Report for ECTA – European Competitive Telecommunications Association

The digital single market and telecoms regulation going forward

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Abbreviations used

The acronyms and abbreviations that are used in this report are explained below.

<table>
<thead>
<tr>
<th>Term</th>
<th>Meaning</th>
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<tbody>
<tr>
<td>(A)DSL</td>
<td>(Asymmetric) digital subscriber line – broadband technology that allows data transmission over copper telephone wiring</td>
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<tr>
<td>ARPU</td>
<td>Average revenue per user – the average amount of revenue a company obtains from a customer using its service</td>
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<td>BEREC</td>
<td>Body of European Regulators of Electronic Communications</td>
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<td>Bitstream</td>
<td>A wholesale product which allows access to an access provider’s broadband network (including the electronics), often using ‘interconnection’ at a higher hierarchical level than the local exchange</td>
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<tr>
<td>Capex</td>
<td>Capital expenditure – expenditure incurred by a company to acquire or to upgrade tangible or intangible assets</td>
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<td>CC</td>
<td>Connected Continent – legislative proposal by the European Commission in 2013</td>
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<td>DAE</td>
<td>Digital Agenda for Europe – one of the seven pillars for the European Commission’s Europe 2020 strategy</td>
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<tr>
<td>DG</td>
<td>Directorate General – a department of the European Commission</td>
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<tr>
<td>DOCSIS 3.0</td>
<td>Data over cable service interface specification version 3 – a standard for transmission of high-bandwidth downstream and upstream data transfer over cable infrastructure (usually hybrid fibre/coaxial)</td>
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<tr>
<td>DSL</td>
<td>Digital subscriber line – a family of technologies used to provide broadband services over copper connections</td>
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<tr>
<td>DSLAM</td>
<td>Digital subscriber line access multiplexer – electronics supporting DSL protocols at the local exchange</td>
</tr>
<tr>
<td>Dual-play</td>
<td>A bundle of two services – in this report the term is used to refer to broadband and fixed voice</td>
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<tr>
<td>EC</td>
<td>European Commission</td>
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<tr>
<td>ERT</td>
<td>Economic replicability test – test introduced by the EC in the 2013 EC Recommendation on non-discrimination and costing methodologies for NGA. The test is based on pre-existing margin squeeze principles but takes a specific approach on some key aspects. It is specific to NGA broadband and focuses only on ‘flagship products’.</td>
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<tr>
<td>EU</td>
<td>European Union</td>
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<tr>
<td>Fast broadband</td>
<td>Internet access through technologies that allow downstream bandwidths of at least 30Mbit/s; definitions of the threshold for fast broadband may vary across countries.</td>
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<tr>
<td>FTTx</td>
<td>Fibre to the x – network architecture which relies on fibre rolled out in the access network (to a greater or lesser extent)</td>
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<tr>
<td>FTTB</td>
<td>Fibre to the building – fibre connects the local exchange to the building basement and copper connects the basement to the customer’s premises</td>
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<tr>
<td>FTTC</td>
<td>Fibre to the cabinet – fibre connects the local exchange to a street cabinet and copper connects the cabinet to the customer’s premises</td>
</tr>
<tr>
<td>FTTH</td>
<td>Fibre to the home – fibre connects the local exchange to the customer’s premises</td>
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<tr>
<td>FTTP</td>
<td>Fibre to the premises – the term is used to denote FTTH and FTTB</td>
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<tr>
<td>Term</td>
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<tr>
<td>FWA</td>
<td>Fixed wireless access – provision of a fixed service using wireless (often mobile) technologies</td>
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<tr>
<td>GPON</td>
<td>Gigabit passive optical network – a specific type of PON</td>
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<tr>
<td>HFC</td>
<td>Hybrid fibre-coaxial – infrastructure that combines optical fibre and coaxial cable, commonly employed by cable-TV operators</td>
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<tr>
<td>HH</td>
<td>Households</td>
</tr>
<tr>
<td>IoT</td>
<td>The Internet of Things – the set of all Internet-connected items (e.g. “smart” TVs, utility meters, home automation, white goods, cars)</td>
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<td>IPTV</td>
<td>Internet Protocol television – TV services delivered over IP-based networks</td>
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<tr>
<td>LAN</td>
<td>Local area network – a computer network serving a relatively small area (e.g. within a building)</td>
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<tr>
<td>LE</td>
<td>Local exchange – a building in the local area which serves as a suitable point of presence for network infrastructure such as an MDF</td>
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<td>LLU</td>
<td>Local loop unbundling – the wholesale use of the incumbent’s physical network infrastructure from the local exchange to the customer's premises</td>
</tr>
<tr>
<td>MDF</td>
<td>Main distribution frame – equipment in the local exchange which allows the connection of the copper cables leading to end user premises to active equipment (e.g. voice switches and DSLAMS)</td>
</tr>
<tr>
<td>NGA</td>
<td>Next-generation access – any access technology that allows the delivery of fast or ultrafast broadband access services (e.g. FTTH P2P, FTTH GPON, VDSL2, DOCSIS 3.0)</td>
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<tr>
<td>NRA</td>
<td>National regulatory authority</td>
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<tr>
<td>ODF</td>
<td>Optical distribution frame – has the same function as an MDF, for fibre-optic cables only</td>
</tr>
<tr>
<td>OTT</td>
<td>Over the top – delivery of a service (such as video distribution or telephony) over the Internet without involving the end user’s ISP in the control of the service</td>
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<tr>
<td>P2P</td>
<td>Point to point – a type of FTTH architecture where each customer premises is connected by a dedicated fibre from the local exchange</td>
</tr>
<tr>
<td>PON</td>
<td>Passive optical network – a type of FTTH architecture where multiple users are served by the same fibre closer to the central electronics, which is split across users by means of a passive splitter (closer to the customer)</td>
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<tr>
<td>PSTN</td>
<td>Public switched telephone network – a system for carrying voice calls over legacy networks, typically using an analogue signal over copper lines in the access network</td>
</tr>
<tr>
<td>PVR</td>
<td>Personal video recorder – a digital video recorder allowing time-shifted viewing of digital TV content</td>
</tr>
<tr>
<td>SLU</td>
<td>Sub-loop unbundling – wholesale use of the incumbent’s network infrastructure from the street cabinet (or equivalent concentration point) to the customer's premises</td>
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<tr>
<td>SMP</td>
<td>Significant market power – concept defined in Art 14.2 of the Framework Directive 2002/21/EC as amended by 2009/140/EC: an undertaking is considered to have significant market power if, either individually or jointly with others, it enjoys a position equivalent to dominance: that is to say, a position of economic strength affording it the power to behave to an appreciable extent independently of competitors, customers and ultimately consumers</td>
</tr>
<tr>
<td>Triple-play</td>
<td>A bundle of three services – in this report the term is used to refer to broadband, fixed voice and TV services</td>
</tr>
<tr>
<td>UFB</td>
<td>Ultra Fast Broadband – a specific programme launched in New Zealand for FTTH roll-out</td>
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<tr>
<td>Term</td>
<td>Meaning</td>
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<td>--------------------</td>
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<tr>
<td>Ultrafast broadband</td>
<td>Internet access through technologies that allow downstream bandwidths of at least 100Mbit/s; definitions of the threshold for ultrafast broadband may vary across countries</td>
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<tr>
<td>VDSL</td>
<td>Very-high-speed digital subscriber line – a fast broadband technology that allows data transmission over shorter copper lines at higher speeds than ADSL, by operating a wider set of frequencies</td>
</tr>
<tr>
<td>VoIP</td>
<td>Voice over Internet Protocol – a system for carrying voice calls over IP networks</td>
</tr>
<tr>
<td>VULA</td>
<td>Virtual unbundling local access – a wholesale product that provides access to an NGA network. VULA provides a virtual connection that gives access seekers a direct link to their customers with a high degree of flexibility over how this link is integrated into their network and a high degree of control over product offerings compared to conventional “bitstream” products</td>
</tr>
<tr>
<td>WBA</td>
<td>Wholesale broadband (or bitstream) access</td>
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1 Executive summary

The European Commission (EC) has announced an initiative to evaluate and review the regulatory framework for electronic communications networks and services and has opened a public consultation. In this context, the European Competitive Telecommunications Association (ECTA) has commissioned Analysys Mason to evaluate the performance of the current European Union (EU) regulatory framework for electronic communications specifically with respect to broadband markets, including next-generation access (NGA). The purpose of this report is to:

- evaluate the development and performance of the European broadband markets, including NGA, under the current regulatory framework
- compare the performance of the European broadband markets to the regulatory regimes in four other countries which are often used as examples of best practice in broadband coverage, take-up and regulation – the USA, Japan, New Zealand and Singapore
- analyse the connection between future investment and competition in NGA, and the impact that regulation can have on this
- attempt to identify whether the regulatory framework for Europe’s broadband markets needs to be dramatically changed, or whether a refinement of the current framework is more appropriate.

The European regulatory framework has focused, inter alia, on creating a competitive environment by imposing a series of obligations on operators with significant market power in markets considered susceptible to ex-ante regulation

A main focus of the European regulatory framework for electronic communications has been on creating a competitive environment by, among other things, requiring national regulatory authorities (NRAs) to impose ex-ante remedies on operators that are found to have significant market power (SMP). These remedies typically allow competitors wholesale access to those parts of the network that represent technical and economic bottlenecks. This has created a situation where alternative operators compete with dominant operators in a variety of ways, sometimes using their own end-to-end networks and sometimes relying on passive or active wholesale access to the access networks of dominant operators.

The European regulatory framework has developed over time, and the number of markets designated by the EC as susceptible to ex-ante regulation has been reduced; from 18 in 2002, to 7 in 2007 and then to 4 in 2014. NRAs can identify additional markets through application of the so-
called “three-criteria test” contained in Article 2 of the EC Recommendation of 9 October 2014 on Relevant Markets Susceptible to Ex-Ante Regulation, which requires:

- high and non-transitory structural, legal or regulatory barriers to entry
- that the market structure does not tend towards effective competition within the relevant time horizon, having regard to the state of infrastructure-based and other competition behind the barrier to entry
- that competition law alone is insufficient to adequately address the identified market failure(s).

In 2010, the EC launched the Digital Agenda for Europe (DAE), which set targets for coverage and take-up of fast and ultrafast broadband services. In May 2015, the EC announced its Digital Single Market Strategy for Europe (DSM). The strategy is built on three pillars:

- better access for consumers and businesses to digital goods and services across Europe
- creation of the right conditions for digital networks and services to flourish
- maximisation of the growth potential of the European Digital Economy.

A number of developments have taken place during 2015 at the EC/EU level, including:

- political agreement between the European Parliament and the Council on an amended version of the Connected Continent (CC) legislative proposal
- an announcement that the regulatory framework for electronic communications networks and services would be evaluated and reviewed (‘pending 2016 Review’).

Both the DSM and the announcement of the pending 2016 Review highlight a need for encouraging investments in NGA networks and question whether changes to the regulatory framework are needed in order to meet this goal.

_The electronic communications regulatory framework in the EU has been successful in achieving increased take-up of broadband services, innovation and lower prices and has also seen an increase in NGA deployment and take-up, with alternative operators playing a key role._

We have reviewed the performance of the European broadband markets under the current regulatory framework and have reached a number of key findings:

- **The current regulatory framework has led to increasing competition**, visible through e.g.:
  - lower prices
  - the launch of **innovative services** such as IPTV, VoIP, cloud storage, unified communications and modern customer premises equipment (CPE).

- **Competition has in turn led to an increase in broadband penetration and revenues**, with benefits shared between end users – who have gained access to (better) broadband products at

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3 Source: http://ec.europa.eu/priorities/digital-single-market/
lower prices – and operators, through an increase in revenues which has allowed re-investment in network developments.

- The **coverage of NGA networks has increased significantly** under the current pro-competitive framework. Total NGA coverage (including cable, FTTH/B and FTTC) reached 68% of households at the end of 2014, up from 48% in 2010. Investment in FTTx networks has been increasing since 2011 which further demonstrates the success of the framework.

- **Alternative operators** have played a key role in the deployment of new networks (especially FTTH), often being early adopters of new NGA technologies; incumbents have often responded to such moves (from both cable and alternative operators) rather than moving first.

- Take-up of fast and ultra-fast broadband products remains limited and is slowly increasing as networks become available and end users are attracted to the services offered over them.

- **Alternative operators are taking a leading role in the diffusion of fast and ultra-fast broadband services**, e.g. by:
  - setting lower prices than incumbents for similar NGA bundles
  - more aggressively promoting higher speeds and offering more services in their bundles than incumbents

In our view, these benefits of vigorous competition (driving lower prices and incentivising take-up of higher speed offers) are essential for achieving high levels of adoption (e.g. meeting the EC’s 50% take-up target for 100Mbit/s).

_NRAs have used different remedies in different EU Member States but this does not seem to have deterred NGA network deployment_

Across the EU there are substantial differences in market structure and in the way regulation has been implemented. We have therefore looked in more detail at five countries: Italy, France, Germany, the Netherlands and Portugal. From these case studies, we have drawn a number of conclusions:

- All examined countries demonstrate that **access regulation has not hindered investments in NGA by the incumbents**.

- **Effective NGA wholesale inputs facilitate investment by alternative operators.** This can take the form of sub-loop unbundling (SLU) (Italy and Germany), in-building wiring (Portugal and France) or effective duct access (Portugal and France (the latter partly through its co-investment programme)). In many cases (e.g. Italy, Portugal, France, the Netherlands,  

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4 Throughout this report ‘alternative operators’ is used to refer to operators other than incumbents and cable operators (which typically exclusively use their own networks). Alternative operators typically access users through (regulated wholesale access to) to the incumbent’s access network and/or their own FTTx networks or a combination of the two.
Germany), alternative and/or cable operators have been the first to invest in NGA networks; incumbents have then responded with their own investment plans.

- Care should be taken when drawing conclusions about the benefits of deregulation and/or forbearance from regulation of NGA wholesale access: Portugal is often cited as a potential example of how deregulation and/or regulatory forbearance leads to NGA investment, but it appears that other factors have played an important role, particularly:
  - the existence of a **high-quality and capillary duct network** that can be re-used for the deployment of FTTx, thus reducing the amount of civil works required (which is one of the main cost drivers for the deployment of NGA networks) and other **country-specific characteristics** (e.g. concentrated population and low labour costs) that lower the deployment costs
  - fit-for-purpose cost-oriented regulated access to this duct network (as well as e.g. in-building wiring access regulation), ensuring that alternative operators can deploy their own networks.

- **Alternative operators play an important role in the commercialisation and adoption of NGA products** (in terms of design of suitable offers and marketing of those offers), driving the affordability of high-speed Internet and thereby leading to increased take-up. This impact is both direct (they attract subscribers through attractive retail offers) and indirect (incumbents will react to the retail offers of alternative operators by launching their own more-attractive offers).

- Appropriately designed co-investment plans which take account of national circumstances can be an effective tool for combining competition and NGA investments, by reducing the deployment costs for operators.

Some non-EU jurisdictions have higher NGA coverage and take-up than the EU, but in our view an absence or reduction of ex-ante regulation is not a main driver of these differences

In order to evaluate the potential impact of changes in the regulatory framework, we have also looked at four non-EU countries which have taken different regulatory approaches to fixed broadband access – the USA, Japan, New Zealand and Singapore. We have compared the performance of their broadband markets (including NGA) based on a number of key indicators, and find that:

- There are multiple cases outside Europe where NGA networks are subject to ex-ante regulation. For example, this is the situation in countries with high broadband coverage and penetration such as Japan and Singapore, but also in New Zealand which previously adopted a regulatory approach based mainly on competition law and then moved towards ex-ante regulation due to dissatisfaction with the outcomes of this largely ex-post approach.
• The countries with the most ubiquitous NGA networks (Singapore and Japan) have reached this point only through extensive use of public funds. New Zealand is also following this route.

• The USA, which has a regulatory regime with limited access regulation
  
  – Performs worse than the EU on take-up of connections with speeds of at least 100Mbit/s and on affordability.

  – Has a lower rate of deployment of FTTx networks than the EU

  – Is leading Europe (in aggregate) on a number of measures, including broadband penetration, NGA network coverage (mostly from NGA cable, see e.g. Figure 1.1) and take-up of connections with at least 30Mbit/s. The better performance of the USA compared to Europe (in aggregate) on these measures is mainly attributable to the large legacy cable footprint. These cable networks were built before broadband development and were subsequently upgraded to be able to provide NGA services and are, as such, not the result of de-regulation.

  – If the USA is compared to Single European countries, the latter, however, perform better than the USA also on broadband penetration: 17 of the top 20 countries in the world are European whereas the USA is ranked 24th.\(^5\)

• The USA lags behind the other jurisdictions examined in this report that do have ex-ante regulation (Japan, New Zealand and Singapore) on broadband penetration and NGA coverage (see e.g. Figure 1.1). It also lags behind Japan and Singapore on take-up of NGA services. This makes it difficult to sustain the position that it is the lack of ex-ante regulation of fibre networks that has enabled the USA’s performance.

*Figure 1.1: Current NGA household coverage by technology [Source: Analysys Mason based on Analysys Mason Research data, NTIA and operators’ press releases, 2015]*

<table>
<thead>
<tr>
<th>Geography</th>
<th>VDSL</th>
<th>FTTB/H</th>
<th>NGA cable</th>
</tr>
</thead>
<tbody>
<tr>
<td>EU</td>
<td>38%</td>
<td>19%</td>
<td>47%</td>
</tr>
<tr>
<td>USA</td>
<td>37%</td>
<td>17%</td>
<td>83%(^6)</td>
</tr>
<tr>
<td>Japan</td>
<td>-</td>
<td>96%</td>
<td>58%</td>
</tr>
<tr>
<td>Singapore</td>
<td>-</td>
<td>100%</td>
<td>99%</td>
</tr>
<tr>
<td>New Zealand</td>
<td>80%</td>
<td>29%</td>
<td>~14%</td>
</tr>
</tbody>
</table>

Note: In New Zealand the FTTH network is being deployed largely in parallel with an existing VDSL network, and so the technologies overlap. In the USA and the EU, the overlap between VDSL and FTTH is relatively small.


\(^6\) Refers to coverage of cable with speeds of more than 25Mbit/s.
Ex-ante regulation does not appear to deter NGA network deployment, and a continued focus on promoting competition is likely to be key for driving take-up of fast broadband services

Overall we have not found any evidence that the current competition-focused regulatory framework in the EU has deterred NGA investments:

- NGA coverage today stands at 68% of households, up from 48% in 2010
- FTTx coverage is at 47% of households, up from 23% in 2010.
- There are numerous currently ongoing and committed fibre deployments across Europe leading to an estimated NGA coverage in Western Europe by 2020 of around 80%.

Competition has been a significant trigger for NGA investments and for stimulating take-up of new and innovative products, including fast broadband services. Such competition is coming from both cable operators and alternative operators using their own networks and/or various regulated access products.

The basic conditions for ex-ante regulation are likely to continue to be fulfilled for NGA products too, and this is likely to remain the case for the foreseeable future, as:

- NGA networks are characterised by high and non-transitory barriers to entry associated with the high costs of civil works, including ducts and poles. There are significant local economies of scale (or “economies of density”): the unit cost per connected household is highly dependent on the local penetration of connected subscribers. Furthermore, costs are sunk once investments are made, which means that new entrants will have difficulty in competing with existing players (which can take pricing decisions at marginal cost). This makes network duplication difficult, especially in the absence of ex-ante regulation of bottleneck resources such as ducts and in-building wiring. The high costs of deployment and significant economies of density also mean that operators active in the same product market but in other geographical areas are unable to easily expand their output into other geographies (as this would require deployment of an NGA network into that area).
- The broadband market (including NGA) does not appear to be tending towards effective competition. Dominant operators continue to have high wholesale market shares (73% in aggregate across the EU) and hold higher retail market shares for VDSL and FTTH than for DSL. If NGA networks are not subject to effective ex-ante regulation there is therefore a risk of reduced competition in the future, especially as the importance of legacy copper networks – which currently exercise some competitive constraints – decreases. There is a risk that unless

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8 This refers to the share of retail broadband connections that are supplied over the networks of incumbent operators.
The regulation of NGA is well adapted to the local market situation as it develops, over time the NGA transition could undo the significant gains that have been brought by the level of competition provided by the current regulatory regime.

- **Competition law alone is unlikely to be effective.** Selected large and high-profile abuse of dominant position cases that have been tried in the electronic communications markets in Europe have taken roughly eight years from the date of opening of the proceeding to the final ruling from the European Court of Justice (ECJ); the time from the occurrence of the abuse itself until the final ruling was (naturally) even longer. The ineffectiveness of competition law alone is also illustrated by New Zealand’s move from an ex-post-based framework to an ex-ante one.

- European incumbent operators, considered in aggregate, continue to hold wholesale (and in some cases retail) market shares above the simplistic threshold of 40% (below which dominance would be considered unlikely from the perspectives of both ex-post competition law and ex-ante regulation). This, as well as limited constraints from operators active in other product or geographic markets, provides further support for the need for continued consistent and appropriate regulation.

**Appropriate NGA wholesale products need to be defined**

The European experience has shown how passive wholesale access products, and in particular LLU, have been a great success and brought massive benefits to consumers, as they have allowed alternative operators to discover the price/performance preferences of customers, achieve economies of scale in the provision of the active electronics, and control the quality of service that is provided. NGA wholesale products should therefore be designed to allow similar gains and benefits to LLU, but they also need to take into account local country-specific characteristics such as the state of the passive infrastructure and the NGA network architecture used. Below we provide further details on what could be appropriate NGA wholesale products in the EU:

- **All architectures:**
  - The EC’s efforts to implement the intrinsically non-discriminatory **equivalence of inputs (EoI)** standard for wholesale products on NGA networks (rather than the equivalence of output (EoO) standard used on legacy copper networks) should continue.
  - **Duct access** can be an effective solution for all NGA architectures where duct networks are widespread and in good shape, and can allow alternative operators to deploy their own networks more economically.

- **FTTC:**

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9 Selected high-profile cases include Telefónica Spain [38784], Deutsche Telekom Germany [37451] and Wanadoo Interactive / France Telecom [38233].
- **Sub-loop unbundling** (SLU) can be effective for alternative operators with sufficient scale, in combination with auxiliary access products. There are cases in Europe where alternative operators have started to use sub-loop unbundling in recent years.

- Some regulators have fully or partially removed SLU obligations where SMP operators are deploying vectoring. *This seems premature, as there are ongoing technological developments to enable the introduction of multi-operator vectoring* (MOV). The Italian regulator has decided not to remove SLU obligations, but instead work on facilitating MOV.

- In addition, virtual unbundling local access (**VULA**) *can be used*, but this will require considerable effort to construct effective products that allow alternative operators to control key inputs.

- **FTTH:**
  - **Fibre unbundling will be critical to allow competition on FTTH networks.** This is already done on point-to-point FTTH networks (e.g. in the Netherlands, Sweden and Slovenia), but equivalent services can also be implemented on passive optical networks (PONs) – this is already done in Singapore, for example.

  - **Symmetric access to some bottleneck resources** (e.g. in-building networks) may also be required to ensure that the first operator does not block the market for subsequent entrants. This approach is already used in multiple countries, including France and Portugal.

Similar to the situation on copper networks, there will likely be a need to **maintain active access wholesale products alongside passive ones** in order to allow nationwide competition. Active access products may be particularly important in the business services market, especially for serving multi-site national and multinational companies.

*The EC’s DAE targets are ambitious, but a change in regulatory policy and framework is unlikely to contribute to reaching the targets*

The EC has set ambitious DAE targets for 2013 and 2020, including:

- **Ubiquitous basic broadband coverage by 2013.** While the vast majority of basic broadband coverage has been provided commercially under the current competition-focused regulatory framework, the additional coverage needed to address non-profitable areas and meet the ubiquitous basic broadband target has been successfully gap-funded using public funds. State aid has since been used to extend coverage into the remaining areas, bringing terrestrial

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10 Such coverage has been achieved mainly by upgrading backhaul to local exchanges from copper to fibre and installing DSLAMs in local exchanges allowing the provision of DSL services. Cable networks have also been upgraded and FTTx networks have been deployed, but these typically overlap with the DSL networks.
network coverage to around 97% at the end of 2014. This increases to 99.9% when satellite is included.\textsuperscript{11}

- \textit{Ubiquitous coverage by 2020 of networks capable of providing at least 30Mbit/s.} This target is unlikely to be met without extensive further investment as well as the use of technologies such as fixed wireless access (FWA) and satellite. There has been some speculation that a relaxation of regulatory requirements could be one way to meet this target. However, we do not believe that such modifications to the regulatory framework would materially contribute towards reaching this target: subsidies from public funds are likely to provide a more effective solution for connecting the limited areas not covered by commercial deployments.

- \textit{50% take-up of at least 100Mbit/s services by 2020.} This target appears to be the most challenging to meet. It requires both substantial network investment and end-user interest and demand. Competition (and hence a pro-competitive regulatory stance) must be considered essential to meeting this goal.

\textit{Changes to the regulatory framework to focus it more on investment are unlikely to be efficient}

Investment is clearly required in order to meet the DAE targets and to ensure that European consumers and businesses have access to up-to-date broadband infrastructure and associated products and services. Investment should, however, be seen as a means to an end (a modern broadband infrastructure) and not as an end in itself. In multiple places in this study, we have shown how investment in NGA networks is taking place in Europe where it is commercially viable under the current regulatory framework. A policy aimed at explicitly increasing investments would therefore need to address either or both of the following areas:

- \textbf{Attempt to improve the business case for commercial investment}
  - \textbf{Increased revenues}: revenues depend on a combination of quantities sold and prices, but demand uncertainty is a major factor in the business case for NGA networks. Demand stimulation is potentially attractive. \textbf{However, higher prices are potentially counterproductive as they could lead to lower take-up and a reduction of societal utility}, as well as monopoly rents.
  - \textbf{Decreased costs}: initiatives to lower the costs of deployment would not involve similar risks of reducing societal utility as discussed above. Such initiatives are, however, already underway within the current framework. NGA networks are being deployed by both incumbents and alternative operators in Europe, and so any initiatives to reduce the costs of deployment should therefore be aimed at all players.

- \textbf{Invest public funds} in one way or another (e.g. through direct subsidies, financing at below market rates, etc.). In order to be efficient and non-distortive, however, such investment should be directed to areas where private investments are unlikely to happen.

\textsuperscript{11} Source: EC Communications Committee (2014), \textit{Digital Agenda Scoreboard 2014 – broadband markets}. 
In the roadmap to its review of the framework, the EC states that only 19% of households are covered by “very high-speed networks able to deal with a likely substantial future increase in demand for upload as well as download”.\(^{12}\) In its framework review consultation issued on 11 September 2015 (e.g. in Questions 32 and 33 and the preceding introductory text) the EC also makes reference to a need to roll out network up to the end users’ premises (implying FTTP or FTTH).\(^{13}\) We have some concerns with justifying a non-neutral stance which favours FTTP or FTTH based on a perceived need for higher upstream speeds, as while there are already some mass-market services which need more symmetrical usage profiles, these are currently much less significant than streaming video (in terms of the traffic generated) and likely to remain so for some time. As a result, we believe that a policy-level focus on a specific and uncertain feature of the ultra-fast broadband offer (i.e. a postulated future increase in demand for upload as well as download) is highly premature.

Having said this, we are not against FTTH. The ability to offer highly suitable passive wholesale access products such as fibre unbundling makes FTTH networks ideally suited to the vigorous competition we favour. However, if a policy stance is to be taken which favours one technology (such as FTTH) over another (such as single operator vectored FTTC/VDSL), it would be better policy to justify this on the grounds of the superior competition benefits that can be provided.

Regardless of whether one technology should be favoured over another, policy makers and NRAs must ensure that appropriate and fit-for-purpose access remedies are made available for any given fibre technology / topology in order to prevent uncompetitive market outcomes, allow competition to flourish in an NGA setting and thus ensure a virtuous circle that leads to increased NGA take-up and investment.

**Conclusion**

Major changes to the regulatory framework appear unnecessary for incentivising the deployment of NGA networks and are unlikely to incentivise take-up; on the contrary, we believe that modifications to the framework of a deregulatory nature may hinder achievement of the DAE targets. Competition – which is encouraged by the current regulatory framework – will be one of the main drivers for take-up of high-speed broadband products and services and for reaching the DAE’s 50% take-up target for 100Mbit/s services.

Overall, we believe that the current regulatory framework has served the European broadband markets well. Therefore we do not see any requirement to modify the main parameters of the regulatory framework, which should continue to be based on:


• identification of markets susceptible to ex-ante regulation through use of the three criteria test
• identification of operators with SMP or joint dominance
• stimulation of competition through the imposition of appropriate remedies, including a range of wholesale access products with a focus on passive access, such as access to ducts and other civil works, SLU and unbundling, complemented by active access products where appropriate (e.g. to enable wide coverage, to enable competition in business services).

Some refinements to the regulatory framework may be warranted, however, including:

• ensuring the availability of appropriate NGA wholesale products that can create the same benefits as LLU by providing unbundled (or equivalent) access to SMP operators’ civil infrastructure, copper sub-loops, and FTTC and FTTH deployments
• applying EoI for wholesale products on NGA networks to ensure a level playing field between alternative operators and the retail arm of the SMP operator
• ensuring that potential duopoly / oligopoly situations can be addressed by reviewing the criteria used to establish joint dominance and the remedies applicable in such situations. This has proven difficult under the current regulatory framework; BEREC recently launched a consultation on this issue, which is also raised in the EC framework review consultation issued on 11 September 2015.14

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14 Source: Ibid, Question 42.
2 Introduction

This report was written for ECTA by Analysys Mason. Its purpose is to:

- evaluate the development and performance of the European broadband markets, including NGA, under the current regulatory framework
- compare the performance of the European broadband markets to that in four other countries with different regulatory regimes which are often used as examples of best practice in broadband coverage, take-up and regulation – the USA, Japan, New Zealand and Singapore
- analyse the connection between future investment and competition in NGA, and the impact that regulation can have on this
- attempt to identify whether the regulatory framework for Europe’s broadband markets needs to be dramatically changed, or whether a refinement of the current framework is more appropriate.

The remainder of this document is laid out as follows:

- Section 3 introduces the current regulatory framework and the challenges related to future policy for, and regulation of, the European telecoms sector
- Section 4 provides an overview of the development of European broadband markets under the current regulatory framework
- Section 5 discusses regulation and NGA networks in specific national European markets, presented in the form of five case studies
- Section 6 compares the performance of European broadband markets (including NGA) with that of four other regulatory environments
- Section 7 discusses prospects for future investment and competition in NGA in Europe.

The report includes two annexes containing supplementary material:

- Annex A lists the ‘relevant markets’ specified by the EC for investigation by NRAs in 2003, 2007 and 2014
- Annex B lists the products considered during our analysis of broadband retail prices.
3 Challenges for future policy for and regulation of the European telecommunications sector

In this section we:

- provide an overview of the current regulatory framework for the European telecommunications sector (Section 3.1)
- describe some of the relevant recent developments in European policy (Section 3.2)
- introduce some of the future trends that regulators need to take into account (Section 3.3).

3.1 The basis of the current regulatory framework

The current European regulatory approach for electronic communications stems from five 2002 EU directives, including a Framework Directive\(^\text{15}\) which sought “primarily to strengthen competition in the electronic communications sector, stimulate investment, foster freedom of choice for consumers and enable them to benefit from innovative services, quality and lower rates.”\(^\text{16}\)

The five 2002 directives are:\(^\text{17}\)

- Directive 2002/22/EC on universal service and users’ rights relating to electronic communications networks and services (Universal Service Directive)

The 2002 framework requires NRAs to conduct regular market analyses of relevant markets that are susceptible to ex-ante regulation; these analyses are to define such markets, identify whether an operator holds significant market power (SMP) individually or jointly with others\(^\text{18}\) and, where


\(^{16}\) Description provided by the EC is available at http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:l24216a.

\(^{17}\) Links to the relevant documents are available at http://ec.europa.eu/digital-agenda/en/telecoms-rules.

\(^{18}\) “Joint dominance” by two or more operators is also possible; we discuss this in the context of fixed access networks in Section 7.1.4.
SMP is found, the NRAs are to place one or more obligations, such as provision of wholesale access, onto those SMP operators in order to stimulate competition. It also aims to align regulation in the electronic communications sector with the principles of competition law, in several ways:

- By requiring that ex-ante regulation only be used where it is necessary (and is removed where it is not necessary)
- Through the processes of market definition and market analysis “in accordance with the principles of competition law”\(^{19}\)
- By aligning the concepts of SMP and “dominance”.

The approach adopted is intended to facilitate a harmonisation of approach across the EU without the need for identical regulatory remedies, and so enables NRAs to reflect the significant differences that exist between countries. The EC and NRAs\(^{20}\) retain a role in ensuring that this common approach is followed, through the so-called Article 7 process.\(^{21}\)

The rules were updated in 2009, through a number of measures:


BEREC was established by the BEREC Regulation (Regulation (EC) No 1211/2009) and was given a formal role in the Directives.

NRAs were initially required to analyse each of 18 relevant markets that the EC had identified in a Recommendation as being susceptible to ex-ante regulation. This number was reduced to 7 in 2007, and then to 4 in 2014 (see Annex A). In order to identify additional markets that are susceptible to ex-ante regulation, NRAs must show that the so-called “three-criteria test” contained in Article 2 of the EC Recommendation is passed, which requires:

- high and non-transitory structural, legal or regulatory barriers to entry
- that the market structure does not tend towards effective competition within the relevant time horizon, having regard to the state of infrastructure-based and other competition behind the barrier to entry
- that competition law alone is insufficient to adequately address the identified market failure(s).\(^{22}\)

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\(^{19}\) As stated in the 2002 Framework Directive, e.g. Articles 15.2 and 15.3.

\(^{20}\) Both individually and via BEREC.

\(^{21}\) Framework Directive 2002, Article 7; this has subsequently been amended.

The regulatory framework instructs NRAs to conduct market analyses by:

- defining the relevant product and geographic markets susceptible to ex-ante regulation
- analysing competition to identify whether any operator holds SMP individually or jointly with others
- deciding on the ex-ante measures to implement if there is SMP.

The Access Directive 2002/19/EC (as amended in 2009) specifies broad types of proportionate ex-ante obligations that NRAs can impose on SMP operators, as outlined in Figure 3.1.

**Figure 3.1: Obligations which can be imposed on SMP operators by NRAs [Source: EC, 2002/2009]**

<table>
<thead>
<tr>
<th>Obligations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transparency of terms and conditions, including prices</td>
</tr>
<tr>
<td>Non-discrimination</td>
</tr>
<tr>
<td>Access to, and use of, specific network facilities</td>
</tr>
<tr>
<td>Accounting separation</td>
</tr>
<tr>
<td>Price control and cost accounting, which may include obligations of reasonable prices, cost orientation and no margin squeeze</td>
</tr>
<tr>
<td>Functional separation and treatment of voluntary separation</td>
</tr>
</tbody>
</table>

The Directives have been added to by a number of related measures, including:

- the 2002 guidelines on market analysis and the assessment of significant market power under the Community regulatory framework for electronic communications networks and services
- three successive Recommendations on relevant markets susceptible to ex-ante regulation in 2003, 2007 and 2014
- the 2009 Recommendation on the regulatory treatment of fixed and mobile termination rates
- the 2010 Recommendation on regulated access to next-generation access (NGA) networks
- the 2013 Recommendation on consistent non-discrimination obligations and costing methodologies to promote competition and enhance the broadband investment environment.

### 3.2 Recent developments in European policy

In this section we introduce a series of recent developments in European policy and regulation of the electronic communications sector:

- the Digital Agenda for Europe (Section 3.2.1)
- the Digital Single Market strategy (Section 3.2.2)
- the Connected Continent and the pending 2016 review of the regulatory framework (Section 3.2.3).
3.2.1 Digital Agenda for Europe

In 2010 the EC launched its Digital Agenda for Europe (DAE), which focuses on the coverage of broadband networks and the take-up of high-speed broadband services. The main targets relating to telecoms are shown in Figure 3.2 below, together with their current status.

<table>
<thead>
<tr>
<th>Target</th>
<th>Status (January 2015)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100% of EU households to be covered by basic broadband by 2013</td>
<td>97% with fixed wireline technologies, 100% using other technologies such as FWA and satellite</td>
</tr>
<tr>
<td>100% of EU households to be covered by broadband above 30Mbit/s by 2020</td>
<td>68% of households covered</td>
</tr>
<tr>
<td>50% of EU households to subscribe to broadband above 100Mbit/s by 2020</td>
<td>6% of households and 9% of broadband subscriptions</td>
</tr>
</tbody>
</table>

In parallel, the EC has suggested or implemented some adjustments to the regulatory framework, including:

- The reduction of the relevant markets susceptible to ex-ante regulation to four (see above), as a reflection of the EC’s conclusions regarding increased competition and the scale and reach achieved by alternative players. It should be noted that the remaining ex-ante markets supply important products, most notably fixed-access ones, which are key inputs to the products and overall business model of the alternative operators that are providing the strong competition to dominant operators that has enabled this level of deregulation.

- The 2013 Recommendation on consistent non-discrimination obligations and costing methodologies to promote competition and enhance the broadband investment environment.²³ In principle, this Recommendation aims to provide incumbent operators with greater incentives to invest in NGA networks by allowing them more pricing flexibility in order to test price points and conduct penetration pricing (i.e. setting low initial pricing to increase demand) in order to offset the current demand uncertainty that exists for NGA networks. The EC states that this could lead to lower wholesale and retail prices (of both the SMP operator’s retail operations and access seekers) and a sharing of investment risk between access seekers and SMP operators (e.g. through differentiated wholesale access prices depending on the level of commitment from the access seekers). If certain conditions are met, the NRAs are recommended not to use cost-oriented price controls for NGA wholesale products and instead adopt a more ‘light-touch’ control, involving the use of a so-called economic replicability test (ERT). The ERT needs to be combined with strict non-discrimination obligations: Equivalence of Inputs (EoI) and technical replication. It can furthermore only be applied if the retail prices

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²³ Source: EC, Commission Recommendation on consistent non-discrimination obligations and costing methodologies to promote competition and enhance the broadband investment environment, 2013.
of the SMP operator are constrained through infrastructure competition or a price anchor from cost-oriented wholesale copper access prices.

3.2.2 Digital Single Market

In May 2015, the EC announced its Digital Single Market Strategy for Europe (DSM).\(^\text{24}\) The strategy is built around three pillars:

- better access for consumers and businesses to digital goods and services across Europe
- creation of the right conditions for digital networks and services to flourish
- maximisation of the growth potential of the European Digital Economy.

As part of the DSM, the EC has stated that “little full "infrastructure competition" has emerged in fixed-line networks, except in very densely populated areas, where cable networks were already present, or where local authorities have been active. There is a need for simpler and more proportionate regulation in those areas where infrastructure competition has emerged at regional or national scale. The deployment of very high capacity networks needs to be encouraged while maintaining effective competition and adequate returns relative to risks”\(^\text{25}\).

3.2.3 Connected Continent and pending 2016 regulatory framework review

In June 2015, two further key developments occurred:

- The European Parliament and the Council reached political agreement on an amended version of the Connected Continent (CC) legislative proposal that the EC originally proposed in September 2013.\(^\text{26}\)

- The EC announced an initiative to evaluate and review the regulatory framework for electronic communications networks and services (‘the pending 2016 Review’).\(^\text{27}\)

The CC package includes an end to retail roaming surcharges within the EU (subject to conditions and permission to introduce fair-use clauses if justified) and the introduction of “net neutrality” rules.

The pending 2016 Review is intended to build on the CC as implemented and is also one of the actions identified as part of the DSM (under its second pillar). As part of the roadmap to the pending 2016 Review, the EC raises questions about the extent to which the current regulatory

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\(^\text{24}\) Source: http://ec.europa.eu/priorities/digital-single-market/.


framework “has sufficiently promoted the transition towards high-capacity Next Generation Access (NGA) networks fit to meet future needs”. In particular, the EC notes that the coverage of “very high-speed networks able to deal with a likely substantial future increase in demand for upload as well as download” remains limited, as “Fibre-To-The-Premises (FTTP) coverage stood at 19% at the end of 2014.” It also notes that the growth in >30Mbit/s broadband slowed in 2014 compared to previous years, while the take-up of >100Mbit/s connections remains low.

There remains a debate about a wider range of issues that might merit policy intervention. To take one example, the fixed business services market has rather different characteristics from the fixed consumer broadband market, with:

- specialist needs (e.g. in relation to resilience, quality of service, and service level agreements)
- a need for coverage of all the sites of a business customer (which may be in a mix of denser and more rural areas), and
- in relation to corporates with offices in multiple Member States, an intrinsically pan-EU dimension.

As a result, business service providers, even those with their own network infrastructure, are also often reliant on high-quality wholesale inputs of various kinds (both regulated and unregulated). NRAs have recognised these differences, and some have conducted separate (national) analyses of these markets (e.g. the fibre to the office (FTTO) market in the Netherlands, the Business Connectivity Market in the UK). Nevertheless, the results of these reviews and commercial developments have led to a patchwork of wholesale input products across the EU, making it more complex and more costly to obtain pan-EU networks.

The CC proposals originally included a much longer list of measures: some of these would, if successfully implemented, have an impact on the currently fragmented wholesale offers needed to support business services that were discussed above. However, the final package agreed with the Parliament and Council did not contain these measures.

On 11 September 2015, the EC, issued a public consultation with 111 questions related to the functioning of the regulatory framework. On the same date, it also issued a public consultation on the needs for Internet speed and quality beyond 2020.
3.3 Additional future trends that need to be taken into account by policy makers and regulators

In addition to the deployment of NGA networks, there are other possible future trends that policy makers and regulators need to take into account, including:

- Consolidation within and across markets in both mobile and fixed sectors. This may lead to a reduced number of competing networks and at the same time may also lead to the emergence of larger-scale competitors to the incumbent operators.

- Integration of fixed and mobile at two levels:
  - a technical level. The interdependence of fixed and mobile networks can be illustrated by a number of technological developments, including the need for high-speed backhaul from mobile sites, the ability to use “picocells” as part of consumer broadband CPE, and by “hybrid” offers that combine fixed access with unused mobile capacity.
  - a commercial level (fixed–mobile convergent offers).

- The Internet of Things (IoT) which will lead to a further requirement for connectivity of multiple devices across many markets, as well as often leading to the negotiation of connectivity contracts on a global (or continental) scale as large enterprises such as car manufacturers do not want to negotiate separate contracts for each country (e.g. where they sell products with integrated SIMs).

- Continued development of multi-play offers in which video plays an increasingly important role, possibly leading to a situation in which content becomes a vital part of offerings.

- Continued emergence and growing importance of over-the-top (OTT) services (i.e. delivered entirely over the Internet) such as Skype and Netflix. The EC has already highlighted how OTT operators are not subject to the same obligations and do not enjoy the same rights as traditional electronic communication services providers.\(^{33}\)

- Increased need for corporate high-speed, low latency and symmetric connectivity due to the use of cloud computing (use of centralised computing, software-as-a-service and storage infrastructure such as Amazon Web Services and Salesforce.com) and so-called “big data” applications.

- Higher-quality wireless networks, as a result of current 3G and 4G roll-out and likely future implementation of 5G networks.

4 The success and benefits of ex-ante regulation in Europe

In this section we provide a quantitative overview and analysis of the performance of European broadband markets under the current regulatory framework. The analysis covers the following areas:

- how the European regulatory framework has encouraged competition, resulting in both lower end-user spend and strong basic broadband take-up (Section 4.1)
- how incumbent and alternative operators in Europe are investing in NGA networks (Section 4.2)
- how take-up of fast broadband services has evolved in Europe (Section 4.3)
- the role that alternative operators play in driving the take-up of fast broadband services (Section 4.4).

Section 4.5 then summarises the key policy messages emerging from this analysis.

4.1 The European regulatory framework has encouraged competition, which has driven down end-user prices while at the same time leading to strong growth in broadband take-up

The pro-competitive approach of the European regulatory framework has largely been successful in its main aims of encouraging competition and, through this mechanism, reducing end-user prices and driving broadband take-up.

As can be seen in Figure 4.1, incumbents’ share of the EU broadband market fell from 50% to 41% between 2005 and 2014. It is mainly alternative operators34 (using a mixture of their own networks and wholesale access from the incumbents) which gained market share over this period; cable operators also made gains, but on a much smaller scale.

As can be seen in Figure 4.2, the increasing level of competition has helped to drive down average revenue per user (ARPU) for broadband (with bundled services), which declined at a CAGR of 2.5% (in nominal terms) between 2005 and 2014. Access-only ARPU decreased at an even faster rate over this period (at a CAGR of -4.5% between 2005 and 2014), as a shift in focus towards bundling of multiple products such as VoIP and IPTV has alleviated the reduction in ARPU for bundles.

34 Throughout this report ‘alternative operators’ is used to refer to operators other than incumbents and cable operators (which typically exclusively use their own networks). Alternative operators typically access users through (regulated wholesale access to) to the incumbent's access network and/or their own FTTx networks or a combination of the two.
While the current pro-competitive regulatory framework has been in place there has also been continuous growth in fixed broadband penetration, to reach 73% of households in 2014, up from 30% in 2005 (see Figure 4.3).
Alternative operators have contributed to the increasing penetration in a number of ways, by reducing end-user prices (see Figure 4.2) as well as by introducing a number of innovations, including:

- voice over IP (VoIP), typically provided as voice over broadband (VoBB)\(^{35}\)
- IPTV and video on demand (VoD) over broadband networks
- other services such as cloud storage, unified communications (tele-presence, video conference) and modern CPE with advanced functions (such as personal video recorders (PVRs)).

Whereas incumbent operators have historically provided fixed voice over the public switched telephone network (PSTN), new entrants have instead used VoIP as a way to bundle together voice and broadband and penetrate the voice market at a lower cost. According to Analysys Mason Research’s Telecoms Market Matrix,\(^{36}\) VoIP services are now available in all EU countries and were launched by alternative operators before the incumbents in all EU countries except Spain and Slovakia; as Figure 4.4 shows, at an EU level the take-up of VoIP services is four times higher for alternative operators than for incumbents (as a proportion of the broadband customer base).

Alternative operators have also aggressively marketed bundles which include TV services over IP (IPTV): as Figure 4.5 shows, take-up figures for IPTV services were consistently higher for alternative operators between 2005 and 2010, although incumbents have caught up in the last few years.

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\(^{35}\) VoBB is provided inside the broadband stream delivered to modems at the end-user premises where the voice-traffic is extracted and routed to specific ports at which telephones can be attached; if necessary, VoBB can be given priority on the access link. VoIP can also be delivered to end-users as applications provided over the Internet by OTT providers (e.g. Skype); however, in this case the network of the broadband ISP cannot control the quality of service provided to the voice service (because it is unaware of which packets are the voice packets).

During the years of expanding take-up, facilitated by competition and innovation brought by alternative operators, total revenue from the broadband sector increased significantly, as can be seen in Figure 4.6 (despite reductions in unit prices). Overall, all stakeholders benefited from this: end users benefited by having access to Internet services, overall society benefited from an increase in productivity, and operators benefited from increased revenue (from higher service take-up) which allowed re-investment in additional network and new network capabilities.
4.2 European operators, both incumbents and alternative players, are investing in network upgrades and deployments

The deployment of NGA networks, especially FTTC and FTTH, has increased strongly in recent years. As a proportion of EU households, FTTx coverage has now almost reached the level achieved by cable (see Figure 4.7 below). Between 2011 and 2014, FTTx coverage increased by eight percentage points a year, and total NGA coverage rose by an average of almost seven percentage points per year.
The availability of FTTx differs extensively between countries, as can be seen in Figure 4.8. Belgium has reached almost ubiquitous coverage (through FTTC), whereas in countries such as Greece, Croatia and Hungary coverage remains below 20%. All countries in Europe saw significant growth in FTTx coverage between 2012 and 2014. This is particularly the case for those countries that were at the lower end of coverage in 2012, which indicates that they have been catching up.

Note: FTTx includes FTTC, FTTH and FTTB (in combination with VDSL or LAN in building networks). VDSL includes VDSL from the cabinet (FTTC), from the building (FTTB) and in some cases (with short local loops) from the central office. Cable growth is driven mainly by the deployment of DOCSIS 3.0 / two-way upgrades rather than by an increase in the number of homes passed with coaxial cable.

Figure 4.8: FTTx coverage by country, EU28 [Source: Analysys Mason Research38]

Source: Analysys Mason Research (2015), FTTx roll-out and capex worldwide: forecasts and analysis 2015–2020
Investments in FTTx access networks in Europe have also increased significantly in recent years, up from EUR3.7 billion in 2011 to EUR8.9 billion in 2014, as shown in Figure 4.9. Both FTTH and FTTC investment have increased in absolute terms, but the focus on FTTC has increased (up from 41% of investments in 2011 to 45% in 2014).

Alternative operators have contributed heavily to the investments in FTTH. Together with cable operators, they often played a role as a catalyst of deployment, by being early adopters of new NGA technologies; whereas incumbents have often responded to these first moves by alternative operators and cable operators.

The role of alternative operators in stimulating FTTH investments has also been found in a recent study by WIK for Ofcom. WIK cites several examples of alternative operators initiating investment in FTTH networks before incumbents, including Stokab in Sweden, DONG and other utilities in Denmark (before being acquired by TDC), Reggefiber in the Netherlands (before being acquired by KPN), as well as LLU operators such as Iliad (Free) in France and Optimus/Sonaecom in Portugal.
4.3 The take-up of fast broadband is limited but increasing

Figure 4.10 shows how the technologies used for broadband evolved between 2011 and July 2014. In particular:

- ADSL remained the dominant technology for broadband access, although its share gradually declined (reaching 63% in July 2014, down from 73% in 2011)
- cable maintained its position as the second largest technology, having grown slightly from 16% in 2011 to 18% in July 2014
- FTTH/B and FTTC/VDSL gained ground over the period, reaching 7% and 8% of total connections respectively, compared to 4% and 2% in 2011
- other technologies (mainly FWA and satellite) made up about 4% of all connections over the period.

The combination of cable and FTTx (the technologies that can offer bandwidth of more than 30Mbit/s) made up around 33% of all connections in July 2014, up from 21% in 2011.

As shown in Figure 4.11, there are significant differences in the use of technologies across Europe. For example:

- FTTH/B is the main access technology in Romania, Latvia and Bulgaria
- cable is the main access technology in Belgium, Hungary and the Netherlands
- FTTC/VDSL take-up has been material in countries such as Romania (18% of broadband lines), Belgium (39%), Ireland (16%) and the UK (17%)
- ADSL still dominates in countries such as Italy, France and Greece but also in countries like the UK and Germany where investment in FTTC/VDSL has been made and where there is a relatively strong presence of cable operators.

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Figure 4.11: Composition of broadband connections by technology by country, July 2014 [Source: Analysys Mason based on Analysys Mason Research\(^{41}\) and EC data, 2015]

\(^{41}\) Source: Ibid
Figure 4.12 shows that the total penetration of fast broadband services (i.e. those offering at least 30Mbit/s download bandwidth) had only reached 16% of European households by July 2014, of which around a third (5% of the households) subscribed to more than 100Mbit/s. Take-up increased significantly between 2010 and 2014, as a result of:

- networks becoming available
- end users discovering and valuing the services
- operators designing attractive offers.

![Figure 4.12: Penetration of broadband subscriptions of at least 30Mbit/s and at least 100Mbit/s as of July 2014 [Source: Analysys Mason based on EC, Euromonitor and EIU, 2014]](image)

Note: The EC penetration data is published on a population basis. It has been converted to a household basis using EIU data for population and Euromonitor data for households.

Figure 4.13 shows how the take-up of FTTx services (as a percentage of homes passed) has gradually increased, to reach a level similar to that of cable networks. Take-up of FTTC as a proportion of homes passed continued to increase between 2010 and 2014, despite the dilution effect of new build. The 'dilution effect' refers to the fact that newly built coverage will initially have lower take-up, as service adoption takes some time. In a situation where there has been a significant increase in coverage one would therefore expect overall penetration as a percentage of homes passed to grow more slowly.

FTTC remains well below the levels of take-up for FTTH and cable, which we believe is due to a combination of the aforementioned dilution effect and the relatively recent launch of FTTC in a number of markets when compared to cable and FTTH.
4.4 Alternative operators are actively contributing to fast broadband take-up

Developments in the market for basic broadband access described in Section 4.1 demonstrate a positive link between the competition brought by alternative operators (providing more attractive and less expensive offers) and the take-up of broadband services. There is no reason why this trend should not continue for fast and ultrafast broadband. A mix of attractive prices and attractive and innovative features will entice end users to take up fast and ultrafast broadband offers instead of basic broadband ones. This intuitive notion is confirmed by a study recently published by the EC.  

This study contains the results of a survey, covering all 28 EU Member States, based on face-to-face interviews with 27,739 respondents. Among other things, the survey reviewed the factors Europeans consider when subscribing to an Internet connection. The study showed that:

- pricing is the most influential factor in consumers’ choice of Internet bundles: “for most Europeans, price is the most important factor when subscribing to an Internet connection”;
- download speed was identified as the second most important criterion, followed by being part of a bundle as the third.

We have sought to understand the extent to which alternative operators contribute to improving pricing, download speeds and other features.

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We have done this by analysing the current broadband offers from incumbent and alternative operators in eight Western European countries. We have not included cable operators in our analysis as these do not typically use the wholesale products made available through the current regulatory framework. Our analysis has been based on a database of bundle prices extracted from Analysys Mason Research’s Multi-Play Pricing Benchmark, and shows how alternative operators are making key contributions to increasing the attractiveness (and hence take-up) of fast broadband services on both the price and speed criteria. When compared to incumbent operators, alternative operators:

- tend to set lower prices for similar NGA bundles
- more aggressively promote higher speeds and offer more services in their bundles.

Our analysis is described in more detail below.

**Alternative operators offer lower prices for similar NGA bundles**

The price advantage of alternative operators is illustrated by Analysys Mason’s analysis of NGA double- and triple-play offers in eight Western European countries (see Figure 4.14), which found that the prices of the cheapest bundle provided by alternative operators (with the exception of dual-play bundles in the UK) range from 50% to 95% of the cheapest prices charged by incumbents for dual- and triple-play bundles with download speeds of >30Mbit/s and >100Mbit/s.

Our findings are consistent with those in other studies, such as the one that Van Dijk carried out for the EC in 2013 and 2014. Van Dijk analysed retail offers in the EU27 and some non-EU countries, and in 2014 stated that “the least expensive offers per country are, in more than 85% of cases, provided by new entrants”. For NGA bundles (standalone, double- and triple-play with 30–100Mbit/s speeds) the proportion was around 80%. The study also found that “the incumbent’s offer with the lowest price is on average between around 30% and 55% more expensive than the least expensive offer”.

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45 The countries analysed are Austria, France, Germany, Greece, Italy, the Netherlands, Portugal and the UK, with the selection determined on the basis of the existence of comparable bundles and data availability.


49 The Van Dijk study included cable operators.

Alternative operators more aggressively promote higher speeds and offer more services

Our analysis shows that alternative operators\textsuperscript{52} also offer higher (download) bandwidths and more services (e.g. IPTV) than incumbents for a price that is comparable to that of a “basic” broadband bundle from the incumbent (which we define as a <30Mbit/s dual-play offer). This can be seen in Figure 4.15, which also shows how, in France, Italy and Germany it is even possible to buy a triple-play 100Mbit/s bundle from an alternative operator at the same price as a dual-play 30Mbit/s from the incumbent.

\textsuperscript{51} The database of bundle prices is extracted from Analysys Mason Research’s Multi-Play Pricing Benchmark 4Q 2014.

\textsuperscript{52} As above, this excludes cable operators.
Figure 4.15: Alternative operators’ bundle prices as a percentage of the incumbents’ basic bundle prices (double-play, speed lower than 30Mbit/s) [Source: Analysys Mason, 2015]

In our view, these benefits of vigorous competition (driving lower prices, incentivising take-up of higher-speed offers) are essential in achieving high levels of adoption (e.g. meeting the EC’s 50% take-up target for 100Mbit/s).

4.5 Key policy messages for policy makers

Our review of the performance of the European broadband markets under the current regulatory framework has identified a number of key policy messages, including:

- The current regulatory framework has enabled entry to the market by alternative operators using wholesale access in combination with their own core and sometimes access network infrastructure. This pro-competitive framework has led to both lower prices and higher penetration of basic broadband services.

- The availability of passive wholesale access products such as civil infrastructure access and LLU/SLU has been instrumental in allowing alternative operators to compete in the market, create innovative products and to pass on benefits (such as higher speeds) to consumers.

- The coverage of NGA networks of different types has increased significantly under the current framework, reaching 68% of EU households at the end of 2014.

- Alternative operators have played a key role in the development of NGA networks (especially FTTP, but also FTTC in some cases), and in the introduction of innovations such as IPTV, VoIP and related bundles.
• Alternative operators are, often together with cable operators, taking a leading role in promoting the take-up of fast and ultrafast broadband services, e.g. by offering lower prices than the incumbents and by offering attractive high-speed bundles. This is a role that the alternative operators also played on basic broadband. As such, we expect that alternative operators will be instrumental in reaching the target of 50% take-up of 100Mbit/s broadband services.
5 Regulation and NGA networks in specific national markets: five case studies

Numerous stakeholders, including the EC itself, have noted that there are substantial differences in the market structure and the implementation of the regulatory framework across EU Member States. We believe that there are lessons that can be learned from each market, and have therefore developed a number of case studies in which we explore country-specific characteristics related to:

- NGA investment
- the implementation of access regulation on NGA networks
- competitive dynamics.

Case studies have been prepared for the following countries, selected in conjunction with ECTA, as they demonstrate different market conditions and regulatory approaches that have led to different outcomes:

- **France** (Section 5.1), where specific regulation has been defined for co-investment and symmetric access
- **Germany** (Section 5.2), where there has been an extensive debate regarding wholesale access to VDSL deployments and SLU can now be partially withdrawn
- **Italy** (Section 5.3), which has lagged on NGA deployment, but the gap has recently been reducing as Telecom Italia and two alternative operators (Fastweb and Vodafone) have been deploying FTTC networks (often in parallel) using SLU access from Telecom Italia
- **the Netherlands** (Section 5.3), where there is extensive NGA coverage through cable on the one hand and a mix of FTTH and FTTC controlled by the incumbent on the other
- **Portugal** (Section 5.5), where FTTH has been deployed by multiple operators (Portugal Telecom, Vodafone and NOS) using regulated access to the incumbent’s ducts.

5.1 Case study: France

5.1.1 Regulation aimed at stimulating competition appears to have driven investments in fibre networks

In France, the approach taken by the NRA (ARCEP) to foster investment in NGA networks by all players has been to attempt to reduce the civil engineering costs involved in deploying NGA networks and to maximise sharing of networks and deployment costs through symmetrical access obligations. This has been done mainly through two regulatory tools:

- **Duct access**: ARCEP mandated that Orange (France Telecom) must provide access to its civil engineering infrastructure under “transparent, non-discriminatory and cost-oriented
conditions”, arguing that it had inherited these from its former monopoly position and that there was an asymmetry in access to ducts between the operators. This was implemented through decisions related to the market for infrastructure access (ex-Market 4) in which ARCEP found Orange to have SMP. The same SMP finding is also used to mandate LLU access on copper.

- **In-building access and co-investment in the access FTTH network**: The main principles of shared investment (on a symmetric basis) have been enacted in French law, and entail the sharing of the last segment of the fibre network among operators. The first operator that rolls out fibre in a building is required to provide access to other operators at a “mutualisation” point. Each operator can then use the network of the first operator from the mutualisation point onwards. The precise requirements have been set out by ARCEP and vary according to population density and housing type:
  - in high-density areas, the mutualisation point can be inside or outside a building (in the latter case it needs to serve a minimum of 100 households)
  - in less dense areas, where only two operators have expressed their willingness to roll out a FTTH network, the mutualisation point needs to serve at least 300 households.

According to ARCEP this is intended to allow:

- operators to limit overall rollout costs;
- only a single installation in buildings, instead of multiple ones by different operators;
- the prevention of local monopolies;
- customers to have a choice of ISPs for their very high-speed services.

The last five years have seen FTTH/B network investment by Free (which began investing in FTTH in 2006), incumbent Orange, two other operators (SFR and Bouygues) and cable operator Numericable (which took over SFR in 2014) (see

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Figure 5.1), with total investment estimated to be around EUR1.8 billion between 2010 and 2014,\textsuperscript{56} and an increase in coverage from 5% in 2011 to 14% in 2014.\textsuperscript{57} In 2011 and 2012, Orange signed agreements of different types\textsuperscript{58} with both SFR and Free to jointly deploy FTTH in less densely populated areas,\textsuperscript{59} and with Bouygues to share investments in horizontal network segments in densely populated areas.\textsuperscript{60} In addition, municipal and regional authorities have initiated FTTH roll-outs in partnership with operators: for instance, in 2012 various collectivités territoriales in the Alsace region partnered with Orange to reach 51% household coverage in the region, and in 2013 the local government of the Loiret region partnered with SFR to deploy FTTH in 21 municipalities.\textsuperscript{61}

Operators have also started deploying VDSL, mainly from the local exchange, after ARCEP progressively removed restrictions on the roll-out of the technology both from the local exchange and from street cabinets.\textsuperscript{62} At the time of writing (September 2015), all major operators in France (except Numericable) offered retail VDSL-based services. Free in particular is making extensive use of VDSL from local exchanges, having upgraded more than 6000 of the 6600 local exchanges covered by its unbundling network (exchanges covering 87% of the population).\textsuperscript{63}

Finally, ARCEP also elaborated a framework for the “Montée en débit” (MED) scheme for FTTC deployments in less dense areas, where FTTH is not going to be rolled out in the medium term. In doing so, ARCEP attempted to make sure that all competitors could continue to provide their services under sustainable economic and technical conditions.\textsuperscript{64}

\textsuperscript{56} Source: Analysys Mason Research (2015), FTTx roll-out and capex worldwide: forecasts and analysis 2015–2020.


\textsuperscript{58} We understand the agreement between Orange and SFR to be for joint roll-out (this agreement may have been slightly amended following Numericable’s take-over of SFR) whereas the agreement with Free is for Free to co-invest in areas where Orange has deployed its network first.


\textsuperscript{60} Source: TeleGeography CommsUpdate, Orange-Bouygues ink deal on fibre deployment, available at https://www.telegeography.com/products/commsupdate/articles/2012/01/17/france-telecom-orange-bouygues-ink-deal-on-fibre-deployment/.

\textsuperscript{61} Source: Analysys Mason Research, NGA Tracker 2Q 2015, 10 July 2015.

\textsuperscript{62} 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 his speech at RuralITIC symposium in Aurillac on 13 September 2012, available at http://www.arcep.fr/index.php?id=2124&L=1&tx_gsactualite_pi1%5Buid%5D=1539&tx_gsactualite_pi1%5BbackD%5D=1&cHash=b778be4397b4a7619fe95ce64d23d057).

\textsuperscript{63} Source: Iliad FY 2014 Strategy & Results Presentation, 12 March 2015.

As discussed above, there is a form of ex-ante access for NGA networks in France, even if not relying on SMP regulation, through symmetrical obligations (in addition to the SMP-based civil infrastructure access obligation imposed on Orange). This regulation does not appear to prevent investment from happening; both Orange and the alternative operators are indeed investing in the deployment of NGA networks under this framework.

5.1.2 Competition in NGA appears to have driven affordability and take-up

Since 2011, infrastructure competition in FTTH has increased, as illustrated by a rapid increase in the proportion of premises covered by more than two FTTH operators between 2011 and 2014 (see Figure 5.2). At the same time, the broadband market saw an overall decline in average spending per user (see Figure 5.3), despite the introduction of higher-speed technologies. Over the same period of time, the number of FTTH connections increased significantly both in absolute terms and in terms of take-up of premises passed (see Figure 5.4 and Figure 5.5).

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65 This equals to 100% FTTH coverage in dense and medium dense areas, the so called private investment areas, see http://www.orange.com/fr/content/download/29400/827088/version/6/file/lDay++visual+support.pdf
66 SFR and Numericable merged under the Altice group in 2014.
The digital single market and telecoms regulation going forward

Figure 5.2: Proportion of FTTH households passed in France that are supported by two or more operators using passive infrastructure access [Source: ARCEP, 2015] 68

Figure 5.3: Average broadband spend per user in France [Source: Analysys Mason Research, 2015] 69

Figure 5.4: FTTH connections by operator in France [Source: Analysys Mason Research, 2015] 70

Figure 5.5: FTTH take-up as a percentage of premises passed in France [Source: ARCEP, 2015] 71

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69 Source: Analysys Mason DataHub, extracted May 2015.
70 Source: Ibid.
5.2 Case study: Germany

5.2.1 The European regulatory framework has helped to maintain competition in the German broadband market

The European regulatory framework has played a key role in the development of Germany’s telecoms market. Germany is the largest LLU market in Europe, with 8.8 million unbundled lines in 2014. Telekom Deutschland (TD) started rolling out VDSL technology in 2006. Before this it requested permission not to be required to provide wholesale access to this network for a three-year period (a so-called ‘regulatory holiday’), on the grounds of the large scale of the investment. This position was initially supported by the German NRA (BNetzA), on the basis that VDSL was a new product and should therefore be free from regulation.

The EC disagreed, issuing a “serious doubts” letter in November 2005, stating that “[w]e insist that the development of the VDSL market in Germany follows the EU rules and that the dominant player will not be given a head start in a monopoly”. BNetzA was forced to review its position: in September 2006 it included bitstream access to VDSL in the wholesale broadband market review. Subsequently, during the spring of 2006, the German government proposed amendments to the Telecommunications act to include specific provisions which more explicitly specified that “emerging markets” should, in principle, be excluded from regulation. These amendments to the law were passed by parliament during 2006 and the amended law came into effect in February 2007.

Within a matter of days, the EC decided to initiate infringement proceedings against Germany relating the emerging markets clause and to refer the case to the European Court of Justice. In 2009, the European Court of Justice confirmed that automatically exempting “emerging markets” from regulation would be incompatible with EU law. TD has since announced plans to start rolling out vectoring technology, enabling it to double VDSL speeds to 100Mbit/s. Consistent with the position expressed by the EC, BNetzA approved the roll-out of vectoring provided that the incumbent or the alternative operator that is deploying vectoring technology grants unbundled access to its competitors or – when SLU is not technically compatible with vectoring – it can refuse to provide unbundled access provided that it offers as a substitute an

73 Words of a spokesman of the then European telecoms commissioner Viviane Reading, reported by the Financial Times on 15 December 2005 in the article ‘Germany forced to alter VDSL exemption’.
appropriate layer-2 bitstream access product.\textsuperscript{78} We understand that TD has yet to launch this layer-2 bitstream product.

The EC added that in order to serve as a substitute for SLU, this kind of offer “should display features which are as close as possible to a physical unbundling product, i.e. it should, in principle, be local, service-agnostic, uncontended in practice and allow for sufficient control of the access connection and the customer premises equipment.”\textsuperscript{79}

In 2013, BNetzA published its decision on vectoring rules after receiving a “green light” from the EC. The decision included the institution of a so-called “vectoring list”,\textsuperscript{80} where the deployment and the access to vectoring by all operators are recorded, and foresaw sanctions on operators in the case of abusive reservation of sub-loops, outstanding deployment of vectoring and failure to make a bitstream product available.\textsuperscript{81}

However, when in June 2015 the EC assessed the German National Broadband Scheme, which included public funding for vectoring in areas with market failure, the EC stated that State aid cannot be used to fund vectoring if it disrupts competition, as “the technology currently does not ensure open access to the network”, adding that “the Commission is therefore concerned that vectoring may have anticompetitive effects”.\textsuperscript{82} Therefore, vectoring can only be funded publicly if either a physical unbundling product or a VULA product approved by the EC is made available. Germany has since announced that it would submit to the EC an access product “capable of granting full access to vectored networks for competitors”.\textsuperscript{83}

In July 2015, BNetzA notified a market analysis for Market 3a to the EC. In this, it included virtual unbundled access to local loops at the MDF (or a point closer to the end user) in the market definition, but stated that there were currently no plans for making such a product available. The EC, in its response, invited BNetzA to make appropriate remedies available in the notified markets without undue delay.\textsuperscript{84}

5.2.2 Regulation has not stopped investments in NGA: both the incumbent and alternative operators have been expanding their NGA networks

Following BNetzA’s decision to mandate wholesale access to TD’s NGA network, TD has continued to invest heavily in its FTTC/VDSL network. In 2012, it announced investments of

\textsuperscript{78} Ibid, p.11–12 and p. 127.
\textsuperscript{79} Ibid, p.11–12 and p. 127.
\textsuperscript{82} Source: http://ec.europa.eu/competition/state_aid/cases/251861/251861_1670916_80_2.pdf.
EUR6 billion between 2013 and 2020 in fibre networks in Germany and in vectoring. According to TD investor relations, its investments have led to an increase in FTTx household coverage to 44% in 2014 (see Figure 5.6); TD plans to expand its NGA footprint further, to reach 80% of households by 2018.

One of the factors which drove TD’s investment in FTTC/VDSL is likely to have been an increase in competitive pressure, coming from both:

- cable operators, which have upgraded their legacy cable infrastructure to DOCSIS 3.0 in order to provide fast (and sometimes ultrafast) broadband services
- alternative operators, which have started rolling out their own infrastructure as well as providing NGA services through TD’s network:
  - Vodafone rolled out VDSL-CO in 750 exchanges between 2009 and 2011, and later expanded the VDSL network through a wholesale agreement with TD. Vodafone has subsequently acquired Germany’s largest cable operator, Kabel Deutschland, and intends to switch its users onto that network in the areas where it is present.
  - United Internet (1&1) controls a proprietary fibre infrastructure which it acquired as part of its acquisition of Versatel in 2014; it is using this in combination with wholesale access to TD’s network.

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87 That is, VDSL from the central office (or local exchange) rather than from a cabinet.
89 Kabel Deutschland’s cable-TV network passes 15.3 million homes (out of 40.4 million total households) in 13 of the 16 German federal states. Source: http://vodafone.com/content/dam/vodafone/media/group_press_releases/kd/Kabel-Presentation.pdf.
Deutsche Glasfaser, owned by Reggeborgh (a Dutch investment firm which founded Reggefiber (see the Netherlands case study in Section 5.4)) and private equity company KKR, is building an FTTH network in suburban and rural areas of Germany and recently announced a growth programme in which EUR450 million will be invested in expanding its infrastructure.  

local and regional players such as M-net in Bavaria and NetCologne and regional players like EWE Tel and Thuringer NetKom (most of which are represented by the association BREKO) have been deploying FTTH/B and more recently also FTTC/VDSL (in areas outside TD’s footprint). BREKO has reported that 76% of the German FTTH/B expansion in 2014 was undertaken by these regional network operators, which by the end of 2014 covered 3.3 million households and had achieved high coverage in specific regions/cities.

In summary, the regulation of NGA does not appear to have inhibited investments in NGA networks by TD or its competitors in Germany, as coverage has increased over time and there has been rapid growth in the number of FTTx connections (see Figure 5.7). However, TD still plays a very important role in the German FTTx market, as it has the majority of retail connections and 75% of the market relies on its infrastructure (see Figure 5.8).

Figure 5.7: FTTx connections in Germany [Source: Analysys Mason, 2015]

Figure 5.8: FTTx connections by operator in Germany in 2014 [Source: Analysys Mason Research, Telekom Deutschland, 2015]

Source: http://media.kkr.com/media/media_releasedetail.cfm?ReleaseID=922707

In 2013, around 90% of BREKO members’ VDSL-enabled cabinets were located outside urban areas, compared with around 5% for TD. Source: BREKO, Broadband Study 2013.

For example, in Q1 2015 M-NET covered more than 50% of the households in Bavaria with FTTB or FTTH; see https://www.telegeography.com/products/commsupdate/articles/2014/11/05/m-net-boosts-ftth-speeds-to-300mbps/.

5.3 Case study: Italy

5.3.1 Italy is catching up quickly with the rest of Europe in terms of FTTx coverage; alternative operators are playing a key role in this development and regulation has facilitated the process

Italy lags behind the European average in terms of NGA infrastructure, as shown in Figure 5.9.\textsuperscript{95} However, in the last two years, operators in Italy have been expanding their NGA networks, mainly through deployment of FTTC, and the gap relative to the rest of Europe is narrowing rapidly.

![Figure 5.9: FTTx household coverage in Italy and the EU28](Source: Analysys Mason Research,\textsuperscript{96} 2015]

Italian NGA infrastructure is entirely based on FTTx, as there is no cable infrastructure in the country. Telecom Italia has the largest FTTx coverage in Italy but its expansion has been strongly influenced by:

- alternative operators, initially Fastweb and then also Vodafone, which have deployed their own FTTC networks (based on access to Telecom Italia’s sub-loops), and
- the threat of expansion from wholesale FTTH operator Metroweb (currently active in Milan and Bologna).

Italy is unique in that some areas have three parallel FTTC networks.\textsuperscript{97} The coverage of the three networks differs, but all three operators have announced plans to continue extending their

\textsuperscript{95} Italy is one of only two European countries (the other being Greece) that does not have any cable-TV network. This has also contributed to the delay in NGA coverage.

\textsuperscript{96} Source: Analysys Mason Research (2015), *FTTx roll-out and capex worldwide: forecasts and analysis 2015–2020*.

\textsuperscript{97} Each of the operators has deployed its own mini-DSLAMs, either its own cabinets or co-located in Telecom Italia cabinets and then uses sub-loop access to Telecom Italia’s copper network.
coverage (see Figure 5.10). Alternative operators Fastweb and Vodafone are both currently investing heavily, with capex amounting to at least 30% of their revenue.

<table>
<thead>
<tr>
<th>FTTC coverage (Q2 2015)</th>
<th>Telecom Italia</th>
<th>Fastweb</th>
<th>Vodafone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planned coverage</td>
<td>37%</td>
<td>~22%</td>
<td>5%</td>
</tr>
<tr>
<td></td>
<td>75% (2017)</td>
<td>30% (2016)</td>
<td>25% (2017)</td>
</tr>
<tr>
<td>Capex as a % of revenue (2014)</td>
<td>14%</td>
<td>34%</td>
<td>30%</td>
</tr>
</tbody>
</table>

Note: The coverage values in the table only refer to FTTC and exclude FTTH. Fastweb has its own FTTH network (partially based on the Metroweb networks), mainly in the Milan area but also in the central parts of some other cities. Telecom Italia and Vodafone offer FTTH in Milan (using the Metroweb network), while Vodafone also offers FTTH in parts of Bologna (over Metroweb).

Figure 5.10: FTTC network coverage (of households) in Italy by operator [Source: operator press releases and investor relations, 2015]

Figure 5.11 shows how incumbent Telecom Italia’s FTTC deployment has taken place following announcements from Fastweb and Metroweb.

Figure 5.11: Timeline of NGA investments in Italy [Source: Analysys Mason, 2015]

Note: Excludes investment in FTTH by Fastweb and Metroweb in the early 2000s.

The deployment of FTTC has been favoured by SMP access regulation imposed on Telecom Italia:

- it has been required to provide SLU since 200198
- duct access to new and existing infrastructure was introduced in 2009 following Telecom Italia’s Open Access undertakings99
- access to dark fibre from the local exchange to the cabinet was mandated in 2012100

an obligation to offer access to and co-location in cabinets built for FTTC was also introduced in 2013.\(^{101}\)

In 2013, AGCOM decided that SLU cannot be withdrawn even when vectoring is implemented, as new multi-operator vectoring (MOV) will allow coordination between the DSLAMs of different operators, meaning that vectoring will not be incompatible with SLU. The review of Market 3a, recently notified by AGCOM to the EC, foresees an obligation for any operator deploying vectoring to implement a MOV architecture, based on AGCOM’s technical specifications, this is intended to allow coordination and interoperability among vectoring systems.\(^{102}\) AGCOM is currently in the process of finalising technical and operational guidelines for MOV in partnership with network operators and vendors.\(^{103}\)

In 2012, Telecom Italia and Fastweb signed an Memorandum of Understanding (MoU) to collaborate on the deployment of FTTC networks in order to identify opportunities for cost savings, with the possibility of sharing infrastructure deployment costs.\(^{104}\) In May 2015, the two companies also signed an MoU with vendors Huawei and Alcatel-Lucent (valid until 2016) to experiment and implement enhanced VDSL solutions to deliver 100Mbit/s and higher bandwidths through FTTC.\(^{105}\)

During 2015, Vodafone and Wind have signed a letter of intent with Metroweb’s shareholders F2i and FSI for an expansion of the Metroweb FTTH infrastructure.\(^{106}\)

5.3.2 Alternative operators are offering FTTH and FTTC at lower prices than the incumbent and provide more nominal bandwidth than Telecom Italia

Fastweb and Vodafone offer FTTH and FTTC subscriptions at significantly lower prices than Telecom Italia (see Figure 5.12). Telecom Italia did reduce its prices during 2014, but still charges more for NGA subscriptions than either Vodafone or Fastweb. Telecom Italia also offers lower speeds (50Mbit/s) than alternative operators (100 or 300Mbit/s) for its cheapest dual-play FTTH offer, but is still more expensive.


\(^{103}\) Source: AGCOM, attachment D to the decision 238/13/CONS, available at http://www.agcom.it/documents/10179/540015/Allegato+21-03-2013+8/ee8b0bc3-9948-49cf-99a3-d7c48c3502d?version=1.0.


\(^{106}\) Source: http://www.f2isgr.it/f2isgr/allegati/comunicati_stampa/2015_05_29_CS_F2I_METROWEB_FIBRA_OTTICA.pdf.
5.3.3 As a result, Fastweb has achieved a higher rate of FTTC take-up than the incumbent

The competitive pricing and higher bandwidths offered by Fastweb have allowed it to outperform Telecom Italia in terms of FTTC take-up of passed premises (see Figure 5.14).
5.4 Case study: the Netherlands

5.4.1 Regulation has not discouraged investment in NGA networks: coverage of FTTH and FTTC/VDSL is higher than the EU average

The fixed broadband market in the Netherlands has historically been led by the incumbent, KPN (43% retail market share in 2014\(^\text{107}\)) and two non-overlapping cable operators, Ziggo and Liberty Global (UPC), which merged in 2014\(^\text{108}\) and now have a combined subscriber market share of 44%.\(^\text{107}\) The remaining 13% is split between Tele2 (~5%\(^\text{109}\)) and other smaller operators, including Online and Vodafone (all below 2%).

In the Netherlands, fibre-based retail products were developed on a small scale (e.g. OnsNet in Nuenen and Amsterdam CityNet\(^\text{110}\)) from around 2004–2006. During 2006–2009, Reggefiber (the main private investor in Amsterdam CityNet) began rolling out FTTH in multiple other cities and towns. Reggefiber’s development accelerated in 2009 after the regulator, the Netherlands Authority for Consumers and Markets (ACM),\(^\text{111}\) approved KPN’s acquisition of a share in

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\(^\text{107}\) Source: Analysys Mason Research, *Telecoms Market Matrix: Western Europe 4Q 2014*.
\(^\text{111}\) Telecoms regulation in the Netherlands was previously overseen by the Independent Post Telecommunications Authority (OPTA). In April 2013, OPTA merged with the Netherlands Competition Authority (NMa) to create the current regulatory body, the ACM. This report refers to both organisations as “ACM”. 
Reggefiber in December 2008, making Reggefiber a joint venture between KPN and Reggeborgh, a private investment company.\textsuperscript{112} In October 2014, a full merger was approved between KPN and Reggefiber.\textsuperscript{113} KPN also operates a VDSL network – from the exchange and from street cabinets – which is complementary to its FTTH footprint.\textsuperscript{114} Reggefiber has been subject to ex-ante regulation since the Market 4 review of 2008 addressed ODF-FTTH.\textsuperscript{115} At present, both KPN networks are subject to ex-ante remedies (including non-discrimination, transparency and tariff obligations):

- *KPN/Reggefiber FTTH network:* open wholesale access based on optical distribution frame (ODF) access\textsuperscript{116} (‘unbundled fibre’) has been provided since roll-out began, in combination with the provision of co-location and backhaul services.\textsuperscript{117} The price regulation is based on a discounted cashflow (DCF) model which takes into account the business case of KPN/Reggefiber; in its July 2015 draft market analysis\textsuperscript{118} ACM suggested retaining this approach to price regulation

- *KPN copper and FTTC/VDSL network:* access has historically been made available through LLU, with SLU also available but not achieving material take-up. In its July 2015 draft market analysis, ACM proposed to phase out SLU and impose VULA regulation instead. The lack of SLU take-up in the Netherlands has been due to the limited scale of alternative operators combined with the design of KPN’s SLU network. On 28 July 2015, ACM accepted the agreements reached between KPN and each of Tele2/Online/Vodafone to use VULA from metro-core locations in lieu of SLU and did not go into detail on the tariff setting or the content of a reference offer.\textsuperscript{119}

FTTH and FTTC/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 the end of 2010 (see Figure 5.15); in 2014, KPN’s VDSL network passed more than 51% of households\textsuperscript{120} and its

\begin{itemize}
\item KPN reportedly covered of 75% of households with 40Mbit/s services in 2014, based on the sum its of FTTH and VDSL coverage. Source: http://corporate.kpn.com/investor-relations/publications.htm.
\item Since 2011 the NRA has considered wholesale access to business fibre networks (ODF-FTTO) to be a separate market from ODF-FTTH access, due to differences in roll-out, limited overlap, considerable price difference and a lack of supply-side substitution. In 2012 it found that KPN also had SMP in this market, and imposed obligations of ODF access, non-discrimination, transparency and tariff regulation. This decision was however suspended in 2013 and annulled in 2015 by the Administrative High Court for Trade and Industry (CBb), the highest court in in the Netherlands on matters of antitrust law.
\item ODF services give passive access to third parties from the ODF to end users over the incumbent’s fibre-optic network.
\item See ACM 2015 draft market analysis, available in Dutch at https://www.acm.nl/nl/publicaties/publicatie/14504/Consultatie-nieuw-marktanalysebesluit-ontbundelde-toegang
\item See ACM announcement and related correspondence, available in Dutch at. https://www.acm.nl/nl/publicaties/publicatie/14545/Aanbod-KPN-virtuele-ontbundelde-toegang-kopernetwerk-VULA/
\item Source: Analysys Mason Research (2015), *FTTx roll-out and capex worldwide: forecasts and analysis 2015–2020.*
\end{itemize}
FTTH network (through Reggefiber) had around 27% coverage. Cable coverage was 91% of premises in 2014.

FTTH deployment initiatives have also been carried out by smaller operators (such as Caiway), as well as on a limited scale by municipal entities.

Figure 5.15: NGA premises passed as a percentage of total premises in the Netherlands, by technology [Source: Analysys Mason Research121] The relatively small market share of alternative operators could be due to the high coverage and strength of the cable operators

Despite the ex-ante regulation of access to the traditional copper, FTTC and FTTH networks of KPN, alternative operators have a small share of the retail broadband market. This could be due to market-specific conditions such as the strength of cable operators, which have historically covered more than 90% of households and in 2014 had a 44% market share (see Figure 5.16). It should be noted that ACM has considered two fixed networks to be insufficient, since it could lead to coordinated behaviour between players and less investment and innovation.122 Vodafone remains optimistic about the retail broadband market; for example, it has stated that it “expect[s] competition from cable operators and ‘no frills’ players to increase [...] We also believe that we will be able to acquire a share of the landline market in both the business and consumer segments.”123

121 Source: Ibid
In its draft market analysis in late 2014, ACM found that there was a risk that KPN and UPC/Ziggo could hold joint SMP in the retail fixed Internet access market, although only KPN was found to have SMP in the related wholesale market. If KPN’s SMP designation were to be lifted, this would remove the ex-ante regulatory constraints on the incumbent in that market. At the end of May 2015, BEREC stated that it “is of the opinion that the Commission’s doubts on the absence of a proper market definition exercise and of an incorrect SMP analysis as a result of the exclusion of cable from the relevant wholesale market are not justified.” BEREC did not comment on the risk of joint dominance. ACM subsequently withdrew its analysis and made a clear statement of its intentions regarding resubmission of a modified analysis by the end of 2015. A draft new market analysis was put to national public consultation in July 2015.

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5.5 Case study: Portugal

5.5.1 Portugal has extensive FTTH coverage and limited regulation and so is often held up as an example of the benefits of deregulation

At first sight Portugal might appear as a case where limited NGA regulation has led to investments. There is currently no FTTH unbundling requirement and, although active wholesale access to Portugal Telecom’s FTTH network was proposed in draft form in 2012, it has not been finalised. The incumbent operator, Portugal Telecom (PT), invested heavily in FTTH between 2009 and 2012, reaching higher coverage than in most other EU Member States.

However, it is important to note that alternative operators were the first to invest in FTTH:

- SonaeCom (subsequently re-named Optimus) was the first operator to begin deploying FTTH in 2008, in Lisbon and Porto. It exceeded 200 000 homes passed at the end of 2009 and has now reached an estimated total footprint of 400 000 homes passed, thanks to an agreement with Vodafone in 2010 under which each operator gives the other access to its FTTH network. In 2013, Optimus merged with cable operator Zon to form Zon Optimus, which uses the NOS brand.

- Vodafone has expanded its FTTH footprint rapidly in the last two years and is closing the gap with the incumbent (see Figure 5.17). In addition, PT and Vodafone signed an agreement in June 2014 under which each operator is intended to give the other access to 450 000 households covered by its network.

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130 Source: Anacom, Consultation on the draft decision on the review of the analysis of wholesale markets of network infrastructure access (market 4) and broadband access (market 5), 2012, available at http://www.anacom.pt/render.jsp?contentId=1117155&languageId=1#.VYfKl_mqqkp.

131 Source: SonaeCom 2009 annual report.

132 Source: TeleGeography Portugal country profile.

Figure 5.17: FTTH coverage in Portugal [Source: Analysys Mason based on Vodafone, Portugal Telecom and Analysys Mason Research data, 2015]

Figure 5.18 shows that take-up of FTTH in Portugal is increasing but remains lower than both cable (which has also been increasing) and DSL (which is relatively flat). Overall, broadband ARPU has declined significantly since 2009; see Figure 5.19. Fibre and DSL ARPUs are very similar, but cable broadband ARPU is lower.

Figure 5.18: Retail subscribers by technology and broadband penetration in Portugal [Source: Analysys Mason Research, Core forecasts, 2015]

Note: No FTTH coverage data is available for NOS.

5.5.2 Country-specific conditions have made FTTH roll-out in Portugal cheap compared to other European countries

The rapid deployment of FTTH (initiated by Sonaeom) by the incumbent and by Vodafone can be explained by the low cost per house passed. In 2012, PT claimed that the cost per premises passed with FTTH was under EUR200, compared with Analysys Mason’s estimate for the average across Western Europe of around EUR700–800.

The lower level of costs is due to a series of features specific to PT’s infrastructure and to Portugal in general:

- The possibility of re-using ducts, which significantly reduces the cost of deploying fibre:
  - a key advantage has been the excellent state of duct systems in Portugal, which ensures that almost no civil works are needed: PT estimates that less than 5% of its FTTH capex is on new civil infrastructure
  - in many other European countries ducts are in a much poorer state and/or there are no ducts in the secondary access network; as a result, civil works can represent between 46% and 70% of FTTH capex.136

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• Favourable population distribution and labour costs
  – PT has stated that 46% FTTH coverage represents areas that generate 74% of Portugal’s GDP.\(^{137}\)
  – PT also cites the comparatively low cost of labour in Portugal.

### 5.5.3 The lack of up-to-date ex-ante regulation of fixed fibre access networks has been counterbalanced by effective access to ducts and in-building segments

It is a fact that on PT’s NGA network there is no regulated access to ‘traditional’ wholesale products such as fibre unbundling, VULA or other wholesale broadband access.\(^{138}\) There are, however, other regulatory measures / access obligations in place that, at least to some extent, provide relevant regulated wholesale access and that have been instrumental in allowing alternative operators to deploy their own networks:

• Effective cost-oriented duct access exists:
  – there is regulation that requires PT to provide access to its passive civil infrastructure, which it does through its Reference Poles Access Offer\(^{139}\) (RPAO) and duct offer, Oferta de Referência de Acesso a Condutas (ORAC)\(^{140}\) which was already implemented in 2004. In February 2004, the EU regulatory framework for electronic communications was transposed into national Portuguese law, and some further points not included in the EU framework (such as infrastructure access) were introduced. In May 2004, the NRA, Anacom, initiated a public consultation on the terms and conditions for this access.\(^{141}\)
  – as stated above, the duct network is highly capillary and in good shape compared to other European countries, and so the access obligation is effective in encouraging alternative operator investment.

• “Vertical” in-building access is also regulated in Portugal, with the sharing of in-building wiring and in-building deployment costs mandated by law:

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\(^{138}\) VULA and bitstream products were proposed in the draft Market 5 review in 2012, but have not been finalised. See ANACOM, Consultation on the draft decision on the review of the analysis of wholesale markets of network infrastructure access (market 4) and broadband access (market 5), 2012, available at http://www.anacom.pt/render.jsp?contentId=1117155&languageId=1#.VYfKl_mqqkp.


Ref: 2004207-386
in new buildings, building owners must install copper pair, coaxial cable and fibre, and operators share the cost of infrastructure.

In old buildings, the first fibre operator has to install at least two fibres per home and must grant access to other operators, and the costs of the infrastructure are shared among the operators which reach the building (with the second operator paying 50%, the third 33%, and so on).

In conclusion, evidence shows that FTTH deployment is cheaper in Portugal than in many other European countries. While there is currently no regulated fibre unbundling or bitstream on the incumbent’s fibre network, there is effective regulation for granting access to the duct system, which is in a good state and, in combination with the other country-specific factors discussed above, makes FTTH deployment by alternative operators possible. Since these conditions do not exist in many other European countries, it is difficult to draw any conclusions regarding the fit of the Portuguese model to other countries.

It is also worth noting that Sonaecom, the major xDSL-based alternative operator at the time, announced that it would deploy its own FTTH network (which it built alone in PT ducts before the FTTH swap with Vodafone) before the NRA adopted its 2009 decision on geographic segmentation / deregulation of the (copper) wholesale broadband access market. The deployments of FTTH networks therefore do not seem to have been triggered by the (geographic) de-regulation of the copper networks.

5.6 Key policy messages for policy makers

A number of conclusions can be drawn from the above case studies:

- All examined countries demonstrate that ex-ante wholesale access regulation has not hindered investments in NGA by the incumbents, in fact in many cases alternative operators (using legacy and NGA-specific regulated wholesale inputs) appear to have driven incumbents to invest.

- The existence of effective NGA wholesale inputs facilitates investment by alternative operators in NGA networks. These inputs may take the form of SLU (Italy, Germany), in-building wiring (Portugal and France) or effective duct access (Portugal and partly Italy and France (the latter through its co-investment programme)). When alternative operators have

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144 Source: Ibid.
145 ANACOM adopted a draft decision on 26 June 2008 and a final decision on 14 January 2009 in which it chose to deregulate the WBA market in competitive areas (184 MDF areas which accounted for 61% of total broadband accesses) where it did not find any SMP. Sonaecom announced its NGA plans on 20 February 2008. See http://www.anacom.pt/render.jsp?categoryId=3767558&tab=&year=2008&month= and http://other.static.sonae.com/2014/07/31/1404956f53793a45f8f725f2b84816b52bd490ef/1404956f53793a45f8f725f2b84816b52bd490ef.pdf?download=1.
been the first to invest in NGA networks, incumbents have then responded with their own investment plans.

- Care should be taken when drawing conclusions about the benefits of deregulation and/or forbearance from regulation of NGA wholesale access: Portugal is often cited as a potential example of how deregulation and/or regulatory forbearance leads to NGA investment, but it appears that other factors have played an important role, particularly:
  
  - the existence of a **high-quality and capillary duct network** that can be re-used for the deployment of FTTx reducing the amount of civil works required (which is one of the main cost drivers for the deployment of NGA networks) and other country-specific characteristics (e.g. concentrated population and low labour costs) that lower the deployment costs
  
  - fit-for-purpose regulated access to this duct network (as well as e.g. in-building wiring access regulation), ensuring that alternative operators can deploy their own networks.

- **Alternative operators play an important role in the commercialisation of NGA products** (in terms of design of suitable offers and marketing of those offers), thereby leading to increasing take-up. This impact is both direct (they attract subscribers through attractive retail offers) and indirect (incumbents will react to the retail offers of alternative operators by launching their own more-attractive offers).

- ** Appropriately designed co-investment plans can be an effective tool for combining competition and NGA investments**, by reducing the deployment costs for operators.
6 Different regulatory environments have led to different outcomes

In this section we compare the European broadband market (including NGA) with that in four other international markets – the USA, Japan, New Zealand and Singapore. The purpose of this comparison is to understand whether there are any lessons that can be learned from these markets that can influence the European regulatory framework, with the objective of improving coverage and take-up of NGA networks and fast broadband services.

This section is structured into three sub-sections:

- an overview of the regulatory regimes in the four international markets, and a comparison with the European framework (Section 6.1)
- a comparison of the performance of these markets (Section 6.2)
- the key policy messages that emerge from these comparisons (Section 0).

6.1 Different regulatory regimes

As discussed in Section 4, the focus of the European regulatory framework has been on creating a competitive environment in the telecoms market by imposing ex-ante remedies on operators which are found to have SMP in relevant markets susceptible to ex-ante regulation. This has created a situation where alternative operators compete with incumbent (and cable) operators on services, using either their own networks, (passive or active) wholesale access to the access networks of the dominant operators, or a combination of the two.

The four non-European markets selected for this comparison use different approaches for regulating fixed broadband access. In summary:

- the USA has chosen not to apply any access regulation for broadband products, and so competition is only between different infrastructure operators
- Japan has implemented ex-ante measures to grant access to the incumbent’s network and at the same time has committed public funds to stimulate investment in NGA networks
- New Zealand has in the recent past shifted from an approach based on ex-post competition law to one that is more like the European approach; most recently it has implemented an ambitious public plan for FTTH roll-out which has resulted in a structural separation of the incumbent
- Singapore has deployed a national NGA network, using a GPON FTTH architecture, on which there are passive access obligations146 in order to promote competition. Again, a form of structural separation is used.

146 In many ways, these passive access obligations on the PON network are very similar to local loop unbundling.
Figure 6.1 provides a summary of the regulatory framework in the EU and those in the four countries discussed above, and compares the wholesale access measures that have been implemented in each geography.

*Figure 6.1: Summary of regulatory features [Source: Analysys Mason, 2015]*

<table>
<thead>
<tr>
<th>Geography</th>
<th>Regulatory framework</th>
<th>Wholesale access</th>
<th>Copper</th>
<th>Fibre</th>
</tr>
</thead>
</table>
| EU        | • Strong ex-ante regulation  
            • Combination of infrastructure-based competition and competition through access to the infrastructure of SMP operators  
            • Functional separation in the UK and voluntary structural separation in the Czech Republic  
            • State aid for NGA deployments only in areas where there is considered to be market failure | Yes, passive and active access remedies where operators have SMP | Yes, passive and active access remedies where operators have SMP |
| USA       | • Weak ex-ante regulation  
            • Infrastructure-based competition  
            • No structural or functional separation  
            • State funding for broadband deployment in rural areas | Restricted: no line sharing, no regulated active products | No |
| Japan     | • Ex-ante regulation  
            • Competition through access to the infrastructure of SMP operators  
            • No structural separation  
            • Public funds and subsidies for fibre networks | Yes, active and passive (co-location) | Yes, unbundling since 2001 |
| New Zealand | • Evolution from ex-post to ex-ante regulation  
            • Competition mostly through access to the infrastructure of SMP operators  
            • Structural separation of the FTTH providers, including the former incumbent’s copper network  
            • Publicly subsidised FTTH roll-out plan | Yes, active (UBA) and passive (UCLL) from 2006 | Yes, prices for the period up to 2020 set by contract; no unbundling of UFB for residential customers until 2020 |
| Singapore | • Ex-ante regulation  
            • Competition through access to the infrastructure of dominant operator  
            • National NGA network, publicly funded and with structural separation | Yes, passive (LLU) | Yes, access to national passive infrastructure, including to GPON, and active wholesale products |

Below we provide more details on each of these four jurisdictions.
6.1.1 USA

In the USA, the telecoms market is regulated at federal level by the Federal Communication Commission (FCC), whose objectives include “promoting competition, innovation and investment in broadband services and facilities” and “[s]upporting the nation’s economy by ensuring an appropriate competitive framework for the unfolding of the communications revolution.”

The Telecommunications Act of 1996 was expected to generate a competitive and dynamic environment in the broadband industry, by introducing unbundling obligations for the so-called incumbent local exchange carriers (ILECs). Between 1996 and 1999, the USA had a regulatory environment that was, for fixed access networks, somewhat similar to the current one in the EU.

However, in the early 2000s the USA took a different path, mainly on the issue of LLU. The EC (see Section 3) focused on stimulating competition via LLU (and other ways to provide competitive services using the incumbents’ access networks). In contrast, the USA moved towards de-regulation, relying mainly on infrastructure-based competition between cable networks and incumbent FTTH or FTTC/VDSL networks. This was due to a number of regulatory and legal developments.

- Unbundling obligations for the ILECs set out in the 1996 Telecommunications Act were progressively removed following legal decisions by the Supreme Court in 1999 and the DC Circuit in 2002 and 2004, and a 2003 FCC policy, the Triennial Review Order which removed the unbundling requirement for FTTH (and in 2004 was extended to cover FTTC). Finally, in 2005 the FCC amended these obligations and removed the requirement for ILECs to unbundle FTTH as well as other services including line sharing and voice origination (known as UNE-P).

- In 2005, the Supreme Court ruled in favour of the FCC’s definition of Internet access services by cable operators as “information services” rather than “telecommunications services”, and therefore cable operators did not have to comply with the 1996 Telecommunications Act in areas such as service standards and leasing of lines to competitors.

• Also in 2005, the FCC extended this definition of Internet access services to DSL services, and in effect de-regulated them.

The result of these developments has been a weakening of ex-ante regulation, and a reliance upon end-to-end facilities-based competition between cable providers (which have upgraded their infrastructure to provide high-speed broadband) and the ILECs (which rely mainly on copper but have begun progressively rolling out their own FTTH and FTTC networks).

6.1.2 Japan

Japan was one of the first countries to introduce competition in the telecoms sector: in 1985 the Telecommunications Business Law paved the way for market liberalisation through the establishment of facilities-based licences for the provision of telecoms services.

The Telecommunications Business Law was amended several times to support the liberalisation of the fixed broadband market. LLU was imposed on the incumbent Nippon Telegraph and Telephone (NTT) in 1997, and restrictions on foreign-capital investment in telecoms companies were lifted in 1998. The regulatory framework was further reviewed in 2001, when a three-year liberalisation plan was introduced to encourage competition in the telecoms sector and promote “the IT revolution”:

• unbundling of fibre infrastructure was mandated
• the NTT structure was changed, with the split of landline operations into NTT East and NTT West
• a set of measures was implemented, aimed at “drastic deregulation for the carriers who are not dominant in the market”, such as liberalisation of charges and tariffs, and
• financial incentives were introduced for operators that were deploying fibre infrastructure: through the Development Bank of Japan the government offered no-/low-interest financing, and provided tax breaks and guarantee of liabilities to operators investing in fibre networks.

These policies have resulted in an extensive roll-out of FTTH and FTTB networks by the incumbent and by several utility companies, such as TEPCO, Chubu Electric Power, Energia and Kansai Electric Power Company.

This has also generated competition on NGA products in the retail market, where alternative operators such as SoftBank (and KDDI) access the FTTB/H networks of NTT and utility


156 Tokyo Electric Power Company, which in 2006 integrated its network with the one of KDDI.

companies. In the last two years some regional broadband operators, such as Tonami, have also been upgrading their legacy cable infrastructure to FTTH, given the increasing popularity of fibre-based services.

In summary, the Japanese regulatory environment grants access to the incumbent’s networks to competitors through ex-ante regulation. This approach favours competition in a similar way to the European model; furthermore, NGA network deployments have been stimulated directly using financial incentives.

6.1.3 New Zealand

New Zealand deregulated its telecoms sector between 1987 and 1989, and privatised its incumbent telecoms operator, Telecom New Zealand (Telecom), in 1990. The initial regulatory framework in New Zealand was characterised by an approach that relied on:

- general competition law to prevent anti-competitive behaviour in the telecoms market
- information disclosure requirements on Telecom (much later rebranded as Spark in August 2014)
- a threat of changes to the regulatory regime, e.g. the introduction of price regulation if Telecom abused its market power.

Following lengthy legal proceedings to establish interconnection prices and a general dissatisfaction with the ex-post regulatory approach, the government introduced a new regulatory regime through the passing of the Telecommunications Act of 2001. This introduced sector-specific regulation and established a Telecommunications Commissioner with the powers to “resolve disputes between industry players, [...] and set prices and access obligations for ‘designated’ services”.

Following concerns over a gap in, among other measures, broadband take-up and pricing between New Zealand and leading OECD countries, the government of New Zealand put increasing regulatory pressure on Telecom, requiring LLU and SLU access to the incumbent’s network and unbundled bitstream access (UBA) in May 2006, by means of the 2006 Telecommunications Amendment Act. As a result, in June 2006 the company voluntarily decided to divide its

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159 Source: TeleGeography GlobalComms database, Japan country information, retrieved in July 2015.
operations into separate units for retail, wholesale and fixed networks; in European terms this was a functional separation. At the same time, Telecom also undertook a substantial programme of investment in FTTC to support both VDSL and long-reach ADSL services.

After the National Party won the general election in November 2008, it launched New Zealand’s Ultra Fast Broadband (UFB) programme, the deployment of which started in 2010. The objective was to bring an FTTH network offering ultra-fast broadband to 75% of the population by 2020. The government committed NZD1.5 billion (around EUR0.9 billion) of public funds to the programme; the detailed investment mechanisms used vary among the local fibre companies (LFCs).

The state’s involvement in the UFB initiative is through a public–private partnership, via the entity Crown Fibre Holdings (CFH). CFH is responsible for managing the government’s investment in the fibre network and for running contestable partner selection process in the 33 candidate coverage areas for the UFB initiative. Under the UFB initiative wholesale prices for active services are set by contracts until 2020. During this period there is no requirement to offer fibre unbundling services for consumers, but fibre unbundling must be offered for business-grade connections. Importantly, CFH funding was only available to wholesale-only providers. To be eligible to receive these funds, Telecom underwent voluntary structural separation and is now made up of two separate companies, Spark (retail services and mobile network) and Chorus (fixed network (copper and fibre)). Not all of the CFH contracts were won by Chorus: several were awarded to local fibre companies operated by electricity distribution utilities. Chorus, the largest telecommunications infrastructure company, is expected to return all funds to CFH by 2036.


Source: Chorus NZ website, Funding the UFB rollout, available at: https://www.chorus.co.nz/ufb


Ref: 2004207-386
New Zealand’s regulatory framework has thus evolved from an approach that relied mainly on competition law to a framework more similar to the European one and focused on promoting competition, where alternative operators can have access to the former incumbent network through wholesale services (in this case, offered by a legally separate entity). Cable-TV networks are relatively under-developed in New Zealand, being available to only around 14% of the population; as a result, competition is highly reliant on wholesale access to Chorus (copper and fibre) and the other LFC networks (fibre).

6.1.4 Singapore

In the second half of the 1990s, the Singaporean telecoms market was progressively liberalised:

- Between 1995 and 1998, the government awarded two more mobile licences, in addition to the one granted to incumbent operator Singtel, and opened the Internet access market to competition
- In 2000, the entire market was opened to competition, including the removal of foreign equity limits\(^\text{174}\)
- By 2001, the country had six broadband access providers, more than 300 Internet service providers and 200 broadband application and services companies.\(^\text{175}\)

The telecoms market was one of the first to be liberalised in the country, and initially this relied exclusively on ex-ante regulation, since Singapore had no national competition enforcement agency until 2005. According to Infocomm Development Authority (IDA), in Singapore there is still “general acceptance that general competition law alone is not sufficient for sectors transiting from a monopolistic to a competitive environment – also needs effective ex ante regulation”.\(^\text{174}\)

Among the stated key regulatory principles, IDA includes the balance between facilities-based and service-based competition, as well as the promotion of effective and sustainable competition. This principle has guided the deployment of the island’s next-generation network: between 2007 and 2008 IDA issued a public tender for the construction of a national fibre network, with the intention of creating a network company that would take charge of the network’s passive infrastructure and an operating company that would be responsible for building and operating the wholesale active infrastructure layer of the network. In total, Singapore’s government has invested around SGD1 billion (approximately EUR0.6 billion) in the nationwide network.\(^\text{176}\)

The network company (passive wholesale provider) contract was awarded to the OpenNet consortium, which was established by four shareholders (including Singtel) in 2008, and then


\(^{175}\) Source: TeleGeography GlobalComms database, Singapore country information, retrieved in July 2015.

acquired by Singtel’s subsidiary NetLink Trust in 2013.177 The operating company (active wholesale provider) contract was awarded to Nucleus Connect, owned by local cable operator StarHub. Nucleus Connect is in charge of providing universal service offers based on bitstream.

Nucleus Connect faces competition, primarily from retail providers buying passive products directly from NetLink Trust, which is the sole provider of passive infrastructure.178 Singtel has been required to reduce its stake in NetLink Trust to below 25% by April 2018, to mitigate concerns over a negative impact on competition.179

Therefore, the Singaporean broadband market uses a competitive model based on three layers:

- passive infrastructure is managed by NetLink Trust (formerly OpenNet)
- active infrastructure, where Nucleus Connect competes with other operators’ wholesale products and self-supply by those operators180
- retail services, with competition among ISPs.

► Passive access to NetLink Trust’s GPON network

An FTTH network generally follows one of two different architectures:

- point-to-point (P2P), where every home is reached by one fibre strand from the local exchange
- point-to-multipoint (P2MP) using PON, where one or more splitters between the local exchange and the premises allow capacity to be shared between the local exchange and the splitter, and dedicated fibre strands connect the (final) splitter to each end-user premises.

Singapore’s national fibre network uses primarily the latter architecture, which allows for the deployment of fewer fibres, but it is more difficult to unbundle as multiple connections are provided over the same fibre in the primary part of the access network. However, NetLink/OpenNet offers dedicated passive access for residential users over PON, which effectively creates separate PONs for each wholesale client (ISP). The wholesale product is illustrated in Figure 6.2 and includes the following:181

- one fibre strand from the fibre distribution frame at the local exchange to a splitter at the building distribution frame for each group of 24 residential premises (i.e. with a 1:24 splitting ratio)
- one dedicated fibre strand from the splitter to a termination point in the residential premises concerned.

177 NetLink Trust is structured as a Singapore Business Trust which limits Singtel’s management control
180 We understand that there are currently at least three active service providers competing with Nucleus Connect.
The wholesale product described above is currently being sold at SGD15 per month (around EUR10) per residential end user and there is no requirement for an access seeker to acquire all 24 connections at a splitter. It is also possible to buy connections with a 1:1 splitting ratio (i.e. P2P) at a higher price.\textsuperscript{182}

This solution allows different operators to have access to passive fibre-based wholesale products where they fully control the quality of service and the product configuration.

![Diagram of FTTH network architecture and unbundling in Singapore](Source: Analysys Mason, 2015)

6.2 Comparison of performance of the four markets

In the following subsections we compare the performance of the broadband markets in Japan, New Zealand, Singapore and the USA in the following areas (as well as providing equivalent data for the EU):

- penetration of broadband services
- competition
- affordability
- NGA coverage and investments
- NGA take-up.

6.2.1 Penetration of broadband services

During the last ten years, the penetration of basic broadband services has increased across all the geographies considered. Very high levels have been achieved in Singapore,\textsuperscript{183} while the level reached in Europe is lower but not too dissimilar to that in New Zealand, Japan and the USA (see Figure 6.3).

\textsuperscript{182} Source: Schedule 15 charges to the NetLinkTrust Interconnection Offer Agreement for Residential End-User Connection, available at [http://www.netlinktrust.com/services/interconnection-access-agreements/ico-agreement/](http://www.netlinktrust.com/services/interconnection-access-agreements/ico-agreement/). A specific offering is available for business connections which are provided with a 1:16 or a 1:1 splitting ratio.

\textsuperscript{183} According to Analysys Mason Research’s *Singapore Telecoms Market Report*, values above 100% for broadband penetration reflect the inclusion of business users as well as residential ones in the total number of subscriptions.
If the USA is compared to individual European countries, however, the picture changes somewhat: 17 of the top 20 countries in the world in terms of broadband penetration (when measured as penetration per population) are European, whereas the USA is ranked 24th, according to the Broadband Commission State of Broadband Report of 2014.184

### 6.2.2 Competition

Liberalisation has led to a reduction in the incumbent’s share of the retail broadband connections market in the EU, Singapore and New Zealand (see Figure 6.4). In Japan we see a different picture: NTT’s (East and West combined) market share increased from 2006 until 2011, but since then it has been losing customers, due to migration from DSL to FTTH/B (which is becoming the preferred choice) and the growth in FWA (which is offered at speeds of up to 40Mbit/s and appears to be popular as an option for tablets and other devices).185 In New Zealand and Japan the incumbent’s retail market share in 2014 was similar to that in Europe, whereas in Singapore it was around 10 percentage points lower.

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In the USA the picture is quite different. There is no nationwide incumbent operator and cable operators typically have a strong position. We have therefore considered the sum of the major ILECs (which typically overlap only to a limited extent) and the two biggest cable operators, Comcast and Time Warner Cable. After declining slowly, the ILECs’ market share stood at around 35% at the end of 2014 – yet adding back only the two largest cable operators (Comcast and Time Warner Cable), which together hold a market share of around 35% in the retail broadband market and of 57% above 25Mbit/s,\(^{187}\) brings the total market share up to nearly 70%. The remainder of the market is made up of small cable and other operators. In 2014, FCC Chairman Tom Wheeler stated that Americans did not have enough choice of broadband providers, especially at higher speeds: indeed, Figure 6.5 shows that the higher the connection speed, the lower the share of households served by more than one provider.\(^{188}\) For example, for services of:

- 25Mbit/s or more, 55% of US households have to rely on a single provider whereas another 19% have no provider at all
- 50Mbit/s or more, the picture looks bleaker: 61% of US households have to rely on a single provider whereas another 21% have no provider at all.

\(^{186}\) Source: Analysys Mason Research (2015), Fixed broadband and voice quarterly metrics 4Q 2014.


Also for 4Mbit/s and 10Mbit/s (essentially basic broadband) 85% and 90% of households have a maximum of two providers to choose from.

![Figure 6.5: Number of operators reaching US households at different speeds [Source: NTIA State Broadband Initiative, 2013]](image)

Cable is the main provider of high-speed services in the USA; for example, within their footprints, Comcast and Time Warner Cable are the only provider of services of 10Mbit/s and above for 29% of residents, and for services of 25Mbit/s and above they are the only provider for 63% of residents.189

### 6.2.3 Affordability

Analysis of revenue from broadband services across the different geographies (see Figure 6.6) indicates that despite the deployment of NGA networks and the upgrade to higher-speed services, broadband ARPU has, since 2009, declined everywhere except the USA, where user spending has steadily increased.190

Figure 6.6 shows that Europeans spend less on broadband services than consumers in the four comparison countries. Multiple studies have shown that this is due to lower prices and not to lower take-up of high-quality services:

- the EC’s *Broadband Internet Access Cost 2014* study (see also Figure 6.7) shows that median retail prices in the EU are:191

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between 15% and 50% lower than those in the USA for standalone, double- and triple-play offers in both the 12–30Mbit/s and 30–100Mbit/s speed ranges

around 25% lower than in Japan for 12–30Mbit/s bundles, while they are around 20% higher for 30–100Mbit/s bundles, as shown in Figure 6.7.

- the Cost of Connectivity Report 2014 by the Open Technology Institute shows that median prices for standalone broadband packages in the EU are lower than those in the USA. The price difference is minimal (2%) for low-bandwidth bundles (4–6Mbit/s) but becomes more relevant for higher-speed bundles where European prices are 23% to 26% lower than the US median price.\(^{192}\)

- the 2015 OECD Digital Economy Outlook reports that a basic-speed basket of fixed broadband is more expensive in the USA than in most European OECD countries and in Japan. Furthermore, the USA is identified as the country with the highest prices (in purchasing power parity (PPP) terms) in the OECD for broadband baskets with speeds higher than 25–30Mbit/s.\(^{193}\)

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6.2.4 NGA coverage and investments

Figure 6.8 shows the current coverage of VDSL, FTTB/H and NGA cable (DOCSIS 3.0 or similar) in each jurisdiction. Figure 6.9 then shows the evolution of total FTTH/B coverage between 2010 and 2014.

Figure 6.8: Current NGA household coverage by technology [Source: Analysys Mason based on Analysys Mason Research data, NTIA and operators’ press releases, 2015]

<table>
<thead>
<tr>
<th>Geography</th>
<th>VDSL</th>
<th>FTTB/H</th>
<th>NGA cable</th>
</tr>
</thead>
<tbody>
<tr>
<td>EU</td>
<td>38%</td>
<td>19%</td>
<td>47%</td>
</tr>
<tr>
<td>USA</td>
<td>37%</td>
<td>17%</td>
<td>83%194</td>
</tr>
<tr>
<td>Japan</td>
<td>-</td>
<td>96%</td>
<td>58%</td>
</tr>
<tr>
<td>Singapore</td>
<td>-</td>
<td>100%</td>
<td>99%</td>
</tr>
<tr>
<td>New Zealand</td>
<td>80%</td>
<td>29%</td>
<td>~14%</td>
</tr>
</tbody>
</table>

Note: In New Zealand the FTTH network is being deployed largely in parallel with an existing VDSL network, and so the technologies overlap. In the USA and the EU, the overlap between VDSL and FTTH is relatively small.

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194 Refers to coverage of cable with speeds of more than 25Mbit/s.
Japan and Singapore are well ahead in terms of FTTP (FTTH/B) deployment, with fibre networks covering nearly all the households. This high coverage has, however, been facilitated by public funds or subsidies. For Singapore, the small size of the country, the relatively modern real estate and the preponderance of high-rise buildings also contribute to the high level of coverage. Both countries also have higher coverage of cable than the EU. In almost all cases cable networks were built only to provide TV services, and the upgrade to NGA was done through the implementation of DOCSIS technologies at a relatively low incremental cost (compared to FTTH network deployment).

New Zealand is catching up thanks to its publicly funded FTTH-based UFB programme, while the FTTC/VDSL network has wide coverage but provides broadband services at a lower speed (from 15 to 70Mbit/s), depending on loop length. The USA and the EU (in aggregate) have similar levels of FTTH/B coverage. The biggest difference between the EU (as a whole) and the USA is the extent of cable coverage. In both the USA and the EU cable access networks were mainly built before DSL and FTTx networks were implemented. In total, cable covers nearly 90% of households in the USA but coverage is only 83% for >25Mbit/s connections and around 60% for >100Mbit/s. In the EU, NGA coverage through cable reaches 47% of households, with a wide variation between 0% (Italy and Greece do not have any cable network) and 100% in some countries like the UK and Sweden.

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198 Sources: NTIA, National Broadband Map has Helped Chart Broadband Evolution, 2015, available at http://www.ntia.doc.gov/blog/2015/national-broadband-map-has-helped-chart-broadband-evolution. One reason may be that rural cable networks are not so easy to upgrade to high speed Internet.
not have any cable network at all) and coverage similar to the USA in countries such as Belgium (90%) and the Netherlands (95%).

6.2.5 NGA take-up

As shown in Figure 6.11 below, the percentage of connections above 30Mbit/s is higher in the USA, Japan and Singapore than in the EU. The EU is, however, ahead of New Zealand, despite the higher NGA coverage in New Zealand. This is likely explained by the fact that NGA deployments in New Zealand are very recent and highlights that time is required to reach high take-up levels. The EU is also ahead of the USA on take-up of connections with speeds higher than 100Mbit/s.

A comparison of Figure 6.11 (latest available speed distribution) with Figure 6.10 (with 2008 data) also highlights how Japan and Singapore have a long history of being ahead of the EU, as shown in the two figures below.

*Figure 6.10: Connections split by bandwidth, 2008*
[Source: Analysys Mason based on Ofcom, the EC and Statistics New Zealand, 2015]

*Figure 6.11: Connections split by bandwidth, 2014 for the EU and New Zealand, 2013 for the rest*
[Source: Analysys Mason based on Ofcom, the EC and Statistics New Zealand, 2015]

<table>
<thead>
<tr>
<th></th>
<th>&lt;30Mbit/s</th>
<th>30-100Mbit/s</th>
<th>≥100Mbit/s</th>
</tr>
</thead>
<tbody>
<tr>
<td>EU26</td>
<td>16%</td>
<td>51%</td>
<td>2%</td>
</tr>
<tr>
<td>USA</td>
<td>23%</td>
<td>51%</td>
<td>2%</td>
</tr>
<tr>
<td>Japan</td>
<td>16%</td>
<td>51%</td>
<td>2%</td>
</tr>
<tr>
<td>New Zealand</td>
<td>2%</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Singapore</td>
<td>21%</td>
<td>44%</td>
<td>37%</td>
</tr>
</tbody>
</table>

Note: Bandwidth splits are 24Mbit/s and 100Mbit/s for New Zealand, and 25Mbit/s and 100Mbit/s for the USA.
6.3 Key policy messages for policy makers

The following key messages can be drawn from the analysis presented above:

- There are cases outside the EU where NGA networks are subject to ex-ante regulation. These include countries with high coverage and penetration such as Japan and Singapore, but also New Zealand which switched to ex-ante regulation due to dissatisfaction with the outcome of the approach previously used, which was based mainly on competition law.

- The countries with the most ubiquitous FTTH networks (Singapore and Japan) have reached this point only through extensive use of public funds. New Zealand is also following this route.

- The USA, which has a regulatory regime with limited access regulation
  - Performs worse than the EU on take-up of connections with speeds of at least 100Mbit/s and on affordability.
  - Has a lower rate of deployment of FTTx networks than the EU
  - Is leading Europe (in aggregate) on a number of measures, including broadband penetration, NGA network coverage (mostly from NGA cable) and take-up of connections with at least 30Mbit/s. The better performance of the USA compared to Europe (in aggregate) on these measures is mainly attributable to the large legacy cable footprint. These cable networks were built before broadband development and were subsequently upgraded to be able to provide NGA services and are, as such, not the result of de-regulation.
  - If the USA is compared to Single European countries the latter, however, perform better than the USA also on broadband penetration: 17 of the top 20 countries in the world are European whereas the USA is ranked 24th.\(^\text{199}\)

- The USA lags behind the other jurisdictions examined in this report that do have ex-ante regulation (Japan, New Zealand and Singapore) on broadband penetration and NGA coverage. It also lags behind Japan and Singapore on take-up of NGA services. This makes it difficult to sustain the position that it is the lack of ex-ante regulation of fibre networks that has enabled the USA’s performance.

7 Future investment and competition in NGA

There is little doubt that the current European regulatory framework has, by encouraging competition, made a positive contribution towards its main objectives of increasing choice, lowering prices, increasing quality and encouraging innovative services. This applies throughout the electronic communications market, and is also acknowledged by the EC in its roadmap for the evaluation and reform of the regulatory framework.\textsuperscript{200}

The DAE seeks increased take-up of ultrafast services of 100Mbit/s and above (for download) in order to reach the 2020 take-up target of 50% of households (see Section 3.2.1). As we have argued above (in Section 4.4, for example), competition is essential in order to achieve the pricing and innovation required to attain these high levels of take-up.

The EC also recently identified investment as a potential future objective, particularly investment in networks capable of providing high download and upload bandwidths.\textsuperscript{201}

In this section we discuss:

- ex-ante regulation and the link to NGA investment and competition (Section 7.1)
- the impact of regulation on achieving the DAE targets (Section 7.2)
- whether the challenges being faced warrant a complete change in regulatory policy in Europe or a refinement of the existing policy and regulatory framework (Section 7.3).

7.1 Ex-ante regulation and the link to NGA investment and competition

It is clear that there are some key differences between legacy copper networks and NGA networks which have an impact on the incentives of investors. These include:

- The fact that copper networks already exist
- The fact that incumbents’ NGA networks are deployed whilst their own legacy copper networks remain in place and continue to (at least initially) serve the bulk of retail and wholesale customers (and compete with other existing FTTx and cable networks). The take-up of NGA network products is therefore influenced by the pricing of retail and wholesale products, both on the legacy copper network and on the incumbent’s NGA network.

In the remainder of this section we first consider whether there is a continued need for ex-ante regulation of access networks in an NGA world, then briefly discuss how competition is key to


\textsuperscript{201} Ibid
stimulating take-up, before providing a view on the most appropriate wholesale products. Finally we also discuss the concept of joint SMP.

7.1.1 Continued need for ex-ante regulation of access networks in an NGA world

To assess whether there is a continued need for ex-ante regulation we address the following three questions:

- Does ex-ante regulation deter NGA investment?
- Do the basic conditions for retaining ex-ante regulation of access products also exist for NGA products and what could be the impact if SMP regulation were lifted?
- Is SMP likely to exist in one or more wholesale markets relevant to NGA?

**Does ex-ante regulation deter NGA investment?**

By observation, there has been extensive NGA deployment in Europe under the current regulatory framework:

- NGA coverage today stands at 68% of households, up from 48% in 2010
- FTTx coverage is at 47% of households, up from 23% in 2010.
- There are numerous currently ongoing and committed fibre deployments across Europe leading to an estimated NGA coverage in Western Europe by 2020 of around 80%.\(^{202}\)

At various places in this report (e.g. in Sections 4.2 and 5) we have identified competition as a significant trigger for NGA investments. This competition comes from both cable operators and from alternative operators making use of regulated access products of various kinds, sometimes in parallel to their own NGA networks. The comparison of the situation in the USA, Japan, New Zealand and Singapore undertaken in Section 6 also shows how the USA situation – where competition, if any, is often between only two players (one cable and one ILEC) – appears to lead to less desirable outcomes than that in the other countries which all have ex-ante regulation. In fact the USA performs worse than the EU on both affordability and take-up of services providing at least 100Mbit/s and lags behind other jurisdictions examined in this report that do have ex-ante regulation (Japan, New Zealand and Singapore) on broadband penetration and NGA coverage. It also lags behind Japan and Singapore on the take-up of NGA services.

**Do the basic conditions for retaining ex-ante regulation of access products also exist for NGA products?**

The three-criteria test that is currently used for finding markets susceptible to ex-ante regulation requires:

high and non-transitory structural, legal or regulatory barriers to entry

that the market structure does not tend towards effective competition within the relevant time horizon, having regard to the state of infrastructure-based and other competition behind the barrier to entry

that competition law alone is insufficient to adequately address the identified market failure(s).

As discussed below, all three of these conditions are true and likely to remain so for one or more key input products used in NGA access networks.

High and non-transitory barriers

The EC defined some of the main types of barrier to entry that can exist in telecoms markets in its 2014 Recommendation on relevant product and service markets. In this section we briefly analyse whether these barriers also apply to NGA networks.

With regard to the barriers to entry relevant for analysis of the first criterion, the 2014 Recommendation on relevant product and service markets mentions two types: structural barriers and legal or regulatory barriers.

- **Structural barriers** result from original cost or demand conditions that create asymmetric conditions between incumbents and new entrants, thus impeding or preventing market entry by the latter. For instance, high structural barriers may be found to exist when the market is characterised by absolute cost advantages, substantial economies of scale and/or economies of scope, capacity constraints and high sunk costs. A related structural barrier can also exist where the provision of service requires a network component that cannot be technically duplicated or only duplicated at a cost that makes it uneconomic for competitors.

- **Legal or regulatory barriers** result from legislative, administrative or other measures that have a direct effect on the conditions of entry and/or the positioning of operators in the relevant market.

The EC further states that barriers to entry may become less relevant with regard to innovation-driven markets characterised by ongoing technological progress. In such markets, competitive constraints would often come from innovative threats from potential competitors that are not currently in the market. In innovation-driven markets, dynamic or longer-term competition could, in the EC’s view, take place among firms that are not necessarily competitors in an existing ‘static’ market.

NGA networks, and particularly FTTP networks, require substantial investment which:

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is sunk (once made), thus making the business case for replication difficult, as existing operators can undercut the pricing of new entrants by (rationally) pricing at marginal cost, whereas a new entrant’s business case will need to take investments into account.

is subject to local economies of scale (or “economies of density”): the unit cost per connected household is highly dependent on the local penetration of connected subscribers. This is because fixed wireline access networks need to deploy physical infrastructure in a very widespread and capillary way, connecting each and every single household. These local economies of scale will not be significantly improved by larger operators arising from regional-level or cross-border consolidation of access network providers (other than that there may be some small economies of scale in driving a harder bargain with suppliers when network build is occurring).

makes it difficult for alternative operators to economically duplicate the assets, especially in the absence of ex-ante regulation allowing access to bottleneck resources such as ducts and in-building wiring.

The main cost associated with deploying NGA networks is civil works, including ducts and poles. Incumbent operators can often, to a greater extent than alternative operators, re-use existing ducts and poles (and their copper connections to network termination points at customer locations) and thus achieve lower deployment costs (especially if there is no effective regulation allowing alternative operators to access these).

The high costs of deployment and significant economies of density mean that operators active in the same product market but in other geographical areas are unable to easily expand their output into other geographies (as this would require a deployment of an NGA network into that area).

While there is significant innovation-driven market entry in the provision of telecoms services, innovations in access network technologies and deployment methods have not been able to sufficiently negate these very substantial civil infrastructure costs. In particular, wide-area fixed-wireless solutions do not provide the kind of per-user busy-hour throughput that can be provided over FTTx. Technological advances have therefore not been able to reduce the substantial deployment costs or provide alternatives to them.

For all these reasons, it appears clear that there are and will continue to be high and non-transitory barriers to entry in many European NGA markets.

We note that the markets identified in the Recommendation (including Wholesale Local Access) are those where barriers to entry are expected to persist over a foreseeable period, so this is not a new conclusion.

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204 Estimates for the cost of civil works as a share of FTTH capex range between 40% and 70%, and include: 46% – FTTH Council (2013, see http://www.ftthcouncil.eu/documents/Publications/FTTH_Business_Guide_2013_V4.0.pdf); 60% – ICT Regulation Toolkit (ITU, see http://www.ictregulationtoolkit.org/en/toolkit/notes/PracticeNote/2974); 70% – CISCO (2009, see http://www.cisco.com/web/HR/expo08/pdf/Thomas_Martin_Fiber_To_The_Home.pdf).
Market not tending towards effective competition

With regard to the second criterion, the 2014 Recommendation specifically mentions that “A tendency towards effective competition implies that the market will either reach the status of effective competition absent ex ante regulation within the period of review, or will do so after that period provided clear evidence of positive dynamics in the market is available within the period of review. […] In such markets, market shares may change over time and/or decreasing prices may be observed.”

Figure 7.1 shows the (retail) market share of incumbent operators in the EU by access network technology. It is clear that incumbents have a significant share of the retail market for FTTH, and especially for VDSL. On FTTH networks, incumbents increased their retail market share between January 2014 and January 2015, while their share of VDSL declined (although it continues to remain high).

Figure 7.1: Incumbents’ share of retail broadband market by technology in the EU, 2013 to 2015 [Source: EC Digital Agenda Scoreboard]

Wholesale market shares at the aggregate EU level are difficult to source or calculate. They will also depend on whether Market 3a or 3b is analysed, and on what technologies (e.g. cable or FWA) are included in the product market definition. However, Figure 7.2 provides an indication of the number of retail broadband lines that were supplied over incumbent operators’ networks vs.
those supplied over cable networks or the networks of alternative operators in January 2014 and January 2015. The wholesale market shares remain considerably higher than the retail ones and are not changing rapidly over time.

Currently, NGA networks co-exist with copper networks. In a scenario where NGA networks are subject to less ex-ante regulation, the copper networks will provide some competitive constraints which may limit the extent to which NGA network owners can abuse their market power. However, as more of the market requires speeds that can only be provided by NGA, any existing or potential competitive pressure from copper products will gradually disappear; the need for regulatory intervention in the NGA market may thus increase over time. There is therefore a risk that over time the NGA transition could undo the significant gains that have been brought by the level of competition provided by the current regulatory regime, unless the regulation of NGA is well adapted to the local market situation as it develops.

The intrinsic characteristics of broadband access networks are such that there is limited possibility for undertakings active in other product markets to enter the market. Wireless networks do not have the capacity or characteristics to be able to replace fixed networks (with the exception of very rural areas where the capacity of a single base station is shared by fewer users). Similar discussions apply to e.g. satellite. Although the available capacity of wireless and satellite networks increases over time, it is not foreseen that they will be able to compete with (fixed) NGA networks.

Convergence is a major theme in retail telecoms markets, but so far it has had a limited impact on wholesale access markets. Some examples of occurring or foreseen convergence include:
- Fixed–mobile retail bundles where two distinct network services are provided under the same subscription
- Convergence of core networks and platforms which allows integrated fixed and mobile operators to use their core networks more efficiently. These do not, however, impact access networks.

The number of networks competing for a given subscriber is typically low (one or two). This number is (as discussed further in Section 7.1.4) unlikely to be sufficient for there to be effective competition in the absence of ex-ante regulation that is currently enabling additional competitors to take part in retail markets on a national level and sometimes in wholesale markets (typically on a more regional level).

► Competition law alone is unlikely to be effective

Under this criterion, NRAs must assess the adequacy of corrective measures that can be imposed under competition law to tackle identified persistent market failure(s). In this regard, the 2014 Recommendation states that “Competition law interventions are likely to be insufficient where for instance the compliance requirements of an intervention to redress persistent market failure(s) are extensive or where frequent and/or timely intervention is indispensable.”

The ineffectiveness of competition law alone has been analysed numerous times by both the EC and NRAs. Competition law has the significant drawback that it takes a very long time to reach final conclusions (as illustrated in Figure 7.3), resulting in uncertainty that could have an impact on investments and competition. In all the selected high-profile competition cases in the European telecoms sector listed below, it took roughly eight years from the date the proceeding opened to when the European Court of Justice (ECJ) made its final ruling; the time from the occurrence of the abuse itself until the final ruling was (naturally) even longer.

The ineffectiveness of competition law alone is also illustrated by experience in New Zealand, where there was a move from an ex-post-based framework to ex-ante regulation (as discussed on page 67 earlier).

Figure 7.3: Time taken to reach the conclusion of selected high-profile competition cases in the European telecoms sector [Source: EC Competition case search function]

<table>
<thead>
<tr>
<th>Defendant [case number]</th>
<th>Period of (alleged) abuse</th>
<th>Date of initial complaint</th>
<th>Date for opening of proceeding</th>
<th>Date of final ECJ ruling</th>
</tr>
</thead>
</table>

206 Source: Ibid, Article 16
<table>
<thead>
<tr>
<th>Defendant</th>
<th>Period of (alleged) abuse</th>
<th>Date of initial complaint</th>
<th>Date for opening of proceeding</th>
<th>Date of final ECJ ruling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wanadoo Interactive / France Telecom [38233]</td>
<td>January 2001 to October 2002</td>
<td>N/A (case brought by the EC on its own initiative)</td>
<td>September 2001</td>
<td>April 2009</td>
</tr>
</tbody>
</table>

**Is there a likely existence of SMP in one or more wholesale markets relevant to NGA?**

If the market is susceptible to ex-ante regulation, then the next question is whether there is SMP.

According to Article 14 of the Framework Directive, “*an undertaking shall be deemed to have significant market power if, either individually or jointly with others, it enjoys a position equivalent to dominance, that is to say a position of economic strength affording it the power to behave to an appreciable extent independently of competitors customers and ultimately consumers.*”

With regard to the finding of SMP, the SMP Guidelines state inter alia the following:

- A dominant/SMP position is found by reference to a number of criteria and its assessment is based on a forward-looking market analysis based on existing market conditions

- Market shares are often used as a proxy for market power. Single dominance concerns normally arise in the case of undertakings with market shares of over 40%, although the EC may in some cases have concerns about dominance even with lower market shares, as dominance may occur without the existence of a large market share

- An undertaking with a large market share may be presumed to have SMP if its market share has remained stable over time

- The existence of a dominant position cannot be established on the sole basis of large market shares. Other criteria used to measure market power include:
  - overall size of the undertaking
  - control of infrastructure not easily duplicated
  - technological advantages or superiority
  - absence of or low countervailing buying power
  - easy or privileged access to capital markets/financial resources
  - product/services diversification (e.g. bundled products or services)
  - economies of scale
  - economies of scope
  - vertical integration

The digital single market and telecoms regulation going forward

- a highly developed distribution and sales network
- absence of potential competition
- barriers to expansion.

As mentioned above, market shares on their own are not sufficient for a finding of dominance. However, the EC’s guidance on the application of Article 82 of the EC Treaty, which is used for the application and enforcement of competition policy across industries, states that market shares provide a “useful first indication” and that dominance is not likely for market shares below 40% of the relevant market. Aggregate incumbent market shares are shown in Figure 7.1 and Figure 7.2 above, and are well above the 40% threshold. This explains why almost all European NRAs have found SMP operators in Markets 3a and 3b (or the previous definitions of passive infrastructure access and wholesale broadband access) based on their current regulation (see Figure 7.4). These market analyses have also considered the other criteria listed above.

**Figure 7.4: Current status of SMP in Markets 3a and 3b in the EU [Source: Analysys Mason, 2015]**

<table>
<thead>
<tr>
<th>Market</th>
<th>Countries with SMP</th>
<th>Geographical scope</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>3a/2014 (or 4/2007)</td>
<td>All EU28 countries; in some cases (e.g. the Netherlands) separate markets have been defined for business fibre and there is currently no SMP in the business fibre wholesale local access market.</td>
<td>Generally national</td>
<td>In some countries (e.g. Portugal and Spain) FTTH is not regulated</td>
</tr>
<tr>
<td>3b/2014 (or 5/2007)</td>
<td>Most of EU countries; exceptions include Malta, Romania and Sweden where the three-criteria test has not been passed or no SMP has been found.</td>
<td>Generally national. Some countries have found SMP only in certain product or geographic sub-markets</td>
<td>Wholesale broadband access to FTTH networks is not mandated in some countries (e.g. France and Portugal)</td>
</tr>
</tbody>
</table>

Notes: There are sub-national geographical market definitions on Market3a/2014 in Finland, Hungary and in the UK which are due to historical divisions of the areas covered by separate incumbent operators. ‘Markets’ refer to the markets defined in the 2014 and 2007 EC Recommendations on relevant markets susceptible to ex-ante regulation.

We see limited reason why the probability of finding SMP should change in a future where NGA networks become more important. In particular:

- SMP operators control key infrastructure that is not easily duplicated. This includes ducts and poles as well as terminating copper segments (used for FTTC and FTTB) that are (at least in part) inherited from their legacy copper networks
- There is likely to continue to be an absence of potential competition due to the high barriers to entry discussed above

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• The competitive constraints arising from operators that are active in other product or geographic markets will continue to be limited due to the barriers to expansion these face (as discussed above).

It is therefore likely that many NRAs will continue to find that incumbent operators have SMP in relevant markets for wholesale NGA services.

7.1.2 Competition is key to stimulating take-up

The EC has identified take-up of high-speed broadband services, particularly those offering 100Mbit/s or more, as a significant priority. In this report we have shown the importance of effective competition in promoting the take-up of new and innovative services, and how alternative operators – often relying in part on their own network and simultaneously using one or more forms of wholesale access from incumbents – are playing a key role in the take-up of high-speed services.

It therefore seems unlikely that reducing the focus on pro-competitive remedies contained in the current regulatory framework would provide the correct incentives for increased take-up of services.

7.1.3 Appropriate NGA wholesale products

The European experience has shown how passive wholesale access products, and in particular LLU, have been a great success and brought massive benefits to consumers (as well as to business users and public administrations), as they have allowed alternative operators to discover the price/performance preferences of customers, achieve economies of scale in the provision of the electronics, and control the quality of service that is provided. A previous Analysys Mason report demonstrated the profound effects that the use of LLU had on prices for higher-generation broadband access in the EU as it was being implemented.\textsuperscript{209} Figure 7.5 below is taken from that report and shows the effect of unbundling on speeds available for a standard price of around GBP20 per month in the UK. There were strong declines in the prices (especially for 4Mbit/s and 8Mbit/s broadband) which correlated with the arrival of large-scale unbundling. We found similar patterns in other countries. These benefits that were attained during the initial implementation period have since been locked into the market.

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Figure 7.5: Lowest market price for a specified speed broadband product over time in the UK [Source: Analysys Mason, 2008]

The benefits provided by passive remedies have recently been analysed by the UK NRA, Ofcom, in its review of the business connectivity market.\(^{210}\) Ofcom identified potential benefits from:\(^{211}\)

- **Dynamic efficiency**, through greater scope for innovation and improvements in service quality as alternative operators have more flexibility in investment decisions and do not need to depend on the incumbent in order to make innovation choices related to access services. Ofcom also recognised that there can be benefits from allowing alternative operators to have more control over the design and configuration/architecture of their networks, which can allow them to operate their networks more efficiently or deliver higher levels of reliability and resilience.

- **Productive efficiency**, leading to lower costs and prices over time, as a larger part of the “cost stack” is exposed to competitive pressure.

NGA wholesale products should therefore be designed to allow similar gains and benefits as LLU. How this can be done depends on factors which may differ from country to country, such as:

- the state of passive infrastructure (i.e. ducts)

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\(^{211}\) In addition, Ofcom noted that, once passive access products are in place, there may, over time, be less need to impose active remedies.
• the NGA network architecture adopted by the SMP operator (although the 2010 EC NGA Recommendation\(^\text{212}\) stated that unbundled access to fibre loops should be made available regardless of the network architecture)
• the characteristics of legacy copper networks (such as the length of sub-loops).

Below we provide further details on what could be appropriate NGA wholesale products in the EU, depending on the network architecture used and on other characteristics such as demand density. Both network architecture and demand density may vary within a country, which means that there is likely to be a need to impose more than one wholesale remedy within the same country and a combination of passive and active wholesale products. As in the copper world, there is also likely to be a need for multiple wholesale products to exist in the same geographical areas.

As discussed in Section 3.2.3 above, business services are different (and likely to require their own wholesale products). Some operators provide pan-European services to multinational companies. It would not always be feasible for these to deploy their own networks where their business customers ask them to.

All architectures

The EC’s efforts to implement equivalence of inputs (EoI) for NGA networks rather than the equivalence of output (EoO) concept used on copper networks should continue, since (as noted by the EC) the incremental costs of using EoI are likely to be limited in the case of new networks.\(^\text{213}\) EoI will ensure that a level playing field exists between the retail arms of incumbent operators and their competitors. The implementation of EoI can require substantial effort and investment from both regulators and SMP operators in order to function properly.

Duct access will be particularly beneficial where the duct network is widespread and in good shape – this is not the case in all European countries, as in some countries cables were directly trenched in the secondary access network (the part closest to end users). The Portuguese experience has shown that having such effective access can allow alternative operators to deploy their own fibre networks. In order to work, the terms of access also need to be appropriate. This includes both price and non-price aspects. A particular factor for rendering duct access effective and useable in practice is the availability of information regarding duct routes (which can, for example, be provided through automated geographical information systems) and the state of ducts. This will require the definition of specific processes and procedures.

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\(^{213}\) The EC discusses EoI and EoO extensively in its Recommendation of 11.9.2013 on consistent non-discrimination obligations and costing methodologies to promote competition and enhance the broadband investment environment, C(2013) 5671 final.
**FTTC**

SLU has been available in theory for many years, but has struggled in practice until recently. However, with sufficient scale, SLU can allow alternative operators to deploy their own FTTC networks. Nevertheless this also requires the availability of other wholesale products such as duct access and/or dark-fibre backhaul between local exchanges and cabinets, and possibly the sharing of costs for new cabinets. There are cases in Europe (e.g. in Italy, Germany and under the “montée en débit” scheme in France[214]) where alternative operators have, in recent years, started to use such access to deploy their own active equipment at cabinets. The Italian case (discussed in Section 5.3) is especially interesting, showing that, under the right conditions, alternative operators can and will invest in their own FTTC networks.

A major issue that is emerging is the extent to which sub-loop access may not currently be compatible with vectoring, which will lead to more-stringent limitations on the effective bandwidths that can be offered over FTTC networks. Some regulators (e.g. in Austria, Belgium, Germany, Ireland and the Netherlands) have made an explicit trade-off between competition and allowing the provision of higher bandwidths over FTTC networks using new technologies such as vectoring, by allowing the removal of SLU when incumbents deploy vectoring. This seems premature: we understand that ongoing technological developments may enable the introduction of multi-operator vectoring (MOV) in the not too distant future.[215] It may therefore be more appropriate to await these developments before dismissing SLU. In Italy where, depending on the area, there are now up to three operators (incumbent Telecom Italia as well as alternative operators Fastweb and Vodafone) with their own FTTC networks in parallel, the Italian regulator has decided that MOV is feasible and so has decided not to remove SLU obligations but instead work on facilitating MOV (see Section 5.3).

In addition, considerably more effort may need to be put into constructing effective VULA products that allow alternative operators to control key parameters.[216] Without this additional work such products will be more like a bitstream or resale service, which restricts the ability of entrants that rely on these inputs to innovate on service features, quality and price.

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[216] BEREC has identified the key parameters for a VULA products as: being based on Ethernet technology, being available in all NGA roll-out areas, including the possibility for access seeker to use and configure CPEs / modems, allowing access seeker to control speed of service within the limits of the bandwidth profile provided to the end-users, providing a bandwidth that is uncontended or with a defined quality of service, including support for different traffic prioritisation, including provision of several VLANs per end user and allowing access seeker to identify end-users and ability to apply security measures. See BEREC (2015), Draft Report on Common Characteristics of Layer 2 Wholesale Access Products in the European Union, available at http://berec.europa.eu/eng/document_register/subject_matter/berec/public_consultations/5009-draft-berec-report-on-common-characteristics-of-layer-2-wholesale-access-products-in-the-european-union.
FTTH

Fibre unbundling will be critical in allowing competition on FTTH networks. This is already done on point-to-point FTTH networks (e.g. in the Netherlands, Sweden and Slovenia), but equivalent services can also be implemented on PONs as we have shown in the Singapore case study. This was also acknowledged by the EC in its 2010 NGA Recommendation, in which it stated that “NRAs should mandate unbundled access to the fibre loop irrespective of the network architecture and technology implemented by the SMP operator.”\(^\text{217}\)

Examples of implementation of services equivalent to unbundling on PON networks include:

- in Singapore, where the passive access provider manages a splitter dedicated to a group of end users for each access seeker, thereby creating end-to-end PON passive connections for each wholesale access seeker (see Section 6.1 for further details).
- in France where regulation requires operators deploying the network to use “mutualisation” points at which other operators can access the network (allowing the network architecture to be either PON, with the splitter at the mutualisation point or closer to the ODF, or P2P).

Such models may lead to a requirement for marginally higher capex, as there will be a need for additional splitters and possibly a small number of additional fibres compared to a one-operator PON. In order to achieve this at the lowest total cost it may be necessary to consider the need for such additional elements at the network design stage, and there may be a role for NRAs in ensuring that this is addressed appropriately. The incentives for such designs would naturally be higher for wholesale-only providers or structurally separated network providers.

Symmetric access to some bottleneck resources (e.g. in-building networks) may also be required to ensure that the first operator does not block the market for subsequent entrants. This approach is used in multiple European countries, including France and Portugal for example (see Section 5).

The French example has also shown how co-investment schemes can be a way to extend NGA coverage while at the same time ensuring sustainable competition, by encouraging alternative operators to contribute to investments, thus also reducing the execution and demand risk.

Combination of passive with active remedies

Similar to the situation on copper networks, there will likely be a need to maintain active access wholesale products alongside passive ones in order to allow nationwide competition. It is unlikely that the demand density and network characteristics will allow alternative operators to use passive remedies throughout the entire geographical territory. Active access products with interconnection points at a higher hierarchical level will therefore be needed to access specific customers.

Active access products may also improve cross-border competition for multinational companies, as an operator active in one member country can use such wholesale access products to connect business customers in countries where it has limited (or no) other activities. In a report commissioned by ECTA, WIK-Consult found that:

- Specialist suppliers of business communications were only able to use their own infrastructure in a minority of cases due to the dispersed nature of many of the sites requiring coverage nationwide and cross-border. In countries where service providers did not benefit from vertical integration, more than 90% of business access lines were leased from third parties, with the majority of these (>75%) coming from national incumbents, although there was some geographical variation

- Leased lines, xDSL bitstream (wholesale broadband access) and wholesale Ethernet services were the primary access methods used by the interviewed companies to reach customers

- Multinational companies had a limited choice of suppliers as many suppliers were generally not able to make suitable offers for given contracts as they could not provide both fixed and mobile services or could not cover all relevant sites or provide consistent services across multiple countries.

WIK-Consult concluded that “achieving consistent and effective wholesale remedies for business communications across Europe could enable the emergence of a truly single market for business communications at the retail level in which providers could expand cross-border and compete with each other on an equivalent basis, independent of their ownership of infrastructure in particular countries”.

Based on best practice across EU NRAs, WIK-Consult further identified some principles that could be considered for wholesale markets for business access and also identified some key elements of a common approach to business remedies.

**Pricing of NGA wholesale access products relative to legacy ones**

There are numerous ways to set wholesale prices for access to the NGA and copper networks of SMP operators, both in absolute terms and relative to one another. Key aspects to consider include the different incentives for deployment of fibre networks, the impact of price levels on different operators, regulatory certainty and ensuring migration to the new network.

The European Commission has since taken a stance for:

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219 Source: Ibid, p. 10

220 Source: Ibid, p. 13

221 Source: European Commission, Commission Recommendation on consistent non-discrimination obligations and costing methodologies to promote competition and enhance the broadband investment environment, 2013.
• Maintaining stable copper prices across Europe in order to reflect a need for stable and predictable wholesale prices

• Allowing pricing flexibility for NGA, aimed at providing incentives for deployment and incentivising take-up (e.g. through penetration pricing) if specific safeguards are put in place (economic replicability test based on margin-squeeze principles and EoI – see Section 3.2.1 for more details).

The basic aims for the pricing of wholesale NGA products should be to:

• allow a fair return on investments in order to not deter investment – including those investing in networks up to the street cabinet or local exchange – in order to not deter investment
• promote and ensure competition, so that the benefits of NGA networks reach consumers and businesses in the form of innovative products and services, and competitive and affordable retail prices. This will also incentivise take-up of the services.

7.1.4 Joint dominance

As we noted in a previous publication,\(^\text{222}\) 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”. Ex-ante regulation cases where two operators have been found to have “joint dominance” are possible, but very rare: between 2004 and 2012, joint dominance was identified by NRAs in 8 cases, and only in 3 cases were the finding of joint dominance and resulting remedies eventually adopted, as shown in Figure 7.6.


<table>
<thead>
<tr>
<th>Year</th>
<th>Country</th>
<th>Market</th>
<th>Final decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>Ireland</td>
<td>15/2003</td>
<td>Agreed by the EC, overturned by national body</td>
</tr>
<tr>
<td>2004</td>
<td>UK</td>
<td>18/2003</td>
<td>Withdrawn</td>
</tr>
<tr>
<td>2005</td>
<td>France</td>
<td>15/2003</td>
<td>Withdrawn</td>
</tr>
<tr>
<td>2006</td>
<td>Spain</td>
<td>15/2003</td>
<td>Adopted</td>
</tr>
<tr>
<td>2006</td>
<td>Malta</td>
<td>15/2003</td>
<td>Adopted</td>
</tr>
<tr>
<td>2007</td>
<td>Italy</td>
<td>18/2003</td>
<td>Adopted</td>
</tr>
<tr>
<td>2007</td>
<td>Malta</td>
<td>5/2007</td>
<td>Withdrawn</td>
</tr>
<tr>
<td>2008</td>
<td>Slovenia</td>
<td>15/2003</td>
<td>Withdrawn</td>
</tr>
</tbody>
</table>

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If there is only one fixed 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 overlapping fixed access networks, then the “invisible hand” of competition would be likely to prevent consumer harm. However, oligopolistic market structures may in some cases contribute to a sub or non-competitive market outcome.

In the situation where there is an oligopoly of two fixed access networks (or perhaps two large plus few very small networks), then ex-ante regulation will only be possible if one operator has SMP or if joint dominance can be proven. To date, it has proved challenging to establish joint dominance, and so this is a potential weakness of the EU regulatory framework. In other words, NRAs may need to be better equipped to address this kind of issue.

BEREC has recently argued in a draft report\(^\text{223}\) that, in addition, a “tight” oligopoly situation with two operators that do not collude with each other could also lead to negative market outcomes. In its recent draft BEREC notes that the test applied in merger assessments was changed in 2004, from a dominance test (similar to the SMP test used in ex-ante regulation) to a less restrictive significant impediment of effective competition (SIEC) test. BEREC argues that the SIEC test could also be considered for ex-ante regulation, stating:

\[\ldots\text{it remains doubtful whether a European regulatory framework that relies on the principle of dominance only will be effective in ensuring that the regulatory goals are met. BEREC cannot exclude the possibility that ineffective tight oligopolies or even tight duopolies might develop and that once markets have developed in a stable yet ineffective manner it would not be feasible any longer to foster effective competition by regulatory means. Preventing such a regulatory gap arising might be the key answer.}\]

The EC framework review consultation issued on 11 September 2015 also raises the issue of whether there should be “exceptions to the principle that ex ante access regulation can only be imposed in circumstances where regulators can demonstrate SMP, individual or joint?”\(^\text{224}\) Options should be explored in the forthcoming review, to ensure that the regulatory framework has the right tools to effectively tackle non-competitive market outcomes.


7.2 Achieving the DAE targets

This section discusses the targets that the EC has set for the deployment and take-up of broadband as part of the DAE.

7.2.1 Target for 2Mbit/s coverage

While the vast majority of basic broadband coverage has been deployed commercially under the EU pro-competitive regulatory framework,\textsuperscript{225} the additional coverage of underserved / non-profitable areas needed to meet the ubiquitous basic broadband target has been successfully gap-funded using public funds. Broadband coverage already stood at 87% of the population in 2005, and in 2008 it was 93%. At that point the EC concluded that (only) rural area coverage could be considered a policy challenge.\textsuperscript{226} Since then, State aid has been used to extend coverage into those remaining areas, bringing terrestrial network coverage to around 97% at the end of 2014. This increases to 99.9% when satellite is included.\textsuperscript{227}

7.2.2 Target for 30Mbit/s coverage

Reaching even 97% household coverage with 30Mbit/s services will require continuous and intensive investment and upgrading of fixed networks until 2020, to extend NGA into rural areas. The current coverage is 68%; as in the case of basic broadband, FWA (e.g. based on LTE-A) and satellite are likely to be critical for the final few percent of households.\textsuperscript{228} Both FWA and satellite are shared mediums whose total capacity is constrained by the amount of spectrum made available and the number of base stations (or satellite beams). They can therefore not be used as supplements for fixed access networks in dense areas (as there would be insufficient spectrum available and/or the density of mobile base stations or satellites would need to be massively increased). In rural areas where demand density is much lower they can be much more suitable, although capacity will remain a significant challenge for certain use cases (e.g. large-scale use of high-definition streaming video) that we expect to be popular in the near future.

There has been recent speculation as to whether a relaxation of regulatory requirements could lead to additional roll-out. Such relaxation could take the form of regulatory holidays, exclusive franchises\textsuperscript{229} or limitations on the rights of users to cancel their contracts.\textsuperscript{230}

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\textsuperscript{225} This has been achieved mainly by upgrading backhaul to local exchanges from copper to fibre and installing DSLAMs in local exchanges to allow the provision of DSL services. Cable networks have also been upgraded and FTTx networks have been deployed but these typically overlap with the DSL networks.


\textsuperscript{227} Source: EC Communications Committee (2014), Digital Agenda Scoreboard 2014 – broadband markets.

\textsuperscript{228} Currently available satellite services for residential European users include >20Mbit/s download speeds offered by Eutelsat (under its tooway brand, see: www.tooway.com) while Avanti offers 15Mbit/s services (see http://www.avantiplc.com/products-partners/products/select). Eutelsat states that it can already offer 50Mbit/s download speeds (and 20Mbit/s upstream) to professional users (see http://eutelsatbroadband.com/about-us/our-satellite/). Further technological developments are expected.

\textsuperscript{229} Not permitted in the EU since Directive 90/388/EEC, recast by Directive 2002/77/EC.
We do not believe that a change in the regulatory framework to allow exceptions of this kind would materially contribute to achieving the 30Mbit/s target; in our view the issue is not that regulated wholesale products are intrinsically unprofitable (because they do make a profit), but rather the commercial viability of wholesale network deployment (in essence, the economies of density in local access networks mean that rural areas have high unit costs). Removing the ability for existing competing operators to upsell higher capabilities to their customers in these rural areas would also be likely to slow the adoption of high-speed broadband services.

Suggestions such as those mentioned above are similar to speculating that allowing higher prices in rural areas might enable the business case to succeed; the difficulty with this analysis is that such pricing differentials are perceived as inequitable and unpopular among end users; in addition, we have already noted that broadband service take-up is relatively price sensitive, so rural take-up of such higher-priced high-speed services is likely to be lower as a result.231

In our view, subsidy from public funds is likely to be a more-effective solution than regulatory ‘tinkering’ in areas where commercial deployment is uneconomic. The State-aid guidelines insist on wholesale access being provided to networks that have received public subsidy.232 This wholesale access furthermore needs to be provided at similar charges to those applied in other more-competitive areas of the country or the EU (whether set by NRAs or not), so as to replicate the market conditions prevailing in those areas.233 It would therefore seem odd to insist on open access where the subsidy is financial, but to allow re-monopolisation if the “subsidy” is regulatory in origin.

7.2.3 Target for 100Mbit/s take-up

50% take-up of ultra-fast 100Mbit/s services appears the most challenging DAE target. Recently, it was reported that take-up is just 5% across the EU (see Figure 4.12 in Section 4.3). Furthermore, achievement of this target requires two conditions to be met:

- **Network investment by operators to make 100Mbit/s speeds more widely available.** This is an issue which is particularly significant for FTTC networks on which new technologies such as vectoring, SuperVector and Vplus (recently proposed by Alcatel-Lucent and Huawei respectively) and G.Fast (for which the first trial implementations are underway) will

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231 We note that regulated wholesale prices are rarely geographically differentiated within the EU: one example is the ability of Reggefiber in the Netherlands to vary its FTTH rental prices depending on the level of investment required. Outside the EU, some countries which have previously had geographical pricing for LLU (e.g. New Zealand) have more recently moved towards using uniform national pricing.


233 Source: Ibid, Article 78 (h).
(depending on the length of sub-loops) allow such speeds to be provided.\(^{234}\) This will, however, require an upgrade of existing electronics as well as replacement of CPE and (depending on current sub-loop length) possibly a further extension of fibre closer to the end users.

- **End-user interest in, and willingness to pay for, the higher-speed bundles** and the services that can be provided over them.

Investment and end-user take-up need to co-exist to create a virtuous circle (as was the case for basic broadband; see Section 4.1). Operators are proceeding with their investments in a gradual way, starting with investments in the most commercially attractive areas (typically dense urban areas) and then gradually moving towards less and less attractive areas when they have proof that the business case is positive (or that investment is required to defend a market position).

This has also been recognised by the EC in its 2013 Recommendation on consistent non-discrimination obligations and costing methodologies to promote competition and enhance the broadband investment environment.\(^{235}\) In this Recommendation it concluded that, due to the existence of demand uncertainty, there is a need to test different price points and conduct penetration pricing (i.e. set initial prices low to attract customers to the new network) on both retail and wholesale levels. This was one of the main arguments used by the EC for the removal of price regulation of NGA wholesale products under certain conditions\(^ {236}\) (as described in more detail in Section 3.2.1).

As demonstrated in this report, competition has played a key role in driving broadband investment and end-user take-up. Competition (and hence a pro-competitive regulatory stance) therefore appears to be essential for meeting the 100Mbit/s take-up goal; as noted above, moves to relax ex-ante access obligations may actually hinder market development.

### 7.3 Policy change or policy refinement for Europe?

Throughout this report and in particular in the previous two sub-sections we have seen how the current European regulatory framework:

- **has performed well in promoting competition, end-user choice and lower prices.** This performance has been encouraged especially by ex-ante regulation mandating SMP operators

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\(^{234}\) VDSL2 17a (currently the most commonly used VDSL profile for FTTC deployments) with vectoring is expected to reach around 150Mbit/s downstream at 500m, whereas Vplus (using a 35MHz profile) should be able to provide 250Mbit/s at the same distance. G.Fast can provide higher bitrates but requires shorter loops (e.g. 500Mbit/s at 200m but less than 200Mbit/s at 500m) and may therefore require further extension of fibre to an intermediate point between FTTC and FTTH (e.g. in basements or at drop points). For more information see, for example, Analysys Mason Research, *FTTdp: the opportunities for deployment*, 2 July 2015, available at http://www.analysysmason.com/Research/Content/Reports/FTTdp-opportunities-deployment-Jul2015/

\(^{235}\) Source: EC, *Commission Recommendation on consistent non-discrimination obligations and costing methodologies to promote competition and enhance the broadband investment environment*, 2013.

\(^{236}\) That is, economic replicability (tested through an ERT) in combination with EoI and a demonstrable constraint on the retail prices of the SMP operator through infrastructure competition or a price anchor from cost-oriented wholesale copper access prices.
to provide passive wholesale access products (civil infrastructure access, unbundling) complemented by active access

- **has not inhibited the deployment of NGA networks.** This is also confirmed by the fact that international jurisdictions with higher NGA coverage than Europe often
  - have reached these levels through the use of public funds or subsidies and/or
  - have some form of ex-ante regulation

- **is likely to continue to be required in an NGA world** where there will remain relevant markets that are susceptible to ex-ante regulation and where single SMP is likely to be found (or where joint SMP or situations which contribute to an insufficiently competitive market outcome need to be addressed) as we have argued in Sections 7.1 and 7.2. Continued ex-ante regulation of access may therefore be necessary in order to ensure effective competition.

There are some requests to make significant changes to European electronic communications regulatory policy in order to incentivise NGA coverage and take-up. In the remainder of this section we discuss the arguments that have been made and provide our view on them.

### 7.3.1 Promotion of efficient investment

As discussed in Section 7.2, further investment is clearly required in order to meet the DAE targets and to ensure that European consumers and businesses have access to up-to-date broadband infrastructure. Investment should, however, be seen as a means to an end (a modern broadband infrastructure\(^{237}\)) and not as an end in itself. A policy that focuses on investment as an end instead of a means would be an error; what is required is efficient investment. In multiple places throughout this study, we have shown how investment in NGA networks is taking place in Europe where it is commercially viable under the current pro-competitive regulatory framework.

In addition, we note that the current regulatory framework already states that duties of NRAs include the promotion of efficient investment. We therefore doubt that a further change to the framework is needed to encourage efficient investment in NGA. Article 8 clause 5d of the Framework Directive (as amended) states that NRAs’ duties include:

\[(d)\] promoting efficient investment and innovation in new and enhanced infrastructures, including by ensuring that any access obligation takes appropriate account of the risk incurred by the investing undertakings and by permitting various cooperative arrangements between investors and parties seeking access to diversify the risk of investment, whilst ensuring that competition in the market and the principle of non discrimination are preserved;

Looking at this in more detail, a policy that sought to explicitly increase investments would therefore need to address one or both of the following:

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\(^{237}\) Which is itself a means to a better economy and a better society.
• attempt to make commercial investment viable in more areas by improving the business case for investment
• invest public funds in one way or another (e.g. through direct subsidies, financing at below market rates, etc.) in order to make marginal cases possible.

We discuss each of these two levers in more detail below.

*Improving the business case for commercial NGA deployment*

A business case can, in an abstract and simplified way, be described by the following equation:

\[
\text{Revenue} - (\text{capex} + \text{opex}) > \text{desired return}
\]

where \( \text{revenue} = \text{price} \times \text{volume} \)

A policy that seeks to improve a business therefore needs to act on one or more of the factors in the above equation.

► *Improving revenue for NGA networks*

Revenue is the product of price and volume. An increase in revenue does therefore not automatically come from an increase in one of the two factors. An increase in that one factor may have an impact on (or be caused by a change in) the other factor that offsets the increase from the first factor.

Price and take-up are related in complex ways. In Section 4.1 we have shown how (basic) broadband revenue grew while prices reduced (as a result of increasing take-up). There is reason to believe that there will be similar dynamics for NGA products. It should be noted that we do not believe that prices need to (or can) necessarily continue to decrease over time; the market is likely to find a point where they stabilise or even increase (depending on the underlying cost structure) – that point is, however, more likely to be found under a framework focused on competition than under a framework focused on high prices. The positive contribution from competition to growing take-up of NGA products has also been discussed (e.g. in Sections 7.1 and 7.2).

A policy to increase (or slow the reduction of) prices is instead unlikely to lead to desired results. It is true that there may be situations in which higher prices lead to better business cases for network owners. Care should, however, be taken to ensure that these higher prices, which *ceteris paribus* have a negative effect on end users, do not lead to lower take-up, a reduction in societal utility and to monopoly rents. A situation of higher prices may be desirable if those higher prices lead to increased coverage, making the services available to more end users who wish to use them (or to other innovations). The use of higher prices for all to fund additional roll-out for some could be compared to a funded universal service obligation (USO), a separate topic which we do not address here. However, any such “deal” would be difficult to implement: there may be more-efficient solutions (e.g. spending on demand stimulation); it will always be difficult to work out
whether the coverage “gained” is genuinely incremental (e.g. it may have been commercially viable at a later date); and it risks institutionalising super-normal returns for the funded operator.

- Reducing capex and opex for NGA deployments

Initiatives which seek to reduce costs involve fewer interactions (such as those between price and volume), and so they appear to have less risk attached to them than initiatives which address (retail or wholesale) pricing.

In Sections 4 and 5, we have shown how both incumbent and alternative operators are deploying NGA networks in Europe. Any initiatives to reduce deployment costs should therefore be aimed at all players. There are already several ongoing initiatives to reduce the costs of deploying NGA networks under the current regulatory framework – e.g. through co-investment, re-use of bottleneck or other resources that are difficult to replicate (through SMP regulation in Market 3a and symmetric measures for e.g. in-building access), and via asset sharing with other utilities.

Investment of public funds

As discussed throughout this report, commercially based investment in NGA networks is already happening in large parts of the EU (68% of the population is now covered by NGA networks and coverage is continuously increasing). It would be questionable, under the EC Broadband State Aid rules (and likely lead to competition distortions), to invest public funds in the areas already covered or in areas that will likely be covered through private investments in the near future. This principle is already reflected in the EC Broadband State Aid rules:

- Public investment can be permitted in areas where there is no provision / market failure (so-called “white areas”).
- Public investment in “grey areas”, where only one operator is present and is expected to be so in the future, is possible, but a detailed analysis is required in order to verify whether state intervention is needed (given the risks of crowding out private investments and distorting competition) or whether alternative measures including ex-ante regulation could be used.
- State investment in “black areas”, where two or more NGA networks are present, is considered likely to carry a high risk of crowding out private investment and/or distorting competition.

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238 Legislation to ensure a reduction in the costs of deploying high-speed electronic communications networks has recently been adopted. Directive 2014/61/EU of the European Parliament and of the Council of 15 May 2014 on measures to reduce the cost of deploying high-speed electronic communications networks, OJ L 157, 27/05/2014, puts forward measures aimed at both increasing efficiency in the use of existing infrastructures and reducing the costs and obstacles involved in carrying out new civil engineering works.

In those areas where it is not commercially viable to deploy NGA networks, there is a stronger rationale for public investment. There are already means for investment as permitted State Aid (and investment is happening under such schemes in several countries).

**Summary**

In summary, we consider it difficult to see how major modifications to the pro-competitive approach of the current regulatory framework can, in practice, contribute to the promotion of efficient investment. The alternatives that have been put forward appear to be either:

- already part of the current framework (e.g. focused State Aid in so-called “white areas”, or initiatives to reduce the cost of deployment for all operators), or
- inefficient or even counterproductive (e.g. attempts to increase prices or alleviate price reductions).

**7.3.2 Regulatory simplification**

The current framework is a complex structure; the mix of Regulations, Directives, Guidelines and Recommendations is common across the EU, but it is extensive and detailed. There is also a series of past Article 7 decisions and commentary which may be relevant (even if these are not binding precedents). This mix in turn sits in a context of national laws – both those which transpose the Directives and also national law covering related matters (such as the French LME240 and various historical decisions (e.g. functional separation in the UK and voluntary structural separation in the Czech Republic).

At the same time, this common framework is implemented by NRAs which must deal with differing national circumstances in relation to the number and type of existing networks and operators, geo-demographics, the economic situation (including large differences in GDP and purchasing power), Internet and PC literacy and usage. These differences impact on the economics of network construction and the outcomes for end users (e.g. service coverage) and lead to varying degrees of competition (of varying types) in different Member States. As illustrated by the case studies in Section 5, these differences in outcome are to a large extent driven by path-dependent factors regarding historical networks and economics. Regulation has played a key role in ensuring that competition could thrive and that alternative operators could invest in NGA but, as shown in this report, regulation does not appear to hinder investments in NGA by incumbent operators.

The challenge for any proposed change to the framework is to allow the NRAs sufficient tools to enable competition to thrive in this variety of circumstances; the level of flexibility required means it is challenging to make the overall structure simpler without losing some of the benefits of the current framework. For example:

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240 LME (Loi n° 2008-776 du 4 août 2008 de modernisation de l'économie, or the law on the modernisation of the economy) which, among various other things, imposed the symmetrical obligations regarding terminating segments of fibre networks that are discussed in Section 5.1. Source: http://ec.europa.eu/information_society/newsroom/cf/dae/document.cfm?doc_id=3265
• Removal of the SMP regime does not appear justified – the SMP concept is at the very core of the current European regulatory regime which, as discussed extensively in this report, has served the European broadband markets well. The SMP regime is key to safeguarding competition, which in an NGA setting will, in turn, drive network deployment and take-up. The SMP regime is also aligned with competition law practice, which ensures consistency of approach in ex-ante and ex-post decisions. A deviation from the SMP principle in ex-ante regulation could instead potentially lead to NRAs and competition authorities coming to very different conclusions when examining the same situations. This is unlikely to benefit any player. Rather than changing the fundamental underlying principles of the SMP regime we would instead propose to make some minor modifications to it in areas where it has some weaknesses, such as ensuring that joint SMP can be addressed in a more effective way.

• Excessive limits to markets susceptible to ex-ante regulation, e.g. by not allowing NRAs to find additional markets beyond those identified by the EC as susceptible to ex-ante regulation by the use of the “three-criteria test” or by excessive focus on retail markets without examining underlying wholesale markets would limit the potential for addressing specific market problems in individual Member States.

• Targeted deregulation (due to sub-national geographical market analysis or differentiated geographical remedies) can lead to additional complexity in data collection and analysis. This is also the case if, within the deregulated or differently-regulated area, the result may be said to be “simpler”. This is not just true of targeted deregulation: symmetric access remedies for in-building wiring might, for example, represent a case where additional regulation allows simplicity in other areas.

• The case studies in Section 5, have already shown how different countries vary in terms of the effectiveness of specific access remedies such as duct-and-pole access and SLU. Changes to the list of relevant markets to avoid regulating the same value chain at multiple points (potentially duct access, dark fibre/LLU/SLU and WBA) might appear to be “simpler”, but the choice of which market (or remedies) to remove would necessarily have very different effects in different Member States (and indeed in different regions of individual Member States). The new Market 3 explicitly recognises these links; NRAs have also already reflected the links between these markets in their geographical deregulation of downstream markets (such as wholesale broadband access) in cases where the upstream regulation led to sufficiently competitive downstream markets (e.g. multiple LLU players plus cable).

The abovementioned options for regulatory simplification (which are substantially of a deregulatory nature) have a number of drawbacks, in particular because they limit the possibility for NRAs to address specific market problems and safeguard competition.

7.3.3 Support for FTTH on policy grounds

In Section 3.2.3 we noted that, in the roadmap to its review of the framework, the EC states that only 19% of households are covered by “very high-speed networks able to deal with a likely
substantial future increase in demand for upload as well as download.\textsuperscript{241} In its framework review consultation issued on 11 September 2015 (e.g. in Questions 32 and 33 and the preceding introductory text) the EC also makes reference to a need to roll out network up to the end users’ premises (implying FTTP or FTTH).\textsuperscript{242} We have some concerns about justifying a non-neutral stance which favours FTTP or FTTH based on a perceived need for higher upstream speeds.

Today, the majority of broadband traffic is streaming video services and related downloads (e.g. using Netflix or YouTube), which are highly asymmetrical in their traffic patterns (i.e. downstream traffic is much greater than upstream). A lot of the forecast future traffic growth will also come from video, via:

- additional take-up of these applications
- additional household devices
- additional usage of these applications by existing subscribers
- developments in quality of the streams viewed (HD, 4k).

All of these factors will contribute to substantial growth of video traffic in the medium term. Ultimately, it is the perceived need for ubiquity in the provision of these services as well as other less bandwidth-hungry ones that is driving targets for take-up of ultrafast broadband services.

While there are already some mass-market services which need more symmetrical usage profiles (e.g. videoconferencing/chat, cloud storage), these are currently much less significant than streaming video. The situation is somewhat different in the business market, where there is a greater need for symmetric upstream and downstream bandwidths, as servers are hosted, employees need to access central systems that are often hosted in the cloud or in different locations, and there is a greater use of e.g. videoconferencing. As a result, we believe that a policy-level focus on a specific and uncertain feature of the ultrafast offer (i.e. a postulated future increase in demand for upload as well as download) is premature. In the terms of the investment discussion above, early investment in FTTH might not be efficient (at this time) in all regions of all EU Member States.

Having said this, we are not against FTTH. The ability to offer highly suitable passive wholesale access products such as fibre unbundling makes FTTH networks – especially those with a point-to-point architecture – ideally suited to the vigorous competition we favour. However, if a policy stance is to be taken which favours one technology (such as FTTH) over another (such as single

operator vectored FTTC/VDSL), it would be better policy to justify this on the grounds of the superior competition benefits that can be provided.

By comparison, in our view it is not a sensible trade-off to sacrifice the benefits of competition in order to obtain a little more network coverage of a specific technology, even if this technology is capable of certain technical aspects such as high upstream speeds. Any model in which the benefits of competition are lost without even obtaining any wider benefits to society has even less merit.

Regardless of whether one technology should be favoured over another, policy makers and NRAs must ensure that appropriate and fit-for-purpose access remedies are put in place where these are needed, in order to prevent uncompetitive market outcomes, allow competition to flourish in an NGA setting, and thus ensure a virtuous circle leading to increased take-up and investment.

244 Benjamin Franklin’s quotation about not trading an essential liberty for a little temporary security springs to mind.
8 Conclusions and recommendations

Throughout this report we have demonstrated how major changes to the regulatory framework appear unnecessary to provide incentives for the deployment of NGA networks, and are unlikely to incentivise take-up. On the contrary, we believe that competition – which is encouraged by the current regulatory framework – will be one of the main drivers for take-up of high-speed broadband products and for reaching the DAE’s 50% take-up target for 100Mbit/s services and, perhaps even more importantly, to increase quality aspects.

We have also shown how, in the absence of regulation, NGA networks are likely to exhibit high barriers to entry and how broadband (including NGA) markets do not currently tend towards effective competition. Competition law alone does not appear to be sufficient to solve the competition problems. We have noted that significant changes to the framework to encourage (efficient) investment or to “simplify” the structure are either unnecessary or are likely to have unfavourable outcomes for competition (and hence consumers) in some areas of some Member States.

In our view, a switch from the current pro-competitive approach to one that is, in some way, intended to explicitly incentivise investment is unlikely to improve end-user outcomes. There is also a risk of unintended consequences such as a lower take-up of fast broadband products (which could damage the commercial business case for building such networks), a reduction in benefits for end users, and public funds being directed to areas where private investment has already taken place or would have occurred in the near future.

Overall, we believe that the current regulatory framework has served the European broadband markets well. Therefore we do not see any requirement to modify the main parameters of the regulatory framework, which should continue to be based on:

- identification of markets susceptible to ex-ante regulation through the use of the three criteria test
- identification of operators with SMP
- stimulation of competition through the imposition of appropriate remedies, including a range of wholesale access products with a focus on passive access, such as access to ducts and other civil works, SLU and unbundling, complemented by active access to address more difficult geographies and to enable the provision of services to businesses, notably those which have multiple dispersed sites.

We have also noted how the varying outcomes in different Member States (and in fact also outside the EU) are largely based on path-dependent factors regarding historical networks and the economics of network deployment. NRAs need to retain the tools and capabilities they require to address these specific market problems and situations.
Our recommendation is therefore that a major change in policy appears unnecessary. Some refinements to the regulatory framework may be warranted, however, including:

- ensuring the availability of appropriate NGA wholesale products that can create the same benefits as LLU by providing unbundled (or equivalent) access to SMP operators’ civil infrastructure, copper sub-loops, and FTTH and FTTC deployments
- continuing the effort to move towards EoI for NGA networks to ensure a level playing field between alternative operators and the retail arm of the SMP operator
- ensuring that potential duopoly / oligopoly situations can be addressed.
Annex A  Definition of relevant markets over time

### Figure A.1: Relevant markets specified by the EC for investigation by NRAs in 2002

<table>
<thead>
<tr>
<th>Number</th>
<th>Market</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Access to the public telephone network at a fixed location for residential customers</td>
</tr>
<tr>
<td>2</td>
<td>Access to the public telephone network at a fixed location for non-residential customers</td>
</tr>
<tr>
<td>3</td>
<td>Publicly available local and/or national telephone services provided at a fixed location for residential customers</td>
</tr>
<tr>
<td>4</td>
<td>Publicly available international telephone services provided at a fixed location for residential customers</td>
</tr>
<tr>
<td>5</td>
<td>Publicly available local and/or national telephone services provided at a fixed location for non-residential customers</td>
</tr>
<tr>
<td>6</td>
<td>Publicly available international telephone services provided at a fixed location for non-residential customers</td>
</tr>
<tr>
<td>7</td>
<td>The minimum set of leased lines (which comprises the specified types of leased lines up to and including 2Mbit/s)</td>
</tr>
<tr>
<td>8</td>
<td>Call origination on the public telephone network provided at a fixed location</td>
</tr>
<tr>
<td>9</td>
<td>Call termination on individual public telephone networks provided at a fixed location</td>
</tr>
<tr>
<td>10</td>
<td>Transit services in the fixed public telephone network</td>
</tr>
<tr>
<td>11</td>
<td>Wholesale unbundled access (including shared access) to metallic loops and sub-loops for the purpose of providing broadband and voice services</td>
</tr>
<tr>
<td>12</td>
<td>Wholesale broadband access</td>
</tr>
<tr>
<td>13</td>
<td>Wholesale terminating segments of leased lines</td>
</tr>
<tr>
<td>14</td>
<td>Wholesale trunk segments of leased lines</td>
</tr>
<tr>
<td>15</td>
<td>Access and call origination on public mobile telephone networks</td>
</tr>
<tr>
<td>16</td>
<td>Voice call termination on individual mobile networks</td>
</tr>
<tr>
<td>17</td>
<td>The wholesale national market for international roaming on public mobile networks</td>
</tr>
<tr>
<td>18</td>
<td>Broadcasting transmission services, to deliver broadcast content to end users</td>
</tr>
</tbody>
</table>


### Figure A.2: Relevant wholesale markets specified by the EC for investigation by NRAs in 2007

<table>
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<td>Access to the public telephone network at a fixed location for residential and non-residential customers</td>
</tr>
<tr>
<td>2</td>
<td>Call origination on the public telephone network provided at a fixed location</td>
</tr>
<tr>
<td>3</td>
<td>Call termination on individual public telephone networks provided at a fixed location</td>
</tr>
<tr>
<td>4</td>
<td>Wholesale (physical) network infrastructure access (including shared or fully unbundled access) at a fixed location</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Number</th>
<th>Market</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Wholesale broadband access (comprises non-physical or virtual network access including ‘bitstream’ access)</td>
</tr>
<tr>
<td>6</td>
<td>Wholesale terminating segments of leased lines, irrespective of the technology used to provide leased or dedicated capacity</td>
</tr>
<tr>
<td>7</td>
<td>Voice call termination on individual mobile networks</td>
</tr>
</tbody>
</table>

*Figure A.3: Relevant wholesale markets specified by the EC for investigation by NRAs in 2014*247

<table>
<thead>
<tr>
<th>Number</th>
<th>Market</th>
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<td>1</td>
<td>Wholesale call termination on individual public telephone networks provided at a fixed location</td>
</tr>
<tr>
<td>2</td>
<td>Wholesale voice call termination on individual mobile networks</td>
</tr>
<tr>
<td>3(a)</td>
<td>Wholesale local access provided at a fixed location</td>
</tr>
<tr>
<td>3(b)</td>
<td>Wholesale central access provided at a fixed location for mass-market products</td>
</tr>
<tr>
<td>4</td>
<td>Wholesale high-quality access provided at a fixed location</td>
</tr>
</tbody>
</table>

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Annex B  Pricing analysis

*Figure B.1: List of products considered for the analysis of prices in Section 4.4 [Source: Analysys Mason based on Analysys Mason Research database 248, 2015]*

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<th>Bundle type</th>
<th>Bundle name</th>
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<td>Double-play</td>
<td>A1 Festnetz-Internet</td>
</tr>
<tr>
<td>Austria</td>
<td>A1 Telekom Austria</td>
<td>Double-play</td>
<td>A1 Festnetz-Internet mit Glasfaser Power 16</td>
</tr>
<tr>
<td>Austria</td>
<td>A1 Telekom Austria</td>
<td>Double-play</td>
<td>A1 Festnetz-Internet mit Glasfaser Power 30</td>
</tr>
<tr>
<td>Austria</td>
<td>A1 Telekom Austria</td>
<td>Double-play</td>
<td>A1 Festnetz-Internet mit Glasfaser Power 50</td>
</tr>
<tr>
<td>Austria</td>
<td>A1 Telekom Austria</td>
<td>Double-play</td>
<td>A1 Festnetz-Internet mit Glasfaser Power 100</td>
</tr>
<tr>
<td>Austria</td>
<td>A1 Telekom Austria</td>
<td>Triple-play</td>
<td>A1 Festnetz-Internet mit Glasfaser Power 16 + TV</td>
</tr>
<tr>
<td>Austria</td>
<td>A1 Telekom Austria</td>
<td>Triple-play</td>
<td>A1 Festnetz-Internet mit Glasfaser Power 30 + TV</td>
</tr>
<tr>
<td>Austria</td>
<td>A1 Telekom Austria</td>
<td>Triple-play</td>
<td>A1 Festnetz-Internet mit Glasfaser Power 50 + TV</td>
</tr>
<tr>
<td>Austria</td>
<td>A1 Telekom Austria</td>
<td>Triple-play</td>
<td>A1 Festnetz-Internet mit Glasfaser Power 100 + TV Plus</td>
</tr>
<tr>
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<td>Tele2 Austria</td>
<td>Double-play</td>
<td>Internet und Telefon 8Mbit/s</td>
</tr>
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<td>Austria</td>
<td>Tele2 Austria</td>
<td>Double-play</td>
<td>Internet und Telefon 20Mbit/s</td>
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<td>Tele2 Austria</td>
<td>Double-play</td>
<td>Internet und Telefon 30Mbit/s</td>
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<td>UPC Austria</td>
<td>Double-play</td>
<td>Take IT easy</td>
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<td>Take IT max</td>
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<td>hol double-play versatile 300 + hol my TV</td>
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<td>Bundle name</td>
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<td>hol double-play GR + 300 (VDSL) + hol my TV</td>
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<td>Double-play</td>
<td>Tuttofibra (da Telecom)</td>
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<td>Double-play</td>
<td>Unlimited BT Infinity 1 + Weekend calls (+ line rental)</td>
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Figure B.2: List of products considered for the analysis of prices in Italy in Section 5.3 [Source: Analysys Mason, 2015]