



Quality Dimensions of Wholesale Fibre Telecommunication Services

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New Zealand Commerce Commission

FINAL REPORT



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GLOSSARY

| Term | Definition |
|--------|---|
| ACCC | Australian Competition and Consumer Commission |
| ACMA | Australian Communications and Media Authority |
| AER | Australian Energy Regulator |
| BEIS | Department for Business, Energy and Industrial Strategy (UK) |
| BEREC | Body of European Regulators of Electronic Communications |
| BROC | Binding rules of conduct (Australia) |
| BT | British telecommunications company, formerly British Telecom. |
| CAA | Civil Aviation Authority (UK) |
| CCA | Competition and Consumer Act 2010 (Australia) |
| CCB | Consumer Challenge Board (UK) |
| CEPA | Cambridge Economic Policy Associates |
| CFH | Crown Fibre Holdings (New Zealand) |
| CIP | Crown Infrastructure Partners (New Zealand) |
| CISC | CRTC Interconnection Steering Committee (Canada) |
| CNMC | National Authority for Markets and Competition (Spain) |
| CNOC | Canadian Network Operators Consortium |
| CRTC | Canadian Radio-television and Telecommunications Commission |
| CSG | Customer service guarantee (Australia) |
| DFAS | Direct fibre access service (New Zealand) |
| DSL | Digital subscriber line |
| EC | European Commission |
| Enable | Enable Services Limited |
| EOI | Equivalence of inputs |
| ETSI | European Telecommunications Standards Institute |
| EU | European Union |



| Term | Definition |
|------|---|
| FCC | Federal Communications Commission (United States) |
| FTTC | Fibre-to-the-cabinet |
| FTTH | Fibre-to-the-home |
| FTTN | Fibre-to-the-node |
| FTTP | Fibre-to-the-premises |
| Gbps | Gigabits per second |
| GEA | Generic ethernet access (UK) <i>Openreach's wholesale service providing RSPs with access to its FTTC and FTTP networks in order to supply higher speed broadband service. The GEA meets BT's obligation to provide VULA.</i> |
| HAL | Heathrow Airport |
| HFC | Hybrid coaxial fibre |
| HSA | High-speed access |
| ICO | Interconnection offer |
| ID | Information disclosure |
| IM | Input methodology |
| IMDA | Info-communications Media Development Authority (Singapore) |
| KPI | Key performance indicator |
| LFC | Local Fibre Company (New Zealand) |
| LLU | Local loop unbundling (UK) <i>A process by which a dominant provider's local loops are physically disconnected from its network and connected to competing providers' networks. This enables operators other than the incumbent to use the local loop to provide services directly to end-users.</i> |
| MBIE | Ministry of Business, Innovation and Employment (New Zealand) |
| Mbps | Megabits per second |
| MPF | Metallic path facility (UK) <i>The provision of access to the copper wires from an end-user's premises to a BT main distribution frame, allowing competitors to provide end-users with both voice and/or data services over the copper wires.</i> |
| MRP | Maximum regulated prices (Australia) |
| NBN | National Broadband Network (Australia) |



| Term | Definition |
|--------------|---|
| NBN Co | The (government-owned) wholesale service provider for the Australian NBN. |
| NetCo | Network Company (operator of the passive infrastructure for Singapore's Next Gen NBN). |
| Next Gen NBN | Next Generation Nationwide Broadband Network (Singapore) |
| NIPA | Network infrastructure project agreement (New Zealand) |
| Northpower | Northpower Limited |
| NRA | National regulatory authority (European Union) |
| NZ | New Zealand |
| Ofcom | The Office of Communications (the UK regulator for communications services). |
| Ofgem | The regulator for the energy sector in Great Britain. |
| OpCo | Operating Company (operator of the regulated active infrastructure for Singapore's Next Gen NBN). |
| Openreach | The access division of BT. |
| OTA2 | Office of the Telecoms Adjudicator (UK) |
| PIA | Physical infrastructure access (UK) <i>A regulatory obligation under which BT is required to allow telecommunication service providers to deploy networks in the physical infrastructure of BT's access network.</i> |
| POI | Point of interconnection |
| PQ | Price-quality |
| QoS | Quality of service |
| RIIO | Revenue = Innovation + Inputs + Outputs <i>The current regulatory framework adopted by Ofgem for regulated electricity networks in Great Britain.</i> |
| RO | Reference offer |
| RRP | Rate rebate plan (Canada) |
| RSP | Retail service provider |
| SAU | Special access undertaking (Australia) |
| SLA | Service level agreement |
| SLG | Service level guarantee |
| SLU | Sub loop unbundling (UK) |



| Term | Definition |
|------|---|
| | <i>Similar to LLU, except that telecommunication service providers interconnect at a point between the exchange and the end-user.</i> |
| SME | Small and medium-sized enterprise |
| SMP | Significant market power |
| SMPF | Shared metallic path facility (UK) <i>Provision of access to copper wires from an end-user's premises to a BT main distribution frame, allowing competitors to provide end-users with broadband services, while BT continues to provide conventional narrowband services.</i> |
| UFB | Ultra-Fast Broadband |
| UK | United Kingdom |
| UNI | User network interface |
| VULA | Virtual unbundled local access (UK) <i>A regulatory obligation requiring BT to provide access to its FTTC and FTTP networks, which allows telecoms providers to connect at a local aggregation point and be provided with a virtual connection from this point to the end-user premises.</i> |
| WBA | Wholesale broadband agreement (Australia) |
| WBA3 | The WBA currently in force for the Australian NBN. |
| WLA | Wholesale local access (UK) |
| WLR | Wholesale line rental (UK) <i>The service offered by Openreach to other telecommunication service providers to enable them to offer retail line services in competition with BT's own retail services.</i> |
| WSA | Wholesale service agreement (New Zealand) |





EXECUTIVE SUMMARY

The New Zealand Government's Ultra-Fast Broadband Initiative (UFB Initiative) has led to four companies (the 'fibre providers') being selected to roll out fibre infrastructure in New Zealand. The fibre services provided by Chorus - the largest fibre provider - are to be regulated under a price-quality (PQ) path. Chorus and the other Local Fibre Companies (LFCs) will also be monitored under an information disclosure (ID) regime.

Under the PQ regulatory framework, Chorus will be required to provide a number of specific regulated services. These include two anchor services (a basic broadband service and a voice service), along with a direct fibre access service (DFAS) and a layer 1 unbundled service.

The regulatory framework requires the Commission to set a quality dimensions input methodology (IM). The IM needs to provide certainty on the rules and processes that the Commission will follow in setting the quality standards for the services provided by Chorus under the PQ path and specifying the service quality information that will be collected through the ID regime.

The quality dimensions IM may apply to a range of fibre services provided by Chorus and the LFCs; these services are expected to evolve over time in line with market developments and the demands of end-users. A key challenge in developing the IM is therefore to strike a balance between achieving the flexibility required to accommodate new services and changing end-user requirements, and providing sufficient certainty on the application of the ID and PQ regimes.

To support its development of the quality dimensions IM, the Commission has requested that CEPA undertake a preliminary analysis of:

- the potential scope of 'quality dimensions' for fibre services;
- relevant international experience in this area; and
- applicability to economic regulation in the New Zealand context.

Case studies

To help inform our advice to the Commission, we have undertaken four detailed case studies that considered approaches to service quality regulation for telecommunications services in other jurisdictions. The jurisdictions we covered were:

- the United Kingdom (Ofcom);
- Singapore (Info-communications Media Development Authority, IMDA);
- Canada (Canadian Radio-television and Telecommunications Commission, CRTC); and
- Australia (Australian Competition and Consumer Commission, ACCC).

We considered a number of other jurisdictions; however, we determined that the four above best fit with the questions posed to us by the Commission.

The case studies have been useful in identifying the different aspects of quality measures other jurisdictions have considered and how they have categorised them. The case studies show that a broad range of approaches can be adopted for the regulation of telecommunication service quality. In our view, each approach has both advantages and disadvantages.



Ofcom has imposed regulatory standards for particular elements of quality, monitors a broader range of quality metrics through information disclosure requirements, and also requires that particular aspects of quality are reflected in Openreach's reference offer (RO). In the Singaporean case, the IMDA does not set regulated standards in most cases, but rather provides guidance on the broad quality dimensions to be included in the Interconnection Offers of the two regulated wholesale service providers (who offer layer 1 and layer 2 services respectively). The Canadian regulator CRTC will monitor certain elements of quality in a competitor quality of service regime, but has also declined to impose mandated targets at this stage. In contrast, the ACCC does not provide guidance in relation to wholesale service quality for Australia's National Broadband Network (NBN); detailed quality provisions are instead captured in the commercially negotiated access agreement. However, in light of escalating end-user dissatisfaction the ACCC has recently intervened by undertaking a consultation on the adequacy of quality standards for NBN services. This has led the wholesale service provider - NBN Co – to provide the ACCC with a court-enforceable undertaking, through which it has committed to improve both reporting and the service level guarantees offered to retail service providers (RSPs).

We highlight the findings from these case studies throughout the report. It is important to bear in mind that the market structure in each jurisdiction has influenced the regulator's focus on particular issues. For example, BT is vertically integrated in the United Kingdom (UK). Concerns were raised that BT was abusing its market position by providing sub-standard connection services to other RSPs through Openreach, its access network division. This led Ofcom to place a strong focus on the most important wholesale products for promoting retail competition and the dimensions of quality that matter most for customers (in Ofcom's view, repairs and installations). In contrast, in Australia there is structural separation between NBN Co and the RSPs, and vertical competition issues have accordingly assumed a lower degree of importance.

Quality dimensions

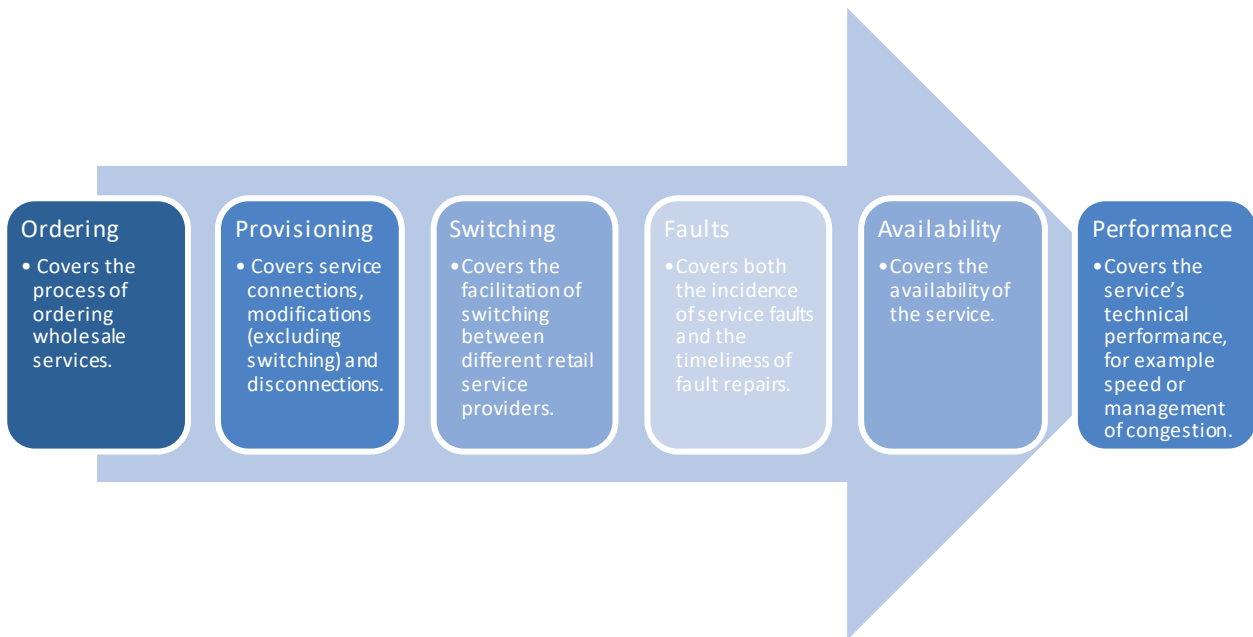
After reviewing the literature and evidence from the case studies, we have defined quality dimensions as elements or aspects of wholesale service quality that relate to distinct parts of a fibre service's 'lifecycle', from ordering to eventual disconnection. We draw a distinction between 'quality dimensions', 'quality metrics' and 'quality standards'. We define quality metrics as specific indicators or measures of service quality that sit within each dimension, while quality standards represent specific targets that a regulated business is required to achieve.

Quality dimensions (and quality more broadly) have a key role in achieving the objectives of an incentive-based regulatory model. Under a general incentive-based framework composed of 'inputs, outputs, outcomes and purpose', we consider that quality dimensions should be considered within the 'outputs' part of the framework. Regulators often choose to place incentives on service providers to deliver specific outputs (including service quality), as outputs can be selected to support the broader outcomes of the regulatory framework, but are typically more measurable.

Our findings from the case studies indicate that fibre quality dimensions can be grouped into six broad categories that reflect the product lifecycle of the services. This is illustrated in Figure 1.1.



Figure 1.1: Quality dimensions based on the product lifecycle



Source: CEPA

Within these high-level categories there may be a range of 'sub-dimensions'. For example, 'provisioning' may relate to new connections, service activation, service modifications, or disconnections. The case studies have shown that these dimensions are applicable, to varying extents, to a wide range of different fibre services, including layer 1 and layer 2 services.

A wide range of quality dimensions and sub-dimensions could be relevant in the New Zealand context, given the range of fibre services that the IM could potentially apply to and the uncertain future evolution of the market. We conclude that the IM should allow the Commission to consider all six quality dimensions that we identify when making a PQ or ID determination.

In addition to the six quality dimensions that reflect the lifecycle of the services, there may also be a requirement for general dimensions that covers the full lifecycle. 'Customer service' may be one such example. While metrics or standards relating to customer service could be specified for each of the six dimensions above, it could be considered that the same customer service metric(s) and standard(s) could apply across all stages of the lifecycle (and therefore all dimensions). In this report, we have not separately identified this 'general' quality dimension separately, but we note that consultation may indicate that is an appropriate addition to the framework.

Options for the quality dimensions IM

The quality dimensions IM needs to set out the **rules** and **processes** underpinning the PQ path and ID reporting requirements set by the Commission. The Commission has not set a quality dimensions IM before. Other IMs established by the Commission range from relatively high-level rules and processes (such as the Transpower cost allocation IM (which is more commonly known as the capital expenditure IM)¹ to

¹ Commerce Commission (2018c).



very prescriptive guidelines that govern how the Commission will approach a particular topic (for example, the cost of capital IM).²

Rules

We see a range of options for how specific the IM is in prescribing how quality standards and quality reporting requirements are set by the Commission under a PQ or ID determination. These broad options are set out below (the levels are hierarchical, in that Level 4 also requires Levels 1-3 to be specified in the IM):

- **Level 1** – The IM sets out broad principles that guide the Commission in setting the PQ and ID determinations. For example, the IM could specify that under PQ, quality standards should be set to ‘ensure that fibre providers are incentivised to provide service levels that meet the demands of end-users’, or ‘ensure that fibre providers have appropriate incentives for innovation and investment’. The IM could also set out the ‘best practice’ characteristics that any quality standards or metrics should meet. For example, best practice characteristics might specify that standards should be relevant for the desired outcome, measurable, verifiable, within the control of the service provider and should not place a disproportionate burden on the service provider.
- **Level 2** – The IM sets out ‘narrower’ principles for each quality dimension. For example, the IM might specify that under PQ, quality standards should be set for the provisioning and fault repair quality dimensions. The IM would then set out principles to guide how the Commission would establish the quality metrics and standards that would apply under these dimensions.
- **Level 3** – The IM sets out the nature of the metrics relating to the quality dimensions that are deemed relevant. For example, the IM might specify that under the ID regime, there must be a quality metric to measure how soon end-users are connected following a connection request. The IM could also set out how metrics should be measured. For example, this might include details on how the data would be gathered, and whether there would be any exclusions (for example, if an end-user failed to attend a connection appointment).
- **Level 4** – The IM sets out specific standards that apply for the PQ/ ID regimes. For example, the IM could contain actual regulated quality standards that would apply automatically in future PQ determinations (for example, ‘the maximum time for new connections is 30 days’). In the ID context, this might involve specifying particular benchmark targets.

At a minimum, we consider that the IM would need to set out the detail contained under Level 1. Our initial view is that an appropriate balance for the quality dimensions IM would be achieved by adopting the Level 2 option outlined above, with the possibility of adopting a Level 3 approach for certain quality dimensions. Including Level 3 detail in the IM would provide fibre providers, access seekers and end-users with additional certainty. However, given the limitations this would place on the Commission’s flexibility in later applying the IM, we consider that there are limited cases for which this would be appropriate. We have identified a number of ‘contextual factors’ (drawn from the case studies and related literature) that the Commission may consider in deciding on the scope of detail to include in the IM:

- **Stability of the regulated services and end-user requirements.** A fast-moving market may result in rapid changes to the metrics and standards against which services should be measured. A

² Commerce Commission (2016).



prescriptive approach to setting quality metrics and standards for services (or groups of services) that are affected by innovation and market structural changes may not keep up with the speed of change in the desired outcomes. Measures for tightly defined services, such as the anchor services, could potentially be less subject to change; however, we note that the anchor services themselves may evolve over time. It is also possible that some aspects of the fibre service lifecycle could be more robust to change. For example, providing fibre services to a new customer will almost always require an installation; therefore, the IM could potentially set out quality metrics that would apply to this dimension (setting standards may still not be appropriate).

- **Incentive properties of the service quality regime.** Quality of service standards and/or reporting requirements have been used in other jurisdictions to incentivise appropriate improvements in service quality over time, and encourage the service provider to innovate and invest in the network. A highly-prescriptive approach would leave less scope for the Commission to use quality standards / information disclosure requirements as levers to improve service levels.
- **Providing certainty.** This factor would consider whether there are any quality dimensions, metrics or standards for which the benefit of providing certainty for the regulated fibre providers (and other stakeholders) could outweigh any disadvantages from pre-determining the quality dimension, metric and/or standard for the duration of the IM.
- **Cost-effectiveness.** This factor would consider the costs associated with adopting different approaches to the IM, for example, a 'bright-line' prescriptive rule versus setting a principle. This would include: the costs of rulemaking; the costs of rule application; and associated social and economic costs.

During the development of the IM, we understand that the industry and other stakeholders will be involved in the Commission's consultations. This will help to identify the areas of focus for the Commission and the key services and/or quality dimensions for which more prescriptive rules may need to be set in the IM.

Processes

Given the objective of providing regulatory certainty, we expect that the IM would set out in detail how the Commission will apply the IM to set quality dimensions, metrics, and standards (where applicable) for the PQ and ID regimes. Broadly, we see two key components in the process of applying the IM:³

- **Rule requirements.** The Commission will need to determine which regulated quality standards and quality reporting requirements are necessary to include in the PQ and ID determinations, respectively. In relation to quality standards, the Commission will also need to consider whether prescriptive rules are required, or whether a more high-level, principles-based approach would be more appropriate.
- **Roles and responsibilities.** There are a broad range of stakeholders – fibre providers, RSPs, end-users (and their representatives) – that could be involved in different ways during the application of the IM. Broadly, the application of the IM could be primarily led by the Commission, or alternatively

³ We expect that before the quality dimensions IM is applied, the Commission would separately confirm the definition of the anchor products. While we have assumed that this is outside the scope of the quality dimensions IM, it may have a material impact on how the IM is applied.



the Commission could establish an industry ‘forum’ to allow the relevant stakeholders to play a more direct role.

In regard to the **rule requirements**, we set out a number of contextual factors that could assist the Commission in deciding whether it is appropriate to apply a prescriptive quality standard for a particular quality dimension. In addition to the other contextual factors outlined above, these factors include:

- Availability of information to set appropriate quality standards (for example, on the cost-quality trade-off).
- Ability for agreement on service quality to be reached through commercial negotiation.
- Extent of competitive pressures faced by the fibre providers.
- Impact on end-users (for example, the level of potential detriment if quality is poor).
- Whether there is evidence that a particular quality dimension is (or is likely to be) problematic.
- Complexity of the service offering.
- Impacts on innovation.
- The other incentives faced by the service provider (including through the price/revenue determination itself).
- The degree of trust between the Commission and the fibre providers.

As general observation, we note from the Ofcom and ACCC case studies that while a lack of prescriptive standards does provide flexibility, these regulators have both intervened after service providers have failed to meet appropriate quality levels. Ofcom responded by setting regulated quality standards for key quality dimensions. The ACCC has not directly increased the level of guidance it provides on service quality, but rather appears to have prompted NBN Co to improve the service level guarantees (rebates for non-performance) it offers to RSPs. We note that in the New Zealand context, there is a potential risk that if quality is poor early on, this could undermine take up of fibre services and the speed of the copper-fibre transition.

In regard to **roles and responsibilities**, we believe the Commission could use a mix of approaches to set the metrics and standards that apply under PQ/ID determinations. The case studies indicated that different approaches have been applied to standard setting, including processes that involved a more active role for the industry. We see no reason why the Commission could not adopt a similar approach. There may be certain quality dimensions for which standards are more appropriately led by the Commission (for example, where the industry is unable to reach agreement, or appropriately reflect the interests of end-users). For other dimensions, it may be more efficient and effective for the Commission to delegate the prescription of the metrics and standards to an industry ‘forum’ that could include representatives from all the relevant stakeholder groups. For example, if highly technical knowledge is required to set appropriate standards/metrics for particular quality dimensions, a forum may be better placed than the Commission to lead this work, particularly if the sector is evolving rapidly over time.

Examples from the case studies include the approach taken by Ofcom in deciding to set regulated quality standards for the ordering and provisioning quality dimensions. This decision was predominantly regulator-led, with Ofcom seeking stakeholder views through a consultation process and also undertaking its own research on the priorities and preferences of end-users. In contrast, the Canadian CRTC ran a consultation process to decide on which quality metrics to include in its quality of service monitoring regime. However,



it then tasked a stakeholder working group – the CRTC Interconnection Steering Committee (CISC) – with the detailed work of defining how the metrics would be measured and setting benchmark targets against which to compare the service providers' performance.

Other considerations

We note several other factors that may need to be taken into account as the IM develops; these are likely not exhaustive.

- **Interaction with the broader regulatory framework.** The Commission will use a 'building blocks' methodology for setting the overall revenue cap that will apply under the PQ path, and regulated price caps will also be set for the anchor services. As with any service, there is a trade-off between quality and price. The Commission will need to consider this trade-off when setting quality standards for the regulated services, including investment strategies and the evolution of the services that are provided.
- **Service definition.** Regulations made under the Act will define anchor services. The definition of these services will almost certainly imply some quality aspects (for example, upload/download speeds). For the First Regulatory Period the Ministry of Business, Innovation and Employment (MBIE) will set the anchor services. After the first regulatory period, the Commission is required to define anchor services. These aspects will need to be taken into account within the broader quality dimension framework and the reporting requirements placed on the fibre providers.
- **Interactions between retail and wholesale service quality.** There are clear interactions between wholesale service levels and retail service levels. While the quality dimensions that apply to the fibre providers should be restricted to factors that are within their control, identifying this may not always be clear cut. For example, when completing a new connection, the customer, fibre provider and RSP will all need to coordinate. Consideration will need to be given to the impact of these interactions on both wholesale and retail quality standards/metrics. RSPs may also choose to deliver a different level of service to end-users, compared to the wholesale service level committed to by the fibre providers. As observed in Australia, alignment between wholesale and retail service standards is needed to ensure that improvements at the wholesale level flow through to end-users.



I. INTRODUCTION

I.1. SCOPE

Following a statutory review of fibre regulation, the New Zealand Government has decided to establish a new incentive-based regulatory framework for fibre services; this will be reflected in an amendment to the Telecommunications Act 2001 (the Act). Cambridge Economic Policy Associates (CEPA) has been engaged by the New Zealand Commerce Commission (the Commission) to provide advice on the quality dimensions of wholesale fibre telecommunications services (fibre services) in New Zealand. This advice will inform the development of the upfront input methodologies (IMs) that set out the rules and processes that will apply to the regulation of fibre services under the new framework.

The Commission has requested that CEPA undertake a preliminary analysis of:

- the potential scope of ‘quality dimensions’ for fibre services;
- relevant international experience in this area; and
- applicability to economic regulation in the New Zealand context.

This report sets out our responses to this request.

I.2. INPUT METHODOLOGIES

As currently drafted, Part 6 of the Telecommunications (New Regulatory Framework) Amendment Bill (the Bill) to amend the Act, specifies that the Commission will be required to develop upfront IMs that will establish the rules and processes that apply to the regulation of fibre services. This is in line with the approach to the regulation of other utilities under Part 4 of the Commerce Act 1986 (the Commerce Act), described in the text box below.

Input Methodologies – Part 4 of the Commerce Act

The Commission makes the following observations around the role of the IMs under Part 4 of the Commerce Act (CEPA’s emphasis):

“IMs underpin the price-quality paths and information disclosure requirements that regulated suppliers are subject to under Part 4 and have the purpose of **promoting certainty for suppliers and consumers** about the rules, requirements, and processes applying to regulation or proposed regulation. Our focus in setting the IMs is to **increase certainty** by maintaining regulations that are **stable**, provide suppliers with **incentives to invest in long-lived infrastructure** and **deliver long-term benefits to New Zealanders**.”

“IMs are one part of the regulatory framework we work with. They **bind both us and suppliers** of the regulated services. The IMs do not take effect at the time they are determined but flow through into the Commission’s price-setting processes under PQ regulation and the information disclosure requirements regulated businesses face.”

Source: Commerce Commission (2018a).

In line with the role of IMs under the Commerce Act, the Bill states that:



“The purpose of input methodologies is to promote certainty for regulated fibre service providers, access seekers, and end-users in relation to the rules, requirements, and processes applying to the regulation, or proposed regulation, of fibre fixed line access services under this Part.”⁴

Among other elements of the new regulatory process, the Commission will be required to set a ‘quality dimensions’ IM. The role of this IM will be to establish the rules and processes that the Commission will follow in specifying both regulated quality standards and the service quality information that will be collected through a new information disclosure regime.

1.3. REPORT STRUCTURE

The remainder of this report is structured as follows:

- Section 2 sets out the context for this study, including an overview of the new regulatory arrangements for fibre services and the current state of the fibre services market.
- Section 3 sets out a high-level summary of the international case studies and our key observations on the relative advantages and disadvantages of the approaches taken to the regulation of telecommunications services in other jurisdictions.
- Section 4 sets out our view on the scope of the quality dimensions that could be reflected in the IM. This section draws on several case studies; these identified a range of quality dimensions that are considered important for the regulation of fibre services in other jurisdictions.
- Section 5 turns to the broad options for setting quality dimensions, metrics and standards. This includes the trade-offs between prescriptive and general rules, and options relating to the process for setting and applying the quality dimensions IM.
- In Section 6 we set out other considerations that could influence how the quality dimensions IM is set and applied, but which are not addressed in detail in our report.

In addition to the main report, there are two appendices. Appendix A provides the detailed write-up of the international case studies. Appendix B provides the references for source material used in this report.

⁴ Amendment Bill (2018), Section 73.



2. BACKGROUND

Summary

In the following section, we provide an overview of the market for fibre services in New Zealand, the arrangements that have governed the provision of fibre services to date, and the new regulatory framework.

The New Zealand Government's Ultra-Fast Broadband Initiative (UFB Initiative) has led to four companies being selected to roll out fibre infrastructure in New Zealand. The fibre services provided by Chorus - the largest fibre provider - are to be regulated under a price-quality (PQ) path. The other fibre providers will be monitored under an information disclosure (ID) regime.

Under the PQ regulatory framework, Chorus will be required to provide a number of specific regulated services including two anchor services – a basic broadband service and a voice service – and also a direct fibre access service (DFAS) and a layer 1 unbundled service.

The regulatory framework requires the Commission to set a quality dimensions IM. The IM needs to provide certainty on the rules and processes that the Commission will follow in setting the quality requirements for the regulated services under the PQ path, as well as specifying the service quality information that will be collected through the ID regime.

The quality dimensions IM may apply to a range of fibre services provided by Chorus and the LFCs; these services are expected to evolve over time in line with market developments and the demands of end-users. A key challenge in developing the IM is therefore to strike a balance between achieving the flexibility required to accommodate new services and changing end-user requirements, and providing sufficient certainty on the application of the ID and PQ regimes.

2.1. FIBRE SERVICES IN NEW ZEALAND

Through the New Zealand Government's UFB Initiative, the existing copper network is progressively being replaced by a fibre network. The network is financed on a concessional basis. Upon the launch of the UFB Initiative in 2009, the Government established Crown Infrastructure Partners (CIP)⁵ as a Crown-owned investment company to manage the Government's investment in the new fibre network. Among other responsibilities, CIP's role has included the negotiation of commercial agreements with the private-sector partners who are constructing the new network, namely Chorus and the Local Fibre Companies - Northpower Limited (Northpower), Ultrafast Fibre Limited and Enable Services Limited (Enable). Chorus is the largest of the commercial partners, accounting for 69.4% of total UFB coverage. Enable, Ultrafast Fibre and Northpower are respectively contracted to provide 15.3%, 13.7% and 1.6% of total UFB coverage.⁶ Deployment of the new fibre network is expected to be completed by the end of 2022, and will eventually reach 87% of New Zealanders.⁷

Wholesale and retail providers of fibre services are structurally separated. The Act sets out 'line of business restrictions' for Chorus, that include:

⁵ Formerly Crown Fibre Holdings.

⁶ CIP (2018).

⁷ MBIE (2018a).



- a prohibition on providing retail services;
- restrictions on providing wholesale services beyond layer 2; and
- restrictions that prevent Chorus from linking together wholesale service inputs in order to provide an ‘end-to-end’ service that is similar to a retail product.⁸

We understand that the LFCs face similar restrictions through their contractual arrangements with CIP. The Bill suggests that the Act will maintain these restrictions but allow the Commission to make case-by-case exemptions from the implementation date onwards.

The fibre services supplied by Chorus and the LFCs (hereafter collectively referred to as the ‘fibre providers’) are purchased by retail service providers (RSPs) as inputs to their provision of fixed line voice and broadband services to end users. The largest RSPs are Spark (44% market share in 2017), Vodafone (27%) and Vocus (13%).⁹ The Commission’s 2017 Telecommunications Monitoring Report notes that the market share of smaller RSPs has been increasing.

Substitutes for fibre services exist where the coverage of alternative access technologies overlaps with the fibre network. Alternative technologies include: the existing copper network owned by Chorus; a hybrid coaxial fibre (HFC) network operated by Vodafone in Christchurch, Wellington and Kapiti; and - increasingly - mobile networks. Mobile networks are operated by several RSPs, namely Spark, Vodafone and 2degrees. The Commission has observed that “[d]espite the ever increasing use of mobile devices, fibre gives consistent delivery of high-speed data which cannot currently be matched by mobile.”¹⁰ In relation to voice services however, consumers have been increasingly adopting mobile rather than fixed-line calls; the Commission notes that mobile calls are often more convenient and that many mobile plans include large (or unlimited) volumes of call minutes.¹¹

2.2. REGULATORY ARRANGEMENTS

At present, fibre services are provided by the fibre providers on terms negotiated by CIP. Following a statutory review of fibre regulation, the Government has decided to establish a new incentive-based regulatory framework for fibre services. We provide an overview of the new and existing arrangements below, with a focus on the regulation of service quality.

2.2.1. Current arrangements

The existing arrangements that govern the quality of fibre services provided by the fibre providers are set out in:

⁸ MBIE (2018b).

⁹ Commerce Commission (2017), page 16. These market share numbers reflect the entire fixed-network broadband market, including fixed wireless subscribers.

¹⁰ Ibid., page 10.

¹¹ Ibid., page 23.



- **Deeds of Open Access Undertaking.** As required under the Act, the Deeds set out the obligations placed on fibre providers to supply services on a non-discriminatory and equivalence of inputs (EOI) basis.
- **Reference Offers** published by the fibre providers, in the form of Wholesale Service Agreements (WSAs). Among other elements, the WSAs set out service descriptions and service levels. These include quality of service provisions in relation to connections, equipment, service orders, continuity of supply, responsibility for fault reporting and rectification, and access to end-user premises. If the agreed service levels are not met, the WSAs include a rebate scheme setting out payments that will be made to the RSPs.
- The **Network Infrastructure Project Agreements (NIPAs)** between CIP and each fibre provider. The NIPAs also include quality of service provisions relating to network performance, average and maximum downtime, provisioning, fault management, traffic, disconnections and the customer installation experience (measured via a survey). In the event that these service levels are not met, the NIPAs provide for the payment of service credits to CIP.

As required by the Act, the Commission operates an existing information disclosure regime for the fibre providers. Among other requirements, the fibre providers must submit an annual report setting out information on their service and product performance. The report covers quality metrics related to provisioning, availability and traffic (for layer 2 services only).¹²

We understand that the Deeds and WSAs will remain in place alongside the new regulatory framework. However, the new incentive-based regulatory regime will replace the current contractual arrangements with CIP, and the existing information disclosure requirements.

2.2.2. The new regulatory framework

Following a period of consultation, in February 2017 the Government released its final proposals on the new regulatory framework for fibre services.¹³ This provides for an information disclosure (ID) regime that will apply to all fibre providers (including Chorus) and a price-quality (PQ) regime for Chorus only. The framework will need to be in place by 2020, or potentially 2022 if the Government extends the implementation deadline. These proposals are set out in the amendment Bill.

As drafted, the Bill sets out that the overarching purpose of the regulatory framework is to:

“... promote the long-term benefit of end-users in markets for fibre fixed line access services by promoting outcomes that are consistent with outcomes produced in workably competitive markets so that regulated fibre service providers—

- (a) have incentives to innovate and to invest, including in replacement, upgraded, and new assets; and*
- (b) have incentives to improve efficiency and supply fibre fixed line access services of a quality that reflects end-user demands; and*

¹² Commerce Commission (2018b).

¹³ MBIE (2017).



- (c) allow end-users to share the benefits of efficiency gains in the supply of fibre fixed line access services, including through lower prices; and
- (d) are limited in their ability to extract excessive profits.”¹⁴

The PQ and ID regimes will initially apply for a three-year period from 2020 to 2023 (‘the first regulatory period’). Subsequent regulatory periods may be between three and five years. LFCs will only be subject to an ID regime during the first regulatory period, due to the competitive constraint provided by the Chorus copper network and Vodafone’s HFC network in Christchurch. However, the Commission will be able to impose PQ regulation in the event that the ID framework does not provide effective constraints on monopolistic behaviour. As Chorus does not currently face the same degree of competitive constraint, it will be subject to both the ID and PQ regimes.¹⁵

The information disclosure regime

The Bill describes the purpose of the ID regime as to “ensure that sufficient information is readily available to interested persons to assess whether the purpose of [the regulatory framework] is being met”.¹⁶

Among other items, the information to be disclosed may include “quality performance measures and statistics”.¹⁷ We understand that the information disclosure regime could potentially apply to any or all of the fibre fixed line access services provided by Chorus and the LFCs.

The price-quality regime

The Bill describes the purpose of the PQ regime as to “regulate the price and quality of fibre fixed line access services provided by regulated fibre service providers.”¹⁸

The Bill sets out that a PQ path must specify the maximum price(s) that may be charged by a regulated fibre service provider and/or the maximum revenues that may be recovered by a regulated fibre service provider.¹⁹ The Government has specified that for the first regulatory period, the PQ regime will set out both:²⁰

- The maximum allowable revenue that Chorus may recover for its UFB business, as calculated under a ‘building blocks’ model. This is similar to the approach to the economic regulation of other utilities that is set out in Part 4 of the Commerce Act. In setting the revenue cap, the Commission will be required to ‘smooth’ any changes in revenue, in order to avoid price shocks.

¹⁴ Amendment Bill (2018), Section 162.

¹⁵ MBIE (2017).

¹⁶ Amendment Bill (2018), Section 185.

¹⁷ Ibid., Section 187(2)(i).

¹⁸ Ibid., Section 191.

¹⁹ Ibid., Section 193 (2).

²⁰ MBIE (2017).



- The maximum prices that Chorus can charge for two regulated ‘anchor services’ (discussed further below), for which both price and quality terms will be set by the Commission.

Subject to the revenue cap and any quality requirements that the Commission may impose (discussed further below), Chorus will be able to offer other fibre services in response to market developments and RSP demands. The Commission will be able to review the terms of anchor products prior to implementation date, as well as unbundled and DFAS and the form of the PQ regime from the second regulatory period (commencing in 2024), subject to certain statutory criteria.

The regulated services

Under the new regulatory framework, fibre services that are subject to the PQ regime are divided into individually price regulated services (‘anchor services’, direct fibre access services’ (DFAS) and ‘unbundled layer 1 services’) and other fibre fixed line services provided by Chorus.²¹

Anchor services

The Commission will set both price and quality terms for the anchor services. Two regulated anchor services are currently envisaged for the first regulatory period, namely a voice service and a basic broadband service. The Bill describes the purpose of the anchor services as “(a) to ensure that baseband equivalent voice and basic broadband services are available to end-users at reasonable prices; and (b) to provide a reference to act as an appropriate constraint on the price and quality of other fibre fixed line access services.”²² It is expected that the anchor services for the first regulatory period will consist of a 100/20Mbps UFB broadband service and a voice-only UFB service. However, the Commission will be able to review the anchor services before the start of each regulatory period, including the first regulatory period.

Other individually price regulated services

In addition to the layer 2 anchor services described above, the Bill also specifies that fibre service providers who are subject to PQ regulation must also provide certain unbundled layer 1 services (i.e., ‘dark fibre’). In particular, the Bill refers to DFAS and ‘unbundled fibre services’:

- DFAS refers to a layer 1 point-to-point access service, used as an input to the services offered to large business by the RSPs, as well as for backhaul for mobile services. We understand that this service is already offered by Chorus and the LFCs.
- The unbundled fibre service refers to a layer 1 point-to-multipoint access service, that could be used by the RSPs to serve residential and small and medium-sized enterprises (SMEs), in combination with their own active electronic equipment. The fibre service providers will be required to offer this unbundled product from 1 January 2020. As product development is still ongoing, the service is not yet fully defined.

We understand that there will not be a layer 1 service for the first regulatory period. However, from the second regulatory period onwards, the Commission will have the ability to set a layer 1 service if certain statutory requirements are met. However, the Bill does state that the fibre providers must provide the

²¹ MBIE (2016).

²² Amendment Bill (2018), Section 206 (7).



DFAS and unbundled fibre service “in accordance with any prescribed specifications and conditions”.²³ The MBIE’s February 2017 discussion paper also notes that fibre providers will have the flexibility to develop other wholesale products, “subject to the revenue cap and some minimum quality requirements”.²⁴

Overall, this suggests that the Commission will be able to specify quality of service requirements in relation to both individually price regulated services and other fibre fixed line access services, if there is a need to do so.

2.3. THE QUALITY DIMENSIONS IM

The Bill specifies that the Commission will be required to develop upfront IMs that will establish the rules and processes that apply to the regulation of fibre services; this will include a ‘quality dimensions’ IM. The role of the quality dimensions IM will be to establish the rules and processes that the Commission will follow in specifying both:

- The quality standards for services regulated under the PQ regime. As noted above, this could capture both the individually price regulated services and other fibre fixed line access services provided by Chorus (and other fibre services that become subject to the PQ regime).
- The service quality information that will be collected through the ID regime (applying to any or all of the fibre services offered by Chorus and the LFCs).

The Bill states that the overarching purpose of the IMs (including the quality dimensions IM) “is to promote certainty for regulated fibre service providers, access seekers, and end-users in relation to the rules, requirements, and processes applying to the regulation, or proposed regulation, of fibre fixed line access services”²⁵. The Bill also sets out several other requirements for the IMs. These include: ²⁶

- Each IM must contain sufficient detail so that each regulated fibre provider is reasonably able to estimate the material effects of the methodology, and clearly set out how the Commission intends to apply the IM.
- The IMs relating to fibre services must be consistent with one another.
- The Commission is required to review each IM within seven years of first publication, and then at intervals of no more than seven years. We understand that the Commission wishes the IMs to be robust to market developments, such that substantial changes within the seven-year period are unlikely to be required; this aligns with the objective of providing certainty.

The quality dimensions IM may apply to a range of fibre services provided by Chorus and the LFCs; these services are expected to evolve over time in line with market developments and the demands of end-users. A key challenge in developing the IM is therefore to strike a balance between achieving the flexibility required to accommodate new services and changing end-user requirements, and providing sufficient certainty on the application of the ID and PQ regimes.

²³ Ibid., Sections 198 and 199.

²⁴ MBIE (2017), page 5.

²⁵ Amendment Bill (2018), Section 73.

²⁶ Ibid., Section 175 (2).



Given these requirements, key questions with regard to the development of quality dimensions IM include:

- What are 'quality dimensions' and what is the scope of the 'quality dimensions' that will be covered under the IM?
- What is the level of prescription that the IMs should include on the rules and processes the Commission must follow in specifying quality standards (under PQ) and service quality reporting requirements (under ID)?
- What will different stakeholders' roles and responsibilities be in developing and applying the IM?

We turn to each of these questions in the following sections.



3. INTERNATIONAL CASE STUDIES

Summary

In this section we set out a summary of the four telecommunications regulation case studies. The jurisdictions covered by the case studies are, United Kingdom, Singapore, Canada and Australia. We considered a range of other jurisdictions but determined that these four were the most appropriate given the questions posed to us by the Commission.

We have considered examples that encompass regulated quality standards, quality metrics reported under information disclosure regimes, and aspects of service quality that are set out within commercially negotiated access agreements.

The case studies show that a broad range of approaches can be adopted for the regulation of service quality. In our view each approach has some advantages and disadvantages. We use our findings from these case studies throughout this report.

3.1. OVERVIEW OF THE CASE STUDIES

We have prepared four case studies that cover a range of approaches to regulating and monitoring the quality of wholesale fibre services. A brief overview of the case studies, including the regulatory approach to service quality adopted in each jurisdiction and our assessment of the merits of the different approaches, is provided below. Further details on each case study and the rationale for selecting these particular case studies can be found in Appendix A.

It is important to highlight that none of the regulatory regimes included in the case studies have an equivalent to the quality dimensions IM – that is, an upfront methodology that describes how the regulator will set quality standards and information disclosure requirements. In some cases, guiding principles and processes are in place, however these are less specific on the approach to quality that we expect will be the case for the quality dimensions IM in New Zealand.²⁷

3.1.1. United Kingdom

In its most recent review of the wholesale local access (WLA) market for broadband, communications sector regulator Ofcom determined that BT continues to have significant market power (SMP).²⁸ As a result, in 2018 Ofcom adopted updated access, pricing and quality of service remedies for the WLA services provided by Openreach, BT's access network division.²⁹

Quality of service remedies apply to a range of wholesale services, including active services provided over Openreach's copper and fibre networks. Ofcom applies three 'levers' to incentivise appropriate service quality:

²⁷ For example, Ofcom operates under detailed European Commission (EC) guidance for how national regulatory authorities (NRAs) should assess market power. The Body of European Regulators for Electronic Communications (BEREC) also provides broad guidance on the types of quality dimensions that are important for market power mitigation; however, this does not set out a detailed methodology for setting service quality standards.

²⁸ Ofcom (2018a).

²⁹ Ofcom (2018b).



- Regulatory minimum quality standards, with Ofcom able to impose financial penalties if targets are not met.
- Transparency measures, which capture a broader range of quality indicators for monitoring purposes.
- Service level agreements (SLAs) to be included in Openreach's reference offer, that must cover particular aspects of service quality. Service standards are then set through negotiations; if agreed standards are not met, service level guarantees (SLGs) set out compensation arrangements.

3.1.2. Singapore

In 2006, Singapore's Government initiated the roll-out of a fibre-to-the-premises (FTTP) network to cover 100% of premises. The industry structure includes two regulated companies – NetCo, who designed, built and now operates the passive infrastructure – and OpCo – who operates the active infrastructure alongside a number of other competitive (unregulated) network operators. NetCo provides a regulated Layer 1 dark fibre service, as well as duct access. OpCo provides regulated Layer 2 and 3 services to RSPs.

The NetCo and OpCo contracts were awarded by a competitive tender process, through which bidders proposed price caps and non-price terms and conditions (including service quality) to be included in a reference Interconnection Offer (ICO). Sector regulator IMDA sets out a number of quality dimensions that must be reflected in the ICOs, through the NetCo and OpCo Interconnection Codes.

3.1.3. Canada

In 2015, the Canadian Radio-television and Telecommunications Commission (CRTC) reviewed its approach to the regulation of wholesale high-speed access (HSA) services.³⁰ This review led to mandated access requirements being imposed on the vertically-integrated owners of fibre networks to make disaggregated wholesale HSA services available to their competitors.

In 2018, the CRTC decided to extend the existing competitor quality of service regime to cover these newly mandated access services.³¹ The CRTC's consultation on the quality of service regime included consideration of the aspects of quality that should be covered.

3.1.4. Australia

NBN Co, a government business enterprise wholly owned by the Commonwealth Government, was established in 2009 to plan, build and operate Australia's National Broadband Network (NBN). The NBN is structured as a wholesale-only, open-access broadband network, and NBN Co is required to provide wholesale access services to RSPs on a non-discriminatory basis. The network is currently in peak roll-out phase and is expected to be in place by 2020.

Unlike the other jurisdictions considered, the ACCC does not currently directly regulate the quality of the wholesale access services provided over the NBN (although a regulated price cap applies). Instead, service

³⁰ CRTC (2015a).

³¹ CRTC (2018).



quality arrangements are contained within a commercially negotiated access agreement. Following concerns raised by RSPs and an apparently escalating volume of end-user complaints, in 2017 the ACCC launched an inquiry into the effectiveness of these standards.³² The ACCC has since accepted a court-enforceable undertaking from NBN Co, which states that NBN Co will improve its service level commitments to RSPs.³³

3.2. OUR OBSERVATIONS

In the table overleaf, we set out our observations on the advantages and disadvantages of the different approaches to regulating quality adopted in each jurisdiction.

³² ACCC (2017).

³³ ACCC (2018).



Table 3.1: Our observations on the advantages and disadvantages of the approaches adopted in other jurisdictions

| Jurisdiction | Advantages | Disadvantages |
|----------------|--|---|
| United Kingdom | <ul style="list-style-type: none"> Ofcom has sought to focus quality regulation on the most important products for customers and the dimensions of quality that matter most for customers (repairs and installations in the case of the UK). Ofcom's approach of setting minimum quality standards conservatively at first and then progressively tightening and extending these standards in the light of further evidence arguably helped reduce the risk of regulatory failure. However, the downside is that consumers continued to experience quality problems for longer. This may be a relatively important issue in New Zealand given the likely importance of reliable quality in ensuring a rapid transition from copper to fibre services. Ofcom has invested considerable time and effort in setting out a detailed system for measuring and monitoring quality to ensure that there is sufficient information available to monitor Openreach's service quality and identify problem areas as they arise. | <ul style="list-style-type: none"> Ofcom has become embroiled in highly detailed and prescriptive regulation that has become more intrusive as standards are tightened and new products are included in the quality regulation regime. This creates a risk of high regulatory costs and a lack of flexibility for operators to respond to changes in cost and demand conditions as technology and markets evolve. Regulatory reviews of quality standards are time and labour intensive, and require Ofcom to resolve a large number of issues. Among other factors, Ofcom's approach to standard-setting explicitly considered end-user requirements, informed by research. |
| Singapore | <ul style="list-style-type: none"> Appears to be a very detailed and comprehensive set of quality standards which provide a high level of certainty. Based on publicly available information, the quality standards appear to have been set as part of the competitive bidding process, which avoided the need for detailed regulatory intervention to set standards. | <ul style="list-style-type: none"> Quality standards appear to be set out in the reference offers of wholesale operators. It appears that these are periodically reviewed under certain specific circumstances. However, it is not clear how easily the regulator can modify quality standards in the light of evidence of poor-quality performance. It is unclear, from the available documentation, to what extent the requirements and views of retail customers are reflected in the quality standards – there does not appear to have been a direct mechanism for taking these into account. The regulatory regime is very different in construction from the situation in New Zealand and this is likely to limit the applicability of the approach in Singapore to New Zealand. |
| Canada | <ul style="list-style-type: none"> CRTC set out a clear set of underlying principles to guide the scope and purpose of quality regulation. This should help provide regulatory | <ul style="list-style-type: none"> The downside of the absence of regulated minimum standards is a lack of certainty with regard to fibre quality. In the New Zealand context, |



| Jurisdiction | Advantages | Disadvantages |
|--------------|---|--|
| | <p>certainty and also ensure that regulation is effective and proportionate (e.g. focused on service quality for the most important products and aspects of quality for consumers, and implemented in a way that is not overly burdensome).</p> <ul style="list-style-type: none"> • CRTC delegated the responsibility for setting minimum standards and rules for monitoring installations and repair performance to an industry body (CISC). This appears to be intended to result in the creation of a regulatory monitoring regime that will allow any problems to be detected. • The approach is light touch and is unlikely to result in over-regulation. | <p>there is a potential risk that if quality is poor early this could undermine take up and the speed of the copper-fibre transition.</p> <ul style="list-style-type: none"> • Given the relatively limited coverage of the quality metrics that will be monitored, there is also a potential risk that the regulator might be unsighted on emergent problems in relation to products or quality dimensions that are outside the current scope of quality regulation. |
| Australia | <ul style="list-style-type: none"> • The standards are determined through commercial negotiations. • The approach is light touch and is unlikely to result in over-regulation. | <ul style="list-style-type: none"> • There is a level of uncertainty around when and to what extent the ACCC may intervene. This is highlighted by the access undertaking submitted by NBN Co, that will result in changes to its WBA3 terms and conditions. • It is also unclear how the obligations imposed on RSPs by the Australian Communications and Media Authority (ACMA) will impact on their terms and conditions with NBN Co. • It is not clear to what extent end-user requirements have been reflected in the service standards. |

Source: CEPA



4. SCOPE OF THE QUALITY DIMENSIONS

Summary

In this section we consider the broad scope that a quality dimensions IM could encompass.

We have defined quality dimensions as elements or aspects of wholesale service quality that relate to distinct parts of the fibre service's 'lifecycle', from ordering to eventual disconnection. We draw a distinction between 'quality dimensions', 'quality metrics' and 'quality standards'. We define quality metrics as specific indicators or measures of service quality that sit within each dimension, while quality standards represent specific targets that a regulated business is required to achieve.

Quality dimensions (and quality more broadly) have a key role within an incentive-based regulatory model. We consider that quality dimensions should be considered in the 'outputs' component of a general regulatory framework that consists of 'inputs, outputs, outcomes and purpose'. Regulators typically place incentives on the achievement of outputs as these can be chosen to support the broader outcomes desired of the regulatory framework, but are typically more measurable.

Our findings from the case studies indicate that fibre quality dimensions can be grouped into six broad categories: ordering, provisioning, switching, fault management, service availability, and service performance. Within these high-level categories there may be a range of 'sub-dimensions'. For example, 'provisioning' may relate to new connections, service activation, service modifications, or disconnections. The case studies have shown that these dimensions are applicable, to varying extents, to a wide range of wholesale fibre services (including both dark fibre and active layer services).

A wide range of quality dimensions and sub-dimensions could be relevant in the New Zealand context, given the range of fibre services that the IM could potentially apply to and the uncertain future evolution of the market. We conclude that the IM should therefore allow the Commission to consider all six quality dimensions when setting a PQ or ID determination.

4.1. WHAT ARE 'QUALITY DIMENSIONS'?

The Bill only defines quality dimensions as "*measures of the quality of fibre fixed line access services*", that "*may include (without limitation) responsiveness to access seekers and end-users*".³⁴ Separately the Bill also makes references to 'quality standards' that must be met by regulated fibre service providers; however, these standards are not defined in the Bill.

As the Bill does not set out prescriptive definitions for quality dimensions and quality standards, we think it is appropriate to consider how quality is typically discussed in relation to regulated telecommunications services. In the telecommunications context, the different elements of quality are often presented in terms of how a service is provided over its '**lifecycle**', from when the service is ordered to when it is eventually terminated.³⁵ We note that this is similar to regulatory approaches to quality in other sectors. For example, Ofgem's activity-based approach breaks the activities of electricity networks into different service delivery components, before defining quality outputs for each area.

Adopting this perspective, we can define 'quality dimensions' as broad aspects of quality that cover the key phases of service delivery. We can further differentiate between 'quality dimensions', 'quality metrics' and 'quality standards'. We define quality metrics as specific indicators or measures of service quality that sit

³⁴ Amendment Bill (2018), Section 164.

³⁵ See for example, ETSI (2011), BEREC (2012, 2016).



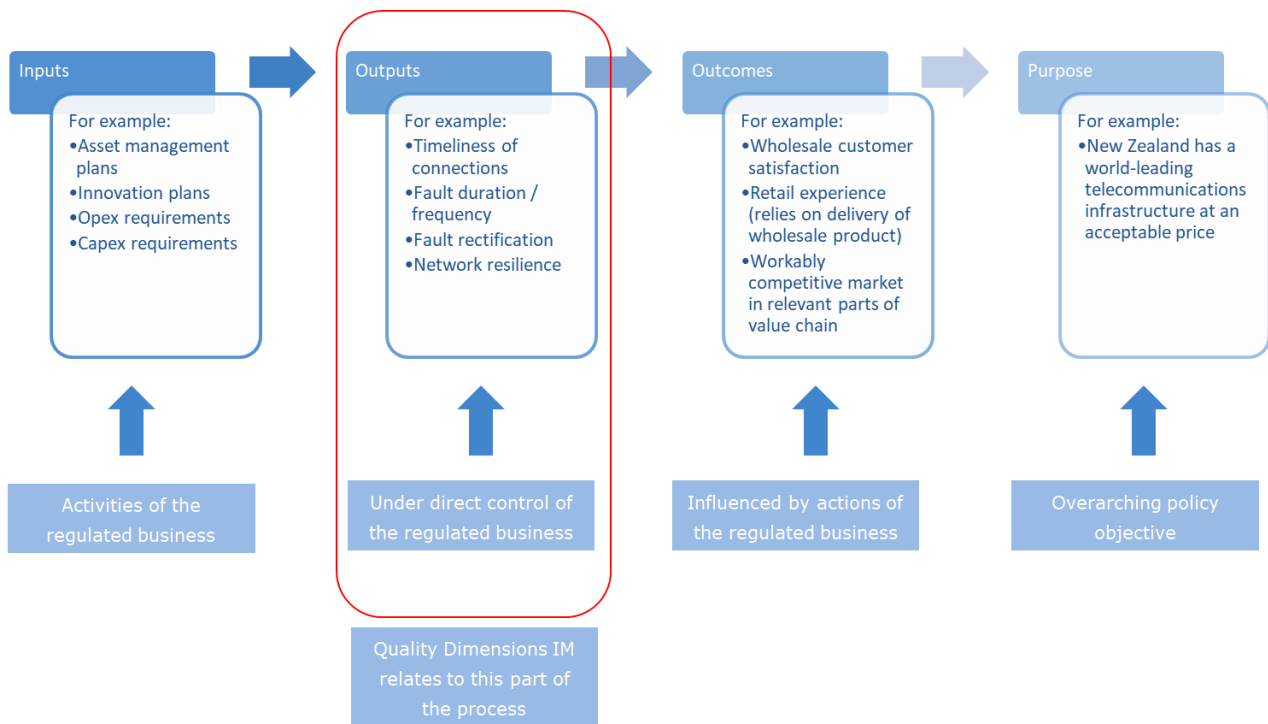
within each dimension, while quality standards represent specific targets that a regulated business is required to achieve. As we discuss further in Section 5, quality standards could potentially be specific, quantitative targets, or alternatively broad principles that set out the Commission’s expectations for service provision.

4.2. WHAT IS THE ROLE OF ‘QUALITY DIMENSIONS’?

We think that it is useful to consider how quality is reflected in other incentive-based regulatory regimes. Other regulators primarily address the issue of regulating quality through the use of output measures in price control processes. Activities that the regulated businesses undertake (**inputs**) lead to measurable **outputs** that the business achieves. These support the delivery of desirable **outcomes**, which in turn ensure that the overarching **purpose** of the regulatory framework will be achieved. This is illustrated in the figure below.

In this context, ‘inputs’ refers to the activities undertaken by the regulated business to deliver the regulated services – for example, preparing an asset management plan or engaging with stakeholders on product development. This is different from what the ‘input methodologies’ refer to – namely the inputs (upfront rules and processes) to the regulatory determination process.

Figure 4.1: Quality dimensions within an incentive-based regulatory framework



Source: CEPA

We propose that the quality dimensions, together with metrics and standards, should be considered within the **outputs** part of the framework above. We recognise that other parts of the regulatory framework may interact with quality standards, and influence the level of quality that is achieved. Initiatives to improve quality standards could potentially be set at the **input** stage – for example, by mandating minimum staff levels to carry out connections, setting requirements for the content of asset management plans, or creating obligations for service providers to engage with their customers on product development.



However, these examples are quite distinct from the specific role of the quality dimensions IM. In particular:

- The outputs focus of the quality dimensions IM relates to the practice of setting and monitoring service quality dimensions, metrics and standards. Outputs relate to aspects of service performance – i.e., *what is the level of service quality that is or should be achieved*. Output measures are typically included in regulatory frameworks to ensure that regulated entities deliver the regulated services to a quality level that is considered to meet the long-term interests of end-users.
- The inputs part of the regulatory framework relates to *how the level of service quality is achieved*. One reason why regulators choose to set target output measures, rather than prescribing the use of particular inputs, is to provide the regulated companies with flexibility in how they deliver the required outcomes. We consider that this flexibility allows companies to be innovative in finding the most efficient ways of delivering the outputs. Similarly, innovation that can lead to different service levels is an input to provide the desired outputs. For example, industry forums to discuss the use of new technology (e.g., capital investment) in delivering fibre services should be captured as an activity. This is why we see the quality dimensions, metrics and standards relating primarily to outputs, rather than inputs.

We think that the distinction above is important to clarify that it is not necessarily appropriate to capture *all* factors that influence service quality within the quality dimensions IM itself. Nonetheless, interactions between the quality dimensions IM and the broader regulatory framework will require consideration. We consider this issue in more detail in Section 6.1.

Typically, there is a trade-off between quality and price, and outputs should reflect the price-quality preferences of end-users. If outputs are set at an inappropriate level, then the regulated services may not be aligned with end-user requirements and/or willingness-to-pay. Outputs may also be combined with rewards or penalties to incentivise the regulated companies to deliver the requisite level of quality.

We note that there are grey areas around outputs and inputs that need to be considered. For example, standardisation of certain services could be considered as an input (for example, part of the regulated businesses' asset management plans) or an output (for example, provision of standardised connectors, to ensure interoperability if customers switch retailer).

4.3. OPTIONS FOR THE IM

The quality dimensions identified in the international case studies can be grouped according to the service lifecycle framework outlined in Section 4.1 above. We have categorised the various metrics and standards applied in each jurisdiction into six quality dimensions:

- **Ordering** – quality indicators relating to the process of ordering wholesale services. This includes acceptance and rejection of service requests and the availability of appointments for provisioning.
- **Provisioning** – quality indicators relating to service connections, modifications (excluding switching, which are captured separately below) and disconnections. These indicators may include timeframes to complete provisioning requests, timely attendance of the service provider at provisioning appointments, and the quality of the provisioning works.
- **Switching** – quality indicators relating to the facilitation of switching between different retail service providers.



- **Faults** – quality indicators relating to both the incidence of service faults and the timeliness of fault repairs.
- **Availability** – quality indicators relating to the availability of the service.
- **Performance** – quality indicators relating to the service’s technical performance, for example speed or management of congestion.

The table below sets out examples of the various quality metrics identified in the four case studies, for each quality dimension. While the range of services differed across the jurisdictions (for example, services ranged across layers 1, 2 and 3), metrics were applied across most of the broad quality dimensions; this reflects that all types of services need to be ordered, provisioned and maintained.

It is important to highlight that the examples below:

- **Cover a mix of regulatory approaches.** In the UK case, Ofcom has imposed regulatory standards for particular elements of quality, monitors a broader range of quality metrics through information disclosure requirements, and also requires that particular aspects of quality are reflected in Openreach’s reference offer (RO). In the Singaporean case, the IMDA does not set regulated standards in most cases. Instead, through NetCo and OpCo Codes they provide guidance on the broad quality dimensions to be included in the NetCo and OpCo Interconnection Offers available to RSPs. The Canadian regulator CRTC will monitor certain elements of quality in a competitor quality of service regime, but has also declined to impose mandated targets at this stage. In contrast, the ACCC has not provided any guidance in relation to wholesale service quality for Australia’s NBN; however, detailed provisions are captured in the commercially negotiated access agreement.³⁶
- **Cover a mix of market structures.** It is important to bear in mind that the market structure in each jurisdiction has contributed to different focuses. For example, BT is vertically integrated in the UK, and concerns were raised that it was abusing its market position in providing sub-standard connection services to other RSPs through Openreach. This led Ofcom to place a strong focus on the ordering/ provisioning and fault repair quality dimensions, given their importance to retail competition. In contrast, in Australia there is structural separation between NBN Co and the RSPs, and vertical competition issues have accordingly assumed a lower degree of importance.

³⁶ While ACCC does not have specific quality of service regulations in place for the NBN, it has however recently intervened by undertaking a consultation on the adequacy of quality standards for NBN services. This has led to NBN Co providing the ACCC with a court-enforceable undertaking to improve its reporting and service level guarantees offered to the RSPs.



Table 4.1: Scope of the quality dimensions – Case study examples

| | Ordering | Provisioning | Switching | Faults | Availability | Performance |
|-------------------------------|--|--|--|--|--|--|
| United Kingdom ^[1] | <ul style="list-style-type: none"> • Availability of / attendance at appointments for service provision (KPI, RO) | <ul style="list-style-type: none"> • Timeliness of installations (regulatory standard, KPI, RO) • Lines working at completion of provisioning (RO) | <ul style="list-style-type: none"> • Completion of service transfers (RO) | <ul style="list-style-type: none"> • Fault repair times (regulatory standard, KPI, RO) • Attendance at fault repair appointments (RO) • Percentage of repeat faults (KPI) | <ul style="list-style-type: none"> • NA | <ul style="list-style-type: none"> • Upload/download speed (per service definition for mandated access services – e.g., up to 40Mbps/10MBps for the FTTC Ethernet service) |
| Singapore ^[2] | <ul style="list-style-type: none"> • Timeframe to process orders | <ul style="list-style-type: none"> • Provisioning and deactivation timescales | <ul style="list-style-type: none"> • NA | <ul style="list-style-type: none"> • Fault repair times • Management of fault reports | <ul style="list-style-type: none"> • Service availability | <ul style="list-style-type: none"> • Upload/download speed (per service definition) • The interconnection offer includes: jitter, latency, packet loss (for OpCo's Ethernet service) |
| Canada ^[3] | <ul style="list-style-type: none"> • Installation appointments met | <ul style="list-style-type: none"> • Average installation time | <ul style="list-style-type: none"> • NA (included in average installation time metric) | <ul style="list-style-type: none"> • Repair appointments met • Average repair time | <ul style="list-style-type: none"> • NA | <ul style="list-style-type: none"> • NA |
| Australia ^[4] | <ul style="list-style-type: none"> • Attendance at appointments | <ul style="list-style-type: none"> • Connection / activation / modification / disconnection timescales | <ul style="list-style-type: none"> • Timescales for service switch (referred to as migration) | <ul style="list-style-type: none"> • Fault repair times • Management of fault reports | <ul style="list-style-type: none"> • Network availability | <ul style="list-style-type: none"> • Utilisation management • Minimum peak-time speeds (per service definition) |

Source: CEPA

[1] Examples relate to the Ethernet FTTC access service, covering: regulated quality standards, monitoring KPIs, and the quality aspects to be included in Openreach's reference offer (RO).

[2] Quality dimensions for the dark fibre (passive) and Ethernet (active) services, as described in the NetCo/OpCo Codes (more detailed requirements are set out in the Interconnection Offers).

[3] Quality dimensions related to the wholesale high-speed access service (active), that are included in the competitor quality of service regime set by the CRTC.

[4] Quality indicators included in NBN Co's commercially negotiated access agreement.



4.4. RELEVANCE FOR THE QUALITY DIMENSIONS IM

There is currently uncertainty around the future evolution of the fibre services market and the types of fibre services that could potentially be subject to PQ/ID regulation. As a result, the quality dimensions IM will need to be robust to a range of future developments in the sector. Therefore, we see merit in allowing the scope of the quality dimensions IM to include all six dimensions shown above.

We note that there may be alternative ways to categorise the dimensions. For example:

- **Categories could be aggregated, or divided into more detailed sub-categories.** We have suggested that the IM allow for separate consideration of a 'switching' quality dimension, that would cover actions undertaken by the fibre providers to facilitate end-user switching between RSPs. Some regulators in other jurisdictions have treated service switches as a separate dimension; for example, Ofcom requires that Openreach's reference offer includes service level commitments for the completion of service transfers. Other regulators do not consider switching separately; for example, the CRTC includes transfers of end-user services between different RSPs as part of a broader 'installation' quality of service KPI. We have chosen to present switching as a separate quality dimension, given its potential importance to retail competition, but note that a different classification is possible; this may also be the case for the other quality dimensions.
- **Aspects of service quality that span the dimensions.** The six quality dimensions we have identified reflect the lifecycle of the services. However, certain elements of quality – such as customer service (e.g., responsiveness to addressing complaints, customer satisfaction) – may be common to all six dimensions. There are different ways that this could be approached in the IM:
 - Customer service could be treated as part of each of the six dimensions. For example, a quality standard such as '[x] days to resolve customer complaints' or '[x minutes] maximum call response time' could be considered separately in relation to provisioning and fault repair activities.
 - Alternatively, customer service could be treated as a separate quality dimension. In this case, the Commission might consider a generic customer service quality target – for example, '[x minutes] maximum call response time' could apply across all of the service providers' activities (i.e., across all six dimensions).

Determining the best approach is likely to depend on whether it would be more appropriate to set customer service targets for specific dimensions (for example, should call response times be faster for calls relating to fault rectification compared to calls relating to a new connection) or whether generic targets are preferable (for example, should call response times really be the same in all cases). In this report, we have not separately identified customer service as a 'general' quality dimension, but we note that consultation may indicate that this is an appropriate addition to the framework. Stakeholders may identify other 'general' dimensions that span all stages of the service lifecycle.

We note that different ways of categorising the quality dimensions will not necessarily place significant restrictions on the quality standards or reporting requirements that the Commission could potentially impose. For example, if service switching were instead captured under the broader 'provisioning' dimension, this need not prevent the Commission from setting a specific standard for switching timescales within this dimension, if this was found to be required. However, there may be practical implications. For



example, from the example above, it may be less complicated to consider customer service type metric as being common to all stages of service provision.

Overall, we consider that these six dimensions set out above should be sufficient to capture the key activities involved in supplying a wide variety of different wholesale fibre products. This does not imply that all six dimensions would necessarily need to be reflected in regulated quality standards or reporting requirements. Rather, the IM would allow the Commission flexibility to capture any or all of the dimensions in a PQ or ID determination, as required to achieve the objectives of the regulatory framework. Key issues are then how prescriptive the IM is in setting out how the Commission will reflect quality in a PQ or ID determination, and how the level of prescription can appropriately balance flexibility and certainty. These questions are considered in the following section.



5. OPTIONS FOR THE QUALITY DIMENSIONS IM

Summary

The quality dimensions IM needs to set out the **rules** and **processes** that the Commission will follow in setting the PQ path and ID reporting requirements. The Commission has not set a quality dimensions IM before. Other IMs established by the Commission range from relatively high-level rules and processes (such as the Transpower capital expenditure IM) to very prescriptive guidelines that govern how the Commission will approach a particular topic (for example, the cost of capital IM).

There are a number of ways in which the IM could be structured. In this section, we focus on three key aspects:

- **Development of the IM.** This relates to the content of the quality dimensions IM; in particular, the extent to which the IM specifies – upfront – what quality dimensions, metrics and/or standards will be covered in a PQ/ID determination. We see a spectrum of potential approaches. At one end of the spectrum, a highly-prescriptive IM could set out the actual regulated quality standards, which would then flow through automatically to the PQ determination. At the other end of the spectrum, a purely principles-based IM would set out the high-level principles the Commission would apply in making the PQ/ID determinations, without necessarily mentioning specific quality dimensions, metrics or standards. A key issue here is the trade-off between certainty and flexibility. We discuss ‘contextual factors’ that could assist the Commission in making this trade-off, and set out our initial views on the content of the IM.
- **Application of the IM.** This relates to how the IM could be applied at the PQ/ID determination stage. That is, how might the Commission decide which quality standards to apply under the PQ path and which reporting requirements to include under the ID regime. An additional consideration is whether quality standards should take the form of detailed, specific targets, or whether it would be more appropriate for the Commission to set broader principles to guide how the fibre providers deliver the regulated services. Again, we set a number of contextual factors that could be used to inform these decisions.
- **Processes, roles and responsibilities.** Finally, we consider options for the involvement of different parties in applying the IM, including the Commission, the fibre providers, RSPs, and end-users (or their representatives). This includes a high-level assessment of the merits of an approach that is predominantly led by the Commission, compared to an approach that allows other stakeholders to take on an expanded role. We also provide our initial thoughts on the identification of end-user requirements during the application of the IM.

5.1. OVERVIEW

As discussed in Section 2.3, the quality dimensions IM will set out rules and processes that will be applied by the Commission to:

- set the quality standards that apply to regulated services under the PQ regime; and
- specify the reporting requirements for service providers that operate under the ID regime.

There are a number of ways in which the IM could be structured to fulfil this purpose. In the following sections, we focus on three key aspects:

- **Development of the IM (Section 5.2).** In this section, we present different options for the content of the quality dimensions IM. In particular, we consider the extent to which the IM should specify – upfront – what quality dimensions, metrics and/or standards will be covered in a PQ/ID



determination. We see a spectrum of potential approaches. At one end of the spectrum, a highly-prescriptive IM could set out the actual regulated quality standards, which would then flow through automatically to the PQ determination. At the other end of the spectrum, a purely principles-based IM would set out the high-level principles the Commission would apply in making the PQ/ID determinations, without necessarily mentioning specific quality dimensions, metrics or standards. A key issue here is the trade-off between certainty and flexibility.

- **Application of the IM (Section 5.3).** In this section, we consider how the IM could be applied at the PQ/ID determination stage. That is, how might the Commission decide which quality standards to apply under the PQ path and which reporting requirements to include under the ID regime. An additional consideration is whether quality standards should take the form of detailed, specific targets, or whether it would be more appropriate for the Commission to set broader principles to guide how the fibre providers deliver the regulated services.³⁷
- **Processes, roles and responsibilities (Section 5.4).** This section sets out options for the involvement of different parties in developing and applying the IM, including the Commission, the fibre providers, RSPs, and end-users (or their representatives).

5.2. DEVELOPING THE IM

In this section, we consider options around the level of prescription that could be included in the IM. By this, we mean how *specific* the IM is in prescribing what quality standards and quality reporting requirements the Commission would set under a PQ or ID determination. In theory, there is a spectrum from a purely ‘principles-based’ approach and to a very ‘prescriptive’ approach.³⁸

5.2.1. Prescriptive or principles-based IM?

The broad conceptual difference between the two approaches outlined above is that a principles-based IM would provide the Commission with greater flexibility in the approach it can take to setting the quality standards and reporting requirements in a PQ/ID determination. On the other hand, a principles-based approach creates a higher degree of uncertainty for the fibre providers, access seekers and end-users, as a result of the flexibility it provides.

In the table below, we provide some illustrative examples of each approach. We see ‘Level 1’ as the base level of detail that a quality dimensions IM would specify; at a minimum, the IM would need to set out broad principles that are aligned with the overall objective that the Commission is aiming to achieve in its application of the PQ/ID regimes. Levels 2 – 4 build on the broad principles by adding increasingly specific details to the IM on what a PQ/ID determination would include. At the very prescriptive end of the spectrum – Level 4 – the IM would set out precisely what quality standards would apply under the PQ path and what quality metrics would be included in the ID regime.

The IM could potentially adopt a mix of approaches. For example, the IM might set out broad principles (Level 1) that apply generally to the fibre providers’ service provision. Alternatively, it may be feasible for

³⁷ This particular consideration does not apply to information disclosure requirements, which are by their nature detailed and specific.

³⁸ We note that there is variation around the definition of a principles-based approach, with some commentators referring to this as an outcomes-based approach (see BEIS, 2018, pages 14-15).



the IM to set out particular quality dimensions and metrics that would definitely need to be included in a PQ/ID determination. For areas where the IM might be more prescriptive, principles would still be needed to determine what is prescribed. In this sense, the different levels of prescription build on each other.

We note that s175(2) of the Bill states that the IM should “set out the matters ... in sufficient detail so that each affected regulated fibre service provider is reasonably able to estimate the material effects of the methodology on the provider.” Therefore, the Commission will need to ensure that the level of prescription meets this criterion.

Table 5.1: Broad spectrum of principles-based and prescriptive approaches

| Examples | |
|---------------------|---|
| Principles-based IM | <p>Level 1 - IM specifies principles to guide which quality dimensions, metrics and/or standards would be included in the Commission’s PQ/ID determinations.</p> <p>Principles could be set with reference to the overarching purpose of the regulatory regime, as set out in Section 162 of the Bill. For example, the IM could specify that under PQ, quality standards should be set to ‘ensure that fibre providers are incentivised to provide service levels that meet the demands of end-users’, or ‘ensure that fibre providers have appropriate incentives for innovation and investment’. Principles could also provide more ‘practical’ guidance on the nature of the quality dimensions that would be included, for example: ‘under ID, the Commission will set quality reporting requirements that cover the life cycle of the relevant regulated fibre service’. The IM could also include guidelines on the required characteristics of quality standards or metrics, for example: ‘quality metrics should be relevant, accurate and verifiable’.</p> |
| | <p>Level 2 - IM sets out the specific quality dimensions that the Commission would assess in making a PQ/ID determination.</p> <p>For example, the IM might specify that under PQ, quality standards would be set in relation to the provisioning and fault repair quality dimensions. The Level 1 principles would then guide how the Commission would establish the quality metrics and standards that would apply under these dimensions, during the PQ determination.</p> |
| | <p>Level 3 - IM sets out the specific quality dimensions and metrics that the Commission would set under the PQ/ID regimes.</p> <p>For example, the IM might specify that under the PQ regime, there must be a quality metric to measure how soon customers are connected following a connection request. The IM could also set out how this should be measured. This might include details on how the data would be gathered, whether there would be any exclusions (for example, if a customer failed to attend a connection appointment), and so on.</p> <p>The Level 1 principles would then guide how the Commission would establish the quality standards that would be set for the different metrics during the PQ determination.</p> |
| Prescriptive IM | <p>Level 4 - IM specifies the quality dimensions, metrics and standards that apply under the PQ/ID regimes.</p> <p>For example, the IM would contain the actual regulated quality standards that would apply automatically in future PQ determinations (for example, ‘the maximum time for new connections is 30 days’). In the ID context, this might involve specifying particular benchmark targets for each quality metric that is subject to monitoring.</p> |

Source: CEPA

Both prescriptive and principles-based guidelines for regulatory decision-making can be found in other regimes. Examples of very prescriptive rules and processes are the Commission’s cost of capital IM that applies under Part 4 of the Commerce Act, and the Australian Energy Regulator’s (AER) rate of return



guidelines. These ‘rule books’ specify in advance precisely how the regulators will approach the topic and for a number of components, specifies the precise values that should be used. Examples of a principles-based approach are the broad policy guidance documents for Ofgem’s Revenue = Innovation + Inputs + Outputs (RIIO) process and Ofwat’s Price Review 14 (PR14). In both cases, the regulators specified upfront the high-level outcomes that the regulatory determinations were intended to achieve. These overarching principles were then applied during the regulatory determination to specify the output measures that the regulated businesses were required to meet.

5.2.2. Relevance for the quality dimensions IM

In considering the choice between a principles-based or more prescriptive approach to the IM, we suggest that there are a number of contextual factors that the Commission might consider. The factors are intended to assist in making the key trade-off between the different approaches – namely flexibility and certainty. We have drawn on the case studies and other academic and regulatory literature to identify relevant contextual factors, as outlined below:

- **Stability of the regulated services and end-user requirements.** The quality dimensions IM aims to ensure that fibre service quality is in line with end-user requirements. A fast-moving market may result in the metrics and standards against which services should be measured changing rapidly. A prescriptive approach to setting quality metrics and standards for services (or groups of services) that are affected by innovation and market structural changes may not keep up with the speed of change in the desired outcomes. Measures for tightly defined services, such as the anchor services, could potentially be less subject to change; however, we note that the anchor services themselves may evolve over time.

It is also possible that some aspects of the fibre service lifecycle could be more robust to change. For example, fibre services will almost always require a connection of the end-user to the network; therefore, the IM could potentially set out quality metrics that would apply to this dimension. Setting standards may still not be appropriate in this case, as there may be scope for the fibre providers to improve their connection processes over time.

- **Incentive properties of the service quality regime.** Quality of service standards and/or reporting requirements have been used in other jurisdictions to incentivise appropriate improvements in service quality over time, and encourage the service provider to innovate and invest in the network. A highly-prescriptive approach would leave less scope for the Commission to use quality standards and information disclosure requirements as a lever to improve service levels over the duration of the IM. This is because it would fix the specific measures and targets in the IM, rather than leaving flexibility to update these, outside of setting the IM, to reflect customer requirements.
- **Providing certainty.** Providing certainty for fibre providers, access seekers and end-users is a key objective of the IM. This factor would consider whether there are any quality dimensions, metrics or standards for which the benefit of providing certainty could outweigh any disadvantages from pre-determining the quality dimension, metric and/or standard for the duration of the IM.
- **Cost-effectiveness.** This factor would consider the costs associated with adopting different approaches to the IM, for example, a ‘bright-line’ prescriptive rule versus setting a principle. This would include: the costs of rulemaking; the costs of rule application; and the social and economic



costs of over-/under-specification of quality standards.³⁹ For example, if it is deemed that a particular metric will be applicable for the entire life of the IM, then consulting on the metric once and setting it out in the IM may be a more cost-effective approach, rather than reconsidering the metric at the start of each regulatory period.

Based on a high-level assessment against these factors, neither of the 'extreme' ends of the spectrum outlined above may be appropriate for the context of the quality dimensions IM. If the IM remains fixed for up to seven-years, this will mean that it could potentially apply to three PQ/ID determinations (if the second regulatory period is also three years). In our view, a highly-prescriptive Level 4 IM – that would hold regulated quality standards constant for three regulatory periods – is likely to be inappropriate for a fast-moving sector. This would also reduce the Commission's ability to respond to any emerging quality problems that were not foreseen at the time the IM was set. On the other hand, an entirely principles-based Level 1 approach would provide a lower degree of certainty for the fibre providers, access seekers and end-users.

Our initial view is that an appropriate balance for the quality dimensions IM would be achieved by adopting the Level 2 option outlined above, with the possibility of adopting a Level 3 approach for certain quality dimensions. That is, the IM would specify:

- The broad principles that the Commission would take into account when setting quality standards and quality reporting requirements (i.e., Level 1). These could be set with regard to the purpose of the regime, as described in Section 162 of the draft Bill.
- The types of quality dimensions that the Commission would consider in making its PQ/ID determination (i.e., Level 2). As noted in Section 4.4, we think that given the wide variety of services that the IM could potentially apply to over its seven-year duration, it would be appropriate to reflect all six dimensions in the IM. This would not imply that the Commission would necessarily set quality standards or reporting requirements against each dimension during a PQ/ID determination.
- There may be some scope for the IM to identify upfront particular quality metrics that will almost certainly need to be included in the ID and/or PQ regimes. For example, connection timeframes will be important for ensuring rapid take-up of fibre services by end users, and may therefore be a metric that the Commission would definitely wish to monitor over the duration of the IM. We note that there may be more scope to set quality reporting requirements upfront in the IM. Unlike quality standards, reporting requirements are more robust to changes in end-user requirements, as no 'target' level of quality is specified. However, the Commission may still need to retain flexibility to require different or more detailed reporting requirements if specific quality concerns emerge over time.
- The IM could also provide 'practical' guidance on the characteristics of the quality metrics/standards that would be included in a PQ/ID determination. For example, 'quality standards should be relevant, accurate and verifiable'.

³⁹ See Black (2007).



5.3. APPLYING THE IM

In this section, we consider how the IM could be applied at the PQ/ID determination stage. That is, how might the Commission decide which quality standards to apply under the PQ path and which reporting requirements to include under the ID regime. An additional consideration is whether, in addition to setting detailed, specific quality standards for a PQ path, the Commission could also set broader principles to guide how the fibre providers deliver the regulated services.

We first discuss the potential application of the IM in the context of a PQ determination. We set out some general considerations on the differences between a principles-based and prescriptive approach to setting quality standards. We then consider a range of contextual factors that could assist the Commission in reaching a decision on whether to set a prescriptive quality standard, or whether a principles-based approach could be more appropriate.

Finally, we provide some initial thoughts on how the application of the IM might differ in the context of an ID determination, noting that there may be overlap with the application under PQ in a number of areas.

5.3.1. Prescriptive or principles-based?

Relevance for the quality dimensions IM

In Section 5.2 we considered whether the *quality dimensions IM* itself should be prescriptive or principles-based; that is, whether the IM should set out broad principles or very specific rules to guide the Commission's PQ/ID determinations. Here we consider what it would mean for the *quality standards* that result from a PQ determination to be prescriptive or principles-based. The draft Bill does not provide a definition of 'quality standards'. However, it does note that quality standards "... *may be prescribed in any way the Commission considers appropriate (such as targets, bands, or formulas)*".⁴⁰ This would not appear to preclude the Commission from adopting a mix of principles-based and prescriptive standards.

Although the IM is at an early stage of development, we think it is useful to consider this issue upfront. This is because it will likely not be appropriate for the Commission to set prescriptive quality standards for all quality dimensions. As we discuss further below, it may be preferable for the industry to agree highly-detailed quality standards through commercial negotiations; these standards would be reflected in the Wholesale Service Agreements (WSAs). However, rather than providing no guidance on certain quality dimensions, it may be appropriate for the Commission to instead set broad principles that the fibre providers would be required to comply with (for example, the principles could underpin the WSA negotiations). The Commission could also opt not to place any broader quality obligations on the fibre providers, beyond certain specific, prescriptive quality standards. However, we consider that there is merit in providing broad principles alongside prescriptive quality standards. In particular, this would allow the Commission to provide more complete guidance on its expectations for fibre providers, including in relation to quality dimensions for which specific standards cannot practically be set by the Commission. This may also be one way that the Commission can ensure that quality standards remain robust to market/technological change over the regulatory period.

⁴⁰ Amendment Bill (2018), Section 193 (4).



In this section, we first provide an overview of the key differences between a principles-based and prescriptive approach to quality standards, before considering the advantages and disadvantages of each option.

Comparison of the two approaches

A 'principles-based' regulatory approach is generally understood as the application of general, high-level, rules.⁴¹ These rules are set to achieve the desired outcomes for end-users without prescribing how the outcomes should be achieved. A prescriptive approach would instead rely on setting detailed requirements against which the fibre providers' conduct could be measured. We consider that both a principles-based approach and a prescriptive approach are compatible with an incentive-based regulatory regime, as both general rules and/or specific quality standards can be set to achieve the desired outcomes for end-users.

In the context of the Commission applying the quality dimensions IM under the PQ regime:

- A **prescriptive approach** would mean setting out the specific quality standard that the fibre provider must comply with. For example, a prescriptive quality standard might specify that 'network availability must be 99%'.
- A **principles-based approach** would mean that the onus would be on the fibre provider to demonstrate compliance with a principle, rather than against an explicit standard. For example, a principles-based rule might state that 'fibre providers must ensure that network service availability is in line with end-user requirements'. Fibre providers would then need to demonstrate that the principle had been met, for example by explaining how they had identified end-user requirements and that the level of availability achieved was in line with this. The principles might flow directly from the overarching objectives that would be set out in the IM. Alternatively, more specific principles could be developed during the PQ determination stage.

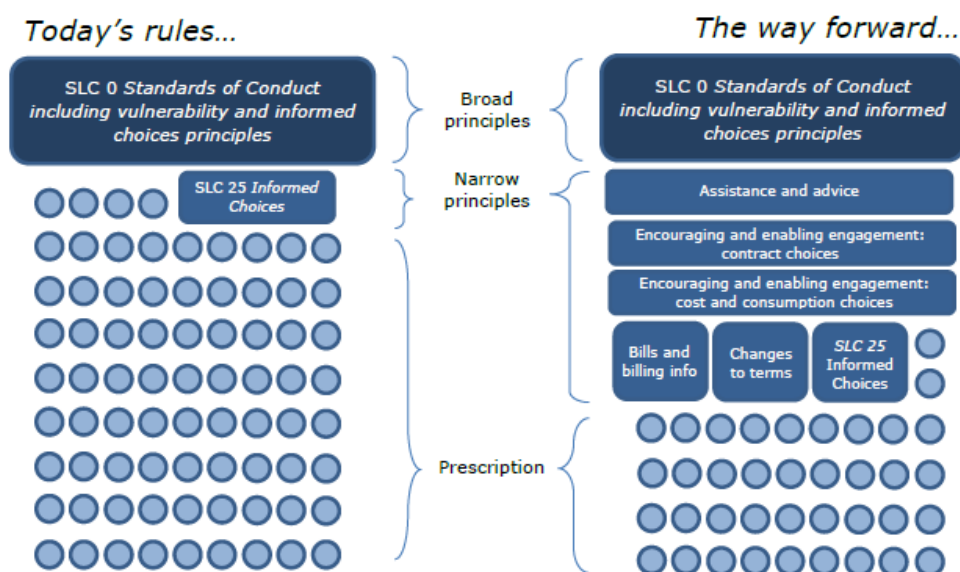
The rules and processes set out in the IM could allow for a mix of prescriptive quality standards and broader principles to be applied under a PQ determination; we are not aware of any 'pure' principles-based approaches adopted elsewhere. There are however a number of regulators (across various sectors) that have adopted, or are proposing to adopt, a more principles-based approach to regulation. These regulators include, the UK Financial Conduct Authority, the energy regulator for Great Britain (Ofgem), and the Australian Law Reform Commission (with regards to the Australian Privacy Act). Ofgem is currently in the process of setting out a new regulatory approach for the retail energy sector. The text box below sets out more details around Ofgem's proposed vision for regulating the conduct of energy retailers.

⁴¹ For a more detailed discussion on principles-based approaches see Black (2007).

Ofgem's approach to retail energy regulation

In July 2015 Ofgem began consulting on the future of retail energy regulation. Ofgem's future regulatory vision was to shift towards a more 'principles-based' approach to regulating the retail energy market. The reason for this is that Ofgem considers that "the retail energy market is undergoing rapid change"⁴² and Ofgem considers that a principles-based approach can "can deliver better outcomes for consumers ... [as] it puts greater responsibility on suppliers to understand and deliver what is right and fair for their customers and enables comprehensive consumer protection."⁴³ The key change associated with the shift towards a principles-based approach was replacing a number of detailed 'prescriptive' rules with more general rules. The most recently proposed Standards of Conduct are to be a mix of general principles and prescriptive rules, as illustrated in the figure below.

Figure A: Ofgem's Current and proposed customer communications rules



Source: Ofgem (2018a)

Ofgem defines the categories of the new rules as:

- **Broad principles:** Standards of Conduct principles, including requirements for suppliers to provide information that is complete, accurate and not misleading, which apply to every piece of supplier-customer communication.
- **Narrow principles:** Narrower principles that would require suppliers to make sure that their communications with consumers deliver key outcomes: to provide the means for consumers to make informed choices, to encourage and enable consumers to engage with their energy supplier, and to make sure consumers know where and how they can get assistance and advice.
- **Prescription:** Ofgem would retain prescription for some areas, for instance where there is only one acceptable way of doing things. This includes setting specific minimum standards for a range of suppliers' outputs.

Ofgem developed its proposals through reviewing the policy intent, stakeholder feedback, and consumer research. Ofgem has thus far received strong stakeholder support for its shift towards a more principles-based regime.

Source: Ofgem (2015), Ofgem (2018a), CEPA

⁴² Ofgem (2018a), page 4.

⁴³ Ofgem (2018b).



Benefits and limitations of the different approaches

In the table below, we set out the key conceptual advantages and disadvantages of adopting principles-based or prescriptive quality standards.

Table 5.2: Relative advantages and disadvantages of prescriptive vs. principles-based quality standards

| | Principles based | Prescriptive |
|---------------|---|---|
| Advantages | <p>Considered to provide a high degree of flexibility for service providers to adopt different approaches to deliver the desired outcomes.</p> <p>More adaptable to changes in the market.</p> <p>Are harder to manipulate compared to 'bright line' rules and should lead to more substantive compliance.</p> | <p>Considered to provide a greater degree of certainty.</p> <p>Considered to provide a greater degree of predictability on the regulatory response to non-compliance.</p> |
| Disadvantages | <p>Considered to provide less certainty compared to prescriptive approaches.</p> <p>Can result in the service providers meeting only a minimum level of conduct.⁴⁴ May also act as a disincentive to improve quality, as this may then be seen as the new 'minimum standard'.</p> <p>Risk of reduced predictability of regulatory responses to non-compliance.</p> | <p>Considered to be less flexible than principles-based approaches.</p> <p>May create a 'tick-box' mentality, rather than service providers seeking to meet desired outcomes.</p> <p>Gaps in the rules may exist, or emerge over time.</p> <p>Could be a barrier to innovation.</p> |

Source: CEPA, Black (2007), BEIS (2018a), Ofgem (2015)

We note that principles-based approaches also place greater responsibility on the regulated companies to 'self-regulate' in complying with the desired outcomes.

It is also worth noting that there are ways to mitigate the disadvantages of the two approaches:

- Inflexibility of prescriptive rules can be reduced by using automatic adjustment mechanisms or 'reopeners' to adjust the standards. This comes with the trade-off of increasing uncertainty.
- A principles-based approach could have accompanying guidance to provide more certainty. This comes with the trade-off of potentially leading to a more prescriptive approach (or the perception of prescription).

Contextual factors

In this section, we set out a number of contextual factors, that could assist the Commission in deciding whether it is appropriate to apply a prescriptive quality standard for a particular quality dimension. We have not labelled these as 'criteria', as we believe the decision on whether to adopt a prescriptive quality standard is nuanced. Therefore, these factors are designed to provide a guide to which approach might be more appropriate for specific quality dimensions. In addition to the four factors identified in Section 5.2.2 –

⁴⁴ We note that this was cited as a key reason for Ofcom to change its quality of service requirements.



stability of the service offering, incentive properties of the regime, certainty, and cost-effective approach – we consider the following factors to be important, in no particular order.

- **Availability of required information.** This factor would consider whether there is sufficient information available to set an appropriate prescriptive standard. A relevant aspect here is the cost implications of setting a prescriptive standard. For example, is there a material cost/quality trade-off involved, and is there sufficient information available to judge the impact? For new services in particular, there is likely to be limited historical performance with which to set standards against. An additional question is whether there is sufficient information to determine an appropriate quality benchmark, that reflects a realistic view of the service quality the fibre providers could achieve.
- **Scope for appropriate standards to be set through commercial negotiation.** This factor would consider whether fibre providers and RSPs would be able to agree quality of service standards through commercial negotiations (i.e., through the WSA process). More prescriptive rules may be required if there is an imbalance in the negotiating positions, while a principles-based approach is feasible when there is a balance in bargaining power.⁴⁵ The Commission may also wish to consider whether the parties are likely to appropriately reflect the interests of end-users during the course of their negotiations.
- **Competitive pressures.** Over time, the competitive pressures faced by the fibre providers may change – for example, with the development of alternative technologies such as 5G mobile networks. Competition in the provision of Layer 2 services could also evolve, with the unbundling of Layer 1 services. The extent of competition (or the threat of competition) may influence the extent to which prescriptive quality standards need to be set for particular services.
- **Impact on end-users.** What happens if the industry cannot agree standards? What are the risks or potential detriment if the companies do not comply with the standards? If there are significant risks around non-compliance, then setting more prescriptive rules may be appropriate.
- **Evidence that the quality dimension is problematic.** There may be specific aspects of the fibre providers' performance that is considered to require a higher degree of scrutiny; in such cases a prescriptive approach could be more appropriate. This could be due to concerns that are identified in existing monitoring data or that are raised by other stakeholders. A principles-based approach may still be acceptable; however, this would allow the service providers more flexibility in demonstrating their compliance with the principles, and this may not provide sufficient detail for the Commission to establish whether performance is adequate.
- **Complexity or simplicity of the service offering.** The relative complexity or simplicity of a service offering may also affect the choice of approach. If the quality dimensions that apply to a particular service are relatively complex, setting a high-level principle (or principles) may be more appropriate than attempting to set a number of prescriptive rules.

⁴⁵ The relative bargaining power of NBN Co and RSPs was cited by Martin Cave (Cave, 2018) in a submission for NBN Co on the NBN wholesale services standards inquiry, as a reason why NBN Co would maintain appropriate quality levels in the absence of regulatory intervention.



- **Impact on innovation.** Quality standards should not discourage service providers from introducing innovative services. For example, new approaches to service delivery could initially have higher fault levels, but benefit end-users in the long term.
- **Interactions with the other incentives placed on the company.** This factor considers whether there are already other incentives on the service providers to deliver particular quality levels (for example, through the price/revenue determination). An additional consideration is whether the incentives on the service provider would be sufficient under a principles-based approach.
- **The degree of trust between the Commission and regulated companies.** The decision between principles or prescription may also depend on the Commission's view of the how the fibre providers might respond under each approach. For example, would principles-based standards be interpreted and applied appropriately in particular circumstances? What is the ability of the regulated companies to adapt to a principles-based versus prescriptive approach? How would non-compliance with a principles-based approach be monitored and enforced? Prescriptive rules may provide greater leverage for compliance divisions within companies, however more prescriptive rules may be required when the risks of non-compliance are high.⁴⁶

We note that these factors have been applied by other regulators when deciding whether to set prescriptive quality standards for regulated service providers. In the text box below, we highlight the factors considered by Ofcom (United Kingdom) in its most recent decision on regulated standards for Openreach.

United Kingdom – Regulatory standards for Openreach's wholesale services

Ofcom applied a range of factors when considering the regulated quality standards that should apply to the wholesale services provided by Openreach. These included:

- Importance of the quality standard to retail competition.
- Ability to measure the quality standard and track compliance.
- The implications of the quality standard for service costs could be identified.
- Whether performance can be controlled by / attributed to the service provider.
- Whether the standard could be defined in a way that incentivised performance (i.e., not too broadly defined, or with too many exceptions).
- Whether there was evidence that the level of quality was problematic.
- Whether a particular aspect of quality was incentivised elsewhere in the regulatory arrangements (for example, overall fault levels were incentivised through the price control).
- That setting a quality standard would not discourage innovation (for example, not discourage service providers from introducing innovative products that could initially have higher fault levels, but benefit end-users in the long term).

Source: CEPA, Ofcom (2018b).

⁴⁶ See Black (2007).



5.3.2. Information disclosure requirements

As noted above, the Commission will apply the IM in making both PQ and ID determinations. We consider that the contextual factors set out above are also relevant when determining what quality reporting requirements should apply under ID. However, there are some additional considerations:

- Relative to PQ, the ID regime places less stringent obligations on the regulated fibre providers.
- While an ID regime possesses some incentive properties, it will not influence service quality outcomes to the same extent as regulated standards under PQ.
- The ID regime could allow the Commission to identify emerging quality issues, rather than focus only on known issues, although this would need to be weighed up against the regulatory burden placed on service providers.
- It would be sensible for the ID regime to allow for a comparison across service providers (i.e., between Chorus and the LFCs).

Therefore, we expect that the rules and processes that are set in the IM for specifying information disclosure requirements during an ID determination may more flexible than for the PQ regime. The ID requirements are also likely to cover a broader spectrum of quality metrics.

In the text box below, we provide two examples of the factors considered by Ofcom (United Kingdom) and the CRTC (Canada) in developing their information disclosure requirements.

United Kingdom and Canada – Principles to inform information disclosure requirements

In addition to the regulatory quality standards, Ofcom imposed a broader set of reporting requirements on Openreach. Although the principles for setting these KPIs were less clearly set out in Ofcom's reasoning, we identified the following factors that informed their decision:

- Avoid placing a disproportionate reporting burden on the service provider.
- Ensure that reporting requirements did not disclose commercially sensitive data.
- Allow Ofcom and access seekers to identify discriminatory practices.
- Provide Ofcom with the ability to track quality aspects that were of particular concern (for example, lengthy delays in rectifying faults).

In Canada, the CRTC made reference to several principles in its decision on the quality metrics to be included in the competitor quality of service regime for wholesale high-speed access services:

- Quality metrics should focus on aspects that have the greatest impact on retail competition.
- The quality metrics should avoid unnecessary complexity.
- The metrics should be proportionate and not overly burdensome.
- That there should be evidence that the quality dimension is, or is likely to be, problematic.

Source: CEPA, Ofcom (2018b), CRTC (2018)

5.4. PROCESSES, ROLES AND RESPONSIBILITIES

A range of stakeholders could be involved – in various ways – in setting the quality standards that apply under a PQ determination and the quality reporting requirements set for fibre providers under an ID determination. In this section, we consider options relating to the roles and responsibilities of these



different parties, including the Commission, the fibre providers, RSPs, and end-users (or their representatives).

The process for making these decisions is partly linked to the level of prescription in the IM. If the IM is highly specific, more work to set quality standards and reporting requirements will be undertaken in the development stage. If the IM is more principles-based, the majority of the decisions will instead shift to the PQ or ID determination stage.

As noted above, our initial view is that it would not be appropriate for the quality dimensions IM to be highly prescriptive. We suggest that at most, the IM may set out some limited quality metrics, to the extent that these are considered likely to be relevant for all PQ/ID determinations over the duration of the IM. In our view, while the Commission will naturally need to consult on the development of the IM, this will be a largely Commission-led process. However, for the application of the IM during a PQ or ID determination, we see greater potential for other stakeholders to take on an expanded role. Therefore, the following discussion relates to the application of the IM, rather than its development.

5.4.1. Broad options for roles and responsibilities

We consider that there are two broad options for stakeholder input in setting quality standards and reporting requirements:

- **Commission-led.** The Commission sets PQ quality standards (whether prescriptive or principles-based) and ID reporting requirements, based on consultation with fibre providers, RSPs, end-users (and/or their representatives) and other stakeholders. In this case, input from other stakeholders would largely take the form of submissions or participation in discussions with the Commission during the consultation process. The Commission may also decide to undertake research to inform its decisions; for example, Ofcom undertook research on end-user quality requirements to inform its decisions on regulated quality standards for Openreach.
- **Industry-led.** A forum representing the industry and customers (potentially both RSPs and end-users) could be formed to agree the quality standards for the PQ path (whether prescriptive or principles-based) and reporting requirements that would apply under the ID regime. The Commission would still ultimately approve the standards and reporting requirements that were agreed upon. There are options for how involved the Commission might be in guiding the industry-led process.

These options are not mutually exclusive. It is plausible that, for example, the Commission could undertake its own consultation on the quality metrics that could apply under a PQ determination, but then delegate to industry to determine the specific quality standards that fibre providers would need to meet. Similarly, for an ID determination, the Commission might undertake a consultation to determine the broad quality dimensions that should be monitored, but then allow an industry forum to determine the specific metrics that would be monitored and precisely how these would be measured. Another variation would be for the Commission to initially allow an industry forum to set the bulk of the quality standards / reporting requirements, and step in only in cases where agreement could not be reached within a reasonable time period.

The Commission could also introduce flexibility to update the metrics and standards over time through the use of an 'reopener' mechanism, triggers or thresholds in the IM. Specific rules around how the metrics and standards could be reopened could reduce any uncertainty created from this process.



Below we highlight some of the key advantages and disadvantages of each broad approach, noting that some of the disadvantages may be addressed by adopting a hybrid approach.

Table 5.3: Relative advantages and disadvantages of industry-led or Commission-led approaches

| | Commission-led | Industry-led |
|---------------|---|---|
| Advantages | <ul style="list-style-type: none"> • Potentially greater assurance that the requirements of all end-users are considered. • Where RSPs are not aligned, the Commission may be better placed to balance the interests of different RSPs (for example, those that are smaller or less well-resourced). | <ul style="list-style-type: none"> • Industry is able to draw on its detailed knowledge of the costs and benefits of setting particular quality standards, and the difficulties in measuring particular reporting requirements • May be appropriate where the knowledge and resources of the RSPs and fibre providers are balanced. |
| Disadvantages | <ul style="list-style-type: none"> • Greater risk of regulatory failure (for example, due to lack of detailed knowledge of the costs and benefits of setting particular quality standards). • Potentially greater costs associated with the consultation process (for example, in an industry-led process, industry stakeholders may have incentives to reach agreement as efficiently as possible). • Less flexible process, due to statutory requirements. | <ul style="list-style-type: none"> • RSPs may have diverging points of view of appropriate quality standards / metrics. • While the interests of end-users and RSPs may be generally aligned, this may not always be the case. • Commission may still need to deploy significant resources to assess and approve the industry's proposals. |

Source: CEPA

5.4.2. Findings from the case studies

In the table below, we set out a summary of the processes that other jurisdictions followed to set service quality dimensions, metrics and standards, with a focus on which stakeholders were involved at various points.

The case studies indicate that a mix of approaches are used in other jurisdictions. Ofcom leads a consultation process to set regulated quality standards and information disclosure requirements. The CRTC established an industry forum to provide it with advice on the detailed application of information disclosure requirements. In Singapore, the IMDA places requirements on the regulated wholesale service providers to include particular quality dimensions and metrics in their reference offers, although it is unclear how they developed these requirements. In Australia, the ACCC largely leaves decisions on quality standards to NBN Co and the RSPs, through commercial negotiations to set the WBA3. However, the ACCC does appear to have 'nudged' NBN Co in a certain direction, as evidenced by the recent accepted undertaking.



Table 5.4: Process for setting the quality regulations adopted in other jurisdictions

| Jurisdiction | Roles and responsibilities in setting quality dimensions, metrics and standards |
|----------------|--|
| United Kingdom | <p>Regulator-led. Ofcom largely leads the process for developing the regulated quality standards and information disclosure requirements that apply to Openreach. The industry (including RSPs and end-user representatives) has significant input into Ofcom’s decisions through the consultation process. Ofcom also undertook its own research on end-user requirements (see text box below).</p> <p>Ofcom also requires particular aspects of quality to be included in Openreach’s reference offer. The detailed quality targets specified in the reference offer are then negotiated by industry participants, overseen by an independent body appointed by Ofcom (the OTA2).</p> |
| Singapore | <p>Regulator- and industry-led. IMDA sets out the dimensions and metrics that are to be covered in reference interconnection offers provided by the regulated wholesale service providers. For some quality metrics the IMDA also specifies targets that the providers must meet. Apart from this, the industry is largely responsible for negotiating the quality metrics and values that will be included in access agreements.</p> <p>It is unclear what process the IMDA followed to set out the quality dimensions and metrics that it requires be included in the reference offer. There is also no obvious way that end-user requirements are explicitly reflected in the quality of service regime.</p> |
| Canada | <p>Regulator- and industry-led. Canada’s sector regulator (CRTC) sets out explicit quality metrics that will be monitored under a quality of service regime. To determine these metrics, the CRTC led a consultation process that included input from industry stakeholders. However, the work to determine the specific details of those metrics (i.e., precisely how they will be measured) is being undertaken by an industry working group. The mandate, structure and chairperson of this group is determined by the CRTC.</p> |
| Australia | <p>Predominantly industry-led. There are almost no regulatory principles or prescription for the wholesale service quality provided by NBN Co. Rather, quality metrics and values are specified in the commercially negotiated terms agreed between the retailers and NBN Co.</p> <p>However, the ACCC has been leading a process to investigate whether these service quality standards are adequate. The ACCC announced on September 2018 that it had accepted an undertaking from NBN Co to improve service level guarantees for retailers; it appears that NBN Co provided this undertaking after the ACCC signalled its intention to impose a regulated quality of service regime.</p> |

Source: CEPA



Reflecting end-user requirements in a wholesale quality of service regime

The international case studies provided limited examples of explicit consideration being given to end-user requirements in the development of the quality of service regime. This may reflect a view that the involvement of RSPs in developing regulated service quality requirements or negotiating commercial quality of service agreements naturally reflects the requirements of end-users, as RSPs must take this into account to compete effectively.

One exception was the consumer research undertaken by Ofcom, to inform its decisions on regulated quality standards for Openreach. Ofcom undertook consumer surveys, which appeared to provide useful evidence on issues such as the impact of poor service quality on end-users, the level of end-user expectations, and some indication of end-user willingness-to-pay for improved quality. However, we note that the results of the surveys did not feed mechanically into the quality standards. Rather, they were one (albeit important) consideration in Ofcom's decision making. In this regard, Ofcom stated that in setting the level of the quality standards they took three considerations into account:

- Impact on customers and competition, with a focus on providing certainty;
- Openreach's operational capabilities; and
- Costs to customers and RSPs.⁴⁷

Consumer research has been used in other regulated sectors to inform regulator's views on the appropriate levels of service quality. For example, in electricity distribution regulators may conduct studies on the 'value of lost load', in order to determine consumer willingness-to-pay for improved reliability. Other approaches include:

- The use of consumer panels to advise the regulator on the interests of consumers. For example, the Consumer Challenge Panel was established by the Australian Energy Regulator to act as a 'critical friend' during their electricity network revenue determinations.
- Requirements placed on regulated service providers to consult with customers or otherwise explicitly take their views into account. For example, the UK Civil Aviation Authority required the establishment of a Consumer Challenge Board (CCB), which has the role of providing Heathrow Airport (HAL) with an independent challenge on its business plan from a consumer perspective (focussed on passengers rather than other types of air traffic consumers). The CCB will also provide the CAA with advice about the extent to which HAL's business plan has been informed by high-quality consumer engagement.

The relevance of these different approaches to the regulation of fibre services in New Zealand will depend to some extent on the process followed to set quality standards and reporting requirements. If the process is mainly industry-led, a primary consideration is likely to be whether RSPs are able to adequately represent the interests of end-users. If the process is primarily Commission-led, an important factor will be the Commission's ability to adequately understand end-user requirements through the consultation process, or whether additional input would be required.

Source: CEPA

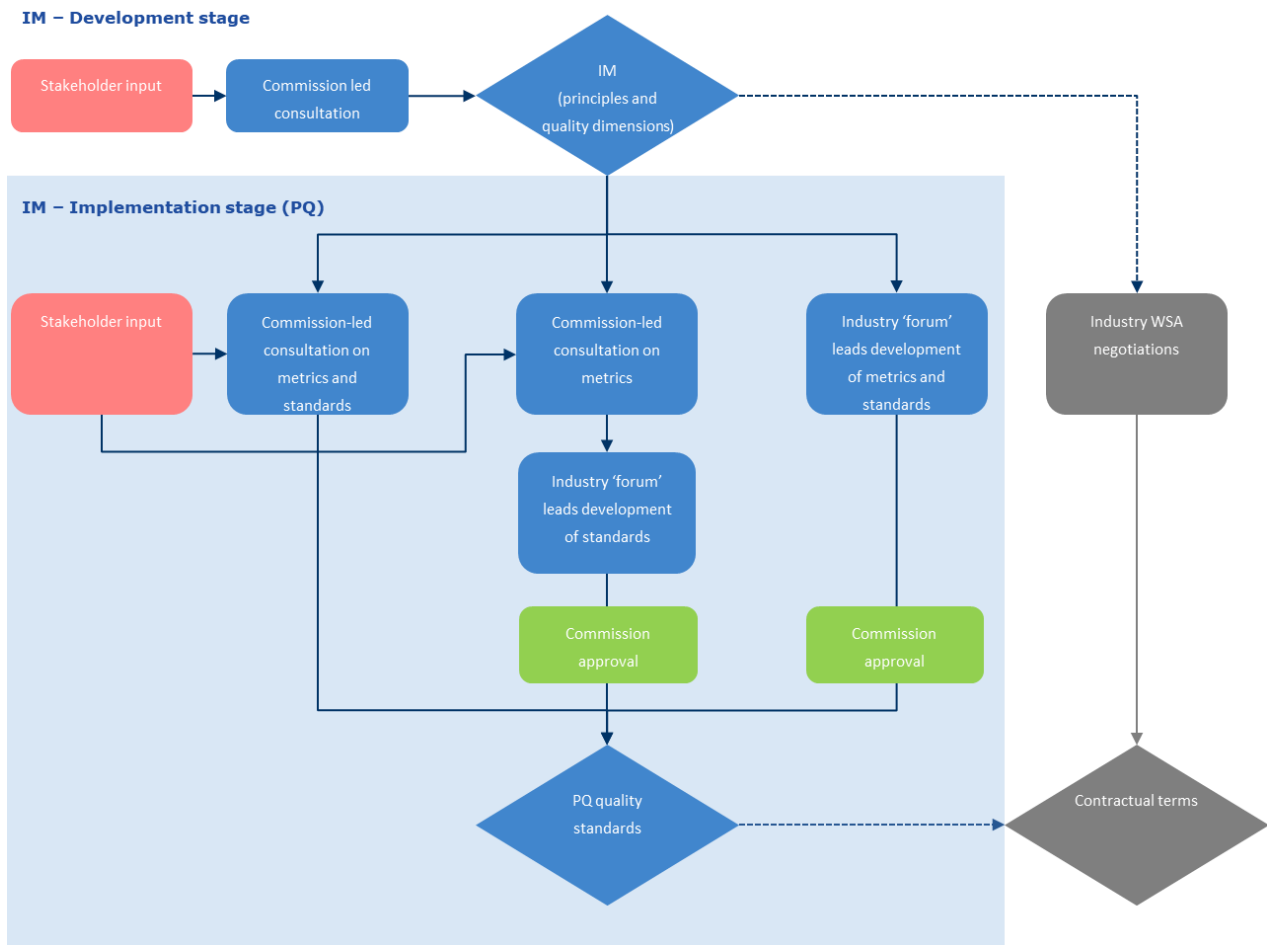
5.4.3. Process options

In the following figure we set out three high-level 'strawman' processes, to illustrate the potential roles different stakeholders could play during the application of the IM. For simplicity, we have set these examples in the context of the IM being applied in a PQ determination; the process under an ID determination may be broadly similar, although without the need to define quality standards.

⁴⁷ See Ofcom (2018b), page 22.



Figure 5.1: Application of the quality dimensions IM - strawman processes



Source: CEPA

Note: In this figure, 'quality standards' may refer to either prescriptive quality standards or broader principles, as discussed in Section 5.3.1.

The figure illustrates three broad options:

- The Commission leads a consultation process to develop the quality metrics and quality standards that apply to the regulated service provider under the PQ path. The Commission would receive input from stakeholders – including fibre providers, the RSPs and end-users – during the consultation process. The Commission may decide to incorporate end-user requirements more explicitly, as outlined in the preceding section.
- The Commission leads a consultation process to develop the quality metrics that will apply to the regulated service provider under the PQ path, receiving stakeholder input through the consultation process. The Commission would then task an industry 'forum' with the development of the quality standards that the fibre providers would need to meet. These standards would be approved by the Commission before being reflected in the PQ determination.
- The Commission tasks an industry 'forum' with the development of the quality metrics and quality standards that the fibre providers would need to meet. The forum's discussions would be guided by the IM (i.e., the quality dimensions and overarching principles), and the Commission could



potentially provide additional guidance. These standards would be approved by the Commission before being reflected in the PQ determination.

Commercial negotiations between fibre providers and the RSPs to agree the WSAs sit alongside the PQ determination process. The dotted lines in the figure above indicate that both the IM and the eventual PQ determination will influence this process, although the industry will have the flexibility to negotiate customised agreements.

If the process is mainly industry-led, a primary consideration is likely to be whether RSPs are able to adequately represent the interests of end-users. If the process is primarily Commission-led, an important factor will be the Commission's ability to adequately understand end-user requirements through the consultation process, or whether additional input would be required.



6. OTHER CONSIDERATIONS

Summary

The preceding sections have set out our view on some of the key issues for developing the quality dimensions IM. These are not the only considerations. In this section, we note several other factors that may need to be taken into account as the IM develops; these are likely not exhaustive.

Interaction with the broader regulatory framework

The Commission will set an incentive based regulatory framework for the PQ path. As with any service, there is a trade-off between quality and price. The Commission will need to consider this trade-off when setting the quality standards for the regulated services, including investment strategies and the evolution of the services that are provided.

Product definition

The Commission is required to define anchor services. The definition of these services will almost certainly set some quality aspects. These aspects should be considered within the broader quality dimension framework and the reporting requirements placed on the fibre providers.

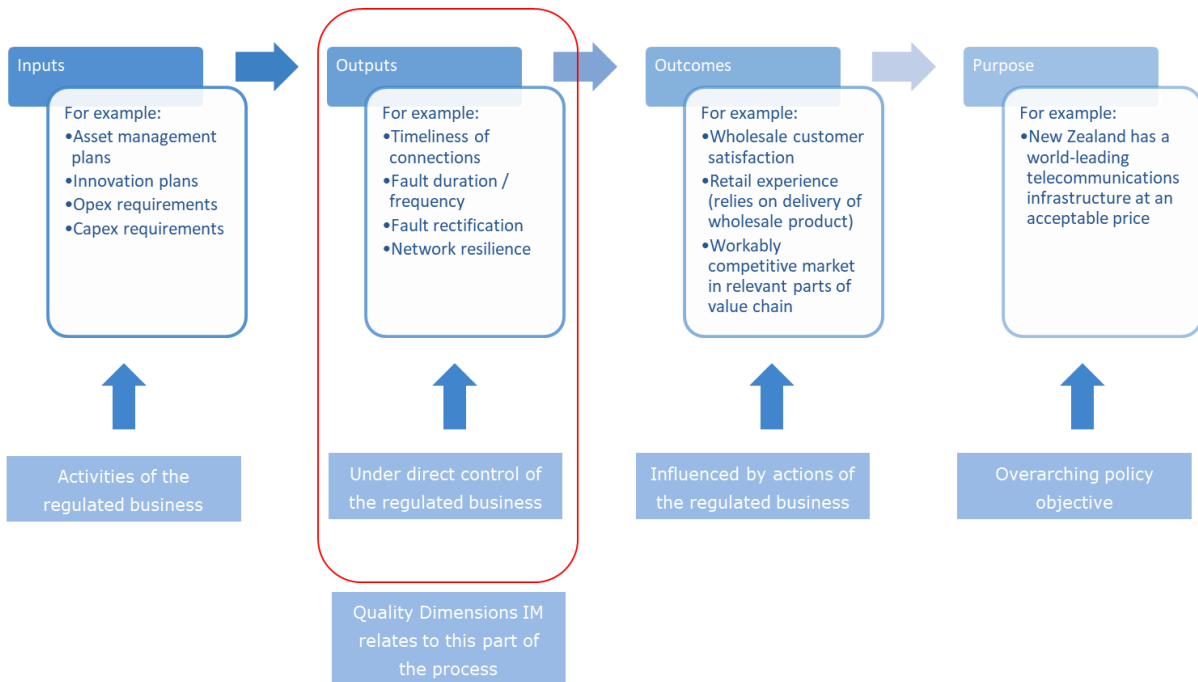
Interactions between retail and wholesale service quality

There are clear interactions between wholesale service levels and retail service levels. While the quality metrics and standards that apply to the fibre providers should be within their control, identifying this may not always be clear cut. The RSPs may also choose to deliver a different level of service than that offered by the wholesale fibre providers.

6.1. INTERACTIONS WITH THE BROADER REGULATORY FRAMEWORK

As discussed in Section 4, we see quality dimensions as falling within the ‘outputs’ element of a generic incentive-based regulatory framework (Figure 6.1).

Figure 6.1: Outcomes framework



Source: CEPA



However, other parts of the regulatory framework may nonetheless impact fibre service quality and may thus need to be considered in the development of the IM. These include:

- Regulated service providers may have **obligations to consult** with their customers (i.e., the RSPs). For example, this appeared to be flagged in the MBIE's July 2016 options paper, which noted that “providers will be subject to a commitment to ongoing service development and RSP engagement. Such a requirement would require UFB providers to publish a ‘road-map’ of future product development and to monitor changing end-user demands.”⁴⁸ In the generic regulatory framework outlined above, these activities would fall within the ‘inputs’ stage of the process. However, consultation and ongoing product development is likely to impact service quality. While not traditionally considered within the scope of fibre service quality per se (which typically refers to the performance of the service itself), it is possible that the Commission could set standards and/or reporting requirements that relate to the quality of the engagement process. The quality dimensions IM may not necessarily be the appropriate place to reflect these requirements.
- Similarly, **other obligations** placed on fibre providers at the input stage – for example, in relation to asset management plans - will likely also influence quality and/or interact with the ability of fibre providers to meet particular standards.
- The **revenue/price determination** itself may also put in place direct and indirect incentives for service quality. For example, Ofcom considered, but rejected, placing regulatory standards on Openreach in relation to fault levels. Among other factors, Ofcom noted that the price control made assumptions on efficient fault levels, which in itself provided Openreach with incentives to perform at or above this level.

6.2. ISSUES RELATED TO PRODUCT DEFINITION

The way that fibre services (and the access obligations attached to these services) are defined also has quality implications.

- Implicit quality standards are often embedded in the **service definition**. For example, the broadband anchor service may be defined as needing to provide 100/20Mbps with a committed information rate of at least [x] in accordance with the UFB specifications. Depending on how detailed the service definition is, this may obviate the need to specify certain quality requirements through the IM process.
- The way in which **access obligations** are specified is also a relevant factor. For example, we understand that while fibre providers will be required to offer an unbundled fibre service from 2020, the Commission is concerned that this alone may not be sufficient to ensure that the service meets RSP requirements. For example, while there is structural separation between the wholesale/retail levels of the fibre services market, there is no separation between layer 1 and 2 services at the wholesale level. That is, in offering the unbundled layer 1 service, Chorus and the LFCs will be competing directly with RSPs in providing layer 2 services. Therefore, while Chorus and the LFCs will be required to provide the unbundled product, there may be concerns that they

⁴⁸ MBIE (2016).



will still have incentives to inhibit the ability of RSPs to compete in the provision of layer 2 services.

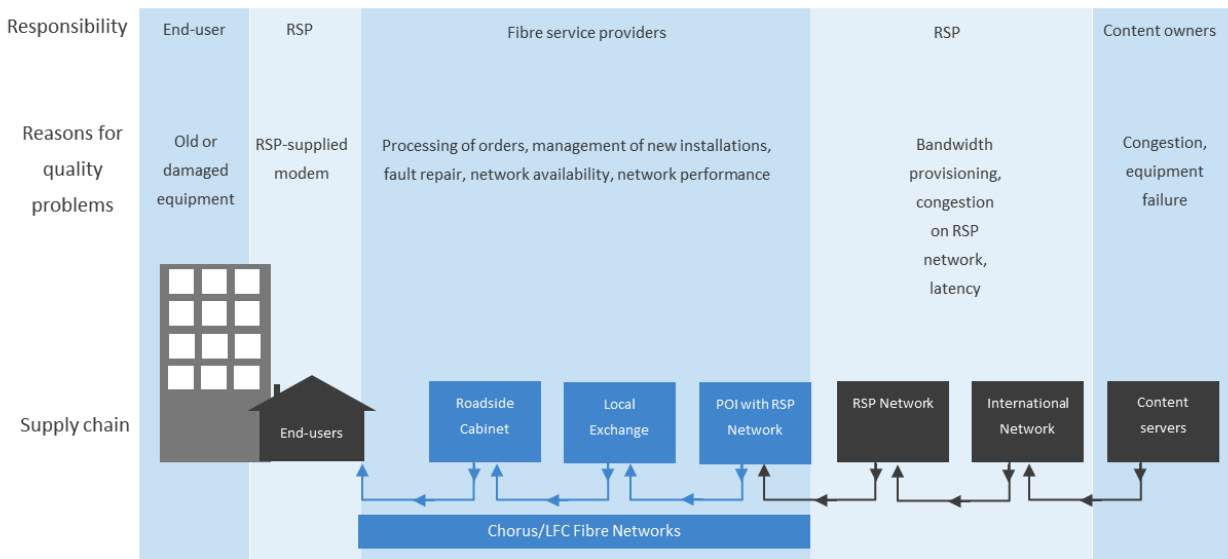
We consider that this type of issue would be best dealt with directly through the specification of the access obligation for this product and the service definition itself, rather than through quality of service provisions. However, there may be some ways in which the quality dimensions IM could support the appropriate provision of these services. For example, one option could be to monitor the proportion of requests for dark fibre access that are rejected on the basis of physical network constraints (for example), in order to detect systematic problems at an early stage.

- There may also be implications for **retail service offerings**. For example, the quality standards set for anchor services may impact the range of differentiated wholesale products offered by Chorus. Given the importance of service differentiation in promoting vibrant retail competition and ensuring that the diverse requirements of end-users can be met, this may be one issue that requires further consideration as the regulatory framework develops.

6.3. INTERACTIONS BETWEEN RETAIL AND WHOLESALE SERVICE QUALITY

Through the amendments to the Act, the Commission will have an expanded role in regulating retail service quality. While the scope of this paper does not include advice on retail service quality regulation, there are interactions between the wholesale and retail levels. In particular, the service quality experienced by end-users will be affected by the activities of both wholesale and retail service providers, as well as the end-user's own equipment, international networks and content providers (Figure 6.2).

Figure 6.2: End-user service quality - contributing factors



Source: CEPA (adapted from NBN Co (2018a))

In our view, this has several implications for the *wholesale* quality dimensions IM:

- Quality dimensions for providers of wholesale fibre service providers should only relate to factors that are within their control. That said, assigning responsibility for service failures is not always straightforward and this will need to be considered with the industry. For example



- If installation requires access to an end-user's premises, delivery time will depend on the end-user's availability, and whether they are in fact at home at the time of the appointment.
 - Poor line connection performance can be either due to a problem on the access network, or potentially a problem elsewhere in the supply chain (for example, if a content server goes down).
 - Some service issues can be due to a problem with the customer's equipment or set up.
- Notwithstanding the point above, wholesale quality standards may still be set with the end-user quality of service in mind.
 - An important interaction is how wholesale service quality levels flow through to the retail level. For example, the experience in the UK has been that some RSPs did not mirror the different service care levels provided by Openreach in their retail service offerings. In particular, there seemed to be a reluctance to allow customers to choose a higher care level service that was backed by a more stringent wholesale SLA. This appears to have been because the RSPs were not confident that Openreach would reliably meet the higher service level, giving rise to concerns that this would trigger customer complaints and losses due to higher compensation payments by RSPs. Similar issues have been experienced with the Australian NBN, which has prompted the ACCC to prod the wholesale service provider NBN Co to offer improved quality of service assurances to the RSPs, and also require RSPs to pass compensation through to end-users.

In the New Zealand context, these arrangements may be negotiated in the WSAs agreed between the fibre providers and the RSPs. However, the Commission may wish to consider the adequacy of these arrangements and the associated implications for retail service quality.



APPENDIX A INTERNATIONAL EXPERIENCE

We have prepared four case studies that cover a range of approaches to regulating and monitoring the quality of wholesale high-speed broadband services:

- Ofcom’s approach to regulating wholesale local access (WLA) broadband services in the United Kingdom.
- The Info-communications Media Development Authority’s (IMDA) quality requirements for wholesale services provided over Singapore’s Next Generation Nationwide Broadband Network (Next Gen NBN).
- The Canadian Radio-television and Telecommunications Commission’s (CRTC) recent decisions in relation to a competitor quality of service regime for wholesale high-speed access services (HSA).
- The Australian Competition and Consumer Commission’s (ACCC) ongoing inquiry into the adequacy of quality standards for wholesale services provided over the National Broadband Network (NBN).

These jurisdictions were selected to cover: a range of approaches to regulating service quality; a mix of regulated wholesale services; cases where publicly available information could be identified on the process and principles used to select the quality dimensions; and cases covering the roll-out of new networks. We also considered, but rejected, a range of other telecommunications sector case studies, including:

- Spain – relatively widespread fibre-to-the-premises (FTTP) coverage, and the National Authority for Markets and Competition (CNMC) has placed a number of quality of service obligations and standards on Telefonica. However, there is limited publicly available information on the details of the CNMC’s approach to defining standards.
- Nordic countries – relatively widespread FTTP coverage; however, market characteristics reduce the relevance of these examples to the New Zealand context. For example, Finland has significant levels of competition between mobile and fixed networks, while in Sweden a large proportion of the FTTP network roll-out has been via municipal authorities, which fall outside of the regulatory quality regime. Further, there is very limited publicly available information on the regulatory approach to quality in these jurisdictions.
- United States – in 2004, the Federal Communications Commission (FCC) removed requirements on local telecommunications companies to provide regulated access, suggesting a low degree of relevance for this study.
- Japan – widespread fibre deployment, however there is extremely limited publicly available information in relation to the regulation of service quality.



| A.1. UNITED KINGDOM | |
|----------------------|--|
| Sector overview | <p>The wholesale services that support the provision of broadband and telephone services to end-users are supported by the wholesale local access (WLA) market. Within the WLA market, privately-owned BT and Virgin Media are the largest fixed access network providers, reaching around 100% and 45% of residential premises respectively. Smaller network providers operate in other parts of the UK. Both BT and Virgin Media operate at the wholesale and retail level.</p> <p>As discussed further below, BT – via its access network division Openreach⁴⁹ - provides regulated WLA services to other competitors that provide retail services, the largest of which are Sky and Talk Talk.</p> <p>A number of BT's retail competitors have announced plans to roll out or extend their own physical access networks. BT has announced plans to accelerate its deployment of fibre-to-the-premises (FTTP).</p> |
| Regulatory framework | <p>Who is the regulator?</p> <p>Ofcom is the sector-specific regulator for the UK communication industry, including telecommunications. Ofcom's functions relating to telecommunications are set out under Part 2 of the Communications Act (2003 – 'the Act'). This sits within the broader European Union (EU) framework for the regulation of electronic communications, as set out in five related European Commission (EC) directives (notably the Framework and Access Directives). This framework requires national regulatory authorities (NRAs – such as Ofcom) to review the state of competition in communications markets, to assess whether any instances of significant market power (SMP) are dealt with adequately and proportionately. Various EC documents guide the SMP assessment process and the appropriate remedies if SMP is found to exist.</p> <p>What services are regulated?</p> <p>In relation to the wholesale local access (WLA) market for broadband, in its most recent market review Ofcom concluded that BT continues to have SMP.⁵⁰ As a result, Ofcom has determined that it is necessary to continue to impose access, pricing and quality of service remedies on the WLA services provided by Openreach. The package of remedies is summarised briefly below:</p> <ul style="list-style-type: none"> • General remedies, relating to all forms of network access. These include <i>inter alia</i>, requirements to provide network access on reasonable request, not to unduly discriminate and to publish a reference offer (RO). Ofcom cites two key reasons for imposing a RO remedy: improving transparency to better monitor anti-competitive behaviour; and providing RSPs with visibility on the terms and conditions available for their competitors to purchase wholesale access services. Ofcom sets out minimum requirements that must be included in the RO, including service quality dimensions. • Specific access remedies, relating to particular forms of network access. These include requirements to offer: <ul style="list-style-type: none"> ○ Physical infrastructure access (PIA) to BT's ducts and poles, that enables providers to deploy fibre in the access network. This aims to promote fibre network investment by competitors. ○ Local Loop Unbundling (LLU) in the form of Metallic Path Facility (MPF) services. This allows RSPs to deliver standard broadband over BT's copper network. |

⁴⁹ In 2017, following competition concerns raised by Ofcom, BT agreed to implement legal separation of Openreach. At the time of writing this process has been partially completed. Ofcom (2018c).

⁵⁰ Ofcom (2018a).





A.1. UNITED KINGDOM

| | |
|-------------------------------|---|
| | <ul style="list-style-type: none"> ○ Sub Loop Unbundling (SLU), which allows providers to physically take over or share part of BT’s existing copper lines between a cabinet and the customer’s premises; and ○ Virtual unbundled local access (VULA), which provides access to BT’s fibre through a virtual connection. BT meets this obligation through the provision of Generic Ethernet Access (GEA – both FTTC and FTTP). <ul style="list-style-type: none"> ● Quality of service remedies will apply to certain WLA services, while other services will be monitored through reporting on key performance indicators (KPIs). ● Price regulation for wholesale services: charge controls for VULA and MPF services, with a basis of charges obligation on SLU services. <p>Is there a quality of service regime?</p> <p>Yes. Ofcom uses a range of measures to regulate and monitor delivery of appropriate service quality by Openreach, as outlined below.</p> |
| Regulation of service quality | <p>Overview of the quality of service regime</p> <p>To date, Ofcom has adopted three sets of ‘levers’ to incentivise Openreach to provide appropriate levels of service quality. These are: transparency measures; service level agreements (SLAs)/ service level guarantees (SLGs); and regulatory quality standards. We describe each approach below.</p> <ul style="list-style-type: none"> ● Transparency measures (in particular, obligations to report on detailed Key Performance Indicators (KPIs)) have been used by Ofcom to monitor key aspects of Openreach’s service over time. Ofcom finds this useful to: encourage Openreach to focus on delivering appropriate quality on all services (not just those subject to mandated standards); detect potential concerns (for example, discriminatory practices) early and react quickly; and resolve information asymmetries. ● SLAs/SLGs are included in the reference offer (RO) that must be provided by BT. SLAs detail Openreach’s commitment to provide services to an agreed quality, while SLGs set out the level of compensation that an RSP would be entitled to if the agreed quality level is not met. These measures therefore represent obligations in regard to individual activities (e.g. for each repair or service provision). While Ofcom may require that certain aspects of quality must be covered under the SLAs/SLGs, BT and the RSPs are able to negotiate the precise details and may also incorporate additional terms beyond those mandated by Ofcom. These negotiations are facilitated by the Office of the Telecoms Adjudicator (OTA2), which is an independent organisation with the role of overseeing cooperation between telecommunications providers. ● Regulatory quality standards apply to Openreach’s performance at the <i>aggregate</i> level. But setting regulated standards, Ofcom aims to ensure that service quality is maintained at a sufficiently high level to support retail competition and provide customers with appropriate service quality. Ofcom may levy financial penalties on BT if these standards are not met. <p>Ofcom has noted that these measures “serve different purposes but work in a complementary way”.⁵¹ However, in the 2018 quality review, Ofcom noted that “[w]hile KPIs can be used to resolve information asymmetries and to observe trends in performance, on their own they are unlikely to be</p> |

⁵¹ Ofcom (2018b), page 29.





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sufficient to prevent a dominant operator from exploiting its SMP”.⁵² Ofcom also observed that despite KPIs and SLAs/SLGs having been in place alongside the regulatory standards imposed in 2014, these complementary measures had “a limited effect in providing Openreach with incentives to perform beyond the standards”.⁵³ Regulatory standards are therefore viewed as the primary measure to incentivise appropriate service quality.⁵⁴

Application of the quality of service regime

Ofcom’s application of the three quality of service levers to different WLA services is outlined below:

- **Regulatory standards:** Ofcom currently applies regulatory standards to broadband and voice services provided over BT’s copper and fibre networks (specifically, the LLU MPF, wholesale line rental (WLR) and GEA-FTTC services). These services have been the focus of concerns, and also account for the highest volume of services. Due to the more limited uptake of GEA-FTTP, mandated standards will not be imposed. Ofcom also decided to remove regulated standards for some services provided over BT’s copper network (SMPF), as these are being progressively deregulated and forecast consumption is low.
- **SLAs/SLGs.** BT’s reference offer will be required to include SLAs/SLGs for copper/fibre broadband services (LLU MPF / VULA (GEA-FTTC and -FTTP).
- **Transparency measures.** KPIs will be in place for the following services: LLU MPF/SMPF, VULA (GEA-FTTC and -FTTP), WLR.

From these decisions, Ofcom’s primary criteria for deciding which services to impose regulatory standards on (rather than less prescriptive regulation) appear to be those services with a relatively high level of demand, that are therefore likely to have a significant impact on the experience of consumers and retail competition.

What aspects of quality are regulated?

In this section, we consider the aspects of quality that are covered under the regulatory standards and SLAs/SLGs. Aspects of quality captured under the transparency measures are considered in the information disclosure section below.

Aspects of quality – regulatory standards

Ofcom has decided to set regulatory quality standards in relation to:

- **Fault repair times.** This was considered appropriate, given the level of importance to consumers and RSPs. Ofcom also noted that this metric could be easily measured, and that precedents were available to inform the cost implications of raising standards.
- **Timeliness of installations.** Regulatory standards were considered appropriate for this aspect of quality, given the potential impact on switching decisions.

Ofcom considered, but rejected, setting regulatory standards in relation to a number of other quality aspects, including **incidence of faults** and **missed appointments**. Fault levels are seen as a key issue for consumers and competition. However, Ofcom noted that the fault repair time standard would provide an incentive for Openreach to reduce the overall level of faults. Further, they also identified difficulties in: assessing the cost implications of setting fault incidence standards; measuring compliance, given that faults can be due to a wide range of issues and detailed investigations could be required to identify whether Openreach was at fault. Fault levels were also

⁵² Ibid., page 26.

⁵³ Ibid., page 29.

⁵⁴ Ibid., page 30.



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thought to be highly sensitive to exogenous factors such as the weather, which could require *force majeure* provisions to allow for cases outside of Openreach's control; Ofcom considered that this may result in very broad standards that may not significantly influence Openreach's performance. Ofcom also noted that it applies a 'best estimate' of efficient fault rates in the price control, which in itself acts as a quality incentive. In relation to missed appointments, Ofcom observed that the available data did not suggest that this was currently a problem. In relation to other standards, Ofcom also noted that it was important that the quality aspect could be easily attributable to Openreach⁵⁵ and that standards should not discourage innovation (for example, by discouraging investment in new approaches that might initially have a higher fault rate).⁵⁶

Ofcom's consultation on these issues received input from consumer groups, industry bodies and RSPs. Ofcom also referenced survey data on consumer preferences.

Aspects of quality – SLAs/SLGs

In terms of quality dimensions, Ofcom specified that the RO must provide, in general:⁵⁷

(i) *details of maintenance and quality as follows—*

(i) *specific time scales for the acceptance or refusal of a request for supply and for completion, testing and hand-over or delivery of services and facilities, and for provision of support services (such as fault handling and repair);*

(ii) *service level commitments, namely the quality standards that each party must meet when performing its contractual obligations;*

(iii) *the amount of compensation payable by one party to another for failure to perform contractual commitments;*

(iv) *a definition and limitation of liability and indemnity; and*

(v) *procedures in the event of alterations being proposed to the service offerings, for example, launch of new services, changes to existing services or change to prices.*

In relation to the VULA Ethernet service provided over the Openreach fibre network, the RO was also required to include:⁵⁸

(a) *Service Level Commitments in respect of at least the following aspects of that service:*

(i) *availability of an appointment for the provision of the service;*

(ii) *attending appointments for the provision of the service;*

(iii) *completion of the provision of the service;*

(iv) *completion of the transfer of the service;*

(v) *line working at completion of provisioning process;*

(vi) *disconnections made in error;*

(vii) *fault repair times;*

(viii) *attending fault repair appointments; and*

⁵⁵ Ofcom (2018b), page 42.

⁵⁶ Ofcom (2018b), page 40.

⁵⁷ Ofcom (2018d), page 106-107.

⁵⁸ *Ibid.*, page 112-113.



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(ix) availability of the relevant operational support systems by which requests for service provision, transfers and fault repair are made as applicable; and
(b) Service Level Guarantees in respect of the Service Level Commitments specified above.

Information disclosure

Aspects of quality – Transparency requirements

The transparency requirements cover a broader set of KPIs, beyond the mandated service quality standards. In the 2017 review, Ofcom revised certain aspects of the KPI framework, including removing indicators that could be derived from other KPIs. This was in order to ensure that the reporting burden on BT was not disproportionate.⁵⁹ In developing the KPIs, Ofcom also considered whether the requested data was commercially sensitive or confidential.⁶⁰

The KPIs adopted for each WLA service are set out in the table below.

Table 6.1: KPIs

| KPI | MPF | GEA-FTTC | GEC-FTTP | SMPF | WLR |
|---|-----|----------|----------|------|-----|
| Appointment availability* | Y | Y | Y | N | Y |
| Provisioning of all orders* | Y | Y | Y | N | Y |
| Repair completion* | Y | Y | N | N | Y |
| Average first available appointment date | Y | Y | Y | N | Y |
| Percentage of orders rejected | Y | Y | Y | N | Y |
| Provisioning of appointed orders | Y | Y | Y | N | Y |
| Average installation time | Y | Y | Y | N | Y |
| Percentage of installations affected by MBORC declarations that missed the Committed Date | Y | Y | Y | N | Y |
| Percentage of orders reported as faulty | Y | Y | Y | N | Y |
| Average time to restore service | Y | Y | Y | Y | Y |
| Percentage of repairs affected by MBORC ⁶¹ declarations that missed the SLA | Y | Y | Y | N | Y |
| Average time to restore service for repairs that have exceed the SLA by more than 20 working days | Y | Y | Y | Y | Y |

⁵⁹ Ofcom (2018b), page 151.

⁶⁰ Ofcom (2018b), page 148.

⁶¹ MBORC refers to 'matters beyond BT's reasonable control'.



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| | Percentage of repeat faults | Y | Y | Y | Y | Y |
| | Percentage of missed installation appointments | Y | Y | Y | N | Y |
| | Percentage of missed repair appointments | Y | Y | Y | Y | Y |
| <p><i>Y = BT is required to provide information to Ofcom and the industry.</i></p> <p><i>N = BT is not required to provide information on the KPI for this service.</i></p> <p><i>* = Regulatory standard applies for MPF, GEA-FTTC and WLR.</i></p> <p>Openreach will be required to report on these KPIs on a monthly basis to Ofcom, and publish a subset of the KPIs on BT's website on a quarterly basis.</p> <p>In addition to these KPIs, Ofcom has developed a separate reporting framework that focusses on customers who experience delays in repairs and installations. This is to address concerns that there is currently limited information on the causes of such delays. Through this measure, BT will be required to provide Ofcom with a standalone quarterly report that includes analysis on the root causes of repair and installation delays. The monthly KPI reporting will also include a set of enhanced KPIs, that quantify volumes of delayed installations and repairs.⁶²</p> | | | | | | |
| Outcomes | <p>In 2014, Ofcom introduced regulated service quality standards for Openreach for the first time. Before this, Ofcom had relied on transparency measures and the SLAs/SLGs contained in the RO. However, they determined that these measures did not incentivise Openreach to maintain adequate quality levels: <i>"it was not apparent that SLG payments could be set at a level that would, on their own, ensure appropriate service standards"</i>.⁶³ Ofcom also found that <i>"from 2009, there had been a gradual decline in Openreach's performance, particularly in relation to fault repairs and provisioning of WLR and MPF services. We also concluded that the prevailing regulatory and contractual framework had not been sufficient to prevent material detriment to downstream competition in the fixed access markets, arising out of BT's SMP."</i>⁶⁴ The decision to impose regulatory standards reflected Ofcom's concerns that inadequate service quality arising from BT's exercise of SMP could impair competition at the retail level by discouraging end-users from switching providers, among other issues.⁶⁵</p> <p>The standards introduced in 2014 were considered to have lifted Openreach's performance. However, Ofcom has noted that despite this, <i>"fault repair performance has not quite returned to 2009/10 levels."</i>⁶⁶ Further, they observed that Openreach was not performing above the mandated levels, despite the incentives provided by the accompanying transparency measures and SLAs/SLGs. Overall, Ofcom concluded that it was necessary to further strengthen the regulatory standards <i>"because service outcomes are not sufficient to ensure that telecoms providers can compete effectively in the retail market and that customers do not suffer harm."</i>⁶⁷</p> | | | | | |

⁶² In addition to the KPIs included in the table above, this will provide information by on volumes of jobs that have exceeded the target completion date by more than 30, 90 and 120 days.

⁶³ Ofcom (2018b), page 28.

⁶⁴ Ofcom (2018b), page 14.

⁶⁵ Ofcom (2018b), page 17.

⁶⁶ Ofcom (2017), page 184.

⁶⁷ Ofcom (2017), page 2-3.





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| | <p>At this stage it is too early to judge whether the revised approach to WLA service quality will have the desired effect.</p> |
| Insights for New Zealand | <p>General observations:</p> <ul style="list-style-type: none">• Ofcom’s approach is the most comprehensive (and prescriptive) of the case studies, and includes reporting/monitoring, guidance on inclusions in commercial agreements, and regulated quality standards.• A significant factor in Ofcom’s decision-making has been the SMP of Openreach; without establishing SMP, Ofcom could not impose access regulation (including mandatory minimum quality standard obligations). BT’s vertical integration is relevant to the extent that it means that anti-competitive discrimination is a concern. However, the general point that an access monopoly may underprovide quality still applies. Whilst the same vertical integration concerns may not apply in New Zealand, the underlying reason for quality regulation for the fibre providers stems, as with Openreach, from their monopoly position in access. <p>Advantages:</p> <ul style="list-style-type: none">• Ofcom has sought to focus quality regulation on the most important products for end-users and the dimensions of quality that matter most for end-users (repairs and installations in the case of the UK).• Ofcom’s approach of setting minimum quality standards conservatively at first and then progressively tightening and extending these in the light of further evidence arguably helped reduce the risk of regulatory failure. However, the downside is that end-users continued to experience quality problems for longer. This may be a relatively important issue in New Zealand given the likely importance of reliable quality in ensuring a rapid transition from copper to fibre services.• Ofcom invested considerable time and effort in setting out a sufficiently detailed system for measuring and monitoring quality. This partly reflects the fact that a lack of adequate monitoring historically meant that Ofcom was taken by surprise when quality issues emerged and was ill-equipped to respond. <p>Disadvantages:</p> <ul style="list-style-type: none">• Ofcom has become embroiled in highly detailed and prescriptive regulation that has become more intrusive as standards are tightened and new products are included in the quality regulation regime. This involves risks of high regulatory costs and a lack of flexibility for operators to respond to changes in cost and demand conditions, as technology and markets evolve.• Regulatory review of quality standards is time- and labour-intensive, and requires Ofcom to resolve a large number of difficult issues. |





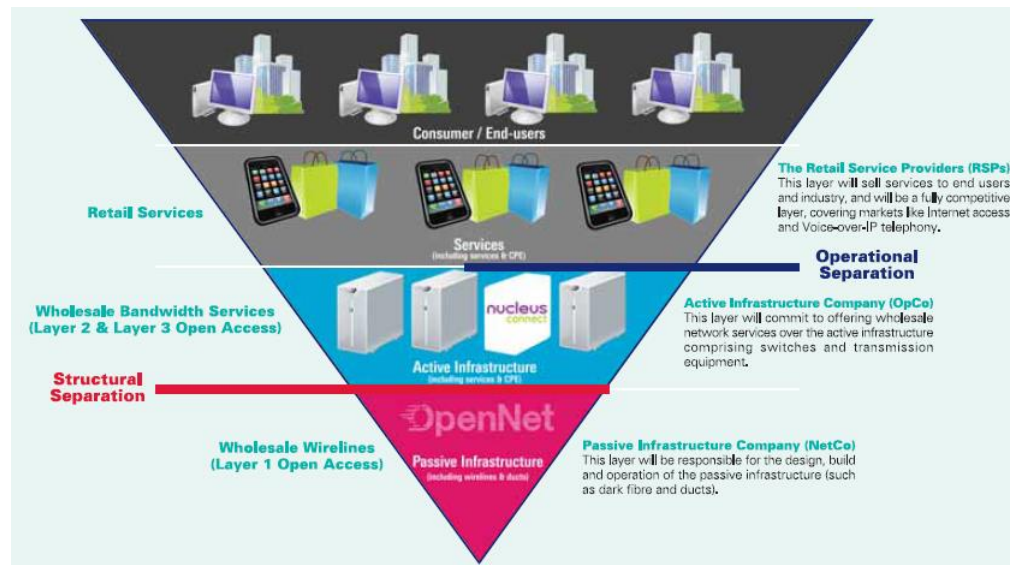
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Sector overview

In 2006, the Singaporean government announced plans to commission a nationwide fibre-to-the-home (FTTH) network, covering 100% of premises. Roll-out of the Next Generation Nationwide Broadband Network (Next Gen NBN) commenced in 2009 and was largely completed in 2013.

The structure of the Next Gen NBN is set out in the figure below.

Figure 6.3: Next Gen NBN structure



Source: IDA (2010), page 5.

The Singaporean model sets out three layers of activity:

- The **passive infrastructure** has been designed, built and is now operated by a single regulated open-access provider with structural separation – the Network Company (NetCo). NetLink Trust) has been the NetCo since 2014.⁶⁸ NetCo provides regulated dark fibre (Layer 1 products) and duct access.
- The **active infrastructure** is operated by a regulated Operating Company (OpCo). OpCo provides regulated Layer 2 and 3 wholesale products to RSPs. Nucleus Connect was selected as the regulated OpCo in 2009. This company operates alongside several other competitive (unregulated) active service providers, who are vertically integrated with RSPs. The intent of creating the regulated OpCo was to allow new RSPs to enter the market without being required to install and operate their own active equipment. In practice, it appears that most RSPs have however opted to deploy their own active equipment, and purchase Layer 1 services from NetCo.⁶⁹
- Retail Service Providers (RSPs) are the final layer that offer services over the Next Gen NBN to end-users. NetCo and OpCo do not sell services directly to end-users.

⁶⁸ The NetCo licence was originally awarded in 2009 to OpenNet, a consortium comprised of Singtel, SP Telecommunications, Singapore Press Holdings and Canada's Axia NetMedia. Singtel has since acquired 100% of the shares in OpenNet.

⁶⁹ Analysys Mason (2015).



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| | <p>Structural separation obligations were placed on NetCo; this included the transfer of Singtel's infrastructure assets (ducts, manholes, exchanges) to a neutral party (AssetCo) which is structurally separate from Singtel. Operational separation was required for OpCo.</p> |
| Regulatory framework | <p>Who is the regulator?</p> <p>The sector is regulated by the Info-communications Media Development Authority (IMDA), whose powers are set out under Section 4 of the Telecommunications Act (2016) and Sections 5 and 6 of the Code of Practice for Competition in the Provision of Telecommunication Services (2012).</p> <p>IMDA regulates NetCo and OpCo through the NetCo Interconnection Code (2017) and the OpCo Interconnection Code (2017). These instruments underpin reference Interconnection Offers (ICOs) that NetCo and OpCo must make available to access seekers, for the provision of open access services on the Next Gen NBN infrastructure. The Codes set out, <i>inter alia</i>, the price and non-price terms and conditions for the mandated services covered under the ICOs.</p> <p>25-year licenses for NetCo and OpCo were awarded in 2008 and 2009 respectively, through an open tender process. As part of this process, bidders were required to specify wholesale price caps to provide certain mandated services and the level of government funding (up to a pre-defined maximum) that they required to deliver these price caps. Bidders were also required to specify the non-price terms and conditions (including service quality standards) that would apply. The IMDA undertook consultation on the proposed terms and conditions before accepting them. Following industry consultation, some modifications were requested (although not on the <i>scope</i> of the proposed service quality provisions).</p> <p>The NetCo and OpCo Codes specify that the IMDA shall review and may require modifications to the price(s) of the mandated services within three to five years from the date that the ICO was first offered by NetCo/OpCo. A price review was undertaken in 2013; it appears that this took place after the terms and conditions of the ICO had already undergone revisions to keep pace with market developments.⁷⁰</p> <p>The Codes specify that the IMDA may also periodically review non-price terms and conditions at “<i>any appropriate time</i>”, including after the following events:</p> <ul style="list-style-type: none">(a) every 3 years from the date that the ICO was first offered by the Licensee;(b) following any review and amendment of the Telecom Competition Code;(c) following any review and amendment of the Act;(d) upon the reasonable request of the Licensee; and(e) upon the emergence of new technologies or enhancement of existing technologies which may be applied to facilitate or improve provision of the Mandated Services or result in the existence of new services which IMDA may require the Licensee to provide as new Mandated Services.⁷¹ <p>New services have been incorporated into the ICO for NetCo, namely supplementary cooling services to enable customers to deploy more equipment with a higher heat load at NetCo's co-location space. This was requested by NetCo's customers; NetCo in turn proposed a set of terms and conditions that were approved by the IMDA following consultation. The consultation included consideration of the service level guarantee (SLG) that should apply to the cooling service (i.e., completion of site preparation work, response times to fault reports).⁷²</p> <p>Access seekers are not required to enter into an ICO, and may instead negotiate customised agreements with NetCo and OpCo. Customised agreements may deviate from the prices, terms and</p> |

⁷⁰ IMDA (2013).

⁷¹ NetCo Code (2017), page 21.

⁷² IMDA (2011).



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| | <p>conditions set out in the ICO, and may also cover new, non-mandated services. However, these must still comply with the requirements of the relevant Code, including the prohibition on unreasonable discrimination against other access seekers. The terms of any customised agreement are also subject to approval by the IMDA.</p> <p>What services are regulated?</p> <p>The Mandated Services provided by NetCo and OpCo are subject to regulation. Broadly, NetCo provides Layer 1 dark fibre services, and also duct access (and associated ancillary services). OpCo provides Layer 2 and 3 Ethernet services (and associated ancillary products). Further details on these services can be found in the respective ICOs for each company.</p> <p>Is there a quality of service regime?</p> <p>As noted above, quality of service standards are set out in each company's ICO. Details of the quality requirements are contained within: schedules for each specific mandated service (for example, Schedule 1 covers Residential End-User Connections); individual process descriptions (for example, Item 4: Ordering and provisioning procedures); and the ICO's general terms and conditions.</p> |
| Regulation of service quality | <p>Overview of the quality of service framework</p> <p>The NetCo and OpCo Codes contain requirements for the ICOs to include service level guarantees (SLGs) for each mandated service:⁷³</p> <ul style="list-style-type: none">• The Provisioning SLG: ordering, provisioning and deactivation of the mandated service. This SLG “shall state the ordering and provisioning times for the Mandated Service, the systems and processes used to monitor the status of ordering, provisioning and utilisation of the Mandated Service, and explain how the Qualifying Person is able to access such information and report any delays on a realtime basis”.• The Service Availability SLG which “shall state the systems and processes used to monitor the availability of the Mandated Service and explain how the Qualifying Person is able to monitor the availability, and report any interruptions or faults, for a Mandated Service ordered on a periodic basis”.• The Fault Rectification SLG, covering rectification of any faults in relation to the ordering, provisioning or availability of the mandated service. This SLG “shall state the systems and processes used to detect and fix any faults in the availability of the Mandated Service together with any fault escalation procedures, and explain how the [access seeker] is able to report and monitor the status of any faults affecting a Mandated Service ordered on a real-time basis.” <p>Further, this SLG: includes procedures for generating trouble reports, including notice periods and response time standards; may require the access seeker to investigate its own network before reporting faults to the NetCo/OpCo; sets out a process if NetCo/OpCo cannot identify the fault; and sets out cost responsibility for fault investigation.</p> <ul style="list-style-type: none">• Finally, the Codes require that the mean time for repair for damage to any connection shall not exceed 8 hours. Otherwise, NetCo/OpCo may specify times for repair faults according to categories of seriousness. <p>The Codes further require that the ICOs specify:</p> <ul style="list-style-type: none">• The parameters used to measure the specified service levels.• The mechanism by which service levels are to be monitored. |

⁷³ NetCo Code (2017), page 38-39.



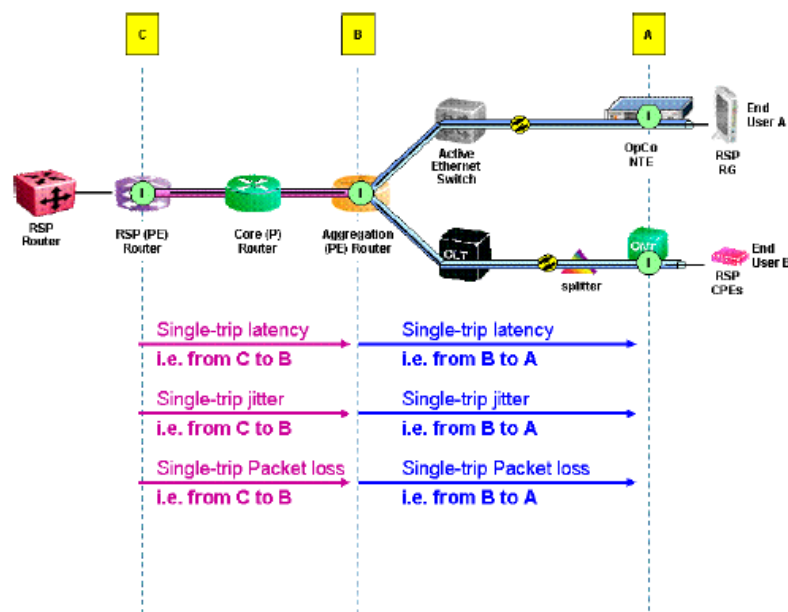
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- When failure to meet a particular service level is deemed to occur.
- How any failures may be rectified.
- How and when a service is deemed to be restored.
- The consequences of, and remedies for, any breach of the service level guarantee.⁷⁴

Accordingly, for each mandated service the ICOs contain:

- General terms and conditions – including provisioning timeframes (e.g., service activation periods), service availability, fault management timescales.
- Depending on the service, more detailed quality of service specifications. For example, for the Provider Backbone Ethernet Virtual Connection product, quality levels for jitter, latency and packet loss are specified for sections B-C of the following network diagram:

Figure 6.4: Example quality of service specification – OpCo Interconnection Offer



Source: OpCo ICO (2017).

Remedies are set out in the ICO for failure by NetCo/Op Co to meet the SLGs. The Codes specify that the remedies must meet a defined minimum rebate level, including a cap on NetCo/OpCo's liability.

What aspects of quality are regulated?

In line with the Code requirements set out above, the aspects of quality that are covered in the NetCo and OpCo ICOs are summarised below.

- **Installations** (provisioning timescales (installation in the building), connection timescales (installation in the home), time for de-activation, percentage of end-user connections delivered in working condition, percentage of installation-related faults repaired within

⁷⁴ For example, see NetCo Code (2017), Clause 15.



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| | <p>required timeframe, co-location timelines (including study time, site preparation time), Ethernet service connection timeframes, service modification times).</p> <ul style="list-style-type: none"> • Network availability / resilience (service availability) • Fault rectification / repair (repair times, mean time to recovery, management of fault reports) • Network performance (for OpCo's Ethernet product - targets in relation to jitter, latency and packet loss). |
| Information disclosure | <p>As noted above, the NetCo/OpCo Codes require that the ICOs describe how RSPs can monitor performance against the SLGs for each Mandated Service. We are not aware of other information disclosure requirements set by the IMDA at the wholesale level, although they do monitor service quality for end-users at the retail level.</p> |
| Outcomes | <p>The IMDA has undertaken several reviews of the ICOs. This included a 2014 review of NetCo's ICO, with a view to improving quality of service outcomes in relation to end-user connections (residential and non-residential).⁷⁵ This aimed to address concerns raised around connection delays and service provisioning standards.</p> <p>The amendments made by the IMDA related to specific service <i>standards</i> however, rather than the overall coverage of the quality of service framework. Aside from this, there do not appear to have been major changes to the scope of the quality of service regulations put in place by the IMDA.</p> <p>There is limited publicly available evidence on the performance of the quality of service provisions in particular. We note that NetLink Trust has been fined on a number of occasions for failing to meet its service quality standards.⁷⁶ NetLink Trust has attributed this to rising demand for fibre broadband, increased switching between RSPs, and issues obtaining access to buildings for installation and maintenance work.</p> <p>However, it appears that the rollout of the network has been generally successful; nearly 100% of households and businesses now covered by the Next Gen NBN, with access to speeds of 1 Gbps. Analysys Mason (2015) also note <i>"that all the major service providers in Singapore have chosen to purchase passive products (from NetLink Trust), rather than active products (from Nucleus Connect). [...] This suggests that the dark fibre remedy in Singapore has successfully enabled infrastructure-based competition."</i>⁷⁷ They also note that since the Next Gen NBN rollout, two new RSPs have launched fibre broadband services and the market share of incumbent RSPs has reduced, suggesting improved retail competition. While the service quality regime may have supported these outcomes, it is unclear to what extent, given the significant influence of other aspects of the market structure and regulatory regime.</p> |
| Insights for New Zealand | <p>General observations:</p> <ul style="list-style-type: none"> • The market structure is different to New Zealand, with NetCo/OpCo structural/operational separation and other competitive providers of Layer 2 and 3 active services. • The NetCo/OpCo Codes appear to set out comprehensive guidance on what the reference offers should include, generally without prescribing highly specific quality metrics or standards. Specific targets are imposed in limited cases (for example, backstop maximum |

⁷⁵ IDA (2014).

⁷⁶ NetLink Trust (2016).

⁷⁷ Analysys Mason (2015), page 24.





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fault repair times). There is limited evidence on the performance of the quality regime, however.

- We note that new products/services and service quality provisions can be included through the IMDA's review processes (for example, a supplementary cooling product was included). It appears there was a temporary disconnect with the price cap arrangements, before the IMDA updated this to take market developments into account. It is unclear whether there were any significant problems as a result, but maintaining consistency between regulated price/quality arrangements is a relevant consideration for the Commission.
- The regulatory regime is very different in construction from the situation in New Zealand and this is likely to limit the applicability of the approach in Singapore to New Zealand.

Advantages

- Appears to be very detailed and comprehensive set of quality standards which provide a high level of certainty.
- The quality standards appear to have been set as part of the competitive bidding process, which avoided the need for detailed regulatory intervention to set standards.

Disadvantages

- Quality standards appear to be set out in the reference offers of wholesale operators. It appears that these are periodically reviewed under certain specific circumstances. However, it is not clear how easily the regulator can modify quality standards if evidence of poor-quality performance emerges. It is also rather unclear to what extent the IMDA actually collects data on wholesale service quality, or whether they rely primarily on RSPs to raise issues.
- It is unclear to what extent the requirements and views of end-users are reflected in the quality standards – there does not appear to have been a direct mechanism for taking these into account.



| A.3. CANADA | |
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| Sector overview | <p>In Canada, broadband services are provided by both fixed-line and wireless operators. Fixed-line operators utilise cable, digital subscriber lines (DSL) and fibre technologies to compete for end-user subscriptions; the competitive positions of these operators has evolved substantially over time. Wireless services (provided by mobile 4G technology, fixed terrestrial services, and upgraded satellite services) are increasingly competing with the fixed-line operators.⁷⁸</p> <p>There is no national scheme to deploy high speed broadband networks (although there has been some degree of targeted state support in certain regions). Fibre development has largely occurred through investments by private companies.</p> <p>There are a number of competing retail service providers in most major urban centres, although there are challenges in rural and remote areas. Physical network owners are vertically integrated, and therefore access to bottleneck infrastructure has been a primary regulatory concern.</p> |
| Regulatory framework | <p>Who is the regulator?</p> <p>The telecommunications industry is regulated by the Canadian Radio-television and Telecommunications Commission (CRTC). Competition at the retail level is supported by a wholesale services access framework that sets out the rates, terms, and conditions under which incumbent telecommunications service providers are required to make parts of their networks available to access seekers.⁷⁹ The concept of essential services has been a guiding principle behind the CRTC's determinations on whether to mandate access to particular wholesale services.</p> <p>What services are regulated?</p> <p>In relation to the regulation of wholesale fixed broadband services, the CRTC has at various points required owners of access networks to make their facilities available to competitors. Most recently, a 2015 ruling⁸⁰ has required Canada's largest internet providers to open up their high-speed fibre-based access networks to smaller rivals, providing a wholesale high-speed access service (HSA). This decision also involved a shift from mandated <i>aggregated</i> wholesale access for an entire network, to <i>disaggregated</i> wholesale access. The disaggregated service will include an access and interface component, but no transport component. As a result, smaller competitors will be able to purchase wholesale access to connections from a telecommunication service providers central office to the end-user's premises; however, they will also need to separately lease or build their own transmission facilities within these locations. The CRTC believes the new system will enhance facilities-based competition and give smaller competitors more control over their costs.</p> <p>The CRTC further specified that:</p> <ul style="list-style-type: none">• There is requirement to make the wholesale HSA services available over fibre-to-the-premises (FTTP) access facilities.• The HSA services may be configured as Layer 3 approaches.• The HSA services must be offered in 50Mbps increments.⁸¹ <p>The process to implement the access arrangements for disaggregated wholesale HSA services is ongoing.⁸²</p> |

⁷⁸ NERA (2015).

⁷⁹ CRTC (2015a).

⁸⁰ CRTC (2015a).

⁸¹ CRTC (2016).

⁸² CRTC (2017).





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| | <p>Is there a quality of service regime?</p> <p>Yes. In addition to its powers to mandate access to wholesale services, the CRTC may also impose a competitor quality of service regime.</p> |
| Regulation of service quality | <p>Overview of the quality of service framework</p> <p>The competitor quality of service regime is structured as a set of performance indicators for certain wholesale services, with a minimum performance standard established for each indicator. Wholesale service providers may be required to pay rebates to access seekers if performance does not meet the established standards; this is referred to as a rate rebate plan, or RRP.⁸³</p> <p>Application of the quality of service framework</p> <p>At around the same time as the 2015 ruling to mandate the provision of wholesale HSA services, the CRTC also issued a determination in response to complaints from access seekers regarding the quality of wholesale HSA services. In September 2013, the Canadian Network Operators Consortium (CNOC) set out its concerns that the large cable companies were not providing wholesale HSA services at an appropriate level of quality. CNOC requested changes to the wholesale HSA services provided by the cable companies, and also requested the establishment of quality of service indicators and an RRP. In its 2015 response, the CRTC determined that these issues should be resolved through commercial negotiation where possible, and established the CRTC Interconnection Steering Committee (CISC) to develop responses to some of the issues raised by CNOC.⁸⁴</p> <p>The CRTC subsequently launched a 2017 consultation to consider the overall scope of its existing competitor quality of service (QoS) regime, including the services captured within the framework, and the QoS measures that should apply. In April 2018, the CRTC released its conclusions in relation to the QoS inquiry.</p> <p>The CRTC noted that while the regime had remained largely unchanged since 2005, the market context had shifted significantly. Demand for a number of services included in the regime had declined. Further, while mandated access had been lifted for some services, it had been introduced for others – notably disaggregated wholesale HSA services – that were not captured within the QoS regime.</p> <p>The CRTC concluded that while some wholesale services could be removed from the QoS regime, both aggregated and disaggregated wholesale HSA services should be included. In its decision, the CRTC noted that this would assist to ensure “that competitors receive a level of service that enables them to compete effectively and to provide service to their end-users efficiently.”⁸⁵</p> <p>The CRTC did not consider it appropriate to establish specific criteria to determine which wholesale services should be included under a competitor QoS regime, as this would not provide sufficient flexibility to consider the individual characteristics of each service. However, the CRTC did set out certain factors that should be considered, in particular:</p> <ul style="list-style-type: none">• Whether the wholesale service is subject to mandated access provisions, in light of its importance in promoting retail competition.• Whether there is significant and increasing demand for the service.• Whether there is evidence of substandard service provision to date. |

⁸³ CRTC (2018).

⁸⁴ CRTC (2015b).

⁸⁵ CRTC (2018), page 1.





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- Whether a strong incentive exists for the service provider to deliver a sub-standard level of service quality.
- Whether the service could be feasibly included in a competitor QoS regime – for example, whether metrics can be established that allow for a quantitative and objective comparison of service quality.
- Finally, the CRTC noted that not all of the above considerations need to be satisfied to justify the inclusion of a service within the QoS regime; equally no single factor can be taken as conclusive evidence. Other factors may also apply depending on the wholesale service in question.⁸⁶

After an analysis of these factors, the CRTC ruled that the regime will apply to wholesale HSA services, both aggregated and disaggregated. While mandated access requirements for aggregated wholesale HSA services are to be lifted in line with the 2015 ruling, the CRTC noted that this would take some time to implement.

What aspects of quality are regulated?

The previously existing QoS regime included indicators associated with ordering and provisioning processes, as well as clearance of fault reports, repair times, whether installation and repair appointments are met, and service failures within the first 30 days following activation.⁸⁷ Under this regime, the larger wholesale service providers were required to report on 22 QoS indicators (for a range of services), of which 14 are subject to an RRP.

In developing its response to the aspects of quality to be included in the updated QoS regime for wholesale HSA services, the CRTC referred to a number of principles, including:

- The purpose of the competitor QoS regime is to ensure that access seekers receive service levels that enable them to compete effectively in retail markets and provide efficient services to end-users. Therefore, the quality dimensions to be included in the regime **should focus on those that have the greatest effect on retail services**. The CRTC considered that these aspects were processes associated with installations and repairs.⁸⁸
- The CRTC rejected a number of indicators proposed by CNOOC, on the basis that they were *“unnecessarily detailed and would be overly burdensome for wholesale HSA service providers at this time, given the inconsistent evidence on the record regarding possible issues associated with wholesale HSA services.”*⁸⁹ This suggests three separate principles:
 - The quality indicators should **avoid unnecessary complexity**.
 - The measures should be **proportionate** and **not overly burdensome**.
 - There should be **evidence** that the quality dimension is, or is likely to be, problematic.

The CRTC did not set minimum service level targets in its decision. Instead it directed the CISC to:

⁸⁶ CRTC (2018).

⁸⁷ CRTC (2018).

⁸⁸ CRTC (2018), page 17.

⁸⁹ Ibid.



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| | <ul style="list-style-type: none"> • propose business rules with respect to how installations and repairs are counted for the categories of wholesale HSA metrics set out above; • propose minimum targets for the percentage of wholesale HSA installation and repair appointments met; and • explore the development of, and propose, interval targets for the average timelines for wholesale HSA installation and repair appointments.⁹⁰ <p>As noted above, the CRTC may specify that the standards set out under the competitor QoS regime be accompanied by an RRP, providing for rebates in the event that the standards are not met. In the case of wholesale HSA services, the CRTC noted that <i>“the evidence filed in this proceeding regarding service level issues related to wholesale HSA services is not consistent, given the lack of standardized metrics, and there is not enough evidence to ascertain the extent of such issues in the wholesale HSA market.”</i>⁹¹ On this basis, the CRTC refrained from imposing an RRP at this time.</p> <p>Therefore, as it relates to wholesale HSA services, the QoS regime will primarily be a monitoring regime. The CRTC noted that this <i>“will provide information that will allow it to assess whether any additional regulatory measures would be appropriate, including an RRP and/or [administrative monetary penalties], and to intervene as required”</i>.⁹²</p> |
| Information disclosure | <p>The CRTC will require wholesale HSA service providers to report on the QoS indicators outlined above, namely:</p> <ul style="list-style-type: none"> • Wholesale HSA installation appointments met. This will capture scheduled appointments to activate services, including transfers from one service provider to another. • Wholesale HSA repair appointments met. <p>While the detailed requirements are to be proposed by the CISC, the CRTC has specified that this information must be provided on both a company-wide and a competitor-specific basis, to allow for comparisons across wholesale customers. The CRTC also noted that performance results for aggregated and disaggregated wholesale HSA may be combined.</p> <p>To address concerns that service providers could improve their performance by setting longer appointment times, the CRTC has also decided to collect information on average installation and repair times, again on a company-wide and competitor-specific basis.</p> <p>In relation to reporting frequency, the CRTC noted that this would need to be sufficient to identify changes or trends in service quality on a timely basis. This was to be balanced against the reporting burden placed on service providers. The CRTC ultimately determined that the indicators will be provided on a quarterly basis. Both company-wide and competitor-specific data will be provided to the CRTC; competitor-specific reports will also be provided to the associated competitor.⁹³</p> |
| Outcomes | <p>We have found limited publicly available evidence on the performance of the quality of service regime in particular (some avenues are still to be explored). However, the CRTC appears to be satisfied that the competitor QoS arrangements are appropriate.</p> |

⁹⁰ Ibid., page 19.

⁹¹ Ibid., page 21.

⁹² Ibid., page 21.

⁹³ Ibid., page 20.





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Insights for
New Zealand

General observations:

- The market structure is quite different to the New Zealand context, with high levels of vertical integration. Fibre roll-out has been primarily led by private investment (with some targeted government support).
- The CRTC has opted for a relatively light-handed approach to service quality for wholesale HSA services – no mandated standards and relatively minimal reporting requirements. They appear to place significant weight on evidence of likely harm from *not* including a particular quality dimension in the QoS regime.

Advantages

- The CRTC set out a clear set of underlying principles to guide the scope and purpose of quality regulation. This should help provide regulatory certainty and also ensure that regulation is effective and proportionate (e.g. focused on service quality for the most important products and aspects of quality for consumers, and implemented in a way that is not overly burdensome).
- The CRTC delegated the responsibility for setting minimum standards and rules for monitoring installations and repair performance to an industry body (CISC). This appears to be intended to result in the creation of a regulatory monitoring regime that will allow any problems to be detected.
- The approach is light touch and is unlikely to result in over-regulation.

Disadvantages

- The downside of the absence of regulated minimum standards is a lack of certainty with regard to fibre quality. There is a potential risk that if quality is poor early on in New Zealand this could undermine take up and the speed of the copper-fibre transition. However, the materiality of this risk is uncertain, given that Chorus and the LFCs have an incentive to drive take-up.
- Given the limited nature of the monitoring regime, there is also a potential risk that the regulator might not have visibility of emergent problems in relation to products or quality dimensions that are outside the current scope of the information disclosure regime.



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| <p>Sector overview</p> | <p>NBN Co, a government business enterprise wholly owned by the Commonwealth Government, was established in 2009 to plan, build and operate the Australia's National Broadband Network (NBN). The NBN is structured as a wholesale-only, open-access broadband network. NBN Co is therefore required to provide wholesale access services to Retail Service Providers (RSPs) on a non-discriminatory basis. Therefore, vertical integration is not a key regulatory concern.</p> <p>The aim of Australia's National Broadband Network (NBN) is to provide all Australians with a high-speed broadband service, using a mix of technologies (fixed line (new fibre-optic cable and the existing copper lines), fixed wireless and satellite). This replaces telephone and internet services that have been provided over existing copper and Hybrid Fibre Coaxial (HFC) networks. The fixed line elements of the network are primarily Fibre-to-the-Node (FTTN), with Fibre-to-the-Premises (FTTP), Fibre-to-the-Building, Fibre-to-the-Curb (FTTC) and HFC deployed in more limited cases.⁹⁴</p> <p>The network is currently in peak roll-out phase and is expected to be in place by 2020. The network is expected to face competition from mobile broadband (and other providers of fixed line broadband) in future; NBN Co's 2018-2021 Corporate Plan reports their expectation that around 15 per cent of customers will choose mobile broadband rather than connect to the NBN.⁹⁵ However, the Australian Competition and Consumer Commission (ACCC) currently considers that "these networks currently provide only limited competitive constraints".⁹⁶</p> |
| <p>Regulatory framework</p> | <p>Who is the regulator?</p> <p>Access to telecommunications services in Australia is generally unregulated, unless a service has been 'declared', as provided for in Part XIC of the <i>Competition and Consumer Act 2010 (CCA)</i>. If a service is declared, access seekers acquire a legal right to negotiate access to the service with the service provider and, if necessary, have their request for access determined by the ACCC.</p> <p>Under the CCA, terms and conditions for declared services may be set out under:</p> <ul style="list-style-type: none"> <p>Access agreements - commercial contracts between NBN Co and access seekers which set out negotiated terms and conditions of supply.</p> <p>There is currently a commercial access agreement in place - the Wholesale Broadband Agreement (WBA) – that was negotiated between NBN Co and RSPs. This sets out the terms and conditions (including service quality standards) for supply of the wholesale NBN Ethernet Product (a Layer 2 virtual connection) and the Facilities Access Service (which enables RSPs to physically connect optical fibre backhaul cables between their network and the NBN access network). The current version of the access agreement (WBA3) was concluded in 2017 after a two-year confidential negotiation process.</p> <p>Special access undertakings (SAUs) – through a SAU, the service provider sets out commitments on the price and non-price terms and conditions it will offer to access seekers. If the SAU is approved by the ACCC, the terms and conditions will be reflected in the relevant access agreement.</p> <p>NBN Co provided a SAU that was accepted by the ACCC in 2013. This governs the prices that NBN Co can charge for the declared services it supplies to the RSPs. In particular, the SAU sets out: initial maximum regulated prices (MRPs) which set a ceiling on the maximum price NBN Co may charge; how the MRPs will be set over time (price control framework); and circumstances in which MRPs may be adjusted. The SAU also sets out certain requirements that must be reflected in any access agreement. As</p> |

⁹⁴ FTTC is currently in a trial phase (NBN Co, 2017a).

⁹⁵ NBN Co (2017b).

⁹⁶ ACCC (2017), page 9.



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discussed further below, the current SAU does not specify any requirements in relation to service quality standards. However, the ACCC has since accepted a court-enforceable undertaking from NBN Co, which states that NBN Co will improve its service level commitments to RSPs.

- **Binding rules of conduct (BROCs)** - temporary rules made by the ACCC, that may specify terms and conditions that must be included in the access agreement for a particular service. BROCs are applied in cases when there is an urgent requirement for rules to be put in place rapidly, before an access determination can be made (see below). No BROCs currently apply to NBN Co.
- **Access determinations** - determinations made by the ACCC, specifying any or all of the terms and conditions for particular services that must be reflected in the access agreement. No access determinations currently apply to NBN Co.

A SAU, BROC or access determination can therefore act as a backstop to commercial negotiations between NBN Co and the RSPs. However, under the hierarchy of access arrangements set out in the CCA, the terms and conditions of commercially negotiated access agreements have primacy over those set by the ACCC.

What services are regulated?

The WBA3 sets out terms and conditions of access for the NBN Ethernet Product - Layer 2 connection between User Network Interface (UNI) and a point of interconnection (POI). There are four mandatory product components:

- Network-Network Interface – i.e., the physical interface between the NBN Co network and the access seeker’s network at the POI.
- Connectivity Virtual Circuit – i.e., the virtual network capacity for transport of customer traffic.
- Access Virtual Circuit – i.e., the virtual connection that carries traffic to and from an end-user.
- UNI – i.e., the physical interface at the end-user’s premises.

There are also optional product features (e.g., multicast and enhanced fault rectification).

Is there a quality of service regime?

Given the framework set out above, the prevailing quality of service standards are those set out in the commercially-negotiated access agreement, the WBA3.

These have not been guided by the SAU, which is largely silent on non-price terms and conditions, including service quality. The ACCC has recently noted that when the SAU was approved in 2013 “the NBN was in the early stages of its rollout and we were not satisfied it was reasonable to lock in service standards at that time”⁹⁷ Interestingly, the initial draft SAU proposed by NBN Co in 2012 set out very detailed quality of service standards (similar to those now contained in the WBA3). However, the ACCC was not satisfied that these were in the long-term interests of consumers, and also noted that it may not be appropriate to lock in such detailed provisions for any significant period of time, given the early stage of the NBN’s development. The ACCC therefore proposed that NBN Co remove reference to non-price terms and conditions from the SAU, leaving these to be agreed through commercial negotiations. The ACCC noted that these terms could be the

⁹⁷ ACCC (2017), page 10.



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| | <p>subject of a future regulatory determination in the event that a commercial agreement was not reached.⁹⁸ Several stakeholders proposed that the ACCC instead set out high-level principles to guide how non-price terms and conditions should be set through the commercial negotiations.⁹⁹ However, the ACCC declined to do so, noting that: it was preferable for commercial negotiations to be reached independently of ACCC direction; there was insufficient time to develop the principles in the timeframe for SAU approval¹⁰⁰; and there was a divergence of opinions among stakeholders on how the non-price terms and conditions should be determined.¹⁰¹</p> <p>Following concerns raised by RSPs and an apparently escalating volume of end-user complaints, in 2017 the ACCC launched an inquiry into the effectiveness of the service quality standards contained in the WBA3.¹⁰² The inquiry will consider whether there is a potential requirement for the ACCC to apply a BROCC or access determination to set service standards.</p> <p>While the inquiry is still ongoing, NBN Co has recently submitted a court-enforceable undertaking to the ACCC, that includes commitments to improve the service level guarantees that it provides to the RSPs.¹⁰³ The main changes relate to the rebates payable by NBN Co to RSPs in the event that the agreed quality standards set out in the WBA3 are not met. The RSPs will also be required to ensure that end-users receive the benefit of rebates paid by NBN Co, although this may be in monetary or non-monetary form.</p> |
| Regulation of service quality | <p>As noted above, the ACCC does not currently regulate service quality for any NBN products. However, we set out below the quality of service provisions that are contained in the WBA3.</p> <p>Overview of the quality of service framework</p> <p>Service levels and performance objectives for the Ethernet product are specified in the WBA3. These comprise:</p> <ul style="list-style-type: none">• Base service level targets - targets (e.g., number of days to complete a connection) vary depending on the type of activity, location of the premises, extent of the physical infrastructure available and the network technology used.• Each service level then has a performance objective - generally specifying what percentage of the time the base service level will be achieved (e.g., the connection service level target will be achieved 90% of the time).• The WBA3 also includes operational targets in relation to certain service levels. These are “non-binding and aspirational” and may be developed into service levels in the future. <p>Failure to meet a service level and/or performance objective is not a breach of the WBA <i>per se</i>. However, NBN Co may be required to:</p> <ul style="list-style-type: none">• take corrective action to address the failure; |

⁹⁸ ACCC (2013a).

⁹⁹ See for example Telstra (2013).

¹⁰⁰ The ACCC is required to approve SAU's within a certain timeframe after submission, although extensions may be obtained in some circumstances.

¹⁰¹ ACCC (2013b).

¹⁰² ACCC (2017).

¹⁰³ ACCC (2018).



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| | <ul style="list-style-type: none"> • provide rebates to its wholesale customers; and/ or • pay compensation to its wholesale customers, in certain circumstances where they have paid a penalty to an end-user. <p>The available remedies vary across each service level target/performance objective.</p> <p>What aspects of quality are covered?</p> <p>The quality standards set out in the WBA aim to cover the full ‘end-user life cycle experience’, namely: connections, appointments, service activations, fault rectification, service modifications, and disconnections. There is also a quality standard relating to network availability, which applies across the end-user lifecycle experience. The elements of quality covered by these standards are summarised below.¹⁰⁴</p> <ul style="list-style-type: none"> • Installations (time to complete end-user connections, timeframes to attend end-user connection appointments, time to activate services, time to deliver completion advice notice, time to complete voiceband reinstatement/transition reversal¹⁰⁵, time to complete service modifications, time to complete disconnections). • Network availability / resilience (availability of the network – different rates specified for the satellite network / all other networks). • Fault rectification / repair (trouble ticket management indicators (for example, time to acknowledge receipt), time to rectify service (for standard and enhanced fault rectification services), timeframe to attend end-user fault rectification appointments, service remediation levels (percentage of actions to ameliorate the line rate achieved by the target date), interference mitigation (percentage of interference solutions achieved by the target date)). • Network performance (Utilisation management on NBN’s transit backhaul network. Two indicators specified for (a) Dimensioning requirements (to provide minimum peak time speeds for various bandwidth profiles) and (b) requirements to maintain utilisation of shared network resources within a defined threshold). |
| Information disclosure | <p>Reporting requirements are also set out under the WBA3. These require NBN Co to report to the RSPs on its performance relating to:</p> <ul style="list-style-type: none"> • All the activities for which service level targets and performance objectives have been set (as set out above, this covers connections, appointments, service activations, fault rectification, service modifications, and disconnections). Reporting for these items is on a monthly and quarterly basis. • Network availability – reporting is required on a quarterly basis for a rolling 12-month period. <p>The ACCC has separately directed NBN Co to publish a quarterly market indicators report relating to NBN access services. Broadly, this report provides data on:</p> |

¹⁰⁴ NBN Co (2018b).

¹⁰⁵ Customer may opt to continue to receive voice services over Telstra’s copper network; this wholesale service reinstates voice services over the copper network after an end-user has been transferred to the NBN.





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| | <ul style="list-style-type: none"> • The volume of NBN access services provided by: access network technology; geographic region; contracted data transfer rate (speed) tier; traffic class; and NBN access seeker. • The aggregated contracted throughput capacity on the NBN. <p>The intent of this report is not to monitor the quality of the access service provided by NBN Co, however. Rather, it aims to promote competition among RSPs through the provision of reliable market information. A key objective was to reduce information asymmetry between Telstra and other RSPs; this was of concern given the better visibility of the NBN roll-out provided to Telstra through the cutover arrangements in the migration from its copper network to the NBN.¹⁰⁶</p> |
| Outcomes | <p>As noted above, the ACCC is currently conducting an inquiry into whether the wholesale service standards that apply to the NBN are appropriate. The inquiry was prompted by a high volume of end-user complaints, relating in particular to connections and fault repairs. The ACCC note that <i>“reviews of NBN consumer experiences to date suggest that the wholesale service standards that have been set through commercial negotiation may not be promoting good consumer outcomes.”</i>¹⁰⁷ As part of the inquiry, the ACCC will consider whether to intervene by making an access determination under its CCA Part XIC powers that would include service quality provisions. The ACCC anticipates that the inquiry will conclude in December 2018.</p> <p>A key issue identified in the ACCC’s discussion paper is the connection (or lack thereof) between retail and wholesale service quality standards. The ACCC notes that while commercial access agreements apply at the wholesale level, the service standards <i>“are a major factor within the NBN supply chain affecting customer experiences and competition in retail markets for NBN services”</i>.¹⁰⁸</p> <p>At the retail level, RSPs have contracts in place with end-users that set out service quality commitments. There are also retail service regulations, set out under the Customer Service Guarantee (CSG) – although in many cases RSPs require customers to waive these.¹⁰⁹ The ACCC has noted that in many instances, retail contracts do not specify the same types of quality standards as can be found in the WBA, namely timeframes for connection and installation, fault rectification and appointments. Therefore, wholesale quality standards do not appear to be flowing through to end-users.</p> <p>While no conclusions have been reached at the time of writing, the ACCC has hypothesised that contributing factors to the disconnect between retail and wholesale service standards could include a lack of confidence on the part of RSPs that NBN service standards will be met. Alternatively, this could result from a lack of competition at the retail level. In their submissions to the inquiry, RSPs have cited discrepancies between the aggregate nature of NBN Co’s service targets under the WBA (i.e., service level target met 90% of the time) and the customer-specific nature of their own service commitments (i.e., targets that must be met for individual customers).</p> <p>Neither NBN Co or the RSPs appear to have raised concerns regarding the scope of the WBA service quality indicators – stakeholder submissions indicate broad satisfaction with the elements of quality that are covered in the WBA. Their concerns are rather focussed on the specific targets and the associated remedies available in the event that these are not met by NBN Co.</p> |

¹⁰⁶ ACCC (2016).

¹⁰⁷ ACCC (2017), page 5.

¹⁰⁸ Ibid., page 5.

¹⁰⁹ Ibid.





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| | <p>As noted above, while the inquiry is still ongoing, the ACCC has now accepted an undertaking from NBN Co to improve the service level guarantees it offers to RSPs.¹¹⁰ In particular there have been changes to how rebates are paid to the RSPs if agreed service levels are not met. The RSPs will have a corresponding responsibility to ensure that compensation flows through to end-users. These changes may help to improve consistency between retail and wholesale service standards.</p> |
| Insights for New Zealand | <p>General observations:</p> <ul style="list-style-type: none">• The Australian NBN has a similar approach to structural separation as for New Zealand. As highlighted in Martin Cave's submission for NBN Co to the ACCC inquiry, this may provide natural incentives for cooperation between the wholesale/retail levels.¹¹¹ We note however that NBN Co will not be required to offer an unbundled layer 1 product.• The WBA process indicates that agreements have been reached on service levels. However, there has been evidence of escalating end-user dissatisfaction, and there appear to be mismatches between quality standards at the retail and wholesale levels.• The ACCC initially avoided setting prescriptive standards (or even guiding principles). This partly reflected concerns around locking in standards for a new technology, as well as a view that it would be preferable for industry stakeholders to reach a negotiated outcome on quality requirements. <p>Advantages:</p> <ul style="list-style-type: none">• The standards are determined through commercial negotiations.• The approach is light touch and is unlikely to result in over-regulation. <p>Disadvantages:</p> <ul style="list-style-type: none">• There is a level of uncertainty around the circumstances in which the ACCC may intervene. This is highlighted by the undertaking recently submitted by NBN Co, in which it committed to change the WBA3 terms and conditions. It appeared that this was prompted by the ACCC signalling its intention to impose regulatory quality standards.• It is also unclear how the Australian Communications and Media Authority's (ACMA) obligations on RSPs will impact on their terms and conditions with NBN Co.• It is not clear to what extent end-user requirements have been reflected in the service standards. |

¹¹⁰ ACCC (2018).

¹¹¹ Cave (2018).



APPENDIX B REFERENCES

- ACCC (2013a), 'Australian Competition and Consumer Commission', *Variation of NBN Co Special Access Undertaking – response to submissions*, July.
- ACCC (2013b), *Consultation Paper - variation of NBN Co Special Access Undertaking*, April.
- ACCC (2016), *Disclosure notice given to NBN Co regarding National Broadband Network Services in Operation Record Keeping Rule Information – Statement of reasons*, March.
- ACCC (2017), *ACCC inquiry into NBN wholesale service standards – Discussion Paper*, December.
- ACCC (2018), *NBN wholesale service standards inquiry – NBN enforceable undertaking*, website – available at: <https://www.accc.gov.au/regulated-infrastructure/communications/national-broadband-network-nbn/nbn-wholesale-service-standards-inquiry/nbn-enforceable-undertaking>, last accessed 18 September.
- Amendment Bill (2018), *Telecommunications (New Regulatory Framework) Amendment Bill*, May.
- Analysys Mason (2015), *International Case Studies – Final report for Ofcom*, July.
- BEIS (2018), 'Department of Business, Energy and Industrial Strategy', *Goals-based and rules-based approaches to regulation*, BEIS Research Paper Number 8, May.
- BEREC (2012), 'Body of European Regulators for Electronic Communications', *BEREC Common Position – BoR (12) 128*, December.
- BEREC (2016), *BEREC Common Position on Layer 2 Wholesale Access Products – BoR (16) 162*, October.
- Black (2007), Julia Black, *Making a success of Principles-based regulation*, *Law and Financial Markets Review*, pages 191-206, May.
- Black (2010), *The Rise, Fall and Fate of Principles Based Regulation*, LSE Law, Society and Economy Working Papers 17/2010 London School of Economics and Political Science Law Department.
- Cave (2018), Martin Cave, *Report in relation to the ACCC inquiry into NBN wholesale service standards*, March.
- CIP (2018), 'Crown Infrastructure Partners', *About*, website – available at: <https://www.crowninfrastructure.govt.nz/about/>, last accessed 18 September.
- Commerce Commission (2016), *Input methodologies review decisions Topic paper 4: Cost of capital issues*, December.
- Commerce Commission (2017), *Annual Telecommunications Monitoring Report – 2017 key facts*, December.
- Commerce Commission (2018a), *Overview of input methodologies*, website – available at: <https://comcom.govt.nz/regulated-industries/input-methodologies/overview-of-input-methodologies>, last accessed 18 September 2018.
- Commerce Commission (2018b), *Chorus Information Disclosure Determination 2018*, Decision No. NZCC 9, June 2018.
- Commerce Commission (2018c), *Transpower Capital Expenditure Input Methodology Amendments Determination 2018*, May.
- CRTC (2015a), 'Canadian Radio-television and Telecommunications Commission', *Review of wholesale wireline services and associated policies*, *Telecom Regulatory Policy 2015-326*, July.
- CRTC (2015b), *Canadian Network Operators Consortium Inc. – Application to improve the quality of wholesale high-speed access services provided by cable carriers to independent Internet service providers*, *Telecom Regulatory Policy 2015-40*, February.



CRTC (2016), *Follow-up to Telecom Regulatory Policy 2015-326 – Implementation of a disaggregated wholesale high-speed access service, including over fibre-to-the-premises access facilities*, Telecom Regulatory Policy 2016-379, September.

CRTC (2017), *Interim rates for disaggregated wholesale high-speed access services in Ontario and Quebec*, Telecom Regulatory Policy 2017-312, August.

CRTC (2018), *Review of the competitor quality of service regime*, Telecom Regulatory Policy 2018-123, April.

ETSI (2011), 'European Telecommunications Standards Institute', *Speech and multimedia Transmission Quality (STQ); QoS aspects for popular services in mobile networks; Part 1: Assessment of Quality of Service*, ETSI TS 102 250-1, V2.2.1 (2011-04).

IDA (2010), 'Infocomm Development Authority' – now the 'Infocomm Media Development Authority' (IMDA), *Singapore's Next Generation Nationwide Broadband Network*.

IDA (2011), *Explanatory Memorandum – Co-Location Supplementary Cooling Service*, October.

IDA (2013), *Review of the prices for OpenNet interconnection offer services 2013*, website – available at: <https://www.imda.gov.sg/regulations-licensing-and-consultations/consultations/consultation-papers/2013/review-of-the-prices-for-opennet-interconnection-offer-services-2013>, last accessed 18 September 2018.

IDA (2014), *Explanatory Memorandum – Direction in respect of the review of CityNet Infrastructure Management Pte Ltd's (as trustee manager of the NetLink Trust) Interconnection Offer for the provision of services over the Nationwide Broadband Network*, December.

Ofcom (2017), *Quality of Service for WLR, MPF and GEA – Consultation on proposed quality of service remedies*, March.

Ofcom (2018a), *Wholesale Local Access Market Review: Statement – Volume 1 – Markets, market power determinations and remedies*, March.

Ofcom (2018b), *Quality of Service for WLR, MPF and GEA: Statement – Statement on quality of service remedies*, March.

Ofcom (2018c), *Progress on delivering a more independent Openreach – Implementation Report – Update on the legal separation of Openreach*, June.

Ofcom (2018d), *Wholesale Local Access Market Review - Annex 33 – Legal instruments*, March.

Ofgem (2015), *The future of retail market regulation*, December.

Ofgem (2018a), *Policy consultation: Domestic supplier-customer communications rulebook reforms*, May.

Ofgem (2018b), *Future of retail market regulation*, website – available at: <https://www.ofgem.gov.uk/gas/retail-market/market-review-and-reform/future-retail-market-regulation>, last accessed 18 September.

OpCo ICO (2017), 'Nucleus Connect Interconnection Offer', *Service Schedule – Provider Backbone Ethernet Virtual Connection (PB-EVC)*, September.

MBIE (2016), 'Ministry of Business, Innovation and Employment', *Telecommunications Act Review: Options Paper*, July.

MBIE (2017), *Telecommunications Act Review: Post-2020 Regulatory Framework for Fixed Line Services*, February.



MBIE (2018a), *Broadband and mobile programs*, website – available at: <https://www.mbie.govt.nz/info-services/sectors-industries/technology-communications/fast-broadband/broadband-and-mobile-programmes#ultra>, last accessed 18 September.

MBIE (2018b), *Telecommunications (New Regulatory Framework) Amendment Bill – Departmental Report to the Economic Development, Science and Innovation Committee*, April.

NBN Co (2017a), *nbn™ technology 101: What is FTTN?*, website – available at: <https://www.nbnco.com.au/blog/the-nbn-project/nbn-technology-101-what-is-fttn.html>, last accessed 18 September.

NBN Co (2017b), *Corporate Plan 2018-21*, August.

NBN Co (2018a), *Factors affecting internet speed and performance*, available at: <https://www.nbnco.com.au/content/dam/nbnco2/documents/speed%20and%20performance%20%200.pdf>, last accessed 18 September.

NBN Co (2018b), *Service Levels Schedule – nbn™ Ethernet Product Module – Wholesale Broadband Agreement*, WBA3 V3.3 (effective 2 July).

NERA (2015), 'NERA Economic Consulting', *Broadband Market Performance in Canada: Implications for Policy*, October.

NetCo Code (2017), *Telecommunications Act (Chapter 323) – Code of practice for Next Generation Nationwide Broadband Network NetCo Interconnection*, April.

NetLink Trust (2016), *NetLink Trust Improves Service Levels But External Challenges Remain*, Press Release, October 2016, available at: <http://netlinktrust.com/medias/investor-media/media/press-releases/108-netlink-trust-improves-service-levels-but-external-challenges-remain.html>, last accessed 18 September.

Telstra (2013), *NBN Co 2012 Special Access Undertaking – Telstra's response to the ACCC Consultation Paper*, January.



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