing if necessary

Figure 8.1: Summary of FTTH regulation in New Zealand [Source: Analysys Mason, 2015]

Network type	Regulation type	Geographic application	Point of interconnection	Symmetric / asymmetric	Pricing model
FTTH regulation (GPON with P2P overlay)	Dark fibre (business customers only)	Nationwide	Local (at the ODF, which is in the Chorus Central Offices)[334]	Asymmetric	Not applicable: contractual price caps set during the tender process (both for launch and evolution), although the regulator can intervene if necessary
	Backhaul (available as dark fibre or an active product)[335]	Nationwide	Regional (between Central Offices)	Asymmetric	Not applicable: contractual price caps set during the tender process (both for launch and evolution), although the regulator can intervene if necessary
	Bitstream	Nationwide	Regional (one PoI per candidate area, e.g. Auckland, of which there are 33 in total)[336]	Asymmetric	Not applicable: contractual price caps set during the tender process (both for launch and evolution), although the regulator can intervene if necessary

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[334] "Central Office – The termination point for the LFC's Network. The Central Office is where the OLTs and/or MUXs (as applicable) are installed. Central Offices are expected to connect to at least several thousand End User premises" (see http://www.crownfibre.govt.nz/ufb-initiative/glossary/).

[335] See https://www.chorus.co.nz/file/48698/chorus-ufb-services-agreement-service-description-for-intra-candidate-area-backhaul-service.pdf

[336] "Point Of Interconnect – The place where the retail service provider's network connects to the wholesale fibre provider's network. This is in a Central Office. A feature of the UFB architecture is a single POI per candidate area, driving competition and supporting open access" (see http://www.crownfibre.govt.nz/ufb-initiative/glossary/).

8.2 Market and regulatory context

8.2.1 Market environment before the regulatory interventions were made

In 2008, the New Zealand government announced the launch of its Ultra-Fast Broadband (UFB) initiative to expand and develop New Zealand's broadband services. In that year, the mass market for broadband networks and services had the following characteristics:

- ADSL/VDSL services were available from the former incumbent Telecom New Zealand (now re-branded 'Spark New Zealand'). A 'cabinetisation' programme was underway, designed to support advanced broadband services in all towns of more than 500 lines. This programme was designed to provide 10Mbit/s to 84% of lines, and 5Mbit/s to 89% of lines by 2012.

- A hybrid fibre–coaxial (HFC) cable TV network was available in the Wellington (Kapiti) and Christchurch areas, with limited geographical coverage.

- LLU was offered and was being used by unbundlers (largely in urban areas).

- The availability of wholesale broadband services (including VDSL) also enabled competition in the provision of retail broadband services.

The former incumbent Telecom New Zealand held a market share of broadband connections of 55% in 2008, with the next-largest operator TelstraClear at around 15%, followed by Vodafone New Zealand and CallPlus at just under 10%.[337]

8.2.2 Underlying regulatory regime

The New Zealand Commerce Commission provides sectoral regulation. Telecom New Zealand is subject to ex-ante regulation in a number of designated markets.

The country's regulatory regime underwent several significant changes in the years immediately prior to the UFB initiative:[338]

- Between 1987 and 2001, only competition law applied. During this period, there was competitive entry in the fixed and mobile telecoms market, but there were major disputes about the pricing of interconnection which were subject to legal appeals all the way to the Privy Council.

- In 2001, industry-specific regulation was introduced through the Telecommunications Act, and the New Zealand Commerce Commission was given responsibility for sectoral regulation.

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[337] Source: TeleGeography, extracted May 2015. Note separate figures for TelstraClear are not available, but its share can be inferred from the drop in 'other operator' connections following the acquisition of TelstraClear by Vodafone in 2012.

[338] A useful tour is available at www.comcom.govt.nz/dmsdocument/10988

- A wider set of measures was introduced in 2006, responding to a government inquiry which was explicitly concerned about the poor performance of New Zealand's telecoms market relative to the member countries of the Organisation for Economic Co-operation and Development (OECD). These measures included LLU, accounting separation and wider powers for the regulator to set access terms on an industry-wide basis (rather than bilaterally). The government also imposed an 'operational separation' which was similar to that of BT/Openreach in the UK; Chorus was the Access Network Services (ANS) unit, equivalent to Openreach. Regulated products offered by Chorus, including LLU and wholesale broadband services, were subject to an equivalence of inputs (EoI) requirement. At the same time, Chorus committed to a large-scale roll-out of cabinetised VDSL and ADSL, as noted above.

New Zealand had therefore transitioned over time from an ex-post-only regime to an ex-ante regime with an imposed operational separation.

8.2.3 Policy objectives

The UFB initiative was proposed by the National Party, after it won New Zealand's General Election in November 2008. The government's stated objective for this initiative was:

"To accelerate the roll-out of ultra-fast broadband to 75 percent of New Zealanders over ten years, concentrating in the first six years on priority broadband users such as businesses, schools and health services, plus green field developments and certain tranches of residential areas"[339]

As noted above, schools and major health facilities are particularly prioritised, with these targeted for coverage by 2016.

(Note: Along with the UFB initiative, the government also put in place the Rural Broadband Initiative (RBI), which aims to deliver broadband peak speeds of at least 5Mbit/s to 86% of homes and businesses in rural areas of New Zealand. The RBI is not discussed further in this report.)

8.3 Regulatory interventions

8.3.1 Summary

State involvement in the UFB initiative is through a public–private partnership, via the entity Crown Fibre Holdings (CFH), which became operationally functional in October 2009. CFH is responsible for managing the government's investment in fibre networks, to achieve the government's objective for the UFB initiative. Another core role of the CFH was to run a contestable partner selection process in the 33 candidate coverage areas for the UFB initiative. As

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[339] New Zealand government (2009), *Ultra-Fast Broadband Initiative, Overview of Initiative*; available at https://www.med.govt.nz/sectors-industries/technology-communication/fast-broadband/pdf-and-documents-library/ultra-fast-broadband-intiative/Ultra-fast-broadband-initiative-overview.pdf

a result of this tender process, commercial agreements[340] were established with the four companies listed in Figure 8.2 below.

Figure 8.2: Details of the local fibre companies (LFCs) established to undertake the UFB roll-out [Source: Crown Fibre Holdings, 2015][341]

Winning bidder	Fraction of UFB total coverage	LFC name
Northpower Limited (Northpower)	1.6%	Northpower Fibre
Waikato Networks Limited (WNL), owned by WEL Networks Limited and Waipa Networks Limited	13.7%	Ultrafast Fibre
Enable Services Limited (ESL) owned by Christchurch City Holdings Limited	15.3%	Enable Networks Limited
Chorus Limited, the former network arm of Telecom New Zealand	69.4%	Chorus

Under the terms of the tender, UFB partners were obliged to be structurally separate from the retail service providers. Having won a significant fraction of the contracts conditional on this separation, Telecom New Zealand underwent a structural separation, resulting in two separately quoted public companies. This structural separation was completed on 30 November 2011. The separated Chorus also faces specific constraints which apply to the copper business (e.g. key performance indicators (KPIs) to ensure non-discrimination), although these are not detailed here as they do not affect the UFB initiative.

As part of the commercial arrangements, undertakings of the LFCs ensure:

- non-discrimination in relation to relevant services
- EoI-capable build
- supply of Layer 2 (active) wholesale services from launch
- supply of unbundled Layer 1 services for point-to-multipoint on an EoI basis, from 1 January 2020
- arm's length dealing between the LFC and access seekers
- correct treatment of confidential access-seeker information
- information disclosure to the Commerce Commission.

The Commerce Commission has a monitoring role. The government has a special share in each LFC with veto power, but does not hold voting rights.

The technology used by the LFCs is Gigabit passive optical network (GPON) with a P2P overlay capability for enterprise connections. Unbundled Layer 1 services for P2P (i.e. enterprise) services are available immediately. As noted above, unbundled Layer 1 services for residential customers on an EoI basis (point-to-multipoint) will only be available from 1 January 2020.

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[340]   Signed in late 2011 and available at http://www.crownfibre.govt.nz/crown-partners/agreements-with-ufb-partners/

[341]   See http://www.crownfibre.govt.nz/crown-partners/

The government is contributing NZD1.35 billion (GBP640 million) to the UFB initiative, with significant amounts of co-investment from the private partners.[342] The CFH funding mechanisms are not the same for each LFC. Nevertheless, there are mechanisms in each funding arrangement which are designed to repay CFH over time.

8.3.2 Coverage obligations

The UFB initiative aims to cover 75% of New Zealanders with FTTH. The initiative will enable speeds of at least 100Mbit/s by 2019.

In addition, alongside the RBI and the Remote Schools programme, the scheme will cover 2473 schools and 39 hospitals by 2016.

A separate extension to the UFB initiative which is currently being progressed will increase the target coverage to 80% of the population, and extend the government's spending by NZD210 million (GBP99 million).

8.3.3 Features

Services provided

At present, only Layer 2 (active) wholesale services are offered for residential and business customers in New Zealand. Layer 1 (passive) wholesale products are available for the business market and will be introduced into the residential market in 2020. The LFC agreements set the price of various wholesale services offered.

Both GPON and P2P variants of Layer 2 (active) wholesale services are specified, as well as direct fibre access (Layer 1, passive service) for business customers. Fibre interconnection between Central Offices (COs) is also provided.

A selection of wholesale services and pricing for Chorus and Northpower Fibre are provided in the table below:

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[342] For example, Chorus estimated its own investment would be between NZD1.4 and NZD1.6 billion (GBP691-GBP790 million based on 2015 exchange rates), see https://www.chorus.co.nz/chorus-provides-20m-fund-for-free-ufb-residential-installs. However, the forecast costs were increased to NZD1.7-1.9 billion (GBP839-938 million based on 2015 exchange rates) in February 2013 (http://www.nzherald.co.nz/business/news/article.cfm?c_id=3&objectid=10867554). Estimates were revised downwards again in November 2014 following the signature of a new contract for the civil engineering work (https://nz.finance.yahoo.com/news/chorus-expects-lower-ufb-build-212100271.html)

Wholesale service	Monthly price (NZD)
GPON bitstream 30Mbit/s down / 10Mbit/s up with 2.5Mbit/s symmetrical CIR[345] with ATA port service monthly charge	37.50
GPON bitstream 100Mbit/s down / 50Mbit/s up with 2.5Mbit/s CIR up / 2.5Mbit/s CIR down with ATA port service monthly charge	55.00
GPON bitstream 100Mbit/s down / 100Mbit/s up with ATA port service monthly charge	178.75
P2P bitstream 100Mbit/s down / 100Mbit/s up with 0 CIR service monthly charge	380
P2P bitstream 1Gbit/s down / 1Gbit/s up with 0 CIR service monthly charge	455
P2P bitstream 10Gbit/s down / 10Gbit/s up with 0 CIR service monthly charge	1355
Direct fibre access service monthly charge	355

Figure 8.3: Extract from Chorus and Northpower Fibre UFB services agreement price list [Source: Chorus,[343] Crown Fibre Holdings, 2012[344]]

Note: Prices are the same within both agreements

Note: Prices are set to increase in July 2015, with annual increases thereafter to 2019 (see pricing section below)

Additional services offered include multicast access, additional CIR and EIR[346] speed, voice services, enhanced SLAs and service route diversity. Separate pricing is provided for educational institutions.

A large number of retail service providers combine this wholesale service with their own services (e.g. national and international connectivity) in order to create retail bundles.

After 1 January 2020, unbundling of the point-to-multipoint residential connections can occur.

Pricing

As part of its initial announcement in September 2009,[347] the Ministry of Economic Development planned regulatory forbearance on pricing. That is, the LFCs would be free to negotiate their own prices for access to the wholesale services as part of the agreement with CFH. The Ministry commented:

> *"The government does not consider that up-front price regulation is necessary or desirable. Instead, prospective partners will be required to set out their proposed prices for products, which they will be required to commit to. This requirement, in combination with ongoing independence, equivalence and transparency requirements, is likely to impose a level of discipline that is appropriate for nascent LFC businesses."[347]*

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[343] See https://www.chorus.co.nz/file/20066/chorus-ufb-services-agreement-price-list---confirmed.pdf

[344] See http://www.crownfibre.govt.nz/wp-content/uploads/2011/12/WLFC-Price-List-14-May-2012-.pdf

[345] Committed information rate.

[346] Excess information rate.

[347] See https://www.med.govt.nz/sectors-industries/technology-communication/fast-broadband/pdf-and-documents-library/ultra-fast-broadband-intiative/Ultra-fast-broadband-initiative-overview.pdf

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However, in May 2011, following feedback from the industry,[348] the Communications and Information Technology Minister announced that, instead, contractual mechanisms would be introduced to prevent any significant changes to price or other key features of the wholesale services.[349] To protect the LFCs which were rolling out networks, a provision was put in place to provide compensation if regulatory action reduced the wholesale prices in the period to 2019. This compensation may take the form of deferred repayment of government funding.

Maximum prices were agreed within each of the individual LFC agreements in late 2011, as well as price caps for services to 1 July 2019.[350] Following four years of flat prices, the LFCs will be able to increase their prices each year between July 2015 and July 2019. For example, a GPON bitstream 30Mbit/s down / 10Mbit/s up with 2.5Mbit/s symmetrical CIR with ATA service will increase in price from NZD37.50 to NZD42.50 on 1 July 2019.

Beyond these pre-agreed contractual price rises, processes were defined for CFH approvals for any revisions to these prices.[351]

Installation fees for residential connections are not charged to service providers purchasing wholesale services (i.e. they are subsidised by the LFC).[352] In the case of business customers, Layer 2 (active) service installation fees are capped at one or two months' recurring fee for the relevant service (depending on the service). Direct fibre access (layer 2, passive product) installation is capped at the equivalent of two months of the recurring fee.[353]

In October 2013, it was announced that Chorus would be increasing the speeds of its wholesale UFB plans and introducing new speed options.[354] As a result, Bitstream 2 Accelerate[355] and Bitstream 3 Accelerate[356] were introduced in June 2014.

QoS obligations

In New Zealand, detailed QoS obligations are included within the commercial agreements with the operators rolling out the FTTH network.[357] These are split between Layer 1 (dark fibre) and Layer

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[348] The key concerns related to the evolution of prices over time, rather than the initial pricing offered; CFH's prices at the time of the speech (May 2011) are described as 'very competitive'. See http://www.beehive.govt.nz/release/regulatory-forbearance-be-replaced

[349] See http://www.beehive.govt.nz/release/regulatory-forbearance-be-replaced

[350] See http://www.crownfibre.govt.nz/wp-content/uploads/2013/03/Chorus-Published-UFB-Price-Caps-Document-3-October-2012.pdf

[351] For example, see Schedule 7 of the NIPA Agreement between CFH and Chorus (24 May 2011); available at http://www.crownfibre.govt.nz/wp-content/uploads/2011/12/Network-Infrastructure-Project-Agreement-NIPA-24-May-2011.pdf

[352] Note: the maximum distance for which the installation is provided free of charge was extended in November 2012; see https://www.chorus.co.nz/chorus-provides-20m-fund-for-free-ufb-residential-installs

[353] See https://www.chorus.co.nz/file/20066/chorus-ufb-services-agreement-price-list---confirmed.pdf

[354] See http://www.stuff.co.nz/business/industries/9316329/Chorus-agrees-to-new-UFB-plans

[355] See https://www.chorus.co.nz/file/48702/Bitstream_2_Acelerate_Service_Description-June-2014-Final.pdf

[356] See https://www.chorus.co.nz/file/48703/Bitstream_3_Acelerate_Service_Description-June-2014-Final.pdf

2 (active) services, and between residential, business and NBAP[358] connections and are defined for an individual installation and at an aggregate level.

The SLAs include service provisioning (installation) timescales for "core" (e.g. basic broadband connections) and "supplementary" products (e.g. multicast, bandwidth upgrades), as well as service availability based on average and maximum downtime (repair timescales), and disconnection timescales (for Layer 2 products only). For Layer 2 (active) services, service levels for traffic are further defined, namely frame delay, frame delay variation and frame loss (for the two different levels of service offered, CIR and EIR[359]).

Timescales are also defined for "onboarding" a new retail service provider (split between Layer 1 and Layer 2 products), including timescales for service testing, completion of co-location services, provision of the Wholesale Services Agreement and OSS/BSS readiness. Finally, SLAs are defined for other services such as colocation.

For each of these SLAs, the contract specifies 'service default payments' (i.e. penalties) and beyond this defines what would constitute a material breach of contract.

8.4 Outcomes of the interventions

We note the limitations of attributing any direct causality between the regulatory intervention and the outcome achieved in each case, and where possible we have flagged to what extent a causal link may be drawn, and where external factors may have had a more significant influence.

8.4.1 NGA roll-out

Coverage of the UFB network stood at 31% of premises in New Zealand in the first quarter of 2015, having grown rapidly since roll-out began in July 2011 (see Figure 8.4 below). This represents almost 46% of target end users for the UFB initiative (target completion date, 2019), in line with government targets.

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[357] See for example Schedule 5 (P134) of the Chorus NIPA: http://www.crownfibre.govt.nz/wp-content/uploads/2011/12/Network-Infrastructure-Project-Agreement-NIPA-24-May-2011.pdf

[358] Non-Building Access Point: a location for a connection that either is not a premise (e.g. a cell site or pumping station) or does not have a physical address (e.g. a bus shelter or lamp post) other than a location that is a concentration point for a regulated backhaul service (for example, a fibre to the node cabinet owned or controlled by Chorus)

[359] Committed Information Rate and Excess Information Rate
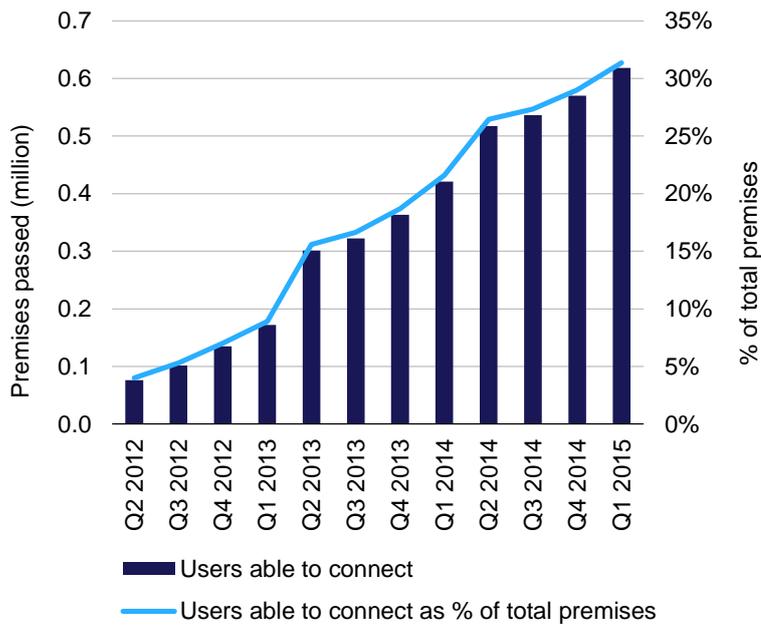
Figure 8.4: UFB coverage [Source: Ministry of Business, Innovation & Employment, 2015][360]

In addition, 94% of target schools are already ready for service, as well as 97% of hospitals (target completion date, 2016).[360]

The NGA roll-out achieved to date can be directly linked to the regulatory intervention, which set contractual commitments for roll-out timescales.

8.4.2 Broadband penetration and NGA take-up

Broadband penetration in New Zealand has seen a very rapid growth since 2006, from a starting point of only 32%, as shown in Figure 8.5 below. Growth observed in 2014 could be linked to FTTH availability / take-up, but may also be related to improved coverage in rural areas as a result of the Rural Broadband Initiative (not discussed here).

The majority of subscriptions remain on DSL (87% in 2014), with a small share of cable and FWA/satellite. Significant take-up of FTTH subscriptions can be seen in 2014 when they represented 4.4% of all broadband subscriptions.

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[360] *Fast broadband deployment progress quarterly updates*; available at http://www.med.govt.nz/sectors-industries/technology-communication/fast-broadband/deployment-progress
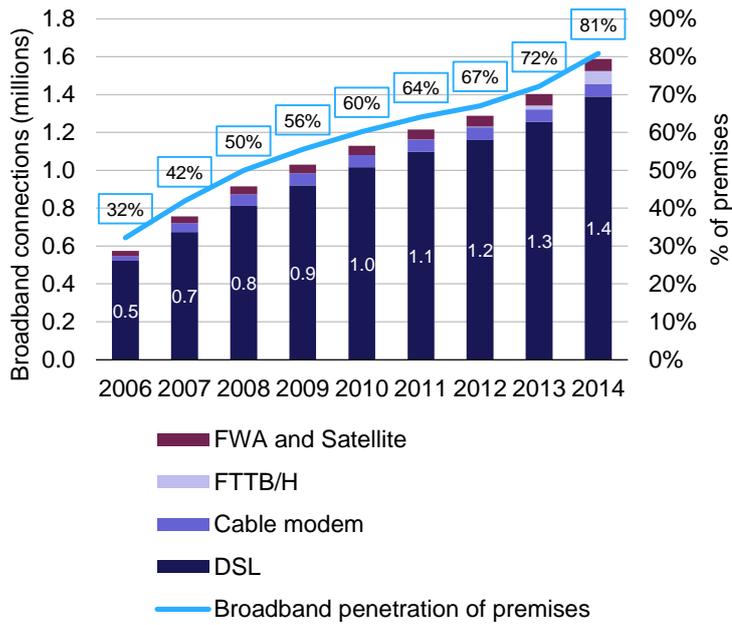
Figure 8.5: Fixed broadband connections by technology and penetration of premises [Source: Analysys Mason Research, 2015][361]

Considering FTTH take-up as part of the UFB initiative specifically, 85 544 users were connected in March 2015, representing nearly 14% of all premises passed, as illustrated in Figure 8.6 below.
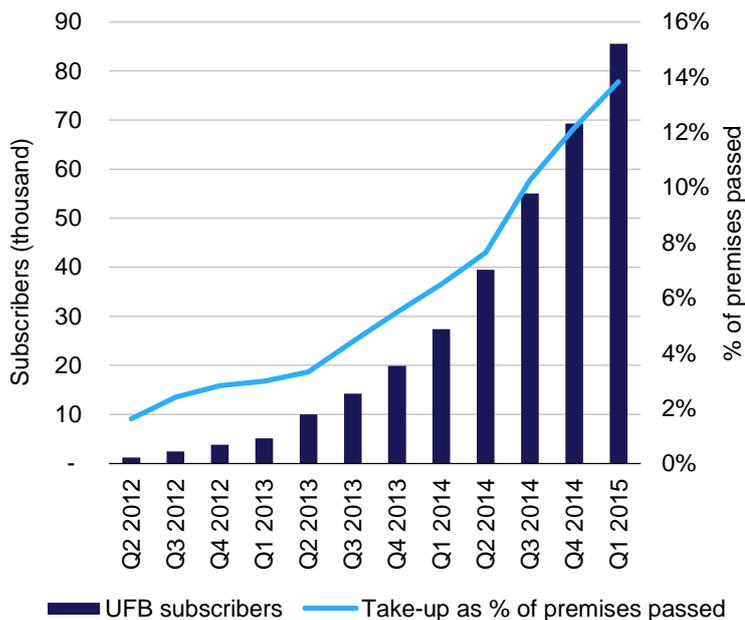
Figure 8.6: UFB take-up [Source: Ministry of Business, Innovation & Employment, 2015][362]

This represents rapid growth since roll-out of the UFB network began, but take-up in New Zealand is lagging behind the majority of the case-study countries.

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[361]   Analysys Mason Research, *Fixed broadband and voice quarterly metrics 4Q 2014*.

[362]   Fast broadband deployment progress quarterly updates; available at http://www.med.govt.nz/sectors-industries/technology-communication/fast-broadband/deployment-progress

Nevertheless, we expect take-up to increase in 2015, partly because the other case-study countries have demonstrated growth over time (see Sections 8.4.3 below).

Comparatively low take-up to date is likely to be reflective of the early stage in the deployment, rather than any issues relating to services available or competition.

8.4.3 Competition

A total of 87 retail providers were actively offering UFB services in New Zealand in March 2015.[362] One of these is Singapore-based operator MyRepublic, a fibre-only operator which started providing services in Singapore in October 2014 using the country's Next-Generation (FTTH) National Broadband Network. At the time of its launch, MyRepublic announced plans to follow a similar model in New Zealand using the UFB network. MyRepublic's entry into the Singaporean market resulted in fierce price competition in the FTTH market, and it may adopt a similar approach in New Zealand.

Information is not available on the split of FTTH connections by operator in New Zealand. However, in relation to total broadband connections, Figure 8.7 illustrates that there was rapid growth in the market share of 'other operators' in 2013 and 2014, which is likely to be linked to FTTH availability and take-up.

By contrast, the market share of Spark (formerly known as Telecom New Zealand) has declined considerably since 2006. In particular, the reduction in Spark's market share in 2013 and 2014 can be linked to increased competition from new fibre operators. However, this downward trend has slowed in the last three years, and in 2014 Spark still retained 48% of all connections. As such, a direct correlation with the regulatory intervention cannot be seen.
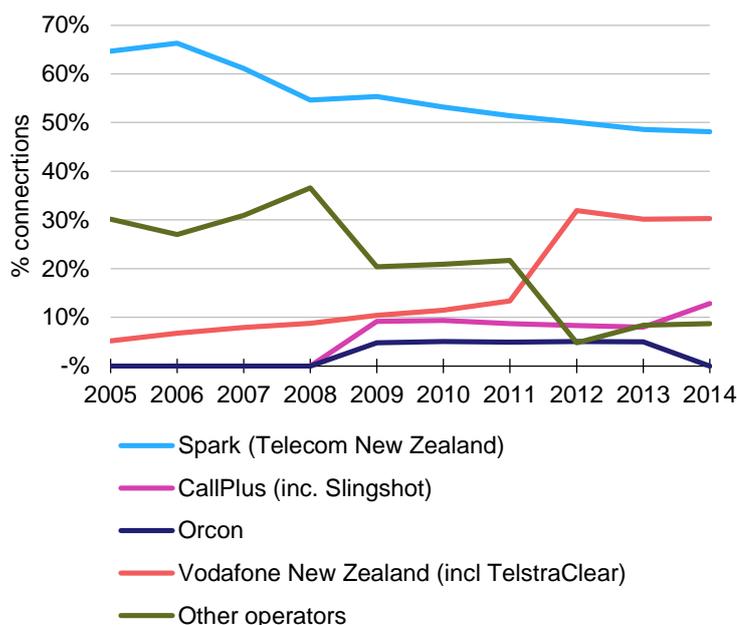

Figure 8.7: Market share of broadband connections in New Zealand [Source: TeleGeography, 2015]

Note: Split of 'other operators' is not available before 2009; however, Orcon launched in 1997 and CallPlus in 1996. Furthermore, prior to 2012, the 'other operators' category includes TelstraClear (acquired by Vodafone in 2012)

Two major mergers have reduced the number of sizeable operators in New Zealand's broadband market from five to three over the last three years. In 2012, the second and third largest operators merged, when Vodafone acquired TelstraClear. Furthermore, in June 2014, the third and fourth operators merged when CallPlus announced its acquisition of Orcon. CallPlus was itself acquired by M2 Group in April 2015; however, this did not result in further consolidation of the broadband market.

8.4.4 Pricing

Analysis of FTTH retail pricing demonstrates that the price premium for FTTH is already being eroded. At the time of writing (June 2015), Spark was offering FTTH for the same price as ADSL for all three usage categories, with and without a landline. However, it should be noted that this FTTH offer is for up to 30Mbit/s only.

Figure 8.8: Screenshot from Spark's website (medium-usage category, with a landline), 29 May 2015 [Source: Spark's website, 29 May 2015]
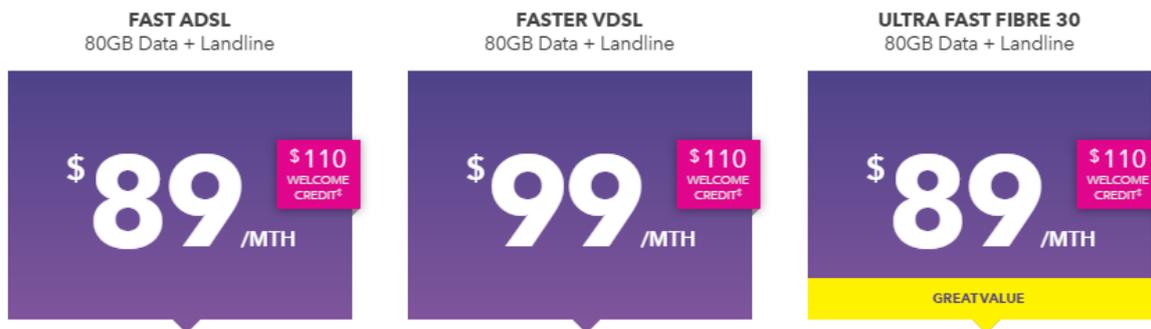
Considering the 100Mbit/s speed category, Spark offers 'Naked Fibre' (i.e. without a landline) for NZD79[363] with an 80GB data cap (medium-usage category), while MyRepublic is currently running a promotion which provides the same speed and unlimited data usage for NZD79.99. This demonstrates the strong competition for these high-end offers.

Vodafone also charges NZD79 per month for a 100Mbit/s naked FTTH offer with an 80GB data cap. An ADSL and 30Mbit/s FTTH offer is also available from Vodafone, at NZD69 per month. However, Vodafone promotes an NZD10 discount for its mobile customers to provide competitive differentiation.

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[363] NZD10 more than for the 30Mbit/s FTTH and ADSL offers.

Similarly, Orcon does not differentiate between ADSL and FTTH for the same data allowance.[364] It is less competitive on the naked FTTH products, and instead focuses on competing on inclusive line rental and calls.

This suggests that the wholesale offers available through the regulatory intervention enable vigorous retail competition.

8.4.5 Profitability

The impact of increased competition from the roll-out of the UFB network is not yet evident in the EBITDA margin of the former incumbent Spark. Indeed, Spark's EBITDA margin increased in 2012 and 2013, before experiencing a slight decline in 2014. We note that a change in Spark's business divisions reported in 2014 means that this figure may not be completely comparable. However, Spark noted in its 2014 annual report that lower-margin fibre (compared to legacy copper) was contributing to a decline in its EBITDA margin.[365] This suggests that the regulatory intervention has had a marginally negative impact on the former incumbent's retail profitability levels.
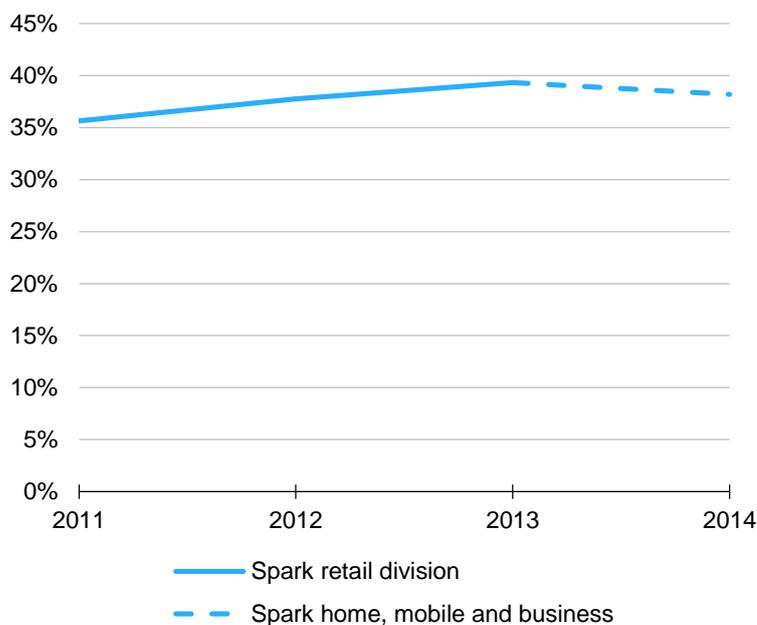
Figure 8.9: Spark's EBITDA margin [Source: Spark financial reporting, 2015]

Note: Data prior to 2011 is inconsistent as it includes the now structurally separated infrastructure division (Chorus)

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[364]   However, it is likely that FTTH users will need to migrate to higher data allowance plans if they wish to use their broadband to stream video etc.

[365]   Spark New Zealand (2014), *Annual Report 2014*; available at http://investors.sparknz.co.nz/FormBuilder/_Resource/_module/gXbeer80tkeL4nEaF-kwFA/file/TEL1854_Spark_Annual_Report_Interactive-v2.pdf

8.4.6 Quality of service

Broadband QoS measures are no longer published by the regulator (detailed reporting was discontinued in 2011).[366]

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[366] See 'Broadband reports'. Available at http://www.comcom.govt.nz/regulated-industries/telecommunications/archive/monitoring-reports-and-studies-archive/telecommunications-monitoring-reports-archive/

9 Portugal

9.1 Summary

Within Portugal, we have considered the regulation of FTTH wholesale broadband access. This includes the already implemented regulation around duct access and vertical access, as well as the draft regulation on active remedies.[367]

The Portuguese regulator, ANACOM, has applied wholesale access obligations on MEO's (formerly Portugal Telecom) ducts to enable third-party operators to roll out FTTH networks. In addition, ANACOM has applied symmetric regulation for access to vertical building infrastructure, which applies to the first operator to roll out to the building. For both of these, the PoIs are, by definition, local, and pricing is based on FRND principles and should be cost oriented. Asymmetric active wholesale access regulation to MEO's network was proposed in draft form in 2012, but has not been finalised. The PoIs for and VULA were not set out in the draft regulation, and as such, are not available. The proposed pricing model was retail-minus for bitstream and cost-oriented FRND for VULA.

Figure 9.1 below summarises the current NGA regulation in the Portugal, by network type, type of remedy and geographic area, stating where the point of interconnection lies, whether the regulation is symmetric or asymmetric and what the pricing model is.

Further details can be found in the full case study that follows.

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[367] We note that the regulation for active remedies has not been finalised since the draft was released in 2012.

Figure 9.1: Summary of NGA regulation in Portugal [Source: Analysys Mason, 2015]

Network type	Regulation type	Geographic application	Point of interconnection	Symmetric / asymmetric	Pricing model
Implemented FTTH regulation (GPON network)	Vertical access	Nationwide	Local	Symmetric	FRND with cost orientation: the second operator to reach the building will pay 50% of the costs incurred in the installation of the shared vertical infrastructure, the third 33% and so on[368]
	Duct access	Nationwide	Local	Asymmetric	FRND with cost orientation[369]
	Duct access	Nationwide	Local	Symmetric	By Decree-Law 123/2009
Draft FTTH regulation (GPON network)	VULA	Nationwide, except for 17 municipalities with alternative fibre networks present	Not available (not quoted in the draft regulation)	Asymmetric	FRND with cost orientation: provide rationale to the regulator for pricing, taking into account the EC statement on cost orientation[370,371]

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[368] See http://organodivigilanza.telecomitalia.it/pdf/Seminario-UfficioVigilanza-14012015.pdf

[369] See http://organodivigilanza.telecomitalia.it/pdf/Seminario-UfficioVigilanza-14012015.pdf, http://www.anacom.pt/streaming/analise_mercados4_5.pdf?contentId=812401&field=ATTACHED_FILE and https://circabc.europa.eu/sd/a/3a11b0d4-1198-471b-b906-c9becf99325f/Decis%C3%A3o%20ORAC.pdf

[370] The EC states: "The price of access to the unbundled fiber loop should be cost-oriented". See http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32010H0572&from=EN

[371] See http://www.anacom.pt/streaming/mercados4_5_consulta_15022012.pdf?contentId=1116435&field=ATTACHED_FILE

9.2 Market and regulatory context

9.2.1 Market environment before the regulatory interventions were made

The fixed-line telecoms market in Portugal is largely in the hands of two operators:

- MEO, formerly Portugal Telecom (PT), the incumbent and owner of both ADSL and fibre infrastructure
- Nos, formerly Zon Optimus, primarily a cable operator[372] that was spun out from the incumbent in 2007.

The Portuguese broadband market has lower broadband penetration (as a percentage of population) than the EU average and the majority of other Western European countries. This is shown in Figure 9.2 below.

Figure 9.2: European benchmark of fixed broadband penetration (subscriptions as a % of population), July 2014 [Source: EC Digital Agenda for Europe, 2015][373]
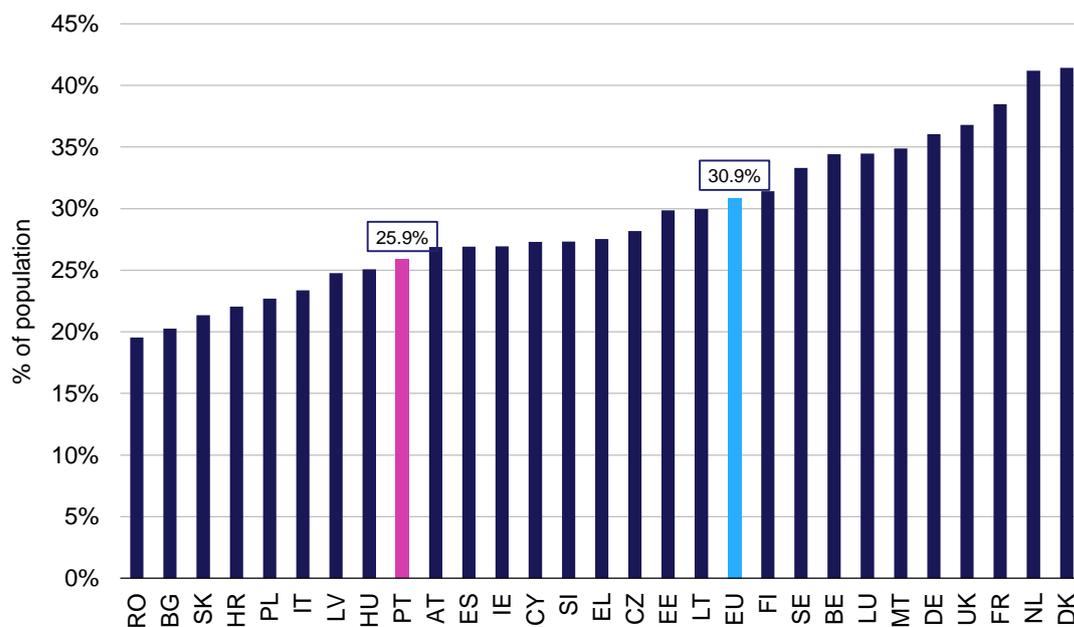
Fixed broadband penetration of households was only 59% at the end of 2014,[374] but is showing strong signs of growth (having stood at 55% at the end of 2013 and 52% at the end of 2012). At the end of 2014, fibre coverage in Portugal was 62% and cable coverage was 82%.

At the end of 2014, MEO had a retail broadband market share of 49%, followed by Nos at 35%. Vodafone (which operates its own ADSL and fibre networks, partly through a fibre sharing

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[372]   Zon Optimus also owns a limited fibre network as a result of the merger between Zon Multimedia and Optimus in 2013.

[373]   See http://ec.europa.eu/information_society/newsroom/cf/dae/document.cfm?action=display&doc_id=8704

[374]   Source: ANACOM.

agreement discussed below) held approximately 10.6% of the retail broadband market, followed by Cabovisão (another cable operator) with 5.5% and other smaller operators at 0.2%.[375]

9.2.2 Underlying regulatory regime

Historically, the Portuguese regulator (ANACOM) considered the geographical market to be the area of coverage of the incumbent's network, which in practice meant a national scope. However, in 2009 it noted that there had been a significant number of developments in the market for broadband access, which suggested differing competitive conditions across the country. In particular:

> "*In the Portuguese case, developments in the broadband market, especially the expansion of LLU in terms of exchanges with co-mingled operators, the number of unbundled accesses and the entry of new operators, and the spin-off of Zon Multimedia, indicate the existence of different competitive conditions geographically which could justify that the definition of the relevant geographic market in this case is no longer that of the country.*"[376]

ANACOM therefore approved an approach for defining geographical sub-markets for the purposes of identification of SMP and subsequent application of regulatory obligations. ANACOM initially focused on two markets identified by the EC:[377] Market 4 (wholesale fixed infrastructure access) and Market 5 (wholesale broadband access). MEO is now required to offer access to products in both Markets 4 and 5 under its Reference Unbundling Offer[378] (RUO) and Reference ADSL Offer,[378] although a geographical distinction is only made in Market 5. MEO is also required to provide access to its passive civil infrastructure, which it does through its Reference Poles Access Offer[378] (RPAO) and duct offer, Oferta de Referência de Acesso a Condutas (ORAC).[379]

Similarly, ANACOM has considered leased-line regulation on a geographically disaggregated basis, defined as former Market 14 in the EC's first list of relevant markets. MEO is required to enable access both to its trunk and terminating leased-line segments on a non-discriminatory and transparent basis in non-competitive routes, which it does through its Reference Leased Line Offer[379] (RLLO) and Reference Ethernet Leased Line Offer (RELLO).

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[375]   Source: ANACOM.

[376]   See http://www.anacom.pt/streaming/analise_mercados4_5.pdf?contentId=812401&field=ATTACHED_FILE

[377]   COMMISSION RECOMMENDATION of 17 December 2007 on relevant product and service markets within the electronic communications sector susceptible to ex ante regulation in accordance with Directive 2002/21/EC of the European Parliament and of the Council on a common regulatory framework for electronic communications networks and services. Available at http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2007:344:0065:0069:en:PDF

[378]   See http://ptwholesale.telecom.pt/GSW/UK/Canais/ProdutosServicos/OfertasReferencia/ORAP/ORAP.htm

[379]   See http://ptwholesale.telecom.pt/GSW/PT/Canais/ProdutosServicos/OfertasReferencia/ORAC/ORAC.htm

9.2.3 Policy objectives

In its 2009 and 2012 consultations on Markets 4 and 5, as well as its 2014 consultation on Market 6, ANACOM stated that it sought to impose obligations in those markets in line with its regulatory objectives as set out in Article 5 of Law 5/2004.[380] ANACOM's regulatory objectives as stated in Article 5 are:

> "a) *Promote competition in the provision of networks and electronic communications services, resources and related services.*
> b) *Contribute to the development of the market inside the European Union.*
> c) *Defend the interests of citizens under this law.*"

As regards objective a), the regulator gives additional detail:

> "a) *Ensure that users, including disabled users, derive maximum benefit in terms of choice, price and quality.*
> b) *Ensure that there is no distortion or restriction of competition in the electronic communications sector.*
> c) *Encourage efficient investment in infrastructure and promote innovation.*"[381]

9.3 Regulatory interventions

9.3.1 Summary

In this section we discuss the outcomes of the two previous analyses of Markets 4 and 5 by ANACOM in 2009 and its draft analysis of 2012, as well as its analyses of the leased-line market (Market 6) in 2010 and its draft analysis of 2014.

Market analysis of 2009

ANACOM noted that the EC maintained that there was a distinction between Markets 4 and 5,[382] but stated that there was a need for a co-ordinated approach when regulating the two markets. Alternative network technologies (referring to NGA networks, in particular fibre-based) to MEO's copper infrastructure were not considered to form part of the relevant markets, although the regulator noted that:

> "[…] it is likely that optical fibre will become a source of competition and therefore any fibre investments should be assessed, including those made by Portugal Telecom. This is, however, a matter for ANACOM, and will be analysed separately […]"

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[380] Electronic Communications Law – Law no. 5/2004 of 10 February, as amended and republished by Law no. 51/2011 of 13 September See http://www.anacom.pt/render.jsp?contentId=1168960

[381] The regulator also stated that its objectives included the efficient use of radio frequencies and numbering resources.

[382] See http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2007:344:0065:0069:en:PDF

In Market 4, MEO was found to have SMP nationwide at both the retail and wholesale level. In Market 5, it was found only to hold SMP in 'non-competitive' areas (as defined in Section 9.3.2). MEO was required to publish reference offers giving non-discriminatory access to its network infrastructure, provision of wholesale broadband services (in non-competitive areas) and access to its civil infrastructure (e.g. ducts and poles).

Market analysis of 2012

The EC issued a Recommendation in September 2010 regarding the regulation of access to NGA networks.[383] In this Recommendation, the EC noted that market conditions would be liable to change significantly following the deployment of NGA networks, and that NRAs should therefore review previous findings which did not take these technologies into account.

ANACOM undertook this review in February 2012, adopting a technology-neutral approach.[384] In particular, the market in this review included the incumbent's copper infrastructure and alternative NGA networks that make use of fibre and DOCSIS 3.0 cable networks, but it excluded wireless broadband technologies.

ANACOM concluded that it may not be economically viable for alternative operators to replicate the entire access infrastructure (both copper and fibre) of the incumbent. The regulator put particular emphasis on fibre-based offerings, and concluded that there were limited areas in Portugal where additional fibre networks were likely to be built. At the time of this review, MEO was aggressively deploying FTTH (PON), which ANACOM considered would impose tight constraints on the technical and economic viability of unbundling that network. Until such time as a technically and economically viable solution for a passive fibre product became available, ANACOM selected VULA as the regulated solution, allowing access for a third party on similar terms to an unbundling offer.[385] MEO was given three months from the final decision (which is not yet implemented)to publish a reference offer.

ANACOM stated that it believed there was a need to maintain an obligation to provide third parties with access to the incumbent's civil infrastructure, in order to continue facilitating NGA network developments. ANACOM therefore required MEO to publish a reference offer to enable this third-party access.

The regulatory interventions outlined in the 2012 review have yet to be finalised, and so obligations introduced as part of this review, such as VULA, are not yet available. ANACOM has stated that it is reviewing market developments (including the recent M&A activities, sharing

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[383] See http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32010H0572

[384] See http://www.anacom.pt/streaming/mercados4_5_consulta_15022012.pdf?contentId=1116435&field=ATTACHED_FILE

[385] VULA obligations are proposed to be imposed except in 17 municipalities with alternative fibre networks present, see Annex III of the 2012 review at
http://www.anacom.pt/streaming/mercados4_5_consulta_15022012.pdf?contentId=1116435&field=ATTACHED_FILE

agreements between market players and revisions to EC policy) before committing to a final version.[386]

Market analyses of leased lines

In 2010, ANACOM considered geographical variations in the competition for leased-line services (Market 6). MEO was designated as having SMP on a nationwide basis for terminating segments of leased lines, as well as in 'non-competitive' (NC) routes for trunk segments.

In the 2014 draft decision, ANACOM observed that a market review was required due to developments that were occurring, particularly the "*sustained investment in high speed next generation networks*".[387] A technology-neutral approach for the market definition was identified, including NGA infrastructure within the market definition.

In the 2014 draft decision, the market for terminating segments was further subdivided by speed, and regulation of high-speed products (≥2Mbit/s) was removed in the so-called competitive (C) areas, while the regulation of trunk segments in NC routes remained unchanged from that imposed in 2010.

9.3.2 Geographical markets

In 2007, the EC noted in its Recommendation on the relevant markets for ex-ante regulation that:

> "[...] it is for national regulatory authorities to define relevant markets appropriate to national circumstances, in particular relevant geographic markets within their territory."[388]

ANACOM first stated in 2009 (as part of its analysis of Markets 4 and 5) that it sought to introduce geographical subdivisions in order to remove obligations in more competitive areas following significant developments in the market. It laid down the following criteria for its geographical units:

> " – they must be mutually exclusive and lower than the national territory;
>
> – The network structure of all relevant operators and services sold in the market should be able to be mapped in the geographical units;
>
> – They must have well-defined and stable borders;

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[386]   See http://www.jornaldenegocios.pt/empresas/detalhe/anacom_vai_ter_de_rever_condicoes_no_mercado_de_fibra_optica.html

[387]   See http://www.anacom.pt/streaming/Mercado4_consulta22dez2014.pdf?contentId=1342456&field=ATTACHED_FILE

[388]   See http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2007:344:0065:0069:en:PDF, paragraph 3.

– Must be small enough so that the conditions of competition does not vary significantly in that unit but at the same time large enough so that the burden of the operators and the NRA regarding the collection and analysis of information is reasonable."[389]

ANACOM determined that there were two relevant geographical *retail* markets:

- 'C areas' – competitive areas
    — at least one co-installed[390] operator
    — at least one cable operator, with a coverage of at least 60% of households
- 'NC areas' – non-competitive areas
    — all remaining areas.

The 'C areas' covered 184 local exchange areas, accounting for 61% of broadband connections in 2009. ANACOM noted that the definition of areas as competitive or non-competitive would require *"periodic reviews, with relatively short periods"*. In particular, it stated that developments that would justify a further a review were most likely to be related to the roll-out of fibre-optic NGA networks.

Although ANACOM had made a distinction between C and NC areas, it found that MEO had SMP in both types of area at the retail level, and therefore retained its nationwide SMP status.

The EC states that:

"in exceptional circumstances, NRAs could refrain from imposing unbundled access to the fibre loop in geographic areas where the presence of several alternative infrastructures, such as FTTH networks and/or cable, in combination with competitive access offers on the basis of unbundling, is likely to result in effective competition [...]"[391]

In ANACOM's 2009 review, it considered that MEO held nationwide SMP in Market 4 and SMP in NC areas in Market 5. Geographical areas were defined in terms of the retail market, and were then applied to wholesale products (but only in the analysis for Market 5). Having defined SMP on the basis of geographic areas, the regulatory obligations were then applied to the geographic areas in which dominance was found. With the deployment of fibre this approach would not necessarily remain relevant. The EC Recommendation on NGA states:

"the transition from copper networks to fibre networks can alter the conditions of competition in the various geographical areas and demand the revision of the geographical scope or remedies applicable to Markets 4 and 5 where these markets or remedies have been targeted based on competition arising from the local loop unbundling."[391]

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[389]   See http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2007:344:0065:0069:en:PDF

[390]   That is, an operator taking advantage of a wholesale offer to deliver broadband services.

[391]   See http://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32010H0572&from=EN

Despite noting a slight increase in MEO's market share[392] in the previously defined sub-market of C areas when it carried out its 2012 review, ANACOM retained the definitions of C areas and NC areas from 2009. It again found that MEO held SMP in Market 4 on a nationwide basis, but only held SMP in NC areas in Market 5.

In its 2010 review of the market for leased-line terminating and trunk segments, ANACOM applied ex-ante regulation to terminating segments nationwide, and to NC routes for trunk segments.[393] This was reconsidered in December 2014, when ANACOM made a further subdivision of terminating segments, between low-speed circuits (<2Mbit/s) and high-speed circuits (≥2Mbit/s). The 2014 draft proposed that regulation was removed for higher-speed circuits.[394]

Given the substantial changes in competitive conditions over the last few years, we note that these markets are likely to change significantly before the regulation is finalised.

The regulation in each of the three markets is discussed in greater detail below.

► *Market 4: Wholesale fixed network access*

In 2009, ANACOM defined two geographical markets at the retail level – competitive and non-competitive. It therefore considered that there were theoretically two geographical markets for each of Markets 4 and 5. However, it concluded that it could not justify such a geographical split for Market 4. It reasoned that since in the absence of regulation there may be no LLU operator (i.e. MEO would revoke access), the criteria of there being an LLU operator present could not be used to remove obligations. A brief analysis of market share was carried out, including alternative infrastructures, and on this basis ANACOM concluded that MEO would be considered to have SMP. Remedies were applied at a national level.

In the 2012 review, ANACOM again determined that there was no basis for geographical segmentation in Market 4, owing to MEO's high market shares in the wholesale network access market:

> "[…] there is no evidence of sufficiently heterogeneous competitive conditions between different geographical areas (in particular between municipalities) to justify the targeting of Market 4, despite the fact that in some areas there is an alternative network […]"[395]

ANACOM noted that out of 308 municipalities, there were only 2 where MEO had a market share of less than 40% at the wholesale level. The geographical application of SMP obligations on MEO in the wholesale fixed network access market remains nationwide to date.

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[392] To an average of 34%, well below the 40% noted by the EC in its analysis

[393] See
http://www.anacom.pt/streaming/deliberacao28set2010_decisao_final.pdf?contentId=1052143&field=ATTACHED_FILE

[394] See
http://www.anacom.pt/streaming/Mercado4_consulta22dez2014.pdf?contentId=1342456&field=ATTACHED_FILE

[395] See http://www.anacom.pt/streaming/mercados4_5_consulta_15022012.pdf?contentId=1116435&field=ATTACHED_FILE

► *Market 5: Wholesale broadband access*

The geographical split of the retail market identified in the 2009 review was also applied to the wholesale Market 5, producing two distinct markets as described earlier in this section: 'Market 5C' (competitive) and 'Market 5NC' (non-competitive). ANACOM identified 184 competitive (5C) local exchange areas in 2009, which were maintained in the 2012 review.

In its 2012 market review, ANACOM expanded Market 5 to include fibre-based services, with the same geographical distinctions made as for the previous copper infrastructure. The regulator deemed it necessary to apply the 'three criteria test', to determine whether regulation should be reintroduced into competitive areas. The EC outlined the three criteria for designating SMP status in its 2007 Recommendation:[396]

> *"(a) the presence of high and non-transitory barriers to entry. These may be of a structural, legal or regulatory nature;*
>
> *(b) a market structure which does not tend towards effective competition within the relevant time horizon. The application of this criterion involves examining the state of competition behind the barriers to entry;*
>
> *(c) the insufficiency of competition law alone to adequately address the market failure(s) concerned."*

ANACOM found that these criteria were not met, and so concluded that the competitive areas would remain free of ex-ante regulation.

► *Market 6: Leased lines*

Market 6 covers the terminating segments[397] of leased lines, irrespective of technology. These are used to provide dedicated capacity.

The geographical scope of leased lines in Portugal was historically defined by the area covered by a particular network. A distinction is made between the trunk (*trânsito*) and terminating segment (*terminais*), but given that MEO's network spans the country, previous regulation was applicable nationwide for both types of segment.

In its 2010 decision, ANACOM considered that the existence of two alternative operators in the wholesale market (equating to 110 links between MEO sites) constituted a competitive trunk segment route. It therefore removed the ex-ante regulation on MEO in competitive areas within the trunk segment.

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[396]   See http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2007:344:0065:0069:en:PDF

[397]   Note that the EC definition only refers to the *terminating* segment, whereas ICP-ANACOM regulates both the terminating and trunk segments in its analysis.

The 2014 consultation retained the 2010 criteria for trunk segments (i.e. the removal of regulation in the 'C routes') but further split the terminating segment into low- and high-speed circuits. For low-speed circuits, the competitive landscape was considered homogeneous at the national level, and the access obligations on MEO were retained.

However, ANACOM focused on the development of next-generation fibre networks (i.e. high-speed circuits). It concluded that there were 36 local exchange areas (out of a total of approximately 1800) which had at least two alternative NGA networks and where MEO's market share was less than 50%. These areas were therefore considered sufficiently competitive and distinct from other geographies. Within these areas, MEO's wholesale market share in high-speed segments was 27%, compared with 87% in NC areas. Ex-ante regulation was therefore applied to MEO in the NC areas of the high-speed terminating segments.

9.3.3 Features

Services provided

► *Market 4: Wholesale fixed network access*

MEO provides access to its passive civil infrastructure through a reference duct offer (ORAC) and reference pole access offer (ORAP).[398] There is an 'extranet' which allows the regulator and other operators to view available space on MEO's passive civil infrastructure (ducts and poles).

In addition, in the unfinalised 2012 review, MEO was required to provide the following through its Reference Unbundling Offer:[399]

- unbundled access for copper
- virtual access for fibre until unbundling is viable
- dark-fibre access when ducts and poles are unavailable
- non-discrimination
- transparency (including notifying ANACOM a minimum of five years before closing any MDF-access lines)
- price control and cost accounting
- accounting separation
- financial reporting.

► *Market 5: Wholesale broadband access*

In the unfinalised 2012 review, MEO was required to provide the following through its Reference ADSL Offer:[399]

- access to copper and fibre networks

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[398]   See http://ptwholesale.telecom.pt/GSW/PT/Canais/ProdutosServicos/OfertasReferencia/ORAC/ORAC.htm

[399]   See http://ptwholesale.telecom.pt/GSW/UK/Canais/ProdutosServicos/OfertasReferencia/

- offer of 'naked DSL'[400]
- non-discrimination
- transparency
- price control and cost accounting
- accounting separation
- financial reporting.

► *Market 6: Leased lines*

MEO was required to provide the following through its Reference Leased Line Offer and Reference Ethernet Leased Line Offer:[401]

- access to leased lines, including end-to-end and partial circuits
- interconnection lines and internal extensions for interconnection
- circuits for access to submarine cables (backhaul)
- connections within exchanges
- non-discrimination
- transparency
- price control and cost accounting
- accounting separation
- financial reporting.

► *Vertical building access*

Vertical building access is also regulated in Portugal.[402] This is a symmetric remedy which is applied to the first operator to deploy fibre to a building. A cost-sharing agreement is in place, whereby the second operator reaching the building pays 50% of the costs, the third 33% and so on.

QoS obligations

Because there are no regulated active or dark fibre products based on the fibre infrastructure in Portugal, quality of service measurements cannot be reviewed. Nevertheless, considering the draft wholesale access services proposed in 2012, ANACOM specified non-discrimination, specifically naming terms of service provision and fault repair times as two key measures.[403]

The 2012 review of Markets 4 and 5 stated that MEO is not permitted to discriminate on quality, or use 'delay tactics'. It also states that a minimum notice period of one month must be given for any changes in its own offerings, to allow other operators sufficient time to react. In addition, a minimum notice period of two months must be given for significant changes to the wholesale

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[400] Naked DSL is the use of a digital subscriber line to provide standalone broadband services, without an analogue telephony service.

[401] See http://ptwholesale.telecom.pt/GSW/UK/Canais/ProdutosServicos/OfertasReferencia/ORCA/RLLO.htm

[402] See http://organodivigilanza.telecomitalia.it/pdf/Seminario-UfficioVigilanza-14012015.pdf

[403] See http://www.anacom.pt/streaming/mercados4_5_consulta_15022012.pdf?contentId=1116435&field=ATTACHED_FILE

offering which would have a material effect on the third party. With regard to the quality of service that MEO must offer, ANACOM concluded that:

> *"the continued obligation of non-discrimination implies that Portugal Telecom should continue to provide conditions similar to those offered to themselves for similar services, that is, more specifically, equal quality of service levels and performance levels, such as terms of service provision and fault repair times."*[404]

We repeat that this 2012 review has not yet been implemented.

9.4 Outcomes of the interventions

We note the limitations of attributing any direct causality between the regulatory intervention and the outcome achieved in each case, and where possible we have flagged to what extent a causal link may be drawn, and where external factors may have had a more significant influence.

9.4.1 NGA coverage

The percentage of total premises in Portugal passed by FTTH/B reached 62% at the end of 2014 (see Figure 9.3 below), one of the highest levels in Europe. Cable has historically been rolled out to a higher percentage of premises than fibre (82% in 2014), but there has been no growth in cable coverage since 2012.
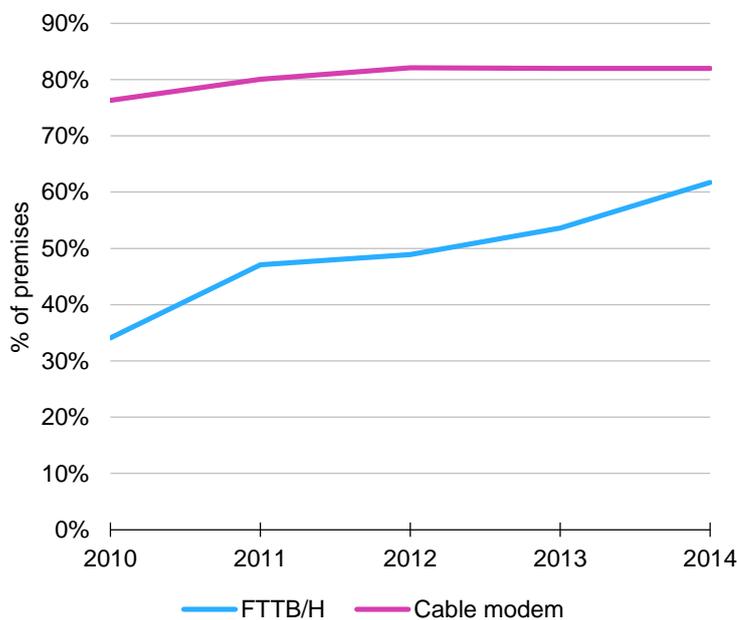
Figure 9.3: NGA premises passed as a percentage of total premises by technology [Source: Analysys Mason Research,[405] June 2014]

In addition to the FTTH network of PT, Vodafone has deployed its own FTTH network (which we understand to be using the regulated duct and pole access offers). We understand that Vodafone

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[404] See http://www.anacom.pt/streaming/mercados4_5_consulta_15022012.pdf?contentId=1116435&field=ATTACHED_FILE

[405] Analysys Mason, *FTTx roll-out and capex worldwide: forecasts and analysis 2014–2019*.

plans to be able to serve almost 2 million homes (50% of total households) by the end of 2015. Some of this network coverage (450 000 homes) has been enabled by a commercial reciprocal access deal to give Vodafone access to part of MEO's FTTH network in exchange for MEO having access to the equivalent number of homes via Vodafone's FTTH network.[406]

It appears that FTTH network roll-out by both MEO and Vodafone has been driven by retail competition concerns. Nevertheless, Vodafone's FTTH network roll-out has undoubtedly been enabled by the regulated duct and vertical access offers.

9.4.2 Broadband penetration and NGA take-up

Broadband penetration in Portugal has almost doubled since 2006, reaching 59% of households at the end of 2014 (see Figure 9.4 below). Notwithstanding this rapid increase, penetration still remains below the levels seen in other Western European countries.[407] It is very hard to disentangle the impact of the relevant wholesale access regulation (specifically duct and vertical access, as neither dark fibre nor active products have been introduced) on overall broadband penetration, though the introduction of fibre products does seem to have led to an increase in the rate of take-up.
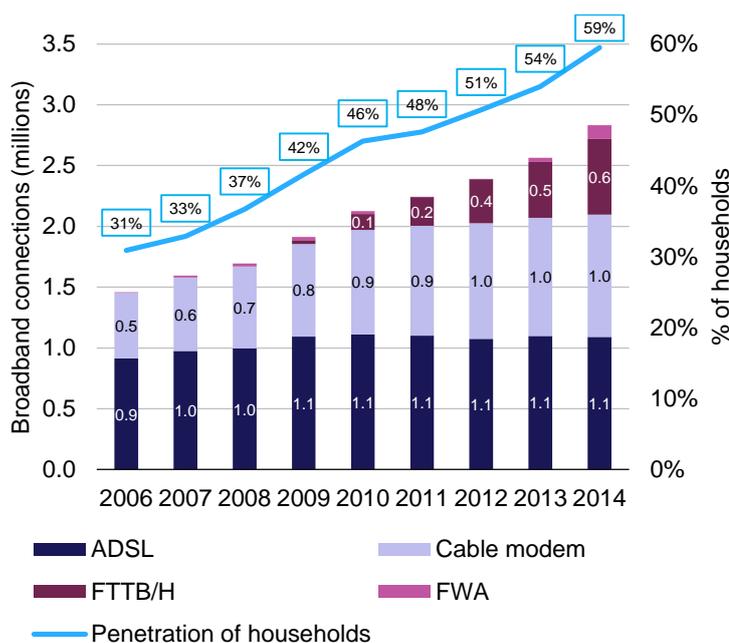
Figure 9.4: Broadband connections by technology and penetration of households[408] [Source: Analysys Mason DataHub, extracted May 2015, ANACOM]

The number of FTTH/B connections has also grown rapidly since 2009, representing 22% of all broadband subscriptions in 2014. Take-up of FTTH as a proportion of premises passed has been relatively high at 22%, suggesting that retail prices have been attractive. Growth in the cable market has been slower, with total cable subscriptions reaching 36% in 2014.

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[406] See http://www.vodafone.com/content/index/about/about-us/policy/news-releases/vodafone-portugal-fibre-sharing.html

[407] See https://ec.europa.eu/digital-agenda/en/pillar-4-fast-and-ultra-fast-internet-access

[408] Note: ANACOM's published household penetration metric uses total subscribers (not total connections).

9.4.3 Competition

MEO sold its controlling stake in PT Multimedia (rebranded Zonin January 2008, and then Nos in 2013) in November 2007. Both MEO and Nos have been gaining market share since year-end 2008, with notable growth for Nos in 2013 when it merged with Optimus. Accordingly, the HHI has been rising since the end of 2008, but fell for the first time in 2014 when both MEO and Nos experienced negative growth.

Initially, after the obligations were removed in competitive areas for Market 5 in 2009, MEO's market share grew from 45% at the end of 2009 to 51% at the end of 2012. However, its market share has fallen in the past two years, to 49% at the end of 2014.

It should be noted that because neither FTTH bitstream nor VULA regulation has been finalised, we cannot infer any impact of this regulation on the broadband market in Portugal. Nevertheless, the increase in Vodafone's market share can undoubtedly partially be attributed to duct, pole and vertical access regulation enabling it to compete effectively in the FTTH market using its own network and also, more recently, due to the agreement established between MEO and Vodafone for sharing of (dark) fibre..
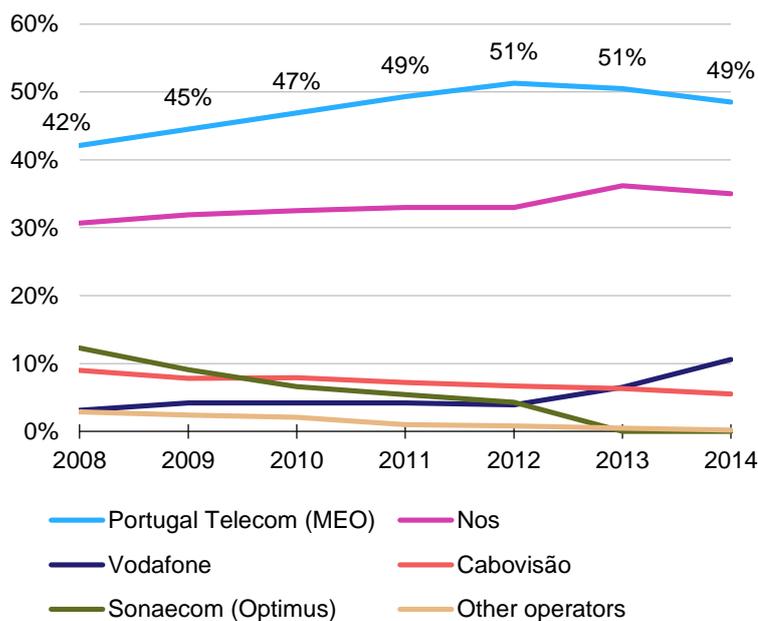
Figure 9.5: Market share of broadband connections [Source: ANACOM,[409] 2015]

9.4.4 Pricing

The average spend per user (ASPU) on broadband services in Portugal has fallen at a CAGR of −7.8% since 2009, dipping to just under EUR15 per user per month in 2014.[410] This represents a very rapid

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[409] ANACOM allocates Vodafone a market share of 10.6% at year-end 2014, but this includes broadband delivered by fixed LTE.

[410] ANACOM's *monthly bill of fixed Internet access service* (Q4 2014 statistics) shows an overall increasing trend over 2014. However, this metric does not include fixed broadband customers who pay for the service as part of a bundle. See http://www.anacom.pt/render.jsp?contentId=1349290#.VXCMNs-b7bi

decrease in spend, suggesting highly competitive conditions in Portugal. This can possibly partially be attributed to the infrastructure-based competition in the FTTH market enabled via the duct and vertical access regulation.
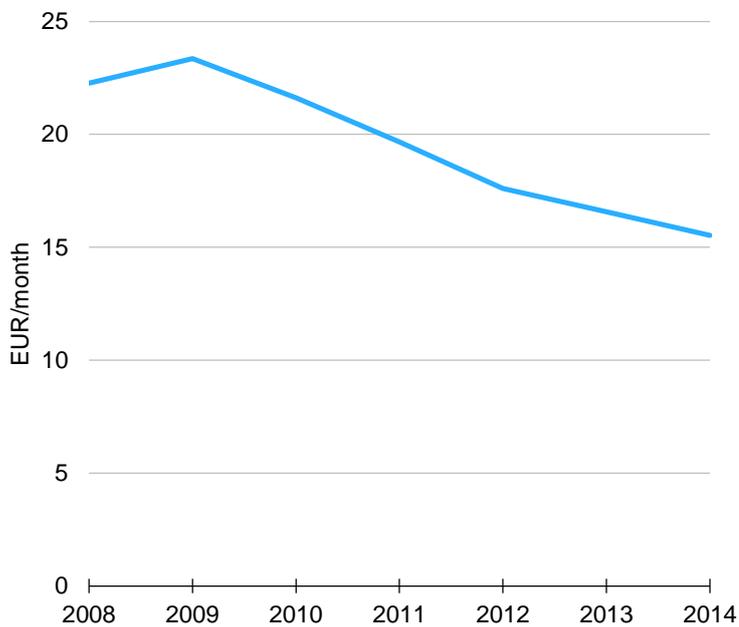
Figure 9.6: Average broadband spend per user per month [Source: Analysys Mason Research core forecasts, 2015]

9.4.5 Profitability

MEO's EBITDA margin remained relatively stable over the period 2009–2014, at around 40%, as shown in Figure 9.7. We note that duct access obligations were imposed in 2004, and there has not been any additional asymmetric regulation of MEO's FTTH network since this point in time. As such, it is not possible to infer the impact of additional regulation. Nevertheless, the reduction in margins since 2012 suggests an increasingly competitive retail market.
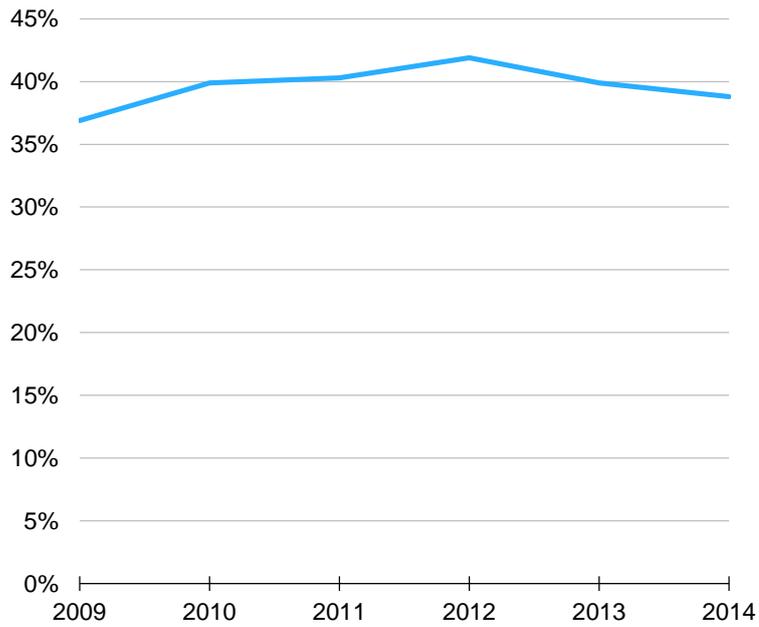
Figure 9.7: PT's EBITDA margin [Source: MEO annual reports, 2015]

Note: Margins quoted include fixed and mobile operations in Portugal

9.4.6 Quality of service

ANACOM does not currently provide statistics on broadband service quality (the last reported data was in 2010).

10 Singapore

10.1 Summary

Within Singapore, we have considered FTTH wholesale broadband access on the national broadband network, via active as well as passive access to a PON.

The Singapore government commissioned a nationwide FTTH network to 100% of premises. Wholesale access remedies and pricing were set as part of the tendering process. Remedies include both passive and active wholesale products, with regional and national PoIs respectively. Duct access has also been implemented, with (by definition) local PoIs and cost-based pricing.

Figure 10.1 below summarises the current NGA regulation in the Singapore, by network type, type of remedy and geographic area, stating where the point of interconnection lies, whether the regulation is symmetric or asymmetric and what the pricing model is.

Further details can be found in the full case study that follows.

Figure 10.1: Summary of NGA regulation in Singapore [Source: Analysys Mason, 2015]

Network type	Regulation type	Geographic application	Point of interconnection	Symmetric / asymmetric	Pricing model
FTTH regulation (primarily GPON with a P2P option)	Duct access	Nationwide	Local	Asymmetric	Cost-based pricing
	Dark fibre	Nationwide	Regional: nine Central Offices[411]	Asymmetric	Contractual price caps set during the tender process
	Bitstream	Nationwide	National: two Central Offices (the second is for network resilience)[412]	Asymmetric	Contractual price caps set during the tender process

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[411] See http://www.ida.gov.sg/images/content/Infrastructure/nbn/images/pdf/Connecting_You_to_NGNBN.pdf

[412] See http://www.ida.gov.sg/images/content/Infrastructure/nbn/images/pdf/Connecting_You_to_NGNBN.pdf and http://www.nucleusconnect.com/press-060510-NCGearsUp.php

10.2 Market and regulatory context

10.2.1 Market environment before the regulatory intervention was made

In 2008, the year before FTTH services were first commercially available on the Next-Generation National Broadband Network (Next Gen NBN), there were two main broadband access providers in Singapore: Singtel, the incumbent operator and holder of the ADSL infrastructure, and StarHub, a cable operator.

Wired[413] broadband penetration was around 74% of premises.[414] Singtel held a 51% retail market share of broadband connections, followed by StarHub with 38%; the remaining 11% was split between QMax (acquired by M1 in 2009), PacNet (acquired by Telstra in April 2015) and other smaller providers.[415]

In 2008, both Singtel and StarHub provided almost 100% coverage of households in Singapore.

10.2.2 Underlying regulatory regime

Although Singtel is designated as a dominant operator and so is subject to ex-ante regulation such as cost-oriented prices for wholesale products and tariff filing for retail and wholesale products, retail broadband is provided through a subsidiary (SingNet) which is not subject to dominance obligations. Likewise, StarHub[416] is not regulated in the retail market, but must offer mandated wholesale access to cable broadband through a bitstream offer.[417]

Within the wholesale broadband market, Singtel is required to offer passive products (LLU and SLU) under its Reference Interconnect Offer (RIO). However, very few of the retail service providers in Singapore choose to purchase passive products,[418] and instead simply resell the services provided by SingNet.

10.2.3 Policy objectives

The Singaporean government first took the decision to oversee and fund the deployment of a next-generation broadband project in May 2005, when the Intelligent Nation Masterplan (iN2015) was

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[413]   Excludes WiMAX and other wireless broadband technologies (e.g. 3G, 4G).

[414]   Note: IDA did not publish 'wired' broadband household penetration statistics prior to March 2011, and so this is a calculation based on total connections and estimated total premises.

[415]   Note: this differs from the market share chart shown below, as this chart excludes smaller operators such as QMax.

[416]   Via its Cable Vision subsidiary.

[417]   StarHub is required to provide a wholesale broadband access service (end-to-end), and a local broadband access service (just the access component) for resellers.

[418]   Indeed, by March 2009, only 11 LLUs lines were leased in Singapore. See http://www.ida.gov.sg/~/media/Files/PCDG/Consultations/20071116_STGovCustSegIndMkt/BGTSFinalDecEM.pdf (page 30).

adopted. One of the objectives of the iN2015 Masterplan was the commissioning of a nationwide ultra-high-speed infrastructure, capable of delivering speeds of 1Gbit/s or more.

The goals of the iN2015 Masterplan are to achieve:

> " – *enriched lives through infocomm*
> – *enhanced economic competitiveness and innovation through infocomm*
> – *increased growth and competitiveness of the infocomm industry*".[419]

One of the key pillars of the iN2015 Masterplan was an *"ultra-high speed, pervasive, intelligent and trusted infocomm infrastructure"*.[420]

These objectives were further detailed in the 'Design Philosophy of Next Gen NBN Technical Infrastructure':[421]

> "• *Singapore's broadband infrastructure to be internationally recognised as amongst the top in Asia*
> • *High-level of coverage of high-speed broadband*
> • *Competitive and affordable broadband pricing*
> • *Competitive and vibrant infocomm industry through open access*
> • *High level of adoption of high-speed broadband*"

Section 10.3 below explains how the implementation of the Next Gen NBN programme was designed to further these objectives.

10.3 Regulatory interventions

10.3.1 Summary

The telecoms regulator, the Infocomm Development Authority of Singapore (IDA), was responsible for designing and managing the process that led to the commissioning of the Next Gen NBN. Following a competitive dialogue process, the IDA split its procurement into two parts: the passive infrastructure operator (NetCo, awarded to a company initially called OpenNet, now part of NetLink Trust) and the active infrastructure operator (OpCo, awarded to a company called Nucleus Connect).

The structure envisaged for the Next Gen NBN is illustrated in Figure 10.2 below:

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[419]   IDA (2010), *Realising the iN2015 Vision*. Available at
https://www.ida.gov.sg/~/media/Files/Infocomm%20Landscape/iN2015/Reports/realisingthevisionin2015.pdf

[420]   See http://www.ida.gov.sg/Tech-Scene-News/iN2015-Masterplan

[421]   See http://www.ida.gov.sg/images/content/Infrastructure/nbn/images/pdf/02_IDA_NGBN.pdf

Figure 10.2: Next Gen NBN industry structure [Source: IDA, 2008][422]
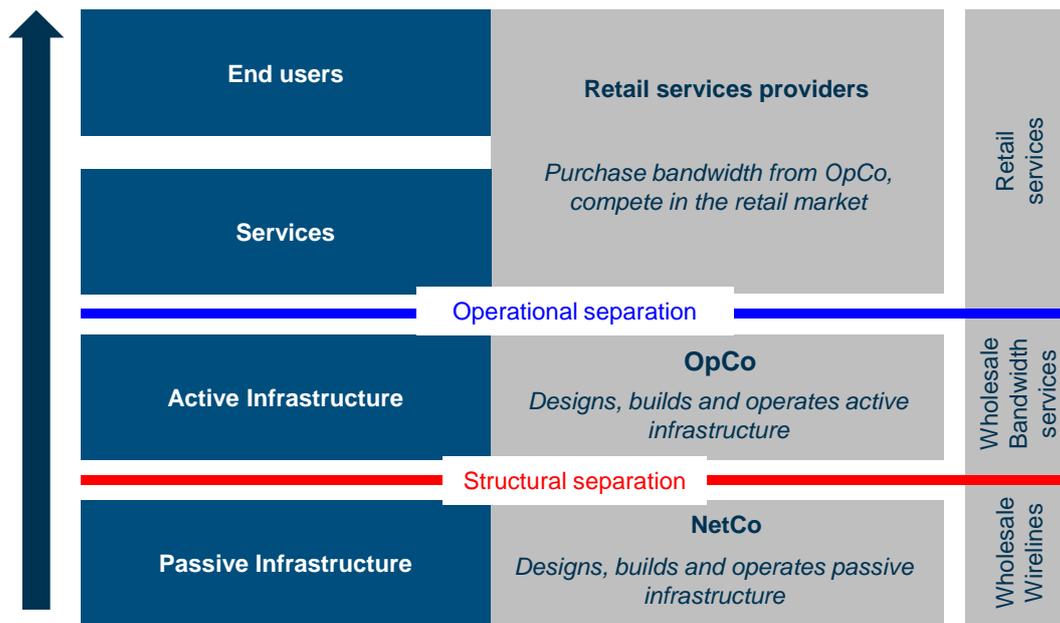
A key principle of the Next Gen NBN was and still is "carrier neutrality", understood as its independence from any existing operator, in order to achieve the objective of enhanced competitiveness in Singapore's broadband market. This independence is both structural and functional with regard to the underlying access infrastructure operated by NetLink Trust (effectively a type of dark FTTH/B), and simply functional with regard to the wholesale active layer operated by Nucleus Connect (Ethernet and IP bitstream access).

As part of the NetCo Request for Proposal (RFP) process, the IDA stressed the importance of open access in order to drive competition. To achieve this objective, the RFP required structural separation of the passive network operator from the retail service providers:

> *"It is also critical for the Next Gen NBN to provide effective open access to downstream operators. This will create a more vibrant and competitive broadband market. As a policy, we have therefore decided to adopt separation between the different levels of the Next Gen NBN to achieve effective open access. The RFP to construct the network will therefore provide for structural separation of the passive network operator from the downstream operators. If necessary, the Government is also prepared to consider legislation to achieve such effective open access for downstream operators in the next-generation broadband market."*[423]

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[422] IDA, *Media Briefing – Award for Next Generation NBN Network Company (NetCo) RFP*, 26 September 2008. See http://www.ida.gov.sg/Tech-Scene-News/Infrastructure/Wired/Next-Gen-NBN/What-is-Next-Gen-NBN/Industry-Structure

[423] Opening Remarks by Dr Lee Boon Yang, Minister for Information, Communications and the Arts at the Media Briefing for the Launch of Next Generation National Broadband Network Request-For-Proposal on 11 December 2007, Ministry of Information, Communications and the Arts, Esplanade Room. Available at https://www.ida.gov.sg/About%20Us/Newsroom/Speeches/2007/20071211191648.aspx

In addition, the OpCo RFP process required the operational separation of the OpCo from any retail operations:

> *"The Next Gen NBN OpCo will have to operate on a standalone basis, separate from its affiliated downstream operating units, and be subject to various obligations, including being established as a separate legal entity and maintaining separate board, management and staff."*[424]

The Singaporean government invested SGD1 billion (GBP475 million using 2010 exchange rates) in the Next Gen NBN, with SGD750 million allocated to the NetCo and SGD250 million allocated to the OpCo. As part of the competitive process, the bidders had to provide committed wholesale prices and state the level of funding that they required to support these (up to the maximum set out above).[425]

The NetCo funding was awarded to OpenNet – a consortium formed by Singtel, SP Telecommunications, Singapore Press Holdings and Canada's Axia NetMedia – to design, build and operate the passive infrastructure, and offer dark-fibre services on a non-discriminatory basis.

An important condition of the OpenNet proposal was the transfer of Singtel's underlying infrastructure assets (ducts, manholes and exchanges) to a neutral party:

> *"As part of OpenNet's proposal, Singtel has committed to transfer these underlying assets to a neutral party within 24 months of the NetCo's Contractual and Financial Close, or CFC in short. The CFC will take place within seven months of today's award. The neutral party, called the Asset Company or AssetCo, will be an independent and separately managed company. It will be owned by a registered business trust or will be structured in a similar manner to be approved by IDA."*[426]

In order to minimise Singtel's control over the AssetCo, a trustee management set-up was applied, resulting in the creation of a business trust called CityNet. As part of the control mechanisms, Singtel could appoint no more than 30% of CityNet's Board of Directors. In July 2011, NetLink Trust was created under the trustee management of CityNet, a subsidiary of Keppel Infrastructure Trust,[427,428] as illustrated in Figure 10.3 below.

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[424] IDA, press release on the opening of the OpCo RFP process, 7 April 2008. Available at http://www.egov.gov.sg/media-room/media-releases/2008/ida-launches-rfp-for-an-opco-to-design-build-and-operate-the-active-infrastructure-of-singapore-s-next-gen-nbn

[425] In fact the winning bidders chose to take the whole subsidy, and commit to low prices.

[426] IDA, press release on the award of the NetCo, 26 September 2008. Available at https://www.ida.gov.sg/About-Us/Newsroom/Media-Releases/2008/20080926174755

[427] CitySpring Infrastructure Trust acquired the business undertakings and assets of Keppel Infrastructure Trust on 18 May 2015, and has retained the Keppel Infrastructure Trust name.

[428] See http://www.telecompaper.com/news/singtel-establishes-netlink-trust-for-infrastructure-assets--817332
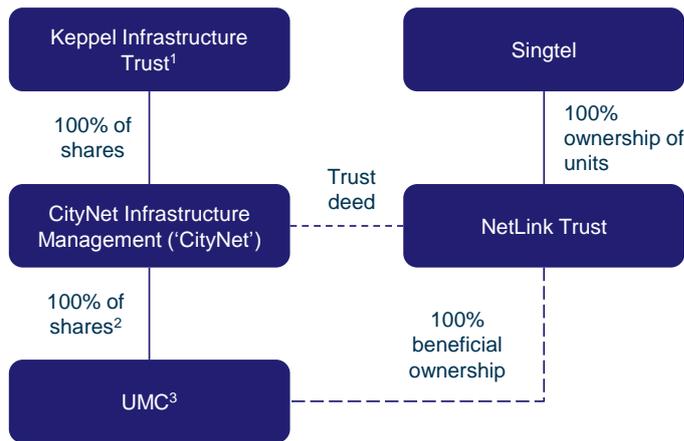
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Notes

1 - Keppel Infrastructure Trust is owned 22.9% by Keppel Corporation and 19.97% by Temasek Holdings (Temasek Holdings also has interests in Keppel Corporation, which are excluded here), with the remaining 57.1% floated on the Singapore stock exchange. Temasek Holdings also owns 52% of Singtel.

2 – CityNet as Trustee-Manager of NetLink Trust holds 100% of shares of UMC on trust on behalf of beneficial owner (NetLink Trust)

3 – UMC (United Maintenance Company) provides manpower services to CityNet in relation to the installation, operation and maintenance of the NetLink Trust network of ducts, manholes and Central Offices

The trust structure is designed to ensure there is full structural separation, without undermining the beneficial ownership of the assets. In other words, NetLink Trust operates totally structurally independently from Singtel, but its (regulated) profits flow back to Singtel. This is the result of a fine balance between separating the essential facilities from Singtel, whilst ensuring their shareholders are appropriately compensated and the new structure is sustainable.

Since its initial creation, however, the ownership structure of OpenNet and its relationship with NetLink Trust has changed. In August 2013, a proposal was put forward for the acquisition of 100% of shares in OpenNet by Singtel and the merger with NetLink Trust, which would remain under the trustee management of CityNet. As part of the merger terms, Singtel is required to reduce its ownership stake in NetLink Trust to 25% by 2018, and IDA imposed a range of safeguards to the management and governance of NetLink Trust until the divestment has happened.[430]

The OpCo funding was awarded to Nucleus Connect – a fully owned subsidiary of StarHub – to design, build and operate the active infrastructure and offer active wholesale products on a non-discriminatory basis.

The resultant industry structure and shareholdings of Next Gen NBN are outlined in Figure 10.4 below.

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[429]   IDA, Consultation Paper on the merger of OpenNet and NetLink Trust and Singtel's acquisition of 100% of shares in OpenNet, 28 August 2013.

[430]   See https://www.ida.gov.sg/~/media/Files/PCDG/Consultations/20130828_LongFormConsoOpenNet/Explanatory_Memorandum.pdf

Figure 10.4: Next Gen NBN industry structure and shareholdings [Source: Analysys Mason, 2015]
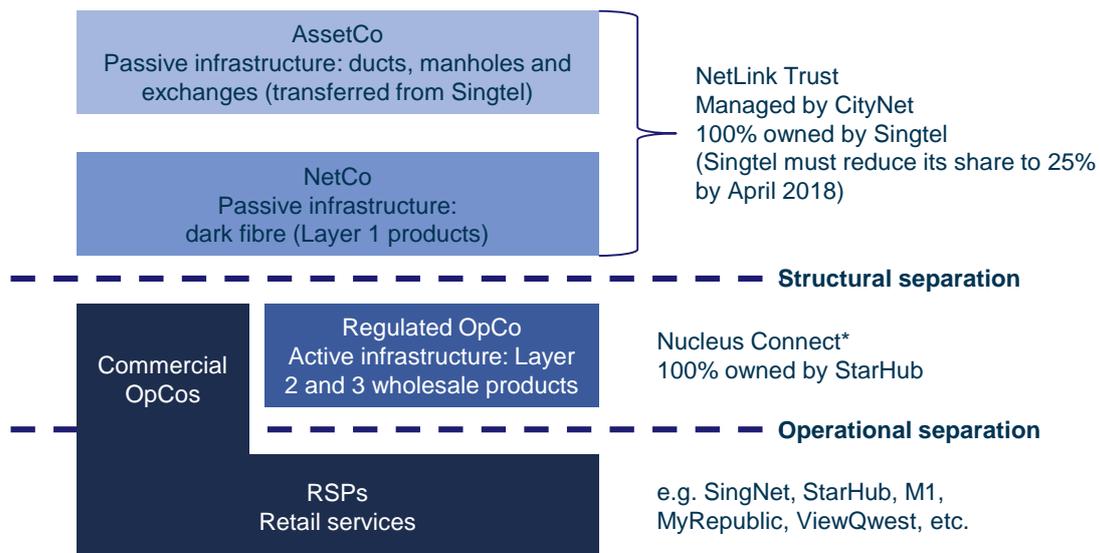
* Nucleus Connect was the party selected to operate the regulated OpCo for the Next Gen NBN. However, there are many commercial OpCos, which are integrated with RSPs. In effect the regulated OpCo provides a stepping stone to enable new RSPs to enter the market easily before deploying their own OpCo. In reality, almost all RSPs have deployed their own OpCos and purchase directly from NetLink Trust where volumes allow in each of NetLink Trust's Central Offices

10.3.2 Features

Services provided

NetLink Trust provides dark-fibre services to network operators, including residential and non-residential end-user connections and connections between Central Offices, MDF rooms and distribution points. A full list of the services provided by NetLink Trust is included within its Interconnection Offer ('ICO').[431]

The dark-fibre product is provided from nine Central Offices, which enable coverage of the whole country. Two fibre lines are deployed to each premises. The network architecture used by NetLink Trust enables the provisioning of both GPON and P2P services. However, despite the theoretical existence of a P2P option, the only services offered commercially are based on the GPON architecture. This can be attributed to the very high price of a P2P connection (SGD3500 per tail-end per month compared to SGD15 for a residential GPON connection).[432]

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[431] See http://www.ida.gov.sg/policies-and-regulations/consultation-papers-and-decisions/pending-decisions/Review-of-OpenNet-Pte-Ltds-Interconnection-Offer, or http://www.netlinktrust.com/services/interconnection-access-agreements/ico-agreement/

[432] See http://www.netlinktrust.com/wp-content/uploads/2009/04/Sch-15-Charges-1-Oct-20141.pdf

The GPON architecture is based on a 1:24 splitter for residential connections, and a 1:16 splitter for business connections. The end-to-end product (from the Central Office to the end-user premises) is managed by NetLink Trust. Each operator is allocated its own splitter for a building.

Nucleus Connect aggregates access to the nine Central Offices and offers an active product to retail service providers with a single PoI, available at two locations. Services offered include residential and non-residential end-user connections, Layer 2 and Layer 3 virtual private networks (VPNs), Ethernet and IP Multicast services. A full list of the services provided by Nucleus Connect is included within its RIO.[433]

QoS obligations

In Singapore, NetLink Trust's Interconnection Offer (ICO) includes a series of regulated QoS requirements for dark fibre products split by connection type (e.g. residential, non-residential, NBAP, CO to CO etc.).[434]

QoS requirements include provisioning timescale (installation in building), connection timescales (installation in home), deactivation (disconnection), fibre take-over (i.e. changing of fibre service provider), fault management (repair, defining mean time to recovery) and service availability (99.99% per month). Penalties are defined for failure to meet each requirement. SLAs are also defined for the OSS/BSS connection and service. The IDA is currently reviewing these terms.[435]

In addition, for active services, Nucleus Connect's ICO defines a series of QoS measures.[436] These include jitter, latency and packet loss for each of the four classes of service (real time, near real time, mission critical, best effort).

10.4 Outcomes of the interventions

We note the limitations of attributing any direct causality between the regulatory intervention and the outcome achieved in each case, and where possible we have flagged to what extent a causal link may be drawn, and where external factors may have had a more significant influence.

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[433] See http://www.ida.gov.sg/Policies-and-Regulations/Industry-and-Licensees/Nationwide-Broadband-Network/Nucleus-Connects-Interconnection-Offer

[434] See http://www.netlinktrust.com/services/interconnection-access-agreements/ico-agreement/. Details of the QoS requirements are contained within the body of the specific connection type schedule (e.g. Schedule 1 – Residential End-User Connection), and within this, in the individual process descriptions (for example Item 4: Ordering and provisioning procedure)

[435] See http://www.ida.gov.sg/policies-and-regulations/consultation-papers-and-decisions/pending-decisions/Review-of-OpenNet-Pte-Ltds-Interconnection-Offer

[436] See http://www.ida.gov.sg/Policies-and-Regulations/Industry-and-Licensees/Nationwide-Broadband-Network/Nucleus-Connects-Interconnection-Offer. Details of the QoS requirements are contained within the body of the specific connection type schedule (e.g. Service Schedule – Residential Per-End-User Connection)

10.4.1 NGA roll-out

At present, almost 100% of all households and businesses in Singapore are covered by the Next Gen NBN,[437] with access to speeds of 1Gbit/s. Figure 10.5 below shows the evolution of Next Gen NBN's coverage since launch.
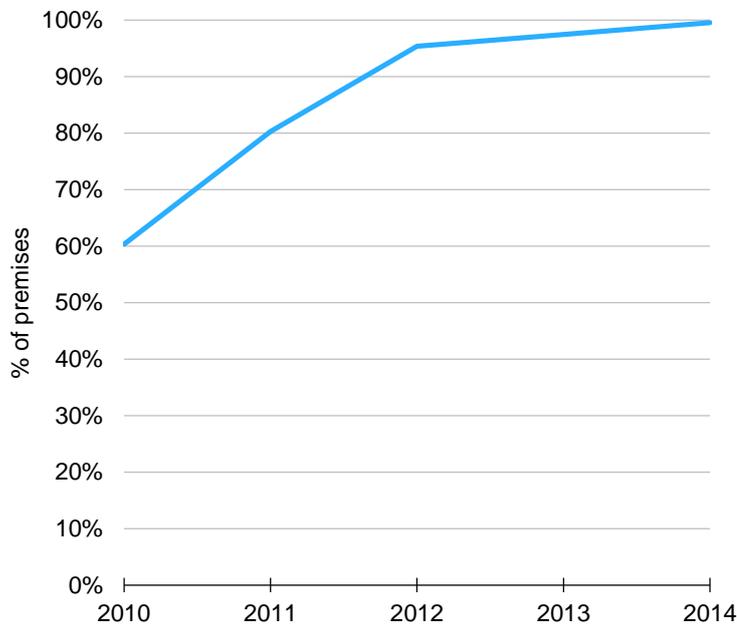
Figure 10.5: Evolution of Next Gen NBN's coverage since launch [Source: Analysys Mason Research, 2014][438]

Note: Roll-out commenced in July 2009.

As part of its universal service obligation, NetLink Trust must connect any physical address on request.

Singapore is the one of the most densely populated countries in the world, which makes 100% FTTH coverage economic where it has not been elsewhere. It should also be noted that the Singaporean government has invested around SGD508 (GBP241) per premises[439] to support this roll-out.

FTTH coverage in Singapore can be directly linked to the regulatory intervention, given that the roll-out schedule was defined within the contract with NetLink Trust.

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[437] Note: This roll-out does not imply that all premises are connected (i.e. have an optical termination point installed). This is only undertaken once an order is received, and is subject to strict connection timescales (see the QoS section below).

[438] Analysys Mason Research, *FTTx roll-out and capex worldwide: forecasts and analysis 2014–2019*, 26 June 2014, verified against intermittent IDA press releases.

[439] This includes the NetCo element only (SGD750 million). The figure would be SGD677 (GBP322) per premises including the OpCo element. This is based on year-average exchange rates for 2010.

10.4.2 Broadband penetration and NGA take-up

Broadband penetration in Singapore stood at 106% of premises in December 2014.[440] This figure is inflated by the inclusion of multiple broadband subscriptions per household, linked to bundled TV offers and the overlap of subscriptions to fibre and legacy products.[441] Nevertheless, we estimate that unique household broadband penetration in Singapore is over 90%, one of the highest in the world.[442]

As of 2014, 49% of all fixed broadband subscriptions were FTTH, with 35% on cable. The migration from DSL and cable to fibre is shown in Figure 10.6 below.
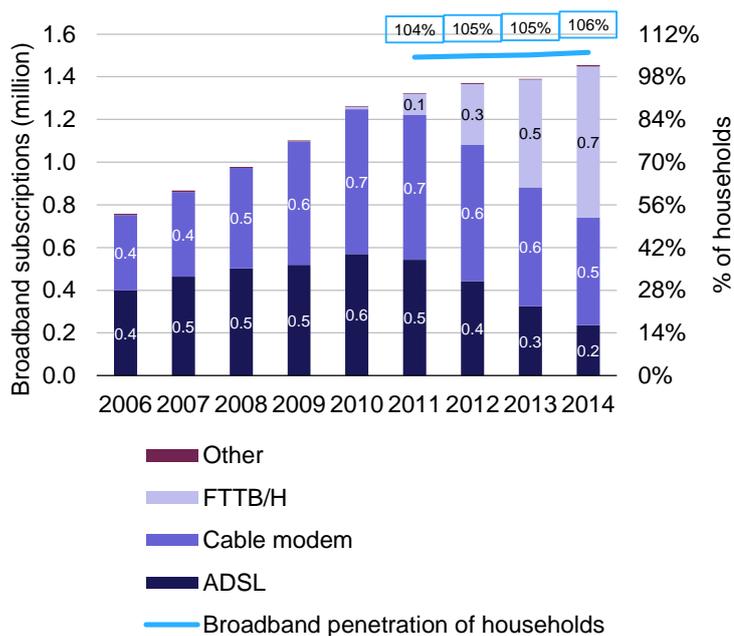
Figure 10.6: Fixed broadband subscriptions (residential and businesses) by technology, and residential fixed broadband Internet penetration of households in Singapore [Source: for connections: Analysys Mason DataHub extracted May 2015; for penetration: IDA, SingStat, 2014][443]

One of the drivers of this high level of broadband take-up was OpenNet's offer to provide free-of-charge installation to residential users for a limited period.[444]

It is not clear whether broadband penetration rates in Singapore would have grown so strongly without the Next Gen NBN. However, the rapid migration to FTTH products does suggest that the regulatory intervention has been a success.

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[440] This is total residential wired broadband connections divided by total households (i.e. excludes business connections), as published by the IDA; see http://www.ida.gov.sg/Tech-Scene-News/Facts-and-Figures/Telecommunications/Statistics-on-Telecom-Services/Statistics-on-Telecom-Services-for-2014-Jul-Dec

[441] Typical contract duration is 24 months, so some households may have moved to a competitive fibre offer without cancelling their previous access immediately.

[442] The IDA measures household access to broadband. The last available data is for 2013, when 87% of households in Singapore had access to broadband; see http://www.ida.gov.sg/Tech-Scene-News/Facts-and-Figures/Infocomm-Usage-Households-and-Individuals

[443] Wired broadband penetration of households was not published by the IDA prior to 2011 (it was aggregated with wireless broadband penetration).

[444] This applies to the first 15 metres of fibre (from the door of an apartment to the first termination point for a high-rise apartment, or from the gatepost to the first termination point for a landed property), which should be sufficient for the majority of homes (see https://www.ida.gov.sg/~/media/Files/Infocomm%20Landscape/Infrastructure/Wired/NextGenNBNFACTSHEET.pdf)

It is noteworthy that all the major service providers in Singapore have chosen to purchase passive products from NetLink Trust, rather than active products from Nucleus Connect.[445] This is in stark contrast to the situation on the copper network, where a very small number of lines were unbundled (see Section 10.2.2 above). This suggests that the dark fibre remedy in Singapore has successfully enabled infrastructure-based competition.

10.4.3 Competition

There is evidence that the Next Gen NBN has succeeded in enhancing competition in the broadband market in Singapore. Since its introduction in 2009, both SingNet[446] and StarHub have lost market share to other providers, as shown in Figure 10.7 below.
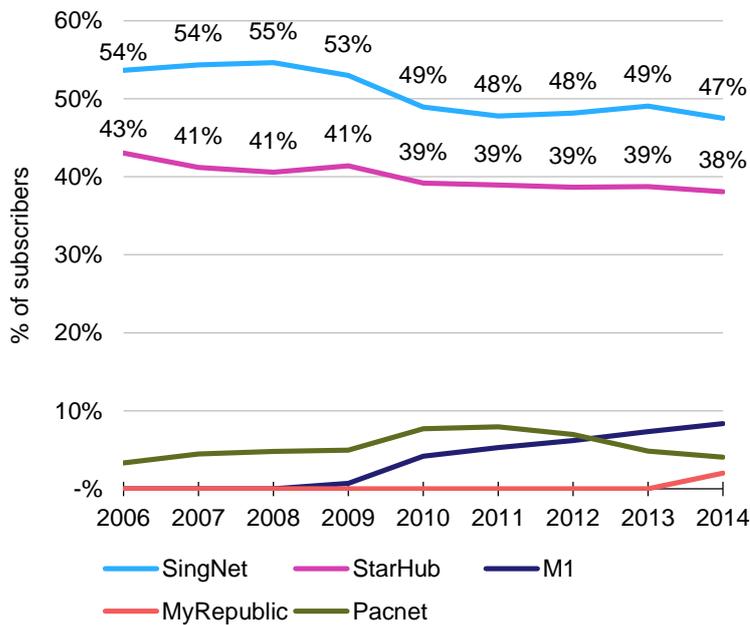
Figure 10.7: Operators' broadband market share of connections [Source: Operator reporting, Analysys Mason Research, TeleGeography, 2015][447]

Note: PacNet suspended its residential offering to focus on business subscriptions from the end of 2012.

Furthermore, two new retail service providers have launched fibre broadband services for the residential segment since the roll-out of the Next Gen NBN – MyRepublic (launched in early 2012) and ViewQwest (launched in January 2012); before construction of the Next Gen NBN, both operators only provided business services. While the market shares of these providers remain comparatively small, MyRepublic announced after only one year of operation that it expected to be

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[445] With the exception of StarHub, which owns Nucleus Connect, and therefore uses it as its OpCo.

[446] SingNet is the retail fixed-line services arm of Singtel, and is a separate entity from the core business, not subject to dominance regulation.

[447] Operator reporting of fixed broadband subscribers is highly inconsistent in Singapore: M1 only reports fibre broadband subscribers (not DSL or cable), whilst StarHub quotes broadband household customers only (not business), and does not include the low-speed broadband connection provided as part of a pay-TV-only service. We note that there is a wide discrepancy between the total subscribers quoted by the major operators in their financial reporting and the totals reported by the IDA, which cannot be explained by the share of smaller operators. As such, we have presented here the market share of the top-five operators based on their reported statistics.

profitable within a few months,[448] demonstrating the efficacy of the wholesale product solutions offered over the Next Gen NBN infrastructure.

The HHI for fixed broadband in Singapore has fallen from 0.42 in 2008 to 0.34 in 2014.

10.4.4 Pricing

The migration to FTTH initially enabled a reversal of the downward trend in overall average broadband spend per user in 2012. However, in 2013 and 2014, as the take-up of FTTH services neared 50%, a downward trend was observed again, as illustrated in Figure 10.8 below.
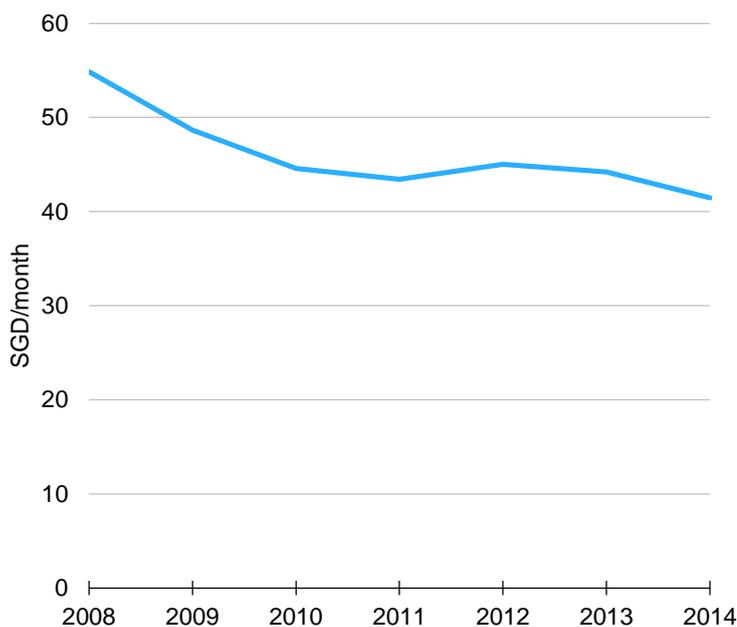
Figure 10.8: Fixed broadband average spend per subscriber [Source: Analysys Mason Research, 2014][449]

This downward trend suggests that competition is effectively constraining the prices of fibre broadband services.

10.4.5 Profitability

Singtel has experienced a rapid decline in EBITDA margin since 2006, as shown in Figure 10.9. This can partially be attributed to the introduction of a structurally separate fibre operator (NetLink Trust) and the migration away from its copper network (both for the retail and wholesale business). However, it should be noted that Singtel's margins were in decline before construction of the Next Gen NBN began in 2008, and so no direct causality can be inferred.

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[448] See https://www.techinasia.com/compete-telcos-crazy-singapore-startup-myrepublic/

[449] Analysys Mason Research, *Developed Asia–Pacific telecoms market: interim forecast update 2014–2019*, December 2014.

In contrast, StarHub successfully maintained a stable EBITDA margin over the period, despite the migration from self-provide cable broadband to fibre broadband from NetLink Trust. Third operator M1 reported declining margins over the same period.
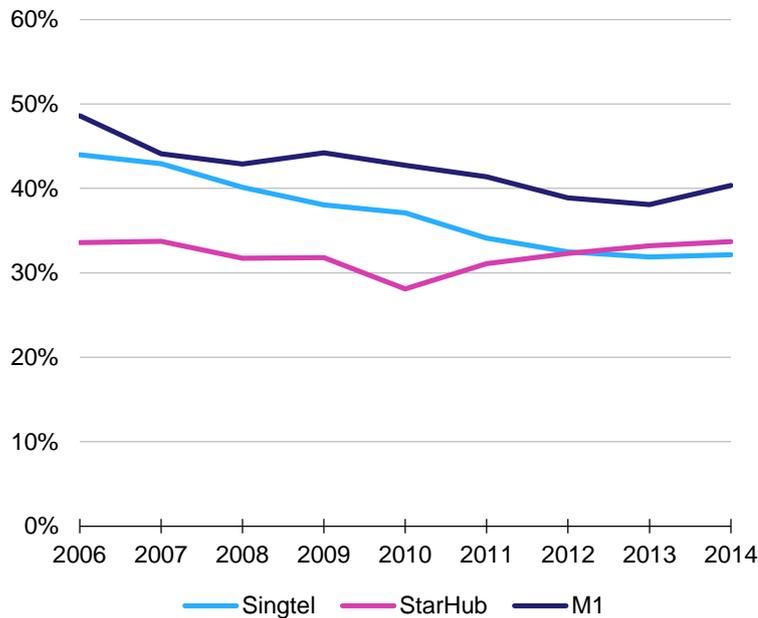
Figure 10.9: EBITDA margins of major operators in Singapore [Source: Operator annual reports, 2015]

Note: Margins shown here include both the fixed and mobile divisions in Singapore

10.4.6 Quality of service

In Singapore, a series of indicators are measured by a panel of testers, including download throughput, upload throughput, latency and packet loss. These are measured by operator for a series of selected plans.[450] Information is also periodically available on NetLink Trust's performance against their time to install requirements.

We provide details on the reported performance on latency and time to install below.

Latency

The IDA mandates that latency should be within 50 milliseconds for local traffic, and 300 milliseconds for international traffic.[451]

As regards local traffic, SingNet achieved latency of 28 milliseconds on its DSL network in December 2014, compared with 9.5 milliseconds for StarHub.[452] In comparison, 100Mbit/s and 200Mbit/s fibre services all achieved 3–4 milliseconds.[453]

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[450]   See https://www.ida.gov.sg/applications/rbs/chart.html

[451]   See https://www.ida.gov.sg/~/media/Files/PCDG/Licensees/StandardsQoS/QualityofService/Qos_webpage_bb.pdf. It should be noted that these standards are technically only applicable to retail service providers with a market share of more than 10%.

As far as international traffic is concerned, SingNet's latency on DSL was 208 milliseconds in December 2014, while StarHub's was 181 milliseconds.[452] International latency for fibre plans was at similar levels, between 202 and 216 milliseconds.[453]

These figures demonstrate that the introduction of fibre services has been successful in reducing local latency.

Time to install

NetLink Trust has been repeatedly fined for failing to meet these obligations, including, most recently, SGD50 000 for the six months ending June 2014. Nevertheless, it should be noted that this does represent a significant improvement on previous periods (previous fines have been around SGD200 000).[454]

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[452] IDA (2014), *Broadband QoS performance for Q4 2014.* Available at http://www.ida.gov.sg/Policies-and-Regulations/Industry-and-Licensees/Standards-and-Quality-of-Service/Broadband-Access-Services/Broadband-QoS-Performance-for-Q4-2014

[453] IDA (2015), *Price and Performance of Residential Broadband Service Plans in Singapore.* Available at http://www.ida.gov.sg/applications/rbs/chart.html

[454] See http://www.straitstimes.com/news/singapore/more-singapore-stories/story/singapores-fibre-network-operator-netlink-trust-fined-it

11 Spain

11.1 Summary

Within Spain, we have considered the wholesale broadband access regulation of Telefónica's FTTH network, as well as duct access and vertical building access remedies.

The Spanish regulator, CNMC, introduced duct access and vertical building access regulation to support third-party operators in deploying FTTH networks. Both products (by definition) have local points of interconnection, and whilst duct access is asymmetric (i.e. access to Telefónica's ducts), vertical access is symmetric (the first operator to roll-out to a building is obliged to provide access to subsequent operators). There is alos a proposed asymmetric vertical access remedy. Pricing of asymmetric duct and vertical access is cost-based; pricing of symmetric access is FRND. In addition, the CNMC has imposed remedies on active wholesale broadband access (NEBA) up to 30Mbit/s, including VDSL. This service is based on regional points of interconnection and a cost-based pricing model. In December 2014, as part of a market consultation, the CNMC proposed to extend the wholesale broadband access (NEBA) to include speeds above 30Mbit/s (in non-competitive areas) and introduce VULA. As for the lower speeds, the NEBA services would have regional points of interconnection, whilst VULA would require interconnection at a local level. NEBA on copper would continue to be calculated using a cost-based approach, and both NEBA and VULA pricing on FTTH would be on the basis of an economic replicability approach.

Figure 11.1 below summarises the current NGA regulation in the Spain, by network type, type of remedy and geographic area, stating where the point of interconnection lies, whether the regulation is symmetric or asymmetric and what the pricing model is.

Further details can be found in the full case study that follows.

Figure 11.1: Summary of NGA regulation in Spain [Source: Analysys Mason, 2015]

Network type	Regulation type	Geographic application	Point of interconnection	Symmetric / asymmetric	Pricing model
Implemented FTTH regulation (GPON network)	Duct access	Nationwide	Local	Asymmetric	Price control, cost-based: the price per metre per month is calculated either by the cross-sectional area taken up or the operator is charged for a whole sub-duct or duct[455]
	Vertical access	Nationwide	Local	Symmetric	Price control, cost-based: the price agreement between Jazztel and Telefónica was taken as a reference, with a 15.29% premium to cover the WACC and NGA risk premium[456]
Draft FTTH regulation (GPON network)	Bitstream (NEBA)	Non-competitive areas: areas where Telefónica's market share exceeds 50% and there are not at least three other operators (LLU or cable), of which two have a market share of at least 10%	Regional (50 regions)[457]	Asymmetric	Economic replicability test[458] (regulation not finalised)
	VULA	Nationwide, except for nine cities which are defined as being effectively competitive[459]	Local (at the ODF, which is in a sub-set of local exchanges)	Asymmetric	Economic replicability test[460] (regulation not finalised)
	Vertical access	Nationwide	Local	Asymmetric	Price control, cost-orientation:
VDSL (VDSL-CO)	Bitstream (NEBA)	Nationwide below 30Mbit/s (non-	Regional (50	Asymmetric	Price control, cost-based including a

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[455]   See http://www.movistar.es/rpmm/estaticos/operadoras/servicios-regulados/oferta-acceso-registros-y-conductos-marco/06-precioscondicionesdefacturacion.pdf

[456]   See http://cnmc.es/Portals/0/Ficheros/Telecomunicaciones/Resoluciones/140618_Resoluci%C3%B3n_DTSA-692-13-Verticales-%20vPUBLICA_.pdf

[457]   See Annex 1, NEBA reference offer, February 2014. Available at http://telecos.cnmc.es/documents/10138/2026311/201402_Texto_consolidado_NEBA_feb2014.pdf/9131e7f8-07b7-4e83-aa27-f5f275837808

[458]   See http://www.cnmc.es/Portals/0/Ficheros/Telecomunicaciones/Consultas_Publicas/Consulta_cnmc/20141219_ProyectoMedida.pdf

[459]   The nine cities are: Madrid, Barcelona, Alcalá de Henares, Badalona, Coslada, Málaga, Móstoles, Sevilla and Valencia.

[460]   See http://www.cnmc.es/Portals/0/Ficheros/Telecomunicaciones/Consultas_Publicas/Consulta_cnmc/20141219_ProyectoMedida.pdf

competitive areas only for services above 30Mbit/s)

regions)[461]

reasonable rate of return on the cost of capital and a risk premium of 15.72%[462]

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[461] See Annex 1, NEBA reference offer, February 2014, http://telecos.cnmc.es/documents/10138/2026311/201402_Texto_consolidado_NEBA_feb2014.pdf/9131e7f8-07b7-4e83-aa27-f5f275837808

[462] See http://telecos.cnmc.es/documents/10138/2026312/20140130_DT2011_739.pdf/747aab52-2235-4b36-95b3-75af4aa722dc

11.2 Market and regulatory context

11.2.1 Market environment before the regulatory interventions were made

The fixed-line telecoms market in Spain has historically had five main operators, with the incumbent Telefónica by far the largest. ONO is the main cable operator, whilst Vodafone, Jazztel and Orange have traditionally been LLU operators. There are also three regional cable companies in the north of Spain: Euskaltel, R Cable and Telecable.

The fixed market has seen dramatic changes in recent years, both in terms of the technology deployed and the market environment. Market concentration has increased significantly since Vodafone's acquisition of ONO (the main cable operator and third-largest operator by subscribers), and Orange's acquisition of Jazztel (a DSL operator and the fourth-largest operator by subscribers), both in 2014.

Telefónica has been very aggressive in its FTTH roll-out plans, initially planning to reach 20 million building units[463] (77% of the total building units in Spain) by 2017.[464] However, in December 2014, Telefónica stated that if the CNMC imposed FTTH access obligations as planned, it would halt any further FTTH deployment.[465]

Telefónica started FTTH deployment in 2007 with some pilot deployments; in 2010 it deployed FTTH on a large scale in Barcelona and Madrid. In 2012, Telefónica finished covering Barcelona and the majority of Madrid. Since that time Telefónica has continued to deploy FTTH in the main cities of Spain, and at the end of 2014 it was estimated to have an FTTH footprint of around 10 million building units.[464]

ONO completed the upgrade of its cable network to DOCSIS 3.0 in July 2011. Meanwhile, Jazztel reached an agreement with Telefónica in October 2012 to co-deploy FTTH to 3 million building units by the end of 2014, and is expected to deploy an additional 2 million building units during 2015. This agreement covers laterals (distribution cables), verticals (building insides) and vertical plug-ins (both operators install boxes).

Vodafone and Orange signed a fibre roll-out agreement in March 2013,[466] aiming to reach 800 000 building units by March 2014, 3 million building units by September 2015 and 6 million by 2017. Following Vodafone's acquisition of ONO, the agreement was amended[467] in July 2014, setting a new target of 2 million building units by September 2015 on a reciprocal basis, and an additional 1 million

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[463]   Building units mainly refers to homes and stores.

[464]   See http://economia.elpais.com/economia/2014/12/28/actualidad/1419786483_636398.html

[465]   See https://circabc.europa.eu/sd/a/451c0cba-a898-4f0b-8765-deb397d376a9/ES-2008-0804-0805%20acte_EN%20(0).pdf

[466]   Source: 'Vodafone and Orange to Co-Invest In Fibre to the Home In Spain', Vodafone news release, 13 March 2013, http://www.vodafone.com/content/index/media/vodafone-group-releases/2013/fibre_spain.html

[467]   Source: 'Vodafone Spain and Orange Spain update fibre sharing agreement', Vodafone news release, 23 July 2014, http://www.vodafone.com/content/index/media/vodafone-group-releases/2014/vodafone-spain-orange-spain-fibre-sharing-agreement.html

homes where Vodafone will provide IP bitstream access to Orange based on ONO's infrastructure. The current joint roll-out in July 2014 reached 800 000 premises across 12 cities.

In 2014, DSL offerings were available nationwide in Spain, while FTTH was available to 49% of households and cable to 47%. Broadband penetration was around 61% of households. Telefónica held a market share of 44% of retail broadband connections, with Vodafone (having recently acquired ONO) on 21%. Orange and Jazztel together held 27% of retail broadband connections, with the remaining 8% being held by a number of smaller operators.

11.2.2 Underlying regulatory regime

Wholesale broadband access

Wholesale broadband access has been a contentious issue in Spain since its introduction.[468] The regulator (the CNMC) has repeatedly sought to improve both the pricing and terms of Telefónica's reference offers, resulting in several revisions and disputes. The CNMC has sought to introduce both passive and active wholesale access remedies and maintain the balance between encouraging infrastructure investment and enabling competition.

The ex-ante obligations imposed on the wholesale broadband access market, which the CNMC approved in January 2009, are currently still in force.

- *Market 4: Wholesale network infrastructure access at a fixed location*. The relevant product market was defined by the CNMC as incorporating wholesale unbundling services for copper pairs, but not the unbundling of fibre. Therefore, the CNMC excludes from the market definition (i) FTTH in the point-to-multipoint topology currently rolled out in Spain; and (ii) cable, due, *inter alia*, to the technical limitations of unbundling the network infrastructure.

- *Market 5: Wholesale broadband access (WBA)*. The relevant product market was defined as incorporating the provision of wholesale broadband access regardless of whether the network supporting the services is based on the public service telephone network (PSTN) (copper pair from the end user to the exchange) or an FTTx network (FTTH, FTTN, etc.). The CNMC designated Telefónica as the undertaking with SMP, and imposed the following obligations on Telefónica: (i) access up to 30Mbit/s; (ii) non-discrimination; (iii) cost orientation and cost accounting; (iv) accounting separation; (v) ex-ante communication of retail offers; and (vi) transparency, including the publication of a reference offer.

EC comments as part of this process

The CNMC considered that due to uncertainties surrounding the substitutability pattern at both the retail and wholesale level, wholesale broadband access at speeds above 30Mbit/s did not form part

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[468] For example, Telefónica was fined EUR151.9 million in 2007 for abuse of dominant position in the provision of broadband Internet access, on the grounds that it was charging wholesale rates that were too close to the retail rates to enable competition. This decision was upheld by the EC despite multiple appeals.

of the relevant product market. Therefore, the CNMC excluded from the market definition speeds above 30Mbit/s regardless of the technology on which they are based. The EC expressed some concerns regarding the 30Mbit/s limitation as well as some other parts of the CNMC's proposals, and its "serious doubts" letter led to CNMC revising some of the original 2009 proposals, including changes to its original plan to impose lighter remedies in certain geographic areas (see next section).

The EC also expressed concerns about the exclusion of FTTH from the market for wholesale network infrastructure access at a fixed location (Market 4) based on the technical limitations of unbundling the point-to-multipoint topology currently used in Spain. However, the CNMC did not revise its proposals in this regard.

Analysis of geographic markets

The level of competition varies significantly across Spain, which has led to a non-homogenous market in terms of coverage, price evolution and quality of retail services. These geographical differences in competition have led to wide variations in Telefónica's market share across the country.

The CNMC therefore identified geographical zones based on:

- competition in the retail fixed broadband market
- competition across NGA infrastructures.

In its analysis, the CNMC defined two zones. The definition of these zones was based only on copper and cable infrastructure. The main variables assessed were the number of alternative LLU operators co-located, the number of alternative infrastructures (i.e. cable) networks, and the potential economies of scale at the local exchange.

The following zones were defined:[469]

- **Zone 1: Higher competition, lower market share for Telefónica**

  — local exchanges at which there are a minimum of three other operators where either:
      o the cable operator covers at least the 60% of building units, and at least two other operators are co-located

    or
      o three LLU operators are co-located and Telefónica's market share is below 50%

  — the local exchange has at least 10 000 copper pairs.

- **Zone 2: Lower competition, higher market share for Telefónica** – the remainder of the local exchanges that are not included in Zone 1.

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[469] See https://circabc.europa.eu/sd/a/451c0cba-a898-4f0b-8765-deb397d376a9/ES-2008-0804-0805%20acte_EN%20(0).pdf

Summary

In its initial proposals that the CNMC submitted to the EC in October 2008, it proposed lighter remedies for Zone 1. Telefónica's obligations would be limited to meeting reasonable requests for access up to 30Mbit/s at 'reasonable' prices, retail tariff filing, accounting separation and transparency obligations. In comparison, for Zone 2, Telefónica would be required to publish a reference offer, with price control and non-discrimination obligations.

However, following the EC's "serious doubts" letter and subsequent investigation, the CMNC's revised proposals applied the Zone 2 obligations to the whole of Spain.

In summary:

- Throughout Spain bitstream obligations would apply to both copper and FTTH networks up to 30Mbit/s[470]

- Passive network remedies would be limited to duct access; Telefónica would not be obliged to provide passive access to its FTTH network.

11.2.3 Policy objectives

The policy objectives relating to ultra-fast broadband in Spain were first introduced as part of the Digital Agenda for Spain, published in February 2013.[471] This document recognised that:

> "The existence of ultra-fast broadband networks is necessary to develop new services and to transfer the benefits generated by digital technologies to Spanish society as a whole."[472]

Within this document, the Spanish government committed to the development of an ultra-fast network strategy, with the following stated objectives:

> "The strategy will promote sustainable competition, technological neutrality, reduced deployment costs, competitiveness and shared use of infrastructure and investments through voluntary agreements among operators."[473]

In June 2013, a Telecommunications and Ultra-Fast Network Plan was published[474] which further outlined these objectives. As part of this plan, the Spanish government committed to providing EUR200 million of funding over three years (2013–15).[475] This was followed by the General

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[470]   In July 2010, the bitstream requirements were revised to reflect the new NEBA service structure (see https://circabc.europa.eu/sd/a/88050166-e165-4410-8d38-3b7f6a386070/ES-2010-1097%20Acte(2)_EN+date%20et%20nr.pdf)

[471]   See http://www.agendadigital.gob.es/digital-agenda/Documents/digital-agenda-for-spain.pdf

[472]   *Ibid*, page 4.

[473]   *Ibid*, page 17.

[474]   See http://www.agendadigital.gob.es/planes-actuaciones/Bibliotecatelecomunicaciones/1.%20Plan/Plan-ADpE-1_Redes-Ultrarrapidas.pdf

[475]   *Ibid*, page 10.

Telecommunications Act of May 2014,[476] which made a commitment to provide 10Mbit/s for 100% of the population by 2017, as well as to meet the wider European Digital Agenda targets of 50% of the population taking up speeds of 100Mbit/s and 100% having access to speeds of 30Mbit/s by 2020.

An important theme that was brought forward in the Digital Agenda and carried through the policy document was the need to improve the consistency of regulation of telecoms networks across Spain. Within the Digital Agenda, the Spanish government noted:

> *"When deploying infrastructures and telecommunications networks, operators in Spain are occasionally faced with inconsistent regulations adopted by multiple public administration bodies, with unjustified barriers and unnecessary complexities which slow down the extension of these networks. Passing a new General Telecommunications Act and simplifying rules and procedure management will be the key to boost the deployment of new networks."*

This was reiterated in the Telecommunications and Ultra-Fast Network Plan:

> *"[the new Telecommunications Act] will unify criteria and standards applicable to the deployment of telecommunications networks. The aim is to achieve clear, more consistent regulation that unifies criteria and points of interaction, which is a basic factor to reduce costs and unnecessary barriers at network deployment."*

Specifically in relation to the fibre access measures proposed within the December 2014 consultation, the CNMC stated that its objectives were to "ensure that the wholesale conditions are sufficient to guarantee effective competition in the retail market".[477]

11.3 Regulatory interventions

11.3.1 Summary

The regulatory interventions to support wholesale broadband access to Telefónica's FTTH network can be divided into four areas:

- active wholesale broadband access (NEBA)
- virtual unbundled local access (VULA)
- duct access
- vertical access.

We detail the interventions used for each one in turn below.

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[476]   See https://www.boe.es/boe/dias/2014/05/10/pdfs/BOE-A-2014-4950.pdf

[477]   See http://www.cnmc.es/Portals/0/Ficheros/Telecomunicaciones/Consultas_Publicas/Consulta_cnmc/20141219_ ProyectoMedida.pdf

Active wholesale broadband access (NEBA)

In January 2013, the CNMC (at the time called the 'CMT') proposed to revise its prices for active wholesale broadband access (NEBA), including FTTH NEBA. The EC had issued a "serious doubts" letter in which its key objections were to the pricing model, the fact that active wholesale broadband access was the only regulated product available on Telefónica's FTTH network, and that the non-discrimination rules were insufficiently stringent. Subsequent to this, the EC launched an investigation. This resulted in a Commission Decision requiring the CNMC to withdraw or amend its approach. On 30 January 2014, the CNMC issued a resolution for the review of wholesale broadband pricing.[478] Telefónica published revised prices in February 2014.[479]

However, as part of its December 2014 market consultation (see the *VULA* section below), the CNMC proposed to remove Telefónica's NEBA (active wholesale broadband access) obligations in areas deemed to be competitive (based on the definition of the cable and copper market). This includes both copper and FTTH bitstream services. Competitive areas were defined as areas where Telefónica's market share does not exceed 40%, which represents 56% of copper lines in Spain. In order to manage the transition, the CNMC proposed to maintain NEBA services for a year after the conclusion of the consultation, and remove the 30Mbit/s limit for this period. Furthermore, the CNMC proposed that active wholesale broadband services should be maintained for business customers, where competition remains weak, and planned to create a separate product to meet this need.[480]

Before the conclusion of the December 2014 consultation, in 24 March 2015, the CNMC launched a public consultation on the revision of NEBA prices, after concerns were raised by Orange, Vodafone and ONO, particularly about the prices of bandwidth in a market where IPTV was offered (e.g. Orange has claimed that it is unable to replicate the retail offers).[481] A decision on this matter is unlikely to be reached until after the December 2014 market consultation has concluded.

VULA

In July 2013, the CNMC recognised the need to undertake a more far-reaching review of the FTTH wholesale broadband access market in Spain, given the significant market developments since its original review in 2009. As such, on 23 July 2013, the CNMC published a pre-consultation seeking operators' opinions on fibre access.[482] Specific points raised include:

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[478] See http://telecos.cnmc.es/documents/10138/2026312/20140130_DT2011_739.pdf/747aab52-2235-4b36-95b3-75af4aa722dc

[479] See http://telecos.cnmc.es/documents/10138/2026311/201402_Texto_consolidado_NEBA_feb2014.pdf/9131e7f8-07b7-4e83-aa27-f5f275837808

[480] See http://www.cnmc.es/CNMC/Prensa/TabId/254/ArtMID/6629/ArticleID/1044/La-CNMC-lanza-una-consulta-p250blica-sobre-la-regulaci243n-mayorista-de-los-mercados-de-banda-ancha.aspx

[481] See http://telecos.cnmc.es/documents/10138/2696978/20150330_Consulta_publica_MTZ_2014-1840_Precio_capacidad_NEBA_VP.pdf/7eb81ec0-f0a0-4e98-9ca9-2fc39f01c373

[482] See Consultation document: http://telecos.cnmc.es/c/document_library/get_file?uuid=f96a062f-8551-4e68-a03a-d904e96bd7b5&groupId=10138; press release: http://telecos.cnmc.es/c/document_library/get_file?uuid=b185dce4-b0fe-43b7-922d-c59b9fde250e&groupId=10138

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- the introduction of a VULA product – i.e. one designed to allow flexibility similar to LLU – to better align with the copper broadband market
- the variation of wholesale access obligations by geographical area depending on levels of competition
- the potential to lift the 30Mbit/s limit on wholesale broadband access services
- the differentiation of business and residential markets.

This was followed on 19 December 2014 by a full market consultation[483] on local access, to review the market evolution and propose preliminary regulation on fibre sharing (for verticals). As part of this consultation, the CNMC re-ran its geographical analysis of competition, and calculated the number of local exchanges in Zone 1 (high competition areas) which had at least three operators with either 10% or 20% NGA network coverage each.

As the level of competition evolved, the CNMC observed that there had been significant growth in the number of local exchanges classed as Zone 1 (i.e. competitive). It therefore decided to remove the constraint on the number of copper pairs, and amended the criteria referring to the presence of alternative operators.

Therefore, the new criteria were:

- **Zone 1: Higher competition** – Local exchanges for which there are a minimum of three operators where

  — a minimum of two alternative operators (LLU or cable) are present with at least 10% market share each
  — Telefónica's market share is below 50%.

- **Zone 2: Lower competition** – The remainder of the local exchanges that are not included in Zone 1.

The CNMC's review followed the same geographical approach as the 2007 geographical competition study, but was forward-looking to take into account potential future infrastructure developments. However, since the NGA roll-out plans are somewhat uncertain and do not provide a geographical breakdown, it was decided that zones should be defined using cities as the geographical unit, rather than each individual local exchange. The CNMC defined nine cities as being effectively competitive.[484] This represents 16.1% of the Spanish population.

In summary:

- Within the nine cities identified (inside Zone 1) – that is, Madrid, Barcelona, Alcalá de Henares, Badalona, Coslada, Málaga, Móstoles, Sevilla and Valencia – the CNMC proposed to remove all FTTH wholesale broadband access obligations, and apply neither NEBA nor

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[483] See http://www.cnmc.es/Portals/0/Ficheros/Telecomunicaciones/Consultas_Publicas/Consulta_cnmc/20141219_ ProyectoMedida.pdf

[484] Madrid, Barcelona, Alcala de Henares, Badalona, Coslada, Malaga, Mostoles, Seville and Valencia.

VULA obligations on Telefónica (although LLU, SLU, duct access and vertical access obligations would continue to apply).

- In the remainder of Zone 1 (competitive areas) (excluding the nine cities), VULA obligations would apply, but NEBA obligations would be lifted after a year (and during this year no 30Mbit/s restriction would apply)

- In Zone 2 (uncompetitive areas), both VULA and NEBA obligations would apply; the 30Mbit/s limit would be removed.

The CNMC is expected to publish its official market review during the second half of 2015.

Duct access

An additional regulatory action to support the wholesale broadband access market and encourage infrastructure investment was nationwide regulated access to Telefónica's ducts. In November 2009, Telefónica's fibre duct access reference offer (MARCo) was approved and published by the CNMC.[485] On 1 March 2011, the CNMC notified the EC about its proposed revisions to prices for LLU, SLU, leased lines and duct access.[486] The CNMC proposed a series of upwards revisions to pricing, including duct prices (for example, one price increased by 228%) in order to reflect Telefónica's increased costs, as demonstrated in its accounts.[487] The EC objected to the approach used to calculate these costs, and instead recommended that the existing cost-accounting approach was maintained.[488,489]

Vertical access

Access infrastructure within multi-storey apartment blocks is referred to as *vertical access infrastructure* and comprises two components:

- vertical infrastructure – the shared optical network terminal (ONT), the fibre cables within the building, and the splitters on each floor which segregate the fibres to individual homes
- connection infrastructure – the connections on each floor between the splitter and each of the homes.

These elements are shown in Figure 11.2.

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[485]   Source: Resolución de 19 de noviembre de 2009 sobre el análisis de la oferta de acceso a conductos y registros de Telefónica y su adecuación a los requisitos establecidos por la Comisión del Mercado de las Telecomunicaciones (MTZ 2009/1223)

[486]   See https://circabc.europa.eu/sd/a/5470f552-9dbd-46e7-933f-06c16022c8ea/ES-2011-1192-1193-1194%20Acte(4)_EN+date%20et%20nr.pdf

[487]   See http://telecos.cnmc.es:8080/c/document_library/get_file?uuid=3b37a2e4-75b6-4af8-9b7e-e02f7e4cf347&groupId=10138

[488]   See https://circabc.europa.eu/sd/a/5470f552-9dbd-46e7-933f-06c16022c8ea/ES-2011-1192-1193-1194%20Acte(4)_EN+date%20et%20nr.pdf

[489]   The final resolution is available at https://circabc.europa.eu/sd/a/92b1e646-cf01-402c-ba06-89465541e3f3/PUBLIC.pdf

![analysys mason]
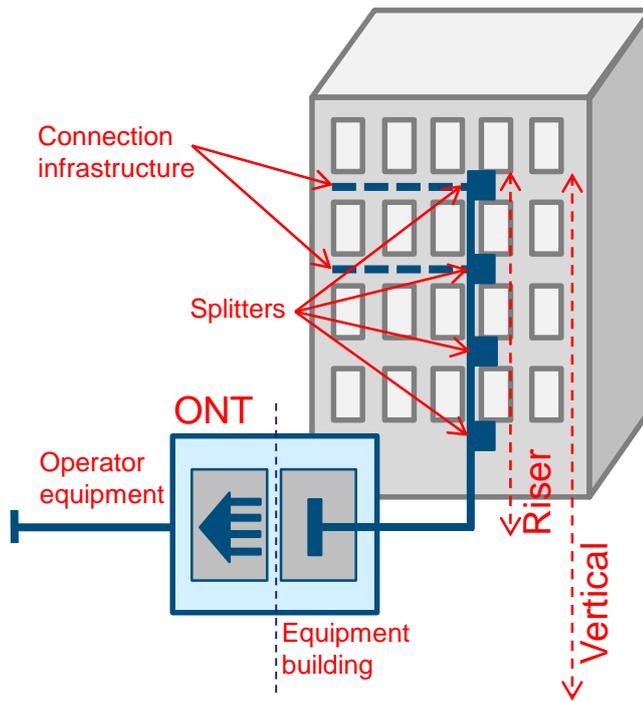
Figure 11.2: Network elements within the building [Source: CNMC, 2015]

The CNMC has regulated vertical access infrastructure, in order to avoid monopolies within particular buildings. This was done using a legislative process in Spain under the Spanish Telecommunications Law Article 30 (not through the EC framework, article 12).[490]

The CNMC first analysed the issue of vertical deployment with fibre roll-out in 2009. It was concerned that there was a risk that access to the interior of a building could emerge as a potential barrier to entry for new operators. Due to the technical solution adopted, or objections to a second round of potentially disruptive civil works within a building, the first operator that deployed fibre within a building could effectively gain a monopoly over that building.

Symmetric obligations were therefore applied to the first operator to deploy a network in a building, namely:

- The first operator which installs the optical equipment/wiring inside the building must meet all reasonable access requests
- Regardless of the solution implemented, the first operator must ensure that the sharing is feasible (at proportionate cost and within a reasonable period)
- An obligation to negotiate reciprocal agreements
- A requirement for centralised management of network elements by the first operator
- A requirement for reasonable prices
- A need for transparency, whereby the operator must provide information about the buildings where optical wiring has been deployed.

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[490] See http://telecos.cnmc.es:8080/c/document_library/get_file?uuid=5c140e07-8830-44a8-ab01-df7317942bce&groupId=10138

Following complaints from Orange and Jazztel regarding Telefónica's vertical access pricing, the CNMC approved fixed prices in its Resolution of 18 June 2014.[491]

The proposed December 2014 remedies also include an asymmetrical vertical access remedy.

In the following sub-sections, we provide further detail of the main obligations imposed by the regulatory interventions, under the headings of coverage, QoS and services to be provided.

11.3.2 Features

Services provided

In respect of its fibre infrastructure, Telefónica is obliged to offer the following wholesale services:

- NEBA
- access to civil infrastructure (e.g. ducts and poles)
- vertical infrastructure access.

Telefónica is not *obliged* to offer dark fibre as standard, although it must do so in cases where access to ducts is not possible.

VULA has been proposed, but a final decision has not been made and so no reference offer is available.

► *Wholesale broadband access (NEBA)*

In February 2014, Telefónica published the most recent update to its NEBA service offer,[492] a month after the CNMC updated the regulated prices. The NEBA service is offered on three different access technologies:

- ADSL2+ / POTS
- VDSL2
- FTTH.

The speeds offered over each of these are shown in the figures below.

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[491] See http://cnmc.es/Portals/0/Ficheros/Telecomunicaciones/Resoluciones/140618_Resoluci%C3%B3n_DTSA-692-13-Verticales-%20vPUBLICA_.pdf

[492] See http://telecos.cnmc.es/documents/10138/2026311/201402_Texto_consolidado_NEBA_feb2014.pdf/9131e7f8-07b7-4e83-aa27-f5f275837808

Figure 11.3: NEBA speeds on ADSL2+ [Source: Telefónica, 2015]

Best efforts		ORO[493]		Real time	
Down	Up	Down	Up	Down	Up
1–20Mbit/s	320–800kbit/s	4–20Mbit/s	640–800kbit/s	128–256kbit/s	128–256kbit/s

Figure 11.4: NEBA speeds on VDSL2 [Source: Telefónica, 2015]

Best efforts		ORO		Real time	
Down	Up	Down	Up	Down	Up
10–30Mbit/s	1–3Mbit/s	1–30Mbit/s	1–3Mbit/s	128kbit/s–2Mbit/s	128kbit/s–2Mbit/s

Figure 11.5: NEBA speeds on FTTH (GPON) infrastructure [Source: Telefónica, 2015]

Best efforts		ORO		Real time	
Down	Up	Down	Up	Down	Up
10–30Mbit/s	1–10Mbit/s	10–30Mbit/s	1–10Mbit/s	128kbit/s–2Mbit/s	128kbit/s–2Mbit/s

► *Duct access*

The CNMC passed a resolution to revise the price of duct access on 5 July 2012. Details of the duct access services and pricing can be found in Telefónica's reference offer, the latest version of which was published in June 2013.[494]

► *Vertical access*

The latest details on vertical access conditions and pricing can be found in the CNMC's resolution of 18 June 2014.[495]

QoS obligations

► *Wholesale broadband access (NEBA)*

In Spain, service levels are defined for the NEBA services within Telefónica's reference offer (published in February 2014).[496] These include installation timescales and fault resolution

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[493] Business-oriented traffic. This traffic has priority over 'Best effort' and has associated SLAs around packet loss and frame delay.

[494] See http://www.movistar.es/operadores/ServiciosRegulados/ficha/PRO_MARCo?paramPestania=soporte&posicionScroll=0l. Information specifically on pricing can be found at http://www.movistar.es/rpmm/estaticos/operadoras/servicios-regulados/oferta-acceso-registros-y-conductos-marco/06-precioscondicionesdefacturacion.pdf

[495] See http://cnmc.es/Portals/0/Ficheros/Telecomunicaciones/Resoluciones/140618_Resoluci%C3%B3n_DTSA-692-13-Verticales-%20vPUBLICA_.pdf

[496] See http://telecos.cnmc.es/documents/10138/2026311/201402_Texto_consolidado_NEBA_feb2014.pdf/9131e7f8-07b7-4e83-aa27-f5f275837808, P252

timescales with association penalties for delay. The reference offer also includes a requirement for equivalence of SLAs for third parties when compared to Telefónica's own services.

In addition, the reference offer lists the minimum quality levels for the frame loss, frame delay and delay variation (jitter) for each of Telefónica's three wholesale products and includes penalties for failure to meet these.

11.4 Outcomes of the interventions

We note the limitations of attributing any direct causality between the regulatory intervention and the outcome achieved in each case, and where possible we have flagged to what extent a causal link may be drawn, and where external factors may have had a more significant influence.

11.4.1 NGA coverage

Roll-out of FTTH has increased significantly since 2010, reaching 35% of premises by June 2014 (see Figure 11.6). Furthermore, estimates suggest that this may be closer to 50% at the end of 2014. This rapid roll-out of FTTH can perhaps be attributed to strong retail competition, but has undoubtedly been enabled by duct and vertical access remedies imposed. Cable DOCSIS 3 roll-out has continued, but significantly more slowly, covering a total of 47% of premises by the end of 2014.

Telefónica's deployment of VDSL in Spain is based on VDSL-CO, which is being used as a stop-gap whilst FTTH is rolled out. As a result, a downward trend in VDSL can be observed between 2010 and 2013, during which time Telefónica overbuilt the VDSL-CO network with FTTH, effectively converting the premises passed from one technology to the other. In 2014, Telefónica's roll-out of VDSL-CO exceeded the rate of FTTH overbuild, and so the total VDSL coverage increased.
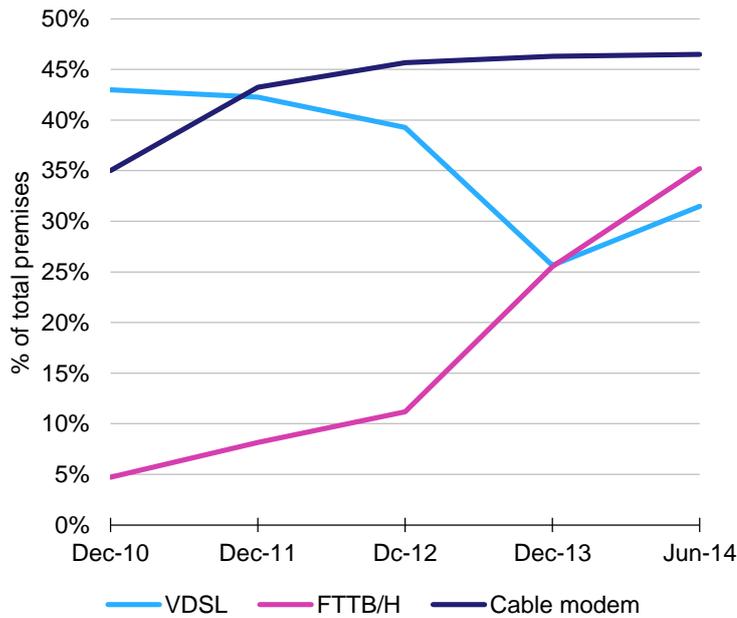
Figure 11.6: NGA premises passed as a percentage of total premises by technology [Source: CNMC quarterly reports,[497] Analysis Mason Research,[498] June 2014]

Data not yet available for December 2014

11.4.2 Broadband penetration and NGA take-up

Broadband penetration in Spain has increased significantly over the last ten years, reaching 61% coverage of premises at the end of 2014 (see Figure 11.7 below). Nevertheless, penetration still remains below the levels in Northern European countries. A recent slight "uptick" in penetration rates could be due to FTTH availability or (for example) other effects including lower prices.

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[497]   VDSL coverage data is taken from *AMR FTTx roll-out and capex worldwide: forecasts and analysis 2014–2019*. Note that 2014 data from the CNMC is for second quarter (June) 2014. A summary of CNMC quarterly data on NGA coverage can be found on page 26 in the following public consultation document: http://www.cnmc.es/Portals/0/Ficheros/Telecomunicaciones/Consultas_Publicas/Consulta_cnmc/20141219_Proyect oMedida.pdf

[498]   Analysys Mason, *FTTx roll-out and capex worldwide: forecasts and analysis 2014–2019*.
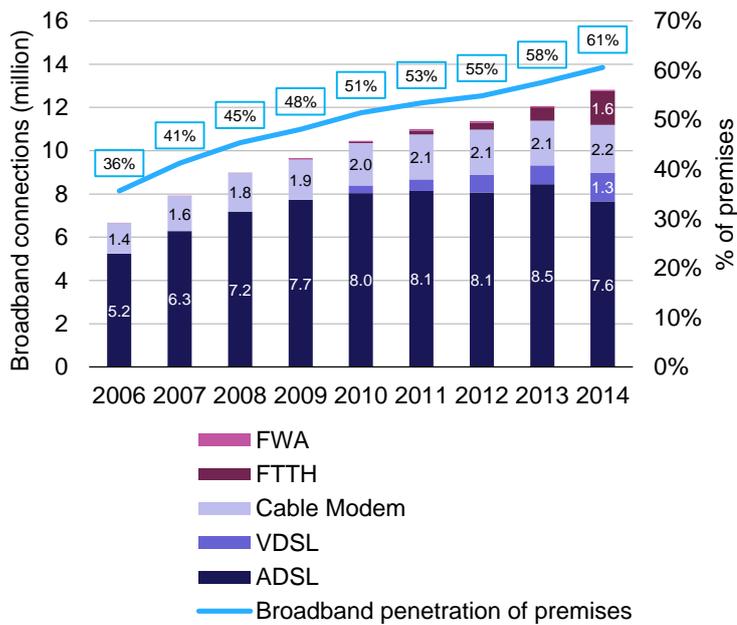
Figure 11.7: Broadband subscribers by technology and penetration of households [Source: Analysys Mason Research,[499] June 2014, CNMC quarterly data[500]]

NGA take-up remains relatively low, with FTTH representing 12% of all connections and VDSL a further 10%. Nevertheless, 2014 saw a sharp rise in FTTH connections, which is likely to reflect the increased coverage. Take-up also suggests that operators have been able to develop sufficiently attractive retail offers to migrate customers from legacy products. Cable subscriptions have grown at a slower pace than the rest of the market, and represented 17% of connections in 2014.

As shown in Figure 11.8, ONO had the highest NGA coverage (at nearly 35%) at the end of 2013, although Telefónica's coverage has been expanding rapidly (with over 50% year-on-year growth between the end of 2012 and the end of 2013). We understand that this has been based primarily on competitive pressures, from both cable operators and from Vodafone's FTTH roll-out.

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[499]   Analysys Mason, *FTTx roll-out and capex worldwide: forecasts and analysis 2014–2019*.

[500]   See http://data.cnmc.es/datagraph/jsp/inf_trim.jsp for CNMC quarterly data. VDSL data has been taken from Analysys Mason Research's *FTTx roll-out and capex worldwide: forecasts and analysis 2014–2019*. Penetration has been calculated using Analysys Mason Research figures for number of premises.
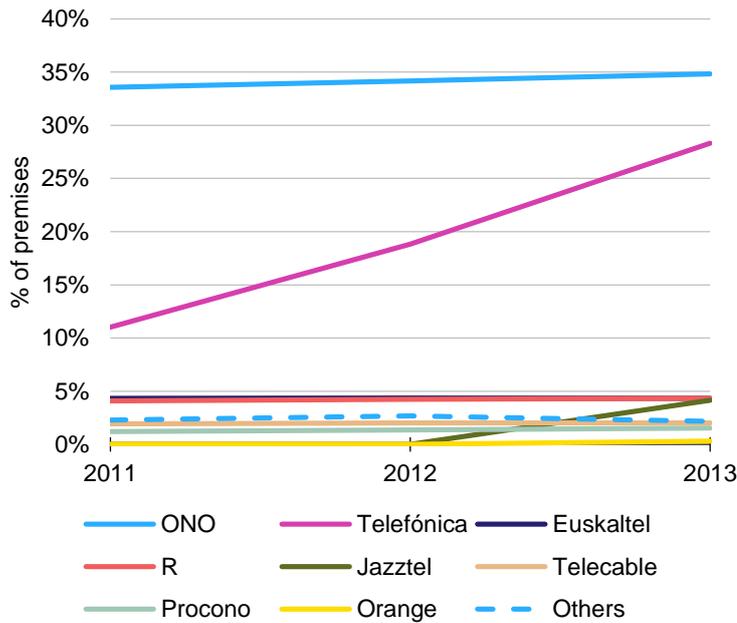
Figure 11.8: Percentage of premises passed with NGA technology, by operator [Source: CNMC quarterly data]

NGA take-up (premises connected as a percentage of total premises passed) is shown in Figure 11.9 below. VDSL and FTTH take-up reached around 20% at the end of 2014. Cable take-up declined from 27% in 2010 to 21% in 2013, but this trend was reversed in 2014 when take-up rose by one percentage point to reach 22%.
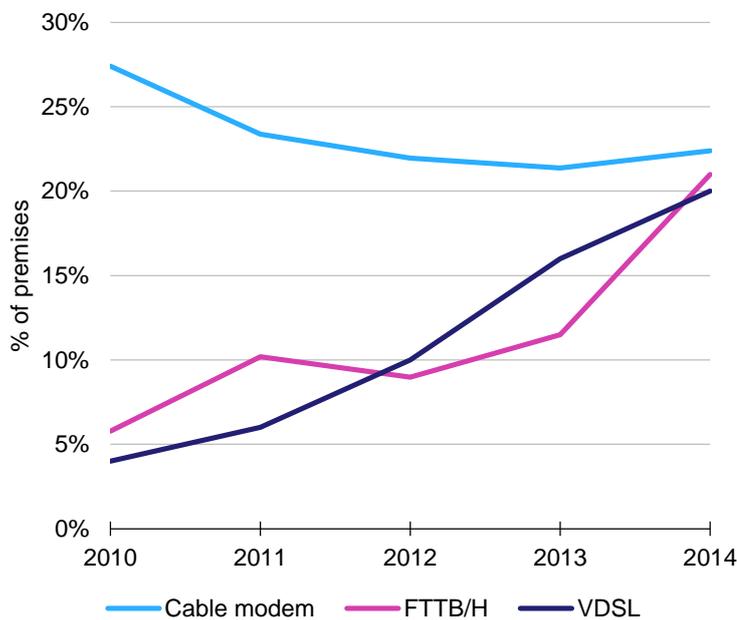
Figure 11.9: Premises connected as a percentage of premises passed, by NGA technology [Source: Analysys Mason Research,[501] June 2014]

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[501]   Analysys Mason, *FTTx roll-out and capex worldwide: forecasts and analysis 2014–2019.*

11.4.3 Competition

Telefónica's market share has fallen considerably over the last six years, from a high of 56% in 2008 to 44% in 2014 (see Figure 11.10 below).
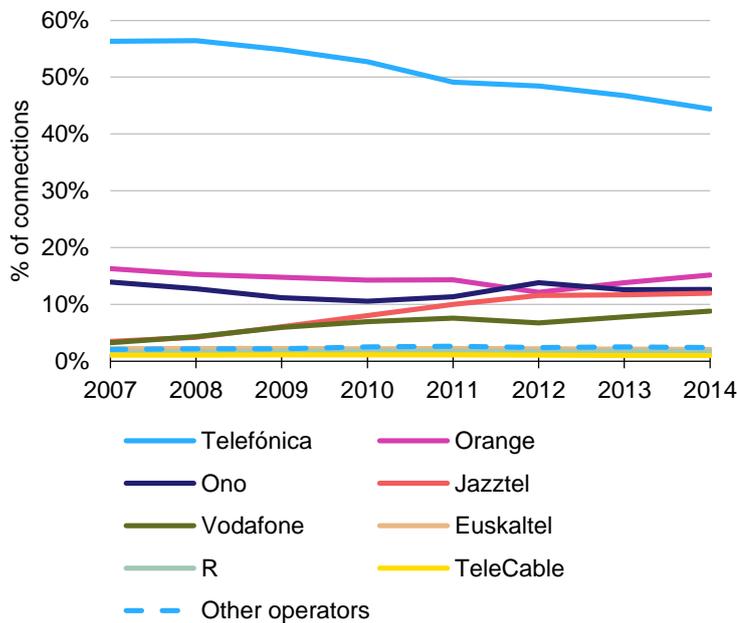
Figure 11.10: Market share of broadband subscriptions [Source: CMNC annual data, CNMC quarterly data][502]

At the end of 2013 there were several mid-sized operators in the Spanish broadband market, including Orange (LLU and FTTH operator), ONO (cable operator, with some DSL), Jazztel (LLU, VDSL and FTTH operator) and Vodafone (LLU, VDSL and FTTH operator), as well as smaller (regional) cable companies (Euskaltel – Basque region, R Cable – Galicia and TeleCable – Asturias), and some smaller operators. Jazztel has seen particularly strong growth since 2007.

The level of competition including continued pressure from the incumbent is evidenced by the recent market consolidation. 2014–15 saw two major mergers, bringing the number of major market players down from five to three. First, Vodafone acquired ONO in March 2014 (approved by the EC on 2 July 2014),[503] and then Orange acquired Jazztel in September 2014 (approved by the EC subject to conditions on 19 May 2015).[504]

Prior to their merger, both Orange and Jazztel had been increasing their market shares in Spain and were perceived by the EC to be important drivers of competition in the market, which might be lost as a result of the consolidation. As such, the EC was concerned by the merger and delayed its decision pending further investigation.[505] In order to address the EC's concerns, Orange made a

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[502] See http://data.cnmc.es/datagraph/jsp/inf_anual.jsp for CNMC annual data. Data has been extended into 2014 using CNMC quarterly data.

[503] See http://europa.eu/rapid/press-release_IP-14-772_en.htm

[504] See http://europa.eu/rapid/press-release_IP-15-4997_en.htm

[505] See http://europa.eu/rapid/press-release_IP-15-3680_en.htm

series of commitments to provide access to its infrastructure, which satisfied the EC and enabled the acquisition to proceed. The commitments were as follows:[506]

- *FTTH*: Orange committed to sell off part of its FTTH network (providing coverage of 700 000–800 000 building units in five of Spain's largest cities) – a similar size to Orange's remaining FTTH network.

- *Copper*: Orange committed to provide the purchaser of the FTTH network with wholesale access to Jazztel's national ADSL network (78% LLU coverage) for up to eight years. Prices for such access would be set at a level to enable the purchaser to compete 'aggressively' in the market.

- *Mobile*: Orange committed to provide an MVNO offer (including 4G) to the purchaser of the FTTH network (if desired) under conditions that are "are at least as favourable as those Orange currently grants to Jazztel".

High levels of competition can partially be attributed to infrastructure-based competition in the FTTH market, enabled by duct and vertical access. However, competition from cable operators also played a key role.

11.4.4 Pricing

The average spend per user on broadband services in Spain has fallen at a CAGR of –6.7% since 2008,[507] reflecting the penetration into lower-value segments. This rather rapid decline can also be attributed to high levels of competition in the Spanish market, as outlined above.
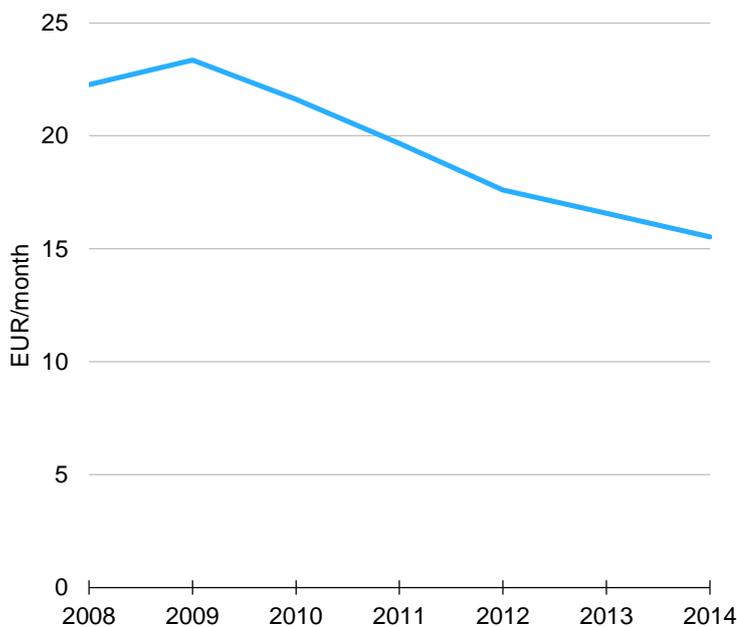
Figure 11.11: Average broadband spend per user per month [Source: Analysys Mason Research core forecasts, 2015]

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[506] See http://europa.eu/rapid/press-release_IP-15-4997_en.htm

[507] Source: Analysys Mason Research, Core Forecasts 2015.

11.4.5 Profitability

Despite its declining market share, Telefónica has achieved both high and stable OIBDA[508] margins since 2008 (indeed they increased between 2006 and 2008, as shown in Figure 11.12 below). The dip in 2011 can be attributed to a one-off large-scale redundancy programme.[509]

Prior to its acquisition by Vodafone, ONO also demonstrated very high EBITDA margins, despite a significant drop in 2013. Vodafone's own margins have been in steady decline since 2008. In comparison, Jazztel achieved rapid growth in its EBITDA margin, in line with growth in its market share, while Orange also succeeded in increasing its EBITDA margin over the period. Nevertheless, Telefónica's margins remain double the levels of these smaller operators.

We note that the competitive dynamics of the mobile market will have had a considerable influence on the margins shown below; however, we do not have access to the data that would be required to disaggregate the fixed and mobile businesses.

There is no clear correlation between the operators' EBITDA margins and the wholesale access remedies imposed.
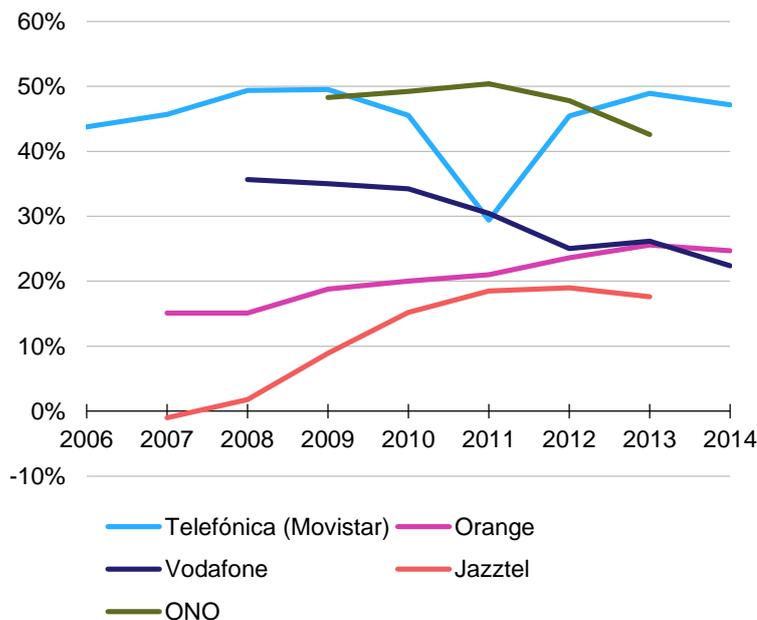
Figure 11.12: EBITDA margins of major operators in Spain [Source: Analysys Mason, 2015]

Note: Margins are for the total Spanish operations (fixed and mobile)

Note: Data for Telefónica shows its OIBDA (rather than EBITDA) margin

11.4.6 Quality of service

In Spain, the focus is on download speeds only. The Spanish Ministry of Industry, Energy and Tourism publishes quarterly monitoring reports on the actual compared to advertised speeds, split between the average, minimum (5th percentile) and maximum (95th percentile). Speed is measured

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[508]   Operating income before depreciation and amortisation.

[509]   See page 33, http://www.telefonica.com/en/about_telefonica/pdf/informes/2011/informe_ia2011_eng.pdf

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by technology for a series of retail broadband plans.[510] Figure 11.13 below shows the measured average download speed of the broadband connection, as a percentage of the nominal advertised speed, for a variety of services and operators.
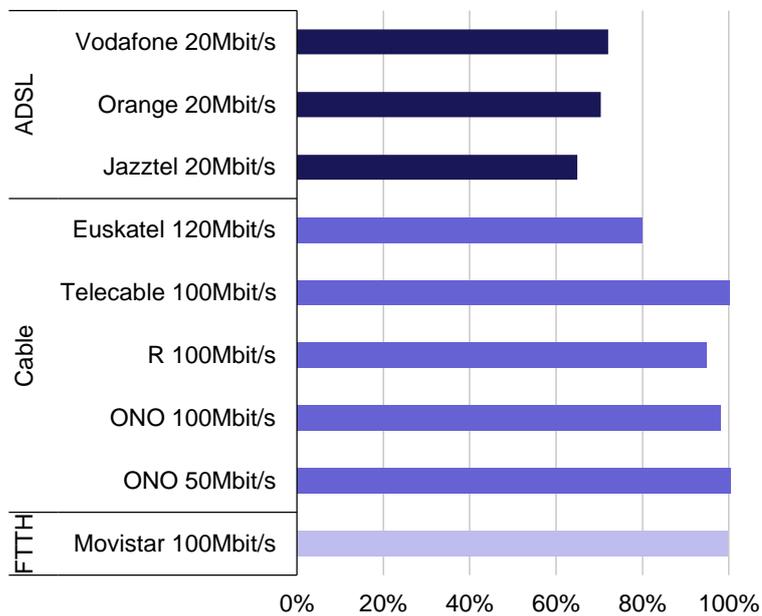
Figure 11.13: Actual download speed as a percentage of advertised download speed for a selection of services (by technology) [Source: Monitoring report, Spanish Ministry of Industry, Energy and Tourism, fourth quarter 2014][511]

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[510] See for example http://www.minetur.gob.es/telecomunicaciones/es-ES/Servicios/CalidadServicio/informes/Documents/Seguimiento_SAI_T4_14.pdf

[511] See http://www.minetur.gob.es/telecomunicaciones/es-ES/Servicios/CalidadServicio/informes/Documents/Seguimiento_SAI_T4_14.pdf

Annex A   Bibliography

This annex provides a list of the documents reviewed and referenced within this report.

Figure A.1: List of documents referenced [Source: Analysys Mason, 2015]

Country	Date	Publishing body	Document title	URL
Belgium	Various	EC (Digital Agenda)	Fast and ultra-fast Internet access – analysis and data	https://ec.europa.eu/digital-agenda/en/pillar-4-fast-and-ultra-fast-internet-access
Belgium	20 June 2011	CIRCABC (EC)	Commission decision concerning Case BE/2011/1227 Commission decision concerning Case BE/2011/1228 Comments pursuant to Article 7(3) of Directive 2002/21/EC	https://circabc.europa.eu/sd/a/e72c7e98-23e8-4328-a61c-e46b42a06a96/BE-2011-1227-1228%20Acte_EN+date%20et%20nr-public.pdf
Belgium	16 October 2014	EC	Telecoms: Commission refers Belgium to Court over independence of national regulator	http://europa.eu/rapid/press-release_IP-14-1145_en.htm
Belgium	8 August 2013	CIRCABC (EC)	Commission Decision concerning Case BE/2013/1485 Comments pursuant to Article 7(3) of Directive 2002/21/EC	https://circabc.europa.eu/d/d/workspace/SpacesStore/5ab26be8-e463-49a7-8a10-363a4d577be0/BE-2013-1485%20Adopted_EN.pdf
Belgium	2010, 2011	BIPT	BIPT annual reports, 2010 and 2011	http://www.bipt.be/public/files/en/20836/BIPT_IBPT_2011_EN.pdf http://www.bipt.be/public/files/en/1136/3648_en_bipt_2010_en.pdf
Belgium	21 December 2010	BIPT	Projet de décision du Conseil de l'IBPT concernant l'analyse du marché radiodiffusion télévisuelle	http://www.bipt.be/fr/operateurs/telecom/marches/radiodiffusion/analyse-de-marche-radiodiffusion-televisuelle-2011/projet-de-decision-du-conseil-de-libpt-concernant-l-analyse-du-marche-radiodiffusion-televisuelle
Belgium	18 July 2011	BIPT	Décision de la conférence des régulateurs du secteur des communications électroniques (CRC) du 1er juillet 2011 concernant l'analyse du marché de la	http://www.bipt.be/fr/operateurs/telecom/marches/radiodiffusion/analyse-de-marche-radiodiffusion-televisuelle-2011/decision-de-la-conference-des-

Country	Date	Publishing body	Document title	URL
			radiodiffusion télévisuelle sur le territoire de la région bilingue de Bruxelles-Capitale	regulateurs-du-secteur-des-communications-electroniques-crc-du-1er-juillet-2011-concernant-lanalyse-du-marche-de-la-radiodiffusion-televisuelle-sur-le-territoire-de-la-region-bilingue-de-bruxelles-capitale
Belgium	18 May 2015	BIPT	Arrêt de la Cour d'Appel de Bruxelles du 13 mai 2015 relatif aux requêtes de Publifin, Brutélé, AIESH, Coditel Brabant et Belgacom demandant l'annulation de quatre décisions de la conférence des régulateurs du secteur des communications électroniques (CRC) du 1er juillet 2011 portant sur l'analyse du marché de la radiodiffusion télévisuelle sur les territoires de la région bilingue de Bruxelles-Capitale, de la région de la langue française, de la région de la langue néerlandaise et de la région	http://www.bipt.be/fr/operateurs/ibpt/litiges/annee-2015/arret-de-la-cour-d-appel-de-bruxelles-du-13-mai-2015-relatif-aux-requetes-de-publifin-brutele-aiesh-coditel-brabant-et-belgacom-demandant-lannulation-de-quatre-decisions-de-la-conference-des-regulateurs-du-secteur-des-communications-electroniques-crc-du-1
Belgium	31 March 2011	BIPT	Avis du Conseil de la concurrence sur le projet de décision de l'IBPT concernant l'analyse du marché de la radiodiffusion télévisuelle	http://www.bipt.be/fr/operateurs/telecom/marches/radiodiffusion/analyse-de-marche-radiodiffusion-televisuelle-2011/avis-du-conseil-de-la-concurrence-sur-le-projet-de-decision-de-l-ibpt-concernant-l-analyse-du-marche-de-la-radiodiffusion-televisuelle
Belgium	20 June 2011	CIRCABC (EC)	Commission decision concerning case BE/2011/1229 Comments pursuant to Article 7(3) of Directive 2002/21/EC	https://circabc.europa.eu/sd/a/bced7f4e-4870-49f3-a1ec-d00bae5d2d50/BE-2011-1229%20Acte_EN+date%20et%20nr-public.pdf
Belgium	6 November 2012	BIPT	La Cour d'appel de Bruxelles rejette la demande de suspension de Brutélé/Tecteo et Numéricable à l'encontre de l'ouverture du câble	http://www.bipt.be/fr/operateurs/press-release/52-la-cour-dappel-de-bruxelles-rejette-la-demande-de-suspension-de-brutele-tecteo-et-numericable-a-lencontre-de-louverture-du-

Country	Date	Publishing body	Document title	URL
				cable
Belgium	None given	CRC	Communication	http://www.bipt.be/public/files/fr/20981/Communication+March%C3%A9+radiodiffusion+t%C3%A9l%C3%A9visuelle.pdf
Belgium	Various	BIPT	Offres de référence câblo-opérateur (series of documents)	http://www.bipt.be/fr/operateurs/telecom/marches/radiodiffusion/offres-de-reference-cablo-operateurs?page=1
Belgium	11 December 2013	CIRCABC (EC)	Décision de la conference des regulateurs du secteur des communications electroniques concernant les tarifs de gros pour les services d'accès aux réseaux cables sur le territoire de la région de langue française	https://circabc.europa.eu/sd/a/b5b79eb4-c11d-471a-a957-2e29227bdda6/BE_2013_1511_FRCSA.pdf
Belgium	7 November 2013	CIRCABC (EC)	Commission Decision concerning Case BE/2013/1511 Comments pursuant to Article 7(3) of Directive 2002/21/EC	https://circabc.europa.eu/sd/a/df55ec84-606e-4e0e-bfe5-3741c07ba46e/BE-2013-1511%20Adopted_EN_fin.pdf
Belgium	21 November 2014	BIPT	Arrêt de la Cour d'Appel de Bruxelles du 12 novembre 2014 relatif à la requête de Telenet demandant l'annulation de la décision de la conférence des régulateurs du secteur des communications électroniques (CRC) du 1 juillet 2011 concernant l'analyse du marché radiodiffusion télévisuelle sur le territoire de la région bilingue de Bruxelles-Capitale	http://www.bipt.be/fr/operateurs/ibpt/litiges/arret-de-la-cour-d-appel-de-bruxelles-du-12-novembre-2014-relatif-a-la-requete-de-telenet-demandant-l-annulation-de-la-decision-de-la-conference-des-regulateurs-du-secteur-des-communications-electroniques-crc-du-1-juillet-2011-concernant-l-analyse-du-marc
Belgium	17 June 2015	BIPT	Projet de décision du conseil de l'IBPT du xx/xx/xxxx concernant la révision des tarifs de gros pour les services d'acces aux réseaux cables sur le territoire de la région bilingue de Bruxelles-Capitale	http://www.bipt.be/public/files/fr/21479/Projet_de_decision_Retail_Minus_Ver_2015-06-17.pdf
Belgium	3 September	CRC	Décision de la conférence des régulateurs du secteur	http://www.bipt.be/public/files/fr/21023/telenet_+FR.pdf

Country	Date	Publishing body	Document title	URL
	2013		des communications électroniques (CRC) du 3 septembre 2013 concernant l'offre de référence de gros de Telenet dans la région bilingue de Bruxelles-Capitale	
Belgium	3 September 2013	CRC	Décision de la conférence des régulateurs du secteur des communications électroniques (CRC) du 3 septembre 2013 concernant l'offre de référence de gros de Coditel dans la région bilingue de Bruxelles-Capitale	http://www.bipt.be/public/files/fr/21022/codite_+FR.pdf
Belgium	3 September 2013	CRC	Décision de la conférence des régulateurs du secteur des communications électroniques (CRC) du 3 septembre 2013 concernant l'offre de référence de gros de Brutélé dans la région bilingue de Bruxelles-Capitale	http://www.bipt.be/public/files/fr/21021/brutele_FR.pdf
Belgium	Various	EC (Digital Agenda)	Fast and ultra-fast Internet access – analysis and data	https://ec.europa.eu/digital-agenda/en/pillar-4-fast-and-ultra-fast-internet-access
France	May 2014	ARCEP	Projet de décision portant sur la définition du marché pertinent de gros des offres d'accès aux infrastructures physiques constitutives de la boucle locale filaire, sur la désignation d'un opérateur exerçant une influence significative sur ce marché et sur les obligations imposées à cet opérateur sur ce marché	http://www.arcep.fr/uploads/tx_gspublication/projdec-adm-4-notif-mai2014.pdf
France	June 2014	ARCEP	Background, key data and main areas of focus	http://www.arcep.fr/uploads/tx_gspublication/supplement-rapport-2013-english-version.pdf
France	4 August 2008	WIPO	LOI no 2008-776 du 4 août 2008 de modernisation de l'économie Journal Officiel de la République Française	http://www.wipo.int/edocs/lexdocs/laws/fr/fr/fr099fr.pdf

Country	Date	Publishing body	Document title	URL
France	18 July 2008	CIRCABC (EC)	Case FR/2008/0780 Case FR/2008/0781 Comments pursuant to Article 7(3) of Directive 2002/21/EC	https://circabc.europa.eu/sd /a/7e7696e1-478b-41e0-9efc-7bff6d77cbdb/FR-2008-0780-0781%20Acte_EN.pdf
France	5 November 2009	CIRCABC (EC)	Case FR/2009/0993 Comments pursuant to Article 7(3) of Directive 2002/21/EC	https://circabc.europa.eu/sd /a/218398fc-6185-4a4a-95e3-b516143cf1f1/FR-2009-0993%20Acte_EN.pdf
France	26 November 2010	CIRCABC (EC)	Commission decision concerning case FR/2010/1144 Comments pursuant to Article 7(3) of Directive 2002/21/EC	https://circabc.europa.eu/sd /a/6ebe5eec-1573-4fd7-8ac8-bd47e645ac85/FR-2010-1144%20Acte(4)_EN+date %20et%20nr.pdf
France	26 May 2011	CIRCABC (EC)	Commission decision concerning Case FR/2011/1213 Commission decision concerning Case FR/2011/1214 Comments pursuant to Article 7(3) of Directive 2002/21/EC	https://circabc.europa.eu/sd /a/ad7ecb2e-8c48-455f-9047-36c990470300/FR-2011-1213-1214%20Acte(5)_EN+date +nr.pdf
France	12 December 2013	CIRCABC (EC)	Commission Decision concerning Case FR/2014/1602 Commission Decision concerning Case FR/2014/1603 Comments pursuant to Article 7(3) of Directive 2002/21/EC	https://circabc.europa.eu/sd /a/0323223f-0a67-47f7-bbff-8bad998a3075/FR-2014-1602-1603%20ADOPTED_EN%2 0-%20PUBLIC.pdf
France	October 2008	ARCEP	Recommendations on the implementation of last drop sharing of the last part on optical fibre networks	http://www.arcep.fr/uploads/ tx_gspublication/recomd-mutual-ftth-1008-eng.pdf http://www.arcep.fr/uploads/ tx_gspublication/etude-topo-mutual-ftth-1008.pdf
France	22 December 2009	ARCEP	Décision n° 2009-1106 de l'Autorité de régulation des communications électroniques et des postes en date du 22 décembre 2009	http://www.arcep.fr/uploads/ tx_gsavis/09-1106.pdf
France	June 2011	ARCEP	Modalités de l'accès aux lignes à très haut débit en fibre optique pour certains immeubles des zones très denses, notamment ceux	http://www.arcep.fr/uploads/ tx_gspublication/20110614-Recommandation-petits-immeubles-ZTD-post-consultation.pdf

Country	Date	Publishing body	Document title	URL
			de moins de 12 logements	
France	21 January 2014	ARCEP	Modalités de l'accès aux lignes à très haut débit en fibre optique pour les immeubles de moins de 12 logements ou locaux à usage professionnel des zones très denses	http://www.arcep.fr/uploads/tx_gspublication/recomd-FttH-immeubles-moins-12-log-ZTD-janv2014.pdf
France	14 December 2010	ARCEP	Electronic Communications and Postal Regulatory Authority Decision No. 2010-1312 of 14 December 2010 specifying the terms and conditions for accessing ultra-fast broadband optical fibre electronic communications lines on the whole territory except very high-density areas	http://www.arcep.fr/fileadmin/reprise/dossiers/fibre/2010-1312-arcep-optical-fibre-decision-en.pdf
France	1 January 2015	Orange	Offre de référence d'accès et de collecte DSL d'Orange (reference offer)	http://www.arcep.fr/index.php?id=2124&L=1&tx_gsactualite_pi1%5Buid%5D=1539&tx_gsactualite_pi1%5BbackID%5D=1&cHash=b77fbe4397b4a7619fe95ce64d23d057
France	February 2014	French government	Plan France Très Haut Débit Dossier de presse (press briefing)	http://www.entreprises.gouv.fr/files/files/directions_services/secteurs-professionnels/economie-numerique/tres-haut-debit/plan-france-tres-haut-debit-dp-2014-02.pdf
France	December 2014	ARCEP	Consultation publique de l'Autorité du 10 décembre 2014 au 20 janvier 2015	http://www.arcep.fr/fileadmin/uploads/tx_gspublication/Decision_operationnelle_FttH_.pdf
France	12 June 2013	EC	Commission Decision concerning Case FR/2014/1602 Commission Decision concerning Case FR/2014/1603 Comments pursuant to Article 7(3) of Directive 2002/21/EC	https://circabc.europa.eu/sd/a/0323223f-0a67-47f7-bbff-8bad998a3075/FR-2014-1602-1603%20ADOPTED_EN%20-%20PUBLIC.pdf
France	30 September 2014	Orange	Offre d'accès en dehors de la zone très dense à la partie terminale des lignes de communications électroniques à très haut	http://www.orange.com/fr/content/download/3468/31507/version/8/file/offre+cablage+FTTH+horsZTD+du+30+sept+2014.pdf

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			débit en fibre optique d'Orange	
France	14 December 2012	SFR	Contrat d'accès aux Lignes FTTH de SFR déployées en dehors des Zones Très Denses	http://groupe.sfr.fr/sites/default/files/contrat-dacces-aux-lignes-ftth-de-sfr-hors-ztd-contrat-v15complete.pdf
France	18 February 2010	Covage	Fibre wholesale offer	http://www.covage.com/uploads/actualites/3696e2d9e7028757921f31ed7e8fe9302deb08a8.pdf
France	May 2015	ARCEP	Mesures de la qualité du service fixe d'accès à l'Internet effectuées au 2nd semestre 2014	http://www.arcep.fr/uploads/tx_gspublication/QoS-internet-semestre2_2014-mai2015.pdf
Netherlands	28 July 2009	ACM	Besluit van de Raad van Bestuur van de Nederlandse Mededingingsautoriteit als bedoeld in artikel 37, eerste lid van de Mededingingswet	https://www.acm.nl/nl/publicaties/publicatie/2356/KPN---Reggefiber/
Netherlands	6 November 2014	ACM	Besluit van de Autoriteit Consument en Markt als bedoeld in artikel 41 van de Mededingingswet	https://www.acm.nl/nl/publicaties/publicatie/13492/KPN-mag-volledige-zeggenschap-in-Reggefiber-krijgen-concentratiebesluit/
Netherlands	26 June 2014	Analysys Mason Research	FTTx roll-out and capex worldwide: forecasts and analysis 2014–2019	http://www.analysysmason.com/Research/Content/Reports/FTTx-worldwide-forecasts-Jun2014-RDTW0/#26%20June%202014
Netherlands	7 June 2012 (Update to original 19 October 1998)	Dutch Ministry of Economic Affairs, Agriculture and Innovation	Act of 19 October 1998, containing rules regarding telecommunication	http://www.government.nl/files/documents-and-publications/notes/2012/06/07/dutch-telecommunications-act/telecommunications-act.pdf
Netherlands	Various	ACM	Besluit marktanalyse ontbundelde toegang op wholesale niveau (Decision analysis unbundled access at wholesale level)	https://www.acm.nl/nl/publicaties/publicatie/9693/Besluit-marktanalyse-ontbundelde-toegang-op-wholesale-niveau/
Netherlands	31 October 2014	ACM	Marktanalyse ontbundelde toegang ontwerpbesluit voor nationale consultatie	https://www.acm.nl/nl/download/publicatie/?id=13466
Netherlands	30 April 2015	CIRCABC (EC)	CASE NL/2015/1727: Opening of Phase II	https://circabc.europa.eu/sd/a/78572bae-5d51-4fee-

Country	Date	Publishing body	Document title	URL
			investigation pursuant to Article 7 of Directive 2002/21/EC as amended by Directive 2009/140/EC	9f94-dbc4290dfc7e/NL-2015-1727%20ADOPTED_EN%20PUBLIC.pdf
Netherlands	31 March 2015	ACM	Marktanalyse ontbundelde toegang ontwerpbesluit voor europese notificatie	https://www.acm.nl/nl/publicaties/publicatie/14110/ACM-biedt-ontwerp-marktanalysebesluit-ontbundelde-toegang-aan-bij-Europese-Commissie/
Netherlands	19 December 2008	OPTA (ACM)	Policy rules: tariff regulation for unbundled fibre access	https://www.acm.nl/en/publications/publication/9713/Policy-rules-tariff-regulation-for-unbundled-fibre-access-/
Netherlands	7 March 2002	EC	Directive 2002/21/EC of the European Parliament and of the Council of 7 March 2002 on a common regulatory framework for electronic communications networks and services (Framework Directive)	http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32002L0021&from=EN
Netherlands	11 July 2002	EC	Commission guidelines on market analysis and the assessment of significant market power under the Community regulatory framework for electronic communications networks and services	http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52002XC0711(02)&from=EN
Netherlands	25 November 2009	EC	Directive 2009/140/EC of the European Parliament and of the Council of 25 November 2009 amending Directives 2002/21/EC on a common regulatory framework for electronic communications networks and services, 2002/19/EC on access to, and interconnection of, electronic communications networks and associated facilities, and 2002/20/EC on the authorisation of electronic communications networks and services	http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32009L0140&from=EN
Netherlands	6 September 2006	OPTA	IS TWO ENOUGH?	https://www.acm.nl/en/download/publication/?id=9102
Netherlands	10 October	EC	Merger Procedure	http://ec.europa.eu/competit

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	2014		Regulation (EC) 139/2004	ion/mergers/cases/decisions/m7000_20141010_20600_4221982_EN.pdf
Netherlands	11 December 2014	RBB Economics	Joint dominance in the Dutch retail market for internet access? A response to ACM's draft market analysis decision on unbundled access	https://www.acm.nl/nl/download/bijlage/?id=12298
Netherlands	11 December 2014	Oxera	A review of ACM's findings of joint significant market power in the retail Internet access market	https://www.acm.nl/nl/download/bijlage/?id=12302
Netherlands	30 January 2015	ACM	Verzoek te reageren op aanpassingen marktanalyse Ontbundelde toegang	https://www.acm.nl/nl/publicaties/publicatie/13797/Verzoek-te-reageren-op-aanpassingen-marktanalyse-Ontbundelde-toegang/
Netherlands	31 Mar 2015	ACM	ACM biedt ontwerp marktanalysebesluit ontbundelde toegang aan bij Europese Commissie	https://www.acm.nl/nl/publicaties/publicatie/14110/ACM-biedt-ontwerp-marktanalysebesluit-ontbundelde-toegang-aan-bij-Europese-Commissie/
Netherlands	28 October 2009	Rechtspraak (Supreme Court)	ECLI: NL: CBB: 2009: BK1315	http://uitspraken.rechtspraak.nl/inziendocument?id=ECLI:NL:CBB:2009:BK1315
Netherlands	9 July 2014	Wik consult (workshop for ACM)	Options of wholesale access to Cable-TV networks with focus on VULA, Workshop for ACM	https://www.acm.nl/nl/download/publicatie/?id=13474
Netherlands	1 February 2010	OPTA	Marktanalyse Breedband Ontbundelde toegang op wholesale-niveau – Ontwerpbesluit	https://www.acm.nl/nl/publicaties/publicatie/9958/Ontwerp-marktanalysebesluit-ontbundelde-toegang/
Netherlands	31 March 2010	CIRCABC (EC)	Commission decision concerning case NL/2010/1052 Comments pursuant to Article 7(3) of Directive 2002/21/EC	https://circabc.europa.eu/sd/a/6dec1ab5-cc8a-4038-bd1c-9a823820190e/NL-2010-1052_ACTE_EN+%20nr%20et%20date.pdf
Netherlands	27 April 2010	OPTA	Marktanalyse Breedband Ontbundelde toegang op wholesale-niveau – Besluit	https://www.acm.nl/nl/publicaties/publicatie/10003/Besluit-marktanalyse-ontbundelde-toegang-op-wholesaleniveau/
Netherlands	3 May 2011	Rechtspraak (Supreme Court)	ECLI:NL:CBB:2011: BQ3135	http://uitspraken.rechtspraak.nl/inziendocument?id=ECLI:NL:CBB:2011:BQ3135

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Netherlands	6 October 2011	OPTA	Marktanalyse Ontbundelde toegang tot zakelijke glasvezelnetwerken – Ontwerpbesluit	https://www.acm.nl/nl/publicaties/publicatie/10272/Ingetrokken-ontwerpbesluit-marktanalyse-ontbundelde-toegang-tot-zakelijke-glasvezelnetwerken-FttO/
Netherlands	14 September 2012	OPTA	Marktanalyse Ontbundelde toegang tot zakelijke glasvezelnetwerken (ODF-access (FttO)) – Ontwerpbesluit	https://www.acm.nl/nl/publicaties/publicatie/10412/Ontwerpbesluit-marktanalyse-ontbundelde-toegang-tot-zakelijke-glasvezelnetwerken-FttO-2012/
Netherlands	25 April 2013	Rechtspraak (Supreme Court)	ECLI:NL:CBB:2013:BZ8522	http://uitspraken.rechtspraak.nl/inziendocument?id=ECLI:NL:CBB:2013:BZ8522
Netherlands	18 December 2013	Rechtspraak (Supreme Court)	ECLI:NL:CBB:2013:274	http://uitspraken.rechtspraak.nl/inziendocument?id=ECLI:NL:CBB:2013:274
Netherlands	21 March 2014, 23 January 2015, 29 May 2015	KPN Wholesale	ODF Access documents (series of documents)	https://www.kpn-wholesale.com/en/our-products/data-networks/physical-access/o/odf-access-(1).aspx
Netherlands	21 December 2011	CIRCABC (EC)	Commission decision concerning Case NL/2011/1278 Comments pursuant to Article 7(3) of Directive 2002/21/EC	https://circabc.europa.eu/d/d/workspace/SpacesStore/5ce2ea44-28bf-4948-b348-a02500cb128c/NL-2011-1278%20Acte_EN%2Bdate%20et%20nr.pdf
Netherlands	Various	KPN Wholesale	MDF Access documents (series of documents)	https://www.kpn-wholesale.com/en/our-products/data-networks/physical-access/m/mdf-sdf-(1).aspx
Netherlands	26 June 2014	Analysys Mason Research	FTTx roll-out and capex worldwide: forecasts and analysis 2014–2019	http://www.analysysmason.com/Research/Content/Reports/FTTx-worldwide-forecasts-Jun2014-RDTW0/#26%20June%202014
New Zealand	5 August 2011	ComCom/ Competition Law and Policy Institute of New Zealand	Regulation of Telecommunications: The lessons learned over the last 25 years and their application in a broadband world	www.comcom.govt.nz/dmsdocument/10988
New Zealand	September 2009	Ministry of Economic Development,	Ultra-Fast Broadband Initiative (Overview of Initiative)	https://www.med.govt.nz/sectors-industries/technology-communication/fast-

Country	Date	Publishing body	Document title	URL
		New Zealand government		broadband/pdf-and-documents-library/ultra-fast-broadband-intiative/Ultra-fast-broadband-initiative-overview.pdf
New Zealand	Various	Crown Fibre Holdings	Agreements with UFB partners (series of documents)	http://www.crownfibre.govt.nz/crown-partners/agreements-with-ufb-partners/
New Zealand	23 August 2011	Chorus	Chorus UFB Services Agreement (Price List)	https://www.chorus.co.nz/file/20066/chorus-ufb-services-agreement-price-list---confirmed.pdf
New Zealand	2011	Northpower Fibre	Northpower Fibre UFB Services Agreement (Price List)	http://www.crownfibre.govt.nz/wp-content/uploads/2011/12/WLFC-Price-List-14-May-2012-.pdf
New Zealand	4 October 2012	Crown Fibre Holdings	Chorus UFB Price Caps	http://www.crownfibre.govt.nz/wp-content/uploads/2013/03/Chorus-Published-UFB-Price-Caps-Document-3-October-2012.pdf
New Zealand	9 September 2011	Telecom Corporation of New Zealand	Network Infrastructure Project Agreement (Telecom Corporation of New Zealand Limited and Crown Fibre Holdings Limited)	http://www.crownfibre.govt.nz/wp-content/uploads/2011/12/Network-Infrastructure-Project-Agreement-NIPA-24-May-2011.pdf
New Zealand	June 2014	Chorus	Chorus UFB Services Agreement Bitstream Services: Service Description for Bitstream 2 Accelerate (Reference Offer)	https://www.chorus.co.nz/file/48702/Bitstream_2_Acelerate_Service_Description-June-2014-Final.pdf
New Zealand	June 2014	Chorus	Chorus UFB Services Agreement Bitstream Services: Service Description for Bitstream 3 Accelerate (Reference Offer)	https://www.chorus.co.nz/file/48703/Bitstream_3_Acelerate_Service_Description-June-2014-Final.pdf
New Zealand	29 April 2015	Analysys Mason Research	Fixed broadband and voice quarterly metrics 4Q 2014	http://www.analysysmason.com/Research/Content/Data-set/Fixed_BB_and_voice_quarterly_metrics_RDMB0/#29%20April%202015
New Zealand	2014	Spark	Spark New Zealand, Annual report 2014	http://investors.sparknz.co.nz/FormBuilder/_Resource/_module/gXbeer80tkeL4nEaF-

Country	Date	Publishing body	Document title	URL
				kwFA/file/TEL1854_Spark_ Annual_Report_Interactive- v2.pdf
Portugal	January 2009	ANACOM	Mercados de fornecimento grossista de acesso (físico) à infra-estrutura de rede num local fixo e de fornecimento grossista de acesso em banda larga	http://www.anacom.pt/strea ming/analise_mercados4_5 .pdf?contentId=812401&fiel d=ATTACHED_FILE
Portugal	17 December 2007	EC	Commission Recommendation of 17 December 2007 on relevant product and service markets within the electronic communications sector susceptible to ex ante regulation in accordance with Directive 2002/21/EC of the European Parliament and of the Council on a common regulatory framework for electronic communications networks and services	http://eur- lex.europa.eu/LexUriServ/Le xUriServ.do?uri=OJ:L:2007:3 44:0065:0069:en:PDF
Portugal	Various	MEO Wholesale	Reference Offers (series of documents)	http://ptwholesale.telecom.p t/GSW/UK/Canais/Produtos Servicos/OfertasReferencia /
Portugal	10 February 2004	WIPO	Assembleia da república	http://www.wipo.int/edocs/le xdocs/laws/pt/pt/pt063pt.pdf
Portugal	20 September 2010	EC	Commission Recommendation of 20 September 2010 on regulated access to Next Generation Access Networks (NGA)	http://eur- lex.europa.eu/legal- content/EN/TXT/?uri=CELE X:32010H0572
Portugal	15 February 2012	ANACOM	Mercados grossistas de acesso à infraestrutura de rede num local fixo e de acesso em banda larga	http://www.anacom.pt/strea ming/mercados4_5_consult a_15022012.pdf?contentId =1116435&field=ATTACHE D_FILE
Portugal	22 December 2014	ANACOM	Mercado de acesso de elevada qualidade grossista num local fixo	http://www.anacom.pt/stream ing/Mercado4_consulta22de z2014.pdf?contentId=134245 6&field=ATTACHED_FILE
Portugal	October 2010	ANACOM	Mercado retalhista e mercados grossistas dos segmentos terminais e de trânsito de circuitos alugados	http://www.anacom.pt/strea ming/deliberacao28set2010 _decisao_final.pdf?contentI d=1052143&field=ATTACH ED_FILE

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Portugal	Various	EC (Digital Agenda)	Fast and ultra-fast Internet access – analysis and data	https://ec.europa.eu/digital-agenda/en/pillar-4-fast-and-ultra-fast-internet-access
Singapore	2010	IDA	Realising the iN2015 Vision	https://www.ida.gov.sg/~/media/Files/Infocomm%20Landscape/iN2015/Reports/realisingthevisionin2015.pdf
Singapore	2010	IDA	Design Philosophy of Next Gen NBN Technical Infrastructure	http://www.ida.gov.sg/images/content/Infrastructure/nbn/images/pdf/02_IDA_NGBN.pdf
Singapore	26 September 2008	IDA	Media Briefing – Award for Next Generation NBN Network Company (NetCo) RFP	https://www.egov.gov.sg/c/document_library/get_file?uuid=c497aea4-701f-4399-bb77-0de6920c9599&groupId=10157
Singapore	11 December 2008	IDA	Opening Remarks by Dr Lee Boon Yang, Minister for Information, Communications and the Arts at the Media Briefing for the Launch of Next Generation National Broadband Network Request-For-Proposal	https://www.ida.gov.sg/About%20Us/Newsroom/Speeches/2007/20071211191648.aspx
Singapore	7 April 2008	eGov Singapore	IDA, press release on the opening of the OpCo RFP process	http://www.egov.gov.sg/media-room/media-releases/2008/ida-launches-rfp-for-an-opco-to-design-build-and-operate-the-active-infrastructure-of-singapore-s-next-gen-nbn
Singapore	26 September 2008	IDA	Press release on the award of the NetCo	https://www.ida.gov.sg/About-Us/Newsroom/Media-Releases/2008/20080926174755
Singapore	26 June 2014	Analysys Mason	FTTx roll-out and capex worldwide: forecasts and analysis 2014–2019	http://www.analysysmason.com/Research/Content/Reports/FTTx-worldwide-forecasts-Jun2014-RDTW0/#26%20June%202014
Singapore	Set of documents published between 13 June 2014 and 3 February 2015	IDA	Review of NetLink Trust's Interconnection Offer (series of documents)	http://www.ida.gov.sg/policies-and-regulations/consultation-papers-and-decisions/pending-decisions/Review-of-OpenNet-Pte-Ltds-Interconnection-Offer http://www.netlinktrust.com/

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				services/interconnection-access-agreements/ico-agreement/
Singapore	1 October 2014	NetLink Trust	Schedule 15 Charges	http://www.netlinktrust.com/wp-content/uploads/2009/04/Sch-15-Charges-1-Oct-20141.pdf
Singapore	7 March 2013	IDA	Nucleus Connect's Interconnection Offer (series of documents)	http://www.ida.gov.sg/Policies-and-Regulations/Industry-and-Licensees/Nationwide-Broadband-Network/Nucleus-Connects-Interconnection-Offer
Singapore	Before 2013	IDA	QoS standards on the NetLink Trust's provisioning of residential end-user connection service	http://www.ida.gov.sg/~/media/Files/PCDG/Licensees/StandardsQoS/QualityofService/QoSFramework_NLTServiceTimeframe.pdf
Singapore	July 2013	IDA	Fact Sheet – Next Generation Nationwide Broadband Network	https://www.ida.gov.sg/~/media/Files/Infocomm%20Landscape/Infrastructure/Wired/NextGenNBNFACTSHEET.pdf
Singapore	8 January 2015	Analysys Mason Research	Developed Asia–Pacific telecoms market: interim forecast update 2014–2019, December 2014	http://www.analysysmason.com/Research/Content/Regional-forecasts-/DVAP-interim-forecast-Jan2015-RDRP0-RDDG0/#08%20January%202015
Spain	13 November 2008	CIRCABC (EC)	Cases ES/2008/0804 and ES/2008/0805 Article 7(3) of Directive 2002/21/EC Article 7(4) of Directive 2002/21/EC	https://circabc.europa.eu/sd/a/451c0cba-a898-4f0b-8765-deb397d376a9/ES-2008-0804-0805%20acte_EN%20(0).pdf
Spain	30 July 2010	CIRCABC (EC)	Commission decision concerning Case ES/2010/1097 Article 7(3) of Directive 2002/21/EC	https://circabc.europa.eu/sd/a/88050166-e165-4410-8d38-3b7f6a386070/ES-2010-1097%20Acte(2)_EN+date%20et%20nr.pdf
Spain	February 2013	Ministry of Industry, Energy and Tourism	Digital Agenda for Spain	http://www.agendadigital.gob.es/digital-agenda/Documents/digital-agenda-for-spain.pdf
Spain	June 2013	Spanish government	Plan de telecomunicaciones y redes ultrarrápidas	http://www.agendadigital.gob.es/planes-actuaciones/Bibliotecatelecomunicaciones/1.%20Plan/

Country	Date	Publishing body	Document title	URL
				Plan-ADpE-1_Redes-Ultrarrapidas.pdf
Spain	10 May 2014	BOE	Boletín oficial del estado Ley 9/2014, de 9 de mayo, de Telecomunicaciones	https://www.boe.es/boe/dias/2014/05/10/pdfs/BOE-A-2014-4950.pdf
Spain	2014	CNMC	Consulta pública relativa a la definición y análisis del mercado de acceso local al por mayor facilitado en una ubicación fija y los mercados de acceso de banda ancha al por mayor, la designación de operadores con poder significativo de Mercado y la imposición de obligaciones específicas	http://www.cnmc.es/Portals/0/Ficheros/Telecomunicaciones/Consultas_Publicas/Consulta_cnmc/20141219_ProyectoMedida.pdf
Spain	2014	CNMC	Resolución por la que se revisan los precios de los servicios mayoristas de banda ancha Gigadsl, ADSL-IP y NEBA	http://telecos.cnmc.es/documents/10138/2026312/20140130_DT2011_739.pdf/747aab52-2235-4b36-95b3-75af4aa722dc
Spain	2015	CNMC	Consulta pública sobre la revisión del precio de la capacidad en pai del servicio de banda ancha mayorista NEBA (MTZ 2014/1840)	http://telecos.cnmc.es/documents/10138/2696978/20150330_Consulta_publica_MTZ_2014-1840_Precio_capacidad_NEBA_VP.pdf/7eb81ec0-f0a0-4e98-9ca9-2fc39f01c373
Spain	July 2013	CNMC	Pre-consulta elaborada por los Servicios de la Comisión del Mercado de Telecomunicaciones sobre la evolución de los servicios de banda ancha en España y la adecuación de la regulación vigente	http://telecos.cnmc.es/c/document_library/get_file?uuid=f96a062f-8551-4e68-a03a-d904e96bd7b5&groupId=10138; press release: http://telecos.cnmc.es/c/document_library/get_file?uuid=b185dce4-b0fe-43b7-922d-c59b9fde250e&groupId=10138
Spain	2010	CNMC	Resolución de 19 de noviembre de 2009 sobre el análisis de la oferta de acceso a conductos y registros de Telefónica y su adecuación a los requisitos establecidos por la Comisión del Mercado de las Telecomunicaciones (MTZ 2009/1223)	http://telecos.cnmc.es:8080/c/document_library/get_file?uuid=4245d32a-72a2-4e9b-9969-633d35816c78&groupId=10138

Country	Date	Publishing body	Document title	URL
Spain	1 April 2011	CIRCABC (EC)	Commission decision concerning Case ES/2011/1192 Commission decision concerning Case ES/2011/1193 Commission decision concerning Case ES/2011/1194 Article 7(3) of Directive 2002/21/EC	https://circabc.europa.eu/sd/a/5470f552-9dbd-46e7-933f-06c16022c8ea/ES-2011-1192-1193-1194%20Acte(4)_EN+date%20et%20nr.pdf
Spain	2011	CIRCABC/Commission of the Telecommunications Market	Resolución sobre la revisión de precios de las ofertas de referencia sobre la base de los resultados del ejercicio 2008 de la contabilidad de costes de Telefónica de España, S.A.U. (DT 2010/1275)	https://circabc.europa.eu/sd/a/92b1e646-cf01-402c-ba06-89465541e3f3/PUBLIC.pdf
Spain	June 2014	CNMC	Resolución sobre el conflicto interpuesto por spain France Telecom España, S.A.U. y Vodafone España, S.A.U. contra Telefónica de España, S.A.U. en relación con el acceso a las infraestructuras verticales	http://cnmc.es/Portals/0/Ficheros/Telecomunicaciones/Resoluciones/140618_Resoluci%C3%B3n_DTSA-692-13-Verticales-%20vPUBLICA_.pdf
Spain	February 2014	Telefónica	Oferta de referencia del nuevo servicio ethernet de banda ancha (NEBA)	http://telecos.cnmc.es/documents/10138/2026311/201402_Texto_consolidado_NEBA_feb2014.pdf/9131e7f8-07b7-4e83-aa27-f5f275837808
Spain	26 June 2014	Analysys Mason Research	FTTx roll-out and capex worldwide: forecasts and analysis 2014–2019	http://www.analysysmason.com/Research/Content/Reports/FTTx-worldwide-forecasts-Jun2014-RDTW0/#26%20June%202014
Spain	11 December 2014	Analysys Mason Research	Western Europe telecoms market: interim forecast update (16 countries) 2014–2019	http://www.analysysmason.com/Research/Content/Regional-forecasts-/WE-interim-forecast-16-countries-Dec2014-RDDF0/#11%20December%202014
Spain	2011	Telefónica	2011 annual report	http://www.telefonica.com/en/about_telefonica/pdf/informes/2011/informe_ia2011_eng.pdf

Country	Date	Publishing body	Document title	URL
Spain	13 March 2015	Ministry of Industry, Energy and Tourism	Parámetros específicos para el servicio de acceso a internet: Velocidad de transmisión de datos conseguida	http://www.minetur.gob.es/telecomunicaciones/es-ES/Servicios/CalidadServicio/informes/Documents/Seguimiento_SAI_T4_14.pdf