CHORUS

OUR FIBRE PLANS

Ā tātau whakaritenga

This document introduces our regulatory proposal for investment in fibre services during PQP2, the four-year price-quality regulatory period starting January 2025. The document includes six of the seven components of our 2023 Integrated Fibre Plan, covering overview, quality, governance, demand, delivery and engagement.

Dear Commissioners and stakeholders

The Chorus board and shareholders are pleased to share Chorus' fibre investment plans with you.

These plans cover the years 2025 to 2028 (called 'PQP2'). They reflect what our end-users have told us matters most – increasing resilience of and access to fibre, while maintaining the current high quality of service and keeping fibre affordable.

Consumers expect digital infrastructure to be accessible, reliable and affordable, just like other essential utility infrastructure.

The recent pandemic and extreme weather events have shown Kiwi homes and businesses to be more reliant than ever on fast and reliable broadband connections. Cyclone Gabrielle proved fibre services were less likely to be interrupted and faster to be restored than the copper network.

Fibre is superior to other broadband technologies – it is the fastest, most reliable and lowest emissions broadband service. This is recognised by the major fibre deployment and upgrade programmes underway in virtually every developed economy.

We want to bring the benefits of fibre to as many New Zealanders as possible, consistent with our purpose "to connect Aotearoa so we can all live, learn, work and play." This purpose is at the heart of our plans (the 'PQP2 proposal'), which we now present to the Commerce Commission for review.

Meet demand, invest for the future and grow the network

Our proposal is to maintain the current high quality of service and a congestion-free network, even as data use doubles and more people connect to our network. We will do this while improving the resilience and sustainability of our services, extending the network to give more New Zealanders access to fibre, and preparing for the next generation of broadband technology.

After extensive stakeholder testing and careful balancing, we propose total capital investment of $1.3 billion and total operating expenditure of $0.7 billion over PQP2. This will enable us to:

- make our services more resilient, especially for those living in smaller communities, to major seismic, weather or other network impacting events. This is essential given increased consumer reliance on broadband as an essential enabler of daily life
- extend the fibre network to make world class fibre services available to 40,000 premises where it is not currently available. A report we commissioned from the New Zealand Institute of Economic Research calculated a $16.5 billion benefit for rural homes and businesses over the next decade if they all had high-capacity broadband
- continue to meet demand for fibre by carrying out 150,000 new installations on our network (this includes installations in our current network footprint and where we expand the network)

- future-proof our network by making Hyperfibre available to those who need it. Hyperfibre is the fastest broadband available in Aotearoa and uses technology that is becoming the default for new fibre deployments globally. It makes up a small but growing share of our services and we need to support it to make sure we do not fall behind other countries in our access to leading connectivity
- invest prudently in solar generation, to improve sustainability and reduce energy costs
- all supported by efficient operating expenditure, which declines slightly per connection over the regulatory period.

Telecommunications is much more dynamic than other utility sectors - evolving technology, policy and macroeconomic developments have a significant influence on our investment decisions. To invest in the network, we need to have confidence in our ability to earn an appropriate return over time. This is why key areas of discretionary capex remain subject to pricing, market and regulatory developments that we will continue to assess in the lead-up to and during PQP2.

Our proposal has also been stress tested by an 'independent verifier', which has provided its report to the Commission.

These are bold, but carefully considered plans that we believe will best meet Aotearoa's needs.

Our success is tied to how well we meet end-users' needs

Our success as a business, reflected in our strategy, core beliefs,[1] and our PQP2 proposal, also depends on a deep understanding of end-user and stakeholder needs. Understanding these views and ensuring the PQP2 proposal fully takes account of them is a priority for the Commission and has been a key focus for the Chorus Board.

We know that 'consultation documents' can be useful, but also that many end-users find these difficult and they are by nature not interactive. This led us to use a combination of surveys, market observation and research, and formal consultation to inform our proposal. Also, when it came to tough trade-offs, stakeholder feedback helped us prioritise investments – so our scarce capital can be directed to what matters most to end-users.

We want to acknowledge and thank:

- the more than 2,500 people, businesses, educational institutions, local authorities, iwi representatives and other parties who engaged with us as we developed and refined our PQP2 proposal
- consumer advocate (and former Chief Executive of Consumer New Zealand) Sue Chetwin, for her role in establishing and overseeing our final rounds of stakeholder engagement and acting as an independent voice for our end-users as we finalised investment and future engagement plans.

The only area where we did not adopt the option preferred by stakeholders is resilience. Stakeholders supported substantially increased resilience investment, driven by recognition of people's reliance on internet services and the social and economic benefits of connectivity, as well as the issues associated with digital exclusion.

We are still proposing a material uplift in resilience investment (doubling what we proposed for our first regulatory period) although not as much as our stakeholders wanted us to invest. The main reasons are that we are mindful of the cost impact for end-users and the risk of 'recency bias' after

1 Described in our letter to investors, page 1 of Chorus' FY23 Annual Report Chorus Annual Report 2021 (nzx-prod-s7fsd7f98s.s3-website-ap-southeast-2.amazonaws.com)

recent weather events. We prefer to retain the option to seek approval for additional investment over the coming years.

Chorus performance and operating environment

Chorus has a strong track record of delivery through the UFB build and, more recently, in navigating COVID-19 disruptions, severe weather events, and a critical shortage of skilled technicians. We are confident in Chorus' ability to deliver on our PQP2 proposal and that our investment plans are in line with the needs of our end-users.

Our analysis clearly shows our plans to expand the network are economic and would deliver real benefits to end-users, whilst our resilience investments are strongly supported by stakeholders.

Chorus is regulated as a monopoly but operates in an environment where our largest customers are also network competitors offering competing products that earn them higher margins. This competition constrains our prices and creates strong incentives to deliver an excellent customer experience and operate as efficiently as possible.

Capital allocation is one of our Board's most important responsibilities. The long-dated nature of our investment means that, for us to invest, we need to have confidence that end-users will utilise our infrastructure and that we will be able to earn a fair return on that investment.

To promote investment in this market context, the government and Commission need to do their part by making balanced policy and regulatory decisions across the sector:

- For Chorus, that means having the flexibility to recover investment over time, and removing outdated and unnecessary regulation, so we can undertake commercially challenging investments that are beneficial for end-users. This includes ensuring rules relating to copper services do not make copper revenues unsustainable and, as a result, discourage our shareholders from supporting broader investment.
- For the retail market, that means greater vigilance to ensure fair marketing to end-users by retailers. Current marketing practices risk directing end-users to products that will not best meet customer needs. This in turn undermines the economics of further fibre investment. Fair marketing is also beneficial for retailers, as the retail market will work best when end-users have the right information to make informed choices.

Although progress is being made to improve retail service quality and transparency, a better balance is needed between the 'belt and braces' economic and competition regulation of Chorus and the comparatively light touch obligations for retailers to market and sell broadband products fairly and transparently.

Next steps

Fibre is the best broadband technology, and we are excited about how our fibre services can enable the digital future of Aotearoa. The Chorus team looks forward to working with the Commission and our stakeholders through the consultation and evaluation process.

Yours sincerely,

MARK CROSS
CHAIR

OUR FIBRE PLANS

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Overview

End-users and stakeholders have told us fibre is increasingly essential for working from home, running a business, entertainment and education. Our investment plan is to maintain our high-quality fibre service and to expand the benefits of fibre by improving resilience, expanding fibre coverage and preparing for continued rapid demand growth.

Our proposal is underpinned by our strategic objective to win in our core fibre business, by:

- being a safe, resilient and efficient asset manager, and evolving our asset management practices
- maximising fibre uptake by having the right value propositions and by continuing our work to promote fibre, educate consumers on the benefits of fibre and providing resources to help end-users make informed choices
- delivering a leading customer experience in connecting and operating the network
- striking the best balance in terms of cost, performance, and customer and end-user impact – including by smoothing the allowed revenue over time if needed (noting that our pricing is already constrained by competition)
- expanding the fibre network where economic and where appropriate investment incentives exist
- ensuring Aotearoa keeps up with the rest of the world by continuing to invest in the next generation of fibre technology (e.g. Hyperfibre)
- partnering with others to help bridge the digital divide.

For us to deliver these objectives we need to continue to grow our business. A growing business is good for end-users and investors, giving us more scope to invest, innovate and deliver the services our end-users demand, while a broader customer base will ultimately drive lower average prices for all.

Consultation

Our proposal has been shaped by what our customers, end-users and stakeholders have told us. We have improved our consultation since our first regulatory period (PQP1), building on the sound foundation of our business-as-usual engagement with Retail Service Providers (RSP**s**) on new products, to carry out proposal-specific consultation for PQP2. We have consulted widely and sought detailed, rich feedback from end-users and other stakeholder representatives.

> *"[fibre] already is 'essential' for daily life. It can't get more important than that."*
>
> Stakeholder feedback

We also drew on our strategic refresh in 2022, through which we gained real insight on our stakeholders' expectations and priorities. Outcomes of the strategic refresh were built into our strategic priorities, which underpin our proposal.

To consult on the proposal, we sought views from a representative range of stakeholders and end-users.

Firstly, we carried out surveys to test broad preferences and areas of interest. We followed those up with a formal written consultation document (supported by a short online form for those with less time to engage) on investment choices and options for regulatory settings.

To get richer insights into the priorities of our end-users, RSPs and others, we engaged Kantar to manage an in-depth process of workshops and interviews with key stakeholders and representative groups of end-users. This involved 11 workshops and more than 30 structured interviews. We tested people's preferences between higher cost/higher benefit and lower cost/lower benefit options for areas of discretionary expenditure (these were reliability/resilience, fibre frontier, Hyperfibre, sustainability and active wholesaler). This gave us valuable insights into how our customers and stakeholders thought about these choices.

The workshops were overseen by consumer advocate, and independent chairperson, Sue Chetwin, to ensure we reached a diverse and representative group of end-users and that the process and materials (e.g. introductory videos) we presented were balanced and fit-for-purpose. She also assessed our summary of how the feedback is reflected in our PQP2 proposal.[2]

Feedback from our end-users, especially through the in-depth workshops and interviews, has shown strong end-user support for increased investment in network resilience and broad support for continued investment in other areas of discretionary capex. The notable exception to this view is from RSPs, who gave feedback that was more concerned about costs being passed through to end-users, and who believed that government should fund more of the cost of resilience improvements and network extension.

The insights and feedback we have received have shaped our proposal. In particular, the strong support for investment in resilience has been set against the cost impact for end-users and the risk of 'recency bias' after recent weather events. We have decided to retain our proposed spend in this area, which is still double the approved resilience spend in the previous regulatory period.

Safe, resilient and efficient asset owner

Our asset management focus is to evolve and develop capability in the way we think about and manage our assets.

Asset management is a broad discipline, covering all aspects of how we can realise the best value from our assets, including enhancing the lifecycle management of our fibre assets. Connection growth reduce in importance as a driver of network electronics investment, and new network assets will approach their first renewal cycles. We need to manage asset lifecycles in a way that strikes the best balance in terms of cost, performance and risk. We also need to do more to integrate economic frameworks into our asset management decision making.

Since our expenditure proposal for PQP1, we have made good progress to adapt our asset management practices and cost estimation focus from primarily build, to operate and maintain. This is in line with our strategic goal of managing and operating safe, resilient and efficient assets.

Our asset management and cost estimation work has been directed towards the areas of greatest near-term value, those assets with most proximate need and establishing wider frameworks and strategically important documents. Specifically, we have:

- refreshed the Asset Management Policy and Strategic Asset Management Plan
- completed a strategic study for optical network terminals (ONTs), which has allowed us to significantly extend asset life – reducing whole of life cost without material impact on service quality

2 A letter outlining Sue Chetwin's views on our stakeholder engagement activities and plans is provided alongside this proposal.

- begun mapping the current state of our asset data and cost estimation practices
- created an exemplar Portfolio Asset Management Plan (PAMP) that can be carried across to other network and IT portfolios. The updated poles PAMP draws together information from our pole testing programme with new analytical techniques to improve targeting of pole inspection and replacement
- created an Asset Information Management Framework that clearly sets out the principles providing the foundations for our future asset data and information practices.

Moving forward, we will continue to develop our value framework. This includes asset health and criticality, asset data, and the analytics we use to bring these dimensions together into prioritised programmes of work.

We have made strong and tangible progress since our PQP1 proposal, but acknowledge the Independent Verifier's view that continued progress is required. This is reflected in our PQP2 proposal.

Rapid growth in fibre demand will continue

We expect end-user demand for data will continue to grow dramatically in PQP2 and beyond – we are forecasting 20% compounded growth in average throughput per user each year over PQP2. We expect the trend of exponential growth in bandwidth demand to continue during PQP2, driven by:

- an increasing shift to 4K TVs, cloud gaming and home automation, while working from home continues and there is increased reliance on cloud-based services
- new applications and technology developments, including:
    - in the near term: augmented and virtual reality, 3D virtual events and 3D imaging, smart homes, robotics, biosensors and enterprise metaverse
    - in the longer term: 3D interactive virtual events, autonomous AI enabled 'Internet of Things' (IoT), adaptive haptics and advanced digital signage
- the increasing power and speed of consumer devices.

Fibre is also enabling more and more digital technology in our public urban spaces. Chorus' 'smart locations' provide a fibre connectivity point at a bus stop, traffic or streetlight to support big bandwidth IoT applications. This can be for CCTV cameras, which require reliable and consistent connectivity for real time data processing, or for community Wi-Fi or digital billboards. This demand will only grow over PQP2 and beyond.

"It's the way the future is going. We rely on internet for everything."

Stakeholder feedback

Growing the number of fibre connections (homes, businesses and smart locations) remains a strategic imperative for our business and is good for our end-users overall – our network architecture is designed to accommodate high uptake, so growing connections will lower the cost per connection and, ultimately, the prices we charge.

To grow connections, we need to ensure our fibre services are attractive compared to alternative services. This is especially important as we see market consolidation of large mobile network operators (MNOs), who also compete with us using alternative technologies. To enable a level playing field, we need to promote fibre to end-users through marketing, and encourage RSPs to

promote fibre by way of our customer incentives programme. It also means managing the balance between price and quality and optimising our product mix to suit a broad range of end-user preferences. Finally, we need to continue to invest in the next generation of fibre technology, so we progressively unlock more potential from the physical network.

Our proposal is underpinned by our demand forecasts, covering demand for network extensions (i.e. new property developments), new installations, new connections and additional bandwidth. These forecasts are fundamental drivers of Chorus' financial and operational decisions. Our demand forecasting methodology is robust, relies on external sources where possible, and has been well challenged and calibrated as it was developed. There remains unavoidable uncertainty with demand forecasts, which is mitigated through ongoing review and forecasting improvements, as well as the connection capex variable adjustment mechanism and its associated revenue wash-up.

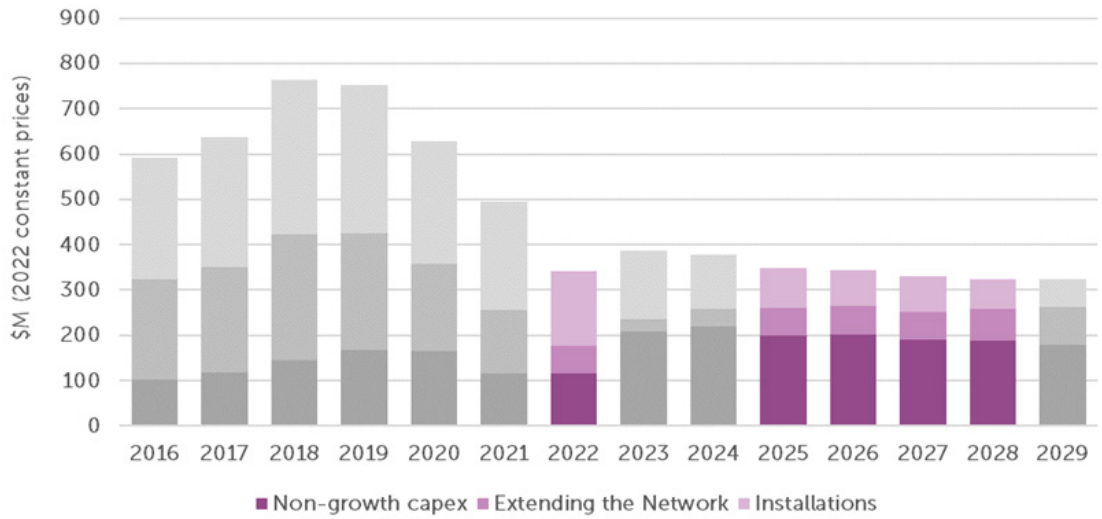
Investment overview

We propose investment of $2.1 billion over the four years from 1 January 2025 to 31 December 2028, including $1,345 million capex and $740 million opex. We also forecast a further $324 million of capex and $190 million of opex in calendar year 2029.[3]

In total, we are proposing increased investment relative to PQP1. Drivers of this increase are inflation, an increasing allocation of shared costs as customers move away from copper, and PQP2 being one year longer than PQP1.

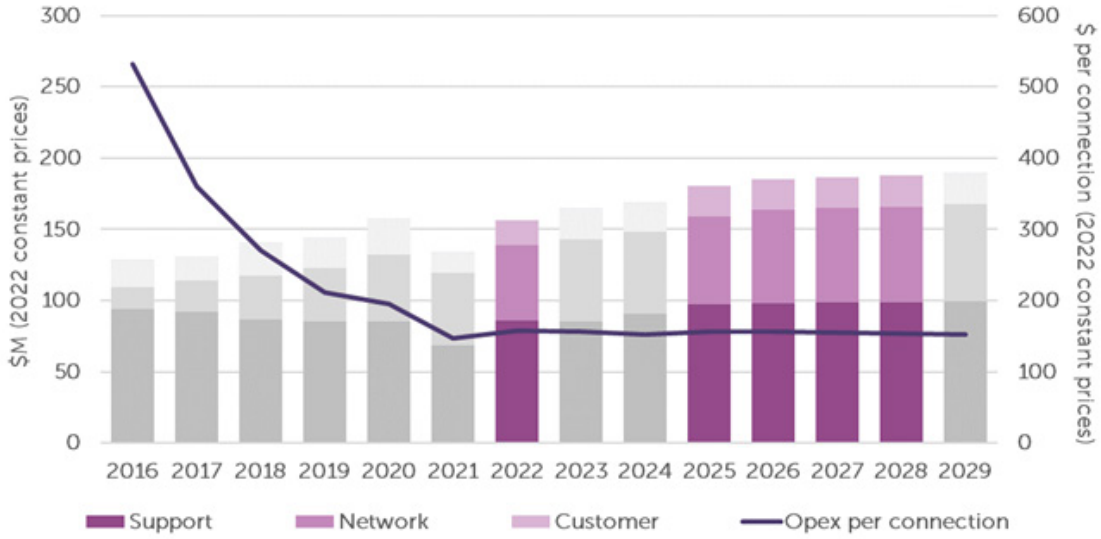
The charts below show the trend in historical and forecast capex and opex. We observe a declining trend in capex following completion of the UFB build. Opex allocated to fibre grows as we have built out more fibre network, but is broadly flat on a per customer basis.

CHART 1: HISTORICAL AND FORECAST CAPEX (PQ FFLAS)



3 Although 2029 falls outside of PQP2, the Input Methodologies require us to provide a forecast of expenditure for this year.

CHART 2: HISTORICAL AND FORECAST OPEX (TOTAL AND PER CONNECTION) (PQ FFLAS)



Our approach to forecasting capital expenditure is similar to PQP1, with generally consistent methodology and capex categories. However, for operating expenditure, we considered the Commission's feedback on our methodology for PQP1 and have developed an improved opex forecasting approach. For PQP2 we have forecast opex using a top-down base-step-trend (BST) forecast model, which is good practice and more fit-for-purpose than a bottom-up forecasting method. We believe this is appropriate for Chorus as it aligns well to our recurring and predictable opex trend.

Our proposal presents our planned capex and opex by expenditure category. These are summarised below.

Extending the Network capex: $253m

This benefits end-users by making fibre available to more people, supporting connections and growth. This category comprises:

- $221m to both expand the fibre footprint to a further 40,000 New Zealanders, and to provide fibre where new premises are built within the existing network (infill, but excluding new property development)
- $32m to make fibre available in new property developments.

Installations: $310m

This benefits end-users as it is the expenditure needed to connect a new end-user to the network. The proposed investment comprises:

- $298m for Standard Installations and $12m for Complex Installations, which cover the build and provisioning costs of different types of fibre installations, and customer incentives.

Network Sustain and Enhance: $309m

This benefits end-users as it is the non-growth capex that keeps the network running. The proposed investment comprises:

- $121m on Field Sustain capex, upgrading or enhancing network assets
- $91m on Site Sustain capex, upgrading current network buildings, maintaining network buildings and engineering services
- $18m on Relocations, moving our assets to accommodate work on other infrastructure (e.g. roading and electricity poles)
- $80m on Resilience, improving network resilience to reduce the likelihood and impact of service outages (note this excludes seismic strengthening which is part of the site sustain capex sub-category).

Network Capacity capex: $292m

This benefits end-users by ensuring network electronics are reliable, cost effective, and able to meet the forecast bandwidth requirements from new and existing connections. The proposed investment comprises:

- $127m for Access – expenditure to replace or upgrade our existing ONTs at our end-users' premises, Optical Line Terminals (OLTs) at our exchanges, and element management platforms
- $80m for Aggregation – adding new or expanding existing network equipment, and migrating OLT uplinks and Handover link services from obsolete to new equipment as required
- $85m for Transport electronics – these increase the amount of data and distance carried over fibre cables using enhanced lasers / optical technology.

IT and Support capex: $180m

This benefits end-users by funding IT systems and other support assets that support the operations of Chorus. The proposed investment comprises:

- $95m for Network and Customer IT, which funds systems and platforms that help us run the network and manage the processes that are important for our customers
- $73m for Business IT, which funds systems and platforms needed for our day-to-day business activities
- $13m for Corporate, which covers accommodation, office equipment and other capital expenditure.

Customer opex: $86m

This is expenditure to attract new fibre end-users and retain existing end-users, benefitting end-users by supporting improved customer experience and supporting connections and growth. The proposed investment comprises:

- $115m for marketing, product management, data insights and account management
- -$29m for non-capitalised provisioning and installation services (this is a negative value due to technical cost allocation and capitalisation adjustments).

Network opex: $261m

This benefits end-users as this is the operating expenditure needed to keep the network running at current service levels. The proposed investment comprises:

- $137m on Maintenance – the costs of physical network inspection and repairs, property maintenance and materials
- $44m on Operating Costs relating to running the network, including electricity costs and leases
- $80m for Network Operations – the labour costs of running the Network Operation Centre (NOC), the assure service desk, the Security Operations Centre (SOC), customer billing, escalations and other customer facing network services.

Support opex: $392m

This benefits end-users by funding the operational costs that Chorus needs to incur to operate effectively. The proposed investment comprises:

- $95m for Asset Management, the internal labour costs for the teams that support our asset management processes and operations
- $94m for Technology, which covers non-capital project work, support contracts, IT services and licences for our IT systems
- $204m for Corporate, which covers our corporate teams, accommodation and other expenses, such as insurance and office expenses.

As with any long-term capital investment programme, our plans are subject to events. The Commission, our investors and our end-users can be confident that we will make investments where they are prudent and efficient. We assess prudency and efficiency when preparing this proposal and when making expenditure decisions across PQP2. In particular, the extent of investment in material areas of discretionary capex will be influenced by market testing of costs and evolving market conditions, including the level of network competition.

Extending fibre further and enhancing resilience

Two areas of significant discretionary expenditure in this proposal are:

- investments to extend our fibre footprint beyond the UFB boundaries, to deliver services to end-users in rural Aotearoa, as supported by stakeholders through our consultation process, and
- investments to enhance our network resilience, reflecting consultation feedback from end-users, the increased importance of fibre services to homes and businesses and the impact of increasingly severe weather events such as Cyclone Gabrielle on our assets and services.

We have carefully assessed how best to balance expenditure on these enhancements, while keeping overall investment at an affordable level.

Access to the internet is now essential for homes and businesses. As our reliance on high-capacity connectivity grows, it is exposing the inequality for the 650,000 New Zealanders caught on the wrong side of an ever-growing digital divide.

> *"It [fibre] supports everything we need in an isolated country – entrepreneurship & social capital, telehealth, AI, there is so much growth & opportunity for education and rural industry."*
>
> Stakeholder feedback

Over the four years of PQP2 we are proposing to spend $201m to provide communal fibre infrastructure to a further 40,000 premises. This would increase the current overall fibre network coverage in Aotearoa from 87% to 89% of the population. It is the first phase of a potential wider plan to take fibre to beyond 90% of the population.[4]

Expanding fibre further is necessary if we are to keep pace with trading partners in Aotearoa given the ambition in Europe for gigabit coverage for all households by 2030, with some countries targeting 99% population coverage with fibre. This proposal is an important first step.

Given the inherent limitations of other technologies, fibre is the technology that will best meet New Zealanders' needs over the coming decades, both where it can provide a fibre-to-the-home (FTTH) service, as well as enabling other technology to support the rural connectivity ecosystem like fixed wireless, mobile, and satellite ground stations.

Cyclone Gabrielle's effects proved the resiliency benefits of fibre, as copper network customers were up to 10 times more likely to lose service than those on fibre and fibre services were able to be restored twice as fast as those on copper. This is because the copper network relies on powered equipment in suburban streets to transmit signals, whereas fibre is a passive network with data transmitted via light. The copper network is therefore much more susceptible to water and lightning damage.

Our resilience projects aim to reduce the frequency and impact of outages. Resilience is our ability to prevent network assets from failing, keep the network running when assets do fail, and restore connectivity quickly if the network does go down. We aim to invest $80m capex on resilience projects (excluding seismic strengthening) across PQP2, doubling the planned per-annum investment from our PQP1 proposal.

These investments include deploying geographically separate cable routes to communities, so if one route is damaged, the broadband service to the community is not affected. They will improve fibre service resilience to more than 100,000 end-user premises.

4 For avoidance of doubt, this further roll-out is not part of this expenditure proposal. It would be subject to financial circumstances and may need support from alternative funding sources.

"Making sure we prioritise supporting our communities and whanau to be connected in case of emergencies is essential."

Stakeholder feedback

We will also make investments in other network capex categories that have resilience benefits but are not included directly in the resilience capex forecast sub-category, such as backup power supply, seismic strengthening of buildings, and proactive fibre route inspections.

We are confident these discretionary investments would deliver real benefits for end-users. However, they come with some risk to Chorus. We need to be confident that:

- regulatory settings will support our ability to recover a normal return over time (i.e. wash-ups should not be capped and there must be no arbitrary resets to the cost of capital)
- we are operating in a balanced commercial market – where the Commission takes stronger steps to ensure the wholesale fibre network model created by government is not undermined by vertically integrated MNOs using their market position to promote their own products relative to fibre
- the PQP2 process retains the flexibility to allow for potential changes in government policy and approaches over the next year – for example, government funding for resilience or rural initiatives could help accelerate, or reshape, our investment plans with better outcomes for end-users.

If Commission decisions on our PQP2 proposal create uncertainty about how much we can commit to our major discretionary capex programmes, we would seek to explore options for managing the uncertainty. We are conscious, for example, that the pre-planning and workforce requirements for network deployment can be significantly affected by delayed approval mechanisms such as Individual Capex Proposals. Such a delay would penalise end-users by slowing the delivery of better socio-economic outcomes much later into PQP2, while creating additional cost for both us and the Commission. Our preference is therefore to use more streamlined tools, such as reopeners or 'uncertainty mechanisms.'

Proposed quality standards

Our expenditure forecast and quality proposal for PQP2 are in balance. This means our expenditure forecast will provide just enough funding for us to meet our proposed quality standards. Any change to the quality standards as we propose them would have flow-on impacts on our funding requirements over PQP2.

For our second regulatory period, we propose to broadly maintain the current level of service quality. We believe this is appropriate because:

- we did not get any stakeholder feedback suggesting a step change up or down in quality was necessary, and we are conscious that any increase in service quality outcomes would come at a cost that would ultimately flow through into higher prices for our end-users
- sustaining quality will require ongoing investment as the network grows, assets age and risk profiles evolve
- we have only recently completed the fibre build project and the new regulatory arrangements are still bedding in. It would be premature to make wholesale changes to the quality outcomes the network is designed to deliver.

For PQP2, we propose a very similar quality standard framework to current settings, with minor adjustments to reflect our experience since the start of PQP1. Availability and Performance were the right quality dimensions to use to set quality standards for the first regulatory period and they remain appropriate for the second. We are very conscious that, at the time of this proposal, we have only one year of quality data available since the new regulatory framework came into effect, which limits the amount of data available that is consistent with the price-quality settings. We will continue to collect and report data across the seven quality dimensions under information disclosure (ID) and there will be ongoing engagement with our stakeholders to understand their evolving needs from fibre services.

We propose to adjust some aspects of the quality standards to better capture how end-users experience network quality and to avoid breaches that do not indicate a failure to invest in and manage the network in accordance with good telecommunications industry practice:

- **Availability standard** – replace current 23 Point of Interconnection (POI) areas with 11 Customer Service Areas (CSAs). The current standard has led to a large variability in the size of the network areas in which our performance is measured. This creates perverse incentives to invest more in availability in smaller areas such as Northland (where we are not the principal LFC), which means we are incentivised to over deliver in some areas compared to others. Moving to CSAs would mitigate this issue by reducing the variability and better align to how we manage service restorations through our field service contracts.
- **Performance standard** – normalise for outlier events such as unforeseeable demand spikes (such as Fortnite upgrades) and network failures.[5] It is not economic to build a network that could accommodate these types of events. Also, we propose to increase the port utilisation threshold back to its previous level of 95%, on the grounds that a lower threshold does not impact on how end-users experience network quality, but increases the risk of 'false positives', where breaches are driven by volatile data rather than inadequate investment over time.

Deliverability

The successful completion of the UFB programme demonstrates our ability to deliver large scale projects and connect new end-users to fibre on time and on budget.

Since we submitted the PQP1 proposal, we have improved and adapted our delivery models and contractual arrangements to meet the changing needs of our end-users and adjust to our operating environment. COVID-19 restrictions and workforce challenges have affected our delivery in recent years, although these issues now seem largely behind us. Our experience since submitting the PQP1 proposal has improved the agility and resilience of our delivery models and helped adapt these to meet our future delivery task reflected in this proposal.

We have carefully assessed our investment plans in light of available field resources and equipment. We are confident we can deliver the investments as described in this proposal, although we of course need to retain flexibility to adapt our plans to reflect changing circumstances over PQP2.

The delivery of our in-field, site, and network capacity work is largely outsourced to external service providers. We use best practice procurement strategies when outsourcing programmes of work to minimise whole-of-life cost and deliver the best possible outcomes for our end-users.

Our other main delivery task is IT change. This includes the ongoing programme to de-merge IT systems from Spark, as well as building digital capability to offer fibre products and efficiently deliver our business activities. We use internal resources to manage and coordinate this work and carry out much of the actual delivery, although we also obtain support from suppliers and contractors.

5 This would set the standard consistent with how it was applied during the UFB programme and avoid creating perverse incentives or double jeopardy with the availability standard.

The year leading up to this proposal has seen a high rate of severe weather events, which have (as well as broader societal and infrastructure impacts) damaged network assets, disrupted our operations and impacted our services to end-users. In particular, Cyclone Gabrielle caused major impacts to fibre customers in the Gisborne, Wairoa and East Cape regions. Our contracts and processes are set up to allow us to respond to major events (such as extreme weather events or earthquakes) in an effective manner.

Governance

We govern our business under a framework that is consistent with good telecommunications industry practice and supported by fit-for-purpose management frameworks. Our proposal-specific governance has been embedded in our wider corporate governance, with additional governance elements where appropriate, to ensure a robust proposal development process.

This governance approach has supported a thorough internal and external challenge process that has shaped our PQP2 proposal.

Cost allocation

As a provider of fibre, copper and other services, some of Chorus' costs are shared between fibre and another service and we need to allocate the costs appropriately between the services.

End-users are continuing to transition away from copper services, either to fibre or to other broadband products offered by our competitors. As fibre connections grow and copper connections decline, the proportion of Chorus' expenditure that relates to copper declines, while the proportion relating to fibre increases. The result is that shared costs are increasingly allocated to fibre, which increases fibre operating expenses, irrespective of other changes in expenditure. This is a natural and expected outcome of the migration from copper to fibre. If the actual rate of copper withdrawal differs from what we forecast, there will be a wash-up in PQP3 to adjust the allocation of costs to fibre fixed line access services (FFLAS).

For PQP1, we were required to use the same method for allocating costs between fibre and other services as we had used for the years prior to PQP1. For PQP2 and beyond, we have an opportunity to assess the most appropriate method of allocating costs between our services. We recommend that the allocator for our corporate labour and IT opex costs changes from one based on expenditure ('totex', i.e. capital plus operating expenditure) to one based on revenue, which better reflects the change in the characteristics of this expenditure.

Next steps

The remainder of this expenditure proposal provides more detail about our plans to achieve our investment priorities over the coming years, supported by analysis on why our proposal will best deliver long-term benefits for end-users.

We look forward to working with the Commerce Commission and engaging with all stakeholders through the regulatory review of this proposal.

1.0 INTRODUCTION

Kupu Whakataki

1.0 Introduction

This chapter describes the scope of our proposal, introduces the document suite and key conventions.

Our Fibre Plans and Our Fibre Assets form the heart of our proposal for expenditure on Fibre Fixed Line Access Services (FFLAS) during our second regulatory period (PQP2), covering the four calendar years from January 2025 to December 2028.

1.1 Proposal scope

Our proposal is for FFLAS in areas where we are subject to price-quality regulation (PQ FFLAS). Section 5 of the Telecommunications Act 2001 defines FFLAS as:

"a telecommunications service that enables access to, and interconnection with, a regulated fibre service provider's fibre network [subject to specified exclusions]."

Services within the scope of FFLAS are described in our modelling and cost allocation report by reference to the Commerce Commission's description of FFLAS services.

The proposal excludes our non-FFLAS services, most notably:

- all copper services
- most backhaul services.

PQ FFLAS also excludes Chorus assets and services in information disclosure-only FFLAS areas, notably:

- Enable Networks areas in and around Christchurch
- Northpower Fibre areas in and around Whangarei
- Tuatahi First Fibre areas in the Waikato, Taranaki, and Bay of Plenty.

While our proposal is for PQ FFLAS during PQP2, we also present information on:

- historical expenditure back to 2016 and forecast expenditure leading up to, and one year beyond, PQP2
- shared expenditure, of which only a portion is allocated to PQ FFLAS. This can provide useful context on PQ FFLAS trends
- some of our wider governance and management activities, as we operate as an integrated business across fibre and other services, and we deliver fibre services using shared assets and resources.

PQ FFLAS

This proposal covers the four-year second regulatory period for FFLAS in areas where we're subject to price-quality regulation only

2025 -2028

1.2 Proposal document suite

Our Fibre Plans works alongside three other sets of information:

- Our Fibre Future – accessible supporting material for our stakeholders. This material is not a formal part of our proposal
- Our Fibre Assets – our investment report. This describes how we manage our network and provides detailed information on every area of investment and operating expenditure
- PQP2 support – technical material including regulatory templates (spreadsheets) agreed with the Commission, a glossary, expert reports, supplementary responses to information requests and our Directors' certification of our proposal.

FIGURE 1.1: PQP2 PROPOSAL DOCUMENT SET

Our Fibre Plans and Our Fibre Assets together cover the requirement to provide an Integrated Fibre Plan (IFP). To provide a holistic view, we have included opex in our IFP document suite rather than providing separate opex documentation.

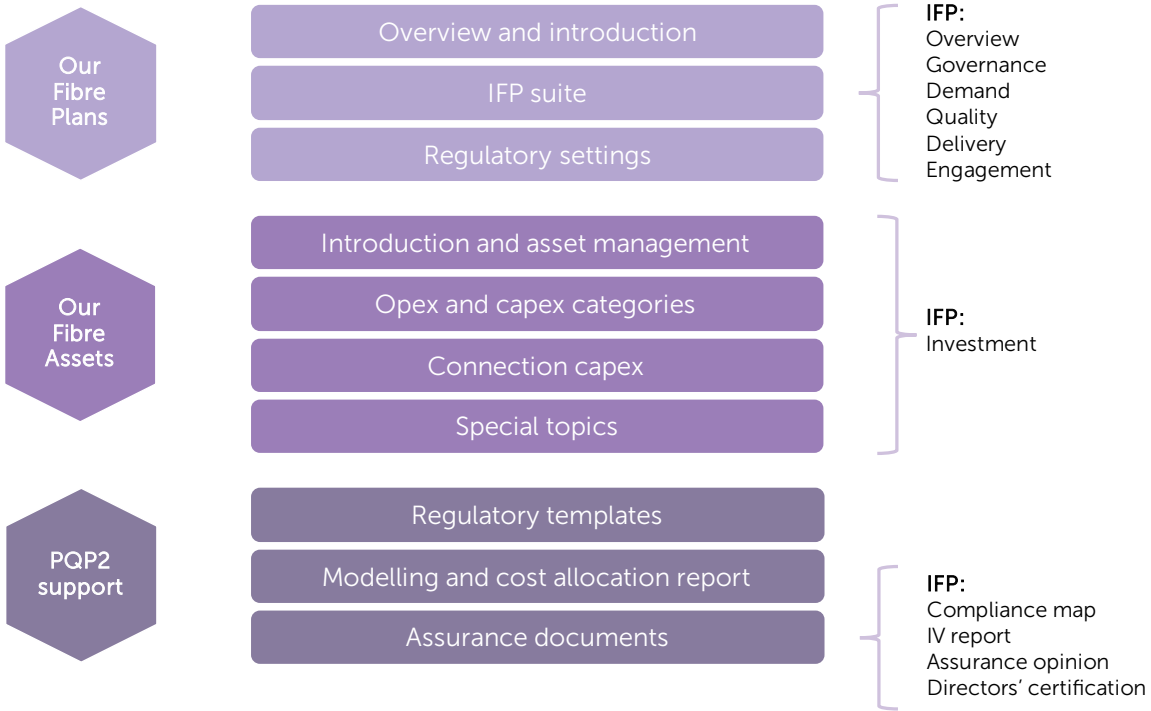
Our Fibre Plans covers most of our IFP requirements and comprises:

- an overview of our proposal, including our operating context, strategic priorities, and proposed investment. This is our IFP Overview report
- information on our proposal approach, including governance and how we have forecast demand, set quality targets, tested deliverability, and engaged with stakeholders. These are our IFP Governance, Demand, Quality, Delivery and Engagement reports
- several recommendations for technical refinements to regulatory settings.

Our Fibre Assets is our IFP Investment Report and comprises:

- a proposal insights chapter, which explores the overall makeup of our proposal and highlights key trends
- information on our assets and our asset management capability
- detailed information on each capital expenditure area, including expenditure drivers and forecasting approach
- a connection capex chapter that breaks connection capex out from other expenditure and meets our requirement to provide a connection capex baseline proposal
- an opex insights chapter, which explores the overall makeup of forecast opex and explains our opex forecasting approach
- detailed information on each opex area, including expenditure drivers and forecasting approach
- supplementary information on two special topics – our deployment strategy for optical network terminals (ONTs) and our rationale and justification for proposing to extend fibre coverage to 89% of Aotearoa during PQP2.

FIGURE 1.2: PQP2 INTEGRATED FIBRE PLAN AND ASSOCIATED DOCUMENTS



1.3 Conventions

Our Fibre Assets provides useful information on expenditure conventions and categorisation. Key things to know when reading this document are:

- unless stated otherwise, figures are in 2022 dollars throughout, and forecast figures use constant prices (i.e. they exclude economy-wide cost movements)
- historical expenditure from 2016-2021 is on a UFB FFLAS basis, whilst expenditure from 2022 onwards is on a PQ FFLAS basis
- forecast costs (from 2023 to 2029) are for PQ FFLAS – i.e. directly attributable FFLAS costs and an allocation of shared costs.

Throughout Our Fibre Assets and Our Fibre Plans we discuss and present a total capex view, where total capex includes base capex and baseline connection capex. This provides a more complete picture of our proposal and reflects the way we plan and operate our business.

2.0 GOVERNANCE

Ngā Whakahaere

2.0 Governance

This is our IFP Governance report. It describes governance at Chorus, and the key management frameworks we use to support effective governance. It describes how we have built our proposal from this foundation, including robust and effective challenge processes.

2.1 Our governance report at a glance

We govern our business under a framework that is consistent with good telecommunications industry practice and supported by fit-for-purpose management frameworks.

Our proposal-specific governance has been embedded in our wider corporate governance, leveraging its strong foundations and complementing it with additional governance elements where appropriate to ensure a robust proposal development process.

Our proposal-specific governance has supported a thorough internal and external challenge process that has shaped the bottom-up build of our PQP2 proposal and has identified savings in our expenditure allowances, whilst also adjusting our plans for expected resource constraints (labour and materials).

We have and will continue to undertake targeted reviews to continuously improve our governance and management framework, also by strengthening our capabilities in regards to what is good asset management and regulatory practice.

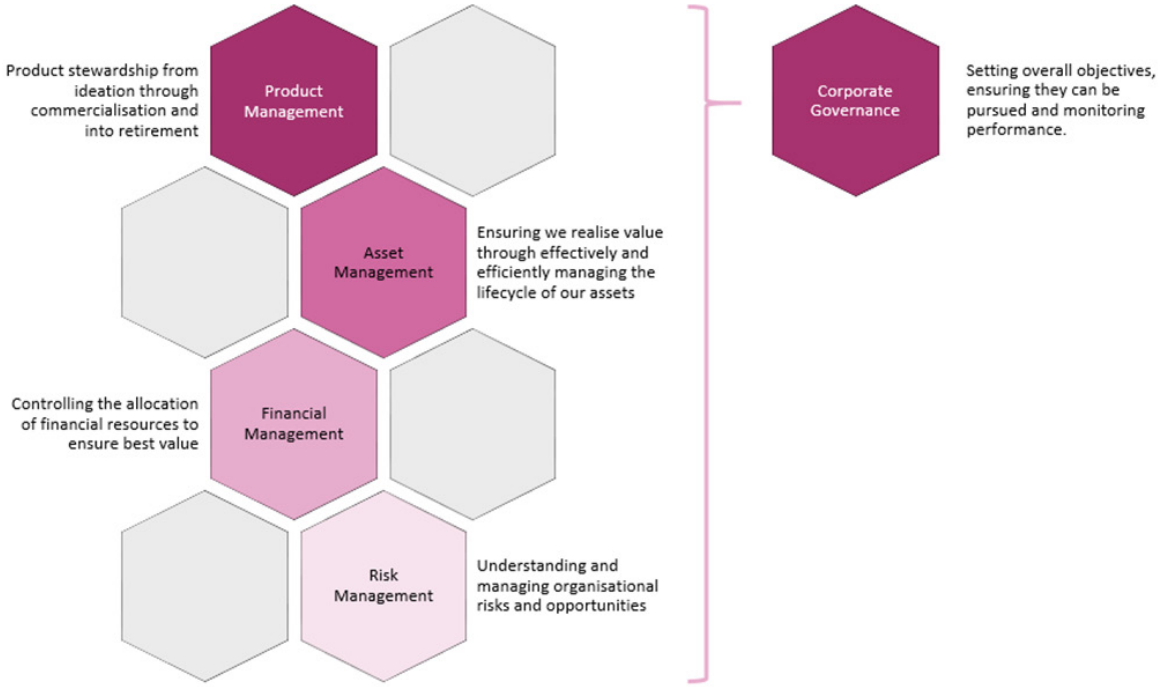
As we progress with implementation of our asset management roadmap, benefits in the form of improved information quality, more systematic risk-criticality trade-offs and reduced asset (and quality of service) risk and, potentially, costs will emerge during PQP2 and flow through to end-users in the longer run.

The figure below steps through the various components that make up our governance framework, including illustrating how our proposal-specific governance is embedded within the corporate governance (and complemented with a thorough internal and external challenge process and other elements where appropriate).

GOVERNANCE

We have robust and thorough governance processes.

FIGURE 2.1: PRODUCT, ASSET, FINANCIAL, RISK AND CORPORATE GOVERNANCE



2.2 Our corporate and proposal-specific governance

2.2.1 Corporate governance

Asset management consultancy AMCL and the Commerce Commission (the Commission) both concluded in their respective reviews of our corporate governance supporting our first regulatory proposal that it is consistent with good telecommunications industry practice.[6] Since then, our corporate governance has continued to evolve and adapt to meet our growing business and to meet new regulatory requirements.

We are an Aotearoa-based company, listed on the New Zealand and Australian stock exchanges, with an independent Board chair and members. Our company constitution and other key documents are publicly available.[7]

Our Board appoints our Chief Executive Officer (CEO), Chief Financial Officer (CFO) and our General Counsel. These three officers attend Board meetings and attend most Board committee meetings.

Our Board works with, and through, our CEO and their teams to exercise its responsibility for strategy, culture, governance and performance. Our Board delegates authority to the CEO to allow for effective operational management and leadership. The CEO further delegates authority within the company subject to the limits of a Board-approved delegation policy.

GOVERNANCE

We govern our business under a framework that is consistent with good telecommunications industry practice.

6 Commerce Commission, Chorus' price-quality path from 1 January 2022 – Final decision: Reasons paper (16 December 2021), at [4.115].
7 Chorus company constitution and key documents: https://company.chorus.co.nz/governance#key-documents-panel-text-lead.

The Board's responsibilities include ensuring we have effective management frameworks in place. Accountability for developing, operating and enhancing management frameworks rests with the CEO and their Executive team.

The Board has three committees, which each have delegated responsibilities, powers and authority: These are the:

- People, Performance and Culture Committee (PPCC)
- Audit and Risk Management Committee (ARMC)
- Regulatory Sub-Committee.

The committee charters are available on our website.[8]

The PPCC is responsible for:

- PPCC – overseeing our people, culture and related policies and strategies

The ARMC plays a key role in assisting the Board to oversee our financial and risk management frameworks, including:

- assisting the Board in discharging its responsibility to exercise due care, diligence and skill in relation to (amongst others) financial management, internal controls, accounting policy and practice, the risk management framework, the integrity of external financial reporting, related party transactions and compliance with applicable laws, regulations and standards
- ensuring processes are in place that keep the Board properly and regularly informed on corporate financial matters
- oversight and monitoring of the performance of internal and external auditors
- assessing the external auditor's independence and qualifications and ensure independence is maintained and the auditor's ability to carry out their statutory duties is not, and could not reasonably be perceived to be, impaired
- endorsing the annual internal audit plan and providing a structured reporting line for, and ensuring the objectivity of, internal audits
- acting as a forum for free and open communication between the Board, internal audit, external auditors and management.

REGULATORY SUB-COMMITTEE

The Board has a specific sub-committee for overseeing the new price-quality and information disclosure reporting and compliance statements, including the preparation of this proposal.

8 Chorus Board Committee charters: https://company.chorus.co.nz/governance#key-documents-panel-text-lead .

Routine Board (or ARMC) processes with direct relevance for our proposal-specific governance include:

- **business planning** – our Board approves business plans, including setting opex and capex budgets and revenue targets for the coming year. Business planning begins in each functional unit and is subject to challenge by the responsible member of the Executive team, and subsequently to scrutiny by the CFO and CEO.
- **financial reporting** – the ARMC oversees preparation of audited annual and interim reports, and the Board approves their release. These reports form the basis for the historical financial information used in our proposal
- **capital governance** – our Board approves in advance any significant projects or programmes of work (over $10m in value or more than five years duration). Individual financial or contract approval requirements still apply after Board approval of the business plan
- **Director certification** – Directors are also required to certify the compliance and accuracy of our PQP2 Proposal. While the certificate is signed by two Directors, our full Board approves the governance processes that support the certification and delegates the authority to two Directors to certify.

ARMC

Our Audit and Risk Management Committee supports of proposal-specific governance via business planning, financial reporting, capital governance and Director certification.

In addition to ARMC activities, the Board and Regulatory Sub-Committee oversee the new price-quality and information disclosure reporting and compliance statements. These disclosures also form the basis of some of the historical financial, asset and quality information used in our proposal.

Both the Board and Regulatory Sub-Committee have played an active role throughout the proposal development process. They have engaged on matters of policy and strategy, as well as approving key decisions.

2.2.2 Our proposal-specific governance

We developed our first regulatory proposal on the back of a fit-for-purpose governance framework that AMCL and the Commission in its reasons paper considered to be "consistent with good telecommunications industry practice".[9]

Our proposal-specific governance for our second price-quality proposal has continued to be embedded in the wider corporate governance environment and complements it with additional governance elements where appropriate to ensure a robust proposal.

Governance elements complemented the proposal development

We have had a dedicated team leading preparation of the proposal, working closely with the relevant subject matter experts from across the organisation within a clear governance framework. The proposal team and governance framework involves:

- **Proposal Team** – central team responsible for planning, advising, coordinating, and guiding the proposal development and delivery work. This team partners with the business contributors, who provide the

9 Commerce Commission, *Chorus' price-quality path from 1 January 2022 – Final decision: Reasons paper (*16 December 2021), at [4.115].

expertise and the information to create the proposal and certify its content.

- **Steering Group** – a programme steering group made up of senior staff who meet fortnightly to guide the team, make resource allocation decisions, manage and address risks and issues, and escalate decisions, risks and issues.
- **Executive Steering Group (ESG)** – comprised of Executives with primary responsibility for the content and quality of the proposal. The ESG meets monthly (or more frequently if required) to provide Executive-level programme governance (e.g. risks, issues, resourcing, delivery), testing and challenging proposal design and content choices and provides a direct link to the CEO and wider Executive.
- **Full Executive** – a standing group comprising the CEO and all Executives. The full Executive is informed of proposal development progress, risks and issues as they pertain to this group and, most importantly, provide guidance on strategic choices[10] and the implications of these for business planning and operations and the proposal.
- **Chorus Board and Regulatory Sub-Committee** – the Chorus Board is briefed, engaged on the process and all material aspects of the proposal as well as approving the proposal for submission, with certification by a delegation of two Directors. This has occurred through the main Board or the Regulatory Sub-Committee. The Regulatory Sub-Committee met quarterly (or more frequently if required) during the PQP2 development process to allow sufficient focus on regulatory matters including, but not limited to, price-quality proposals.

In developing the PQP2 proposal, staff and the governance groups above were assisted by independent third parties. These parties, their role and contribution are summarised below.

External reviews

Prior to certification by Directors, the draft PQP2 proposal was independently verified by Synergies Economic Consulting, who worked in partnership with Mott MacDonald, and independently audited for accuracy and compliance by KPMG.

The Independent Verification (IV) process is a mandatory requirement under the Input Methodologies. It was conducted under the terms of a tripartite deed between Synergies, the Commission and Chorus. Under this deed the IV owes an overriding duty of care to the Commission,[11] and regular communication between the three parties to the deed occurred throughout the IV's engagement.

The purpose of the IV process is to evaluate the proposal against the expenditure objective and evaluation criteria in the Capex Input Methodology and the extent to which the proposed expenditure reflects good telecommunications industry practices. This allows the Commission to focus its evaluation on any areas of concern identified by the IV.

INDEPENDENT VERIFICATION

The Verifier provides an opinion on whether information provided in this proposal meets the expenditure objective and reflects good telco industry practice, while having regard to relevant assessment factors and how they've been applied.

10 For example, how stakeholder feedback is accounted for in expenditure and operational planning.
11 *Deed relating to PQP2 Independent Verification* (3 May 2023), at [2.2].

KPMG's audit provided assurance to the Directors over the following elements of the proposal:

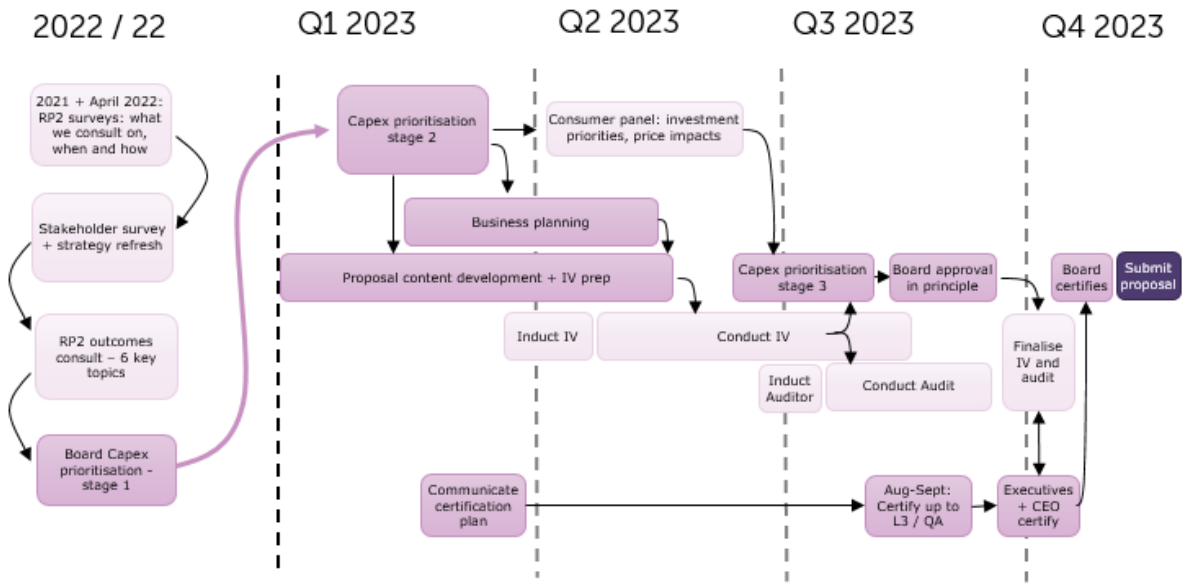
- Numerical accuracy of financial and other forecasts
- Compliance with the regulatory requirements under Part 6 of the Telecommunications Act (the Act) – namely the Input Methodologies and other requirements relating to opex as issued by the Commission under s 221 of the Act
- Accurate representation, in all material respects, of Chorus' operations.

The diagram below illustrates the high-level process by which the PQP2 proposal was developed and approved.

AUDIT

Audit scope includes numerical accuracy of forecasts, compliance and accurate representation of Chorus' operations.

FIGURE 2.2: PQP2 PROPOSAL DEVELOPMENT PROCESS



The PQP2 proposal development process included:

- three stakeholder surveys, a formal consultation and in-depth price-quality trade-off discussions through the PQP2 stakeholder workshops and interviews[12]
- three stages of investment prioritisation, informed by the stakeholder feedback above, and separate market research and analysis
- a series of nine interactions with the Chorus Board and Regulatory Sub-Committee, including with the Independent Verifier and Independent Chair of our stakeholder workshops and interviews, as well as more in-

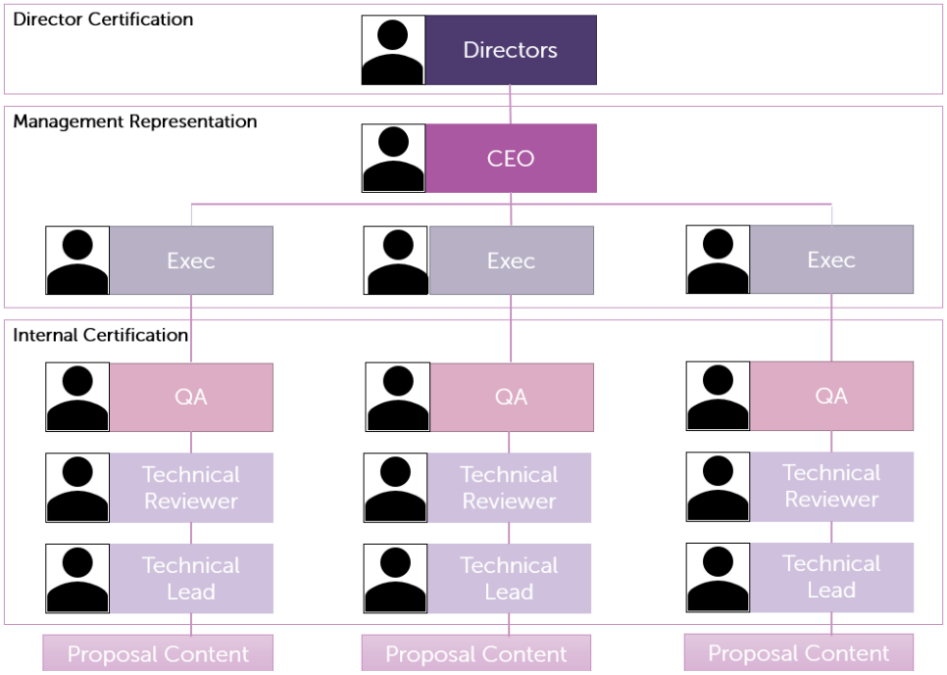
12 Please refer to our Engagement chapter for more information on our stakeholder engagement processes.

depth out-of-cycle Director briefings, leading to approval and certification of the PQP2 proposal.

In addition to reports from the IV, auditor and Independent Chair overseeing the PQP2 stakeholder workshops and interviews, as part of their wider reasonable enquiry, certifying Directors place reliance on certification by Chorus management. These representations begin at a technical level, followed by technical review, quality assurance and Executive and CEO certification. The focus of this internal certification is to ensure:

- the information we provide is accurate and reflects the business operations of Chorus
- the proposal is complete and complies with Commission requirements.

FIGURE 2.3: MANAGEMENT REPRESENTATION TO DIRECTION CERTIFICATION



Overall proposal governance

The process used to develop our proposal and the governance activities has included:

- Stakeholder engagement – we have engaged stakeholders at multiple stages to improve the quality of our proposal and ensure priorities reflect the needs of end-users and other stakeholders. The Engagement chapter describes how engagement has iteratively shaped our PQP2 proposal.
- Asset management roadmaps – our asset management, cost estimation and asset data roadmaps submitted to the Commission in August 2022, and the progressive implementation of these roadmaps, is increasingly influencing Chorus' asset management and planning practices, with flow through to expenditure forecasts.

- Top-down guidance – following testing with the Chorus Board, our finance and strategy teams provide guidance to inform the annual business planning process. This includes demand forecasts, macro-economic indicators, capital constraints and any strategic prioritisation guidance.[13]
- Bottom-up forecasting – informed by top-down guidance, a 10-year bottom-up capex forecast is prepared using appropriate forecasting methodologies (e.g. different between lifecycle, demand and benefits drivers). Bottom-up opex forecasts are prepared for the near term to inform budgets and market guidance, with base, step and trend (BST) for medium-and longer-term horizons used for the first time by Chorus.
- Internal review and challenge – the planning process involves successive review and challenge rounds involving finance and investment managers, senior managers, individual Executives and the CFO and CEO. The review process is designed to test assumptions on the need, timing, cost and deliverability of operating and capital expenditure categories individually and collectively.

  Feedback is sought from the Board on the draft plan and any changes are made. The Board is then asked to approve the budget for the following year and note the outyears of the 10-year plan.
- Independent verification – as outlined above, our PQP2 proposal was required to be verified by an independent verifier approved by the Commission.

  The independent verifier challenged our proposed expenditure and provided opinions on our proposed quality standards and the effectiveness of stakeholder engagement.

In July 2023, Synergies provided a draft report with its findings. This draft provided us with the opportunity to make changes to our proposal ahead of Synergies final verification report and submission of our proposal. Changes we have incorporated into our proposal since the draft report include:

- clarification of terminology, explanation and justification of assumptions, linkages, further substantiation and evidencing of plans and proposed expenditure (in multiple areas across the entire proposal), where necessary, to satisfy evaluation criteria specified by the Commission
- adjustment to proposed capex (totalling $19m reductions) and opex (separation of $14m in investment enabled opex efficiency gains from the BST forecast) and expenditure categorisation changes to better align with the Commission's priority expenditure categories
- further development of the PQP2 Engagement report, with explanation of link between end-user feedback and the PQP2 proposal, and modification of proposed changes to quality standards.

PROPOSAL EVOLUTION

We incorporated feedback from the IV and auditors into our final PQP2 proposal.

13 Stakeholder feedback and market research informs top-down guidance.

We expect Synergies' report to assist the Commission with its evaluation of the PQP2 proposal and to provide confidence to stakeholders that our proposal strikes an appropriate balance between the cost and quality outcomes of our network services. We acknowledge some areas where further scrutiny will be required by the Commission during evaluation, in particular resilience and network extension, where proposed investment is subject to market testing (cost and deliverability) and developments.

- **Final stakeholder testing** of the major discretionary areas of expenditure in our draft proposal occurred in parallel with IV. This process largely validated plans developed in light of earlier stakeholder engagement – although there are two areas where stakeholder preferred a higher case investment option (resilience and sustainability). Further information on how we engaged with stakeholders, and took their feedback into account, is detailed in the Engagement report.
- **Board approval and Director certification** – approval of expenditure and quality proposals occurred after considering final stakeholder and IV feedback. This included Directors meeting with the IV and twice with the Independent Chair of our stakeholder engagement processes. Director certification occurred after completion of management certification and external audit.

BALANCE

Our proposal strikes an appropriate balance between cost and quality outcomes.

The section 221 notice requires Chorus to explain the governance process relevant to planning and delivery and milestones passed in respect of Chorus' internal governance and approval policies for:

- each connection type or connection sub-type
- priority base capex and opex sub-categories.

The entirety of the opex, base capex and connection capex (including priority base capex and opex categories) included within the PQP2 proposal was subject to the internal planning, governance and approval processes and approval processes described above. In terms of milestones passed, the planned expenditure has been subject to:

- independent verification in accordance with the terms of reference specified by the Commission
- independent audit in accordance with the terms of reference specified by the Commission
- Director certification in accordance with the requirements specified by the Commission.

Expenditure proposed in this submission and undertaken in PQP2, including priority connection capex, base capex and opex will be subject to the approval, governance and delivery policy and frameworks described in the financial management section below (2.3.2). The application of those processes will take appropriate account of demand and other developments.

While approval for all the planned expenditure will be subject to those processes, a portion of the proposed base capex relating to network extension and resilience remains subject to pricing and market developments.

2.3 Our key management frameworks

2.3.1 Product management

Product management is primarily concerned with bringing new products to market, improving existing products, and managing products through to retirement. This process is critical for:

- ensuring our services are attractive, competitive and compliant
- prioritising product efforts to make best use of limited Chorus and retailer change capacity
- linking product priorities into asset management to drive network capability
- linking product priorities into financial, regulatory and wider management activities.

PRODUCT MANAGEMENT

Our product management processes ensure our services are attractive, competitive and compliant.

'Product' in our context can mean anything from major new features or services to small enhancements or tweaks to existing offerings. Product encompasses the following:

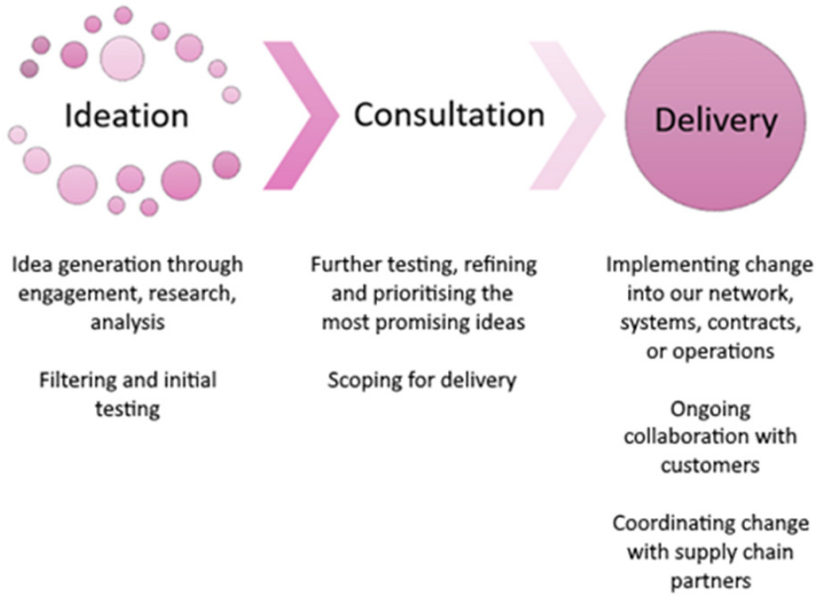
- **New network capabilities or technology** – for example, emerging Optical Network Terminal (ONT) capabilities (such as smaller-form-factor for 'Internet of things' use cases), XGS-PON technology (which enables our Hyperfibre plans) and improved network transport technology (e.g. 100Gbps high bandwidth handover links)
- **New market opportunities** – for example, Big Fibre Boost, Chorus Datacentre Connect, ONT PowerSense, smart locations
- **Process improvements** – for example, improvements to the 'intact ONT' connect experience and self-installation for upgrade or replacement ONTs
- **Commercial arrangements** – for example, incentive offers for Retail Service Providers (RSPs), such as the current Pure Fibre, Home Fibre Starter and FLASH incentive programmes[14]
- **Implementation of the contractual framework** – necessary for the post-2022 environment, including the new regulatory framework
- **Social or community benefit initiatives** – for example, Network for Learning (N4L) with schools, our 'Shed and Shine the Light' programme of community engagements, COVID-19 Ministry of Education subsidy, and our participation in the Digital Boost Alliance
- **Product lifecycle management** – for example, copper withdrawal plans and grandfathering legacy business services.

Product management starts with ideation and moves through consultation and into delivery, which can involve commercial, operational, information

14 More information on current incentives can be found on our service provider website: https://sp.chorus.co.nz/product-offers

technology and network technology changes. Delivered products are then managed through their lifecycle and into retirement.

FIGURE 2.4: PRODUCT DEVELOPMENT SEQUENCE



Our Chief Customer Officer (CCO) is accountable for the operation of this process. Key components of the management system are the following:

- **Initiative to Market (I2M) process** – this involves a weekly forum that reviews initiatives and operates an approval gate between ideation and consultation, and a launch approval process for taking initiatives from delivery into operation. Stakeholders from across the business (including financial, legal, commercial and operational) meet to discuss initiatives' aims and risks, with a view to broad internal visibility of our product pipeline and ensuring appropriate scrutiny.
- **RSP engagement** – we have around 90 RSP customers (at the time of writing) who are critical to the success of our products. We coordinate our engagement through multiple channels that include the TCF Product Forum, Product Roadmaps, account management, Chorus Live roadshows and Chorus Informer updates made available on our service provider website.[15] In 2022 we established a new semi-annual Chorus Strategy briefing for RSPs that gives our product, sales and marketing (PSM) team an opportunity to update RSPs on recent performance, product and proposition updates, and to discuss these with RSPs.
- **Market research** – we have a dedicated consumer and market insights team that frames research objectives, plans and executes research initiatives and develops recommendations based on findings. We also run a monthly customer experience survey with an external research partner. This team advised and supported PQP2 engagement activities and development of the Engagement report.

15 Chorus service provider website: https://sp.chorus.co.nz/

- **Product, sales and marketing technology delivery** – we run an integrated technology and business delivery programme to bring new product capability and changes to market. The technology office is responsible for the coordination and delivery of network, IT and integration business change.

Key links between the product management system and other management systems include the following:

- **Financial management** – via Executive Steering Groups and our Quarterly Business Review, we operate approval gates between consultation and delivery where the product strategy is looking to commit capital expenditure.
- **Business planning** – our product strategy and roadmap interact with business planning to form revenue targets, and expenditure budgets and forecasts.
- **Asset management** – our product strategy and roadmap link with our network strategy and planning, delivery and operation, providing a continued focus on the customer and products.
- **Regulatory planning and compliance** – via business planning and compliance management forums to ensure compliance with regulatory requirements such as information disclosures and pricing compliance.

Product management is a fast-moving area for telecommunications, and an ongoing priority as we work to attract and retain fibre consumers. Important trends over PQP2 include the following:

- As connection numbers grow and connection activity slows, an increasing part of our business is focussed on managing intact services. In addition, we will be managing the final stages of migration from copper services in some parts of our network within the Ultra-Fast Broadband (UFB) footprint.
- To protect and enhance the long-term value of our network, we are refreshing our Initiative to Market process to enhance our prioritisation and value assessment capabilities.
- We are augmenting our core fibre offerings with services that ensure RSPs and end-users get the best experience on our network and remove any inhibitors to this (for example, by reducing in-home network problems and improving service ordering and management processes).
- As our network matures, we have an opportunity to enhance product lifecycle planning and improve linkages to asset lifecycle management.

PRODUCT MANAGEMENT

It's a fast-moving area for telecommunications, and an ongoing priority for us to ensure we're meeting customer and end-user requirements.

Regulatory management

There is also an important regulatory management element to our product management system.

Since demerger, various regulatory instruments have played a role in shaping our products and how we provide them. Our product processes are geared at keeping the business aware of the landscape, and at ensuring appropriate oversight from a regulatory and legal perspective.

Particularly relevant are the following:

- Open access deeds of undertaking for fibre services – these require us to supply services over parts of our network on a non-discriminatory basis, and in some cases to an equivalence of inputs (same prices, processes and systems) standard.
- Line of business restrictions – these are intended to prevent vertical re-integration. At a high level they constrain us from selling telecommunications services directly to consumers, services above Open Systems Interconnection Layer 2, and 'end-to-end' links without any aggregation between sites.
- General competition law – obligations set out in the Commerce Act that apply to all businesses and inform our interactions with customers and competitors.

As we continue to transition into the new form of economic regulation, we have put appropriate processes in place to:

- test whether new products or product variations fall within the scope of Fibre Fixed Line Access Services (FFLAS) regulation
- comply with geographically consistent pricing requirements for new and existing FFLAS
- meet compliance requirements relating to revenue control, quality standards, information disclosure and declared services
- undertake internal interpretation reviews of the regulatory requirements under Part 6 of the Telecommunications Act to align on compliance assumptions made and to ensure adequate justification of these assumptions.
- undertake compliance reviews with KPMG in support of their audit opinion on compliance with the regulatory requirements under Part 6 of the Telecommunications Act.

REGULATORY MANAGEMENT

Price-quality regulation is only one of many regulatory requirements Chorus must manage. These various regulatory instruments shape our products and operations.

2.3.2 Financial management

Financial management is concerned with ensuring financial resources are put to their best use. It includes core financial planning, funding, control and reporting functions.

Our CFO is accountable for our financial management systems. Key activities include the following:

FINANCIAL MANAGEMENT

We ensure our financial resources are put to their best use, including via business planning, capital approvals, quarterly planning cycles, external and performance reporting, policy setting and asset accounting.

- **Business planning** – our Board approves a business plan by June each year that sets budgets and revenue targets for the coming year and forecasts performance over 10 years. The business planning round spans six months of direction setting, forecast preparation, and challenge and approval activities.
- **Capital approvals (refer to Figure 2.5 below)** – capital funding requests are presented to Executive Steering Groups (ESGs), comprising the Chief Technology Officer (CTO) with a delegated financial authority (DFA) of up to $5m and relevant Executive(s) that operate as formal approval gates. These ESGs review business cases above certain thresholds, ensure cross-functional alignment and alignment to the wider company strategy and approve prioritisation decisions that balance changing needs against budgeted resources. For capital funding requests over $5m, the business cases are passed on to the CFO, who has a DFA of up to $10m and the Board for any amounts exceeding $10m for formal approval.[16] This process includes:
    - estimation of the business benefit for each project (feature) over time, including productivity gains, new or changed revenue streams, and avoided costs
    - estimation of the one-off costs, split by opex and capex
    - estimation of the ongoing costs, including technical support, licensing, business and technical operational support, and additional headcount
    - additional costs that may affect other features.
- **Quarterly Planning Cycle (refer to Figure 2.6 below)** – this process links in the monthly ESGs with a Quarterly Business Review (QBR), and quarterly Big Room Planning (BRP). This provides a wider strategic alignment to ensure capital expenditure is correctly prioritised.
- **External reporting** – we prepare annual and interim audited financial statements, and as a dual-listed issuer, have continuous disclosure obligations on both the NZX and ASX. We also prepare annual regulatory disclosures and compliance statements for publication or submission to the Commission, as well as responding to ad hoc regulatory information requests.
- **Performance reporting** – we track monthly progress against operating and capital budgets, and delivery against financial targets, quality of service measures and strategic priorities. This supports reporting to management, our Board and the market.
- **Policy setting** – developing and updating financial policies for Board, ARMC or CEO approval. Policies include delegation of authority, accounting, procurement, external auditor independence, fraud, legal and compliance, managing risk and market disclosure.
- **Asset accounting** – we maintain a Fixed Asset Register (FAR) that records asset settlement and depreciation. We document our approach to asset capitalisation (in line with generally accepted accounting practice (GAAP)),

16 In addition, 'minor works' which are low risk, small value projects which are generally closely associated with meeting customer connection demand or maintaining services levels are subject to a bulk approval process annually. Examples of expenditure approved in this manner are fibre installations, new property developments, and responding to requests from utilities and Road Controlling Authorities to relocate network elements.

which is updated as required. We maintain a regulatory equivalent (the regulatory asset base), which complies with Commission requirements.

Key links between the financial management system and other management systems include the following:

- **Product management** – our Initiative to Market (I2M) process operates an approval gate between ideation and consultation and a launch approval process ahead of delivery, and we scale overall resourcing through interaction with business planning.
- **Risk management** – financial management interacts with risk management to identify financial risks and opportunities and implement mitigations.
- **Asset management** – intersections occur in planning, decision-making and delivery with the allocation of financial resources to efficiently manage the total cost of asset ownership. Our Agile Funding Process operates as an approval gate between planning and delivery.

Figure 2.5 provides an overview of capital approvals for Tier 1 (projects over $1m) and Tier 2 (projects over $50,000) projects.

FIGURE 2.5: TIER 1 AND 2 CAPITAL APPROVALS AND EXECUTION PROCESS

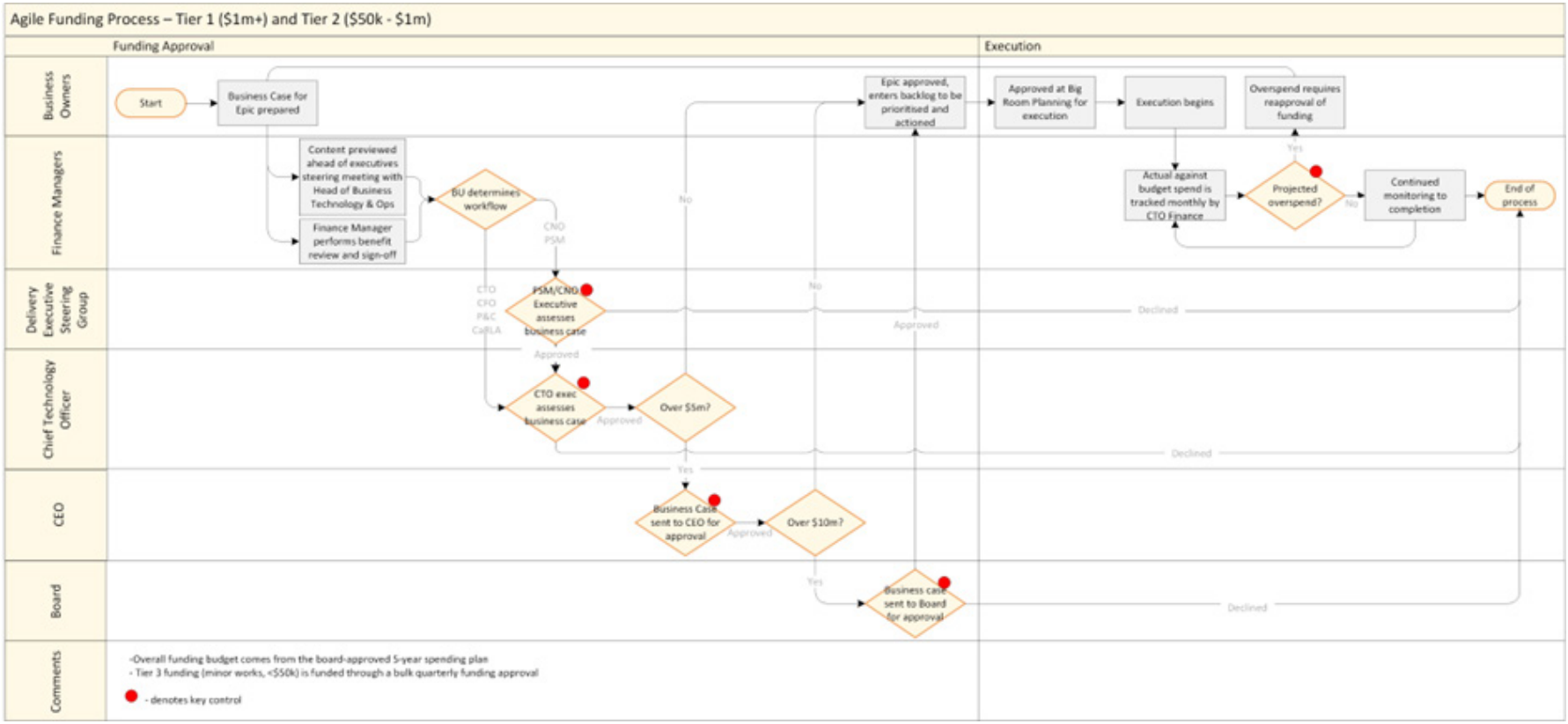
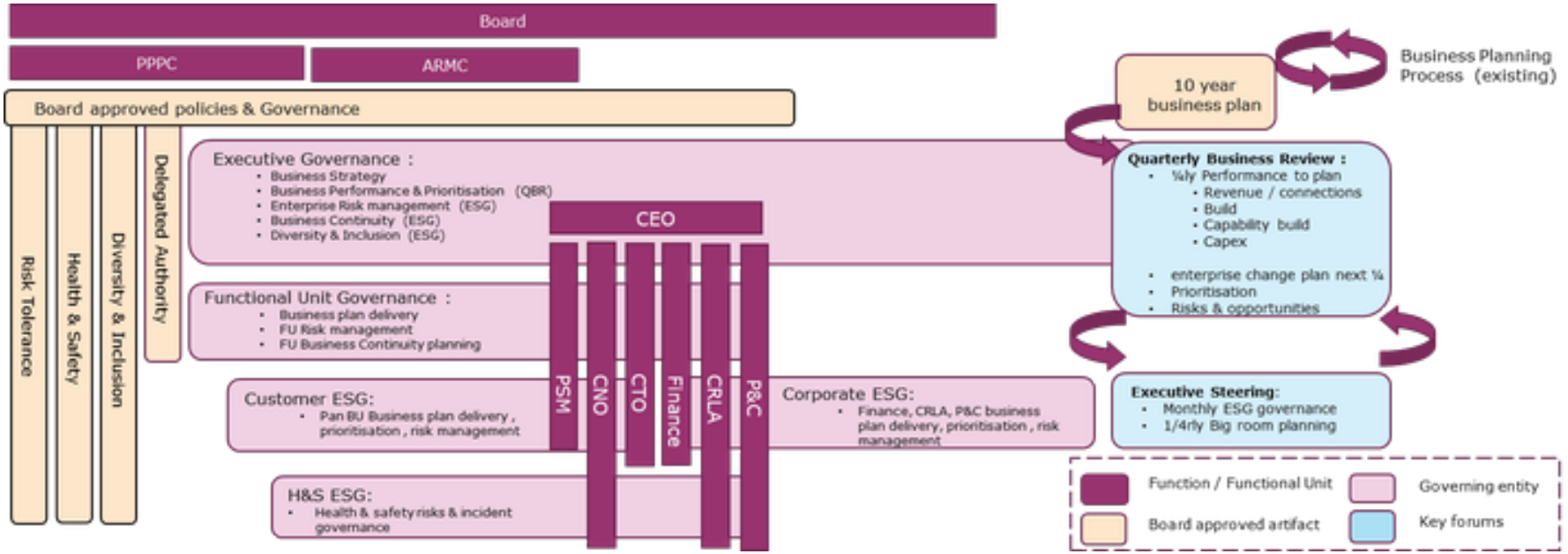


FIGURE 2.6: OVERVIEW OF CHORUS GOVERNANCE ARRANGEMENTS, POLICIES, CURRENT BUSINESS FUNCTIONS AND PLANNING CYCLES



Development priorities

As we are halfway through PQP1, we have progressed from regulatory development (focused on rules development) into full implementation and optimisation. This has driven and will continue to drive considerable change. So far, we have:

- developed asset management and cost estimation development roadmaps and engagement plans, provided to the Commission in 2022. These have been or are being implemented now.
- produced reporting of our price-quality (PQ) performance (including against expenditure allowances and quality standards) to Executive and business teams and the Board.
- allocated accountability of PQ performance (expenditure and quality) to the relevant business units – spreading more widely the ownership of our PQ performance across the organisation and ultimately enhancing our performance against the PQ settings
- implemented monitoring of our under- or over-recovery of FFLAS revenue to better understand its impact on the wash-up balance and on our future FFLAS revenue requirements
- begun a journey to systematise PQ financial reporting. The current focus is on the delivery of our FFLAS expenditure forecasts through the SAP tool 'Business Planning and Consolidation'. When completed, the conversion of our total forecast expenditure to FFLAS will be performed in a system instead of through a complex set of Excel models. As we continue to implement these projects our reporting will become less manual and more effortless overall, driving cost efficiencies in the longer term.

In addition to strengthening the implementation of the initiatives listed above, for the remainder of PQP1 and PQP2 our ongoing efforts will focus on:

- embedding production and delivery of new information disclosure and other compliance requirements (as developed by the Commission in 2021) to simplify production and reduce risk of error in these complex and interlinked compliance deliverables
- building on our PQP1 and PQP2 preparation efforts to streamline and enhance our ability to produce regulatory proposals in future and to better embed these relevant processes withing the organisation, driving cost efficiencies in the longer term
- evolving our decision-making capability to better align with the regulatory incentives, driving cost efficiencies in the longer term but also to allow for more streamlined regulatory approval processes.

IMPLEMENTATION OF PQID REGULATION

We have moved from development of PQID settings into full implementation and optimisation. This has involved significant business change, including new performance reporting and associated responsibilities, revenue monitoring and systemisation.

2.3.3 Risk management and internal audit

Risk management is concerned with understanding and addressing risks and opportunities. Our risk management system is concerned with ensuring:

- risk management is consistently embedded into day-to-day business operations and decision-making
- suitable processes and ownership are in place for identifying, understanding and managing risks
- our Board approves the risk management policy, sets the risk appetite and tolerances and approves the principal risks.

RISK MANAGEMENT AND INTERNAL AUDIT

We seek to understand and manage risks, including developing risk tolerance levels.

Our Board annually reviews and sets a risk appetite statement and risk tolerance levels and reviews and approves principal risks, along with holding quarterly discussions on emerging and unforeseen risks. The ARMC receives and reviews regular management reporting against the risk management framework and on principal, and business unit risks. Our Board also periodically reviews and approves a managing risk policy available on our website.[17]

We have an internal audit programme that includes the use of external specialists to review and report on internal processes and controls. The ARMC provides oversight of the internal audit programme and monitors actions arising.

A dedicated Compliance Manager, including with the support of external specialists, also provides expertise and oversight of a framework for managing key legislative, regulatory and contractual obligations, and over internal policies.

Our General Counsel is accountable for risk management and internal audit, and our CEO and wider Executive have company-wide oversight and decision-making responsibilities for operational risks within their functional units within the Board-approved risk management framework. We have a dedicated team to support effective risk management, including by promoting awareness, building capability and advising on good practice.

Key links between risk management and other management systems include the following:

- **Product management** – the relevant approval gates ensure risk assessment from a wide range of stakeholders.
- **Financial management** – the ARMC has responsibilities across risk and financial management, and much of the financial management system is directed at addressing risk. The risk management system provides supporting expertise and systems for monitoring and reporting, including through the internal audit programme.
- **Asset management** – the asset management system considers risk profiles and impacts against the Chorus risk framework. It identifies mitigation plans where progress is monitored and reported. The risk

17 https://company.chorus.co.nz/sites/default/files/downloads/chorus-board-approved-policy-managing-risk-policy.pdf.

management system provides the overarching system for monitoring and reporting.

Development Priorities

As we move from network build, through connection and into operation, our risk management priorities and focuses are changing. In particular, we are working to:

- enhance asset risk management, as part of our wider asset management capability build
- manage compliance obligations associated with new price-quality and information disclosure regulation
- co-optimise outcomes under the new form of economic regulation for end-users and us, to ensure the sustainability of our business for end-users and other stakeholders.

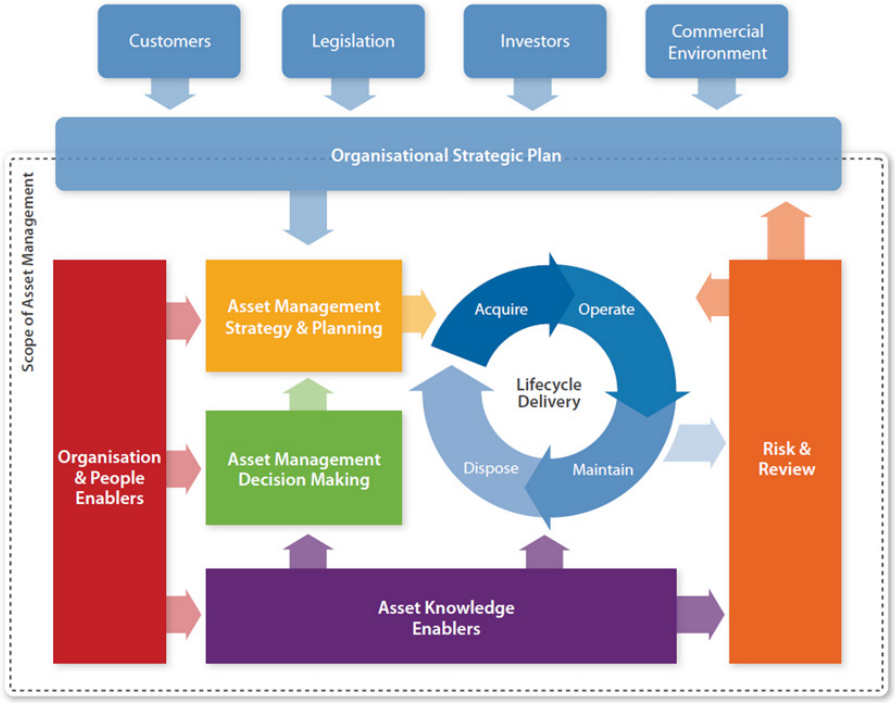
2.3.4 Asset management

Since our first price quality proposal, we have undertaken extensive work to better understand our current asset management capability, our vision of what this should look like in the future, and the governance needed to improve outcomes for customers and our shareholders.

It is important to recognise we are on an asset management journey to evolve and develop capability in the way we think about and manage our assets. The history of the telecommunications sector in Aotearoa, and in particular the roll-out of UFB in a competitive market, has significantly influenced our historical approach to asset management and the drivers for investment.

Asset management is a broad discipline, covering all aspects of how we can realise the best value from our assets to meet our regulatory and strategic objectives.

FIGURE 2.7: IAM CONCEPTUAL ASSET MANAGEMENT MODEL[18]



In August 2020 we commissioned AMCL, a leading asset management consultancy, to undertake an independent review of our asset management capability against international benchmarks and two internationally recognised asset management frameworks:

- ISO55001
- The Global Forum on Maintenance & Asset Management (GFMAM) 39 subject areas.[19]

We have already provided the full AMCL report to the Commission for its reference. A key finding of this independent review found our asset management capability was similar to other organisations undertaking their first assessment against the ISO 55000 criteria, with our asset management maturity found to be generally competent but behind leading practice compared with other recently assessed companies.

AMCL found our strengths oriented toward lifecycle delivery, which fits with our recent focus on UFB roll-out. Many of our assets are short-lived, and we also offer services and products in a competitive environment of fast-paced technological change. This means we have strengths in organisational culture and decision-making agility relative to other utility sectors. We recognise potential exists to lift our asset performance in areas that are becoming more important value drivers in our current operating environment. We fully appreciate that increasing our asset management capability will enable us to gain more value from our capital and operational expenditures, and more effectively manage risks that impact customer service levels.

ASSET MANAGEMENT

Various opportunities for improvement have been identified within our asset management systems and processes. We are using development roadmaps to implement changes.

18 Copyright 2014 Institute of Asset Management (www.theIAM.org).
19 Further information on the GFMAM can be found at https://gfmam.org/publications.

Since AMCL's independent review we have further enhanced our practices to support our first and subsequent regulatory proposals, and the early part of our transition from a build to operate environment. We have used the 39 subject areas defined by the GFMAM to inform our future planning and have created a series of three development roadmaps that have already been provided to the Commission in August 2022. These roadmaps include our:

- **Asset Management Development Roadmap** – outlining a programme of work to adapt and improve our asset management capability in the coming years (and focussing on PQP1)
- **Asset Data Development Roadmap** – focusing on our management of asset data across all of our asset portfolios
- **Cost Estimation Development Roadmap** – to improve consistency, robustness and confidence in our future cost estimating processes.

To deliver our development roadmaps, we will need additional dedicated resource, and longer term we'll need to evolve our operating model and capability to better fit our new ways of managing our assets. Our leaders will champion change and ensure our culture and priorities support our asset management system. This commitment to change is already demonstrated by supplementing our existing structure with the creation of a Centre of Excellence to bolster resourcing and leadership in the near term. To prepare for longer-term change, we plan to develop capability and competency models, and to link asset management into ongoing work on operating model change.

Our Chief Technology Officer (CTO) is accountable for our asset management system overall, though the breadth of asset management means there are strong links to finance, strategy, operations, customer executives and, ultimately, the regulatory function.

We have a CEO-approved asset management policy. Key components of our asset management system include:

- business planning process that translate asset plans into financial forecasts that are challenged and approved to set annual budgets and provide a 10-year view of expenditure needs
- approvals for programme and individual expenditure plans based on business cases that provide analysis to support decision-making
- product and risk management systems that interact with these planning and approval processes to support our asset management plans and influence our capital programme and network capability
- physical network lifecycle delivery that is managed through our customer and network operations executive using contracted field service providers
- asset information being managed by investment managers, with enterprise-wide systems for financial accounting (FAR) and geospatial data (NetMAP).

CENTRE OF EXCELLENCE

Additional resources are required to deliver against our development roadmaps, championed by our leaders and a newly created Centre of Excellence.

Having completed the UFB rollout in late 2022, we are intensifying our efforts to re-design our asset management practices and governance as envisaged in our asset management roadmaps, our 2022 Information Disclosures[20] and August 2023 progress report to the Commission.

In doing this we have focused, and continue to focus, our efforts where they will make a difference for end-users. We will not succeed if we adopt a compliance-centric focus or simply transpose solutions from other sectors that do not recognise and/or differentiate for the specific characteristics of the telecommunications and fibre sectors in Aotearoa. Our initial objectives are to create an environment across Chorus that enables incremental changes to be made through building capacity and momentum, creating a solid foundation for further, deeper change and learning through doing.

Our PQP2 proposal has a richer understanding of our current state than before – we have updated and used some of our Portfolio Asset Management Plans (PAMPs) and IT Development Plans (ITDPs) to trial multiple asset management system improvements. We also have captured these insights into our Strategic Asset Management Plan (SAMP) and various framework and guideline documents that can improve our cost estimation processes.

By the end of PQP1 (December 2024) we aim to have begun embedding the capabilities and processes that will transform asset management across our wider activities.

Development priorities

Priorities for enhancing our asset management system include the following:

- **Documentation** – implement a review and upkeep cycle for our asset management documentation that will support accountability, improve capability and further inform improvement priorities.
- **Asset information** – develop an asset information management strategy and an asset information management framework, and begin to implement asset information system improvements.
- **Reliability** – develop a network reliability strategy suitable for the transition from a contractual to regulatory investment framework.
- **Planning** – scope improvements to our planning and decision-making, including to adapt to our new regulatory arrangements.
- **Organisation and people** – review whether and how we should further evolve our operating model as build activity winds down and installation activity eases

20 Published on our website: Price quality and information disclosures | Chorus NZ

3.0 DEMAND

Te Tonotono

3.0 Demand

This is our IFP Demand report. It introduces demand types and their linkages to our plans, presents our key forecasts and explains how we put those forecasts together.

3.1 Our Demand report at a glance

Understanding demand trends is fundamental to us – for both the short and long-term, it enables us to plan effectively and efficiently, from both a financial and operational perspective.

Many important aspects of our PQP2 proposal rest on our assumptions for certain demand types. For example, our forecasts for:

- demand from developers to lay fibre into new property developments (NPD demand) drives our forecast for Extending the Network capex
- demand from end-users to have fibre installed at their premises (installations demand) drives our forecast for Installations capex
- demand from end-users to activate their connection (connections demand) drives our forecast for provisioning costs we capitalise
- bandwidth demand drives our forecast for Network Capacity capex and informs our proposed changes to the setting of the performance quality standard.

CONSISTENT

Across our proposal we use consistent demand forecasts for network extension, installations, connections, and bandwidth.

In recognising the importance of understanding demand trends for our business, we have an internal team that forecasts various types of demand that inform our fibre and copper businesses. This team uses a range of sophisticated forecasting tools with reference to independent and well-accepted sources, where available, and engages with subject matter experts from across Chorus to forecast the relevant demand types as precisely as practically possible.

The governance and challenge processes we apply to our demand forecasting function are rigorous, acknowledging the significance of demand forecasts for downstream activities and customer outcomes. These processes include thorough peer challenges, ex-post reviews and, for bandwidth demand, benchmarking our forecasts against those from global peers. In any case, before outputs from our demand forecasting function are passed on downstream as inputs to our expenditure forecasting functions, final sign-off is required by Senior Management, following the processes we describe in our Governance report.

SUFFICIENT

Our proposal is designed to meet forecast demand.

We acknowledge there will always be residual forecasting risk, particularly when forecasting outcomes that are impacted by factors outside our control, such as demand for network extension or new installations. These are, amongst other things, strongly linked to macro-economic factors, competitive pressures, force majeure events, technology trends and end-user behaviour.

While we continuously look for ways to improve our current methodologies – and a lot has happened in the short time frame since we produced our PQP1 demand forecast – significant uncertainty remains in some areas. This means we will continue to rely on other regulatory tools to mitigate some of the risk that is associated with demand uncertainty. For example, we can use the connection capex mechanism to wash-up the differences between forecast and actual installation volumes, and we can use the individual capex proposal mechanism to respond to demand trends we were unable to foresee at the time of making our PQP2 proposal.

The types of demand that are key drivers of our forecast PQP2 expenditure are largely related to network growth, directly or indirectly. While we are seeing signs of fibre uptake saturation in some areas, continuous demand from developers to lay fibre into new property developments in combination with our network extension plans mean demand for installations and connections activity remains strong.

At a high level, we see the following key demand trends impacting immediately on our forecast expenditure for PQP2:

- Following historically high levels from 2020 through to 2022, the volume of **new property developments** will slowly decline as the housing deficit erodes and population-driven demand moderates.
- Following the peak of fibre installations in 2018-2019 following Ultra-Fast Broadband (UFB) roll-out, we expect **installation and connection volumes** to settle at a long-term steady state, largely driven by ongoing NPD demand and network extension plans.
- Peak throughput on the network – and therefore **bandwidth demand** – is forecast to grow by 25% per annum, predominantly driven by continuous growth in the average usage per connection.

ENHANCED

We have significantly enhanced this report compared to our 2020 Integrated Fibre Plan.

FORECASTS

We forecast new property development demand declining, installation volumes settling to a steady state, and bandwidth demand growing by 25% per annum.

3.2 Introduction

Demand forecasting enables us to plan effectively and efficiently, from both a financial (expenditure and revenue) and operational perspective. Understanding future demand as it relates to our business helps us provide fibre services consistent with the expectations of our customers, end-users and investors. It better enables us to identify needs across a range of areas that are crucial to our service, including:

- internal and external labour requirements – e.g. field resources to execute orders and operational staff to manage orders
- IT requirements supporting our ordering system capability
- evolving network electronics technology – e.g. the transition to next generation optical network terminals (ONTs)

- capex requirements relating to areas such as Network Capacity and Installations
- Maintenance opex.

3.2.1 Types of demand

Although there are many types of demand that are important to Chorus, this report focuses on the four types that have key direct or indirect impacts on our FFLAS-related forecasts:

1. **Network extension demand** – demand from communities and property developers to extend the network into new areas
2. **Installation demand** – demand from end-users and property developers to install a new fibre lead-in
3. **Connections demand** – demand from end-users to activate their connection
4. **Bandwidth demand** – demand for network capacity based on end-user traffic.

Network extension demand

Before end-users can install fibre, we need to extend the communal network into their town, street, or development. Historically, much of this work has been planned well in advance (i.e. with the government during the UFB build), and is therefore not demand-driven. Going forward, more of our network extension work will be driven by demand for property development (often referred to as NPD demand).[21]

Over the near term, we forecast how contracted developments will proceed, and over a longer horizon we also forecast demand that is not already contracted. These forecasts are an input to our Extending the Network capex, but also impact future Network Sustain and Enhance capex and Network opex requirements as new assets created have operating and maintenance requirements.

Installations demand

Once we have extended communal network coverage, end-users or property developers can order an installation for their house, office, or other end point (such as digital billboards). This installation work is entirely demand-driven and discussed in our chapter on Installations capex.

Our associated funding requirements are part of the connection capex expenditure we propose for PQP2 which is designed to mitigate installation demand uncertainty in setting expenditure allowances.

Connections (lines) demand

Once an installation is completed and an ONT installed at an end point, an end-user can activate their connection. End-users can also deactivate

NETWORK EXTENSION

With less planned extension, new property developments will become a key driver for network extensions.

CONNECTIONS

Most installation costs are recovered as 'connection capex'. A 'connection' is an active installation, and an 'intact' is an installation without an active connection.

21 We note our plans to extend the UFB network beyond its current footprint are not in scope for this Demand report but are discussed in detail in our Fibre Frontier report. This is because this extension does not have a direct link to demand as, for example, NPD, and is predominantly driven by the economic benefit it will provide to New Zealanders.

connections, reducing the pool of active connections (but leaving an intact connection in place).

While our connection forecast only drives a small proportion of the network capacity capex forecasts, it drives our Customer opex and, most importantly, is a key driver of our bandwidth forecast.

Bandwidth (network capacity) demand

Once connected, end-users can transfer data across our network. Bandwidth demand depends on the number of connected end-users, and peak throughput per user. Both parts of this equation grow over time, and we must add network capacity to keep the network congestion-free and to deliver a quality of service as determined by the quality standard for network performance.

BANDWIDTH

We add network capacity to ensure we can meet bandwidth demand without congestion.

3.2.2 Stakeholder feedback

We consulted on aspects of future demand, and particularly the assumptions that inform our demand forecasting, during round three of our formal proposal consultation in November 2022. While the overall feedback was limited – possibly reflecting the technical nature of this topic – we noted the insight from retail service providers (RSPs) that data usage was likely to continue to grow, while the rate of connection growth would slow, meaning the utilisation of existing fibre assets was likely to increase.

We agree with this observation regarding data usage, which is reflected in our bandwidth demand forecast. In this context we note the increasing volatility of demand spikes, localised and aggregated, are problematic from a forecasting perspective. We discuss the issue this creates in our Quality report – in short, while we build network capacity ahead of demand to manage this, building sufficient capacity to cater for every potential demand spike would require significant additional investment. In our view this would not be prudent or efficient and we suggest a change to the performance quality standard to acknowledge this volatility and avoid the need for inefficient investment.

We also agree with RSPs that connection growth within the current network footprint will slow, though we consider connection growth will continue through NPD, network expansion, infill work and smart locations. We note installation volumes are subject to the connection capex mechanism (discussed in the Connection Capex chapter of Our Fibre Assets), mitigating demand uncertainty.

CONSULTATION

We consulted on demand assumptions to provide an opportunity for stakeholders to share their views and insights.

3.3 Links to our price-quality proposal

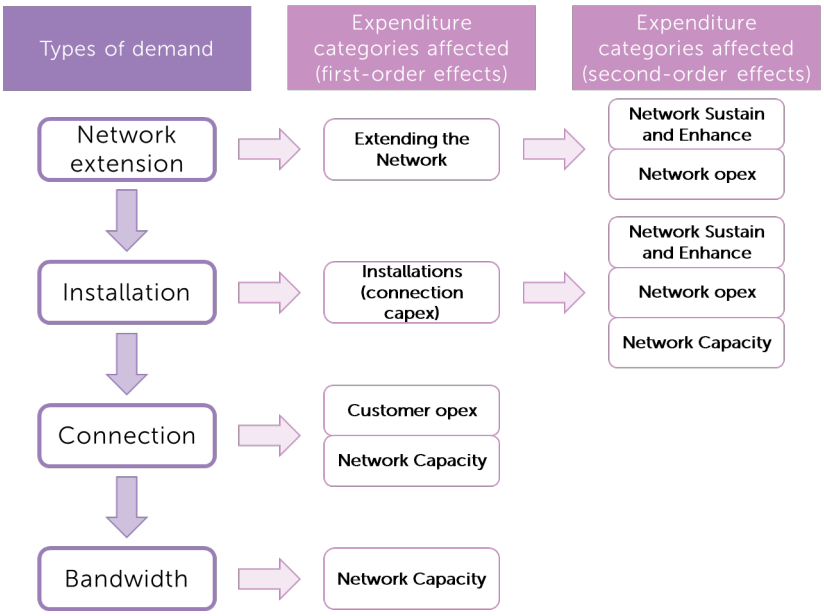
As briefly explained above, these demand types all link to a range of expenditure forecasts.

The below chart provides an overview of these linkages, which are further discussed in this report under each demand type section.

LINKED-UP

We have a linked-up approach to forecasting types of demand and their impact on demand-sensitive expenditure.

FIGURE 3.1: TYPES OF DEMAND AND FLOW ON EFFECTS



Bandwidth demand also explicitly links to our proposed quality standard for network performance, which uses port utilisation as a proxy for network congestion. We provide more detail on this relationship in our Quality report.

3.4 Demand modelling framework

We use a range of models to forecast each type of demand. These models have linkages to one another to ensure they are internally consistent and, ultimately, to maintain alignment across planning process.

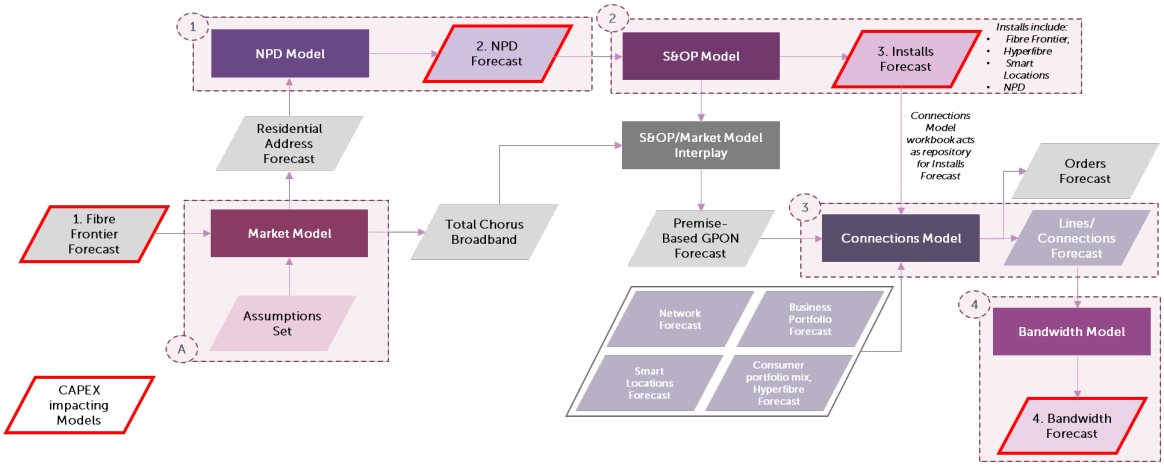
The below table and diagram show the various models we use to forecast demand, as well as the expenditure categories they drive.

TABLE 3.1: DEMAND MODELS

MODEL:	DESCRIPTION:	KEY OUTPUT:	OUTPUT INFORMS:
A. Market Model	A key foundational model that essentially acts as a 'scene setter' for downstream models. While it does not directly forecast one of the four demand types covered in this chapter, it provides integral inputs into these models	Residential address forecast	NPD Model
		Chorus broadband connections (copper and fibre)	Connections Model
1. NPD Model	The key model we use to forecast demand from developers to lay fibre into new property developments. It uses the residential address forecast from the Market Model.	NPD forecast	S&OP Model
			Extending the Network capex

MODEL:	DESCRIPTION:	KEY OUTPUT:	OUTPUT INFORMS:
2. S&OP Model	The Sales & Operations Planning (S&OP) model is what we use to forecast fibre installations across our network. Amongst other inputs, it uses the NPD forecast from the NPD Model.	Installations forecast	Connections Model Installations capex
3. Connections Model	The model we use to forecast connections across our fibre network. It compiles and balances multiple product forecasts from across the business.	Connections forecast	Bandwidth Model Customer opex
4. Bandwidth Model	The model we use to calculate regional bandwidth forecasts by combining the average throughput per user forecast (ATPU) with the connections forecast (by product) from the Connection Model. We also propose to set our quality standard for network performance having regard to our bandwidth forecast.	Bandwidth forecast	Network performance quality standard Network Capacity capex

FIGURE 3.2: DEMAND MODEL FRAMEWORK



3.5 Demand forecasting challenge and governance

We follow separate challenge processes for NPD, installations and connections demand on the one hand and bandwidth demand on the other hand.

As all demand forecasts primarily serve our business planning processes, ultimate sign-off for these forecasts is obtained under the associated governance processes (see our Governance report for more information).

The separate challenge processes we follow are as per below:

For NPD, installations and connections demand

- **Model change control** – changes are peer reviewed and documented. Changes are made to reflect changing business requirements (for instance, the introduction of a new product in the Connection Model), or to implement an updated modelling approach.
- **Model version control** – a separate copy (Excel workbook) is created for each version of the model. There is at least one version for each time period (monthly for the S&OP Model, per planning round for the Market, NPD, and Connections Models), and usually more as different scenarios are evaluated.
- **Forecast accuracy review** – forecast accuracy is reviewed every time updated actual data is available (monthly for the S&OP Model, quarterly for the Market Model), and the results are shared with relevant stakeholders. The reasons for variances to forecast are identified, communicated as relevant, and forecast changes or other corrective actions recommended.
- **Forecast output review** – forecast outputs are subject to challenge/ review sessions with a broad audience (including the Finance team) before final sign-off.

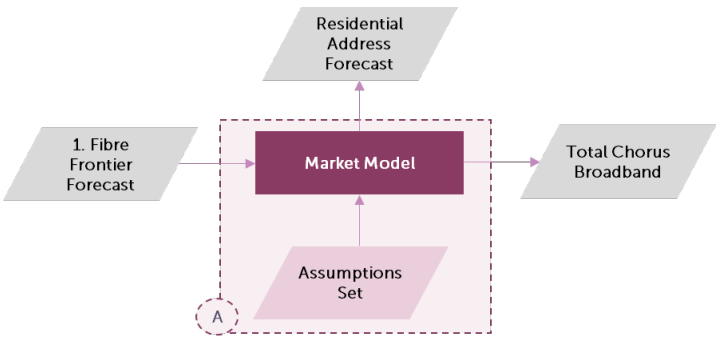
CHECKS AND BALANCES

We apply layers of governance and challenge to ensure our forecasts are robust.

For bandwidth demand

- Internal review of actual vs forecast – the forecast is internally reviewed each year as actual data becomes available. The reasons for variances are identified and used to inform challenge sessions.
- Annual discussions with peers at both NBN (Australia) and TDCnet (Denmark) are used to compare forecast numbers, trends, assumptions and methodologies. The reasons for variances are identified and used to inform challenge sessions.
- Challenge on assumptions and methodology – input from actual vs forecast review and from information sharing with global peers is used to re-assess key assumptions and methodologies. Any resulting changes are then implemented and communicated.
- Forecast output review – the forecast outputs, including the reason for any changes, are subject to challenge/ review sessions with the Capacity Planning team and Head of Technology Strategy and Architecture before final sign-off.

3.6 Total broadband connections (Model A – Market Model)



3.6.1 Context and drivers

Understanding movements in the total fixed broadband connections in Aotearoa (including for Chorus services) is crucial for us to undertake more granular demand forecasting activity.

We use the Market Model to provide a quarterly forecast of total fixed broadband connections in Aotearoa (including Chorus') and over the relevant time-horizon (currently ten years).

The Market Model is a key foundational model that acts as a 'scene setter' for downstream models. While it does not directly forecast one of the four demand types covered in this chapter, it provides integral inputs into these models, either directly or indirectly.

For example, the residential address forecast from the Market Model is an input to the NPD Model. The outputs from the NPD Model, in turn, become inputs into the S&OP Model and are a factor in the installation forecast.

Forecasting total fixed broadband connections requires us to form a view on key underlying parameters, focusing on:

- the macro-economic settings and how these are impacted by domestic and global factors, e.g. COVID-19
- how fibre will continue to position itself against alternative technologies.

PQP2 is expected to commence against a backdrop of muted economic growth. Elevated inflation and upwards pressure on interest rates will continue to present cost of living challenges. Eroded household balance sheets from reductions in property values are likely to reduce consumer confidence and spending. Combined, these have the potential to prompt some end-users to explore lower cost broadband solutions and opt for lower cost wireless services.

While some of the uncertainties driven by COVID-19 have been resolved, the return to a 'new normal' is still unfolding.

For the residential sector, volatility in immigration levels and subsequent population growth continues to introduce uncertainty into our forecasts. Presently, immigration has returned to higher levels than expected, however, the longevity of this increase remains unknown. The short-term impact will likely affect housing occupancy rates and be reflected in fluctuating residential address broadband penetration rates. In the medium term, dwelling supply will shift to meet the demand generated by population growth impacting NPD.

For the business sector, it is acknowledged that COVID-19 has impacted how people work, with digitisation of the workplace and working from home arrangements becoming increasingly common. This continues the trend of blurring lines between residential and business segments, where the traditional construct of a 'workplace' is evolving.

MARKET MODEL

The Market Model (Model A) forecasts total the fixed broadband connections in Aotearoa as a foundation and scene-setter for other models.

Emerging technologies such as fixed wireless broadband and low earth orbit (LEO) satellites are increasing competition and impacting demand for our services.

Broadly, we expect fibre will continue to respond well to these competitive pressures. We intend to continue offering a range of fibre products that balance price and quality in a way that we will remain competitive relative to alternative technologies. With an increasing fibre end-user base, as well as the resolution of the recent technician shortage, we expect fibre consumers' satisfaction to increase and bring continued competitive strength in return.

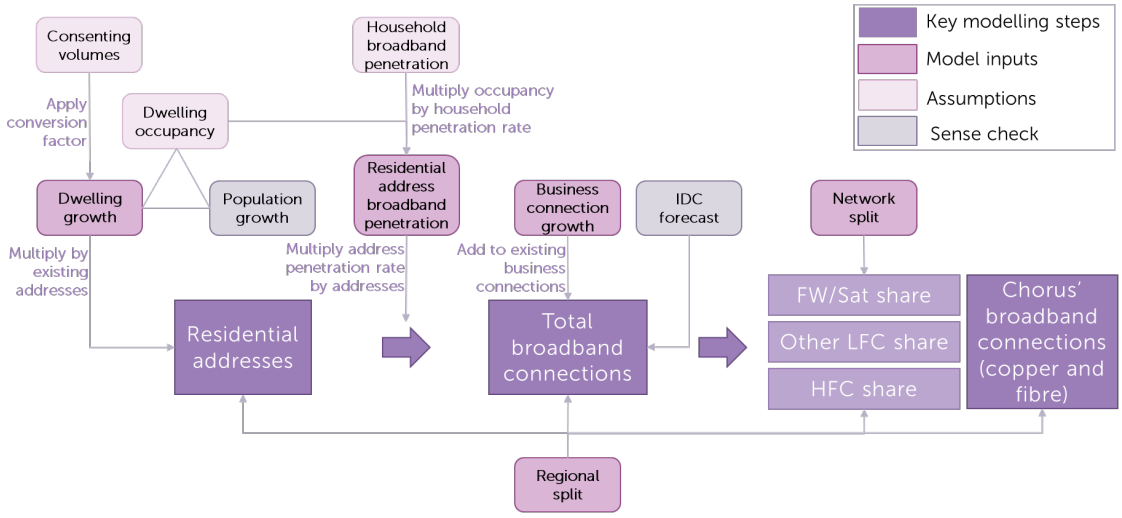
COMPETITION

Emerging technologies such as fixed wireless and LEO satellites are increasing competition and impacting demand for our services.

3.6.2 Model overview

The diagram below shows the forecasting methodology and data flow of Market Model.

FIGURE 3.3: MARKET MODEL OVERVIEW



At a very high level, the key modelling steps are as follows:

1. **Calculate residential addresses** – forecasting the number of residential addresses[22] in Aotearoa based on dwelling growth (informed by consenting volumes and sense-checked against population growth)
2. **Calculate total broadband connections** – forecasting the total number of broadband connections in Aotearoa by multiplying the residential address forecast by the residential address broadband penetration rate for the given quarter and adding expected business connection volumes
3. **Calculate Chorus' broadband connections** – allocating the total broadband connections to Chorus' competitors based on their expected market share and allocating the remainder to Chorus.

22 We use the term 'residential addresses' in the Market Model to describe both occupied and unoccupied physical buildings used for residential purposes. Some of our inputs use the term 'dwellings', which is the term used by Statistics NZ for the same metric. We use 'residential addresses' as it allows us to clearly distinguish residential and non-residential addresses. "Households" is the measure of usually occupied residential addresses/dwellings.

3.6.3 Forecast inputs

Where possible, we draw on external and objective datasets to inform the underlying settings of the Market Model. To ensure consistency across the relevant datasets, we assess the external data against internal datapoints, expected market evolution, and wider economic factors.

Table 3.2 below provides an overview of the model inputs required and their derivation, as per the forecasting methodology outlined above.

TABLE 3.2: MARKET MODEL INPUTS

INPUT	DESCRIPTION	SOURCE (ACTUALS)	SOURCE (FORECAST)
Residential Address (Dwelling) Growth	Net change in count of any unit that is used (or intended to be used) for human habitation	Stats NZ – Dwelling Estimates	Derived from consenting volumes, by assuming the historical conversion rate from consent volumes to net dwelling growth of approximately 91%. Further details regarding consenting volumes and population growth are provided in the assumptions section below
Residential Address Broadband Penetration	Quarterly broadband penetration growth	IDC[23] Residential Fixed Broadband Connections divided by StatsNZ Dwellings (addresses)	Derived from the product of Household Broadband Penetration and Dwelling Occupancy. Further details are provided in the assumptions section below
Network Split	Market Share for: • Fixed Wireless (FW)/ Satellite (Sat) • Other Local Fibre Companies (LFCs) • Hybrid Fibre Coaxial (HFC) Cable	IDC	Derived from IDC forecasts, internal Chorus assumptions, and market information. Further details are provided in the assumptions section below
Regional split	Proportion of Chorus' broadband connections by region: • Chorus UFB Areas • Other LFC UFB Areas • Non UFB Areas	CoreLogic and Chorus observed 'actuals'	For addresses: Chorus extrapolation of CoreLogic trends. For regional penetration and network market share: previous Market Models settings are adopted, with an iterative approach to ensure trends established are aligned with overarching assumptions, as well as observed actuals. Further details are provided in the assumptions section below
Business Connection Growth	Quarterly growth in business connections	IDC	IDC Forecast (Sept-22) out to Dec-26, followed by alignment with GDP growth from then on

23 International Data Corporation (IDC), a global provider of market intelligence.

3.6.4 Uncertainties and assumptions

Forecasts always have inherent uncertainty, but we have implemented some methodology improvements to mitigate the risks from uncertainties in address growth and residential address broadband penetration. To assist with minimising these uncertainties, we also complete sense checks in the modelling process.

TABLE 3.3: MARKET MODEL ASSUMPTIONS AND SENSE CHECKS

ASSUMPTIONS/ SENSE CHECKS	DESCRIPTION	SOURCE (ACTUALS)	SOURCE (FORECAST)
Consenting volumes	Number of consents issued for new residential dwellings	Stats NZ – Building Consents Issued New Dwellings	MBIE National Construction Pipeline Report 2022
Population growth	Estimate of the number of people who usually live in Aotearoa	Stats NZ – Population	Stats NZ Long Term Median Forecast
Dwelling occupancy	Proportion of dwellings that are occupied by households	Derived from dividing the actual household count (from Stats NZ Household Estimates) by the actual dwelling count	Assumed by Chorus to return to pre-housing deficit levels of approximately 94% over the forecasting period
Household broadband penetration	Proportion of occupied dwellings (households) that have a broadband connection	Derived from IDC's actual connection volumes and Stats NZ's household count	Derived from IDC forecasts, internal Chorus assumptions, and market information
IDC forecast	External actuals and forecast of fixed line connections in Aotearoa including network and consumer/business split	IDC – Infrastructure Tracker (Used as a cross check to forecast file)	IDC - 5-year annual forecast

Dwelling growth

Broadly speaking, we expect demand for dwellings (and subsequent dwelling growth) to be driven by population growth and housing trends. Our PQP1 proposal was impacted by COVID-19 and the resulting volatile immigration levels and population growth. These uncertainties have continued to affect our forecast address growth for PQP2. To mitigate some of this volatility we developed a more comprehensive approach to forecasting address growth by applying a conversion factor to time-shift consenting forecasts as shown in the graph below.

FIGURE 3.4: RELATIONSHIP BETWEEN CONSENTING VOLUMES AND DWELLING GROWTH

We then sense check our dwelling growth forecast against forecast population growth to assess the interplay between demand and supply. If forecast population growth is higher/lower than our forecast dwelling growth, then either:

- we have underestimated/overestimated our dwelling growth forecast, or
- occupancy rates will increase/decrease.

As shown by the chart below, the correlation between population growth and dwelling growth has been particularly volatile in recent years, but we forecast dwelling growth to exceed population growth over PQP2. We don't consider this is an indication that we have overestimated dwelling growth – rather, as occupancy rates are relatively high at the moment (discussed further below), a fall to more sustainable levels makes sense.

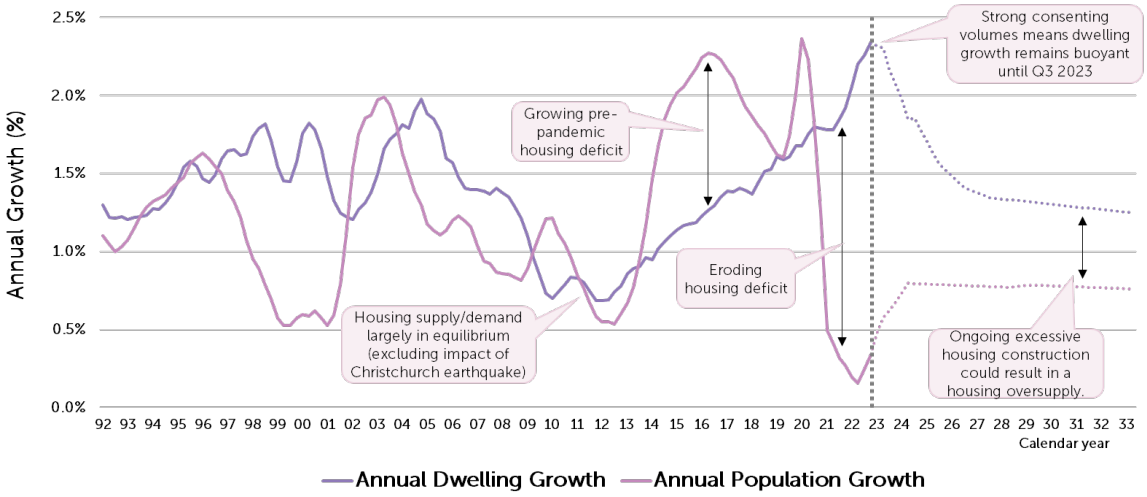
From 2013 to 2019 strong population growth in excess of dwelling growth resulted in a dwelling deficit. This was compounded in early 2020 by the influx of returning New Zealanders at the start of the pandemic. However, since 2021 dwelling growth has continued to rise and population growth has stabilised, eroding the dwelling deficit.

In our base case, dwelling construction exceeds expected population growth under Stats NZ's median population forecast (see Figure .5 below). This gives rise to a potential housing oversupply in the long run. This will likely be absorbed through three mechanisms:

- a return to more sustainable levels of dwelling occupancy (see below)
- a smaller average family size and subsequent smaller dwelling floor area (meaning more houses are required to house the same population)
- social housing moving people out of temporary accommodation.

There remains a great deal of volatility in population growth which is heavily affected by immigration settings. With continued surprises to the upside this will continue to absorb potential surplus dwelling stock.

FIGURE 3.5: RELATIONSHIP BETWEEN POPULATION GROWTH AND DWELLING GROWTH

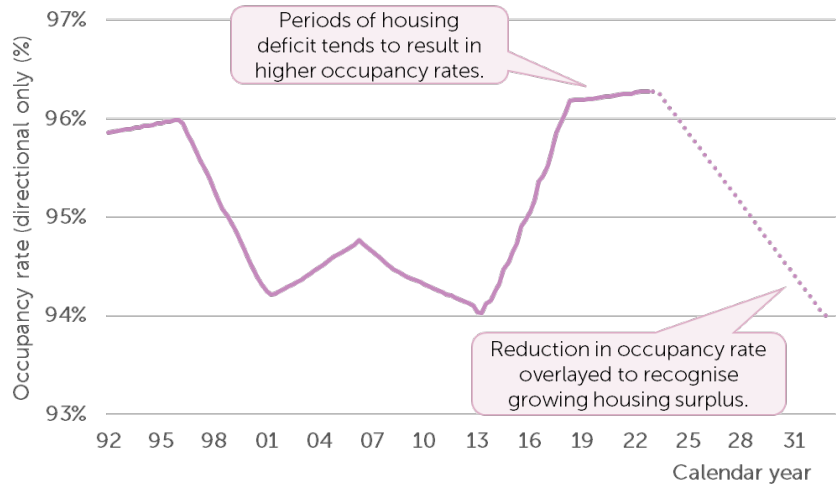


Dwelling occupancy

Dwelling occupancy is estimated by determining households as a proportion of dwellings. Dwelling growth rates are slow to adjust to changes in dwelling demand arising from changes in population growth. Dwelling occupancy rates act as a buffer to absorb fluctuations in dwelling demand.

Presently dwelling occupancy rates are tracking at elevated levels as a result of pre-pandemic population growth exceeding dwelling growth, resulting in housing stock that would usually be vacant beginning to be used. As depicted in the below graph, we expect this will return to more sustainable levels as recent and forecast population growth is below dwelling growth.

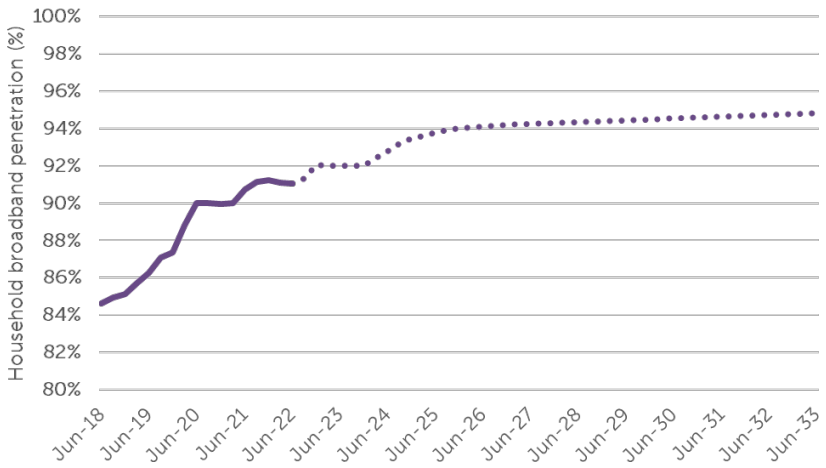
FIGURE 3.6: OCCUPANCY RATE (ACTUAL AND FORECAST)



Household broadband penetration

The below graph shows the trend in household broadband penetration as well as our respective forecast.

FIGURE 3.7: HOUSEHOLD BROADBAND PENETRATION (ACTUAL AND FORECAST)



In recent years we have seen solid growth in household broadband penetration due to:

- late adopters connecting
- a growing proportion of people who have been brought up around technology ('digital natives')
- a greater reliance on broadband as an essential utility following COVID-19.

Our Market Model forecast assumes that household broadband penetration will continue to grow, albeit at a slowing rate, as government and industry initiatives continue to address broadband affordability to improve digital inclusion.[24] This is in line with the expectations of the CCI [ ], a global provider of market intelligence. Terminal penetration is expected in the mid-2040s at around 97% (with the remaining properties being 'mobile only' or off the grid).

Network split

Our forecast takes into consideration competitive developments, published insights, and internal knowledge of copper connection volumes. Our forecasts for overall fibre market share track broadly in line with IDC's forecasts over the near term (until around 2025), after which we orient to a view that balances the publicly stated fixed wireless aspirations of mobile operators and fibre's ability to compete. We assume fibre will remain competitive based on our active wholesaler approach and the strength of our fibre value proposition, which we will continue to evolve. We note that the rollout of 5G technology and competitive satellite services provide alternatives for those customers where copper is the only terrestrial offering

HOUSEHOLD BROADBAND PENETRATION

Our Market Model forecast assumes that household broadband penetration will continue to grow, albeit at a slowing rate.

24 For example, Crown Infrastructure Partners' Rural Broadband Programme and Remote User Scheme will facilitate the ability for all households to access broadband, closing the digital divide.

available. However, we expect further growth of these alternative technologies will slow as:

- the copper customer pool erodes
- we extend our current fibre network beyond its current footprint.

Currently, we assume fixed wireless/satellite (FW/Sat) market share is higher in Chorus UFB areas than other LFC UFB areas, as their builds were completed earlier. Our assumption is that this allowed other LFCs to migrate a significant proportion of their available copper base to fibre, prior to FW/Sat entering the market in a significant way. However, over time we expect the impact of this earlier completion to subside as equilibrium market share dynamics are reached across all UFB areas in the longer term.

We also expect FW/Sat market share in non-UFB areas to peak around 2026, before declining as the copper tail is eroded and new properties are predominantly developed with fibre capability.

TABLE 3.4: FORECAST FW/SAT MARKET SHARE

	0 YEAR (JUN-23)	1 YEAR (JUN-24)	3 YEAR (JUN-26)	5 YEAR (JUN-28)	10 YEAR (JUN 33)
FW Market Share	CCI [ ]	CCI [ ]	CCI [ ]	CCI [ ]	CCI [ ]
Chorus UFB	CCI [ ]	CCI [ ]	CCI [ ]	CCI [ ]	CCI [ ]
LFC UFB	CCI [ ]	CCI [ ]	CCI [ ]	CCI [ ]	CCI [ ]
Non-UFB	CCI [ ]	CCI [ ]	CCI [ ]	CCI [ ]	CCI [ ]

Regional split

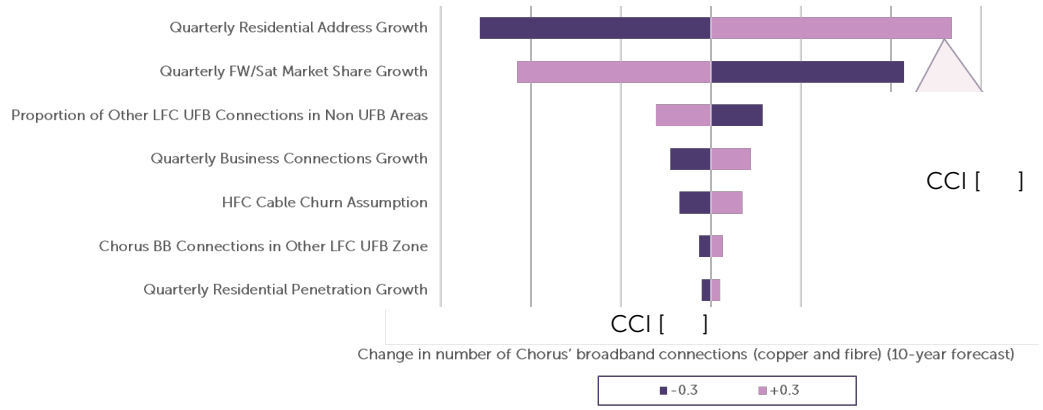
From a regional perspective we assume that dwelling growth trends noted in CoreLogic data[25] for the residential sector will continue (i.e. dwelling growth is occurring at a faster pace in non-UFB areas than in UFB areas, as urban fringes are further expanded).

3.6.5 Forecasting risk

Our sensitivity analyses highlight the extent to which uncertainty in our inputs affects the output of the Market Model, i.e. Chorus' broadband connections. The tornado diagram below shows that two inputs (address growth and the market share of alternative broadband technologies) pose the most substantial forecasting risk.

25 CoreLogic is a prominent property data provider in Aotearoa.

FIGURE 3.8: IMPACT ON CHORUS 10-YEAR BROADBAND CONNECTIONS GROWTH FROM VARIATIONS IN DRIVERS OF +/-30%



In response to this analysis, we have modelled strong and weak connection growth scenarios to better understand where our forecast sits in the range of possible outcomes and, ultimately, to confirm its reasonableness.

Our scenarios consider two main factors – the economic environment (i.e. the effect of population growth and resulting dwelling growth) and the competitive environment (i.e. the level of competition from alternative broadband technologies).

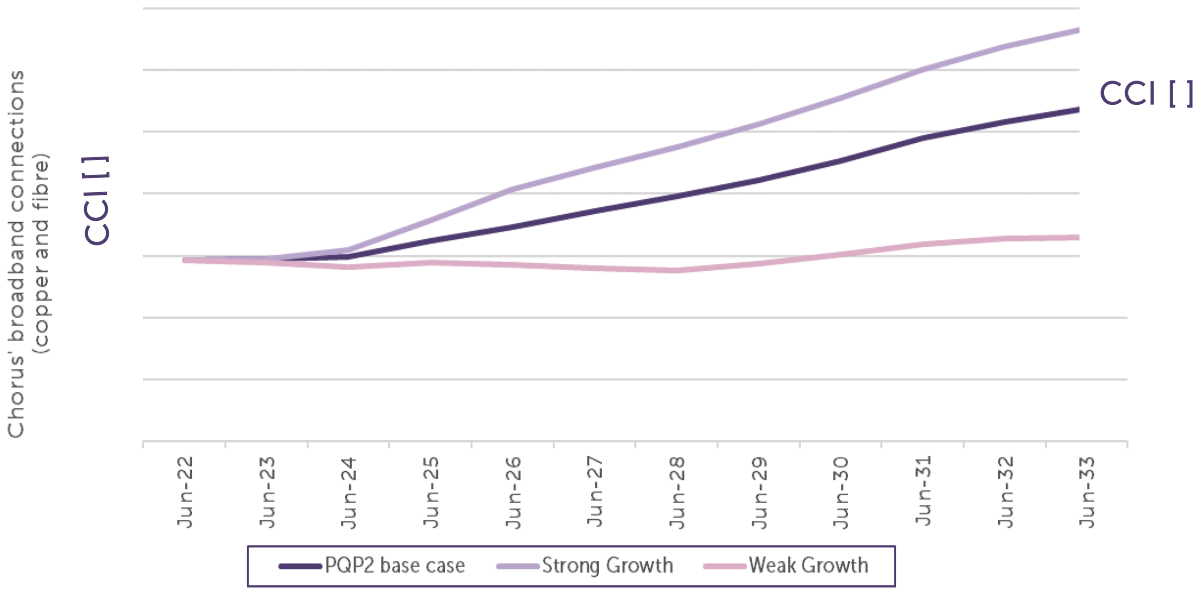
In the strong connection growth scenario, we assume strong population growth resulting in elevated levels of dwelling growth and connection uptake combined with muted competition from alternative broadband technologies. On the other hand, in the weak connection growth scenario we assume a sharper reduction in housing construction, constraining dwelling growth, and fiercer competition from alternative technologies. Our base scenario demonstrates what we consider to be the most likely outcome, balancing economic and competitive factors – not just the mid-point within the range.

The recent net migration and subsequent population growth[26] in Aotearoa increases the likelihood of our strong connection growth scenario eventuating, although it remains volatile as altered immigration settings take effect. It remains to be seen whether this will translate into longer-term strong net migration or whether it is a 'blip' as visa backlogs are cleared.

We see limited potential for competing technologies to perform below that assumed in our base case, limiting the impact on the strong connection growth scenario. However, 5G and LEO satellite broadband solutions present competition risk to both rural and urban connections, so the effect on the weak connection growth scenario is more substantial.

26 Specifically, Statistics NZ's migration actuals.

FIGURE 3.9: CHORUS BROADBAND CONNECTIONS (FIBRE AND COPPER) PQP2 SCENARIOS

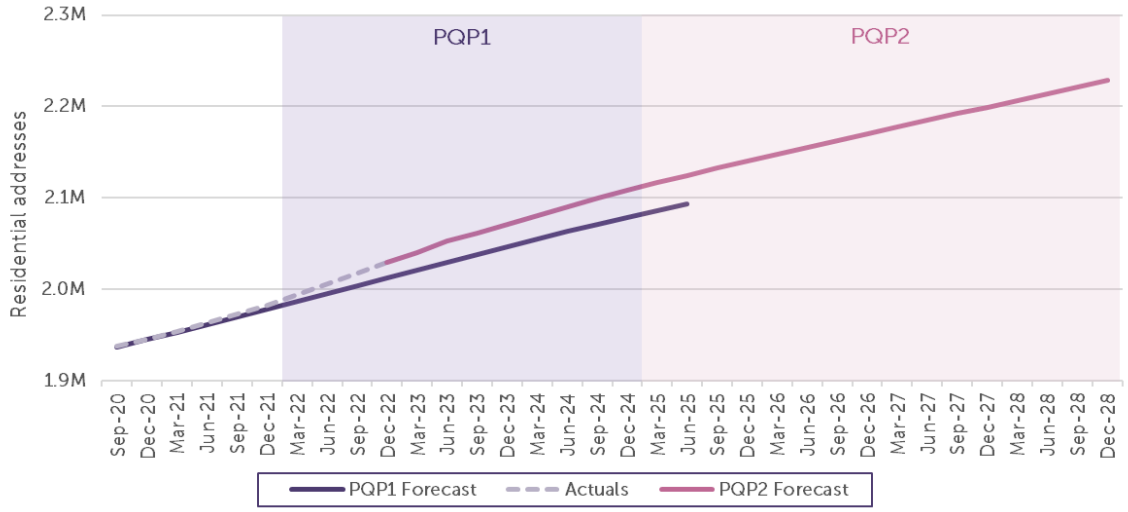


3.6.6 PQP2 forecast

Residential addresses

Residential address growth in PQP1 has been only slightly higher than expected, with December 2022 volumes 0.84% (17,000) higher than forecast (2.01 million). Address growth in PQP2 is expected to continue in-line with recent observed results. As outlined above, we have improved our processes to ensure that our address growth forecast considers immigration, population growth and consenting views.

FIGURE 3.10: RESIDENTIAL ADDRESSES



Residential address broadband penetration

The combination of dwelling occupancy and household broadband penetration gives residential address broadband penetration.

The slight deviation from our PQP1 forecast (noting the scale of Figure 3.11) has been predominantly driven by the impacts of COVID-19 on household broadband penetration, resulting in a step-wise growth rate as opposed to the smooth curve anticipated based on observed trends at the time (refer to Figure 3.7 for a longer term view of household broadband penetration). CCI [

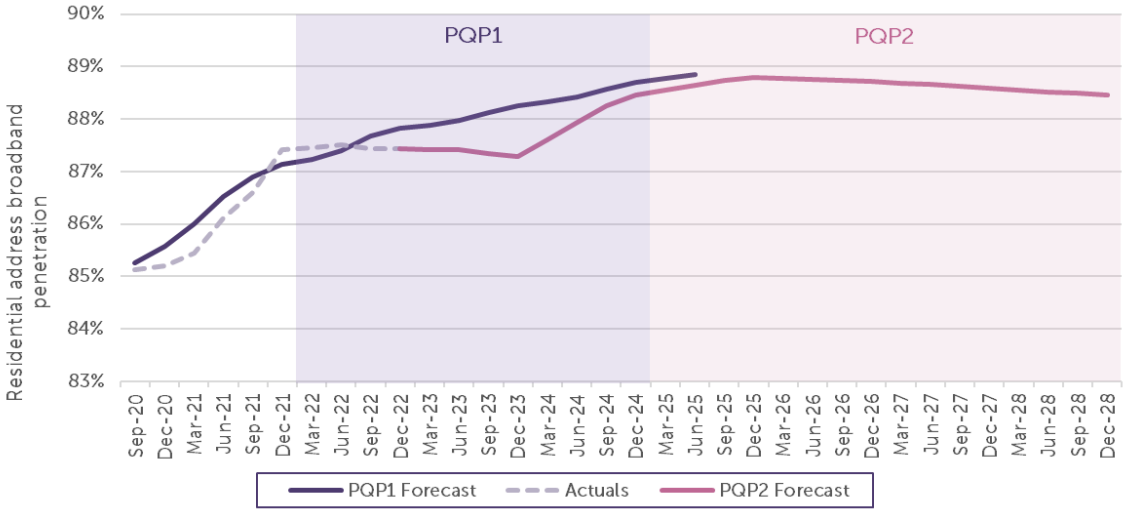
].

Across PQP2, we expect dwelling occupancy to reduce as the housing deficit erodes (see Figure 3.6), reducing from 96% in 2023 to around 94% over the next ten years as dwelling construction exceeds population growth. This reduced level of dwelling occupancy (94%) reflects occupancy levels prevailing in 2013.

We believe household broadband penetration will continue to increase CCI [ ] until it reaches approximately 97% in 2046.

The net effect of this is a small increase in residential address broadband penetration during the early part of PQP2, followed by a slight decline over the longer term as the flattening of household broadband penetration (as we reach terminal penetration) is more than offset by the increase in unoccupied houses.

FIGURE 3.11: RESIDENTIAL ADDRESS BROADBAND PENETRATION

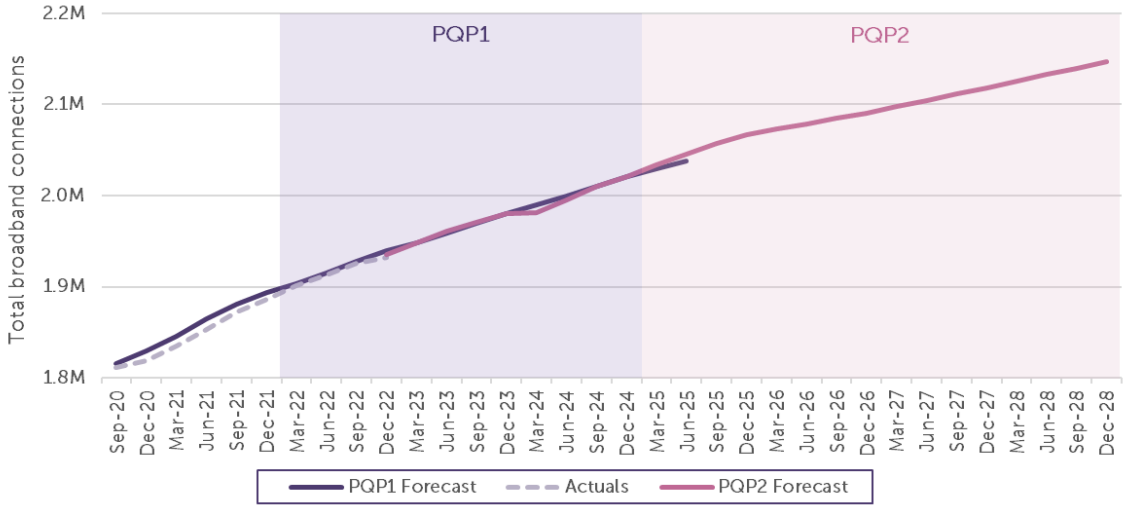


Total broadband connections

Assumptions about total broadband market growth have largely held true. This is illustrated in the below graph which shows actual total broadband market figures compared to our PQP1 forecasts.

We expect the connection growth trajectory from PQP1 to continue into PQP2, albeit at a slower rate as residential address broadband penetration slows.

FIGURE 3.12: TOTAL BROADBAND CONNECTIONS

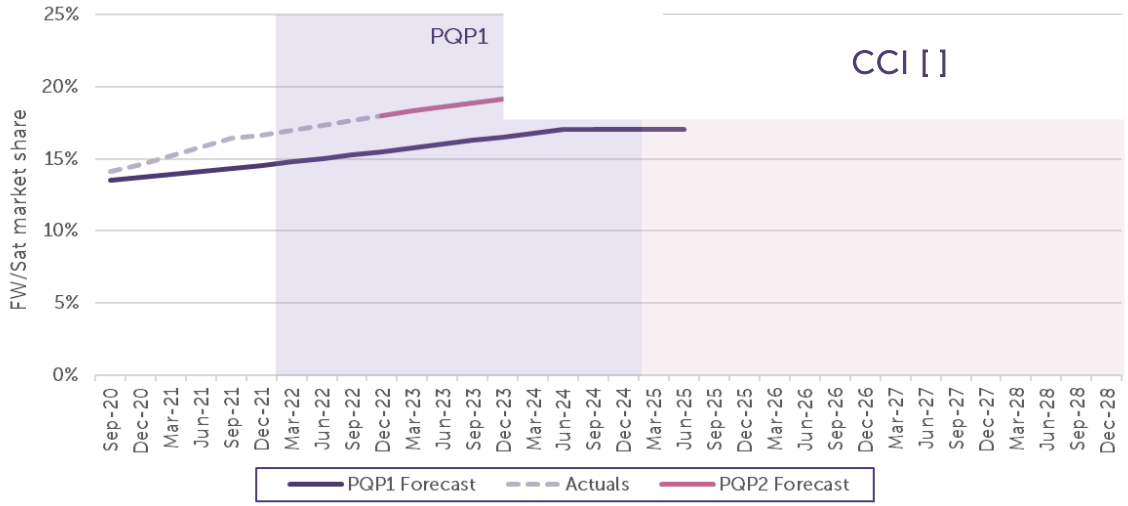


FW/Sat market share

Actual FW/Sat growth has been higher than forecast in our PQP1 proposal, and there is no market information suggesting this will change in the near term.

- Spark appears on track to achieve the low end of its FY23 target 30% - 40% of connections on FW. Its revised strategy is to grow this to 35% by FY26.
- One NZ (previously Vodafone) announced its intention to grow FW to greater than 25% of fixed line connections in its October 2022 Infratil Investor Update.
- 2degrees has not publicly stated quantitative FW aspirations following its merger with Vocus, however it has previously signalled fixed wireless as a growth opportunity in investor presentations.

FIGURE 3.13: FW/SAT MARKET SHARE



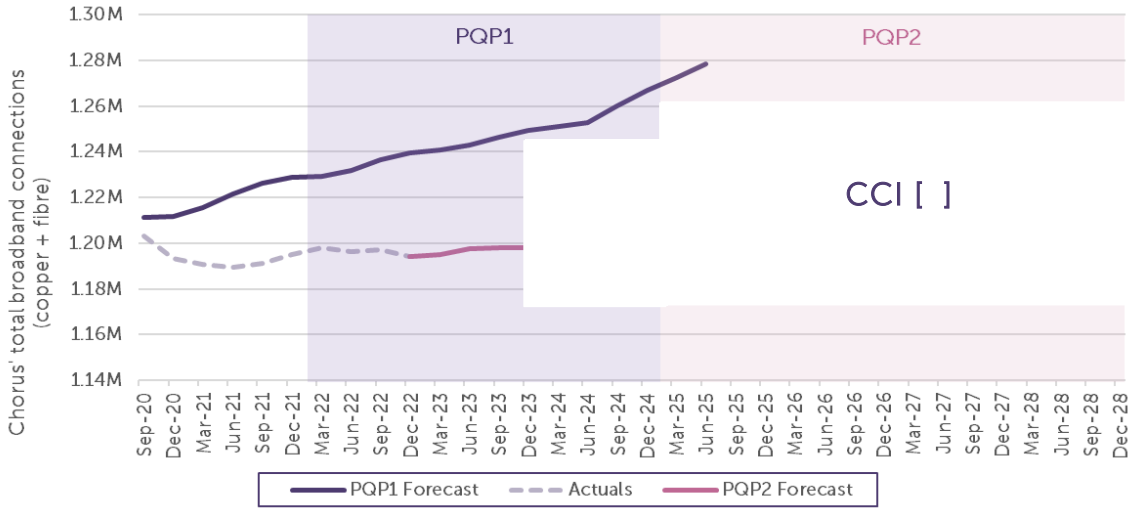
Chorus' broadband connections (copper and fibre)

Over the past few years, two competing factors have impacted the overall growth of our total broadband connections (copper and fibre). While fibre connections are growing (driven by address growth, migrations from copper and increased residential address broadband penetration), our copper connections base is being eroded by FW/Sat offerings and the success of other LFC networks that were established under the UFB initiative. Put simply, the growth in the fibre base has been offset by the decline in the copper base.

We expect these forces to persist for the remainder of PQP1.

However, in PQP2 we expect the erosion in our copper base to slow as there will be very few copper connections remaining in the market, and those that do remain are likely reluctant to move to alternative technologies. As such, our otherwise strong growth in the fibre broadband market will no longer be offset but will instead be positively impacted by our success at winning NPD market share and our ambitions to extend our fibre network beyond its current footprint. This can be seen in the below figure showing a flat trend in Chorus broadband connections until March 2024 and growing from that point onwards.

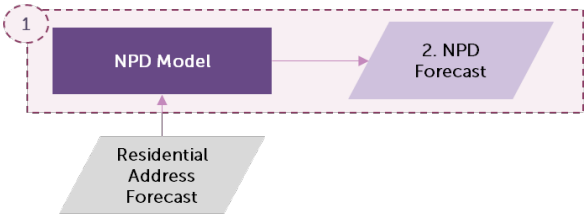
FIGURE 3.14: CHORUS BROADBAND CONNECTIONS (COPPER AND FIBRE)



3.6.7 Linkages

The Market Model is not directly linked to downstream financial models, but its outputs are used as inputs into other forecasting models or processes. Please refer to Figure 3.2 for detail.

3.7 Network Extension demand (Model 1 – NPD Model)



Context and drivers

Extending the network makes fibre available to new end-users. It involves building fibre in a street or development, establishing a connection back to a local central office, and provisioning enough access coverage and capacity, aggregation capacity and transport capacity to begin serving installation and connection demand.

Typically, network extension activity comprises:

- **new property development (NPD)** – providing service to new addresses which have no legacy copper service. These range from simple residential subdivisions through to larger developments such as new apartment buildings, new retirement villages, or entirely new suburbs in urban fringe areas
- **augmentation extension** – extending the fibre network to existing addresses currently served by another technology, usually copper.

NPD MODEL

The NPD Model (Model 1) ensures consistency across forecasts for address growth, network extension, installations, and connections.

Our plans to extend the UFB network beyond its current footprint and our corresponding uptake assumptions are not in scope for this Demand report but are discussed in detail in our Fibre Frontier report. This is because this extension does not have a direct link to demand as, for example, NPD and is predominantly driven by the economic benefit it will provide to New Zealanders. This section focuses on NPD extension and how NPD demand is forecast.

Broadband connectivity has become an essential utility. Purchasers of new homes expect broadband services to be available in the same way as they expect to be connected to water and electricity. Chorus competes with other providers of fibre services to win contracts to connect NPDs and, if successful, works with developers to deploy fibre in these subdivisions.[27]

Over PQP2, connecting NPDs will be our biggest area of network extension activity outside of the Fibre Frontier programme. We will have largely completed currently contracted NPD work by the beginning of PQP2, so NPD activity during PQP2 will mostly be work that is not currently contracted. Forecasting this yet to be contracted NPD work is our most significant network extension forecasting task.

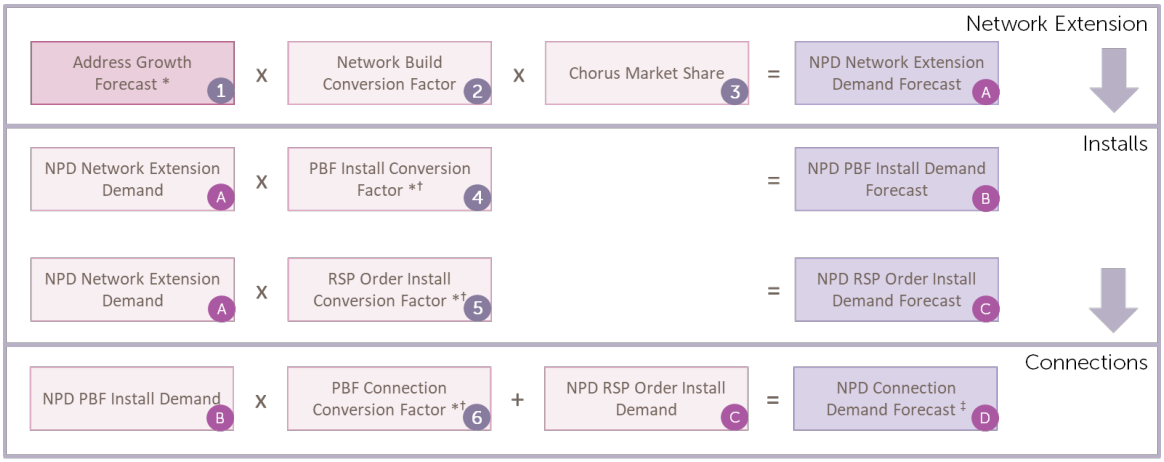
3.7.1 Model overview

We forecast demand for NPD within the NPD Model. The main purpose of this model is to ensure consistency across forecasts for address growth, network extension, installations, and connections. Recognising that NPDs follow a general process of infrastructure development (network extension), dwelling construction (fibre installation) and finally occupancy (active connection), we achieve this consistency using a series of conversion factors and time lags. This means that, for instance, a downward trajectory in forecast address growth would translate into a similar trajectory for demand forecasts for network extension, installations, and connections.

The diagram below illustrates our forecasting methodology, including the data flows into and out of the NPD Model, and the conversion factors and time lags used.

27 Chorus only deploys fibre in new subdivisions, as copper is increasingly struggling to keep pace with end users' connectivity needs and has a higher cost profile, both to deploy and maintain.

FIGURE 3.15: NPD MODEL OVERVIEW



* *Smoothing and lagging applied to deal with variability in development sizes and cycle times.*

† *PBF Install Conversion Factor + RSP Order Install Conversion Factor <1, i.e. of all new addresses which have network provided by NPD network extension, so will have fibre installed via PBF, some via RSP order, and some will remain without fibre installed.*

‡ *Represents the forecast of connection base growth via new addresses connecting to fibre for the first time.*

At a high level, forecasting NPD involves the following five steps:

1. **Input historic and forecast address growth** – taken from one of the outputs from the Market Model
2. **Apply a network build conversion factor** – this transforms forecast address growth into forecast NPD network extension activity for the overall market
3. **Apply a forecast of Chorus Market Share** – this provides the forecast for Chorus' NPD network extension activity
4. **Apply install conversion factors** – these transform network extension activity into installation forecasts. There are different install conversion factors for each of the two different NPD installation processes:
    a. Pre-Built Fibre (PBF) – where the developer opts to have fibre installed when the house is being constructed
    b. RSP order – where PBF does not occur and the eventual end-user places their own order for a fibre install. In cases where the end-user uses a competing technology, we may not receive an order for a fibre install.
5. **Apply a connection conversion factor** – this transforms forecast fibre installations to forecast fibre connections:
    a. For PBF installations, this is dependent on the lag between the house being constructed and occupied, and on the proportion of end-user occupiers who choose fibre over a competing technology
    b. For RSP order installations, every completed order provides an immediate active connection, so no connection conversion factor is required.

3.7.2 Forecast inputs

Table 3.5 provides an overview of the inputs and assumptions required and their derivation as per the forecasting methodology outlined above. We note that because the NPD Model covers mostly internal processes, there is a higher reliance on internal Chorus data in this model than in the Market Model.

TABLE 3.5: NPD MODEL INPUTS

INPUT	DESCRIPTION	SOURCE (ACTUALS)	SOURCE (FORECAST)
1. Address Growth Forecast	Net change in count of any unit that is used (or intended to be used) for human habitation	Stats NZ Dwelling Estimates – via Market Model	Via Market Model: Derived from consenting volumes, by assuming the historical conversion rate from consent volumes to net dwelling growth of approximately 91%. Further details regarding consenting volumes and population growth are provided in the assumptions section in Table 3.3
2. Network Build Conversion Factor	Relationship between address growth and network extension demand	Stats NZ (via Market Model) and CoreLogic Greenfields Dataset	Forward projection of rate based on historical actuals
3. Chorus NPD Market Share	Measurement of Chorus' success in winning network extension work with property developers	CoreLogic Greenfields Dataset and Chorus Internal Data	Forward projection of rate based on historical actuals (assuming current market share remains stable)
4. and 5. PBF and RSP Install Conversion Factors	Relationship between network extension and NPD installations	Chorus Internal Data	Forward projection of rate based on historical actuals
6. PBF Connection Conversion Factor	Relationship between PBF installations and PBF first-time connections	Chorus Internal Data	Forward projection of rate based on historical actuals

3.7.3 Forecasting risk

Because the Market Model provides a key input for the NPD Model, the forecast risks associated with the Market Model are also forecast risks here. However, the NPD Model has further forecast risks as follows:

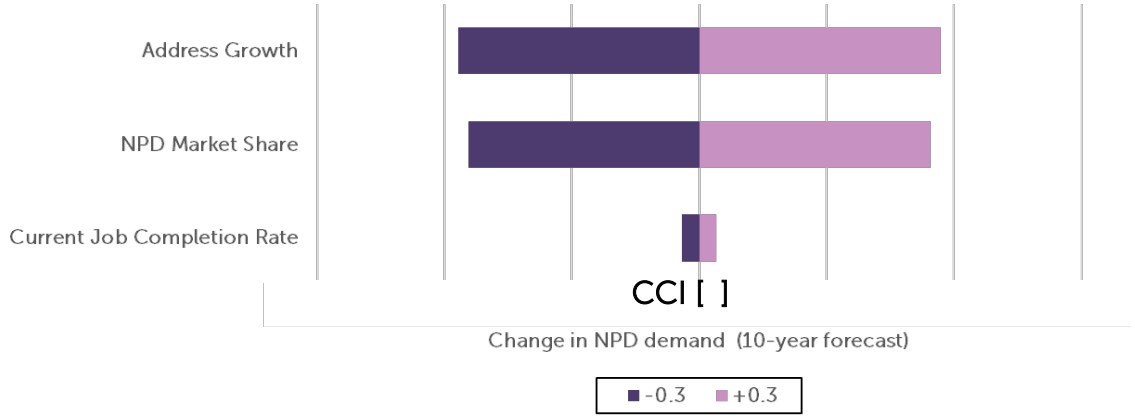
- NPD Market Share – a reduction in Chorus' share of the NPD Market would result in a decline in demand for network extension, installations, and connections. The competitive landscape differs across different parts of the country due to UFB contract areas and local market players. The list of competitors includes LFCs, lines companies, and smaller providers.

- **Economic factors** – various supply side factors may influence the speed at which property developments progress. We are currently seeing softening NPD demands, which can be largely attributed to workforce constraints, increasing finance costs, and falling property prices. We expect that these conditions will correct over the months ahead, in part driven by high net migration rates, and demand will increase accordingly. Our forecasts for the PQP2 period generally reflect a steady state as is typical of longer-term forecasts, but due to the market dynamics described 'overs and unders' are expected.

We carried out sensitivity analysis to better understand the impact of these uncertainties on the forecast outputs of the NPD Model.

This is illustrated in the tornado diagram below, highlighting the relative impact on NPD demand which may arise from uncertainty in these assumptions. The current job completion rate line captures the sensitivity to the expected completion rate of currently in-flight jobs, recognising the risk of current economic factors causing delays or cancellations.

FIGURE 3.16: IMPACT ON CHORUS 10-YEAR NPD DEMAND FROM VARIATIONS IN DRIVERS OF +/-30%



3.7.4 Uncertainties and assumptions

Relative to other demand types we forecast, forecasting demand for NPD is becoming increasingly important as NPD forms a growing proportion of overall activity.

In light of the forecasting risk outlined above, we acknowledge forecasting NPD is complex. There is significant variability within the sector (notably development size and cycle time) which can lead to significant volatility of actual activity on a monthly level. This has been especially evident in the past three years, with fluctuations driven by COVID-19 and the subsequent economic and supply conditions. There are also modelling challenges due to incompleteness of external datasets, which form inputs to the conversion factors described in the forecast inputs section.

Acknowledging this complexity we have introduced output testing against historical periods, especially where direct linkages between datasets or conversion factors are not available.

For example, a gap in the available data is the timeframe in which new dwellings are occupied. This makes it difficult to know whether a fibre connection has not been activated because the occupant has opted for an alternative technology, such as fixed wireless, or simply because the dwelling is not yet completed or occupied. To allow for this, we have estimated a conversion rate, which looks at network build and connection data available internally, and then tested the performance of this rate on actual data. The average forecast error (measured as the 'MAPE', mean absolute percentage error, on monthly data) is 10% across the last six months and 16% across the last 18 months, which helps to provide confidence in the forecast for future periods.

Looking forward, we will continue to identify opportunities to further develop our forecasting of NPD, recognising the increasing importance of NPD to our forecasts in the years ahead. This is likely to involve further leveraging external datasets and increasing our modelling sophistication, in conjunction with capturing and leveraging more detailed internal data on the NPD process.

3.7.5 PQP2 forecast

The chart below shows historical and forecast NPD demand. The unit of measurement is the number of developments, known internally as NPD build jobs. Developments can vary significant in size, from a simple suburban subdivision to a large greenfield development covering several hundred new homes. On average, there are around six new addresses created per development.

We can see that NPD demand reached historically high levels from 2020 through 2022. This reflects the high rates of address growth and building consents over the same period, with Chorus' share of the NPD market remaining reasonably stable.

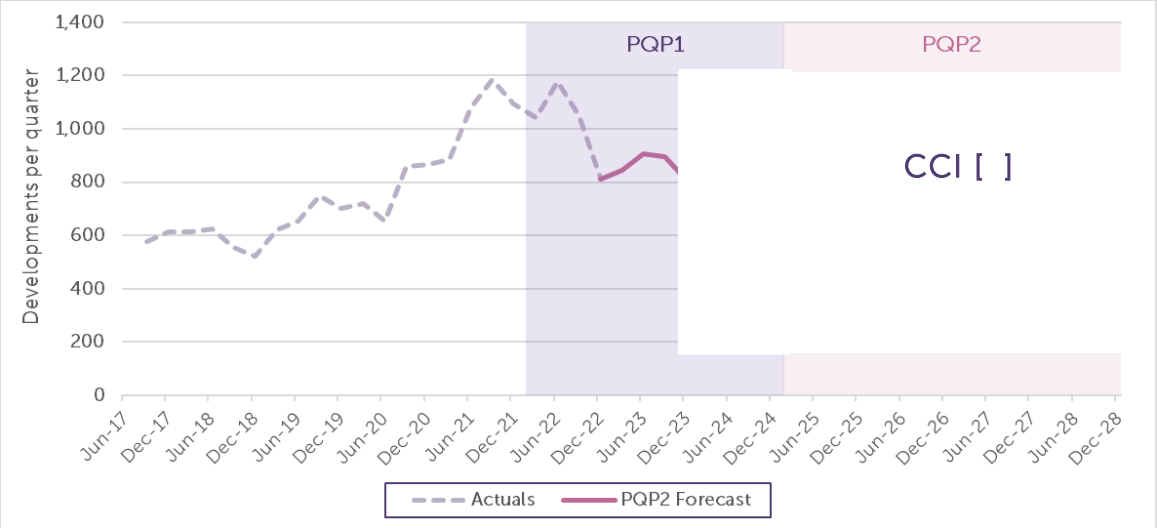
In the most recent months, we have seen demand decline from the previous peak, although the current volume is still relatively high in a longer historical context. This drop has been largely attributed to a short-term slow-down in economic activity, exacerbated by supply constraints across the construction sector.

The PQP2 forecast, as explained previously, largely follows the profile determined by the address growth forecast used in the Market Model. Volumes are expected to slowly decline back towards pre-COVID-19 levels.

NPD DEMAND

NPD demand reached historically high levels from 2020 through 2022. Volumes are expected to slowly decline back towards pre-COVID-19 levels.

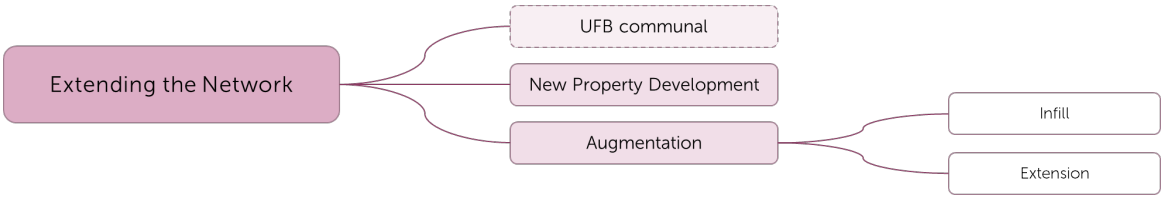
FIGURE 3.17: NPD DEMAND



3.7.6 Linkages

As discussed in the network extension chapter of Our Fibre Assets, we forecast our Extending the Network expenditure across three sub-categories: UFB Communal, New Property Development and Augmentation.

FIGURE 3.18: NETWORK EXTENSION EXPENDITURE SUB-CATEGORIES



Our NPD demand forecast directly links to our New Property Development capex. However:

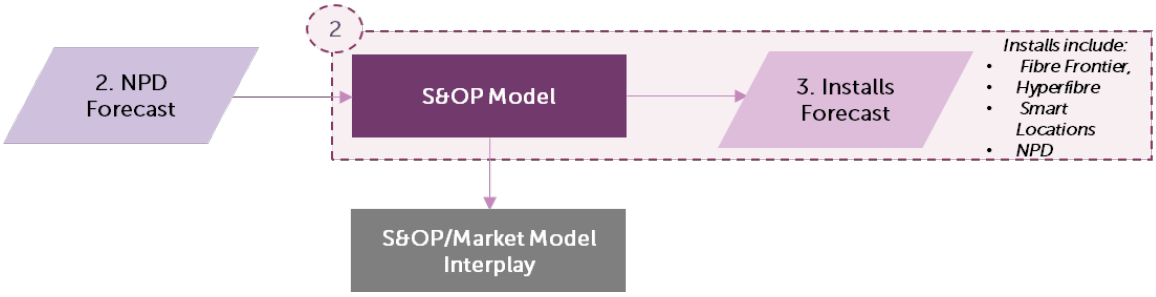
- having completed the contracted UFB build in 2022, we do not forecast any UFB Communal capex for PQP2 or beyond.
- as explained earlier in this section, Augmentation capex is predominantly driven by its economic benefit and discussed further in the Fibre Frontier chapter of Our Fibre Assets.

More generally though, by extending the network, NPD demand has links to the following other expenditure areas:

- **Network Sustain and Enhance capex** and Network opex– network extension creates new assets for us to operate, maintain and (eventually) replace. Fibre costs less to operate (more energy efficient and temperature tolerant) and maintain (fewer faults) than copper.
- Installations capex – network extension expands the pool of sites where fibre can be installed.

- Network Capacity capex – network extension includes providing initial access, aggregation and transport coverage and capacity. We then have ongoing investment to optimise demand, capability and lifecycle requirements.
- **IT and Support capex and Support opex** – network extension uses some shared assets and operating resources (including central office buildings). As the fibre network grows, more shared costs are required to support it.

3.8 Installations demand (Model 2 – S&OP Model)

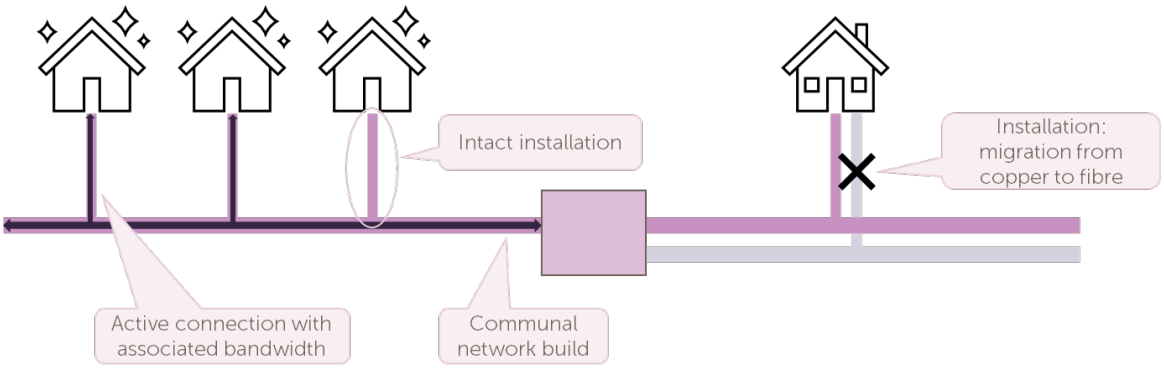


3.8.1 Context and drivers

The Sales & Operations Planning (S&OP) model forecasts Chorus' installation volumes.

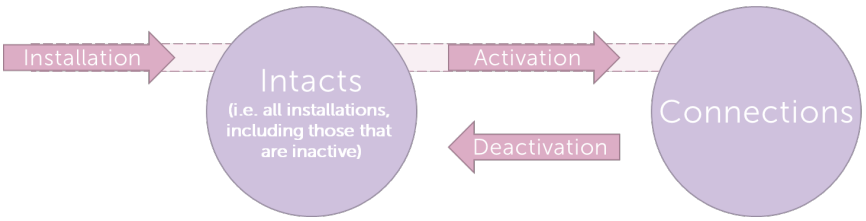
An installation is where a link is established between the communal network and the end-user connection point.

FIGURE 3.19: OVERVIEW OF ACCESS NETWORK



Once in place, a connection across this link can be activated, but an installation can also persist without an active connection. For example, when an end-user moves out of a premises and disconnects their broadband service, the installation to that premises remains in place and can be reused by the next occupier for their broadband service (referred to as 'intacts').

FIGURE 3.20: DISTINCTION BETWEEN INTACTS AND CONNECTIONS



There are three main types of orders for fibre installations, split across four main drivers:

1. **RSP Order** – where an end-user requests a broadband connection at an address which is in a fibre-ready area but requires an installation to their premises before their broadband service can be activated. Most of these orders occur in addresses which have historically had a copper service available, but some also take place in new addresses (NPD) where the developer has not had fibre installed during the development phase (pre-built fibre, as described below).
2. **Chorus Order** – where fibre is installed to the house without an RSP order. The end-user is subsequently required to place an intact order to an RSP to activate a broadband service. There are two drivers of Chorus orders:
    a. **Pre-built fibre (PBF)** – where a property developer requests the houses in their subdivision to have installations established as part of the build. These form the majority of NPD installations
    b. **Migrations** – where Chorus campaigns in an area that is fibre-ready to encourage end-users to have fibre installed
3. **Upgrade Order** – where an installation is in place, but it needs to be upgraded to enable the service requested by the end-customer – e.g. a ONT upgrade to enable Hyperfibre-grade services.

3.8.2 Model overview

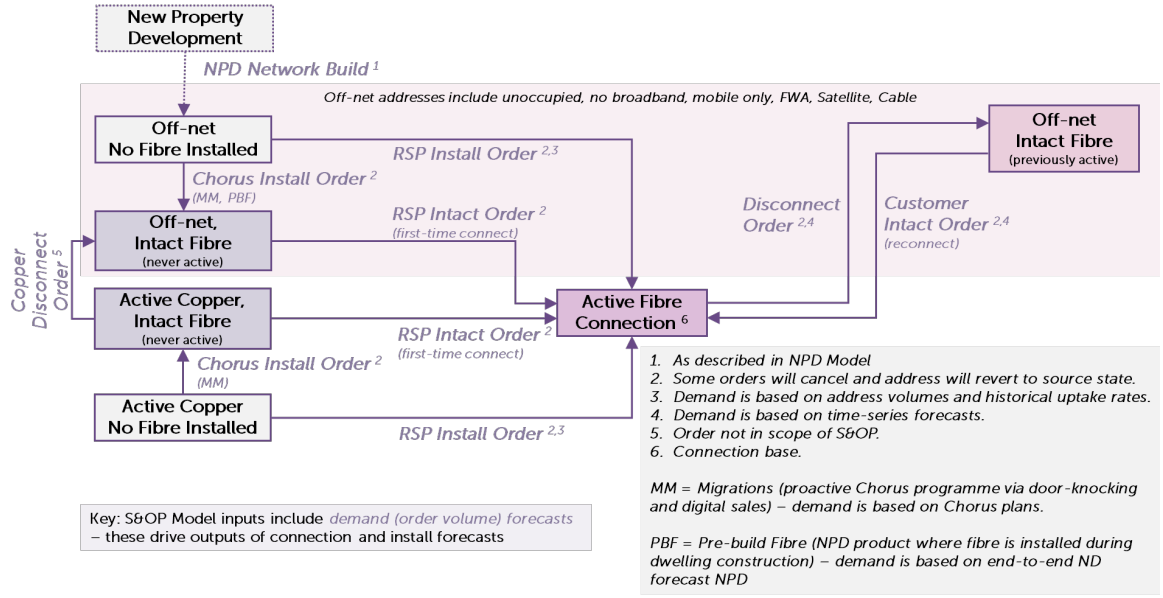
The purpose of the S&OP Model is to balance short-term demand and supply for fibre installations, and to develop longer-term demand forecasts for fibre installations, other order activities such as upgrades and intacts, and connection base. As fibre uptake has increased at varying rates across Aotearoa depending on when fibre became available in each area, installations forecasts are developed for each local area. There are 87 local areas (or 'schedule codes') across Aotearoa. These schedule code forecasts also inform service company capacity requirements in each area.

The following diagram provides an overview of the system being modelled, show the various address connectivity states (boxes), and the order activities which result in a change in state (arrows). Upgrades to Hyperfibre are excluded from this diagram for ease of illustration.

S&OP MODEL

The S&OP Model (Model 2) forecasts Chorus' installation volumes.

FIGURE 3.21 OVERVIEW OF CONNECTIVITY STATES AND ACTIVITIES

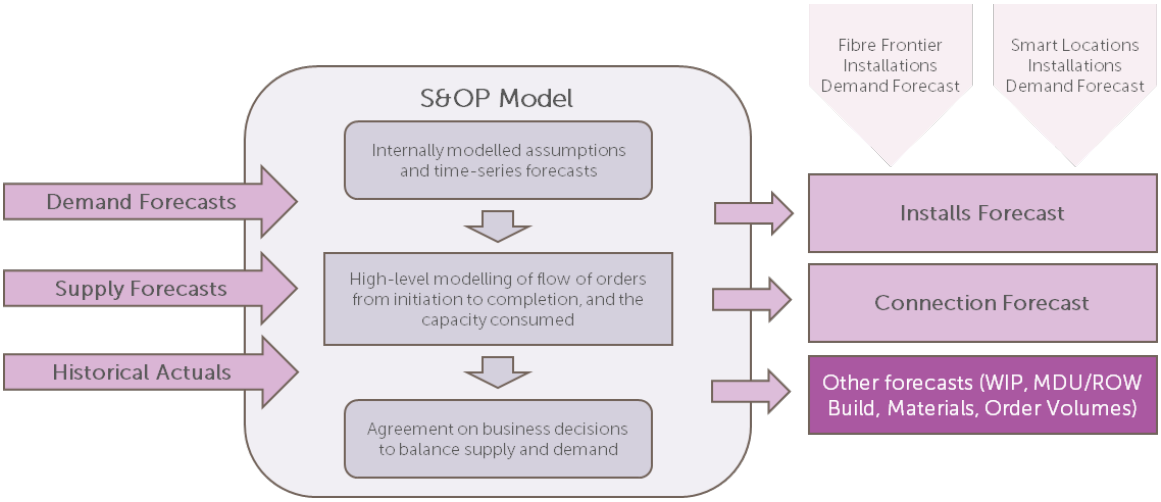


At a high level, the S&OP Model forecast involves the following four steps:

1. **Input demand forecasts** – these are set out in the inputs section, and include:
    a. Various demand forecasts for fibre installation
    b. Various demand forecasts for intact connection
    c. Hyperfibre upgrades forecasts
2. **Input short-term supply forecasts** – these act as a constraint on supply until February 2024, and then moderate supply forecasts through to December 2024 to ensure a realistic decline in the volume of inflight orders (referred to as work-in-progress, or WIP) to a long-term steady state which is appropriate to future demand levels.
3. **Convert demand inputs into expected installations and connections forecast** – we apply supply-side constraints and other assumptions including cancellation rates and requirements for multi-dwelling units (MDU)/ right of way (ROW) build activity to forecast the number of installations/connections actually completed
4. **Consider interplay with Market Model** – we assess the long-term growth of fibre connections, and moderate order forecasts to ensure that the connection base forecast adheres to the Market Model forecast in the outer years (discussed below and in the S&OP/Market Model Interplay section).

The diagram below illustrates our forecasting methodology, including the data flows into and out of the S&OP Model.

FIGURE 3.22: S&OP MODEL OVERVIEW



Because the S&OP Model focuses on Chorus fibre, including fibre installations drivers and connection base growth, the model is valuable where fibre penetration is relatively low and fibre connection base growth is largely driven by migrating of copper connections to fibre.

However, because the model does not forecast overall market size and competitor share, it has a limited ability to accurately forecast the connection base when fibre uptake is high, installation volumes are low, and the connection base growth is largely driven by competitive share (retention). To account for this, over the next 2-5 years the fibre forecasts in the S&OP Model become increasingly governed by the Chorus Broadband forecasts from the Market Model. This relationship between the models is discussed in more detail in the S&OP/Market Model Interplay section.

3.8.3 Forecast inputs

Table 3.6 provides an overview of the demand forecast inputs. We note that because the S&OP Model covers mostly internal processes, there is a higher reliance on internal Chorus data in this model than in the Market Model.

TABLE 3.6: S&OP MODEL INPUTS

INPUT	DESCRIPTION	SOURCE (ACTUALS)	SOURCE (FORECAST)
NPD Installations Demand Forecast	NPD installation orders (PBF and RSP)	Chorus data	Output of NPD Model, covering PBF and RSP orders
UFB1 Installations Demand Forecast	Installation orders for existing addresses in UFB1 areas, which are placed with an RSP and result in an immediate connection	Chorus data	Long-term declining trend, which reflects the tail-end of fibre uptake in areas which have had fibre available for many years

INPUT	DESCRIPTION	SOURCE (ACTUALS)	SOURCE (FORECAST)
UFB2 Installations Demand Forecast	Installation orders for existing addresses in UFB2 areas, which are placed with an RSP and result in an immediate connection	Chorus data	Generated by applying a fibre uptake curve, based on historical analysis, to the number of addresses which will have fibre available for each fibre flexibility point
Migrations Installations Demand Forecast	Installation orders from Chorus' Managed Migrations campaign, which are placed with Chorus and result in an intact ONT	Chorus data	Based on Chorus internal campaign plans to encourage fibre installations
PBF Connections Growth Forecast	Connection orders from PBF installations	Chorus data	Output of NPD Model, reflecting the expected conversion of PBF installations into active connections
Migrations Connection Growth Forecast	Connection orders from Chorus' Managed Migrations campaign installations	Chorus data	Generated by applying an expected conversion rate to historical and forecast migrations installations, reflecting the conversion of these installations into active connections
Hyperfibre Upgrade Forecast	Orders for Hyperfibre-capable access equipment	Chorus data	Based on expected end-user driven demand for Hyperfibre, using historical analysis of high-speed 1 gigabit per second (Gbps) fibre uptake (see Appendix A to this chapter)

Table 3.7 provides an overview of other key assumptions and overlays used in the S&OP Model

TABLE 3.7: S&OP MODEL KEY ASSUMPTIONS AND OVERLAYS

ASSUMPTION/OVERLAY	DESCRIPTION	SOURCE (ACTUALS)	SOURCE (FORECAST)
Fibre Frontier Installation Demand Forecast	Installation orders for existing addresses in Fibre Frontier areas	N/A	Based on Fibre Frontier programme
Smart Locations Installation Demand Forecast	Installation orders for smart location demand	Chorus data (not material or used for forecasting)	Based on smart locations product owner forecast, aligned with market analysis and investment plans[28]

28 See Appendix B to this chapter for more detail.

ASSUMPTION/OVERLAY	DESCRIPTION	SOURCE (ACTUALS)	SOURCE (FORECAST)
MDU/ROW Build Forecasts	Demand for consenting and communal network build work within MDUs and ROWs. This activity is triggered by the first fibre installation order placed within the MDU/ROW extent	Chorus data	Generated by applying historical conversion factors to RSP and Migrations Installations forecasts, assuming that the proportion of orders which require consent and communal area build remain constant. This results in MDU/ROW forecasts declining in line with overall installations forecast
Intact and Disconnect Order Forecasts	New connect orders at addresses where fibre is already installed, and disconnection orders at addresses which have active fibre services	Chorus data	In the short term, these are based on a time series model which incorporates trend and seasonal aspects. From March 2024, these are increasingly used to align the S&OP Model with the Market Model, reflecting the overall broadband market share forecasts
Intact Truck-roll Forecasts	Intact new connect orders which require a truck roll. This is forecast for completeness of service company activity (and cost), and is typically required to resolve an issue which prevents an intact fibre installation from being activated remotely	Chorus data	Generated by applying the historical small proportion of intact orders which require a truck roll to the intact forecast

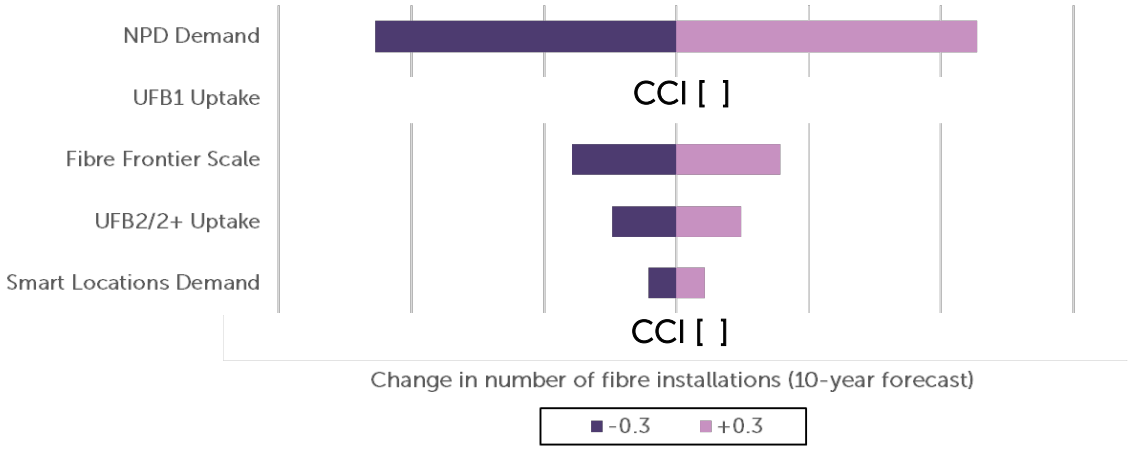
3.8.4 Forecasting risk

Many of the forecasting uncertainties which manifest as risk in fibre connection forecasts have been covered in the Market Model section, especially those relating to competitive factors and market growth.

The uncertainty associated with forecasting installation volumes reduces over time as fibre penetration plateaus and installation volumes decline. Increasingly, uncertainty sits with the NPD forecast, as well as around the number of existing fibre-ready addresses which will not have fibre installed. These scenarios are likely to arise where a property has a long-term occupant who uses a competing technology (fixed wireless or satellite) or does not use broadband, or the address has not been developed or occupied over a long period.

The relative scale of these uncertainties is illustrated in the below tornado diagram.

FIGURE 3.23: IMPACT ON CHORUS 10-YEAR INSTALLATIONS FROM VARIATIONS IN DRIVERS OF +/-30%



3.8.5 PQP2 forecast

In recent years, including early PQP1, most fibre installations have been driven by end-users in existing houses ordering fibre after it became available in their area. The associated uptake rates and demand profile are relatively well understood, and as such were easier to forecast, especially during mass-market adoption. This was further assisted by our Managed Migrations programme being based on our planned activity in the shorter term. Variances during PQP1 have been largely driven by external factors, including the impact of COVID-19 restrictions, and more recently supply constraints due to labour shortages. These are discussed further below.

Looking forward into PQP2, we expect that the volume of installations will continue to decline. The mix will shift towards a greater proportion of demand coming from NPD, upweighting the forecasting risks discussed in the NPD section. In recognition of this, we have changed our forecasting approach from previous years to separately forecast activity in new addresses (via the NPD Model) and existing addresses.

As shown in Figure 3.24 below, the historical peak of fibre installations occurred in 2018-2019, followed by a dramatic drop in the June 2020 quarter due to the COVID-19 outbreak. In the period following this, including the early part of PQP1, installations declined as expected but were slightly above our PQP1 forecast due to:

- catching up on installation work that had been delayed due to COVID-19 restrictions
- the success of our Managed Migrations campaigns, which were therefore extended for longer and at higher volumes than anticipated in our PQP1 forecast
- higher than forecast address growth, which resulted in higher NPD demand.

INSTALLATION DEMAND

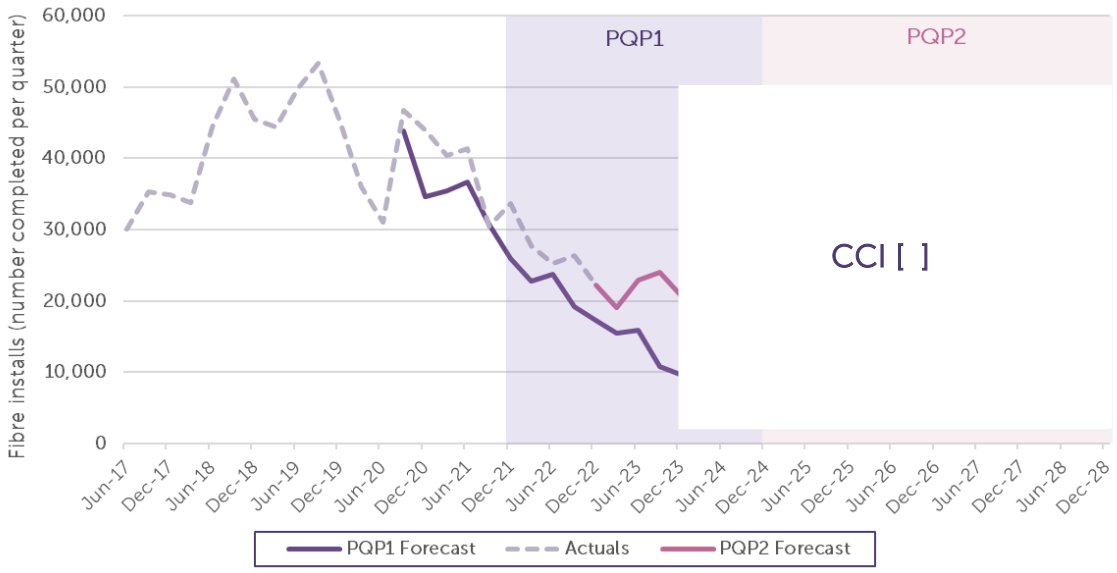
Looking forward into PQP2, we expect that the volume of installations will continue to decline after the 2018-2019 peak. Demand is primarily driven by NPD, Fibre Frontier and smart locations

More recently, installation volumes were suppressed from April 2022 through to March 2023 due to field capacity constraints reflective of labour constraints more broadly [see our Delivery report for detail]. The forecast uplift from June 2023 through to December 2023 reflects an expectation of increased capacity, and hence an ability to catch up on deferred demand.

Both the PQP1 and PQP2 forecasts settle on a long-term steady state through 2024-25, which is largely driven by ongoing NPD demand, reflective of the long-term address growth forecast. The PQP2 forecast also includes anticipated Fibre Frontier and smart locations demand, which collectively account for CCI [ ] installations in the PQP2 period from a total of 135,000.

Chorus has 1,470,000 addresses with fibre available at the end of December 2022. Of these, 75% had fibre installed, and an additional 2% had an order in progress (32,000 orders in WIP). We expect that by the end of PQP2 an additional 195,000 addresses will have fibre available, through network extension driven by NPD and our plans to extend our fibre network to approximately a further 40,500 New Zealanders. Our forecast is that an additional CCI [ ] installations will be completed in this period, resulting in CCI [ ] of fibre-available addresses having fibre installed.

FIGURE 3.24: FIBRE INSTALLATIONS



3.8.6 Linkages

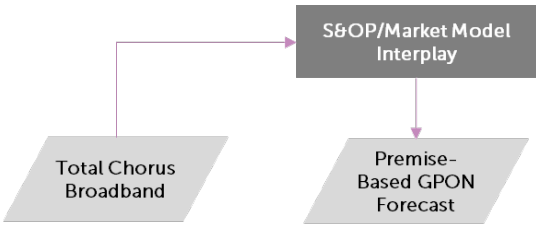
Our installations forecast predominantly links to our forecast for Installations capex. Furthermore, installations demand has linkages to the following expenditure categories:

- **Extending the Network capex** – network extension feeds into installation activity by increasing available addresses.
- **Installations capex (Customer Incentives)** – we provide incentives to encourage fibre installations, and we promote fibre through our active wholesaler activities. This supports our forecast volumes and helps us

attain (and retain) fibre connections, that in turn supports efficiency by spreading our fixed costs across a larger number of connections.

- **Network Sustain and Enhance capex and Network opex** – installations establish new physical network assets that we must maintain and eventually replace. As the fibre network grows, it drives a larger portion of maintenance costs. Non-growth capex per connection reduces as connection numbers grow.
- **Network Capacity capex** – installations establish ONTs at a site that we must manage through their lifecycle. Each installation consumes an access port in our exchanges and (once connected) generates additional bandwidth demand that feeds into capacity optimisation considerations.
- **IT and Support capex and Support opex** – as fibre connections grow and copper connections decline, shared costs are reallocated to fibre. As installation activity declines, we capitalise fewer costs and some resources can be scaled down. Cost per connection reduces as connection numbers grow.

3.9 S&OP/Market Model Interplay



To ensure alignment across the modelling suite, a key activity is the interplay between the Market Model output of Chorus total broadband figures and the S&OP fibre forecast. In the near-term, the S&OP Model is the key model for fibre connections, and we subtract these volumes from the Market Model volumes to forecast the near-term copper outlook. However, because the S&OP forecast horizon is limited, and as copper volumes fall, we use the Market Model and expected copper balances to inform the likely longer-term fibre outlook.

FIGURE 3.25: S&OP MODEL/MARKET MODEL INTERPLAY

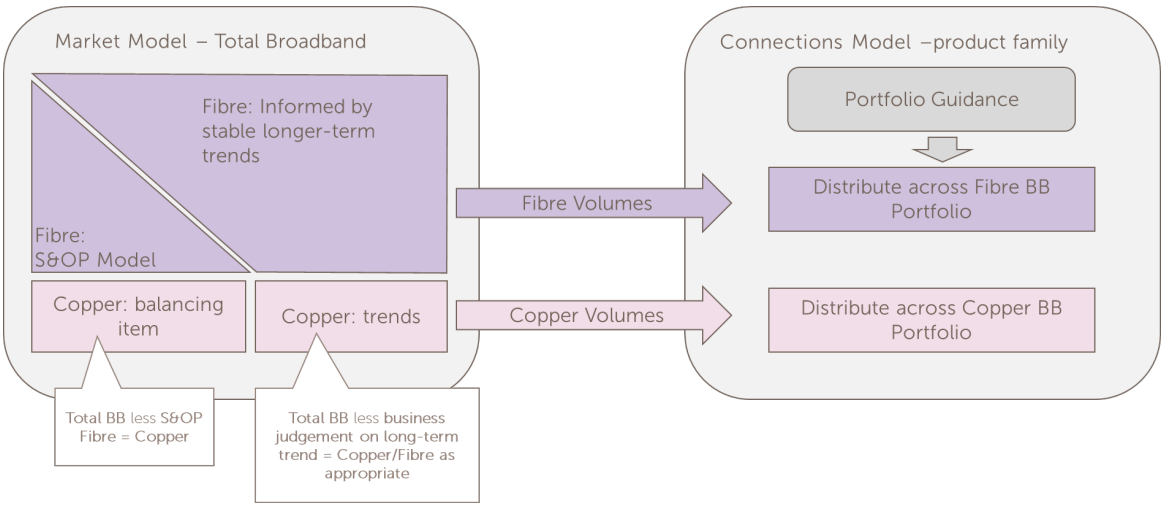


Table 3.8 provides a more granular view of the forecast horizon and the interaction between these two models.

TABLE 3.8: S&OP MODEL/MARKET MODEL INTERPLAY BY FORECAST HORIZON

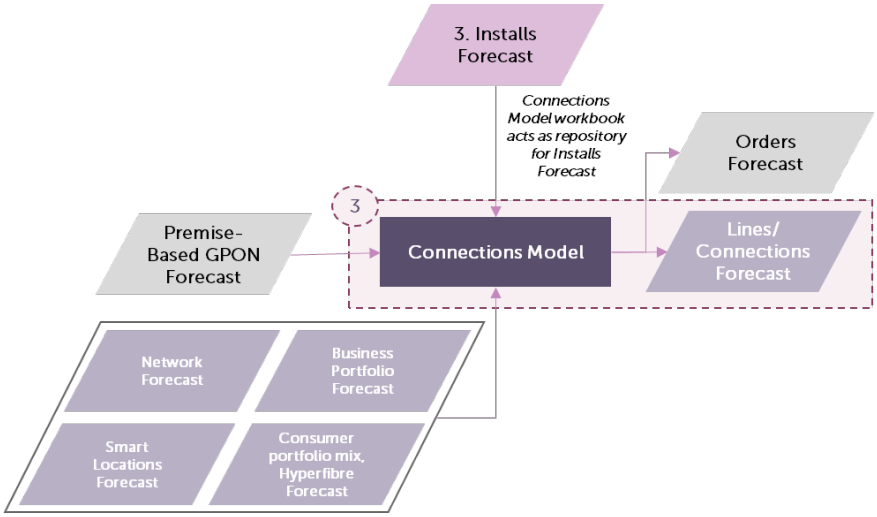
TIME PERIOD	FEB-23 TO FEB-24	MAR-24 TO JUN-26	JUN-26 TO DEC-28	JAN-29 ONWARDS
Fibre Install Forecast	From S&OP Model, including service company capacity as a constraint	From S&OP Model, with no service company constraints (assuming demand requirements can be met)	From S&OP Model, with no service company constraints (assuming demand requirements can be met)	From S&OP Model, with no service company constraints (assuming demand requirements can be met)
Fibre Connection Forecast	From S&OP Model, driven by short-term forecasts of installs, connection uptake, and retention	From S&OP Model, influenced by Market Model forecasts to provide a smooth trajectory of fibre growth (i.e. as copper connection input assumptions are approached)	Calculated (Total Broadband minus Copper Connections and/or informed NPD win-rate)	Calculated (Total Broadband minus Copper Connections and/or informed NPD rate)
Copper Connection Forecast	Calculated (Total Broadband minus Fibre Connections)	Calculated (Total Broadband minus Fibre Connections)	Business judgement on expected long-term copper trends	Business judgement on expected long-term copper trends
Total BB Forecast	From Market Model	From Market Model	From Market Model	From Market Model

TIME PERIOD	FEB-23 TO FEB-24	MAR-24 TO JUN-26	JUN-26 TO DEC-28	JAN-29 ONWARDS
Key message	Independent fibre forecasts from S&OP, with service company constraints	Guided fibre forecasts from S&OP forecasts model, without service company constraints	In UFB areas, fibre forecasts are largely driven by the Market Model as copper volumes become very low. In non-UFB areas, NPD and Fibre Frontier* forecasts via the S&OP Model are a driver of fibre growth.	In UFB areas, fibre forecasts are largely driven by the Market Model as copper volumes become very low. In non-UFB areas, NPD and Fibre Frontier* forecasts via the S&OP Model are a driver of fibre growth.

*Where Fibre Frontier figures are dependent on the appropriate regulatory settings and approvals.

Once the ten-year view of fibre has been established, this can then be used as an input in the Connections Model.

3.10 Connections demand (Model 3 – Connections model)



3.10.1 Context and drivers

Once the communal network is in place, and an installation to the customers' premises is completed, a connection can be activated. As discussed above, if a connection is deactivated, the intact installation persists.

Connections (which are ultimately RSP enabled) are driven by:

- **Availability of fibre in a communal area** – whilst new connections within existing UFB areas are expected to decline as respective fibre uptake approaches saturation, we expect this will be offset by new connection demand from extending our network (predominantly through NPD, but also as a result of our Fibre Frontier plans to increase fibre coverage beyond the UFB footprint)

- **End-user awareness of fibre** – this occurs naturally as the network continues to mature but is also influenced by Chorus' marketing efforts as an active wholesaler
- **Attractiveness of fibre compared to copper or other options** – this will change as the price-quality trade-off between fibre and other connection options change. Fibre attractiveness is most likely to drive ongoing business-as-usual penetration growth, as end-users within existing fibre footprints continue to disconnect copper and take up fibre (especially in UFB areas). Looking more closely at connections 'by type' over the PQP2 period, we also expect fibre attractiveness to drive a natural migration of plans up the speed chain as consumer requirements continue to grow (as already highlighted by the growing demand for our 1Gbps product since its release).
- **Uptake of smart locations and our success at winning contracts** – one of our key business objectives is to seek out new fibre revenue opportunities. Smart locations are installations to non-buildings, including traffic lights, CCTV, cell sites and electronic billboards. This is a highly competitive market, particularly as competitive pressure from alternative technologies increases. To accelerate momentum and bring our strategy to life we will commit to further partnering with smart location and managed service providers as well as RSPs.

3.10.2 Model overview

We forecast connections within the Connections Model. The Connections Model does not undertake any significant forecasting process – rather, it draws together and balances multiple product forecasts from across the business to produce:

- a view of Chorus connection forecasts, by product family
- an associated orders forecast – which is a translation of the connections forecast into expected orders to be placed with Chorus (based on historical ratios).

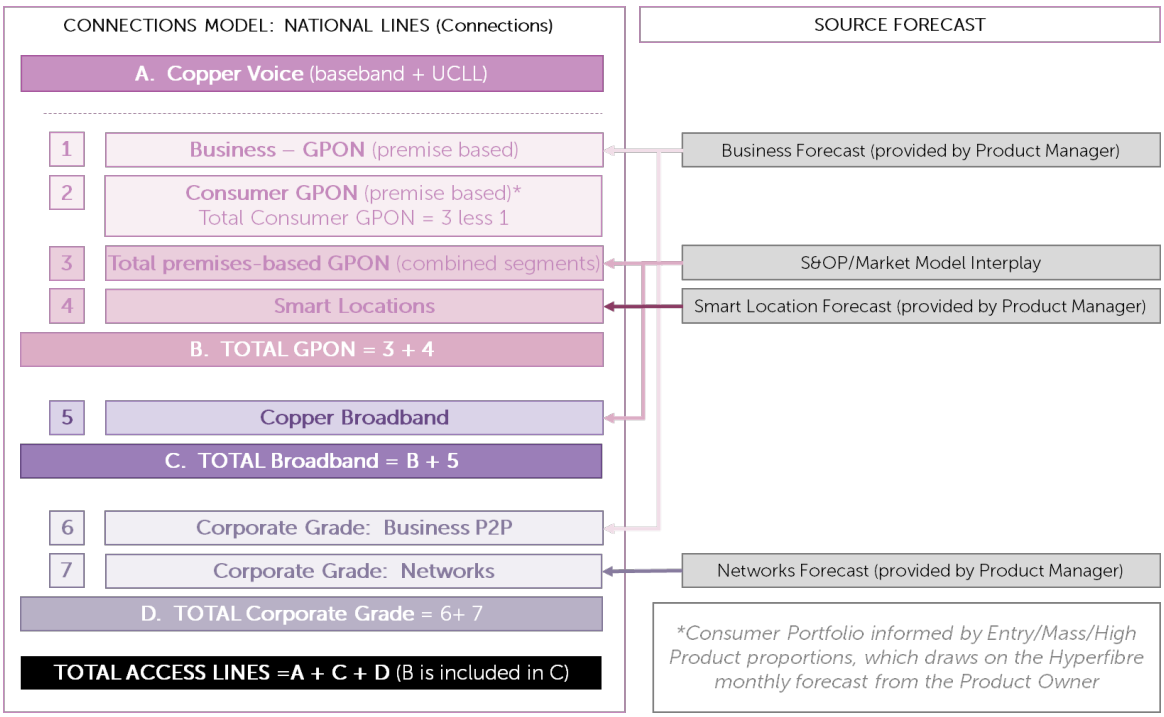
The foundational step to providing these outputs is the development of the National Lines forecast (where 'Lines' has been a term historically used for 'connections').

The following diagram provides a simple overview of the logic and data flows to get to the National Lines forecast. The boxes on the right identify the upstream forecasts that we utilise for the respective Connections Model component.

CONNECTIONS MODEL

The Connections Model (Model 3) forecasts connections, drawing together and balancing multiple forecasts across the business.

FIGURE 3.26: CONNECTIONS (NATIONAL LINES) MODEL OVERVIEW



We forecast Business, Networks, Hyperfibre and Smart Locations inputs using forecasts from the relevant product managers, relying on their skills, experience and long-standing expert knowledge (boxes 1, 4, 6 and 7, and *).

The Total premises-based gigabit-enabled passive optical network (GPON) forecast (box 3) is sourced from the S&OP/Market Model Interplay outputs. The Consumer GPON forecast (box 2) then acts as the balancing item by being the result of subtracting the Business GPON forecast from the Total premises-based GPON view. This balancing logic ensures there is complete alignment with the upstream forecasts (i.e. the Market and S&OP Models).

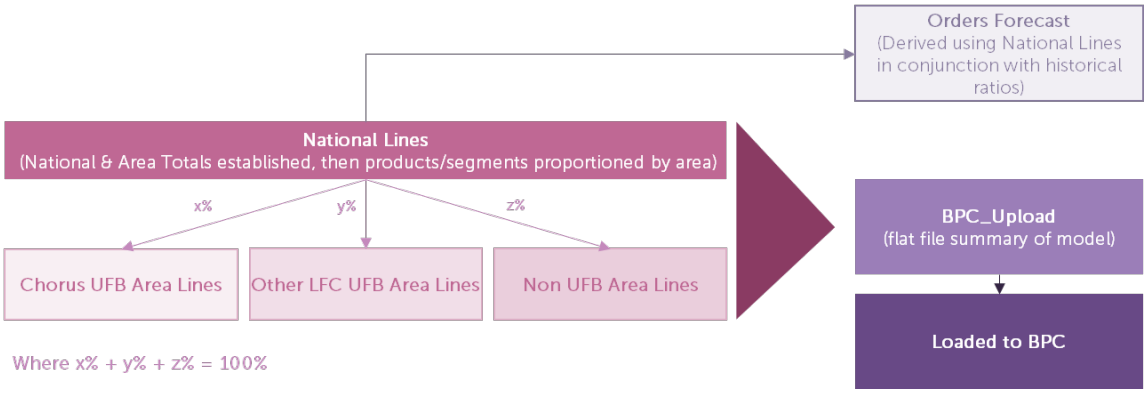
The National Lines forecast is the sum of the forecasts for Copper Voice, Total Broadband (which includes GPON and copper), and Total Corporate Grade.

We then turn this National Lines forecast into a Chorus connection forecast by product family. This involves two steps:

1. **Splitting the National Lines forecast into regions** – we draw on information from the S&OP Model/Market Model Interplay to split the forecast into Chorus UFB, Other LFC UFB and Non-UFB areas
2. **Developing additional regional detail** – we add additional regional detail, such as segment views and product specific forecasts, having regard to current segment/product shares in the market with adjustments made for any known events such as product launches or grandfathering plans over the forecast horizon.

Once the Lines forecasts (i.e. national and regional connection views) are completed, they are uploaded into our financial systems (i.e. BPC, a SAP module).

FIGURE 3.27: CONNECTIONS (NATIONAL LINES) MODEL OUTPUTS



3.10.3 Forecast inputs

The key forecasting inputs are (as per the above diagram):

TABLE 3.9: CONNECTION MODEL INPUTS

INPUT	DESCRIPTION	SOURCE (ACTUALS)	SOURCE (FORECAST)
Business Portfolio Forecast	Forecast of business connections, both GPON and corporate grade, by product families	Chorus Access Lines Report	Annual forecast provided by the Business product owner and translated into a monthly view in the Connections Model.
S&OP/Market Model Interplay	Forecast of total copper and fibre broadband connections (premises-based) – at a national and regional level	Chorus Access Lines Report	Output of the interplay between the S&OP and Market Models.
Smart Locations Forecast	Forecast of smart locations connections	Chorus Access Lines Report	Annual forecast provided by smart locations product owner and translated into a monthly view.[29]
Networks Forecast	Forecast of network segment products (e.g. Mobile Access)	Chorus Access Lines Report	Monthly forecast provided by the Network product owner.
Consumer Portfolio profile forecast	Portfolio view of expected proportion of connections on Entry/Mass/High-end market segments. This assists with understanding changing prevalence of certain plan families across the forecast horizon – e.g. when a mass market plan today may become an entry level plan at a point in time.	Chorus Access Lines Report	Profile developed with Consumer product managers, drawing on historical observed actuals. This view draws on a monthly Hyperfibre forecast provided by product managers.[30]

29 See Appendix B of this chapter for more detail.
30 See Appendix A of this chapter for more detail.

Our Business Portfolio, Networks, Hyperfibre and Smart Locations forecasts rely on forecasts from our own experts and their respective judgements. Key judgement is required when ensuring the product view is realistic across the ten-year forecast horizon. For example, products that are currently 'entry level' may become obsolete, and those that are currently 'mass market' may become an entry level product.

Our Hyperfibre and smart locations forecasts are explicit drivers of some of our PQP2 capex, and as such are discussed further Appendices A and B to this chapter.

3.10.4 Forecasting risk

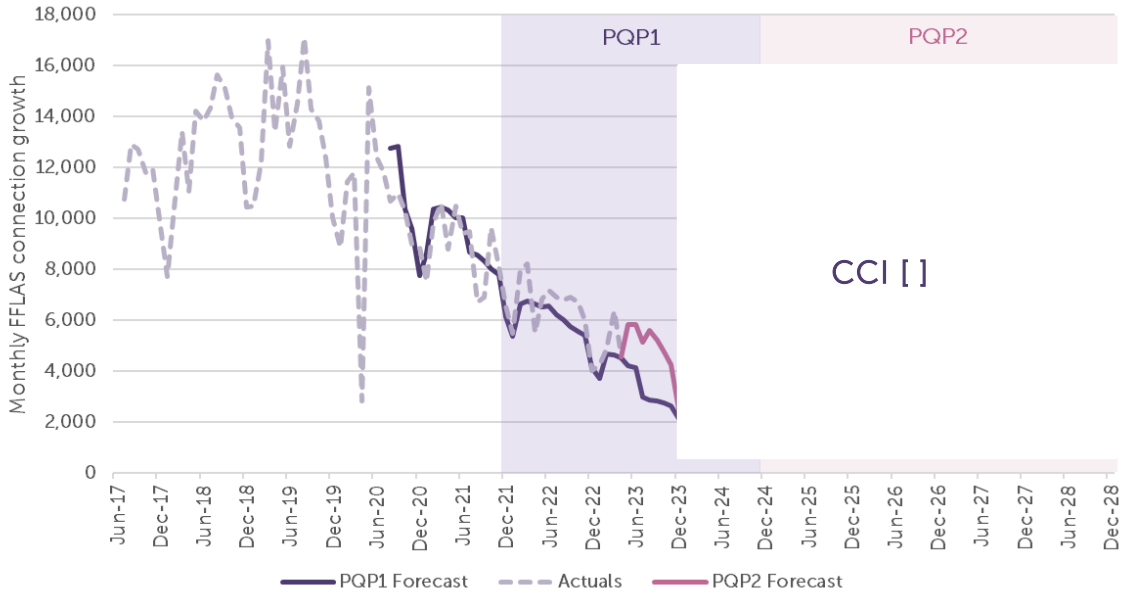
Forecasting risk associated with the Connections Model arises from uncertainty within its inputs. While some risk comes from relying on Chorus' internal experts to provide some of the inputs using their own professional judgement, the most material risk comes from the 'Total premises-based GPON forecast', as this is the most material driver of connections forecast (driving more than 98% of the fibre connections forecast). This forecast is subject to a robust derivation process as discussed in the S&OP/Market Model sections.

3.10.5 PQP2 forecast

Other than some short-term deviations, which are to be expected, our actual connection volumes to date have been generally consistent with our PQP1 forecast. Net fibre growth for PQP1 for the 18 months to June 2023 was 112,000, moderately higher than the forecast of 97,000. This confirms our approach to essentially carry forward our PQP1 forecasting approach while improving some of the underlying assumptions, where relevant, as outlined earlier in this chapter.

Our PQP2 forecast ultimately sees monthly connection growth volumes continuing the downward trajectory indicated in the PQP1 forecast and observed actuals to date.

FIGURE 3.28: FFLAS (PQ AND ID-ONLY) CONNECTION GROWTH



This trajectory reflects our success at migrating customers in UFB areas off copper and onto fibre, leaving significantly fewer customers on the copper network and reducing the potential fibre connections available.

By the end of PQP2, we forecast this growth in fibre connections will increase our total FFLAS connections that are in scope for PQ regulation to just above CCI [ ]. The below table shows the breakdown by region – Chorus UFB FFLAS, Non UFB FFLAS and connections in other LFC areas (not subject to PQ FFLAS regulation).[31]

TABLE 3.10: END-USER FFLAS CONNECTIONS BY REGION

				PQP1			PQP2		
	2020	2021	2022	2023	2024	2025	2026	2027	2028
Chorus UFB FFLAS	783,419	880,996	953,537	CCI [ ]	CCI [ ]	CCI [ ]	CCI [ ]	CCI [ ]	CCI [ ]
Non-UFB FFLAS	25,844	31,887	37,466	CCI [ ]	CCI [ ]	CCI [ ]	CCI [ ]	CCI [ ]	CCI [ ]
PQ FFLAS	809,263	912,883	991,003	CCI [ ]	CCI [ ]	CCI [ ]	CCI [ ]	CCI [ ]	CCI [ ]
Other LFC UFB (ID-only) FFLAS	5,110	5,488	5,782	CCI [ ]	CCI [ ]	CCI [ ]	CCI [ ]	CCI [ ]	CCI [ ]

31 See Appendix C at section 3.14 for a breakdown of end-user FFLAS connections by Point of Interconnect (POI) regions.

				PQP1			PQP2		
	2020	2021	2022	2023	2024	2025	2026	2027	2028
NATIONAL (ID) FFLAS	814,372	918,370	996,784	CCI [ ]	CCI [ ]	CCI [ ]	CCI [ ]	CCI [ ]	CCI [ ]

As illustrated in Figure 3.28 above, growth in fibre broadband peaked in 2019, near the completion of the initial UFB program.

Approximately half of the remaining copper base is in non-UFB areas, where Chorus' fibre footprint is limited and tends not to overlap the copper footprint. We don't expect these areas to drive fibre growth.

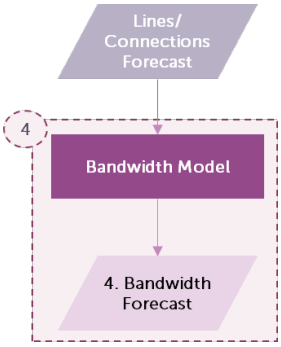
3.10.6 Linkages

Our connections forecast by product type is predominantly used as an input to bandwidth demand forecasting, which is the key driver for network capacity capex.

Forecast connections also link to the following other expenditure categories:

- **Installations capex (Customer Incentives)** – we provide incentives to encourage fibre installations, and we promote fibre through our active wholesaler activities. This supports our forecast volumes and helps us attain (and retain) fibre connections, that in turn supports efficiency by spreading our fixed costs across a larger number of connections.
- **Network Sustain and Enhance capex and Network opex** – installations establish new physical network assets that we must maintain and eventually replace. As the fibre network grows, it drives a larger portion of maintenance costs. Non-growth capex per connection reduces as connection numbers grow.
- **IT and Support capex and Support opex** – as fibre connections grow and copper connections decline, shared costs are reallocated to fibre. As installation activity declines, we capitalise fewer costs and some resources can be scaled down. Cost per connection reduces as connection numbers grow.

3.11 Bandwidth demand (Model 4 – Bandwidth Model)



3.11.1 Context and drivers

To provide a congestion-free service,[32] we need to ensure network capacity stays ahead of growing bandwidth demand.

Bandwidth demand refers to the amount of data traffic generated by end-users. We are particularly interested in the bandwidth demanded at the peak time of day – typically around 9pm – as the capacity of our network needs to be higher than this peak so as not to cause congestion, which can negatively impact the end-user experience.

Examples of how congestion can impact experience include:

- poor quality and increased buffering when watching online video
- poor voice and video quality during online meetings
- unresponsive social media and messaging apps
- slow response times when playing online games
- slow or failed webpage browsing and file downloads.

Bandwidth demand is driven by a wide range of factors, such as:

- increasing uptake and usage of video streaming services
- availability of higher-quality (4K and 8K) video content and devices
- increasing number of screens and smart home devices per household
- new applications and innovative services from over-the-top providers such as Amazon, Google, Netflix, Microsoft, Apple, and Meta
- uptake of new technologies like cloud gaming, virtual/augmented reality and the Metaverse
- changing end-user behaviour such as working from home and 'multi-screen mashups'.[33]

3.11.2 Model overview

To forecast the total bandwidth demand at peak time we multiply the connection volume forecast from the Connections Model with the average demand per connection.

The metric we use to model average demand per connection is referred to as Average Throughput Per User (ATPU). This metric describes the average contribution per connection during the busiest five-minute time period of the day.

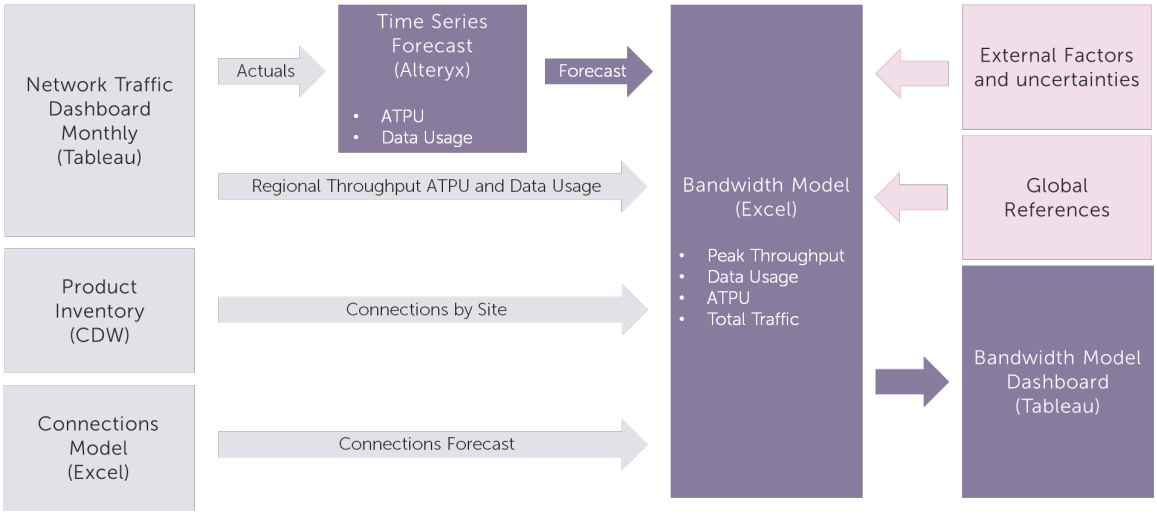
The process to forecasting peak throughput is as per the below flow diagram. Essentially, we follow these key steps using a range of system applications as labelled:

BANDWIDTH MODEL

The Bandwidth Model (Model 4) forecasts the total bandwidth demand at peak time using connection volumes multiplied by average demand per connection

32 As specified by the performance quality standard that applies to us under our price-quality regulation.
33 Using multiple online applications on multiple screens simultaneously (e.g. gaming, streaming, social media).

FIGURE 3.29: BANDWIDTH MODEL OVERVIEW



The Chorus Bandwidth Model has three components:

- **Calculate ATPU time series forecast** – the ATPU Time Series Model (using Alteryx[34] software) takes the historical network traffic data and calculates the parameters for the underlying ATPU time series model
- **Calculate regional bandwidth forecast** – we use combine the ATPU forecast with the Connections Model and current product inventory using the Bandwidth Model (Excel)
- **Produce dashboard results** – the Bandwidth Model Dashboard (Tableau) is a reporting and data visualisation dashboard.

3.11.3 Forecast inputs

The key inputs to the bandwidth forecast are the connection volume forecast from the Connections Model (discussed above) and the ATPU growth rate forecast.

TABLE 3.11: BANDWIDTH MODEL INPUTS

INPUT	DESCRIPTION	SOURCE (ACTUALS)	SOURCE (FORECAST)
Connection volume forecast	Number of Chorus connections	Chorus data	Output of Connections Model
ATPU growth rate forecast	Average contribution per connection during the busiest five-minute time period of the day	Chorus data	Output of the ATPU Time Series Model (based on historical actual ATPU growth rate trends and reference forecasts from global industry analysts and other network operators)

34 Alteryx is a leading analytics and data science platform.

We note the following key points about ATPU metric:

- **Downstream focus** – bandwidth demand is highly asymmetric. About 90% of data traffic is in the downstream direction (i.e. downloading content from the internet), and only 10% is in the upstream direction
- **Diversity of individual user behaviour** – every connection is different. Connections do not all peak at exactly the same time of the day or month. This means ATPU is not a measure of an individual connection's peak usage but rather the average contribution at the time when the network peak occurs.
- **Peak time** – the busiest five-minute period of the day is normally around 9pm although it can vary across the week and across the year. For example, it is usually a bit later in the summer months and a bit earlier in the winter. It can also vary during online events, such as live sporting fixtures and major games releases.
- **Measurement period** – bandwidth demand fluctuates throughout the day and can change significantly over a short period of time. We use a five-minute measurement period to account for short timeframe peaks.
- **Instantaneous peaks** - traffic can peak at a higher level at instants during that five-minute time period. However, it is impractical to monitor and measure instantaneous peaks as the minimum granularity of traffic counters in modern network equipment is typically 5 minutes.

We have been collecting five-minute traffic statistics from the network for over a decade. We use statistical modelling techniques (exponential smoothing time series model) to forecast the future growth rate based upon this historical data set (see graph below).

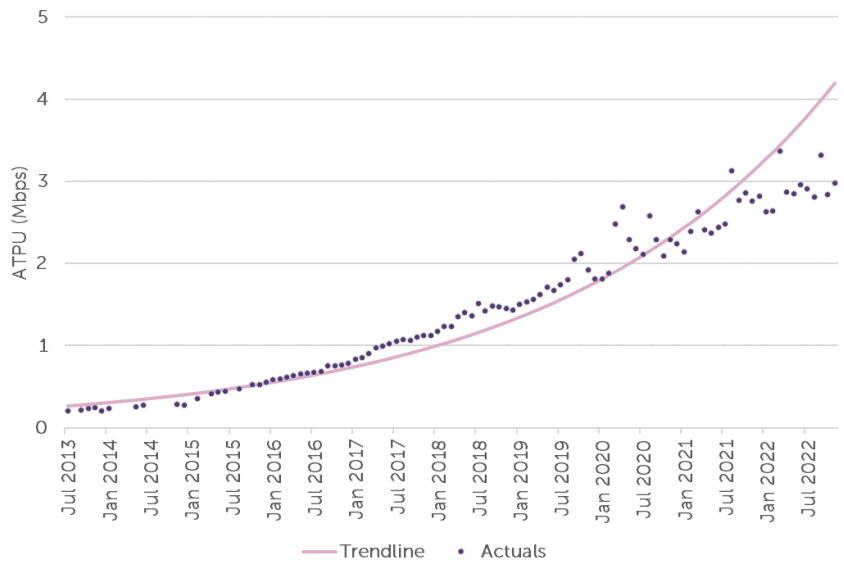
Analysis shows that long-term growth has followed an exponential curve. This aligns to 'Neilsen's Law of Bandwidth Growth' which was codified in 1998 by Jacob Nielsen and relates to the growth internet bandwidth since the 1980s. Our key judgement is that this exponential growth trend will continue across the forecast period.

AVERAGE THROUGHPUT PER USER (ATPU)

Bandwidth growth follows an exponential curve, which we expect to continue into PQP2, with a compounding average growth rate of

>20%

FIGURE 3.30: HISTORICAL ATPU



Global analysts such as Analysys Mason and overseas network operators also forecast bandwidth to grow at an exponential rate over the long-term. We benchmark our forecast against the bandwidth forecasts in the table below (noting that they include a variety of metrics, measurement methodologies, markets and network technologies). This benchmarking exercise validates that our forecast is at the appropriate level.

TABLE 3.12: GLOBAL COMPARISON OF BANDWIDTH GROWTH RATES

SOURCE	FORECAST GROWTH RATE (COMPOUND ANNUAL GROWTH RATE)
Chorus (ATPU) (2022-2028)	20.5%
Analysys-Mason NZ Forecast (busy hour throughout)	CCI [ ]
NBN Australia (mean busy hour throughput)	10%
TDC Net Denmark (monthly data usage)	13%
Frontier Communication USA (monthly data usage)	23%
AT&T Consumer Fiber USA (monthly data usage)	50%

3.11.4 Forecast risk

Bandwidth forecast risk arises primarily from uncertainty around changes in consumer behaviour and the dynamics of the global technology industry. This includes:

- the extent to which consumers will increasingly adopt and use digital content and services
- the impact of demographic effects – e.g. younger generations having a much higher demand for digital content and services
- the uptake in connected devices and screens per household
- the evolution of digital service offerings by global over-the-top providers – e.g. Netflix, Meta, Microsoft, Apple, Google, Amazon, Tiktok, Disney, Zoom, and Epic Games
- the pace of transition in the domestic TV market from broadcasting to online streaming – e.g. Sky's new 4K Hybrid Box and Pod
- the unpredictable disruptive impact from emerging technology – e.g. virtual and augmented reality, holograms, and the Metaverse
- other significant events that rapidly shift consumer behaviour – e.g. global pandemics and weather events.

BANDWIDTH FORECAST UNCERTAINTY

Bandwidth forecast uncertainty is mainly driven by consumer behaviour and changes in the global technology industry

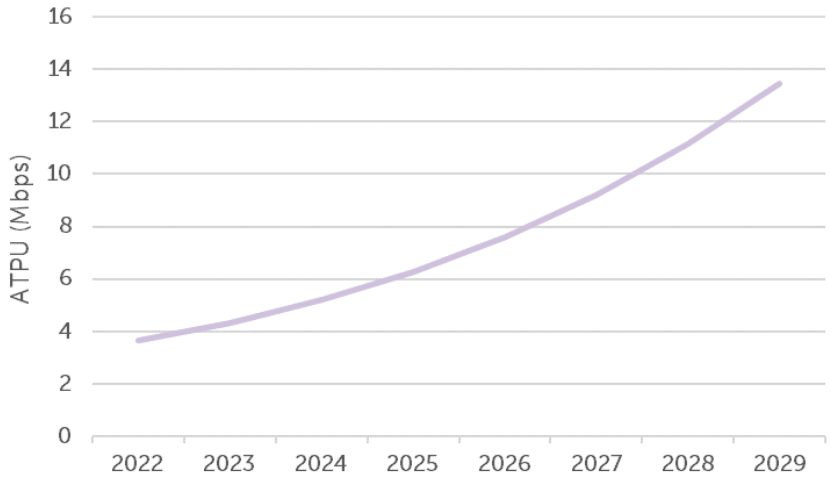
The most material events that have altered consumer behaviour and introduced bandwidth demand volatility were the impacts of COVID-19 and traffic surges caused by the software updates to the popular online game 'Fortnite'.

- **COVID-19** – pandemic-related lockdowns fundamentally changed consumer behaviour by requiring working and learning from home, and the required adoption of video calling and collaboration services, in a very short space of time. This caused a significant uplift and increased volatility in data demand on Chorus' fibre network throughout 2020 and 2021. The growth in data usage was flat in 2022 as Aotearoa transitioned to a 'new normal', but we believe this is a short-term hangover from COVID-19. As reflected in our ATPU growth rate forecast, we expect the long-term growth trend to return.
- **Online game releases** – Epic Games typically release new seasons of the Fortnite game at the same time globally every 2-3 months at an off-peak time in the United States. However, due to the time zone of Aotearoa, these releases often coincide with our evening traffic peaks. As discussed in our Quality report, this can cause significant surges in network traffic that are difficult to manage. Due to their unforeseeable nature, we do not attempt to include these short-term spikes in our bandwidth forecast.

3.11.5 PQP2 forecast

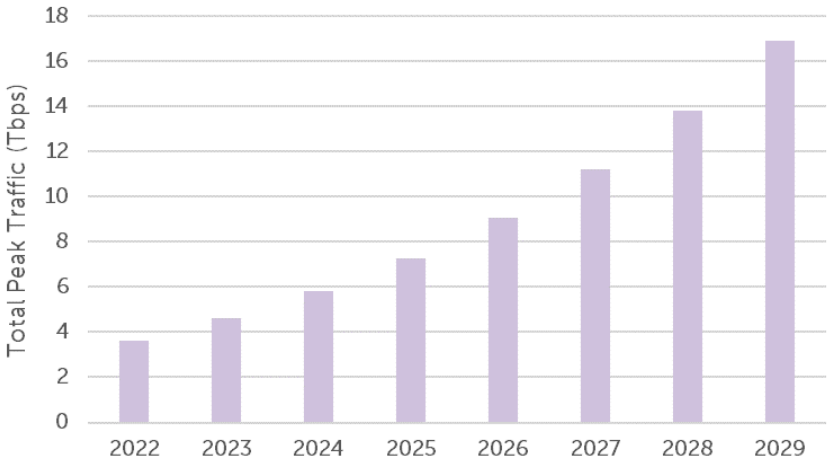
The ATPU is forecast to grow by 20.6% per annum from 3.6Mbps in 2022 to 13.5Mbps in 2029.

FIGURE 3.31: FORECAST ATPU (YEAR END)



Total Peak Traffic on the network is forecast to grow 25% per annum from 3.6 terabits per second (Tbps) in 2022 to 16.9Tbps in 2029.

FIGURE 3.32: FORECAST TOTAL PEAK TRAFFIC (YEAR END)



3.11.6 Linkages

Bandwidth demand links to the following expenditure categories:

- **Extending the Network capex** – network extension stimulates more connections and changes the spatial distribution of demand. We provision access coverage and capacity when we extend the network and this feeds through to aggregation and transport demand. For rural extensions, we may also build transport fibre to tie back to the existing network
- **Installations capex** – new installations (and therefore connections) fuel bandwidth growth. When initial coverage is consumed, we provision additional ports and when bandwidth demand reaches a threshold, we need to upgrade access capacity, which can flow through to aggregation and transport bandwidth demand
- **Network Capacity capex and Network opex** – growing bandwidth demand can drive new transport and aggregation fibre that will eventually need to be replaced. Bandwidth growth can also drive new access, aggregation and transport electronics equipment, which in turn consumes electricity and requires cooling (though it is more power efficient and heat tolerant than copper equipment)
- **IT and Support capex and Support opex** – some shared costs are allocated based on bandwidth metrics, meaning growth drives a reallocation of some shared costs from copper to fibre.

Bandwidth demand also links to our proposed quality standard for network performance, which uses port utilisation as a proxy for network congestion. We discuss this relationship in more detail in our Quality report, included in this document.

NETWORK PEAK

Network peak is a product of connection growth and ATPU growth. We forecast a compounding annual growth rate of

25%

3.12 Appendix A – Hyperfibre demand forecast and forecasting methodology

Hyperfibre is a service using next generation technology that supports speeds of up to 10Gbps downstream and upstream, deployed over our existing nationwide fibre infrastructure. It uses XGS-PON technology.

We forecast Hyperfibre demand as part of our regular planning cycle, which starts from the current year and extends ten years into the future. CCI [

].[35]

The current Hyperfibre demand forecast is built over three-time horizons (see Figure 3.33).

HYPERFIBRE

Hyperfibre is a service using next generation technology that supports speeds of up to 10Gbps downstream and upstream.

35 Our 'Gig' plan has been renamed several times. Other names include Fibre Max, Fibre Pro, and Consumer Max.

FIGURE 3.33: HYPERFIBRE S-CURVE FORECAST

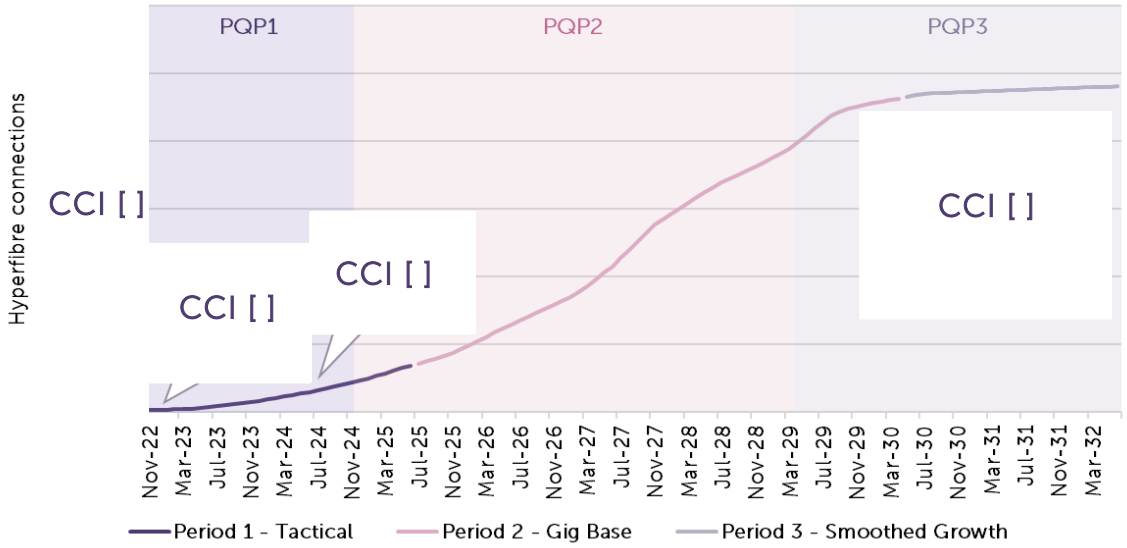


TABLE 3.13: FORECAST TOTAL HYPERFIBRE CONNECTIONS IN EACH YEAR

CCI [

]

3.12.1 Pre-PQP2: CCI [ ]

When Hyperfibre originally launched in 2020, the product was ahead of its time. It was a deliberate decision by us to bring leading-edge technology to Aotearoa and ensure New Zealanders that wanted access to this technology could do so. The market demand for the product at the time was low, however, we anticipate the broadband market will continue to advance in line with historic trends.

CCI [

HYPERFIBRE DEMAND PRE-PQP2

Hyperfibre was 'ahead of its time' when launched and early rollout has relied on RSP uptake of the product.

-].

Judgements about when each RSP will take up and start marketing Hyperfibre are unavoidably uncertain. We made an assessment for each of the largest RSPs based on current commercial discussions with the RSPs and our assessment of market trends.

Other core assumptions we make include the following:

- Uptake of Hyperfibre by RSPs will be largely based on the proportion of Gig connections sold by each RSP (those with a higher Gig customer proportion are more likely to push Hyperfibre).
- Our incentive offers relating to Hyperfibre (e.g. a credit to cover the cost of Hyperfibre cable routers, so they can get the best experience from Hyperfibre, will also drive demand).
- RSPs with the most Hyperfibre interest at the moment, e.g. My Republic and 2Degrees, are likely to be the first to accelerate the sale of Hyperfibre products. CCI [

  ].
- Hyperfibre connections will come from our Gig base. Hyperfibre provides the opportunity for (current and future) high-end consumers to further migrate up the speed chain from our Gig product.

CONSUMER DEMAND

"Fast and uninterrupted is key to driving innovation and keeping NZ connected."

Stakeholder feedback

3.12.2 PQP2 and beyond: CCI [ ]

CCI [

].

CCI [

].

3.12.3 Beyond PQP2: CCI [ ]

CCI [ ].

3.13 Appendix B – Smart locations demand forecast and forecasting methodology

3.13.1 Why now for smart locations?

Chorus's business objectives include to continue to win in core fibre and seek out new fibre revenue opportunities.

We are seeking new fibre revenue opportunities so our actual FFLAS revenue moves closer to the maximum allowable revenue (MAR) set by the Commission for a regulatory period. We currently under-recover the MAR quite significantly. Whilst we are not forgoing the under-recovery, the regulatory mechanisms push the recovery out to future fibre end-users. This creates some misalignment between the service we provide and our associated cost recovery.

Recovering a higher proportion of our MAR now will support future investment and, over time, deliver lower average prices for end-users.

Smart locations are non-premises connections where high-bandwidth and reliable connectivity is critical, for example, digital billboards, CCTV, traffic management systems. Connecting increasingly more smart locations to our fibre network is a significant opportunity to increase our customer base and, in turn, to generate incremental revenue.

SMART LOCATIONS

Smart locations are non-premises connections where high-bandwidth and reliable connectivity is critical, for example, digital billboards, CCTV, traffic management systems.

3.13.2 Our smart locations volume forecast

Our short-term objective (pre-PQP2) is to further prove fibre as the technology of choice for high-bandwidth smart locations. This will include targeted marketing activities to improve our product offering as well as process related activities to enhance our delivery efficiency that would reduce unit cost, which in turn is expected to stimulate demand for fibre from smart location operators.

Combined, we expect these activities will enable increased smart location market penetration for us in PQP2.

Our specific PQP2 objective is to accelerate the momentum and to further partner with RSPs and managed service providers with a view to lay fibre to, and subsequently connect, around CCI [ ] new smart locations. This would increase our total smart location connections to just under CCI [ ], lifting our smart locations fixed addressable market share to CCI [ ].[36]

36 The addressable market is based on IDC Fixed high bandwidth use case source data.

TABLE 3.14: SMART LOCATIONS FORECAST

CCI [

]

3.13.3 Smart location demand drivers

Internet of Things

The primary driver of our smart locations demand forecast is business demand for Internet of Things (IoT) solutions.

"The Internet of things (IoT) describes physical objects (or groups of such processing ability, software and other technologies that connect and exchange data with other devices and systems over the Internet or other communications networks." [37]

Business and public demand for IoT solutions is experiencing significant growth, CCI [

].[38]

CCI [ ] assumes that both the private and public sector will increasingly more adopt IoT solutions, primarily with the objectives to:

- reduce business costs via automation
- improve customer experiences via increased data capture and utilisation
- improve sustainability metrics (i.e. IoT can reduce carbon emissions by optimising energy usage and reducing waste)
- create safer/better living environments for NZ communities (e.g. Smart Cities)
- generate and monetise new revenue streams.

INTERNET OF THINGS

The primary driver of our smart locations demand forecast is business demand for Internet of Things (IoT) solutions.

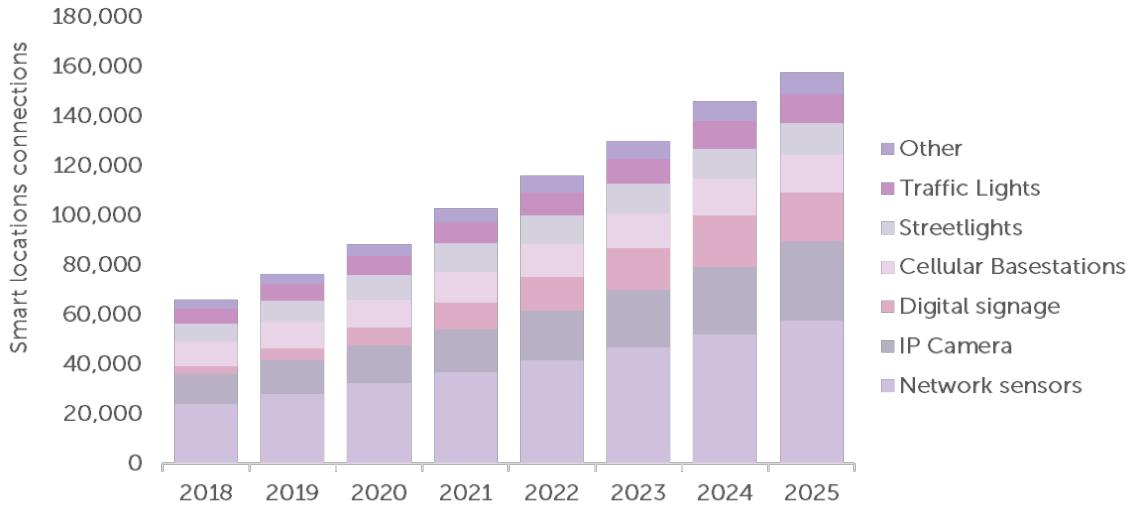
37 Source: Wikipedia
38 CCI [ ]

CCI [ ] has identified high-bandwidth use cases for which fibre would be the technology of choice, including:

- outdoor CCTV (IP Cameras) digital signage
- outdoor traffic management.

These high-bandwidth use cases are on a trajectory of growth as illustrated in the IDC's connection forecast for the New Zealand IoT market below. [39]

FIGURE 3.34: IOT MARKET (IDC)



Advancements in technology

The second driver is advancements in technology. There are continuous advancements in technology that push demand from low-bandwidth to high-bandwidth connectivity requirements. This is reinforced by increasing efforts in the private and public sectors to enable the digital transformations through Artificial Intelligence, Big Data, facial recognition, live streaming and digital video resolution.

Development in device and hardware technology are particularly driving this trend, including advancements in:

- ONT technology – new small factor pluggable ONTs allow more effective and efficient connection to existing fibre infrastructure, and in turn increase the competitiveness of fibre relative to alternative technologies
- CCTV device hardware
- street furniture options – smart location operators now have options including visual boards, bus stops or poles, which drives bundled options for connectivity.

ADVANCEMENTS IN TECHNOLOGY

There are continuous advancements in technology that push demand from low-bandwidth to high-bandwidth connectivity requirements.

39 Source data: IDC IoT Ecosystem Fixed Forecast 2021 for Total connections

3.13.4 Forecasting uncertainties and risk

As alluded to before, our plan to connect approximately another CCI [ ] smart locations over PQP2 will be carried out on the back of expected growing demand and our planned initiatives aimed at increasing our smart locations market share.

The key assumptions driving risk in our smart location connection forecast are therefore:

- the extent to which we can achieve process improvements that in turn reduce unit cost over time, including the appeal any resulting lower unit cost would have on customer demand
- our ability to improve customer experience through reduced order to connect times, particularly if any automation efforts turn out to be cost prohibitive
- uncertainty in the overall addressable market and category growth as estimated by IDC.

Whilst we believe these uncertainties are real and result in significant risk in our smart location connections forecast, our proposal to cover the associated capex by the connection capex mechanism as discussed in the connections capex chapter would remove demand risk entirely from the capex forecast.

Still, we have implemented governance processes that test and challenge these key assumptions:

- We validate the IDC's addressable market data through internal review.
- We validate the IDC's IoT category growth through desktop research, drawing from information RSPs publish on the IoT market performance.
- We challenge our own smart location connections forecast as part of the governance process that we follow for our internal planning processes.

3.14 Appendix C – End-user FFLAS connections by POI

The below table shows the breakdown of end-user FFLAS connections by year by Point of Interconnect (POI) region. The volumes shown here align to those total volumes provided in Table 3.10.

TABLE 3.15: END-USER FFLAS CONNECTIONS BY POI

	PRE-PQ1	PQP1				PQP2			
	2020	2021	2022	2023	2024	2025	2026	2027	2028
Ashburton	5,940	6,913	7,650	7,814	8,053	8,252	8,340	8,379	8,469
Auckland	421,894	458,804	486,697	507,895	532,604	555,995	572,878	587,130	598,463
Blenheim	10,698	11,635	12,340	13,167	13,747	14,178	14,437	14,615	14,826

	PRE-PQ1		PQP1			PQP2			
	2020	2021	2022	2023	2024	2025	2026	2027	2028
Christchurch	8,979	11,635	13,724	15,608	16,766	17,554	17,958	18,204	18,459
Dunedin	36,672	38,818	41,491	43,168	44,816	46,194	47,066	47,639	48,323
Gisborne	8,599	9,623	10,416	11,002	11,504	11,925	12,205	12,427	12,639
Greymouth	5,501	6,552	7,196	8,167	8,754	9,102	9,266	9,384	9,514
Hamilton	11,205	17,543	20,547	22,703	24,032	24,764	25,005	25,127	25,397
Invercargill	19,878	23,250	25,946	28,093	29,537	30,453	30,863	31,060	31,411
Kapiti	10,435	13,075	14,787	15,563	16,184	16,656	16,934	17,124	17,362
Levin	6,340	7,439	8,488	9,273	9,795	10,179	10,431	10,639	10,828
Masterton	8,359	9,942	11,078	12,265	12,907	13,345	13,583	13,732	13,918
Napier & Hastings	33,783	39,588	43,017	45,020	46,828	48,293	49,186	49,837	50,564
Nelson	23,292	26,207	28,397	30,096	31,339	32,272	32,802	33,146	33,597
New Plymouth	1,391	1,834	2,106	2,256	2,347	2,400	2,416	2,421	2,443
Oamaru	4,082	4,457	4,910	5,511	5,885	6,142	6,302	6,416	6,523
Palmerston North	29,092	32,019	35,978	38,836	40,730	42,064	42,759	43,113	43,644
Queenstown	14,575	18,385	21,866	24,104	25,690	26,877	27,613	28,166	28,662
Rotorua	16,915	18,087	18,961	20,048	21,001	21,792	22,322	22,728	23,120
Taupo	8,511	9,659	11,042	13,167	14,294	15,031	15,458	15,747	16,019
Tauranga	5,752	9,080	12,369	15,846	17,513	18,444	18,810	18,986	19,218
Timaru	10,040	11,812	14,007	15,720	16,742	17,418	17,753	17,922	18,149
Whanganui	286	328	353	365	379	388	390	391	394
Wellington	100,486	115,174	124,329	129,724	135,868	141,674	145,969	149,578	152,513
Whakatane	6,289	8,674	9,596	10,581	11,166	11,497	11,610	11,660	11,785

	PRE-PQ1		PQP1			PQP2			
	2020	2021	2022	2023	2024	2025	2026	2027	2028
Whangarei	5,378	7,836	9,493	12,136	13,307	13,944	14,205	14,338	14,510
TOTALS	814,372	918,370	996,784	1,058,126	1,111,789	1,156,832	1,186,560	1,209,908	1,230,749

4.0 QUALITY

Te Kounga

4.0 Quality

This is our IFP Quality report. It describes the quality of service we plan to deliver, explains how we measure quality, forecasts key outcomes and shows links to planned expenditure.

4.1 Our quality report at a glance

4.1.1 Network quality in PQP1 to date

Network quality in PQP1 has been good so far.

- Network availability, as measured by two availability quality standards, has had no breaches in any regions, with only the Whangarei area being at risk of going out of band at one stage. Corrective actions were put in place for Whangarei to avoid breaching the quality standard for the year 2022, and daily reporting has been created for all areas to proactively identify any future possible events.
- Network performance, as measured by the performance quality standard, has seen:
  - one breach of the quality standard resulting from an unprecedented and unforeseeable event. This event, however, did not impact on end-user experience, which has been in line with expectations
  - a significant impact from Cyclone Gabrielle, where we narrowly avoided breaching the standard due to events outside of our control.

QUALITY STANDARDS

Chorus has three quality standards for PQP1: two availability quality standards and a performance quality standard.

3

4.1.2 What stakeholders want

Stakeholders consider broadband services essential to New Zealanders, citing the importance for working from home, running businesses and education. In consultation, an early survey found mixed views on whether end-users were prepared to pay more for fewer outages. In our later consultation round, where costs and benefits of options were presented, most stakeholders supported investment options to improve resilience (noting the projects consulted on were targeted at increasing network redundancy, rather than improving performance relative to the quality standards), However, retail service provider (RSP) stakeholders in particular were more concerned about the potential cost of improvements.

STATUS QUO

"Just maintain standards."

Stakeholder feedback

4.1.3 Overall quality direction

We will sustain existing levels of quality in PQP2 and propose to broadly carry over the quality standards from PQP1 into PQP2.

4.1.4 Where we propose change

We propose to adjust some aspects of the PQP1 quality standards carried over into PQP2 to better capture how end-users experience network quality and to avoid breaches that do not speak to a failure to invest in and manage the network in accordance with good telecommunications industry practice.

Our proposed changes particularly address issues with the way quality standards were set for PQP1 with a view to improve their effectiveness going forward and to help enable the new regulatory regime to work as intended. While improving end-user experience for some proposed changes has been a consideration and would be a noticeable outcome, creating end-user benefit has not been the key driver for our proposed changes.

In particular, we propose the following changes to the quality standards set for the mandatory (i.e. those that must have associated standards) quality dimensions of availability and performance.

- For the availability quality standards[40] set for Layer 1 and Layer 2 we propose to replace the current 23 availability Point of Interconnect (POI) areas with 11 Customer Service Areas (CSAs) to deliver a more consistent end-user experience across the network and allow us to be more responsive to issues.
- For the performance quality standard[41] we propose to:
    - remove the impact of unforeseeable and unprecedented demand spikes from our performance against the quality standard, as we are not funded to build a network that could accommodate these spikes and it would not be economic to do so
    - increase the port utilisation threshold back to its Crown Infrastructure Partners (CIP) level of 95%, as evidence suggests a lower threshold does not impact how end-user experience quality but increases the likelihood of quality standard breaches, triggering compliance cost for Chorus and investigation cost for the Commerce Commission (the Commission).
    - remove the impact of port utilisation events caused by network failures from our performance against the quality standard, as currently the standard measures reliability for which the Commission has put in place separate availability standards. This creates an element of 'double-jeopardy', where we can be penalised for network failure-driven port utilisation events under the quality standards set for both the availability and performance quality dimensions.

We are not proposing to change how availability and performance are measured and reported under Information Disclosure (ID). It is important that Chorus, the Commission and other stakeholders are able to observe changes in quality over time (including as a result of any changes to the price-quality (PQ) quality standard settings), and continuity of quality measures under ID will ensure this. What we are proposing are changes to the PQ compliance boundary settings for the availability and performance quality dimensions to better calibrate the incentives to preserve quality.

QUALITY FROM PQP1 TO PQP2

We will sustain existing levels of quality in PQP2 and propose to broadly carry over the quality standards from PQP1 into PQP2.

EXISTING QUALITY STANDARDS

We propose to adjust some aspects of the PQP1 quality standards for PQP2 in order to better capture how end-users experience network quality.

40 See section 4.10 for more information on our proposal for the availability quality standards.
41 See section 4.11 for more information on our proposal for the performance quality standard.

4.1.5 No new quality standards for PQP2

We have considered whether any new quality standards are appropriate for PQP2 based on our expenditure plans.

Quality standards operate in concert with market and other regulatory mechanisms to ensure we have incentives to supply services of a quality that reflects end-user demands. The three quality standards included in our proposal, together with market incentives and other elements of the regulatory framework, will maintain strong incentives for us to provide high quality fibre services in PQP2 across all dimensions of quality.

Regarding our performance against non-mandatory quality dimensions as reported under ID for 2022, our provisioning and fault response performance was adversely impacted by the service company reset (minor impact) and technician shortage (major impact), which was largely a result of pandemic border controls and immigration policy. These impacts have been ongoing into 2023 and compounded by extreme weather events including Cyclone Gabrielle – see our Delivery report for more detail.

That being so, we do not believe a quality standard for provisioning and/or fault response is necessary or appropriate. We already have strong incentives to connect end-users and restore faults in a timely manner. The issues described above are both short-term and related to factors largely beyond our control. Response to these issues and their impacts has been a key focus for Chorus at an operational, management and governance level and it cannot be reasonably argued that PQ quality standards would have improved the response. We have been communicating these impacts transparently through briefings to the Commission and engagement with our RSP customers.

Also, with very limited historical information available today, it would be premature to propose introducing further quality standards for PQP2, particularly as this would risk setting the potential new standards at levels that are too aspirational,[42] hence jeopardising the regulatory purpose of setting quality standards.[43] Poorly calibrated quality standards can also introduce perverse incentives to act in ways that are contrary to end-users' interests.

We will continue to collect data under ID and continue to engage with our stakeholders to understand their evolving needs in a world that becomes increasingly reliant on reliable and resilient broadband. We will assess the implications for network quality and consider the merits of having additional quality standards in subsequent PQ periods.

NO NEW QUALITY STANDARDS

We propose no new quality standards for PQP2. The three existing standards in concert with market incentives and other elements of our regulatory framework maintain strong incentives for us to provide a high service across all quality dimensions.

4.1.6 Our expenditure proposal is based on our quality proposal

We note that our expenditure forecast and our quality proposal for PQP2 are in balance. This means our expenditure forecast would provide just enough funding for us to meet our proposed quality standards. Any deviations from the quality standards as we propose them for PQP2 would have flow on impacts on our funding requirements. For example, when considering tighter quality standards (including when not adopting our proposed adjustments to the settings of the PQP1 quality standards), our funding requirements for PQP2 would have to be reconsidered and our expenditure forecasts would

BALANCED PRICE-QUALITY PROPOSAL

Our proposal provides just enough funding to meet our proposed quality standards. Any changes to the proposed standards will have a flow on impact on funding requirements.

42 It is good regulatory practice to set quality standards at levels that are achievable, unless regulatory funding is increased to provide new levels of service quality that are different from those achieved in the past.
43 Which is, in short, to create an incentive to not let quality degrade below a minimum level of service quality.

need to increase to enable us deliver a quality that meets the associated standards.

In this context, we specifically mention the implications unforeseeable and unprecedented demand spikes can have on our performance measured against the performance standard. If bandwidth demand associated with these types of spikes is not removed from the measure of our performance, our funding needs in PQP2 would need to increase significantly to reduce the risk of us breaching the standard.

See sections 4.11.5 and 4.11.6 in particular for the relationship between bandwidth demand and our funding requirements.

4.2 What is quality?

Quality is a broad concept – it is the user-facing outcomes we seek from our expenditure – and has specific regulatory meaning and context. Some key ideas about quality are the following:

- **Balance** – any regulatory proposal should aim for the right PQ balance. If we spend more then, all things being equal, prices and quality will be higher over time (and vice versa). A key goal for any infrastructure provider is to align this balance with the longer-term interests of end-users
- Wholesale – we provide wholesale services to our RSPs, who in turn provide services to end-users. This means we cannot control everything that will impact the quality that end-users experience. However, our infrastructure is critical to end-user experience. As a wholesaler, we have a dual focus on our direct customers – working with them to provide seamless services – and end-users
- Products – unlike many utilities, we offer differentiated products – e.g. with differing speeds, configurations, fault restoration targets and technologies. This allows our customers and end-users more choice because we offer multiple PQ trade-off points, albeit based on a common underlying infrastructure. We also have regulatory oversight and contractual arrangements that govern our product offers in detail
- Infrastructure – in this context, the appropriate focus of our proposal is on infrastructure quality, i.e. the availability and performance levels our network and operational arrangements are set up to support (and from which we can offer differentiated services)
- Pace – our ability to shift quality over a PQ period (up to five years) is not absolute. Some quality outcomes are readily altered by changes in expenditure – for example, ignoring possible resourcing constraints, we could double or halve customer operations resourcing, noticeably impacting timeliness.44 Other quality outcomes are slow-moving or indirect – for example, we could double the pace of resilience investment, which would flow through to reduced downtime, but not instantly
- **Other outcomes** – quality is not the only investment outcome we target. Other important drivers include safety (of our workers and the public), lifetime cost (i.e. spending more now to reduce costs in future) and community outcomes (such as reducing visual impact). This is important

44 This assumes an unconstrained labour market.

context when discussing the potential impact of alternative quality outcomes on our forecast expenditure for PQP2, as not all of our expenditure categories would be impacted.

Our discussion of quality uses ideas set out in the Fibre Input Methodologies (Fibre IMs).[45] Table 4.1 provides a guide to terminology.

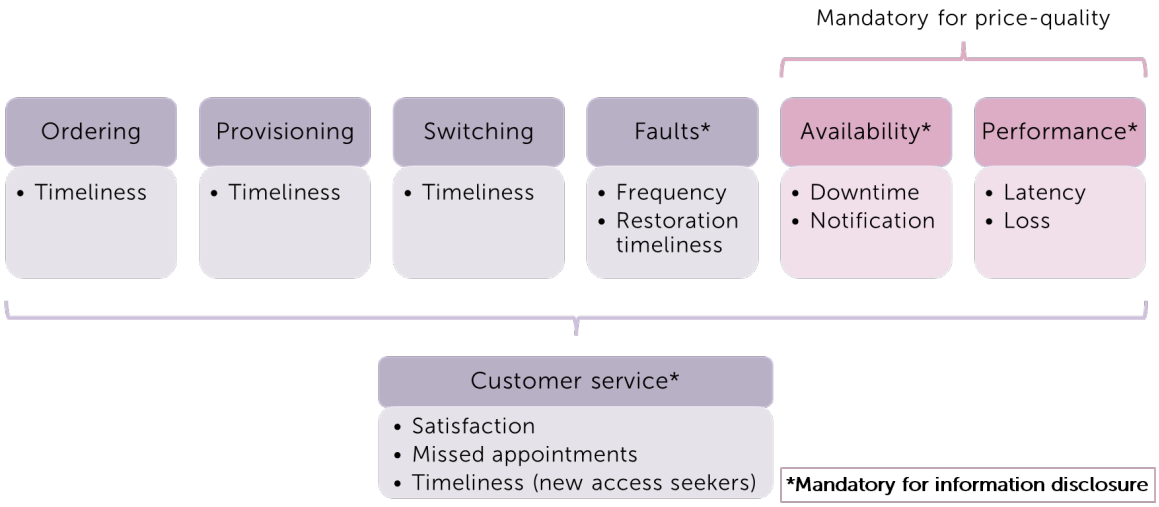
TABLE 4.1: QUALITY TERMINOLOGY

TERM	MEANING	EXAMPLES
Quality dimension	A high-level aspect of service quality. Defined in the Fibre IMs.	• Availability • Performance • Provisioning
Quality metric	Something that can be measured. Examples given in the Fibre IMs.	• Time to provision • Time to restore • Port utilisation
Quality performance measure	A specific measure of quality. Set in PQ and ID determinations.	• Average utilisation (%) over a five-minute period
Quality performance statistic	A level of quality (e.g. for a target). Set in PQ determinations.	• % of ports with high (>70%) utilisation • % of ports with very high (>95%) utilisation
Quality standard	A specific quality-related compliance requirement. Set in PQ determinations.	• no more than 20% of ports should have very high utilisation in any month

Figure 4.1 provides an overview of the quality dimensions set in the Fibre IMs, which include six lifecycle-based dimensions and one over-arching customer service dimension. Two dimensions are mandatory for PQ regulation, meaning they must have associated quality standards. Four dimensions (including the two PQ dimensions) are mandatory for information disclosure.

45 See Subpart 6 of Part 3 of the Fibre Input Methodologies Determination 2020. Fibre-Input-Methodologies-Determination-2020-consolidated-as-of-29-November-2021-21-December-2021.pdf (comcom.govt.nz)

FIGURE 4.1: OVERVIEW OF QUALITY DIMENSIONS



4.3 Scope of this report

In this report we set out what our stakeholders have told us about quality and our quality aim for PQP2. We examine the foundations of the quality of service we provide, consider our performance against the PQP1 standards, and propose changes to the PQP1 standards to better calibrate the quality standards to achieve our quality aim.

The quality standards proposed in this report provide the basis for our expenditure proposal in PQP2. We are not proposing a step-change in any aspect of quality and, accordingly, this report does not discuss in detail what any such change would mean for services, expenditure and whether this might require additional quality standards.

For PQP3 and subsequent regulatory periods we will reconsider our approach to network quality and to setting quality standards. This might include proposing different quality standards and/or proposing quality standards for some of the non-mandatory dimensions where market conditions have changed or where appropriate given expenditure plans in those periods. By then we expect our understanding of the PQ balance as experienced by end-users will have improved substantially and we will have gained valuable insights from having repeatedly reported performance against these dimensions under ID regulation.

SUSTAINED QUALITY STILL REQUIRES INVESTMENT

Sustaining quality requires ongoing investment as the network grows, assets age and risk profiles evolve.

4.4 Stakeholders support our overall quality goal to sustain quality

The stakeholder feedback we received through our engagement activities leading up to this proposal and as discussed in our Engagement report supports our proposal to sustain the quality of our fibre services.

To be clear, we are not intending to relax quality, and do not have plans for investment or changes in our operations that would lift quality to a new level. However, sustaining quality will require ongoing investment as the network grows, assets age and risk profiles evolve.

This is a continuation of our journey since PQP1. We think this is still appropriate, primarily for two reasons:

- Whilst we found it hard to consult with stakeholders on the details and technicalities that make up our regulatory quality framework, we did not get any stakeholder feedback suggesting a step change up or down in quality was necessary, particularly in light of any resulting pricing implications. Stakeholders consider broadband services essential to New Zealanders, citing the importance for working from home, running businesses and education. In consultation, an early survey found mixed views on whether end-users were prepared to pay more for fewer outages. In our later consultation round, where costs and benefits of options were presented, most stakeholders supported investment options to improve resilience (noting the projects consulted on were targeted at increasing network redundancy, rather than improving performance relative to the quality standards). However, RSP stakeholders in particular were more concerned about the potential cost of improvements.
- It would be premature to make wholesale changes at this stage. As we have only just transitioned into new regulatory arrangements and our focus has been on initial network build and connection growth. We are only now transitioning to a steadier state environment.

STAKEHOLDERS SUPPORT SUSTAINED QUALITY

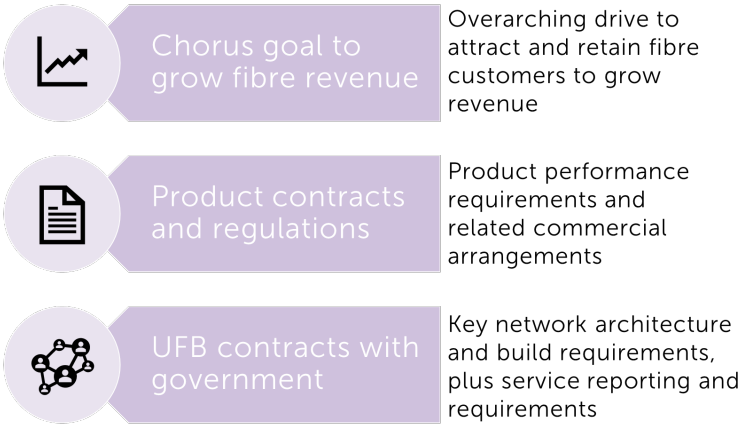
We received no feedback from stakeholders suggesting that a step change in quality was required. Whilst most stakeholders support increased resilience investment, this is balanced by cost concerns.

4.5 We are transitioning further into the new regulatory regime

The quality we deliver now has the Ultra-Fast Broadband (UFB) build contract at its foundation. We also have our service contracts with RSP customers and regulations as a guide to outcomes, and we have our strategic goals as an overarching driver for continuous improvement.

We signed our first UFB contract with the government in 2011 following a competitive tender and negotiation process. This played a major role defining the quality designed and 'built-in' to the network.

FIGURE 4.2: QUALITY CONTEXT



We also agreed product specifications that have been added to and updated through subsequent regulatory and commercial developments. For example, direct fibre access service (DFAS), our unbundled, point-to-point 'dark fibre' offering, was required in our UFB agreement and was introduced in 2011 subject to a government-approved reference offer. We agreed an updated service level framework for our reference offer in 2018. From the start of PQP1, DFAS was incorporated in the regulatory framework as a declared service. The initial product requirements informed our initial build, and updated requirements build on what we've learned since and inform our ongoing investment and operations.

Throughout PQP1, the UFB build contracts and their product frameworks are transitioning to new regulatory requirements. For products, there is a policy goal of a smooth transition for both price and quality. For underlying infrastructure quality, we are guided by:

- our network architecture, as developed and implemented through the UFB programme. While architecture can be changed for future extensions, altering existing architecture would require major investment over a long timeframe
- UFB requirements that are 'built-in' to the network through our planning, asset and operational standards and practices. We could build towards new performance levels over time as assets are replaced, cycled or augmented
- our product environment, which has evolving product speeds but is otherwise generally stable in terms of quality requirements. We have bilateral contractual agreements with our customers specifying, amongst other things, the quality associated with our fibre product offerings. Our contractual framework includes extensive and detailed change mechanisms and cannot be changed unilaterally. Any change materially impacting quality would need to be consulted on, negotiated and notified for a significant period prior to implementation (potentially over a year)
- the impact increased quality may have on prices. In order to recover the cost associated with increased quality we might have to lift the prices for our products. There is only limited scope in the short term for such price increases given the existence of an 'anchor' service and price point, and due to the competitive pressures arising from alternative technologies such as fixed wireless.

Cutting across these requirements, we continue to pursue initiatives that will result in a lower cost per connection for our fibre fixed line access service (FFLAS), which will ultimately flow through to what end-user pay for broadband. We do this by:

- monitoring and adapting to customer and end-user preferences and experiences, competing technologies and end-user trends
- striking a balance between quality and cost that makes our services attractive now and into the future
- promoting our services so we can attract end-users, sustain momentum and spread fixed costs across more connections

MANY LAYERS OF REGULATION

PQ regulation is only one of several layers of regulation and contractual agreements that Chorus is subject to.

'BUILT IN' REQUIREMENTS

Our network architecture was developed and implemented through the UFB programme. UFB requirements are 'built into' the network through our planning, asset and operational standards and practices.

- continually seeking out and implementing improvement opportunities to reduce costs or improve services
- proactively providing our customers with visibility of real-time network information to help them manage the retail services they provide across our network
- prudently adopting good industry practices that cost-effectively enhance the long-term quality of our infrastructure.

Considering this context, and as we transition further into our new regulatory arrangements, we think the prudent course involves:

- continuing to improve our understanding of the PQ balance as experienced by end-users, also by reflecting on the level of quality that was built into the network under prior forms of regulation and under PQP1 settings and how this should evolve going forward with changing end-user expectations
- broadly holding quality stable whilst this understanding grows and we transition further into our new regulatory arrangements
- adjusting some aspects of the PQP1 quality standards carried over into PQP2 to better capture how end-users experience network quality currently, and to better calibrate the existing standards to support holding quality stable.

4.6 The price-quality measures for PQP1

For PQP1, the Commission set quality standards for the mandatory quality dimensions availability and performance.

- 'Availability' is defined in the Fibre IMs as "...the extent to which [ID/PQ] FFLAS is not subject to downtime". Example metrics in the Fibre IMs are maximum downtime, average downtime and notification to access seekers of outages.
- 'Performance' is defined in the Fibre IMs as "...the technical functioning of [ID/PQ] Fibre Fixed Line Access Services (FFLAS), including the extent to which this affects the experience of an access seeker or end-user". Example metrics given in the Fibre IMs are frame delay, frame loss ratio, frame delay variation and port utilisation.

The Commission did not set any standards for the optional quality dimensions of ordering, provisioning, switching, faults and customer service.

The Commission noted the following for the non-mandatory quality dimensions:

- For provisioning, faults and customer service, "Market-based incentives such as competition from FWA [fixed wireless access] providers means there are already strong incentives in these dimensions."[46]

AVAILABILITY

"...the extent to which [ID/PQ] FFLAS is not subject to downtime."

Fibre IMs

PERFORMANCE

"...the technical functioning of [ID/PQ] Fibre Fixed Line Access Services (FFLAS), including the extent to which this affects the experience of an access seeker or end-user."

Fibre IMs

PROVISIONING, FAULTS & CUSTOMER SERVICE

"Market-based incentives such as competition from FWA providers means there are already strong incentives in these dimensions."

Commerce Commission

46 Chorus' price-quality path from 1 January 2022 – Final decision Reasons paper, 16 December 2021, para 7.72

- For ordering and switching, they "had not seen sufficient evidence that ordering and switching were important to the purpose of PQ regulation at this stage" and "that switching is covered by the TCF [Telecommunications Carriers Forum] Customer Transfer Code".[47]

They also noted the need to collect more data under ID before setting quality standards for the non-mandatory quality dimensions, saying that "For PQP1, we see ID regulation as a key tool we will use to collect relevant data on the optional dimensions of quality. We can use information collected during PQP1 to inform subsequent price-quality decisions to promote the long-term benefits of consumers". [48]

The Commission was particularly concerned by any potential enforcement consequences regarding any breaches of quality standards. They noted that "given the serious enforcement consequences of a breach of a quality standard, we do not consider that it is proportionate to impose quality standards for the optional quality dimensions at this stage". [49]

The below table from the Commission's PQP1 reasons paper summarises the quality standards that apply to us in PQP1.

Note, the 'availability POI areas' referred to for the quality standards set for availability are in regard to the 26 UFB POI areas with the smallest three combined into their neighbours to make 23 availability POI areas.

ORDERING & SWITCHING

"...Not seen sufficient evidence that ordering and switching were important to the purpose of PQ regulation at this stage."

Commerce Commission

TABLE 4.2: PQP1 QUALITY STANDARDS[50]

MANDATORY VS. OPTIONAL	QUALITY DIMENSION	QUALITY STANDARD	APPLIES TO	DETERMINATION REFERENCE
Mandatory	Availability: average unplanned downtime Reporting differentiated by geography (availability POI area) and service layer (Layer 1 and Layer 2)	To comply with the Layer 1 availability quality standard in a given availability POI area in a regulatory year, Chorus' average unplanned downtime must not exceed, for a Layer 1 aspect of a fibre network, 160 minutes in an availability POI area.	Each availability POI area	Clause 8.1
		To comply with the Layer 2 availability quality standard in a given availability POI area in a regulatory year, Chorus' average unplanned downtime must not exceed, for a Layer 2 aspect of a fibre network, 40 minutes in an availability POI area.	Each availability POI area	Clause 8.2

47 Chorus' price-quality path from 1 January 2022 – Final decision Reasons paper, 16 December 2021, para 7.76
48 Chorus' price-quality path from 1 January 2022 – Final decision Reasons paper, 16 December 2021, para 7.83
49 Chorus' price-quality path from 1 January 2022 – Final decision Reasons paper, 16 December 2021, para 7.71
50 Chorus' price-quality path from 1 January 2022 – Final decision Reasons paper, 16 December 2021, table 7.1

MANDATORY VS. OPTIONAL	QUALITY DIMENSION	QUALITY STANDARD	APPLIES TO	DETERMINATION REFERENCE
		Downtime attributable to force majeure events and non-diverse transport services are excluded from measurement of the availability quality standard		Clause 4.2 (definition of 'net unplanned downtime')
	Performance: port utilisation	To comply with the performance quality standard for a regulatory year, the percentage of Chorus's ports experiencing port utilisation, upstream or downstream, equal to or exceeding 90% in any five-minute interval in one or more calendar months, must not exceed 0.12%.	Chorus' PQ FFLAS network	Clause 8.3
Optional	Ordering	None		
	Provisioning	None		
	Switching	None		
	Faults	None		
	Customer Service	None		

4.7 How we have performed so far against the quality standards

At the time of submitting this proposal to the Commission, we are in the second year of our initial PQ period, having audited performance information available for year one of PQP1 (2022) and only preliminary and unaudited information for some of 2023.

4.7.1 Availability

As described in the Table 4.2, for the availability quality dimension the Commission determined an 'average net unplanned downtime' metric with the following quality standards:[51]

- the average net unplanned downtime for Layer 1 must not exceed 160 minutes in a given availability POI area in a regulatory year
- the average net unplanned downtime for Layer 2 must not exceed 40 minutes in a given availability POI area in a regulatory year.

AVAILABILITY

Our performance in PQP1 against the availability quality standards has been within band for all areas.

51 'Average net unplanned downtime' is defined in the Commerce Commission's Fibre Price-Quality Path Determination 2021.

Network availability has been within band for all areas

Our performance in PQP1 against the availability quality standards has been within band for all areas (availability POIs). While Northland is in band, the Layer 1 performance was close to the quality standard in 2022.

The poor performance in Whangarei (an area where procuring sufficient technical resourcing has always been difficult, especially since COVID-19) was compounded due to increased resource demand from non-FFLAS work and by the transition of our Field Services Agreement (FSA) to a new field supplier, which has now been completed.

Ensuring that we stayed within band required us to significantly exceed the performance above the level of performance necessary under business-as-usual circumstances, as we had to 'claw back' lost performance to stay within the quality standard over the year. This was a challenge due to:

- the low number of fibre customers in Northland – we are not the UFB provider in Northland and the large fibre customer base in Whangarei is on the Northpower network
- low fault numbers overall – with a fault rate of less than 5 faults per 100 connections (per annum), this minimises the opportunity to group faults and adds to the impact of the geographical challenges
- reduced field labour capacity – this is mostly attributable to border and visa changes for migrant workers and the impact of COVID-19
- geographical challenges – the end-user base is mostly split between Kaitaia, Kerikeri and Kaikohe, adding a large amount of driving time as technicians must travel between these towns to repair faults. This has also been compounded by the closure of State Highway 1 through the Mangamuka Gorge requiring long detours. This increased travel time increases the time to repair and therefore adversely impacts the downtime.

The main sustained action we have taken in this region has been adding additional permanent resources to Northland to provide quicker restoration times. We also temporarily moved resources from other areas as part of the 'claw-back' process.

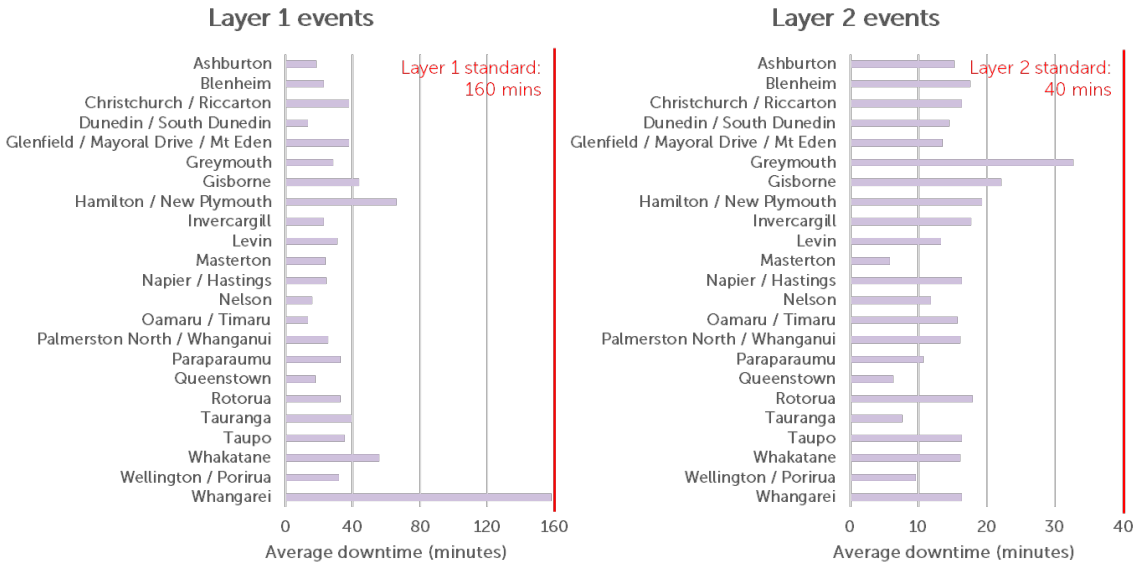
We have increased our performance monitoring and internal reporting requirements across all POI areas to manage performance daily. In particular, we now:

- actively review and manage faults with overdue commitments
- identify times where the overall performance is tracking towards a breach.

Overall, we are now able to better anticipate future performance issues so we can take corrective action proactively, such as moving additional field resources into a geographical area.

For the remainder of PQP1, we are confident that these actions reduce the likelihood of a breach of the availability quality standards.

FIGURE 4.3: AVERAGE DOWNTIME PER AVAILABILTY POI AREA



4.7.2 Performance

As described in Table 4.2, for the performance quality dimension, the Commission determined a 'port utilisation' metric with the following quality standard:

- the percentage of Chorus' ports experiencing port utilisation, upstream or downstream, equal to or exceeding 90% in any five-minute interval in one or more calendar months, must not exceed 0.12%.

The intent of the 90% port utilisation threshold is to provide an indication of network stress. It is lower than the 95% maximum utilisation threshold we have as a customer contractual service level or under the previous performance regime with CIP. At 90% utilisation there is no performance degradation in end-user experience, but limited headroom before degradation will start to be noticed.

See section 4.11 for supporting evidence, as well as more context in the Commission's PQP1 reasons paper.[52]

A port percentage limit of 0.12% allows up to four ports to exceed the utilisation threshold and remain compliant (as at August 2023, there were approximately 4,400 active ports in the fibre network). As the network evolves using higher speed technology, the number of ports in the network will reduce, further reducing the number of ports that would trigger a breach at 0.12% of ports.

We note that we put forward a 90% port utilisation threshold in our PQP1 proposal as part of our recommendation that the quality standard for PQP1 would be 'reporting only'. In the context of reporting only, a lower threshold is reasonable as a means of identifying potential performance degradation early. However, and as we commented in our submission on the

PERFORMANCE

We experienced a number of challenges with the performance quality standard, with it being confirmed only a few days prior to the start of the regulatory period, tightening the threshold from our previous contractual performance requirements.

52 Chorus' price-quality path from 1 January 2022 – Final decision Reasons paper, 16 December 2021, para 7.186.

Commission's draft PQP1 decision, in the context of a binding compliance boundary, a lower threshold is inappropriate because it requires us to spend above the levels set by our expenditure allowances for PQP1, whilst being unlikely to deliver any noticeable benefit to end-users who will eventually be paying these incremental costs.

Good performance despite challenging circumstances

We experienced a number of challenges with the performance quality standard in 2022 as noted below:

- The standard was only confirmed in the final determination in December 2021, just prior to PQP1 coming into effect, giving no transition time from the previous performance regime with CIP. The port utilisation threshold reducing from 95% to 90% required changes to our monitoring and response processes that took time to evaluate and put in place. Changes have since been made to our capacity management process, described further below. Some ports in the network had augmentation under action that could not be completed before the new standard came into effect.
- Significant peak demand volatility, as first experienced from 2019, has continued due to overseas content/game providers optimising global releases for North American time zones. These unpredictable surges in demand are not able to be controlled or precisely forecast by us, requiring further changes to capacity management processes to create more headroom on the network compared to baseline forecast demand levels. These events were a relatively new phenomenon when planning for our PQP1 proposal submission, so were not completed or factored into our baseline demand and the resulting funding requirements.
- Equipment supply and field resource constraints have made network expansions take longer than previously experienced. This has driven more changes to our planning and technology delivery processes. It has created more pressure to trigger work earlier as the time to complete work has increased. Ongoing challenges for the supply of equipment from overseas has driven earlier commitment to vendor orders and the need to hold local inventory for items previously ordered on demand.

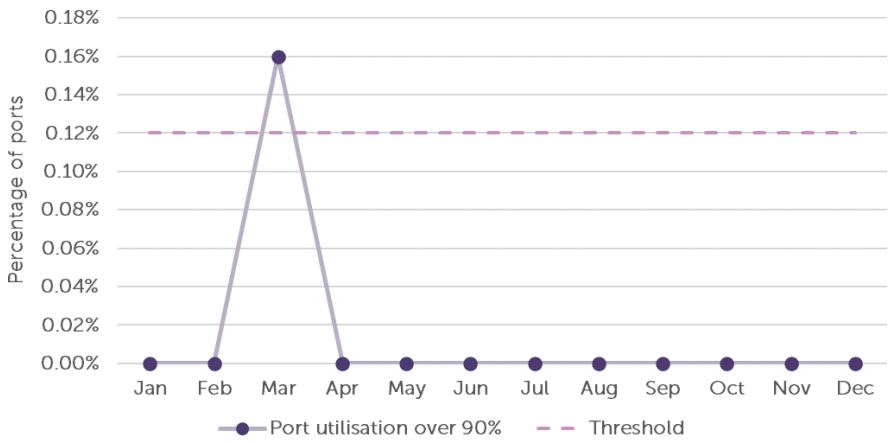
DEMAND VOLATILITY

Demand on our network has been increasingly volatile in recent years and we expect these trends will continue.

An unforeseeable and unprecedented spike caused quality standard breach

An event in March 2022 caused a breach of the performance standard for that year. In July 2022, we provided a breach report to the Commission as required by the PQP1 Determination, which describes the breach in detail.

FIGURE 4.4: ACTUAL PORT UTILISATION FOR 2022



An update to the popular video game 'Fortnite' was pushed globally by the developers at a time which coincided with daily peak demand in Aotearoa. This produced an unforeseeable and unprecedented 25% spike in peak demand, that caused three links in the fibre aggregation network (comprising six ports) to experience utilisation over 90%. We note that as none of the six ports ever exceeded 95% utilisation the event did not constitute a 'fault' under either the PQ Determination or contracts with our customers.

We note the following context to better understand this breach:

- To the best of our knowledge, no end-users were impacted by this event. The traffic performance data for the affected links suggests no deterioration in the performance experienced by end-users. We received no contact from any end-users or RSPs noting reduced performance.[53]
- This breach did not indicate any deterioration of the network or failure to manage it in accordance with good telecommunications industry practice. Rather, the fact that this unprecedented demand event resulted in port utilisation over 90% on only three links (with none exceeding 95%) indicates effective of network capacity management.
- The links that exceeded 90% port utilisation were identified as requiring capacity augmentation and had job requests in place for upgrade in October 2021 – prior to both the issue of the PQ determination which set the new 90% utilisation threshold, and the demand spike of 20 March 2022. Augmentation lead times (as discussed above) meant this upgrade could not be completed prior to the demand spike, but all three links have now been upgraded.

The event that resulted in this breach of the performance quality standard is part of an increasing trend of unpredictable traffic events (see Figure 4.5 below). Demand events having even greater impact cannot be ruled out and, arguably, should be expected.

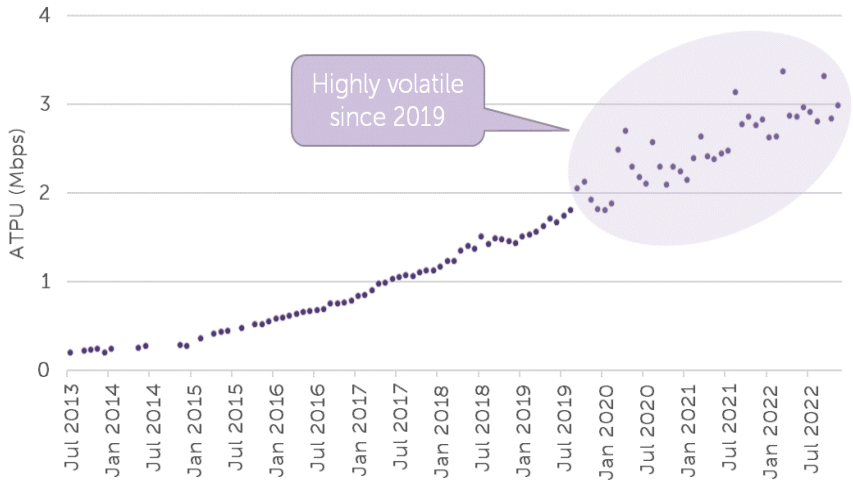
PERFORMANCE

We breached the performance standard in early 2022 due to an unexpected spike in demand. However, no end-users were impacted by the event.

53 We also note that all exceedances of the 90% threshold happened over a 20-minute period only.

More recently (i.e. in the second half of 2022) we have noted a period of lower month on month growth. However, we have also noted further unforeseen demand spikes of a smaller nature, signalling that such spikes will continue to occur.

FIGURE 4.5: AVERAGE THROUGHPUT PER USER (ATPU)



Cyclone Gabrielle almost triggered another quality standard breach

Over and above its wider network impacts with associated loss of service, Cyclone Gabrielle caused high port utilisation that almost resulted in another quality standard breach. This arose where loss of power and fibre paths resulted in a double failure on the route up to Kaikohe, leaving a single 10Gbps link carrying all the traffic normally supported by over 100Gbps of link capacity. The associated port utilisation increased to 92% before generators were able to bring additional capacity back online. However, we narrowly avoided breaching the quality standard as only 2 ports of the 10Gbps link were affected (i.e. only 0.05% of the total number of ports).

4.7.3 We have adapted our capacity management process

Whilst we continue to plan detailed network expansions for the next three years to keep ahead of forecast growth based on current technology solutions, we have adapted our capacity management process to meet the new port utilisation threshold for forecast traffic levels (and a specified tolerance for unpredictability).

The main change is lowering the acceptable operational port utilisation target to 50%, with ports reported with over 60% utilisation treated by escalation. Effectively, this brings forward investment in new capacity to keep ahead of possible demand spikes up to a reasonable level.

Whilst we have been able in the short term to repurpose funds under the fungible expenditure allowances to cover this accelerated expenditure, in the longer term our funding requirements would need to increase if the Commission decided to carry over the existing setting of the performance quality standard from PQP1 into PQP2.

In any event, and despite our increased efforts, there remains a risk that we will face situations similar to that which caused the 2022 breach again, as it is the nature of these unpredictable events that their full extent and timing cannot be forecast accurately.

In section 4.11.6 we discuss the potential additional funding we would need to be better able to accommodate these unpredictable events under the current settings of the performance quality standard. However, we do not have the relevant financial inputs[54] yet to determine whether building a network that can accommodate extreme demand spikes yields an economic benefit to end-users. Until we have these inputs, we would not consider it prudent to progress a major investment programme to allow for significant capacity headroom to meet short duration demand spikes.

As we discuss in more detail later in this report, our investment plan for PQP2 is based on the expectation of a pragmatic adjustment to the current quality standard, as outlined below, to ensure we strike a PQ balance that is in the long-term interest of end-users.

RESIDUAL RISK

We have adapted our capacity management process to meet the new port utilisation threshold, including a specified tolerance for unpredictability. However, there is a remaining risk due to the nature of these unpredictable events.

4.8 Context for our proposed quality standards for PQP2

The Fibre IMs require the Commission to set quality standards in a PQ determination for performance and availability. Standards are optional for other quality dimensions.

In setting quality standards, the key overarching principle is to ensure that end-user preferences for fibre service quality are met, while being co-optimised with their willingness to pay for these services.

Our proposed quality standards for PQP2 are grounded on that principle, considering also:

- the purpose of quality standards
- the relationship between quality and expenditure (our funding requirements)
- the market context
- other regulatory context.

54 E.g. the monetary value of unserved demand

4.8.1 The purpose of quality standards

The purpose of quality standards is to act as a minimum level of quality and encourage investment in, and maintenance of, the network to not let quality degrade below a given level. They correct for a broad incentive to underspend the regulatory allowances that would result in quality degradation over time. As such, quality standards are a trigger for compliance activity – in effect, they should operate as a backstop that is triggered infrequently to provide an opportunity to address emerging issues or arrest a deterioration in quality.

In practice, there is an art to setting standards at a level that:

- avoids false positives, i.e. identifying events that would trigger compliance activity unnecessarily, when there is no statistically significant deterioration in underlying performance and in how end-users experience network quality
- is nonetheless sensitive enough to function effectively and to indicate in a timely manner deterioration in the underlying network quality
- does not have unintended adverse impacts, such as stimulating overly cautious risk management that raises costs, slows innovation or otherwise worsens quality.

Experience from other regulated businesses is that it takes time to get the balance right. Considering this, we agreed with the Commission's decision for PQP1 to only set quality standards for the mandatory quality dimensions availability and performance, particularly as there are already strong incentives in place on us to provide network quality at a level that meets end-user preferences. For example, competitive market pressures incentivise us to offer fibre services of a quality that supports the best broadband in Aotearoa (more context below).

Also, when reflecting on the serious enforcement consequences of a breach of a quality standard, it appears premature to introduce quality standards for the non-mandatory quality dimensions at this early stage of the new regulatory regime. Breaches are increasingly more likely when the standards are set at the wrong levels due to limited historical information – this could set a trigger for compliance investigation by the Commission without the network quality, as experienced by end-users, being materially affected.

Any quality standard – even if aimed at ensuring maintenance of existing quality – has costs. This is because the potentially severe consequences of non-compliance mean the standard becomes a focus at a management and governance level, which has resourcing consequences. Similarly, the severity of the potential consequences means compliance with a standard can become prioritised over doing what is optimal for providing the best service to end-users. Accordingly, quality standards should only be introduced where there is a clear absence of other incentives to provide the quality end-users demand, and where there is a potential standard that will drive optimal behaviour with justifiable costs and low risk of perverse incentives.

THE ART OF QUALITY STANDARD SETTING

The purpose of quality standards is to act as a minimum level of quality and encourage investment in, and maintenance of, the network to not let quality degrade below a given level, but without triggering false positives or unintended consequences.

TOO EARLY FOR CHANGE

It takes time to get the balance right and it appears premature to make significant changes to the standards or to impose new standards.

4.8.2 Quality and expenditure balance

It is fundamental to PQ regulation to balance the quality end-users want from the network with the funding requirements the regulated supplier would have in providing services at the desired quality.

This means in practice, quality should be set at a level that reflects historical performance, unless the Commission approves step-changes in forecast expenditure (up or down) to account for the increased/decreased funding needs a regulated supplier would have when improving quality/letting quality degrade.

We built the network to a specific standard and planned our expenditure to support that. Both build and expenditure directly affect quality outcomes over time and must be explicitly considered when setting quality standards.

Consistent with what stakeholders have told us, our overall quality goal is to hold quality steady.

This insight is not only a key driver for our quality proposal, but also to determine our associated funding requirements as expressed in our expenditure forecasts. The goal is that quality and expenditure must be in balance – the expenditure forecasts forming part of this proposal should flow through to the quality standards the Commission will set, and vice versa.

Any quality standards that deviated from that goal would require adjustments to our funding needs, as we would otherwise be over/under-funded to deliver the level of quality the setting of standards is designed to ensure.

The below graphics illustrate the linkages between the PQ quality dimensions 'availability' and 'performance' and our expenditure areas, covering the strength of the linkage as well as the pace at which changes in spend would flow through to how end-users experience network quality.

Key:

Linkage strength:
How direct is the relationship between spend and quality?

One of several drivers | A key driver | Direct link

Linkage pace:
How quickly would a change in spend materially alter quality?

Beyond PQP2 | By the end of PQP2 | Within 12 months

PRICE-QUALITY BALANCE

Our proposed expenditure assumes quality standards are held steady except for the minor changes we propose in this chapter.

Any quality standards that deviate from our proposal would require adjustments to our funding needs, as we would otherwise be over/under-funded to deliver the level of quality the setting of standards is designed to ensure.

TABLE 4.3: LINKAGES BETWEEN EXPENDITURE AND THE AVAILABLITY QUALITY DIMENSION

AREA	STRENGTH	PACE
Extending the Network | all Installations | all The initial build quality of our network will influence Layer 1 reliability over coming decades. Additionally, without overbuilding the network, some planned downtime is required for short periods when growing the footprint of our network.		
Network Sustain and Enhance | Resilience Investment in resilience can reduce the risk of widespread downtime events.		
Network Sustain and Enhance | Field Sustain Replacing or refurbishing in-field assets reduces Layer 1 downtime risk.		
Network Sustain and Enhance | Site Sustain Replacing or refurbishing site assets reduces Layer 2 downtime risk.		
Network Sustain and Enhance | Relocations Relocation work protects network elements.		
Network Capacity | all The age, built (or configured) quality and capacity of our network electronics influences Layer 2 reliability. We build in a certain amount of duplication in high customer concentration areas to protect services. Investing in non-production environments allows us to test changes to give confidence they will be delivered as seamlessly as possible into the live network.		
Network | Operating Costs Increase the number of field resources to reduce the time to restore.		

TABLE 4.4: LINKAGES BETWEEN EXPENDITURE AND THE PERFORMANCE QUALITY DIMENSION

AREA	STRENGTH	PACE
Network Capacity | all We manage aggregation port utilisation through ongoing aggregation network capacity investment. A major change in RSP POIs would also shift aggregation port utilisation patterns. Aggregation capacity investment has knock-on impact on transport needs. We invest in new transport links or link capacity to stay ahead of demand. Our access network is designed to minimise the need for physical reconfiguration. We stay ahead of bandwidth growth through technology investment. We will sustain investment to meet growing demand as connections grow and as average throughput per user increases. Even without bandwidth growth, we would invest for lifecycle (reliability and vendor support) and product evolution.	▲▲▲	●●●
Network | Network Operations Our Network Operating Centre (NOC) monitors and manages network operation, including technical support and escalation.	▲▲△	●●●
Network | Operating Costs Investment in capacity can impact power and cooling needs and increase the fibre access share of exchange space.	▲▲△	●●●
Support | Asset Management Our engineering teams manage network capacity. Changing our investment into those teams has a direct effect on our ability to manage capacity.	▲▲△	●●●

4.8.3 Market context

As a guiding principle, quality standards should not go further than what is required to mitigate any incentive the regulated supplier might already have to deliver lower levels of quality than end-users demand.

In this regard, the impact of market pressure is worth emphasising, because it is the key driver of our performance. Our business model is based on selling fibre services. Business line restrictions mean we cannot sell services directly to end-users, so instead we sell our products to end-users through RSPs.

Increasingly, RSPs have choices. Fibre faces competition from unregulated, vertically integrated mobile network operators (MNOs), who have a closer relationship with end-users and are using their market position to promote their own products. Where RSPs are also MNOs, in order for fibre to remain competitive the quality of our fibre services needs to be attractive enough that end-users prefer them to the RSP's own cheaper services.

Therefore, there is already a strong incentive on us to provide fibre services of a quality that meets end-user demands, which mitigates the need for extensive quality standards under PQ regulation.

EXISTING INCENTIVES

We face market competition and are therefore already incentivised to provide a quality service, mitigating the need for extensive PQ quality standards.

4.8.4 Regulatory context

Quality standards need to be viewed as one piece of a multi-faceted quality regulation framework.

There are other forms of regulation on us that limit both the incentive and opportunity for us to allow the quality of fibre services to degrade, such as non-discrimination and equivalence of inputs.[55] This reduces the need for extensive quality standards and narrows their role to addressing any remaining adverse incentives.

MANY LAYERS OF REGULATION

PQ regulation is only one of many layers of regulation and contractual agreements that Chorus is subject to.

4.9 Summary of proposed quality standards for PQP2

Generally, we propose to sustain quality in PQP2 and broadly carry over the quality standards from PQP1 into PQP2. We are not proposing any new or additional standards for the reasons described earlier in this report.

We propose amending the quality standards from PQP1 to better capture how end-users experience network quality and to avoid breaches that do not speak to a failure to invest in and manage the network in accordance with good telecommunications industry practice.

In summary, we propose the following amendments to the PQP1 quality standards carried-forward into PQP2:

- For the availability quality standards (see section 4.10) set for Layer 1 and Layer 2 we propose to:
    - replace the current 23 availability POI areas with our existing 11 Customer Service Areas (CSAs) to deliver a more consistent end-user experience across the network and allow us to be more responsive to issues
- For the performance quality standard (see section 4.11) we propose to:
    - remove the impact of unforeseeable and unprecedented demand spikes from our performance against the quality standard, as we are not funded to build a network that could accommodate these spikes and it would not be economic to do so
    - increase the port utilisation threshold back to its pre-PQP1 CIP contract rate of 95%, as evidence suggests a lower threshold does not impact on how end-users experience quality, but increases the likelihood of quality standard breaches, triggering compliance cost for Chorus and investigation cost for the Commission.
    - remove the impact of port utilisation events caused by network failures from our performance against the quality standard, as currently the standard measures reliability for which the Commerce Commission has put in place separate availability standards. This creates an element

ADAPT AVAILABILITY QUALITY STANDARDS

We propose to replace the current 23 POI areas with our existing 11 CSAs to deliver a more consistent end-user experience.

11 CSAs

55 Equivalence of inputs requires that Chorus' active (Layer 2) fibre product set is built on the same passive (Layer 1) products which are available to RSPs. Therefore Chorus cannot degrade quality in relation to passive infrastructure without also degrading its active products. Non-discrimination means all RSPs receive the same service which, in turn, means all RSPs get the benefit of the significant countervailing power of the large MNOs to demand high quality services.

of 'double-jeopardy', where we can be penalised for network failure driven port utilisation events under the quality standards set for both the availability and performance quality dimensions.

4.10 Our proposal for the availability quality dimension

For PQP2, we propose to maintain the existing availability quality standards, but seek to resolve issues with the current way the standards are disaggregated, which has caused issues in PQP1 and which we discussed in our submission on the draft PQP1 price-quality determination.[56]

We propose a change to the availability quality standards that would alter their geographic disaggregation and that would apply to the availability standards for both Layer 1 and Layer 2.

In particular, we propose to substitute the 23 availability POI areas with the 11 Customer Service Areas (CSAs) for both the Layer 1 and Layer 2 availability quality standards. A Customer Service Area is a geographic area for which we contract field service work.

Issues with current settings

The PQP1 availability quality standards apply to 'availability POI areas'. These are the 26 UFB POI areas, with the smallest three combined into their neighbours to make 23 availability POI areas. There are two main drawbacks to the way the availability quality standards are geographically disaggregated:

- There is a significant inequality in the number of connections across the 23 availability POI areas. This creates incentives that are inconsistent with the idea of equality between end-users and that are generally adverse to efficient reliability planning and management of field resources.
- The 23 availability POI areas do not align to how we manage fault response on the network. This makes it more difficult for us to respond to emerging issues with downtime in a particular area making compliance more resource intensive than it needs to be.

We accept the Commission's desire to geographically disaggregate application of the availability standards to ensure we don't overly focus reliability and restoration efforts on the main population centres. However, the current disaggregation goes too far in this regard – inviting us to prioritise areas in which we have few connections. We think our proposed disaggregation strikes a better balance. See section 4.10.1 for more detail on why the current geographic disaggregation causes issues.

Benefits of proposed change

Changing the geographic disaggregation of the availability quality standards would reduce the inequality between geographic areas and align application of the standards with how we manage fault response. This in turn would:

- deliver a more consistent end-user experience across the network

ADAPT PERFORMANCE QUALITY STANDARD

We propose to increase the port utilisation threshold back to its pre-PQP1 CIP contract rate of 95% and remove 'double-jeopardy' of penalisation under both availability and performance standards for the same network failure event.

95%

BENEFITS OF AVAILABILITY CHANGE

Will reduce geographic inequality and deliver a more consistent end-user experience, allowing us to align responses to the way we manage field resources.

56 https://comcom.govt.nz/__data/assets/pdf_file/0026/259352/Chorus-Submission-on-Chorus-price-quality-path-from-1-January-2022-draft-decision-8-July-2021.pdf, page 43

- allow us to better respond to and manage service restoration issues since each area to which the standard applies would align to a field work management area
- continue to provide a transparent view on network availability, as there is no prospect that our amended standards could be used to conceal diminished performance. We will continue to report downtime across the 26 POI areas in our ID reporting for PQP2, so stakeholders have a clear and granular view of any change in availability outcomes over time in all parts of Aotearoa.[57]

See section 4.10.2 for more detail on these benefits and section 4.10.3, which tests the impact – including on transparent reporting – of our proposed change using actual performance data for the 2022 disclosure year.

Implementation

In giving effect to our proposal, the 'buffer' built into the availability quality standards for Layer 1 and Layer 2 might need adjusting.[58] We have not looked into this yet and would work with the Commission on this later to ensure more historic information is available which would inform the calculation of the minutes buffer.

ADAPT AVAILABILITY QUALITY STANDARDS

We will continue to report against the 26 POI areas under our Information Disclosure requirements.

4.10.1 Issues with PQP1 geographic disaggregation

Inequality between POI areas creates a significant issue. Four POI areas have fewer than 10,000 Chorus fibre Connections, while the Auckland POI area has more than 500,000. The PQP1 quality standards treat all these areas as equivalent.

In practice, this means that downtime on a single access line in the smaller POIs has over 65 times more impact in terms of compliance than downtime on a line in Auckland. This creates a perverse incentive for us to focus our investment efforts for network reliability and restoration on POIs where the performance against the quality standard is more sensitive to downtime. The reason we have so few connections in these areas is that we are not the main UFB provider, so the incentive is even more perverse as it also drives us to focus our efforts on POIs where we are not the most important provider for end-users.

Auckland is an outlier as most POI areas have a relatively small number of connections. The average number of Chorus fibre connections in a POI area, including Auckland, is around 45,000. This means the current standard exposes us to a risk of quality standard breaches in smaller POI areas from events which are expected but out of our control, despite a network design that is aligned with good industry practise.

POI GEOGRAPHIC DISAGGREGATION

The 26 POIs represent vastly different volumes of connections ranging from our smallest POI area with <8,000 connections to our Auckland POI area with >500,000 connections.

57 For clarification, we are not proposing the proposed changes to reporting against the availability quality standards under PQ regulation should flow through to ID regulation.

58 For the Layer 1 and Layer 2 availability quality standards, the Commerce Commission the standards are based on the service levels from the UFB arrangements with an additional buffer to account for the grater enforcement consequences and uncertainty that result from a breach of a Part 6 quality standard compared with the UFB contractual mechanisms and to reduce the probability of unnecessary breaches (ones which do not reflect declines in underlying service performance, but instead random variation in performance). See Chorus' price-quality path from 1 January 2022 – Final decision Reasons paper, 16 December 2021, para 7.102

We acknowledge the Commission's intent to capture 'extreme events' which could cause end-user harm through disaggregation, however we remain of the view that such events are likely to be known anyway, even in the absence of any regulatory requirement. If more granular detail is required, ID and other reporting are better tools for monitoring extreme events than trying to account for these in an outcome-based quality standard.

These 23 availability POI areas also do not align with how we manage field work. This has made it challenging for us to address emerging issues with performance against the quality standard in a particular area when we become aware of it. For over a decade, we have used a management framework based on 11 CSAs. The geographical areas for these CSAs were based on each area having roughly the same number of customers, and on each area being large enough to support an effective number of technicians. Since we moved to the CSA framework, we have used performance management metrics to benchmark and optimise performance of each area against the other areas.

4.10.2 Proposed change to geographic disaggregation

Our proposal is to substitute the 23 availability POI areas with the 11 Customer Service Areas (CSAs) for both the Layer 1 and Layer 2 availability quality standards. A CSA is a geographic area for which we contract field service work.

As per the below graphic, the average number of connections across the availability areas would increase from currently around 45,000 to around 94,000. Auckland would be split into three similar sized areas and the smallest area would have around 7,000 connections.

FIGURE 4.6: POI TO CSA MAPPING

POI	Connections	% NZ
Whangarei	10,343	1%
Auckland	504,848	49%
Hamilton / New Plymouth	21,231	2%
Tauranga	11,870	1%
Whakatane	10,084	1%
Rotorua	19,398	2%
Taupo	11,928	1%
Gisborne	10,677	1%
Napier / Hastings	44,676	4%
Palmerston North / Wanganui	38,087	4%
Masterton	11,855	1%
Levin	9,001	1%
Paraparaumu	15,629	2%
Wellington	129,143	13%
Blenheim	13,011	1%
Nelson	29,520	3%
Greymouth	7,568	1%
Christchurch	7,635	1%
Ashburton	7,926	1%
Timaru / Oamaru	20,614	2%
Queenstown	24,023	2%
Dunedin	43,802	4%
Invercargill	27,113	3%
Total	**1,029,981**	**100%**

CSA	Connections	% NZ
Northland	38,440	4%
Auckland North	155,144	15%
Auckland Central	166,437	16%
Auckland South	155,173	15%
Taranaki	6,861	1%
New Waikato	12,180	1%
BOP	59,196	6%
Eastern North Island	147,069	14%
Wellington	108,271	11%
Upper South Island	48,094	5%
Lower South Island	133,118	13%
Total	**1,029,981**	**100%**

Note: CSA percentages do not add to 100% due to rounding

This change to disaggregation would mean downtime on a single access line in the smallest CSA would then only have 24 times more impact than downtime on a line in the largest CSA. This would reduce inequality across the regions that we serve, as the regional difference in impact on our performance would reduce by roughly 64% compared to the status quo. We believe that this change would:

- deliver a more consistent end-user experience across the network
- allow us to better respond to and manage service restoration issues, since each area to which the standard applies would align to a field work management area
- reduce the incentive on us to invest more heavily in network reliability for smaller POI areas to deliver a level of performance over and above what is generally considered good telecommunications industry practice
- provide more granularity for the greater Auckland area, as it would effectively de-average the Auckland performance by assessing the performance separately for the existing three distinct Auckland CSAs (as opposed to the current approach to treating the greater Auckland area as one).

4.10.3 Impact of proposed changes based on 2022 data

We have tested the impact of our proposed change to the availability quality standard using actual performance data for the 2022 disclosure year as shown below.

- Layer 1 – in all cases, downtime for each CSA would have been within band and under the standard of 160 minutes
- Layer 2 – in all cases downtime for each CSA would have been within band and under the standard of 40 minutes.

FIGURE 4.7: LAYER 1 DOWNTIME BY CSA (2022)

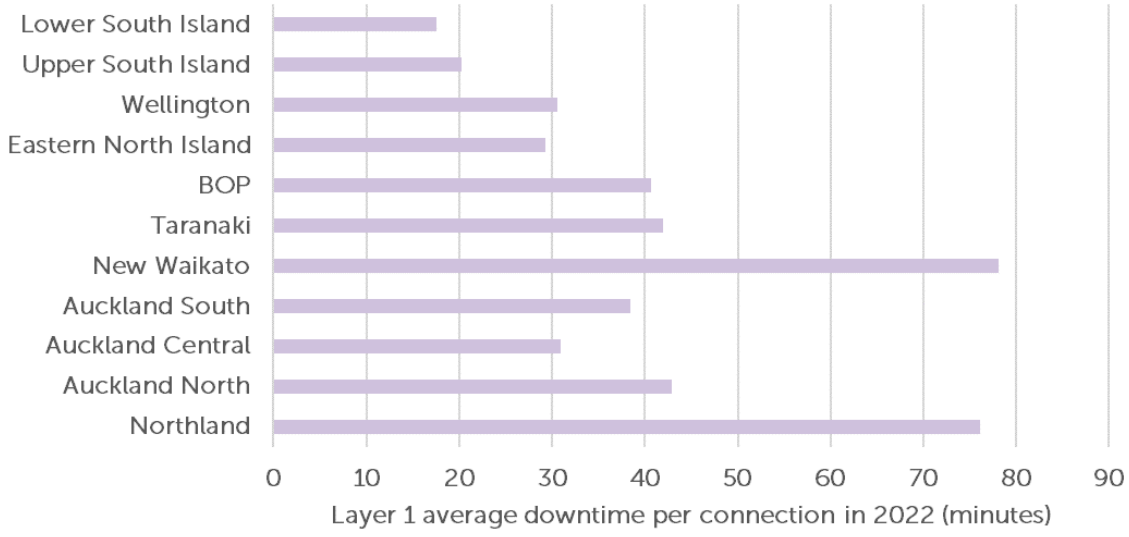
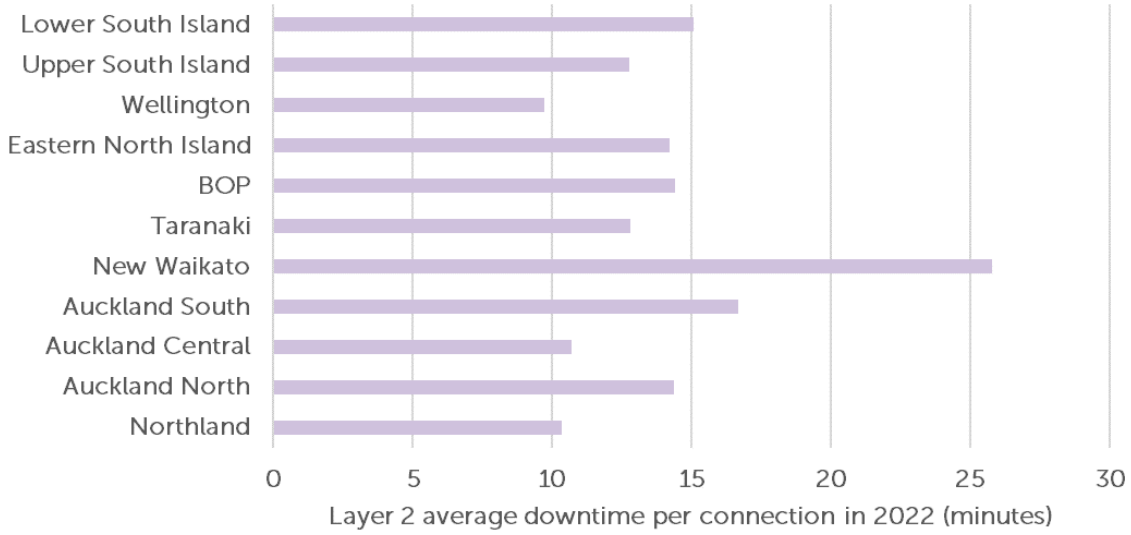


FIGURE 4.8: LAYER 2 DOWNTIME BY CSA (2022)



We note the following:

- We would not have been at risk of breaching the standard and, specifically, of being investigated for an issue that would not indicate a failure to invest in and manage the network in accordance with good telecommunications industry practice (i.e. we would not have been at risk of incurring a 'false positive').
- Consistent with the transparency provided under the PQP1 settings, poorer performance such as for Layer 1 availability in the Whangarei area will still be identifiable through availability outcomes for the Whangarei POI disclosed under ID. Performance in the Northland CSA, including Whangarei, would still have shown up as being materially poorer relative to other CSAs and would have instigated investigations and, if considered prudent, mitigating actions by Chorus. The Waikato CSA would also have been investigated due to similar performance outcomes to Northland. Therefore, the amended standard will drive the appropriate behaviours.

4.11 Our proposal for the performance quality dimension

We propose to broadly carry over the quality standard for the performance quality dimension into PQP2, but with some adjustments to reduce the likelihood of breaches that do not represent a failure to invest in and manage network capacity in accordance with good telecommunications industry practice.

We propose two changes to the performance standard that address demand-side events. These are:

- removing the impact of unforeseeable and unprecedented demand spikes from our performance against the quality standard
- returning the port-utilisation threshold back to its previous level of 95% from 90%.

We also propose one change that addresses supply-side events. This is:

- removing the impact of port utilisation events caused by network failures from our performance against the quality standard.

4.11.1 Removing the impact of unforeseeable and unprecedented demand spikes from our performance against the quality standard

Issues with current settings

The current setting of the quality standard is unsustainable as it represents an uncapped liability to us to provide capacity even for the most unforeseeable and unprecedented events, whilst our regulatory funding to build incremental capacity is capped and aligned to the bandwidth forecast the Commission relied upon in setting our expenditure allowance for network capacity.

See section 4.11.4 why unforeseeable and unprecedented demand spikes are likely to become more common.

ISSUES WITH CURRENT PERFORMANCE STANDARD

Represents an uncapped liability for unforeseeable and unprecedented events.

Benefits of proposed change

PQ trade-offs would remain in balance, as we would avoid the significant investment required to build capacity headroom to accommodate these rare events.[59] Such additional investment would not be consistent with good telecommunications industry practices, as the expected cost to end-users from a network that has significantly more capacity headroom would most likely considerably outweigh any associated benefits they might receive. In addition, our funding requirements to meet the level of quality set by the standard could be forecast with increased certainty – expenditure could be targeted at meeting the forecast bandwidth consumption with an agreed headroom in line with our updated capacity management practices.

See section 4.11.5 why it is not prudent to build a network that can accommodate unpredictable and unforeseeable demand spikes.

BENEFITS OF PROPOSED CHANGE

Would avoid significant investment to build capacity headroom to accommodate rare demand spikes.

Implementation

We do not propose a particular implementation to give effect to our proposed change, as we want to test this with the Commission further as it evaluates our proposal. However, we currently see two broad approaches that both rely on linking our performance assessment to bandwidth demand.

- Option 1 - would link our performance to the bandwidth forecast the Commission will rely upon in setting our expenditure allowance for network capacity. Any demand-side events pushing actual bandwidth demand outside this forecast (plus the additional headroom a prudent network operator would provide) would not count towards the quality standard.
- Option 2 - would link our performance to the rolling average of actual bandwidth demand for the most recent six months. Any demand-side events pushing actual bandwidth demand outside this rolling average (plus

59 We note that due to the inherent uncertain nature of these unforeseeable demand spikes the risk of a breach can never be fully mitigated even if we built a network that would allow for additional significant capacity headroom.

the additional headroom a prudent network operator would provide) would not count towards the quality standard.

See section 4.11.7 on how the Commission could give effect to our proposed change.

4.11.2 Returning the port-utilisation threshold back to its previous level of 95% from 90%

Issues with current settings

Evidence suggests a lower threshold does not impact how end-users experience quality but increases the likelihood of further quality standard breaches akin to the one we had in March 2022. The traffic performance data for the affected links suggests there was no deterioration in the performance experienced by end-users. We received no contact from any customers or end-users noting reduced performance. Still, we needed to provide a breach report to the Commission, who must now conclude whether it should follow up with a formal breach investigation.

We note the Commission came to the same conclusion in its PQP1 reasons paper where it states that "95% is widely considered to be the level where the fibre network associated with that port is considered to be non-performing".[60]

Benefits of proposed change

Regulatory compliance costs to us and the Commission would be reduced.

See section 4.11.8 on why increasing the port utilisation threshold to 95% would prevent further 'false positive' breaches.

ISSUES WITH CURRENT PERFORMANCE STANDARD & BENEFIT OF CHANGE

Evidence suggests a lower threshold does not impact end-user experience. Lowering the standard will reduce compliance costs for both the Commission and Chorus, without impacting end-user experience.

4.11.3 Removing the impact of port utilisation events caused by network failures from our performance against the quality standard

Issues with current settings

Port utilisation above the maximum threshold caused by network failures did not count as a breach under our performance measurement regime for UFB. Including these (as reflected in the current setting of the standard) means the standard measures reliability for which the Commission has put in place separate availability standards. This creates an element of 'double-jeopardy' where we can be penalised for network failure-driven port utilisation events under the quality standards set for both the availability and performance quality dimensions. This in turn creates a perverse incentive to either limit network diversity (i.e. make the network less reliable to keep port-utilisation in band by not diverting traffic away from broken routes) or substantially over-provision capacity (i.e. to ensure every link can handle any traffic that could conceivably be directed onto it in any and all equipment failure scenarios).

Benefits of proposed change

The exception would avoid the element of double-jeopardy and remove the perverse incentive discussed above. The regulatory regime would work as

REMOVAL OF DOUBLE JEOPARDY RISK

Current standards mean Chorus can be penalised under both the availability and performance standards for network-failure events, which can cause a perverse incentive to either limit network diversity or over-invest in capacity.

60 Chorus' price-quality path from 1 January 2022 – Final decision Reasons paper, 16 December 2021, para 7.186.

intended and better incentivise efficient investment and prudent management of the network.

See section 4.11.8 for more detail on why port utilisation events caused by network failures should not count towards the performance quality standard.

4.11.4 Demand spikes are expected to become more common

Bandwidth demand has never followed a smooth trend and some allowance for variability is prudent to allow for step changes in demand that may occur without warning. However, there is a diminishing overall end-user benefit in extra capacity if:

- the potential 'pain' of congestion is limited to a small number of short duration events per year
- the cost of mitigating those events rises exponentially.

We expect to continue to see these one-off demand spike events. There is no indication they will reduce, and we see potential they will increase due to the following supply and demand factors.

Demand factors include the following:

- Increasing global agility in the use of digital channels to deliver new services is increasing the unpredictability of the number, scale and concurrence of high bandwidth demands.
- Instantaneous global distribution of high bandwidth content is a relatively new phenomenon (since 2019) and used by relatively few companies. This distribution method may become more widely used in other segments beyond gaming.
- The global companies at the source of these bandwidth demands are not sensitive to the local market conditions in Aotearoa for network performance or pricing signals faced by their customers for inputs such as broadband.
- Chorus does not undertake traffic management to slow or reduce demand during peak times as this is difficult given obligations in our customer contracts and is not considered best practice in Aotearoa. Using traffic management techniques would likely lead to degradation in end-user experience that is similar to or worse than high port utilisation.

STRONG GLOBAL PERFORMANCE

Chorus does not constrain end-users' ability to demand very high bandwidths. Aotearoa is 17th/180 countries for global fixed broadband performance.

17th

Supply factors include the following:

- The high access speeds of Chorus fibre services mean there is no constraint on end-users' ability to demand very high bandwidths simultaneously compared to non-fibre & legacy technologies.
- Broadband networks across Aotearoa, including Internet Service Provider (ISP) networks, continue to expand to have sufficient capacity for projected bandwidth demand, therefore not artificially limiting bandwidth spikes before they reach the Chorus network. Aotearoa sits 17th out of 180

counties on the Ookla Global Index for fixed broadband performance as at March 2023.[61]

4.11.5 It is not prudent to build a network for unprecedented demand spikes

To mitigate the risk of further breaches in PQP1, we have increased our investment in Layer 2 capacity. This involves building more headroom capacity on the network, effectively bringing forward investment.

However, we do not consider this approach a long-term solution. As explained above, we strongly believe it would not be prudent to build a network that could accommodate even the most unforeseeable spikes that could possibly be greater than what has ever been experienced before.

If the performance quality standard was carried forward unchanged into PQP2, we would need sustained increased funding to build a network that would allow for these rare and extreme demand spikes to be accommodated in the longer term. This is because we would have to invest considerably to allow for substantial capacity headroom, which would ultimately flow on to price increases to end-users for our fibre services to allow us to recover these costs.

The challenge is to identify a reasonable balance where we do not have enough information or end-user feedback to determine their willingness to pay to avoid what amounts to the potential for an occasional inconvenience to potentially just a small group of end-users. We consider our proposed changes to the existing standard achieves this balance.

4.11.6 Impact on funding requirements for PQP2

In designing our network, we already provide capacity headroom to accommodate an unexpected 50% uplift in demand. While there is no industry standard (we are aware of capacity headroom allowances ranging from 30 -100%)[62] we consider 50% a prudent allowance to accommodate for:

- the considerable inherent uncertainty of bandwidth demand forecasting
- the time lag between observing the need for additional capacity and being able to implement additional capacity. This time lag is three months on average, but can be up to two years in extreme cases, requiring us to build well ahead of forecast demand eventuating
- the need to use modular building blocks when augmenting the network. Whilst we aim to deploy minimum increments, creating some additional headroom is often unavoidable.

61 https://www.speedtest.net/global-index
62 Smaller operators would typically have higher headroom allowances because their base bandwidth capacity is so low they are more susceptible to swings from demand side events.

We cannot precisely forecast what additional funding we would need for PQP2 to provide sufficient network capacity to accommodate bandwidth demand patterns such as those triggered by the Fortnite event in 2022. This is due to the unpredictability of these events. As discussed earlier, the rapid global uptake of new online applications is likely to accelerate driving materially different patterns over very short timescales. We cannot forecast what is coming next.

Our PQP2 forecast for Network Capacity capex is driven by our forecast for bandwidth demand, which is described in the Demand report and excludes any short-term impacts from unpredictable demand events such as Fortnite releases. However, to further evidence our conclusion that it is not prudent to build a network that might accommodate at least some of these unpredictable demand spikes (i.e. without breaching the standard as it is set for PQP1) we ran a sensitivity analysis on how much more funding we would require to provide more capacity headroom.

While these are not precise figures, our analysis indicates we might have to incrementally spend up to $11m in PQP2 alone if we wanted to increase our capacity headroom allowance from 50% to 100%. We note that the incremental funding we would require beyond PQP2 is likely to follow an exponential curve, taking into account the compounding impact bandwidth growth has been following and is likely to continue to follow.

AVOIDING IMPRUDENT INVESTMENT

It would not be prudent to build a network capable of accommodating every possible extreme spike in demand.

4.11.7 Linking the quality standard to bandwidth demand could give effect to our proposal

We do not propose a particular implementation to give effect to our proposed change, as we want to test this with the Commission further as it evaluates our proposal. However, we currently see two broad concepts that would both rely on linking our performance assessment against the performance quality standard to bandwidth demand. We refer to these as Option 1 and Option 2.

Option 1

Option 1 would:

- link the performance assessment to the bandwidth demand forecast the Commission will rely upon in setting our expenditure allowance for Network Capacity capex
- exclude any demand spikes that are greater than that bandwidth demand forecast from our performance against the quality standard.

We note the Network Capacity capex forecast for PQP2 rests on our bandwidth demand forecast. Linking the performance against the associated quality standard to the same bandwidth demand forecast would establish a clear link between our forecast expenditure and the outcome under the performance quality measure.

Consequently, unforeseeable and unprecedented demand spikes that the network is not configured for would not constitute a breach of the standard. This is because such spikes that would push actual port utilisation outside the bandwidth demand forecast would not count against compliance with the quality standard.

Consistent with our capacity management policy, it would be prudent to add an additional headroom of 50% to the upper bound as this would be consistent with good telecommunications industry practice.

We describe bandwidth forecasting in detail in our Demand report included in this document. Of most relevance to the performance quality standard is that some inherent uncertainty and therefore risk is unavoidable. Adding a tolerance to the bandwidth forecast that could set the upper bound for the quality standard seeks to increase the obligation on us, at the same time as capping it for bandwidth levels significantly above a reasonably derived forecast.

Setting this headroom to 50% would align with our capacity planning thresholds and therefore the way we forecast capex.[63]

Option 2

Option 2 would:

- link the performance assessment to the rolling average of actual bandwidth demand for the most recent six months
- exclude any demand spikes that are greater than this rolling average from our performance against the quality standard.

Consistent with additional headroom that should be added to the bandwidth demand forecast that would be used to assess our performance under Option 1, we suggest additional headroom of a similar magnitude (i.e. around 50%) should be added to Option 2 if the Commission progressed with it for its PQ determination.

Unlike Option 1, Option 2 would not create a direct link between the bandwidth demand forecast the Commission will rely upon in setting our Network Capacity capex allowance and our performance against the quality standard. However, in contrast to Option 1, Option 2 would self-adjust for sustained bandwidth demand trends that were unforeseeable at the time the Commission made its PQ determination. This is a noticeable benefit, as under Option 1 any sustained bandwidth demand trends that are not reflected in the forecast at the point of the determination could distort our assessment against the quality standard materially and potentially require the Commission to re-open the PQ determination in order to reset the quality standard for the permanent step-change in bandwidth demand.

Technical implementation

We deliberately do not provide any further technical details here as to how this could be implemented through the PQP2 determination.

We are keen to explore this idea further with the Commission and stakeholders as part of the Commission's PQP2 quality consultation process, where initially the focus would be on the policy implications of this change. We expect this would later be followed by a technical consultation phase,

63 In practice we manage our network such that port utilisation would not exceed 60%, so that in the event of a 50% increase in traffic no breach of the quality standard would occur. The required headroom for planning purposes has been adjusted upwards over time taking into account the relative rate of bandwidth growth and the time it takes to expand network capacity. While the rate of bandwidth growth is fairly consistent over the long term, the time it takes to add incremental capacity has been increasing. This is due to the increasing complexity of the network as it expands –e.g. the need to migrate services from older platforms onto newer generation higher capacity technology to make extra capacity available where it is needed.

where the Commission typically would focus on the implementation through the PQ determination (and possibly Fibre IMs amendments if required) to give effect to any policy decisions it has made.

The purpose of our proposed change is to mitigate unforeseeable and unprecedented demand spikes from temporary events that would otherwise require a significant uplift in our funding needs.

However, given the long-term bandwidth forecast that is required for the PQP2 proposal (up to six years into the future), there is a real risk that events will happen over that period that were not accounted for in the forecast and would push total demand permanently outside its boundaries.

If an event of that kind occurred (e.g. 4K sport live streaming) we would, as a prudent fibre network owner and operator, invest in network capacity accordingly to ensure the step change in bandwidth demand is met. To ensure we can recover such spend through our FFLAS revenue we would most likely apply to the Commission via an individual capex proposal (ICP) to increase our regulatory expenditure allowances.

There is no current mechanism under the Fibre IMs or the PQP1 determination that would give flexibility such that any consequential changes to the quality standards could be made.

This would particularly be an issue under Option 1. We suggest the Commission considers providing such flexibility if it prefers implementing Option 1 (or an alternative similar option), as only then would our proposal work as intended.

Generally, we would be in favour of a solution that would not require a formal PQ determination re-opener. Rather, we suggest exploring ways to consider and account for the implications on quality standards (and possibly our opex allowance) when the Commission makes an ICP determination.

4.11.8 Returning the port utilisation threshold to 95% would prevent further 'false positive' breaches

Normalising for unforeseeable and unprecedented demand spikes is our main priority, as this would significantly reduce the risk of us breaching the quality standard for these types of events while leaving the other key parameters that define the standard unchanged. However, consistent with our views expressed in the Commission's consultation process for PQP1 and our breach report for the March 2022 event, we continue to believe the utilisation threshold should be set at 95%.

In the March 2022 breach, where ports exceeded 90% but remained below 95%, end-user experience was unimpacted, indicating this was a 'false positive' and should not have triggered a chain of compliance actions by us and the Commission.

In 2017, a significant and thorough process was undertaken between CIP, Chorus and other TCF members to define a fit for purpose performance regime that was seeking to drive largely the same outcomes as described under the PQ determination.[64]

64 The resulting performance regime can be accessed via this link https://www.crowninfrastructure.govt.nz/wp-content/uploads/2011/12/UFB-Performance-Management-and-Reporting-17-Nov.pdf

During that process, research and analysis was undertaken, which led to agreement that port utilisation levels below 95% would be deemed the practical indicator that actual performance characteristics experienced by users were compliant with the contractual service level agreements for Frame Delay (Latency), Frame Delay Variation (Jitter) and Packet Loss.

Alongside the research and analysis that was carried out at that time, we prepared a White Paper. Amongst other things, this paper summarises our findings regarding the impacts of increasing port utilisation on service performance. No findings suggested service performance was degrading at port utilisation levels of below 95%. Excluding port utilisation events caused by network failures

The performance quality standard measured by port utilisation is intended to demonstrate that we are investing in and managing the capacity of the network in a manner consistent with good telecommunications industry practice, and delivering the level of performance end-users demand and are willing to pay for.

The quality standard is predicated on the idea that if we do not provision adequate capacity in the fibre aggregation network then port utilisation will increase eventually to a level that begins to impact the service experienced by end-users. This is correct, but there are other reasons port utilisation might increase unrelated to provisioned capacity in the network. In particular, this can result from 'network failures'.

A network failure is an event where an element of a network does not work as intended for any reason. Such a malfunction could result from anything – from a failed software upgrade to the physical destruction of a fibre link by an earthquake or flood. In these circumstances, the network will automatically attempt to preserve connectivity by directing traffic around the failed element. The irregular traffic flows that result will, in turn, cause higher port utilisation on the links the network is using to avoid the failed element.

As demonstrated by the impact Cyclone Gabrielle had on our network and our network performance, there is the potential for this to result in a breach of our performance quality standard – especially where there are failures to multiple elements of the network, such as in a natural disaster event.

We believe it is important that port utilisation events caused by network failures be excluded from the performance quality standard for the following reasons:

- Utilisation above the maximum threshold caused by network failures did not count as a breach under our performance measurement regime for UFB. The UFB Layer 2 performance measurement and reporting regime describes 'network failure'.[65] This would include for example, the failure of a link aggregation group (LAG)[66] or Layer 2 services network element (including failure due to network or software upgrades), but would not include a lack of provisioned capacity (including the failure of a single link in a LAG).
- The purpose of the performance standard is to ensure appropriate investment in the capacity of the network. Including congestion from

65 CIP, *Layer 2 Performance Measurement and Reporting Regime*, November 2017, clause 7.7
66 Link Aggregation Group is the term for a group of ports that are combined into a whole, e.g. if three 10Gbps links were combined to create a 30Gbps link.

network failure means the standard measures reliability, for which the Commission is proposing separate availability standards. The exception avoids an element of double-jeopardy.

- Including congestion from network failure may disincentivise efficient diversity. When a primary link fails, traffic may be loaded onto a diverse secondary link in a way that causes the secondary link to congest. In this scenario, the diversity has prevented end-users totally losing service, but the congestion may risk failure of a performance standard.
- Though the exact number changes regularly, there are currently around 2,300 uplink ports and 1,500 internodal ports in the Chorus network. This means only four ports can exceed the maximum utilisation threshold in a month before the standard is breached. This leaves no headroom for 'false positives', where congestion is caused by events rather than insufficient capacity.

To be clear, we are not saying that equipment failure should be excluded from the performance quality standard because equipment failure is not our responsibility. While equipment failure is our responsibility, our management of that is about the reliability of the network, not its capacity. We have a separate quality standard for network reliability under the availability dimension. By attaching penalties to something other than performance, an incentive is created to either limit network diversity (i.e. make the network less reliable to keep port utilisation in band) or substantially over-provision capacity to ensure every link can handle any traffic that could conceivably be directed onto it in any and all equipment failure scenarios.

A decision to remove the exclusion for network failures for PQP1 also created extremely undesirable incentives that were evident during Cyclone Gabrielle. During the cyclone, Chorus observed network elements failing and traffic being rerouted to secondary links in near real-time. It appeared to us that some secondary links would congest, which could result in a breach of the performance standard. To ensure we did not breach the standard, we could have shut down the secondary links, meaning none would have exceeded the utilisation threshold, but cutting-off communication. The resulting downtime would have been excused under the force majeure provisions of the availability standards. We want to be very clear - Chorus would never limit connectivity to a disaster affected area just to ensure regulatory compliance, but the absence of an exclusion for network failures from the performance quality standard invites us to do so. We recommend in the strongest possible terms that this exemption be restored.

5.0 DELIVERY

Te Kawenga

5.0 Delivery

This is our IFP Delivery report. It describes how we are set up to deliver on our plans, identifies key delivery risks and mitigations, and describes key linkages between delivery programmes and network performance.

5.1 Our history of delivery

In our PQP1 proposal we described Chorus' performance from its establishment through to 2020. This included establishing Chorus as a standalone entity and developing the corporate and core information systems to operate as such. It also included the successful completion of the first of our Ultra-Fast Broadband (UFB) programmes on time and on budget while meeting rapidly increasing data use as well as significantly higher than expected demand for fibre connections and faster plans.

In our PQP1 proposal we described how this track record was enabled through adaptation of our delivery models and contractual arrangements to meet the changing needs of our customers and demands on Chorus.

In the period since our PQP1 proposal we have further adapted our delivery models and contractual arrangements and continued our track record for delivery. Nevertheless, like most organisations in Aotearoa, and to a degree globally, we have grappled with supply chain issues, labour constraints and, more recently, inflationary pressures.

Our experience since submitting the PQP1 proposal has improved the agility and resilience of our delivery models and helped adapt these to meet our future delivery task reflected in this report, in particular, through our reset of field services agreements and our management of labour market conditions as immigration restrictions were applied and removed.

Later in this section we describe how we have addressed these challenges and how we will continue to adapt practices to deliver an ambitious plan in PQP2.

ON TIME AND ON BUDGET

We have a strong history after the UFB rollout of delivering large and complex projects on time and on budget.

COMMITMENT TO DELIVER

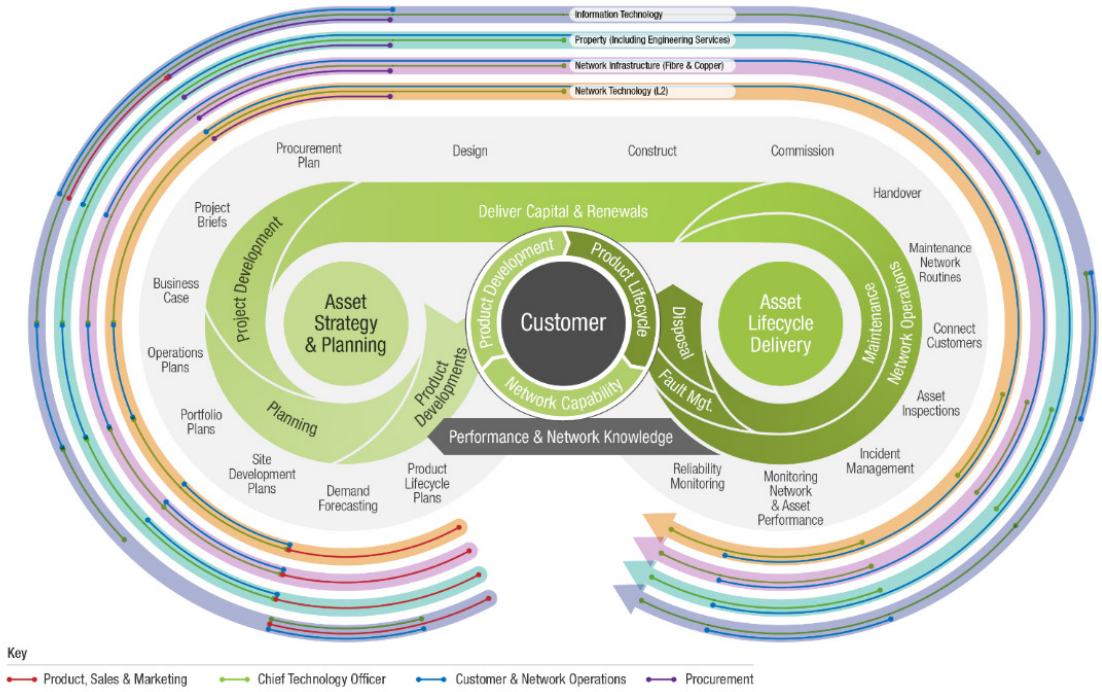
Our commitment to deliver was exemplified by tireless efforts with field service partners in overcoming a COVID-19 related technician shortage so we could connect customers and restore services after major weather events.

5.2 How we deliver

The following diagrams illustrate the flow from end-user drivers and network knowledge through to strategy and planning, and then into delivery of our projects and programmes.

Figure 5.1 is an overview of the Chorus asset management lifecycle, from end-user need to disposal and renewal. This shows the main accountabilities across our teams throughout the lifecycle, and will remain mostly unchanged from the PQP1 proposal.

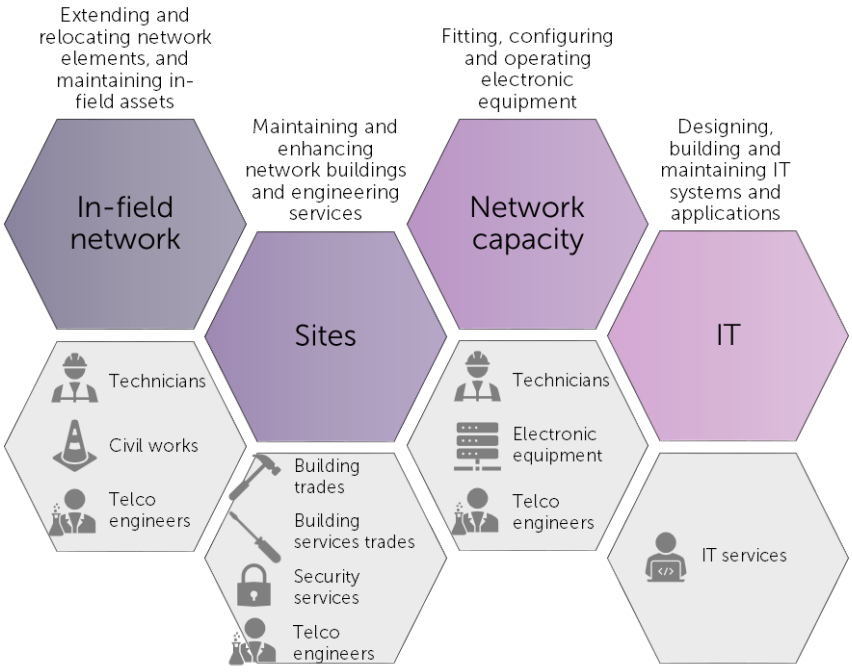
FIGURE 5.1: OVERVIEW OF FLOW FROM DRIVERS TO DELIVERY



5.2.1 Delivery areas

Figure 5.2 shows activities and resources for our main delivery areas. Together, these comprise the bulk of the capex and opex work in our PQP2 plan.

FIGURE 5.2: KEY DELIVERY AREAS AND RESOURCE TYPES FOR EACH AREA



The delivery of our in-field, site, and network capacity work is largely outsourced to external service providers. We explain this process further in the outsourced delivery section below.

Our other main delivery task is IT change. We use internal resources to manage and coordinate this work. Much of the actual delivery also uses internal resources, with support from suppliers, contractors and outsourced service providers.

Over the past twelve years, we have been executing a major IT programme of work to de-merge IT systems from Spark. This has been driven by separation commitments between Chorus and Spark, overseen by the Ministry of Business, Innovation and Employment (MBIE), with an overall aim of creating competition in the broadband market and keeping infrastructure separate from retail business. We still share some systems with Spark, and report to the Minister annually on our progress towards exiting shared systems.

We have also built digital capability to offer fibre products and efficiently execute connection, provisioning and switching activities. This work requires close coordination with Retail Service Providers (RSPs) to prioritise, develop, test and deploy changes. Finally, we have developed and evolved systems to support fibre network operation and in-field activities. These systems require coordination with key suppliers and Field Service Providers (FSPs).

5.2.2 Procurement

Our procurement policy ensures we apply consistent, professional procurement practices and secure necessary materials and services at appropriate quality levels on commercially favourable terms.

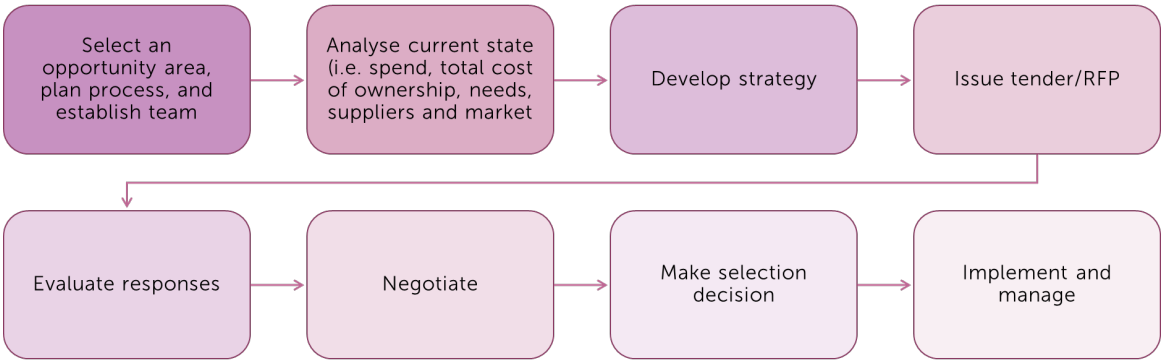
Our policy requires us to use best practice procurement strategies and tools. These strategies and tools help ensure the lowest whole-of-life cost through sustainable relationships that enable and incentivise suppliers to deliver the best possible outcome through:

- clear processes for establishing, renewing and varying supply arrangements
- commercial terms that incentivise efficiency, quality and performance
- contract governance and performance management.

These strategies are covered in more detail in the section below on outsourced delivery.

Our procurement processes utilise competitive processes to identify, evaluate and award outsourced work.

FIGURE 5.3: CHORUS PROCUREMENT PROCESS



The largest single procurement exercise during PQP1 so far has been the review and reset of our Field Service Agreements (FSAs). These contracts require continual management and are expected to evolve as work plans for PQP2 are confirmed through the PQP2 process.

5.3 Outsourced delivery

We make extensive use of outsourcing for in-field, site and network capacity work. As mentioned above, our largest outsourcing contracts are our two FSAs, which cover most of our in-field work. However, as shown in Table 5.1 below, we have multiple other contracts for other important services.

TABLE 5.1: KEY DELIVERY CONTRACTS

AREA	CONTRACT	CONTRACTS	KEY RESOURCES	SCOPE
In-field	Field services agreement (FSA)	2 (although some in-field work remains contestable)	Technicians Civil works	Covers network sustain, restoration, maintenance and relocation activity. It also covers business-as-usual build such as infill, capacity extension, and connections (including work in end-user premises and connections in multi-dwelling units). It also includes copper connect and network restoration and maintenance services. A category of work under the FSA is contestable. Chorus signed a reduced scope version of the FSA (i.e. FSA Lite) with CCI [ ] to compete in this contestable work.
Site	Network property maintenance, building and engineering services	1	Building trades Building services trades	Covers property maintenance, minor works and project work for exchange buildings and engineering services (i.e. power, cooling, security and other services).

AREA	CONTRACT	CONTRACTS	KEY RESOURCES	SCOPE
	Security operations centre (SOC)	3	Security and fire (compliance) services	Our three contracts cover the following: 1. Monitoring of sites, access management, CCTV review, guarding and mobile patrols 2. Installing and maintaining security equipment, building warrant of fitness checks, and security systems software support 3. Installing, maintaining and testing fire equipment, building warrant of fitness checks, and ensuring compliance with local authorities.
	Network operations centre (NOC)	1	Telco engineers	Covers remote configuration management and commissioning activities along with network surveillance, incident and problem management.
Capacity	FSA	2	Technicians Telco engineers	The same FSA discussed above that delivers in-field services also covers some business-as-usual capacity work, for example, installing aggregation equipment.
	Equipment Supply	1	Electronic equipment	Covers network electronics suppliers, supply and technical support for access, aggregation and transport electronics and element management platforms.
IT	Master Service Agreements (MSAs)	Multiple	IT services	Although most of IT services are delivered internally, we have MSAs with multiple IT suppliers, which have coded pricing for professional services. We engage IT suppliers in two different ways: 1. We source dedicated technology resources via purchase agreements each financial year to augment our own teams under our planning and oversight. This represents about 15% of our IT capex each year. 2. We engage a technology supplier via a statement of work (SOW) for outcomes-based professional services. This is then largely planned and executed by that supplier. This represents about another 15% of our IT capex each year.

5.3.1 Types of outsourced work

Our outsourced work can be categorised into three classes depending on how it is priced:

1. **Coded work** – certain delivery outcomes (i.e. repeatable tasks that are provided at volume) have fixed prices under their respective contracts that can only be adjusted by CPI during the term.
2. **Quoted work** – service companies must obtain three quotes (and evidence this if required) for work that is not repeatable, is bespoke, or

requires specialist third-party inputs (e.g. civil works). The cost of this work must be passed through directly, with an uplift/margin allowance as specified in the contract (which represents an allowance for the cost and efforts spent in obtaining the quotes and managing and awarding the work).

3. **Fully contestable work** – work that Chorus considers, in its sole discretion, is likely to meet or exceed **CCI [ ]** is fully contestable (even if it should fall under a previously awarded contract), as is any other work specified as such in a Statement of Work. Chorus reserves the right to tender this work to all service providers (or others) at any time.

In 2022 we completed a fundamental review of, and subsequent changes to, our contractual model with our FSPs in anticipation of completing UFB network construction and slowing installation volumes.

NEW CONTRACTS

We completed the re-contracting of our field service contracts in 2022 in order to optimise for future volumes and Chorus requirements.

5.3.2 Contestable major one-off delivery programmes

As noted above, in addition to coded and quoted work, we deliver one-off projects or programmes in our work plan. These projects/programmes are contestable in any geographical area and not covered by our standard outsourced contracts. Examples include:

- Major transport fibre route extensions. During PQP1 we completed the Fox Glacier to Haast to Lake Hawea fibre extension and the Te Anau to Milford Sound fibre extension projects. In PQP2 we are planning a number of further fibre route extensions to improve access to, and resilience of, services
- major building refurbishment programmes including seismic strengthening
- extension of network coverage to new housing and subdivisions
- relocation of network for large infrastructure projects such as Auckland city rail corridor.

For these larger one-off projects or programmes, our procurement team works with business owners to negotiate and execute a contract that best balances time, cost and quality objectives.

5.3.3 Governance

Each contract contains a comprehensive governance regime that requires parties to meet regularly to monitor performance and risk:

- Joint Governance Board and General Manager meeting – quarterly
- Joint Advisory Board Heads of Departments – monthly and as needed
- Level 4 Forums of senior operational leads and business and project leads – various frequencies
- annual plans – specific annual action plans for quality, and health and safety
- daily operational calls.

5.3.4 Performance management

Each contract also sets out required performance levels and includes clauses, which incentivise providers to meet those requirements. Performance levels are detailed in statements of work (SOWs) and associated service level agreements (SLAs). These include:

- Key performance indicators (KPIs) – the set of key deliverables with objective performance measures linked to at-risk financial incentives (i.e. retention of revenue that's earned back based on performance). Examples from our FSA include connecting/fixing/building within certain timeframes, arriving on time, managing workload, customer satisfaction and quality standards.
- Incentives regime – financial bonuses are available for delivery of projects ahead of time or the supplier increasing their performance level.
- Where performance levels under SLAs are not satisfied, we have the following options available:
    - default notices – a tiered regime, notices can be issued for major or minor breaches, to remediate material or systemic faults and breaches with requirements to produce for approval and execute performance improvement plans. Under a major notice, failure of the supplier to remedy gives us the ability to procure another party to perform the work
    - loss of exclusivity – if a service provider has breached an obligation, or we do not believe they will achieve their SLAs or KPIs we can reallocate work to another party
    - standard contractual rights – warranties, breach, step-in, termination (all or in part).
- Our contracts also give us the following abilities to assess our service providers' work:
    - completion – on completion we can verify that work is performed to the contractual standard, complete service or get third parties to complete works where there is non-performance
    - quality provisions – we can undertake assurance audits and reporting, quarterly plans, non-conformance reporting (NCR) put right and continuous improvement.
- Technical documents – clear standards for technical requirements, process and customer service. Technical documents may also contain specific and more detailed performance standards and measures that apply to different tasks and services at a more granular level. We require supplier compliance to the Australian Standards for Quality (Quality balance scorecard) ISO9001, ensuring that they have the right tools and process in place to assess, manage and correct quality and perform the work.

PERFORMANCE MANAGEMENT

Our contracts with suppliers ensure clear performance levels and standards, with incentives for good performance and recourse for under-performance.

These performance management arrangements and the governance arrangements described in section 5.3.3 are designed to achieve key service outcomes at the least cost. Contract design and periodic calibration ensure contracts, governance and performance management arrangements remain

fit for purpose. FSA contracts were awarded by means of competitive tender process.

5.3.5 Major event response

Our contracts and processes are set up in such a way that allows us to respond to major events (such as extreme weather events or earthquakes) in an effective manner. For example:

- our contracts allow for temporary suspension of performance management obligations due to force majeure events
- we establish constant operational contact (daily operational calls at minimum). During Cyclone Gabrielle we also established a tactical team across Chorus, the NOC and our service companies
- we ensure there is regular communication between both senior operational managers and general managers
- we establish a clear prioritisation of work
- we have moved technician resources into locations of greatest need (including between the two FSPs by way of cooperative deployment agreements), and from other workstreams into restoration
- we have established additional health and safety management procedures for unusual health and safety risks arising from extreme weather events.

MAJOR EVENT RESPONSE

2023 has been a challenging year in response to extreme weather events. However, we've been able to adapt and work in partnerships to re-establish connections as quickly and safely as possible.

5.4 Delivery in the field

In-field work accounts for an estimated 43% of planned expenditure (across opex and capex) in PQP1 and we forecast this will change to 37% in PQP2. Overall, the volume of in-field work in PQP1 so far has been higher than initially forecast in the PQP1 proposal, and we now expect PQP2 work volumes to remain at similar levels. This is mostly due to higher forecast network extension, associated installation, and resilience investment.

In our PQP1 proposal we anticipated a slowdown of network extension and installation activity as a result of completing the UFB2/2+ communal network build and COVID-19 significantly reducing new property development. While we completed UFB2/2+ communal build as expected, we over-estimated the negative impact that COVID-19 would have on new property development and installation volumes. Actual new property development activity was 150% higher (the highest on record) and installation volumes were 23% higher than forecast for 2022.[67]

However, growth in fibre is slowing and the copper network is reducing. Net fault volumes across both fibre and copper are declining as we migrate customers from copper to fibre, reducing the number of older copper lines, which are generally less reliable than fibre.[68] While we expect fibre faults will increase as network components age, this is not yet apparent, and we are not forecasting a marked increase in fibre faults during PQP2.

DELIVERY IN THE FIELD

Most of our field expenditure is outsourced. It includes work for extending and relocating network elements, and maintaining in-field assets.

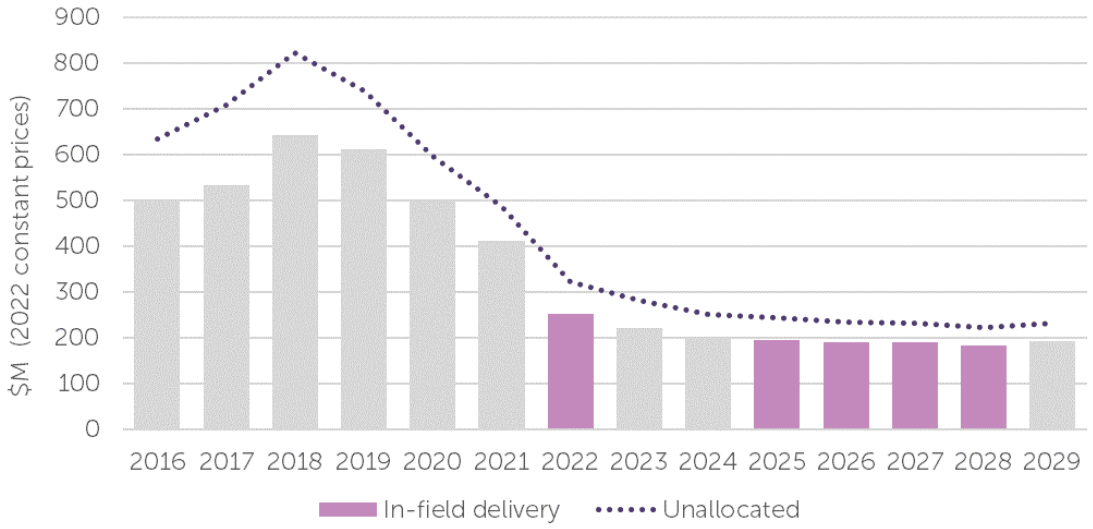
$190m p.a.

67 As disclosed in 2022 Information Disclosures: chorus-fibre-information-disclosure-dy22-ceo-cover-letter.pdf (ctfassets.net)
68 Fibre is more reliable than copper in terms of general environmental-related maintenance, although we do note that copper has some advantages in extreme weather events where there are out power outages, as copper networks can provide 'phantom power' to end-user devices (i.e. ONTs).

Further information on activity volumes, trends, forecast assumptions and uncertainties are covered in the Extending the Network, Installations, Network Sustain and Enhance (specifically the Field Sustain and Resilience sections), Network Opex and Connection Capex chapters of Our Fibre Assets.

Historical and forecast in-field expenditure is shown in Figure 5.4. We plan to invest an average of $190 million per annum over the PQP2 period,

FIGURE 5.4: HISTORICAL AND FORECAST IN-FIELD EXPENDITURE



To address the changing scale and mix of work in the field, we reviewed and reset key service company contracts, i.e. the FSA, in 2022. This included consolidation of contracts and geographic regions to realise efficiencies as work type changed and total activity (copper plus fibre) declined.

Appropriate further changes to field services contracts will be made when required, noting that contracts agreed in 2022 contain greater flexibility to adapt, for example, if end-user or regulatory requirements change.

5.4.1 Managing delivery

Table 5.2 summarises how we manage key in-field delivery work types, with a focus on how we hand work over from planning (or policy) to delivery, and how we monitor delivery performance.

TABLE 5.2: WORK TYPE AND HANDOVER FOR IN-FIELD DELIVERY

WORK TYPE	HANDOVER
New network build	Once work has been awarded to a service company to construct, work packets are loaded into our iTools work management system. This allows for tracking of design and build related tasks against baseline dates and acts as a document repository relating to the build activity.

WORK TYPE	HANDOVER
Standard installations/ connections	Once an order comes through the Chorus Portal from an RSP, we automatically generate a work order via our new Work Request Manager (WRM) which is sent to the applicable FSP who dispatch it to a field crew that has the correct skillset, training and capabilities to complete the job.
Complex installations/ connections	Once an order comes through the Chorus Portal from an RSP, the build portion of the complex connection is then raised in iTools and the FSP picks up the build component and allocates it to the correct workforce. On completion of the 'build' the FSP completes the 'connect' portion of the work via the WRM work order.
Field sustain – volumetric	Field sustain work is either identified from field observations or monthly network performance reporting, or triggered by third-party activity such as roadworks. Some identified works that are of a transactional nature are approved via a weekly management review forum. Other works are checked for alignment to approved business plans and are approved within the capital investment approval framework. Network elements requiring replacement, remediation or new build are managed via the iTools work track system.
Reactive and recoverable maintenance	Reactive maintenance is identified by either end-users reporting a loss of service or by equipment fault alarms. Faults are logged into our fault management system – Service Manager (SM) and resultant work tickets are automatically routed to the appropriate FSP via our Work Request Manager (WRM).
Preventative maintenance	Network maintenance routines are scheduled preventative maintenance which is dispatched monthly via our new cloud-based system called eMaint. Network elements requiring replacement or remediation are managed via the iTools work track system.

5.4.2 Risks

In Table 5.3 we identify, assess and describe mitigations for key risks for delivery in the field.

TABLE 5.3: KEY RISKS ASSOCIATED WITH PROCURING, RESOURCING AND DELIVERING IN THE FIELD

KEY RISK	ASSESSMENT	MITIGATION
Service company sustainability Declining expenditure impacts service company sustainability under current contractual structures.	Previous contractual arrangements were optimised for build and connect and reflect underlying maintenance volumes. These needed revision in light of evolving and smaller work programmes. Unaddressed, this risk had the potential to impact both delivery and quality outcomes.	• Reset of service company contracts in 2022 was optimised for future volumes and Chorus requirements, including ensuring sustainable service companies (e.g. reducing the number of FSPs from three to two)

KEY RISK	ASSESSMENT	MITIGATION
Service company resourcing Acute shortage of technicians from early/mid 2022 arising from the lifting of COVID-19 travel and immigration restrictions (allowing technicians from overseas to travel home for extended periods and/or change jobs as they were no longer tied to work visas) and domestic labour market tightness.	Immigration restrictions have been eased, allowing service companies to employ technicians from overseas. Initiatives were also implemented to attract domestic technicians and improve technician retention. Technician shortage remains a serious issue in the short term but has eased significantly by August 2023 and is expected to ease further in late 2023 or 2024.	• Continuing implementation and operation of existing initiatives to attract and retain technicians • Providing a clearer line of sight to expected medium-term work volumes
Unplanned work / extreme events Increased scale and frequency of large network-impacting events exceeds resource availability impacting restoration or business-as-usual work programmes.	This kind of work can arise, for example, due to natural events (such as earthquakes or storms), fires, vandalism, or latent issues (such as structural defects, weathertightness or hazardous materials). In ordinary circumstances we would not anticipate difficulty securing materials or labour for unplanned work unless the issue is widespread. However, in some cases, if unaddressed this risk has the potential to impact delivery of unplanned or even planned work and quality outcomes, potentially across all quality dimensions (depending on the nature of the event). For example, the Auckland flooding and Cyclone Gabrielle recovery work has been challenging due to scale of work and technician shortages described above.	• Designing our fibre network architecture to limit the impact of hazards at core sites • Increasing network resilience (fibre route, core site and electronics) to reduce exposure to service interruption (and speed up and simplify service restoration and remediation) • Contractual arrangements and operational plans with FSPs giving flexibility to relocate and even share technician resources where required
Rural sustainability Sustaining adequate coverage in rural areas as work volumes decline.	Copper work contributes to sustainability of work volumes for rural technicians. Declining copper connections exacerbates transition challenge.	• Structuring of contracts and engagement with potential providers • Multiskilling of technicians to work on copper and fibre
Contractor insolvency	This risk has the potential to impact delivery and service quality, for example provisioning and availability.	• Ensuring contract structures support sustainable service companies • Preparing contingency plans that can be executed in event of service company failure • Working with service companies to strategically ensure multiple providers are available

KEY RISK	ASSESSMENT	MITIGATION
Worker welfare Long supply chains and use of migrant or vulnerable workers exacerbate risk to worker welfare.	Exploitation of workers, including migrant workers is unacceptable. Poor worker welfare is not desirable or sustainable and can contribute to poor quality outcomes.	• Building comprehensive safeguards into supply contracts, supported by a Supplier Code of Practice and dedicated resource in both Chorus and the FSPs accountable for ensuring sufficient supply chain oversight
Organisational change Handover to delivery, and performance monitoring disrupted as we or FSPs implement organisational change.	Change can cause a dip in productivity, including due to staff shifting focus, or needing to re-learn, upskill, or redevelop processes and relationships.	• Careful change planning, management and support (e.g. our programme to migrate work from our incumbent FSPs to the new FSPs under the 2022 FSA reset) • Retaining capacity to rapidly catch-up on any delayed work
COVID-19 / pandemic At higher alert levels some of our work is restricted. Domestic outbreak would likely disrupt productivity further. Domestic or global outbreaks could interrupt materials and equipment supply.	We have developed work practices that limited disruption during lockdowns for COVID-19, while protecting worker and public safety. We have not experienced any interruption to materials or equipment supply to date. However, supplier lead times have increased this this has the potential to impact delivery and service quality (specifically new installations).	• Evolving work practices as needed to minimise lock-down impacts while protecting worker and public safety • Monitoring and reviewing supplier capabilities and performance • Increasing local holdings of imported equipment • Precautions to mitigate against the impact of a severe domestic outbreak or escalation of offshore outbreaks.

5.4.3 Expenditure and network performance linkages and synergies

Key opex and capex linkages for in-field delivery

The delivery of our in-field services affects the following capex and opex categories:

- Extending the Network capex
- Installations capex
- Network Sustain and Enhance capex (specifically the Field Sustain, Relocations and Resilience sub-categories)
- Network opex (specifically the Maintenance sub-category)

More details about the linkages between this expenditure and other capex and opex categories, as well as linkages to network performance can be found in their respective chapters of the Our Fibre Assets document.

We use common resources across build, connect, relocations, network sustain (capex) and maintenance (opex), [69] as well as across fibre and copper. The overall scale and mix of work across all these areas is the key consideration for how we set up contract structures and manage workflows.

Since our PQP1 proposal, our plans to extend our fibre network beyond the UFB2/2+ footprint have matured. As noted above and explained further in the Fibre Frontier chapter of Our Fibre Assets, we are proposing to extend our footprint beyond the UFB areas. We are currently testing the market for this extension work to confirm our pricing assumptions and capacity to deliver on the proposed plans. We will continue to engage with the Commerce Commission through the evaluation of this proposal, as this investigative work evolves.

FIBRE FRONTIER

We will continue to engage with the Commission as we develop our delivery plans for network extension beyond the UFB footprint.

As new installation and connection rates decline and maintenance spend reduces due to copper withdrawal, we will lose some economies of scale in the field.[70] In more remote areas with lower connection volumes, continuing to procure sufficient technician cover to maintain provisioning and fault response times remains challenging. Reconfiguring contract structures in 2022 mitigated, but did not eliminate, these challenges. As fibre build and connect volumes (and all copper volumes) decline, we are seeing less specialisation and a greater reliance on multi-skilled technicians (as per our mitigation plan for rural sustainability).

There is a link between delivery volumes in the field and our in-house resourcing for planning, programme and operational management and contract administration. As volumes in the field change, so too does the internal resourcing to support the field work. Over time the capitalisation of associated internal labour and support costs will fluctuate with field work type and volume.

Our work in the field increases the number of connections, flowing through to demand for network capacity. We deliver initial coverage and capacity through our extend and install work, at which point we have to shift to optimising network capacity investment to take into account bandwidth growth, lifecycle renewal and new product sets. This optimisation becomes an ongoing network capacity workstream.

Our work in the field also flows through to changing building and engineering services needs. Fibre equipment consumes less electricity and takes up less space than copper equipment 'per-bit', allowing us to reduce electricity related costs as we transition customers from copper to fibre, and optimise buildings and building services as our copper equipment is gradually decommissioned.

Our delivery in the field is supported by IT systems, which we scale and adapt to support product enhancements and improve asset management and operations. An example of this is our investment in handheld digital tooling and improvements to asset information modelling for technicians in support of both the pole retest programme, as well as the manholes inspection programmes. These IT investments of approximately $1 million result in

69 Build and connect resources link to our Extending the Network and Installations expenditure categories; relocations and network sustain relate to our Network Sustain and Enhance expenditure category; and Maintenance opex link to our Network Opex expenditure category.
70 Declining total Chorus connections (fibre and copper) also impact overall work volumes and scale. For example, total connections have declined from around 1.8m at demerger to 1.4m today.

capital benefits of $670,000 per annum and operating expenditure savings of $640,000 per annum on these long-running testing programmes in the field.

Delivery in the field is also supported by our customer operations teams which support activities that cannot be fully automated and ensure effective coordination between field activities, RSPs, end-users and network configuration activities.

Key network performance linkages for in-field delivery

In-field maintenance activity will typically address identified faults or other issues, resolving current service performance issues, or mitigate future issues which may adversely impact service or network resilience, or increase whole-of-life costs.

Build and connect activity will typically increase access to FFLAS services by increasing network coverage areas and network capacity to match growth, retire obsolete technology, and in some cases increase network resilience.

Activity such as roadworks or electricity network construction and maintenance can cause faults and impact our RSPs and end-users. As such, we work with councils, lines companies and other parties to mitigate this risk by relocating and managing our assets around their activities.

In-field activity can also cause faults that impact our customers and end-users. Our work procedures, training, quality assurance and network architecture are designed to limit these impacts, and we have been able to reduce the detrimental impact of 'hands in the network' over time.

Some in-field activity also requires planned outages which we coordinate with and communicate to RSPs.

In-field activities have a significant impact on customer service perceptions. This includes:

- our network extension work, which is highly visible and can be disruptive
- installation work, which is the most direct interaction most people have with us as it involves technicians in their home
- restoration services, which directly impact end-user experience.

Minimising the impact of network extension work and smoothing the customer experience in connecting to the fibre network has been and remains a major focus area. A good measure of progress improving the connection experience is the proportion of fibre installations completed in a single day – which has increased from below 40% to over 70% in the last two years. This is reflected in strong customer satisfaction ratings. In September 2023 this is at 8.2 out of 10 for installations that require physical work to be done (relative to 8.2 in September 2020 and 6.9 in 2016).

In-field activity determines the built-quality of our assets. We have evolved network and asset design over the course of the UFB build and connect programmes to continually improve built-quality. We've also evolved how we manage workmanship standards. Some of these matters have an immediate impact on network performance (for example, changing from above-ground cabinets to in-ground pits has reduced vehicle damage) but mostly it will take

ECOSYSTEM

Our FSPs are a key part of the ecosystem for delivering our services to customers and end-users.

time for built-quality to translate to lifecycle cost or network performance outcomes.

Fibre faults remain low, with a fault on average once every 20 years relative to a fault once every five years for copper services. While cost to restore each fault is higher for fibre faults, overall fibre fault restoration costs are significantly lower on a per connection basis than copper services.

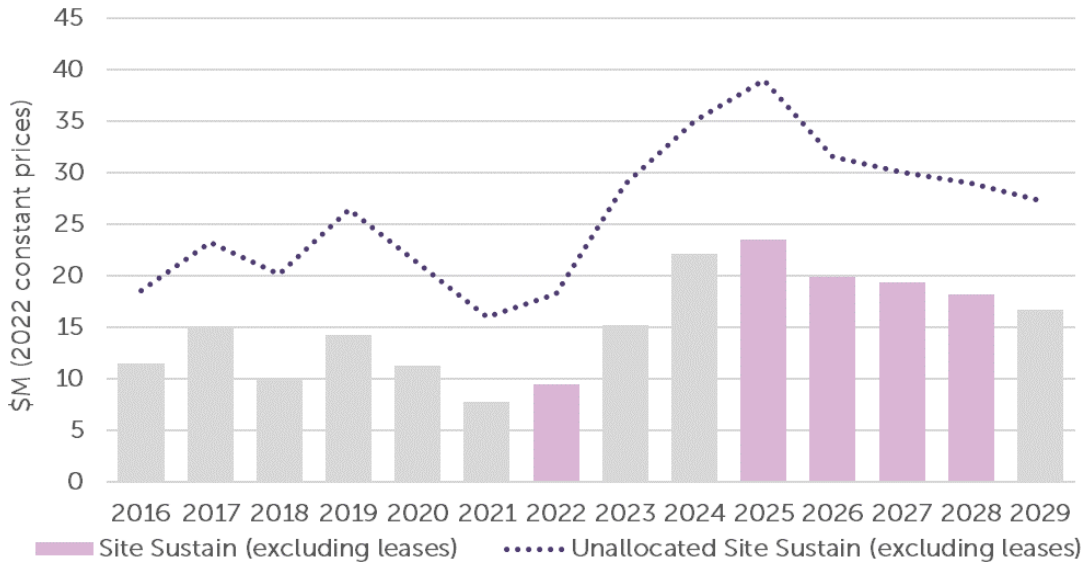
Significant coordination is required across our internal and external product ecosystem to identify, develop and execute changes. Our FSPs are a key part of such efforts, which in turn support performance across all quality dimensions.

To manage future work resources, agreements with field service suppliers contains forecasting KPI performance clauses to deliver only what we forecast. This allows them to right size business in advance.

5.5 Delivering site services

Network buildings and engineering services account for 6% of our planned capex in PQP2. Excluding large projects and programmes, the volume of work will remain reasonably steady into PQP2. This is shown in Figure 5.5.

FIGURE 5.5: HISTORICAL AND FORECAST SITE SUSTAIN CAPEX



Further information on activity volumes, trends, forecast assumptions and uncertainties for network buildings and engineering services are covered in the Network Sustain and Enhance (Site Sustain) capex chapter of Our Fibre Assets.

At present, the following notable projects or programmes are underway:

- Courtenay Place exchange mid-life refurbishment – a staged upgrade of building infrastructure with an estimated total investment of $33.2 million.[71] Works cover chilled water systems, electrical services, engine alternator and uninterruptible power supply, seismic improvement works, roof replacement, window remediation and lift upgrade. We are developing a plan to complete this project over the next four to six years
- alternative sites – a multi-year programme of work CCI [ ]. Works include the upgrade and capacity increase of key power and building services within Chorus exchange buildings
- earthquake resilience – a multi-year programme of work to improve the earthquake resilience of network exchange buildings
- weathertightness – a multi-year programme of work replacing end-of-life roofs to ensure continued weathertightness of exchange buildings.

DELIVERING SITE SERVICES

Site services delivery includes maintaining and enhancing network buildings and building services.

$20m p.a.

Along with these projects, annual maintenance and equipment upgrade programmes for property and engineering services target equipment that is approaching end-of-life and/or capacity constraints. Asset performance parameters determine the priority of assets to be replaced or upgraded.

These asset performance parameters include:

- maintenance strategy (i.e. preventative or proactive work)
- importance (i.e. applying a scale rating to area importance and item importance)
- utilisation (i.e. utilisation of asset is close to design limits)
- replacement condition (i.e. asset is reaching end-of-life)
- optional factors (e.g. regional factor or cost factor).

The annual asset maintenance and replacement programme is developed in conjunction with the FSP with oversight from property and investment managers.

In addition to our network property maintenance, building and engineering services, site services also include our Security Operations Centre (SOC) and our Network Operations Centre (NOC).

Security Operations is a part of our broader Network Operations team, and looks after two national portfolios, i.e. Security and Fire (Compliance). This team often does work that is aligned with our Property team (i.e. involves the same projects) but it has separate budget responsibilities.

5.5.1 Managing delivery

Projects are either delivered through our FSP for routine work, or through competitive tender for larger and more complex works.

71 Unallocated nominal dollars.

For major projects these are procured through competitive tender because this ensures we can select the most suitable provider, balancing time, cost and quality considerations (see section 5.3 explaining contestable work). The projects tend to have a large component of specialist resources, and require specialist forms of construction contracts, e.g. NZS3910.

For more routine work, overall volumes are determined by budget constraints. As signalled in our PQP1 proposal, our focus in this area in PQP1 was to complete the most critical work, while gathering information and developing plans for optimal investment and operations beyond PQP1. These plans are reflected in the PQP2 proposal.

Table 5.4 summarises how we manage key site services delivery work types, with a focus on how we hand work over from planning (or policy) to delivery, and how we monitor delivery performance.

TABLE 5.4 WORK TYPE AND HANDOVER FOR SITE SERVICES DELIVERY

WORK TYPE	HANDOVER
Scheduled equipment upgrades and replacements (capex)	Annual Work Programme (AWP) developed in conjunction with the FSP. Using asset condition data, resilience and importance levels to determine priority. Work packets are loaded into our iTools work management system.
Major projects and programmes	Engagement of specialist technical design followed by competitive procurement process. Such projects are contracted using Chorus bespoke contracts or modified industry contracts, e.g. NZS3910.
Annual planned maintenance programmes and reactive maintenance (opex)	Annual Maintenance Programme (AMP) developed in conjunction with the applicable FSP. The AMP outlines scheduled maintenance and applicable frequency. Reactive maintenance is undertaken by the FSP based on contracted rates.

5.5.2 Risks

In Table 5.5 we identify, assess and describe mitigations for key risks for delivery of our site services.

TABLE 5.5: KEY RISKS ASSOCIATED WITH PROCURING, RESOURCING AND DELIVERING SITE SERVICES

KEY RISK	ASSESSMENT	MITIGATION
Unplanned work / extreme events Increased scale and frequency of large network-impacting events exceeds resource availability impacting restoration or business-as-usual work programmes.	This kind of work can arise, for example, due to natural events (earthquake or storms), fires, vandalism, or latent issues (such as structural defects, weathertightness or hazardous materials). We would not anticipate difficulty securing materials or labour unless the issue is widespread (e.g. a major urban earthquake). Our network architecture is designed to limit the impact of issues in core sites.	• Contracting alternate FSP for Property Maintenance and Engineering Services • Ensuring engineering consultancy services contracts are in place for specialist technical support • Ensuring redundancy for core sites

KEY RISK	ASSESSMENT	MITIGATION
	Unaddressed, this risk has the potential to impact delivery of unplanned and potentially planned work and quality outcomes, potentially across all quality dimensions (depending on the nature of the event).	• Contracts contain terms and conditions requiring our suppliers to work with us, and to have civil defence plans and business continuity plans.
Contractor insolvency	This risk has the potential to impact delivery and service quality, for example upgrades, routine maintenance and availability. However, we expect this risk to be lower for site services than for in-field services as there are more companies that provide these site services.	• Ensuring contract structures support sustainable service companies (i.e selecting a shortlist of potential suppliers based on their sustainability history) • Having contingency plans that can be executed in event of service company failure • Ensuring cost and statements of work are detailed and descriptive to eliminate ambiguity
Worker welfare Long supply chains and use of migrant or vulnerable workers exacerbate risk to worker welfare.	Exploitation of workers, including migrant workers is unacceptable. Poor worker welfare is not desirable or sustainable and can contribute to poor quality outcomes.	• Building comprehensive safeguards into supply contracts, supported by a Supplier Code of Practice and dedicated resource accountable for ensuring sufficient supply chain oversight
COVID-19 / pandemic At higher alert levels some of our work is restricted. Domestic outbreak would likely disrupt productivity further. Domestic or global outbreaks could interrupt materials and equipment supply.	We have developed work practices that limited disruption during lockdowns for COVID-19, while protecting worker and public safety. We have not experienced some any interruption to materials and or equipment supply to date. However, supplier lead times have increased, which has the potential to impact delivery and service quality.	• Evolving work practices as needed to minimise lock-down impacts while protecting worker and public safety • Monitoring and review supplier capabilities and performance (i.e. monthly reports) • Increasing local holdings of imported equipment • Taking precautions to mitigate against the impact of a severe domestic outbreak or escalation of offshore outbreaks

5.5.3 Expenditure and network performance linkages and synergies

Key opex and capex linkages for site services delivery

The delivery of our site services affects the following capex and opex categories:

- Network Sustain and Enhance capex (specifically the Site Sustain sub-category)

- Network opex (specifically the Maintenance and Operating Costs sub-categories)

More details about the linkages between this expenditure and other capex and opex categories can be found in their respective chapters of the Our Fibre Assets document.

Some network building and engineering services work is driven by the space, power or cooling needs of our network electronics.

Newer generations of fibre network electronics are more energy-efficient, but increased connections and bandwidth demand increases net electricity usage, flowing through to opex.

Investment to maintain or extend the useful life of our sites helps minimise their whole-of-life costs.

Our NOC contract enables the completion of the delivery of our network capacity assets (and associated capex) by commissioning and configuring the network element into service. As such, it is a critical final step in delivering our network plan.

The SOC ensure the safety and security of staff, equipment and buildings, and work closely with our Property team, which is integral to completing all capex and opex work.

Key network performance linkages for site services delivery

Our network buildings and engineering services, which includes power systems and backups, directly affect network performance. Secure, well maintained and resilient buildings and power supply support underlying network performance. For example:

- building structure and envelope integrity and robustness protect network equipment, which supports availability
- security and fire systems protect network equipment, reducing risk of faults and unavailability
- maintaining or enhancing building services, including power supply and back-up systems, reduce faults and improve availability.

Retaining more sites, with meshed connections, improves network resilience and reduces the impact of faults on network availability, and upgrading power supplies and cooling supports higher-performance services and increasing demand.

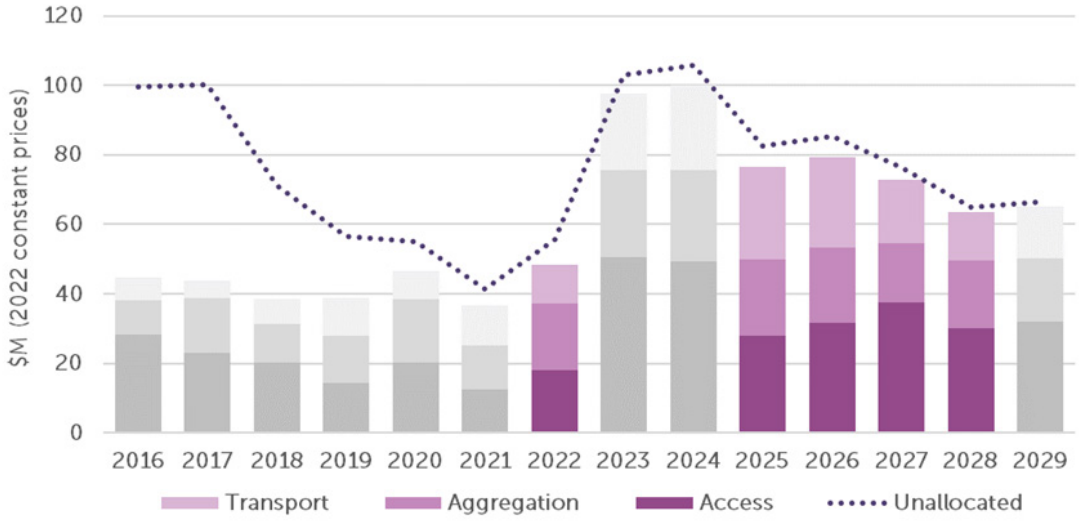
5.6 Delivering network capacity

Network capacity investment accounts for around 22% of our planned capex expenditure in PQP2, excluding initial coverage and capacity fitted as part of extension and connection work (which is included as part of in-field delivery).

Further information on activity volumes, trends, forecast assumptions and uncertainty for Network Capacity capex are covered in the Network Capacity chapter in Our Fibre Assets.

Network Capacity expenditure increased during PQP1, driven by bandwidth growth, lifecycle renewals (i.e. technical obsolescence) and new product sets (e.g. Hyperfibre rollout). Overall expenditure in this area is forecast to trend slightly downwards in PQP2 as a number of time-sensitive lifecycle replacements and capacity upgrades are completed.

FIGURE 5.6: HISTORICAL AND FORECAST NETWORK CAPACITY CAPEX



A large proportion of network capacity expenditure is on equipment and associated supplier configuration work, so these are a key focus in delivering our network capacity programme. For this reason, our focus is on Network Capacity capex rather than Network opex.

The majority of the network coverage and capacity build is driven by proactive programmes to add capacity or manage lifecycle needs or equipment obsolescence. For example, the 2020 supplier roadmap update identified older aggregation equipment was increasingly being deprecated from future software, and therefore must be removed or upgraded by 2026. This proactiveness allows effective medium-term planning by Chorus, equipment suppliers and service companies. This medium-term is based off a conceptual ten-year plan, with a more detailed plan for the first five/six years, but we order or commit to build for the near-term (i.e. two years). This mitigates most delivery risk and enables efficient design, procurement and delivery. Further, by proactively deploying network electronics in anticipation of demand we enable shorter lead times when connecting end-users or enabling additional bandwidth. A further aim of this approach is to enable the lowest whole-of-life cost for the required service, taking account of equipment cost, labour availability and cost, electricity costs and other factors.

DELIVERING NETWORK CAPACITY

This area of delivery includes fitting, configuring and operating electronic equipment across the network.

$73m p.a

5.6.1 Managing delivery

Table 5.6 summarises how we manage our two key network capacity delivery work types, with a focus on how we hand work over from planning (or policy) to delivery. Specialist programme managers with domain expertise provide a

wrapper across these different types of activities and help manage interdependencies within and between pieces of work.

TABLE 5.6 WORK TYPE AND HANDOVER FOR NETWORK CAPACITY DELIVERY

WORK TYPE	HANDOVER
Network capacity build, expansion, replacement, decommissioning, etc.	Centrally planned and managed by Customer and Network Operations (CNO) and translated in to briefs for FSPs to complete final design and scheduling. There are a range of approaches depending on the stream of work (e.g. proactive build and replacement work vs. reactive work).
Network capability introduction and software upgrades	Planned and executed by the Chief Technology Office (CTO) delivery team using the same processes as IT delivery, utilising internal and external suppliers.

Our upgrade and development plans span multiple years but are subject to frequent changes due to changes to technology, demand or strategy. As a result, work programmes are rarely locked in for multiple years, allowing flexibility to accelerate, decelerate or change course.

Programmes of work with particularly large or unique resource requirements or with fixed end dates may be contracted separately in order to provide the appropriate mechanisms to ensure delivery and efficiency.

5.6.2 Risks

In Table 5.7 we identify, assess and describe mitigations for key risks for delivery of network capacity.

TABLE 5.7: KEY RISKS ASSOCIATED WITH PROCURING, RESOURCING AND DELIVERING NETWORK CAPACITY

KEY RISK	ASSESSMENT	MITIGATION
Equipment supply chain delays Equipment availability and supply is a risk for Aotearoa as we are a small market with no domestic manufacturing capacity we rely on international suppliers, and one supplier in particular (i.e. Nokia).	We have experienced supply chain issues, including as a result of COVID-19, however we have successfully mitigated these through adjusting our processes and rephasing activities to take into account supply performance. We are aware that Nokia is our single supplier for key equipment, although it is a stable supplier that keeps up with industry trends and is aware of other suppliers.	• Holding up to six months of local inventory holdings, e.g. optical network terminals (ONTs) • Forecasting volumes to suppliers to signal requirements and trigger different contractual thresholds for delivery lead times, and ordering items earlier in build project lifecycles • Increasing the weight put on forecasting future requirements • Tracking supplier lifecycle notifications, especially end of supply dates where replacement technologies will need to be selected to use in the future. For example, Nokia provides end-of-life notices for their network electronics. • Alternatively, ordering on a project-by-project basis for high unit cost and/or low turnover items (to avoid high holding costs and mitigate obsolescence risk during the holding period) • We monitor Nokia's activity, lead times and market share to verify their sustainability

KEY RISK	ASSESSMENT	MITIGATION
Unfavourable exchange rates	We are exposed to unfavourable changes in exchange rates because core supplier pricing is in US dollars.	• We use derivative financial instruments to reduce our exposure to unfavourable changes exchange rates.
COVID-19 / pandemic (in Aotearoa) Potential for compound impacts of accelerated demand coupled with installation challenges if severe outbreak occurs.	This risk has the potential to impact delivery and service quality, for example provisioning and availability. However, we have developed work practices that limited disruption during COVID-19 while protecting worker and public safety. These may need to be evolved if further COVID-19 or other pandemic outbreaks occur.	• Evolving work practices as needed to minimise lockdown impacts while protecting worker and public safety, such as reduced number of workers in the same work place • Ensuring contingency plans anticipate severe COVID-19 outbreak scenario, for example deprioritise non-urgent work to ensure critical work receive higher priority.

5.6.3 Expenditure and network performance linkages and synergies

Key opex and capex linkages for network capacity delivery

The delivery of network capacity affects the following capex and opex categories:

- Network Capacity capex
- Network opex (specifically the Network Operations sub-category)

More details about the linkages between this expenditure and other capex and opex categories can be found in their respective chapters of the Our Fibre Assets document.

There is some crossover in technician and engineering resources between in-field work and network capacity work.

Adding new equipment to the network requires additional opex to:

- maintain – costs of routine maintenance work, etc.
- power – i.e. electricity costs
- locate – costs of ensuring sufficient floor space, suitable building condition, and building services (and/or specific footprint charges where equipment is co-located in Spark buildings).

The removal of older equipment (either copper or older fibre electronics) will reduce this opex. However, as opex costs are relatively consistent between older and newer equipment, replacements are not driven by net opex savings (cost savings are more likely to be in capex).

During the build and migration phases, opex will be higher to support both the copper and fibre networks simultaneously. This adds further incentive to complete copper withdrawal in a timely manner.

Key network performance linkages for network capacity delivery

Network capacity delivery is critical for sustaining performance as demand grows, as it maintains support and compatibility across the network, reducing faults and supporting network availability. The drivers of network capacity delivery relate directly to the availability and performance of the network, specifically the Layer 2 availability and port utilisation quality standards.

The way we deliver network capacity is crucial to the performance of our network. As such:

- we take a proactive approach to delivering network capacity. Network electronics are time consuming to replace, so we replace equipment:
    - before it reaches technological obsolescence, to avoid breaching the performance quality standard
    - before it is unable to meet bandwidth growth, to avoid breaching the availability quality standard
- we phase our network capacity work into annual deliverables and work with partners to ensure that delivery is successful and that we are compliant with the quality standards
- we deliver OLT upgrades and XGS cards proactively so that Hyperfibre orders can be provisioned more quickly, improving customer satisfaction. Provisioning time and installation satisfaction are both measures of quality reported under information disclosure (ID)
- we deliver resilience by using a network architecture that employs equipment with built-in redundancy (i.e. redundant power supply), dual paths/links/sites, which supports network quality and improves flexibility for network capacity work. Our customer engagement surveys have shown a strong support for network resilience.

In its PQP1 price quality determination in December 2021, the Commerce Commission adopted port utilisation as a quality standard, carrying over a key measure from earlier arrangements with Crown Infrastructure Partners. However, the Commerce Commission reduced the maximum port utilisation threshold that had been used in earlier arrangements and in Chorus' proposal from 95% to 90%. This required a change to Chorus' planning policy, bringing forward network capacity investment. Before this change could be made and implemented, a significant spike in demand in March 2022 (due a major upgrade to the video game 'Fortnite' coinciding with peak demand in Aotearoa) caused a breach of the quality standard for which a breach report was submitted. We note that, while end-user experience was not affected by this event, it highlighted the increasing 'peakiness' of demand and the prudency of investing to increase capacity and deliver ahead of demand.

5.7 Delivering IT change

IT accounts for 12% of our planned capex expenditure in PQP2. Overall, the volume of IT work will be slightly lower than recent peaks.

We have completed a major programme of reducing reliance on legacy Telecom systems managed by Spark for fibre and enterprise functions, that was driven by our regulatory commitments, overseen by MBIE.

This has included developing core systems such as a separate desktop environment, our enterprise resource planning system (SAP), data warehouse, fibre and copper fulfilment, fibre and copper fault management, customer billing, and more recently work management.

We have also put in place a suite of systems and applications to support new service company arrangements, connection activity, network configuration management, and product management. Most of these systems interact with each other, and with RSP systems or people.

Further information on activity volumes, trends, forecast assumptions and uncertainties for delivering IT change are covered in the IT and Support chapter in Our Fibre Assets.

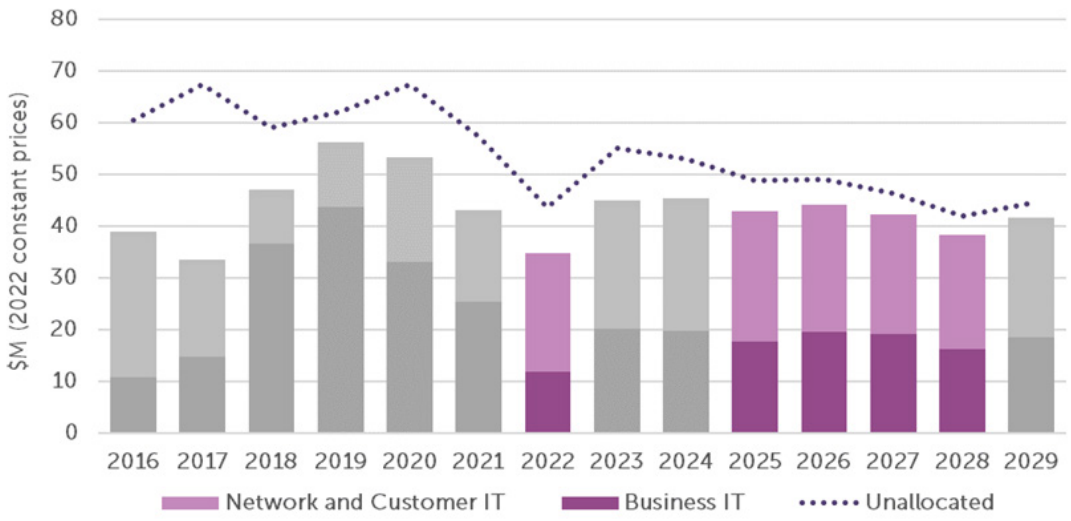
Figure 5.7 shows the historical and planned profile of IT capex. Lower capex during PQP1 reflected completion of the transition from shared Spark systems. In PQP2 IT capex totals $167 million.

DELIVERING IT CHANGE

Delivery includes designing, building and maintaining the IT systems and applications that underpin the network.

$42m p.a.

FIGURE 5.7: HISTORICAL AND FORECAST IT CAPEX



Approximately 91% of our PQP2 IT capex is people-based resource expenditure, with 15% being provisional for professional services engagements with IT suppliers. 8% is split evenly between forecast software purchases and hardware purchases, with a further 1% on capitalised interest. Our forecast for PQP2 IT capex is deliberately constrained by our resourcing and operating model so as to provide predictable expenditure that can be delivered upon by ensuring that:

- our resources are broadly fixed, with step-changes upwards and downwards in line with the completion or commencement of major initiatives or programmes
- we scale our product and customer investment forecast to deliver a steady pace of change. This reflects that there are change capacity limits across the sector, so we cannot execute more product change than our customers or sometimes our FSPs can absorb
- we size lifecycle and compliance work based on our best view (accounting for system risk, complexity and criticality) of the extent of work needed to manage risk and maintain support across our existing systems
- optimisation initiatives can be flexed over time to help balance peaks and troughs and delivery constraints across the IT delivery programme
- our plan includes provision for asset management-focused work to link existing systems and introduce new capability.

RESILIENCE

"Demand will only increase. Building resiliency into the network to withstand future problems is important."

Stakeholder feedback

5.7.1 Managing Delivery

Our overarching approach to delivering IT is about continuous planning, delivery and improvement. Prior to the start of PQP1, we completed a transition from traditional waterfall project delivery to a form of Agile.

Agile is an iterative and incremental approach for delivery. It is a methodology for developing a product or managing work where solutions evolve through collaboration. This is done together between self-organising and cross functional teams and their customers to focus on delivering the highest value in the shortest time. In particular:

- to meet the growing number and complex changing needs of our customers, our business needs to continue to evolve in the way we work to be able to respond quickly and efficiently
- to be effective, our delivery needs to become smaller and more frequent, iterative and strategically aligned across our organisation
- to be successful, we need to demonstrate that we can deliver more customer value, faster, without compromising quality, in an open and transparent manner across our organisation to ensure we minimise wasted effort.

AGILE

Our IT is delivered using Agile methodologies, which involves an iterative and incremental approach, with solutions evolving through collaboration.

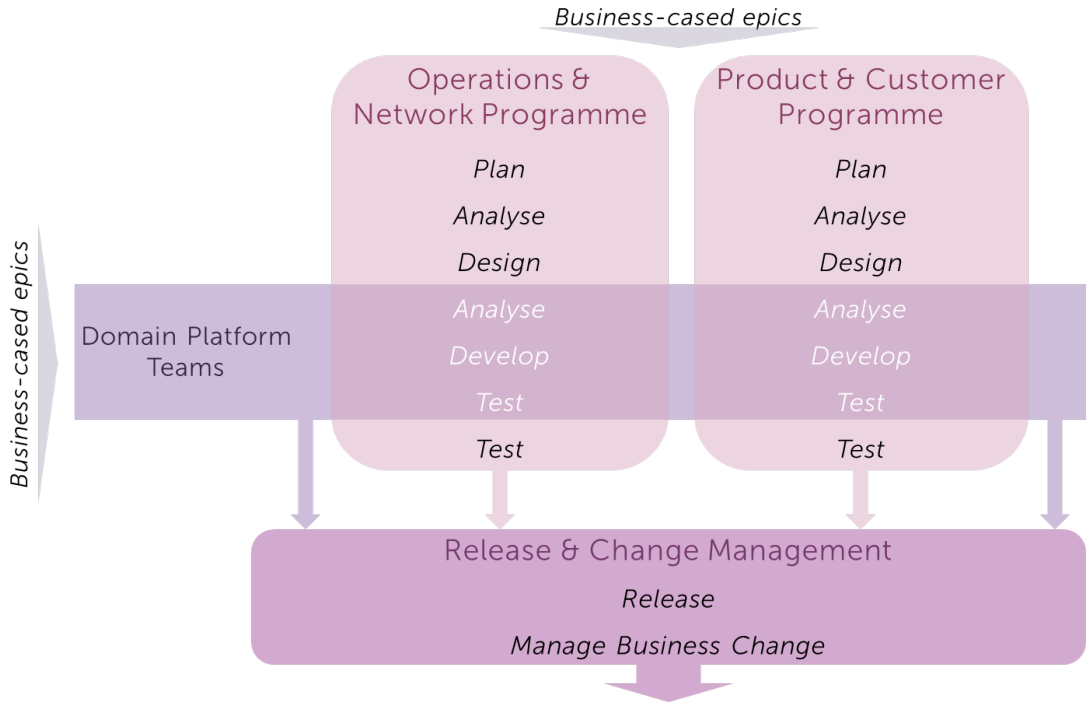
At the core of our IT delivery model we have designed three types of virtual organisations:

- **Platform** – dedicated squads assigned to a single or a small group of technology platforms within each IT Domain where intellectual property

and technical leadership can be fostered and grown. These teams are responsible for the development and change of these platforms.

- Programme – dedicated squads deliver on the strategic objectives for both PSM (Product, Sales and Marketing) and CNO (Customer and Network Operations). Leadership squads directly plan and govern initiatives, while delivery squads coordinate complex change across platform teams, manage quality and testing, and plan and execute people and business change. These squads are deeply integrated with and dependent on the input from all parts of our business.
- Release – a governing function that works with the programmes and platforms to ensure that we maintain quality and structure to how we bring change to production whilst protecting the current-state performance of our environment.

FIGURE 5.8: CHORUS CTO IT DELIVERY OPERATING MODEL



Agile at Chorus

For Chorus, the implementation of Agile within IT delivery has produced better outcomes for customers and end-users through a far more rigorous and continuous prioritisation of initiatives, as well as a faster cadence of delivery and change. This adds up to delivering the highest value initiatives, faster, with equivalent or fewer resources.

A core principle of our IT operating model is to ensure that we always have more work (backlog) than we can currently execute with our largely fixed resources. In concert with the Agile concept of breaking down work into discrete features, it means that we are forced to prioritise and can deliver more relevant features more quickly. This combination of right-sizing our resources and ensuring a constant backlog means that we have high confidence in our forecasts and our ability to meet them.

By systemising our planning and processes, and by shifting to consolidated, quarterly planning and governance rhythms we have gained a number of benefits, including that:

- all planned and inflight work is transparent within and across Chorus teams
- dedicated squads and resources support functional units, which can then prioritise their own work, reducing overall cycle time and whilst building intellectual property (IP) within the squad
- common methods and quality standards can be implemented, measured and improved
- quarterly plans are socialised and then committed via 'Big Room Planning', providing greater certainty
- consolidated governance can govern and prioritise the overall programme of work.

The agile framework has a set of descriptive terms and ceremonies that underpin it and have been adopted within Chorus. The main elements are summarised below for context:

- Epic – an epic outlines functionality at a high level, a business outcome, initiative or project that can be broken down into a number of features.
- Feature – a feature describes a discrete piece of functionality that delivers tangible value. It can fulfil a specific outcome for the RSP, end-user or Chorus business within an epic.
- Sprint – a sprint is a short, time-boxed period of 2 weeks when a Chorus squad works to complete a set amount of work.
- Release – a release is the movement of a software product or hardware system from development into production.
- Launch – enabling features in production to be used by the business to deliver business value.
- Big Room Planning – a quarterly planning ceremony that shares strategic priorities, determines epics that will proceed, identifies and manages dependencies, recognises success and determines plan feasibility.

PRIORITISATION

We always have more IT investments we want to make than we have the resources to deliver on. This ensures we constantly reprioritise to make the most relevant and beneficial investment choices.

By using a common delivery framework anchored around business features – with features being something tangible in a sometimes intangible area like IT – we can track performance on throughput, business value and cost. Some recent examples of features include:

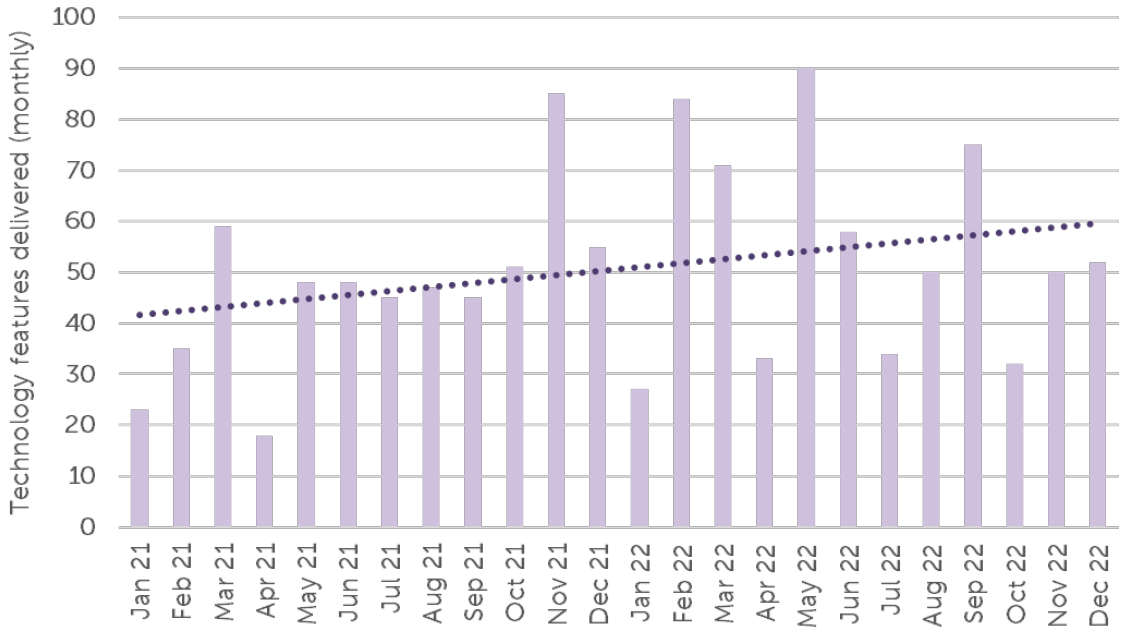
- the capability to provide RSPs an Automated Hyperfibre Feasibility for intact fibre connections (i.e. being able to provide RSPs with instant confirmation of whether a Hyperfibre product can be ordered)
- the capability for RSPs to place an order for (and Chorus to connect) a new Chorus Exchange Connect product (i.e. a backhaul product)
- the capability for RSPs to troubleshoot and successfully log a fault on a new High Priority Access product (i.e. a new 1Gbps symmetrical product for medium to large businesses)
- user interface improvements for end-users and RSPs on the Chorus Outages Map (i.e. a web portal which shows network faults and outages, which was used heavily during Cyclone Gabrielle)
- the capability to stop an RSP from being able to order an older or legacy product that is being grandfathered and will be eventually withdrawn
- the automated generation of customer quotes for requested changes or relocations of Chorus equipment in the field, such as ONTs, cables or poles.

CONTINUOUS IMPROVEMENT

We have been delivering more features per quarter over time, showing the continuous improvement in our processes.

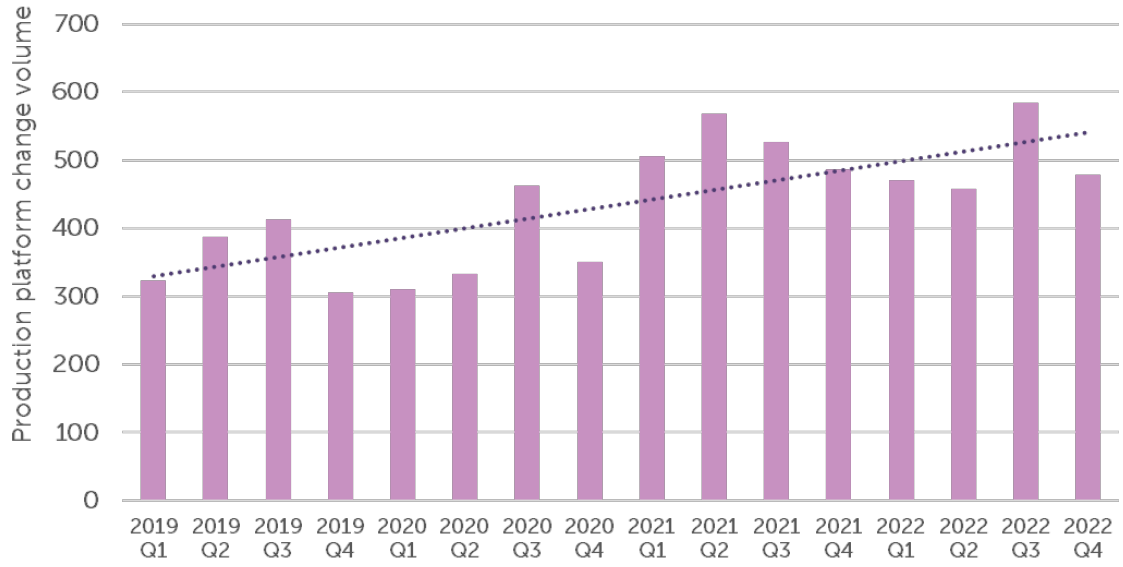
Since the beginning of 2021 our volume of features delivered per quarter has trended upwards as we have refined our operating model and made continuous improvement. This is illustrated in Figure 5.9.

FIGURE 5.9: TECHNOLOGY FEATURES DELIVERED OVER TIME



Another key metric we track is the volume of changes made to production platforms. This is a metric which is indicative of both the volume of activity (changes) as well as our preparedness for release (quality and automation). Compared to the two years prior to our operating model change, we can see a 33% increase in the annual volume of change.

FIGURE 5.10: PRODUCTIVITY INCREASE OVER TIME



5.7.2 Risks

In Table 5.8 we identify, assess and describe mitigations for key risks for IT delivery.

TABLE 5.8: KEY RISKS ASSOCIATED WITH PROCURING, RESOURCING AND DELIVERING NETWORK CAPACITY

KEY RISK	ASSESSMENT	MITIGATION
Volume and disruption of change Increasing cadence and impact of planned IT change may become too disruptive for customers and Chorus users.	Change can cause unanticipated delays in programmatic work, delaying the launch of new capability.	• Careful change planning, management and support. • IT change roadmaps are created for and shared with both RSPs and FSPs. These roadmaps undergo consultation for minor and major change, and as a result the IT programme can accept changes upon request or feedback. • Designing for and building technology resilience within platforms to reduce impact of change

KEY RISK	ASSESSMENT	MITIGATION
Inability for suppliers and our people to operate and manage IT assets Stable operations are required to provide a platform to continually drive effective change.	An unstable operations platform would reduce our ability to drive effective change, slowing the rate of change and driving further operational and cost risks.	• Optimising key supplier contract renewals • Maintaining visibility of Spark exit plans through joint plans and governance • Implementing asset management frameworks identified in asset capability improvement plans • Business governance around strategic priorities and application of resources • Converting contract staff to permanent roles, with development paths that encourage growth and retention of IP
Failure of information and network security Any major cyber impact including the distributed denial-of-service (DDOS) attacks seen in late 2020 and data breaches seen in Australia in 2022 can impact IT delivery.	The impact or and response to a cyber-attack could disrupt our ability to meet our intended plans.	• Regulatory control formalisation and reviews • Investment in security capability and controls • Security awareness programmes • Formal policy and standards • Supplier security reviews • Third-party operational auditing
COVID-19 / pandemic Domestic outbreak causing staff or supplier illness could impact delivery. Domestic or global outbreaks could interrupt materials and equipment supply.	We have developed work practices that limited disruption during lockdowns for COVID-19, while protecting worker and public safety.	• Evolving work practices as needed to minimise lockdown impacts while protecting worker and public safety • Monitoring and reviewing supplier capabilities and performance • Increasing local holdings of imported equipment.

5.7.3 Expenditure and network performance linkages and synergies

Key opex and capex linkages for IT delivery

The delivery of our IT services affects the following capex and opex categories:

- IT and Support capex (specifically the Network and Customer IT and Business IT sub-categories)
- Support opex (specifically the Asset Management and Technology sub-categories)

More details about the linkages between this expenditure and other capex and opex categories can be found in their respective chapters of the Our Fibre Assets document.

IT investment supports business performance, improved service outcomes and efficiency. Key influencers and sources for investment span:

- End-user:
    - expectations on broadband experience, quality outcomes and their digital experiences
    - verbatim or direct feedback on Chorus experiences and processes
- RSP:
    - requirements for integration and automation in pursuit of operational efficiency and customer experience
    - need for products and services that allow them to differentiate and compete in the market
    - consultation input on product and feature priority and desirability
- Chorus':
    - need to comply and thrive under price-quality and ID regulation (e.g. demonstrating compliance, disclosures, expenditure proposals, commitments and roadmaps with Commerce Commission, asset management capability and roadmaps)
    - regulatory obligations (e.g. Telecommunications Service Obligations, the Telecommunications (Interception Capability and Security) Act 2013, and Business Line Restrictions)
    - customer and market objectives to support fibre uptake
    - new product line extensions to meet current and future customer needs
    - new products to open new markets
    - objectives to drive operational efficiency, control or reduce costs
    - objectives to meet customer service and quality outcomes
    - technology strategy objective to enable industry agility and growth
    - technology strategy objective to enable the best service on the best network
    - technology strategy objective to fuel our business with information
    - technology strategy objective to actively manage our technology platforms.

IT investment is simultaneously a requirement to ensure the ongoing operation of our business, as well as an enabler of changing demands. Some examples from PQP1 include the launches of:

- end-user capability, such as
    - a new property development ordering and management portal, delivering benefits such as instant automated quotations which previously took two weeks

  - automated customer surveying tools to capture sentiment and allow Chorus to target improvements

- new product features and extensions for RSPs, such as
  - handover geodiversity providing RSPs choices for customer resilience
  - improvements to Hyperfibre processes to improve connect times by approximately 50%
  - High Priority Access (HPA), a new symmetrical 1Gbps business-grade product to enable a migration-path for RSPs consuming legacy fibre products on the Chorus Regional Ethernet Network
- FSP capability, such as
  - new capability and the managed transition of two FSPs to modern integrated work management capability for Fibre Connect and Assure, in support of the FSA contract changes
  - technician applications for entering information directly while auditing Chorus poles and manholes
- Chorus capability, such as
  - new planning capability for regulatory modelling and forecasting in support of PQP2 PQ submissions.

In addition to the above we have a continual rolling programme of investment that keeps current IT platforms current, supported, operational and compliant with NZ law and board policy and tolerance.

6.0 ENGAGEMENT

Te Whakawhitinga

6.0 Engagement

This is our IFP Engagement Report. It describes how engagement shapes our plans, including consultation on our PQP2 proposal. It outlines how we will continue to engage, including as we execute our PQP2 plan and prepare our PQP3 Proposal.

6.1 Overview of Chorus' consultation and engagement for PQP2

It is important that stakeholder feedback and preferences are appropriately reflected in our proposal. Our approach to engagement in PQP2 has stepped up relative to PQP1 to better engage with end-users and key stakeholder groups on our investment choices and options.

Engagement with our stakeholders,[72] particularly Retail Service Providers (RSPs), is a core business function. Engagement enables us to run our business. It informs key decisions from product development and pricing to investment in networks and systems that best meet the needs of RSPs and end-users. Market feedback and end-user research tells us if the balance between price and quality is right in the product mix we offer and in our fibre services more broadly.

In addition to our normal corporate engagement, we have undertaken extensive proposal-specific consultation. The way our proposal-specific engagement builds on our business-as-usual engagement is represented in Figure 6.1, although the majority of this chapter focuses on the proposal-specific engagement.

Over the past two years we have engaged with end-users and stakeholders through surveys, consultation material, workshops and interviews. We sought views on stakeholder and end-user preferences and priorities, then tested these through different channels and with different presentations of the topics to ensure we received a balanced and informed set of insights.

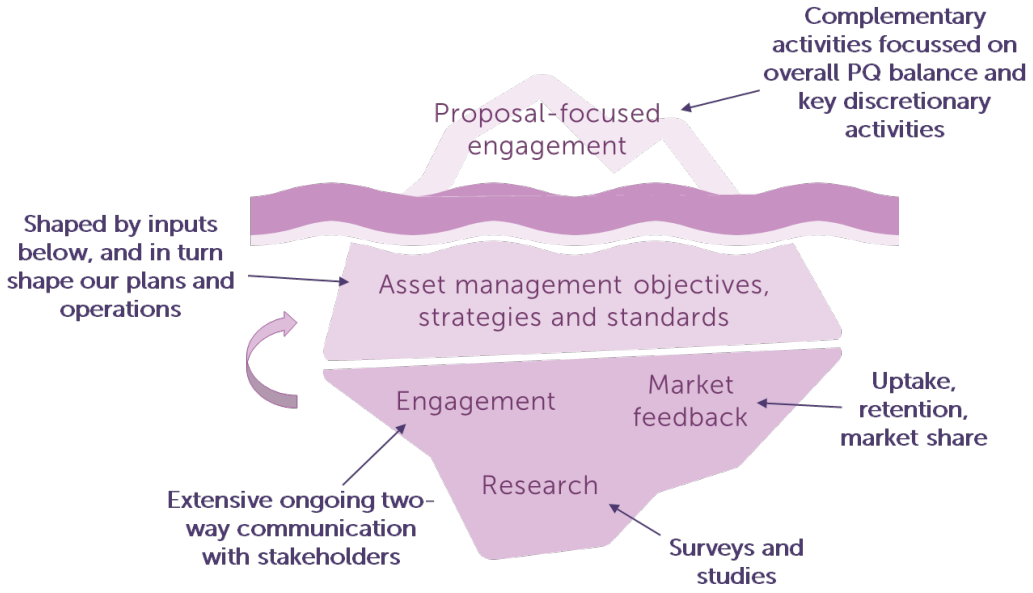
The process was effective in achieving our goal to build our understanding of stakeholders' priorities and preferences and, importantly, the underlying drivers of those priorities. The feedback we received was extremely valuable and has been built into our decisions. In particular, we have sought to balance views supporting the benefits of further investment against concerns about increasing the cost of fibre services. This feedback helped us develop a proposal that reflects our stakeholders' and end-users' long-term interests in terms of efficient investments, suitable service quality outcomes and overall willingness to pay.

ENGAGEMENT AS A CORE BUSINESS FUNCTION

Stakeholder engagement is a core business function, enabling us to run our business effectively

72 In this document we use the term 'stakeholder' when referring to a broad range of audiences we communicate with. We use more specific terms when referring to a specific audience. We use the terms 'customer' to refer to direct customers (such as RSPs) and 'end-user' to refer to consumers who ultimately use our fibre services.

FIGURE 6.1: ICEBERG APPROACH TO STAKEHOLDER ENGAGMENT



Overseeing the final stage of the process was an independent chairperson who was tasked with making sure our procedures were fair, open and transparent. Her reports to the Chorus Board on that stage concluded that:

"The Board can be confident its consumer engagement on the five potential further areas for investment (resilience, fibre frontier, hyper fibre, sustainability, and active wholesaler) has been carried out in a robust and independent manner. Similarly, the feedback and preferences obtained in that engagement are largely reflected in the PQP2 investment proposals you have been presented with. The Board might want to further consider its investment in resilience at the base level, even though that is substantially more than the PQP1 level."

The key insights gleaned from the process and their impact on our proposal are summarised below.

TABLE 6.1: KEY INSIGHTS AND IMPACTS ON PROPOSAL

AREA	INSIGHTS	IMPACT ON PROPOSAL
Importance of fibre	Reliable broadband service is seen as essential and its importance is growing over time.	We are proposing a substantial investment programme to meet demand, maintain current services and quality standards, extend fibre to new areas and improve resilience.
Reliability and service quality	This was consistently seen as the most important area of investment.	We are proposing a substantial increase in resilience spend relative to PQP1. Stakeholders supported going further, but we had to balance this against cost and Independent Verifier concerns.

AREA	INSIGHTS	IMPACT ON PROPOSAL
Willingness to pay	Early consultation saw people slightly opposed to paying more for fewer outages. Later, post Cyclone Gabrielle, there was majority support for spending more to improve reliability. RSPs were concerned about cost and generally supported lower levels of investment.	We are proposing to broadly maintain quality standards, and not ask customers to pay more for improvements. Although the investment programme is substantial, we do not expect material increases in pricing in PQP2 (in real terms) due to competition and the anchor price cap.
Extending the network	There was general support for extending the network to rural areas to share the benefits of fibre more broadly. There was some concern from RSPs in particular about cost and risk of urban-rural cross subsidy.	We are proposing a modest extension of the fibre network, to a further 40,000 premises (or 2% of Aotearoa). To do more would create financing challenges and likely need government funding support.

In the remainder of this chapter, we provide more detail on our business engagement, our proposal-focused engagement and how these have shaped our proposed service quality and expenditure plans.[73]

6.2 Ongoing product development engagement

Customer and stakeholder engagement is vital to the success of our products and services. Our product management system involves considerable customer engagement and end-user research, such as:

- RSP requests and feedback (a source of material for the ideation phase)
- consulting on initiatives
- extending engagement into the delivery phase with product co-design and product trials.

These engagement activities aim to prioritise product development activity and ensure delivery is commercially and operationally successful. This work spans product development in the consumer, business and network market segments, collaborating with RSPs and technology partners on process and system enhancements to ensure improving customer experience, and activities such as extending our network into new property developments. Engagement channels include:

- regular updates and engagement via email and online channels
- formal consultation sessions with RSPs
- ad hoc engagement on specific initiatives with key RSP stakeholders, facilitated by dedicated RSP account teams
- seeking feedback on White Papers exploring new technology use cases

PRODUCT DEVELOPMENT ENGAGEMENT

We use multiple channels to engage regularly with our customers to help prioritise product development activity

73 We also submitted an Engagement Plan in August 2022, which contains many examples of our 'BAU' engagement activities, including case studies.

- industry events, such as Chorus Live
- the Ultra-Fast Broadband (UFB) Product Forum facilitated by the NZ Telecommunications Forum (TCF).

This engagement is designed to ensure we comply with competition and regulatory requirements and incorporate RSP needs. This includes ensuring no inappropriate favouring of RSPs occurs and that we do not engage in a way that risks facilitating collusion between competitors (as in several cases, our customers are also competitors). We build on our customer engagement work with direct end-user research, which includes monthly survey activity and targeted research. This is an important input for ideation and as we short-list, refine, and test the marketability of product initiatives.

Feedback is gathered from this engagement and combined with our regulatory, network and product performance obligations (e.g. commitment to a congestion-free network) to form robust product initiative plans. These plans run through a gated cross-functional business case process to ensure alignment to IT and network roadmaps.

This process influences Network and Customer IT and supporting capex, where customer consultation with RSPs is a formal process used to share, seek feedback, and validate the types of investments and proposed changes. This is a critical function as it ensures that the investments that we are looking to make are also desired by our customers. This gives confidence that our capex in PQP2 will be invested in consultation with our customers, promoting efficiency and ensuring that the outputs meet stakeholders' needs.

This process has also directly influenced Customer Incentives capex (part of our Installations capex), where the design of the new mass-market incentive offer was directly influenced by RSP feedback on the settings and arrangements that would work best for them.

6.3 Engagement on our corporate strategy refresh

In early 2022, Chorus carried out a full review of our corporate strategy. Our aim was to confirm what we should be working to deliver over the next three to five to ten years. We sought feedback from internal and external stakeholders by way of:

- 18 one-to-one interviews including end-user representatives, RSPs, analysts, investors, and government agencies
- a survey of other stakeholders (750 residential New Zealanders and 400 businesses in Aotearoa with more than five employees).

In considering the areas Chorus should prioritise for investment, stakeholder feedback was that:

- investing to be competitive and deliver positive customer experience is well supported and expected as part of being a prudent business
- investment in network resilience is vital for all stakeholders

STRATEGY REFRESH

Extensive stakeholder feedback informed our 2022 corporate strategy refresh, which has underpinned the development of this proposal

- portfolio evolution should be where customer demands are real, just ahead of the curve. There is an appetite for Chorus to work with RSPs to understand and deliver to customer needs
- accessibility in the regions is a hot topic and the expectation on Chorus is to deliver fibre where it's economically viable
- beyond this, partnerships are favoured to help deliver good social outcomes. A view of 'fairness' is coming through and needs to be considered in line with wider purpose and sustainability goals
- investment in systems is important but only so far as to keep Chorus competitive, efficient and delivering a positive end-user experience
- joint infrastructure projects should be explored. Where possible, Chorus should approach these from a NZ Inc perspective.

These priorities have informed our investment choices and decisions and flowed into Board decision-making. This can be seen in the planned increase in Resilience capex proposed for PQP2, the plan to extend the fibre footprint as much as is affordable (our Fibre Frontier initiative), and our increased focus on sustainability.

6.4 Engagement on extending the fibre network

In January 2023, Kantar carried out research for us to test the views of end-users who reside outside the current fibre footprint, i.e. our potential 'rural' end-users. This research objective was to provide Chorus with a better understanding of potential rural end-users. It covered the following areas:

- current levels of technology and internet awareness, usage and experiences
- fibre interest levels, perceptions and attitudes
- willingness to pay and willingness to coordinate for fibre services.

Respondents indicated a very strong (84%) likelihood to take up fibre once it was available in their area. However, respondents were less positive about contributing towards fibre installation. At the lowest price point tested (a customer contribution of $500 towards an install), only CCI [ ] would contribute. This fell to CCI [ ] at $1,000 contribution. Many of the verbatim comments received as part of the research also referenced the fairness of rural end-users having to pay for installs when their urban counterparts had received fibre for free.

6.5 Proposal-specific engagement

6.5.1 Overview

Our proposal-specific engagement has utilised multiple channels and modes of engagement as we seek to reach views from a diverse and representative range of stakeholders and end-users.

Firstly, we carried out surveys of stakeholders and representative samples of end-users to test broad preferences and areas of interest. We followed those up with a formal written consultation document (supported by a short online form for those with less time to engage) on investment choices and options for regulatory settings.

The results of these earlier rounds of engagement were valuable but we found that responses to the formal consultation document were limited to larger RSPs and interest groups, while the survey responses indicated preferences without giving insight into the underlying reasons.

Therefore, we engaged Kantar to carry out more in-depth engagement with representative end-users through workshops and structured interviews with key stakeholders. These workshops and interviews sought views, including on price-quality trade-offs and relative prioritisation, on key areas of discretionary investment for PQP2.

In summary the four rounds of engagement were:

1. Initial survey – on preferences and level of interest
2. Key issues survey – on issues and topics of interest
3. Formal consultation –on expenditure choices and potential regulatory settings
4. Stakeholder workshops and interviews – to gain deeper insights into preferences and willingness to pay.

The process and outcomes from each round of engagement are summarised below, with a description of how the feedback is reflected in the proposal.

PQP2-SPECIFIC ENGAGEMENT

In addition to our "BAU" engagement activities, we have undertaken four rounds of PQP2-specific stakeholder engagement over an 18-month period leading up to our PQP2 proposal submission

4 rounds

6.5.2 Round 1: Initial survey

The first survey was held in November 2021. It focused on gathering initial information on stakeholder preferences and interests to inform subsequent rounds of consultation.

TABLE 6.2: ROUND 1 (INITIAL SURVEY) KEY INFORMATION

Goal	To gather initial information to support our further engagement on the proposal – specifically how our stakeholders and end-users would like to be engaged with and their topics of interest
Channel	Survey-based, by way of a Kantar representative sample, and a publicly available survey that was sent to key stakeholders, made available on our website and publicised through our social media channels
Scope	Sought views on what topics stakeholders were interested in, preferred future methods of communication and general views on the future of fibre
Responses	190 stakeholder responses (15 organisations and 175 individuals), plus 1,000 individuals through the Kantar survey

Key findings were as follows:

- In terms of mode of communication, there was a preference for online surveys, followed by consultation documents and face-to-face engagement.
- Over 80% of respondents indicated they were interested in Chorus' fibre investment plans and service quality goals for PQP2.
- For individual New Zealanders (i.e. those participating in the 1,000 person survey), the topics of most interest were:
  - upkeep of the network to contain future costs and reliability
  - fixing faults quickly
  - ensuring services evolve to meet future demand
  - staying ahead of demand growth to avoid network slowdown.
- For stakeholders, the topics of most interest were:
  - quality of service – goals and measurement of performance
  - Chorus' business and services – plans for future
  - investment plans – impact on services and prices.

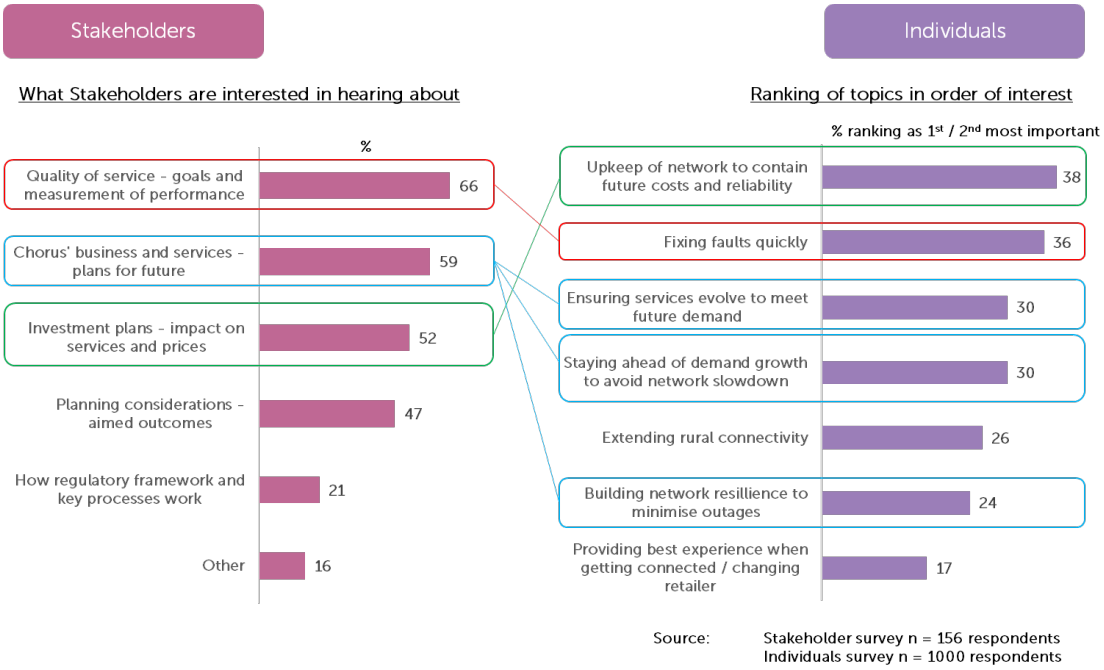
UTILITY-LIKE

"It's now a complete service like power or water – it's a 'must have'"

Stakeholder feedback

These areas of interest are shown in the graphic below.

FIGURE 6.2: AREAS OF INTEREST FOR STAKEHOLDERS AND INDIVIDUALS



The results of this engagement round are not directly reflected in our proposal as the intention was to gain insights to shape later rounds of engagement.

6.5.3 Round 2: Key issues survey

The second survey was held in April 2022. It sought views on specific topics of relevance to our proposal development.

TABLE 6.3: ROUND 2 (KEY ISSUES) KEY INFORMATION

Goal	Building on the first survey to seek views on the relative importance of different topics so we can assess which areas of investment are more or less important to our stakeholders and end-users
Channel	Same as Round 1 – i.e. survey-based, by way of a Kantar representative sample, and a publicly available survey that was sent to key stakeholders, made available on our website and publicised through our social media channels
Scope	Sought views on the importance of sustainability, network resilience, and digital inclusion, as well as the barriers to fibre uptake
Responses	312 stakeholder responses (35 organisations and 249 individuals), plus 1001 individuals through the Kantar survey

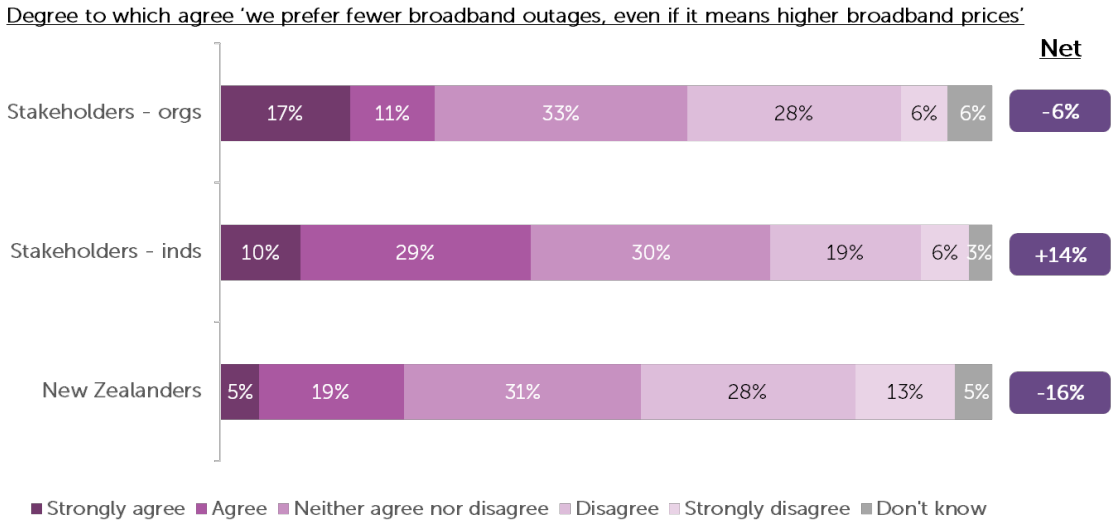
Key findings and how they influenced our proposal are summarised in Table 6.4. Insights from this survey were also built into the subsequent consultation paper.

TABLE 6.4: SUMMARY OF RESPONSES TO THE APRIL 2022 SURVEY

INSIGHT/FINDING	HOW IT IS REFLECTED IN PROPOSAL
Drivers of uptake/upgrades Cost was the primary reason end-users (with access to fibre) who were unhappy with their current service had not signed up to fibre or moved to a higher-speed plan.	Our 2023 individual capex proposal influences our proposed Customer Incentives capex. Our customer incentives improve affordability of connecting to fibre or upgrading to a faster fibre plan and so directly address the cost concerns.
Importance of broadband Having a broadband service is essential for stakeholders and New Zealanders, with respondents citing the importance for working from home, running businesses and education.	We are proposing expenditure at a level that will hold service quality steady. We have substantially increased our proposed investment in resilience relative to PQP1 and plan to extend the fibre network out further to another 2% of New Zealanders through our Fibre Frontier initiative.
Energy efficiency The majority of stakeholders and New Zealanders placed some importance on the energy efficiency of broadband services.	Our PQP2 proposal includes approximately $12m of investment to install solar panels on our exchange sites to reduce costs and improve energy efficiency.
Willingness to pay for improved reliability	We have proposed keeping quality standards unchanged from PQP1 (other than points of detail) so we are not targeting a material change in service quality.

INSIGHT/FINDING	HOW IT IS REFLECTED IN PROPOSAL
Paying more money for fewer outages (see Figure 6.3 below) received a mixed response, with the balance of New Zealanders and stakeholder organisations slightly opposed, but individual stakeholders in favour.	
Digital inclusion Stakeholders generally thought Chorus should be doing more to assist Aotearoa to "close the digital gap". Improving access to and affordability of fibre were seen as the primary ways Chorus could help to improve digital inclusion.	In terms of affordability, Chorus is working with government and the Digital Equity Coalition Aotearoa to better understand the digital divide and develop a coherent plan for supporting end-users for whom affordability is a challenge. We do not propose any specific initiative as part of this proposal. In terms of access, the Fibre Frontier initiative and our ongoing investments to connect new property developments will increase the proportion of households able to access fibre.

FIGURE 6.3: RELIABILITY-PRICE TRADEOFF PREFERENCES



Stakeholders – orgs: 35 organisations who responded to Chorus' survey
Stakeholders – inds: 249 individuals who responded to Chorus' survey
New Zealanders: random sample of 1001 individuals surveyed by Kantar on our behalf

6.5.4 Round 3: Formal consultation

A written consultation paper, 'Help us shape New Zealand's fibre future', was published on 8 November 2022. This consultation round comprised a written consultation alongside a stakeholder survey.

TABLE 6.5: ROUND 3 (FORMAL CONSULTATION) KEY INFORMATION

Goal	To obtain views on potential areas of change in our PQP2 proposal and stakeholder preferences in terms of options we were considering
Channel	Formal consultation document, with supporting two-page summary version and a survey. Sent to key stakeholders, made available on our website and publicised through our social media channels
Scope	Taking themes from our previous consultation rounds, we sought views on expenditure on reliability, extending fibre to rural users, technology, active wholesaler, sustainability and customer experience. We also consulted on aspects of quality standards, demand, price path, use of economic tools to guide investment and approaches to gain further end-user insight
Responses	Six written submissions from stakeholders (three from RSPs, two from representative organisations and one from a local authority) and 21 responses to the stakeholder survey

TABLE 6.6: SUMMARY OF RESPONSES TO THE PQP2 CONSULTATION OF NOVEMBER 2022

SUMMARY OF FEEDBACK	HOW IT IS REFLECTED IN PROPOSAL
Extending the fibre network Generally supported by the non-RSP submitters. RSP submitters were supportive but raised cost concerns and/or noted that the investment should only be funded through regulated revenue where there is an economic benefit.	We are proposing to spend $201m to extend fibre to a further 2% of the population as part of our Fibre Frontier programme. Subject to government support, we would consider further deployment. Noting RSP concerns, although there is some uncertainty, we expect the investment to extend fibre to 89% of New Zealanders would be primarily or fully funded by the incremental connections added to the network. We would not undertake this investment unless there were clear positive economic benefits.
Reliability and resilience General agreement that this is an important, or increasingly important, area of investment. There were some concerns that it "must not impact on affordability" or "come at a wholesale price premium".	We have substantially increased our proposed investment in resilience relative to PQP1. These investments are consistent with our network architecture standard and do not seek to increase resilience above the Board-approved thresholds.
Technology uptake (Hyperfibre) RSPs generally did not support proactive XGS-PON optical network terminal (ONT) deployment.	We believe it is important to prepare for future technology. We note the RSP respondents have commercial reasons for opposing Chorus providing higher-speed services. We are proceeding with plans to ensure our network is Hyperfibre-capable. However, taking account of feedback we have reduced the scope of planned proactive ONT deployment, removing $11m from the capex forecast.
Active wholesaler strategy	Our active wholesaler strategy is essential to Chorus' competitive positioning. The market structure in Aotearoa, where our main competitors are also our major customers whom we rely on to sell our products, means we need to promote the benefits of fibre widely.

SUMMARY OF FEEDBACK	HOW IT IS REFLECTED IN PROPOSAL
RSPs that own their own mobile networks opposed Chorus promoting fibre to end-users. The one RSP submitter that did not own a mobile network agreed there were benefits in informing end-users about different technologies and what was most suitable for them, but did not see any need to increase investment.	
Sustainability and digital inclusion Non-RSP submitters saw this as important, and that affordability was the key method for Chorus to promote digital inclusion. RSPs supported this in principle but raised concerns regarding the cost. They saw value in partnering with government and RSPs to achieve digital inclusion and sustainability goals.	Our PQP2 proposal includes approximately $12m investment to install solar panels on our exchange sites to reduce costs and improve energy efficiency. Chorus is working with government and the Digital Equity Coalition Aotearoa to better understand the digital divided and develop a coherent plan for supporting end-users for whom affordability is a challenge. We do not propose any specific initiative as part of this proposal.
Customer experience RSPs supported Chorus investing to improve customer experience.	We consult with RSPs on our planned roadmap, both seeking priority and validation as well as input for investment. This confirms the investments we make in this area are necessary and valued by our customers. The Product and Customer roadmap is typically only 18 months long and so specific initiatives for the PQP2 period are not yet known. However, demand for new products and capabilities has always been consistent and we expect it to continue to be so. Investment in resilience is a core component of the customer experience and we are proposing a substantial increase in resilience investment in PQP2 relative to PQP1. In terms of service quality, we are mindful of the cost implications of seeking to improve quality standards. In the absence of any clear end-user feedback supporting an uplift in performance against the quality standards we have not proposed any specific expenditure that would mean a step change in our proposed service quality (noting as well that the performance standard already ensures end-users should not experience congestion).
Quality standards A local authority commented that fast repair times matter and current rural fault response times were an issue. RSPs sought more information or were in favour of Chorus having standards for end-user impacting activities such that RSPs can communicate expectations to end-users. One RSP was supportive of small-scale quality targets.	The feedback was targeted at service quality more broadly than the specific quality standards that apply to Chorus. Our aim is to sustain the quality of our fibre services – we are not intending to relax quality, and do not have plans for investment or changes in our operations that would lift quality to a new level. This balances views of the importance of service quality against the cost of fibre services.

SUMMARY OF FEEDBACK	HOW IT IS REFLECTED IN PROPOSAL
Demand forecasting RSPs noted data usage was likely to continue to grow, while the rate of connection growth would slow, meaning the utilisation of existing fibre assets was likely to increase. RSPs had different views on the drivers of further growth for fibre.	We agree bandwidth growth is expected to remain exponential. Spikes of demand will continue and are virtually impossible to forecast – we build network capacity ahead of demand to manage this, noting that we cannot provide capacity to manage every potential spike in demand. In the Quality chapter, we suggest a change to the Performance standard to acknowledge this and reduce the risk of further breaches due to such events. Connection growth will continue through New Property Developments, network expansion, infills and smart locations. However, these are subject to the connection capex mechanism so will be washed up, minimising any forecasting risk.
Price path communications There was general support for communicating price path inputs.	Chorus had intended to carry out a final round of consultation, including on price-path implications. However, we undertook a more in-depth and detailed round of end-user workshops and stakeholder interviews. Stakeholders will be able to comment on price path outcomes through the Commission's consultation process.
Use of empirical studies to make investment decisions, e.g. value of lost service (VOLS): One RSP argued there was no role for economic studies to inform investment decisions. Another RSP noted that wider social objectives should be out of scope.	Building a bespoke, directly targeted estimate of VOLS is an objective for Chorus in advance of PQP3.

From the 21 survey responses, there was a clear view that outcomes matter more than price across a range of investment options, as shown in the chart. However, we note this is a very small sample size, which should reduce the weight we place on this insight.

FIGURE 6.4: STAKEHOLDER VIEW ON PRICE VS. PRICE OUTCOMES

Stakeholder feedback from the first three rounds of consultation was factored into the prioritisation of discretionary capex by the Chorus Board in December 2022 and taken into account in our planning processes in the first half of 2023. In turn, this informed the key focus areas for the in-depth engagement in the fourth consultation round.

6.5.5 Round 4: Stakeholder workshops and interviews

Process

We employed Kantar to manage an in-depth process of workshops and interviews with key stakeholders and representative groups of end-users. Kantar facilitated discussions on key areas of discretionary expenditure for PQP2 over April and May 2023, with additional RSP interviews in June and July 2023.

The process was overseen by consumer advocate Sue Chetwin, the former Chief Executive of Consumer New Zealand, as an independent chairperson. The purpose of her oversight was to provide the Chorus Board with an assurance that the end-user research and insights gleaned had been conducted in a way that provides:

- assurance that independent, robust and proper methodologies have been followed
- for a broad cross-section of New Zealanders to have their say
- for reporting of the end-user engagement to the executive leadership team and the Board to not be limited in any way
- the executive leadership team and the Board with clear directions and input from an end-user experience around its five strategic investment options.

WORKSHOPS & INTERVIEWS

We engaged third-party, Kantar, to manage 11 in-depth workshops and 33 interviews, overseen by an independent chairperson.

11 & 33

The independent chair supported our efforts to make sure we reached a diverse and representative group of end-users and to ensure the process and materials (e.g. introductory videos) we presented were balanced and fit-for-purpose.

TABLE 6.7: ROUND 4 (STAKEHOLDER WORKSHOPS AND INTERVIEWS) KEY INFORMATION

Goal	To gain richer insights into the priorities of our end-users and other stakeholders regarding our investment choices
Channel	End-user workshops and stakeholder interviews. To ensure the participants were able to make informed comments, Kantar first presented videos and introductory material to educate respondents on each topic and ensure they understood the context. Kantar then presented three options (broadly: high, middle and lower levels of expenditure) and explained the benefits and end-user cost impacts of each. Kantar recorded participants' preferences and, importantly, the underlying reasons and justifications. See Figure 6.5 below for summary of the process.
Scope	We sought detailed views and price-quality preferences for investment options in network reliability (resilience),[74] Fibre Frontier (network extension), sustainability, Hyperfibre, and our active wholesaler strategy. Due to time constraints, no workshop or stakeholder considered all five topics; they considered two to three each and views were collated across all results to form conclusions.
Responses	11 workshops (with 12 participants in each) and 33 structured interviews – see Figure 6.6 below.

A summary of Kantar's process for the workshops and interviews is below:

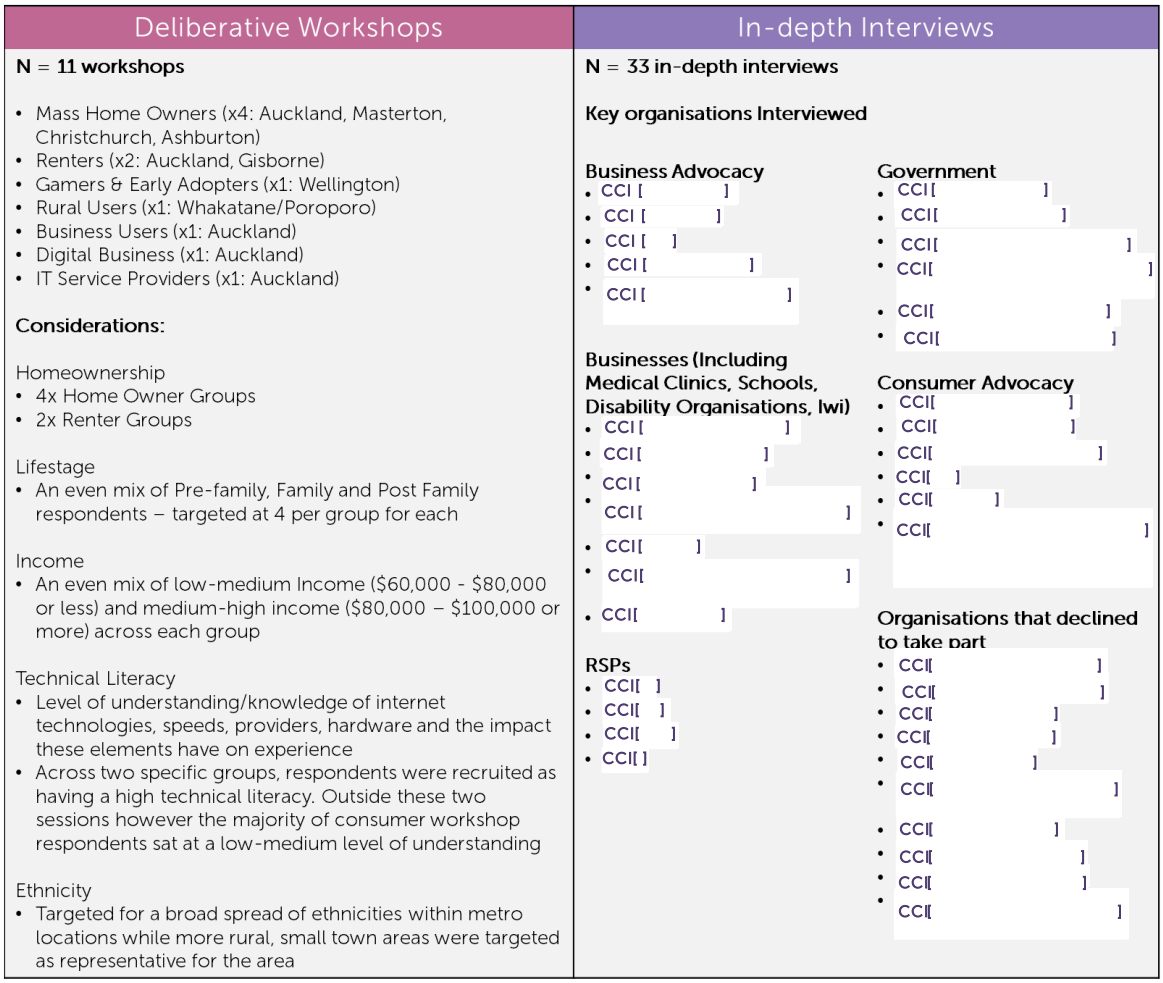
FIGURE 6.5: KEY FEATURES OF WORKSHOPS AND IN-DEPTH INTERVIEWS

Deliberative Workshops	In-depth Interviews
Key features: • 2.5 – 3.5 hours • 12 individuals • In-person format with moderators on the ground in each respective location (Auckland, Christchurch, etc.) • Dual moderators • Incentives of $250 **N = 11 workshops** Deliberative workshops are designed to educate technical and commercial details involved with a topic and then force decision making in light of trade-offs and investment options Longer run times and large amount of participants is key to ensure we achieve a level of depth in each topic while also consulting a wide cross section of perspectives and demographics in each workshop	Key features • 45 minutes – 1 hour • Individuals from businesses/consumer advocacy groups and government organisations • Online (for both respondent convenience and national coverage) • Incentives of $150 donation to charity of choice **N = 33 in-depth interviews** In-depth interviews explore the technical and commercial issues in a one-on-one setting to achieve the necessary depth required in decision making Online settings minimise inconvenience for professional respondents and presents the opportunity for a national approach

74 We are aware that resilience and network reliability are different concepts, but the two concepts merge for most stakeholders and end-users.

A summary of interview participants is in the graphic below, showing the diverse range of interests we sought to engage with.[75]

FIGURE 6.6: RANGE OF DEMOGRAPHICS AND ORGANISATIONS ENGAGED WITH



Results and how they are reflected in the proposal

In interpreting and understanding the results, Kantar assessed the perspectives from which the end-users and other stakeholders were approaching the questions. The majority of stakeholders:

- were influenced in their preferences by two major and recent events – Cyclone Gabrielle (which amplified concerns about resilience) and the cost-of-living crisis (which heightened awareness of service affordability for households)
- took a 'we' rather than 'me' perspective, i.e. where there was a tension between collective and individual benefits, stakeholders generally preferred the collective good – as can be seen in support for increased resilience investments or extending the benefits of fibre to rural areas,

75 We offered the opportunity to be interviewed to all of our RSP customers.

without being overly concerned about potential cross-subsidisation (although, notably, RSP stakeholders took a different perspective here)

- did not always "see the future" and envision a need for a future-oriented product (in relation to Hyperfibre in particular). They prioritised what is needed now over what could be needed in future. For example, this led them to (generally) prefer making the current network resilient compared to investing in Hyperfibre technology.

Kantar's results presented stakeholder preferences in two ways:

- relative priorities between the different expenditure types (e.g. whether resilience is a preferred option relative to extending the network, or vice versa)
- preferences for a 'higher, medium, or lower' investment choice (terminology varied between the options) within each expenditure type.

We see the second set of preferences as more determinative. In reality, Chorus is likely to invest in all of these areas and the core question is whether we increase, decrease or maintain our planned levels of investment in each.

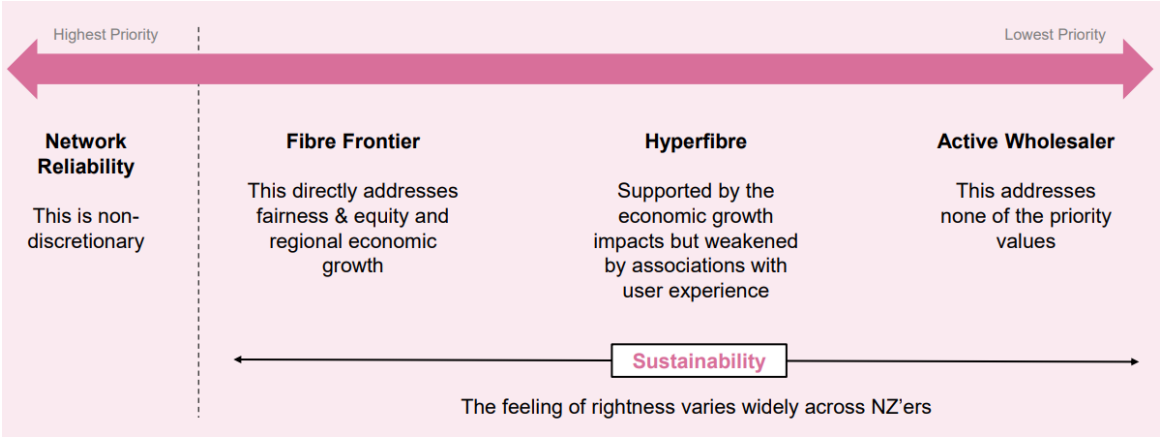
However, the relative priorities between different expenditure types are still relevant and are summarised in Figure 6.7 below (with commentary based on the values framework applied by the stakeholder groups). Network reliability (resilience) was clearly the priority area of investment for our stakeholder groups, noting that the consultation was carried out shortly after Cyclone Gabrielle. Most stakeholders supported this on the grounds that it was a core function of a business like Chorus and that it was necessary to have a resilient network for equity reasons, so everyone can benefit from a reliable fibre service. RSPs also preferred investment in network reliability over other options,[76] but on the grounds that it supported their customers' experience.

RESILIENCE

"It's an essential service. You cannot have unreliable internet"

Stakeholder feedback

FIGURE 6.7: RELATIVE PRIORITIES OF EXPENDITURE TYPES



76 Note RSPs were only asked to consider the network reliability, Fibre Frontier and sustainability investment areas.

The investment options presented to stakeholders reflected feedback from the three prior rounds of consultation. Each option included a base case, high case and low case (although terminology differed between some topics).

In general, we observed that:

- the majority of stakeholders generally supported either our base case or increased expenditure. They recognised the benefits of the investments, particularly in terms of equal access to fibre, importance of resilience and the need to future-proof the network
- RSPs were more focused on cost implications than other stakeholders and more concerned with potential cross-subsidy implications. As such they tended to support lower-investment options
- network reliability/resilience was the highest-rated investment area for both stakeholders (for access and equity reasons) and for RSPs (for customer experience reasons).

Details of the options presented, including costs and benefits, and the stakeholder preferences are in the Appendix to this chapter.

Table 6.8 summarises the feedback and how we reflected it in the expenditure proposal.

TABLE 6.8: STAKEHOLDER FEEDBACK FROM FINAL CONSULTATION ROUND

TOPIC	SUMMARY OF FEEDBACK - OVERALL	HOW REFLECTED IN PQP2 PROPOSAL
Network reliability/ resilience	Majority of stakeholders supported high case – reliability is seen as non-negotiable for a network provider. RSPs supported base case but expressed concerns about increased prices to residential end-users. Also saw a role for government in funding resilience.	Base case adopted (substantial increase in resilience investment for PQP2 and balances feedback between stakeholders, RSPs and the Independent Verifier). There is an option to invest further, but this would be subject to funding (and most likely would require government support).
Fibre Frontier	Majority of stakeholders endorsed base case – there is support for extending fibre, but also some views that Starlink is a better option in rural areas. RSPs raised concerns about cost and cross-subsidy risk for urban end-users.	Base case adopted (first major non-UFB contracted fibre extension). Continuing to seek government support for further deployment. In relation to RSP concerns, although there is some uncertainty we expect the investment to extend the fibre network to 89% of New Zealanders would be funded by the incremental connections added to the network.
Sustainability	Majority of stakeholders endorsed base case, with some support for high case, but views are highly variable. RSPs supported the low case. They generally agreed with proposed spend but do not support Chorus passing on the cost.	Base case adopted, option to invest further if economics support.

TOPIC	SUMMARY OF FEEDBACK - OVERALL	HOW REFLECTED IN PQP2 PROPOSAL
Hyperfibre	On balance, stakeholders endorsed base case, as need to future-proof. A notable minority do not support the investment. This was not directly tested with RSPs, but some did oppose it as unnecessary.	Base case largely adopted. However, taking account of feedback we have reduced the scope of planned proactive ONT deployment, removing $11m from the capex forecast. Deployment will be primarily in response to demand.
Active wholesaler	Majority of stakeholders endorsed base case, with a stronger preference for education than marketing.	Base case adopted, continue current level of marketing investment. Education is already a core component of our marketing strategy as we aim to ensure people are aware of the benefits of fibre and the best broadband option for them.

6.6 Plans for future stakeholder engagement

The Fibre Input Methodologies require this report to also outline consultation that is planned by Chorus, including planned consultation on any aspect of capex for the regulatory period relevant to the capex proposal or subsequent regulatory periods. The plan set out below relates solely to our proposal-focused engagement. Our business-as-usual engagement will continue as part of our normal operations and will evolve in response to commercial drivers and regulatory requirements.

At this stage it is too early to definitively plan for engagement to support our PQP3 proposal. The market, the relevant issues, and technology will change, and our future plans will also be influenced by the Independent Verifier's and the Commission's feedback on our PQP2 stakeholder engagement. However, our intention is to build on our PQP2 process, running a similar approach for PQP3 but with particular enhancements to:

- bring forward the stakeholder engagement so we have relevant feedback earlier in the proposal planning process
- carry out a 'final proposal' round of consultation including overall price and quality proposals for stakeholders to consider.

6.6.1 Draft engagement plan for PQP3

We intend to base our consultation plan for PQP3 on the International Association for Public Participation (IAP2) Quality Assurance Standard[77] (or any successor standard), to ensure it meets best practice guidelines. In Table 6.9 we set out our initial draft plan for future engagement on Chorus' expenditure plans. Noting that our PQP3 proposal will be made in 2027, this is of course subject to change based on events, investment objectives and innovations over that time. However, it is our best view of the likely approach.

77 Clause 6 of: https://iap2.org.au/wp-content/uploads/2019/07/IAP2_Quality_Assurance_Standard_2015.pdf

TABLE 6.9: DRAFT ENGAGEMENT PLAN FOR PQP3

Purpose and objective	The core purpose of the engagement would be confirmed closer to the proposal, but we would likely aim to understand our end-users', RSP customers' and other stakeholders' preferences in relation to our investment choices and service quality outcomes, including trade-offs where relevant, such that stakeholder and end-user preferences inform our future expenditure and quality plans and regulatory proposals. More generally our engagement seeks to build open and collaborative engagement with our end-users and stakeholders, to gain insights, feedback and perspectives that can inform our decision-making, improve service quality and support product development. By engaging with stakeholders we seek to build trust and build lasting relationships to help us meet our end-users' needs. We also build understanding of our regulatory settings which will improve the basis for future feedback.
How we will identify stakeholder groups	Chorus generally has a good understanding of who our stakeholder groups are. We have contractual relationships with our RSP customers and we know where in the country our FFLAS services are available. We have well-established relationships with local authorities, other lifeline utilities, government agencies, community groups and stakeholder organisations. In terms of mass-market end-users it is likely that we would, as for PQP2, use a market research firm to build representative groups of end-users for any surveys or end-user workshops or panels. The challenge for PQP2 has not been to identify stakeholders, but to find representatives of those stakeholders with capacity to engage – see next section.
How we will engage with the identified stakeholder groups	As for PQP2, and in line with stakeholder preferences identified through our PQP2 engagement activities, it is likely that we would first survey both our key stakeholders and a representative sample of end-users to obtain their views on their level of interest in our investment plans. For our PQP2 process, there were some groups where it was difficult to find a suitable contact with capacity to engage. We would seek to address this by (for example) starting the process early and identifying those groups who are likely to be difficult to engage with before the engagement process begins. Our aim would be to create contacts or relationships that we can build on for our engagement. We would also seek to build on and expand our engagement with Māori representative groups.
Schedule of activities	See Figure 6.8 and discussion below.

Resources required and access to these resources	The following resources would likely be needed for a successful stakeholder engagement programme (consistent with PQP1): Internal: • Market insights experts to engage external research • Communications experts to develop material for the engagement, potentially including video material • Regulatory experts to set the direction and questions • Investment managers to provide the underlying information on investment options and their costs and benefits. • External: • Market research firm or firms capable of surveying representative samples of end-users, running end-user workshops and conducting structured interviews with key stakeholders • Independent advisor to oversee the process, or similar governance mechanism to provide assurance that it is independent and the information provided is balanced and fair. It is too early to confirm which individuals and firms would be utilised. However, given the importance of regulatory proposals to Chorus and the need to ensure a robust engagement process is applied, we will ensure sufficient resources are available to complete the engagement successfully.
Risks and barriers to execution of the engagement plan and mitigations for these risks	See initial risk assessment (Table 6.10) below. A full risk assessment will be created as part of project planning in FY2025-26, prior to the start of the engagement process.
Budget	To be confirmed in FY2025-26, prior to the start of the engagement process
Roles and responsibilities of the project team	To be confirmed in FY2025-26, prior to the start of the engagement process. We expect these will include: • Project team – responsible for managing and delivering the engagement and ensuring it is built into business processes • Business subject matter experts (SMEs) – experts on key topics who provide necessary detail on the issues and options • Content creators – responsible for packaging Chorus' corporate information in an accessible way for stakeholders to engage with • External survey owner and/or facilitator – engaged to lead the surveys or workshop sessions to gather insights from stakeholders in a structured and consistent way, and to provide analysis of the results • Independent chairperson or equivalent governance mechanism – responsible for ensuring the process and materials are fair and balanced • Project steering group – responsible for making decisions on how the process operates and recommendations to the Chorus Board on actions to take in response to the findings.

Communication strategy and reporting mechanism to project owners and stakeholders	Stakeholder engagement is a core part of a regulatory proposal process. As such, we expect that regular reports on progress would be provided to project sponsors. This reporting would track progress against the overall goal, intended timeframes, risks, and the extent to which we are achieving input from different stakeholder groups. There would need to be regular, transparent, open communication between the project team, our independent advisor and any third-party service provider assisting with the project. We would also aim to provide feedback to stakeholder participants on what we have heard from the consultation at the end of each round of engagement.
Evidence to be gathered and evaluation points	Success of the engagement process will be judged by the extent to which the objective is achieved. We would expect to have gathered clear insights on stakeholders' preferences for our future investment choices and service quality outcomes, and the underlying reasons for those preferences. We would expect to have gathered this in a way that is applicable to our expenditure plans, such that we could adjust them to reflect stakeholder preferences. We would further evaluate the success of the project in terms of the extent to which we engaged with all stakeholder types, including hard-to-reach groups.
Alignment with IAP2 spectrum[78]	Our objective for expenditure consultations would be consistent with the 'CONSULT' element of the IAP2 Spectrum of Public Participation, which is: "To obtain public feedback on analysis, alternatives and/or decisions." Inherent in this element is the commitment: "We will keep you informed, listen to and acknowledge concerns and aspirations, and provide feedback on how public input influenced the decision."

6.6.2 Forward-looking view of consultation activities

While the precise form and timing of our engagement will vary depending on events, investment objectives and feedback on our PQP2 process, our current plan is to carry out several rounds of engagement as the proposal is developed.

This will likely include:

- an initial round or rounds of consultation, likely to include an 'issues consultation' or similar method to gather views on broad options for investment levels and service quality outcomes. This could also include end-user surveys
- an 'end-user workshop' or similar process to seek detailed views on discretionary investment choices, in time to inform key business decisions
- a 'final consultation' round to test overall price and quality outcomes, in advance of our final decision on the proposal scope and content, which could include multiple channels such as a consultation document supported by a survey.

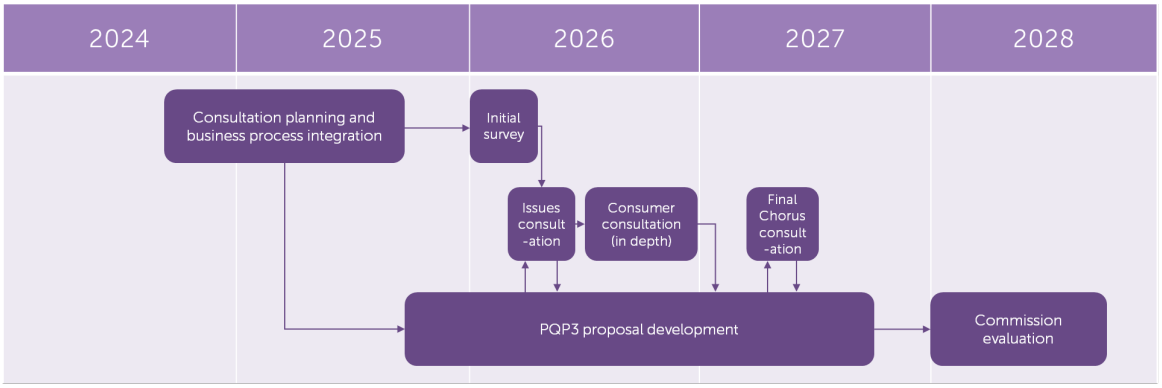
Our current view is that the first three rounds of consultation would be undertaken prior to the FY2027-28 planning process, so detailed feedback on preferences can influence our planning from the start. The final round would be to test outputs (e.g. price and quality implications) from our planning

78 https://iap2.org.au/wp-content/uploads/2020/01/2018_IAP2_Spectrum.pdf

processes with stakeholders, but still in time to influence the final decision on what to include in our expenditure proposal.

The draft intended process and timings are summarised in Figure 6.8.

FIGURE 6.8: INDICATIVE TIMELINE OF PQP3 CONSULTATON



6.6.3 Initial risk assessment

A full risk assessment with impact analysis and confirmed mitigations would be developed as part of the engagement planning process.

TABLE 6.10: INITIAL RISK ASSESSMENT FOR PQP3 CONSULTATION

RISK	PLANNED MITIGATION
There is insufficient time to gather valuable feedback, or the engagement is too late in the process to influence outcomes.	• Careful project planning and prioritisation of the engagement process • Building consultation into planning processes, as in the draft schedule above • Ensuring sufficient resources are available to avoid timing challenges
Lack of stakeholder interest or input, or lack of stakeholder confidence that their views will be addressed.	• Initial engagement with stakeholders on their topics of interest and preferred modes of engagement • Building relationships in advance where required • Ensuring the consultation is meaningful and seeks views on topics that are important to our stakeholders • Providing feedback to participants on the outcomes of each engagement round so they can see their views are understood and are being taken into account • Engaging a market research firm with a track-record of getting mass market end-user input • Aiming to set consultation timeframes that do not conflict with other priorities (e.g. avoid holidays and financial reporting periods) • Incentivising (compensating) end-users and businesses appropriately for their time, as we did for PQP1
Scope or objectives are unrealistic or poorly defined.	• Clearly specifying the scope of the consultation exercise and its objectives and ensuring these are understood by participants

RISK	PLANNED MITIGATION
Consultation material is too complex or is viewed as biased.	• Engaging independent advisor to participate in the process of developing the consultation material to ensure it is comprehensible, balanced and fair
Poor facilitation means input is not gathered.	• Engaging suitable experts to manage any end-user workshop or interview process

6.7 Appendix – detail of results from workshops and structured interviews (Round 4)

This appendix summarises the investment options presented and the results from the workshops and interviews for each area of discretionary investment. Different stakeholder groups considered different topics, so the number of stakeholders who considered each topic will vary.

Note that our current plans and the options for different levels of investment relate to Chorus' planned expenditure levels at the time of the consultation, not to what we have spent in or proposed for PQP1.

TABLE 6.11: NETWORK RELIABILITY (RESILIENCE)

OPTION	DECREASED INVESTMENT	CURRENT PLANS	INCREASED INVESTMENT
Description	By end of 2030, communities with more than 3,000 premises have diverse fibre paths.	Broad spread of communities with diverse fibre paths, including some down to 1,000 premises.	By end of 2030, all communities with more than 1,000 premises have diverse fibre paths.
Required spend	$51 million	$57 million	$127 million
Additional cost per premises per month	$0.23	$0.26	$0.57
Supported by	• 1 RSP • 1 business stakeholder	• 3 end-user workshop groups • 2 RSPs • 1 community representative body • 1 business stakeholder • (plus 1 business stakeholder which supported current investment levels but delivered faster)	• 5 end-user workshop groups • 1 RSP • 5 industry associations • 4 community representative bodies • 4 government or local government bodies • 3 business stakeholders

TABLE 6.12: FIBRE FRONTIER (NETWORK EXTENSION)

OPTION	DECREASED INVESTMENT	CURRENT PLANS	INCREASED INVESTMENT
Description	Extend the fibre network to connect 88.8% of households in Aotearoa. More than 29,000 additional households and businesses in rural regions have the option to connect to fibre.	Extend the fibre network to connect 89.3% of households in Aotearoa. More than 41,000 additional households and businesses in rural regions have the option to connect to fibre.	Extend the fibre network to connect 89.7% of households in Aotearoa. More than 52,000 additional households and businesses in rural regions have the option to connect to fibre.
Required spend	$117-157 million	$181-221 million	$258-298 million
Additional cost per premises per month	$0.67	$0.98	$1.35
Supported by	• 1 end-user workshop group • 1 industry association • 1 RSP	• 4 end-user workshop groups • 3 industry associations • 2 RSPs • 3 community representative groups • 4 government or local government bodies • 1 business stakeholder	• 2 end-user workshop groups • 1 RSP • 2 industry associations • 1 community representative • 2 business stakeholders • 1 government or local government body

TABLE 6.13: HYPERFIBRE

OPTION	STOP INVESTMENT	CURRENT PLANS	HIGHEST INVESTMENT
Description	Throughout PQP2, only 67% of Kiwis with available fibre connections have the option for an easy upgrade to Hyperfibre.	By the end of 2028, 88% of Kiwis with available fibre connections would have the option for an easy upgrade to Hyperfibre. We target exchanges with the highest demand, so only 5% of upgrade requests will encounter extended delays by the end of PQP2 in December 2028.	100% of Kiwis (incl. homes and businesses) with available fibre connections would have the option for an easy upgrade to Hyperfibre by 2028.
Required spend	$0 million	$28 million	$50 million
Additional cost per premises per month	$0.00	$0.24	$0.43

OPTION	STOP INVESTMENT	CURRENT PLANS	HIGHEST INVESTMENT
Supported by	• 2 end-user workshop groups • 2 industry associations • 1 community representative group • 2 business stakeholders • 1 government or local government body	• 1 end-user group and 5 stakeholders	• 2 end-user workshop groups • 1 community representative • 1 industry association • 2 government or local government bodies

TABLE 6.14: SUSTAINABILITY

OPTION	CURRENT PLANS	HIGHER INVESTMENT	HIGHEST INVESTMENT
Description	Solar rollout between 2024-2030 A significant portion (up to three-quarters) of our exchanges would be producing renewable energy by the end of PQP2. Our electricity purchase costs are lower, and we are better protected from changes in electricity prices.	Solar and battery rollout between 2024-2030 As for previous option plus up to three quarters of exchanges would be producing renewable energy that can be stored for use at (electricity network) peak times and overnight. Those exchanges also have improved resilience to power outages.	Solar and battery and EV rollout As for previous option, plus Chorus contributes to cost of technicians replacing their vans with electric vehicles - reducing emissions and operating costs.
Required spend	$20 million	$28 million	$40 million
Additional cost per premises per month	$0.13	$0.20	$0.30
Supported by	• 4 RSP or business stakeholders	• 5 end-user workshop groups • 1 industry association • 2 community representative groups • 1 RSP or business stakeholder	• 2 end-user workshop groups • 1 industry association

TABLE 6.15: ACTIVE WHOLESALER

OPTION	DECREASED INVESTMENT	CURRENT PLANS	INCREASED INVESTMENT
Description	Reduced marketing activity supporting awareness and engagement around fibre and how to make the most of your internet connection. Reduced spend on web and digital services.	Investment in maintaining the profile and positioning of fibre, fostering an informed marketplace so end-users can make informed choices about speeds and plans, and how to get the best experience with their broadband.	Increased investment in maintaining profile and positioning of fibre. Opportunity for greater targeted promotion of high-speed plans such as Hyperfibre to relevant end-users. Also would allow for further expansion of support for education about internet options and how to get the best in-home experience.
Required spend	$8 million	$12 million	$16 million
Additional cost per premises per month	-$0.26	$0.00	$0.26
Supported by	• 0 stakeholders • (plus 1 end-user workshop group was split between this and the current plan option	• 5 end-user workshop groups • 1 industry association • 2 community representative group • 1 business stakeholder	• 1 industry association • (plus 1 end-user group was split between this and the current plan option)

7.0 REGULATORY SETTINGS

Ngā Tukanga Whakahaere

7.0 Regulatory settings

This chapter proposes improvements for implementation in PQP2 to adapt to changing circumstances and better promote the purpose of the Telecommunications Act.

7.1 Development of input methodologies

We recommend the Fibre Input Methodologies (IMs) for PQP2 are amended to better promote the long-term benefit of end-users compared to the current IMs by:

- introducing an innovation and sustainability (I&S) mechanism
- other technical changes to ensure the IMs are fit-for-purpose for the upcoming price-quality (PQ) path reset.

These are meaningful incremental improvements that will enhance the operation of the fibre regulatory regime, improve predictability and certainty, and deliver better outcomes for end-users over PQP2 and beyond.

IM CHANGES

We are proposing changes to the Fibre Input Methodologies, which would better promote the long-term benefit of end-users.

7.2 Incentivising innovation and sustainability

This section describes our proposal for an I&S mechanism for PQP2 to incentivise I&S activity for the long-term benefit of fibre end-users. The mechanism provides a simplified case-by-case approval process for small-scale I&S projects that emerge during PQP2 but for which there was not sufficient certainty to include in expenditure plans.

In the Site Sustain section of the Network Sustain and Enhance chapter in Our Fibre Assets, we are putting forward a proposal to install solar panels at our exchange sites, for sustainability and cost efficiency purposes. The business case for that investment is strong. However, we are aware that other sustainability and innovation opportunities could arise during PQP2 and, without a means of gaining regulatory approval, the benefits arising from these opportunities would be delayed or potentially lost.

INNOVATION & SUSTAINABILITY

We propose the introduction of an I&S mechanism to incentivise I&S activity for the long-term benefit of end-users.

7.2.1 Need for innovation and sustainability incentives

Rapid innovation and adaptation are inherent traits of the telecommunications sector. However, investments in innovation and sustainability by telecommunications suppliers can be relatively uncertain in nature, with short lead-times, small initial expenditure amounts and varying risk profiles. This can pose challenges for regulated firms to justify, and regulators to approve, I&S initiatives as part of a traditional, multi-year, expenditure approval process.

Our proposal aims to overcome these challenges to create a low-cost and streamlined process by which incremental I&S projects can be developed and approved over PQP2 and beyond. This incentive mechanism is an important enabler of Chorus' ambitions to innovate and provide new and better services while reducing our carbon footprint and achieving broader sustainability goals. Supporting this mechanism would be a valuable signal of the Commerce Commission's (the Commission) commitment to innovation and sustainability investments by regulated businesses by making flexible tools available to facilitate new types of projects.

The mechanism will:

- encourage focus and stimulate effort by Chorus in pursuing innovation and sustainability opportunities at a time when investment in these areas is needed
- provide a predictable and pragmatic process for approving value-enhancing projects which are typically subject to project uncertainty (e.g. over costs, benefits or timing).

SUSTAINABILITY

"Sustainability spend shows really tangible community commitment and contribution in a very, very important area of business these days"

Stakeholder feedback

The mechanism is based on the scheme introduced by the Commission ahead of the 2020 price reset for electricity distribution businesses for innovation projects, and is tailored for Chorus' circumstances, including extending the allowance to sustainability projects. Schemes for directly incentivising innovation and sustainability for regulated electricity and gas suppliers have also been introduced by international regulators.

7.2.2 Overview of I&S mechanism

Our proposed mechanism implements a simple process for Chorus to apply in-period for expenditure approval for small-scale innovation and sustainability projects, subject to a pre-defined cap and eligibility criteria to ensure investment is focused in the right areas and is incremental to approved allowances.

Qualifying projects can involve opex or capex (or a mixture of both), and a certain minimum percentage of the costs is expected to be borne by Chorus itself. Each approved allowance will be included in the maximum allowable revenue (MAR) wash-up calculations and resulting MAR wash-up credits are available to be drawn down in future regulatory periods.

The criteria and process for the mechanism would be set out in the IMs applying to PQ regulation. The total cap size for a regulatory period and the minimum percentage of costs required to be borne by Chorus would be specified by the Commission in each PQ determination.

The I&S mechanism does not affect any of the other expenditure forecasts in this proposal – rather, it is an opportunity to seek approval for additional qualifying projects or trials as they emerge during PQP2. The size and nature of the incremental investments is not expected to have any impact on PQP2 quality standards.

TABLE 7.1: KEY FEATURES OF I&S MECHANISM

FEATURE	COMMENTS
Streamlined in-period assessment of completed I&S projects	An application made by Chorus confirms upfront criteria have been satisfied and includes executive certification and an audit report. An independent specialist report confirming the potential benefits to fibre end-users will be supplied for projects expected to involve more than $1m of costs. Consultation is not required
Applies to opex and/or capex incurred on a project focussed on: • the creation, development or application of a new or improved technology, process, product, service or approach in respect of the provision of Fibre Fixed Line Access Services (FFLAS), or • the delivery of reduced carbon emissions or other environmental improvement in respect of the provision of FFLAS	Qualifying projects would include investigations, trials, feasibility studies, product development, customer surveys, knowledge-building, energy efficiency, and climate change adaptation or mitigation projects. Must not include opex or capex approved under other expenditure approval mechanisms (e.g. base capex). Costs related to copper or unregulated services are excluded
Total size of allowances for PQ period is 0.5% of Chorus' PQP2 MAR	This is consistent with the UK Network Innovation Allowance innovation scheme. Total size can be reviewed and adjusted for PQP3 and beyond
Maximum individual project size of less than $5m	Note that capex projects of $5m or greater can be applied for by Chorus under an individual capex proposal (ICP)
Chorus contributes at least 10% of the costs	Minimum contribution can be adjusted for PQP3 and beyond
Commission to give indication of whether particular projects are likely to qualify if requested	A non-binding view from the Commission can be obtained within 20 working days of a request by Chorus in order to enhance predictability
Final approval of the investment to be made on an ex-post basis	Chorus to make an application for funding once the investment has been made, to avoid regulatory delays in proceeding with the projects and to remove forecasting risk associated with the expenditure amount
Approved expenditure to be included in the MAR wash-up	Approval of a project would not result in a price-path reopener. Recovery of the investment would be included in MAR in the next PQ period with a time value of money adjustment
Disclosure and reporting	Information can be made publicly available, subject to commercial sensitivity or confidentiality requirements

The IM drafting necessary to implement the I&S mechanism is included in the Appendix below.

7.3 Other 'fit-for-purpose' IM amendments for PQP2

We recommend that other technical amendments are implemented for PQP2, as detailed in the table below, which discusses the rationale for, and benefits of, each amendment. They include IM amendments previously raised with Commission staff.

These are appropriate changes to be made under s 181 of the Telecommunications Act 2001 outside of the statutory seven-year fibre IM review cycle because:

- they ensure the fibre IMs are fit-for-purpose for the upcoming PQP2 PQ reset (including correcting known errors in the existing fibre IMs)
- they do not involve fundamental changes to the foundational building blocks for the cost of capital, asset valuation, cost allocation or tax, nor materially alter the balance of risk and benefits between Chorus and end-users.

TABLE 7.2: RECOMMENDED IM AMENDMENTS

AMENDMENT	REFERENCES	REASONS AMENDMENT SHOULD BE MADE	ASSESSMENT AGAINST IM AMENDMENT CRITERIA
1. In-period updating of price path for approved ICPs	Chorus IM amendments Letter to Commission, 3 October 2022; Chorus submission on draft decisions for fibre price-quality information disclosure (PQID) November IM amendments, 8 July 2021	Under the current IM settings, any capex that is approved in-period through an ICP is recovered via a wash-up in the subsequent regulatory period. This means Chorus would be expected to incur the costs but would not be permitted any additional revenues for some years. While in net present value (NPV) terms this deferral is recognised through the time value of money adjustment in the wash-up account, it creates a cashflow shortfall, which is particularly acute for larger projects or programmes of work (e.g. if there was a substantial network project proposed through an ICP) and/or for longer regulatory periods. Cashflow and associated financing concerns could pose a material disincentive to Chorus for undertaking ICP projects, which would otherwise benefit fibre end-users. Given the potentially critical role of future ICP projects, Chorus considers that approval of an individual capex allowance should result in an in-period updating of PQ path (based on the expected commissioning date of the assets) to enable Chorus to recover the costs and efficiently finance its operations each year.	Supports incremental improvement to the way the price path is set by ensuring that revenues can adjust in-period where major new capital expenditure projects are approved. Supports incentives to invest by mitigating cash-flow risk associated with large capex projects. Does not create a risk of excessive profits, as is simply aligning a revenue allowance more accurately to the time approved expenditure is incurred. Is achieved through simple amendments to the IMs relating to regulatory rules or processes – adding a price path reconsideration provision similar to the IMs for Transpower.

AMENDMENT	REFERENCES	REASONS AMENDMENT SHOULD BE MADE	ASSESSMENT AGAINST IM AMENDMENT CRITERIA
2. Depreciation commencing in year of commissioning	Chorus IM amendments letter to Commission, 3 October 2022; Chorus submission on draft decisions for fibre PQID November IM amendments, 8 July 2021	Currently assets cannot be depreciated until the year after they are commissioned. This is inconsistent with generally accepted accounting practice (GAAP), defers recovery of investments even after they are commissioned, and causes practical challenges in aligning regulatory and accounting asset values. Amending the IMs to allow assets to be depreciated in the year of commissioning will enhance certainty by making the approach consistent with GAAP and could improve investment incentives by mitigating the risk of asset stranding. The change would be NPV-neutral and make the fibre IMs consistent with the IMs for Transpower.	Supports incremental improvements to the price path by ensuring recovery of costs can begin once an asset is commissioned. Enhances certainty and reduces compliance costs by aligning regulatory and accounting requirements. Does not create a risk of excessive profits, as it simply better aligns the time-profile of the return of investment with costs.
3. Timing of annual benefit of Crown financing	Chorus IM amendments letter to Commission, 3 October 2022; Chorus submission on draft decisions for fibre PQID November IM amendments, 8 July 2021	The IMs materially overstate the Crown financing benefit building block with respect to repayments of Crown financing that occur during a regulatory year – see previous submission for details. This means the IMs will lead to an overstatement of the benefit of Crown financing and will result in a PQ determination not reflective of actual costs incurred by Chorus in respect of Crown financing during the regulatory period. Unless this is amended, the PQ determination would be inconsistent with s 171 of the Act, which requires the maximum revenues set by the Commission to reflect the actual costs of Crown financing.	Removes technical error in the IM determination, ensuring cost of capital IM is consistent with legislation. Improves accuracy of calculation and ensures that business decisions related to financing and investment are not unduly distorted by regulatory rules. Does not create a risk of excessive profits, as it limits compensation for Crown financing to actual costs incurred per s 171.
4. Change to definition of notional deductible interest	Chorus IM amendments letter to Commission, 3 October 2022; Chorus submission on draft decisions for fibre PQID November IM amendments, 8 July 2021	The IMs should be amended to address an inconsistency in the leverage assumptions used to calculate notional deductible interest for Chorus in clause 2.3.1(7). The way 'notional deductible interest' is currently calculated with respect to regulatory tax allowance doesn't account for the actual mix of debt and equity portions of Crown financing for Chorus. This understates our regulatory tax allowance and is also inconsistent with s 171 of the Act which requires that the maximum revenues reflect, in respect of any Crown financing, the actual financing costs incurred by the provider.	Removes technical error in the IM determination, ensuring taxation IM is consistent with primary legislation. Improves accuracy and ensures that business decisions related to financing and investment are not unduly distorted by regulatory rules. Avoids windfall gains or losses, as it limits compensation for notional tax costs to those reflecting actual costs incurred per s 171.

AMENDMENT	REFERENCES	REASONS AMENDMENT SHOULD BE MADE	ASSESSMENT AGAINST IM AMENDMENT CRITERIA
5. Connection capex to include customer incentives capex	Chorus incentives ICP submission, 1 November 2022	The process for the 2023 individual capex proposal highlighted that ICPs are not well suited to the uncertain and variable nature of customer incentives capex. The regulatory settings should allow for a more dynamic approach to incentives capex that supports innovation by Chorus to meet end-user demands. We recommend changing the IM definition of connection capex to include customer incentives capex. The result would be a connection capex variable adjustment that would apply to incentives. This would be beneficial because the Commission could specify a reasonable unit rate up front, which can be confirmed as being lower than the expected incremental revenues per added connection. Chorus then bears the risk of any commercial need to spend more than that amount per connection, but the volumes are washed-up – removing the risk associated with forecasting incentives uptake.	Supports incremental improvement to the way the price path is set by providing a more efficient and less costly process to ensure individual capex allowances are not set too high or too low, noting the uncertain and variable nature of this expenditure. Enhances certainty as Chorus would have certainty across a regulatory period of the per unit value of incentives capex that has been approved. Also ensures that there is no windfall gain or loss due to fluctuations in incentive payment volumes.
6. Wash up for CPI in opening year of regulatory period	Chorus CPI letter to Commission, 19 October 2022	As has been the subject of correspondence between Chorus and the Commission during 2022 and 2023, there is no clear wash-up for variations between actual and forecast inflation in the opening year of a regulatory period (which is inconsistent with the treatment of inflation in other years of a regulatory period). This appears to be a historical oversight and there is no policy or principled reason to allocate all inflation forecasting risk to Chorus in year 1, and to end-users in other years. The IMs, PQ determination and wash-up notice should apply a consistent inflation wash-up across all years of a regulatory period. This could be done either by amending the IMs or the PQ determination. Here we present a solution by way of the IMs, but a variation to the PQ determination (e.g., by specifying the year 1 revenue cap net of CPI) would also be an acceptable solution. We note this solution does not resolve the failure to compensate Chorus for the inflation spike in the first year of PQP1, which continues to have the effect that we will never be able to make a normal return on our investments that were in the regulatory asset base (RAB) at that time.	Enhances certainty and incentives to invest, by creating confidence that Chorus will be able to recover the costs of its investments and operating costs irrespective of unforecast inflation shocks.

AMENDMENT	REFERENCES	REASONS AMENDMENT SHOULD BE MADE	ASSESSMENT AGAINST IM AMENDMENT CRITERIA
7. Confirming the scope of Crown financing wash-up	N/A	Clause 3.1.1(11)(b) of the IMs implements a wash-up for actual Crown financing balances during a regulatory period. However, the current drafting can be read as also encompassing the difference in the effective financing rate calculated under ID versus that adopted at the time the PQ path was set. The Commission has confirmed in the explanatory material issued at the time of the relevant IM decision that the wash-up should be performed in respect of actual Crown financing balances only. We recommend the provision be amended to clarify this intent.	Improves clarity of a technical aspect of the IM determination. Enhances predictability and compliance.
8. Cost allocation definition changes	N/A	The cost allocation IM applies in respect of assets by attributing unallocated closing RAB values to the provision of FFLAS (see cl. 2.25(4)). The resulting allocated closing RAB values automatically become allocated opening RAB values for the next regulatory year (see cl. 2.2.5(3)). The definition of "asset value" in cl. 1.1.4(2) to which cost allocation processes are applied incorrectly refers to "unallocated opening RAB value" rather than "unallocated closing RAB value". This should be corrected.	Corrects a technical error in the IM determination thereby making the mechanics of the post-allocated RAB roll forward mechanism internally consistent. Simplifies and improves processes for PQ path proposals and evaluation.
9. Addressing stranding risk	Chorus IM amendments letter to Commission, 3 October 2022; Chorus submission on draft decisions for fibre PQID November amendments, 8 July 2021	It is evident that the risk of asset stranding is dependent on constantly evolving market circumstances. An approach that fixes the ex-ante stranding allowance across multiple regulatory periods (e.g. the current 10 basis points annual allowance specified in the cost of capital IM) fails to recognise the dynamic nature of stranding risk. We propose the Commission determine the stranding allowance as part of each PQ determination in conjunction with the other regulatory mechanisms and decisions used to address stranding risk, including availability of in-period reopeners, revenue smoothing, wash-ups, and the length of the regulatory period. This would allow Chorus the ability to propose regulatory settings to respond to current information and changing expectations and evidence – ensuring that combined stranding mitigation measures are appropriately calculated and applied to reflect the risks, and allow the Commission to revise its assessment of stranding risk as part of each PQ determination to assure itself that the combination of regulatory tools is properly achieving the purpose of Part 6.	Provides additional certainty to regulated providers that the risk of stranding will be appropriately accounted for in light of dynamic circumstances. Supports ongoing incentives for efficient investment and innovation.

7.4 Appendix – Drafting of IM amendments

Our suggested drafting to implement the changes discussed in this section for the Fibre Input Methodologies Determination 2020 are set out below.

7.4.1 Innovation and sustainability mechanism

Clause 1.1.4

Insert new definitions in clause 1.1.4(2) as follows:

independent specialist	means a person who – (a) is **independent**; and (b) has been engaged by **Chorus** to produce the report in respect of an **innovation project** or **sustainability project** referred to in clause 3.9.2;
innovation project	means a **project** focussed on the creation, development or application of a new or improved technology, process, product, service or approach in respect of the provision of **FFLAS**;
sustainability project	means a **project** focussed on the delivery of reduced carbon emissions or other environmental improvement in respect of the provision of **FFLAS**;
qualifying application	means a written document provided by **Chorus** to the **Commission** containing the information in clause 3.9.1(2);

Clause 3.1.1

Insert new paragraphs (j) and (k) as follows:

(j) **operating expenditure** determined, after that **regulatory period** commenced, for that **regulatory year**, in respect of an **innovation project** or **sustainability project** under clause 3.9.3(1); and

(k) any **value of commissioned asset** determined, after that **regulatory period** commenced, for that **regulatory year** in respect of an **innovation project** or **sustainability project** under clause 3.9.3(1), and with respect to the relevant **commissioning date** determined for each **value of commissioned asset** under clause 3.9.3(2)).

Part 3 Subpart 9

Insert new Subpart 9 in Part 3 as follows:

3.9.1 Process and requirements

(1) The **Commission** must determine the values set out in clause 3.9.3 in respect of a **regulatory year** for an **innovation project** or **sustainability project** within 60 working days of receiving a **qualifying application** from **Chorus**.

(2) A **qualifying application** must contain the following information in respect of an **innovation project** or **sustainability project** completed by **Chorus** in the relevant **regulatory year**—

(a) description of the **project**, including:

(i) the **project's** purpose;

(ii) start date and duration of the **project**;

(iii) the parties that participated in the **project**;

(iv) the steps taken by **Chorus** to achieve the **project's** purpose; and

(v) a summary of the results of the **project**;

(b) the total costs incurred by **Chorus** in respect of the **project**;

(c) the amount of total costs that are:

(i) **operating expenditure** attributable to **PQ FFLAS** by applying Part 2 Subpart 1; and

(ii) **value of commissioned assets** attributable as **asset values** to PQ FFLAS by applying Part 2 Subpart 1;

(d) how the attributed values under paragraph (c) have been calculated;

(e) the **commissioning date** of each **value of commissioned asset**;

(f) **capital contributions** in relation to the **project**;

(g) a certification by the **CEO** of **Chorus** that, having made all reasonable enquiries, it is their belief that, in all material respects the **project** meets the definition of an **innovation project** or **sustainability project**;

(h) a report by an **auditor** that confirms the values and information in paragraphs (b) – (f) have been—

(i) compiled, in all material respects, in accordance with the requirements in the **input methodologies**;

(ii) properly extracted from **Chorus's** financial records sourced from its financial systems; and

(iii) audited in accordance with applicable auditing standards issued by the External Reporting Board in accordance with its functions under the Financial Reporting Act 2013 or any equivalent standards that replace these standards; and

(i) if the sum of the attributed values in paragraph (c) were expected by Chorus to exceed $1m prior to commencing the **project**, a report by an **independent specialist** in respect of the **project** as specified in clause 3.9.2.

(3) There is no requirement for **Chorus** to consult with any interested person in proposing or undertaking a **project**, or in preparing or making a **qualifying application**.

3.9.2 Report by independent specialist

A report by an **independent specialist** included in a **qualifying application** must:

(a) be in writing and be obtained by **Chorus** prior to commencing the **project**;

(b) state that in the opinion of the **independent specialist**:

(i) the proposed **project** meets, in all material respects, the definition of an **innovation project** or **sustainability project**;

(ii) the purpose of the **project** extends to one or more of the following:

(A) providing **FFLAS** at a lower cost;

(B) providing **FFLAS** at a higher quality;

(C) facilitating the introduction of new products, processes or services that have not been applied in **FFLAS** markets in New Zealand;

(D) building knowledge and expertise to support the future provision of **FFLAS**; and

(E) reducing the carbon emissions or other environmental impact of providing **FFLAS**;

(iii) the benefits of the **project** are likely to be of general application to the activities of **Chorus**; and

(c) include the curriculum vitae of the **independent specialist** evidencing expertise in a field relevant to the **project**.

3.9.3 Value of innovation and sustainability incentive for a project

(1) The values determined by the **Commission** in respect of costs incurred by **Chorus** in respect of an **innovation project** or **sustainability project** consist of, subject to subclause (3)—

(a) **operating expenditure** attributable to **PQ FFLAS** by applying Part 2 Subpart 1; and

(b) **value of commissioned assets** attributable as **asset values** to **PQ FFLAS** by applying Part 2 Subpart 1.

(2) The **Commission** must determine the relevant **commissioning date** relating to each **value of commissioned asset** determined under clause (1)(b).

(3) The values determined under subclause (1)—

(a) must be less than $5m in total for any single **innovation project** or **sustainability project**;

(b) must not, when the values determined under subclause (1) for all other **innovation projects** or **sustainability projects** for that **regulatory period** are added to them, exceed the 'total eligible cost cap' for **innovation projects** and **sustainability projects** specified in the **PQ determination** for the **regulatory period** to which the **regulatory year** relates;

(c) must not consist of costs that are **base capex**, **connection capex**, or **individual capex** for the **regulatory period**;

(d) must not consist of costs included by the **Commission** as **operating expenditure** in the **regulatory period** in determining the price path for the **PQ determination** to which the **regulatory year** relates;

(e) must not consist of any costs that are customer incentive expenditure;

(f) when expressed as a percentage of total costs incurred by **Chorus** for the **project**, must not exceed the 'maximum eligible percentage' specified for **innovation projects** and **sustainability projects** in the **PQ determination** for the **regulatory period** to which the **regulatory year** relates; and

(g) must be net of **capital contributions**.

3.9.4 Indicative view of Commission to be given within 20 working days

(1) **Chorus** may request an indicative view from the **Commission** as to whether a proposed **project** is likely to meet the definition of an **innovation project** or **sustainability project** and qualify for approval under clause 3.9.3.

(2) The request must be:

(a) made in writing to the **Commission**; and

(b) contain the information in clause 3.9.1(2)(a)(i)-(iii) about the **project** that **Chorus** proposes to undertake.

(3) The **Commission** must respond to **Chorus** in writing within 20 working days of receiving a request with its view of the likelihood of the proposed **project** meeting the definition of an **innovation project** or **sustainability project**.

(4) The response of the **Commission** under subclause (3) is indicative only, and does not oblige the **Commission** to determine any amount under clause 3.9.3.

3.9.5 Consultation and publication

(1) The **Commission** is not required to consult with, or otherwise seek feedback from, interested persons on its actions or decisions in this Subpart.

(2) Information relating to the **qualifying application** under clause 3.9.1 or a request for an indicative view under clause 3.9.4 can be made publicly available by the **Commission**, subject to withholding any information the **Commission** considers commercial sensitive or otherwise confidential.

(3) Where **Chorus** considers that any information it provides the **Commission** in relation to this Subpart is commercially sensitive, or is information that **Chorus** has a right to confidentiality in and it does not waive the right, it must:

(a) include that information in writing in an appendix; and

(b) clearly mark the information as commercially sensitive or confidential.

(4) For the avoidance of doubt, nothing in subclause (3)—

(a) prevents the **Commission** making information identified by **Chorus** as commercially sensitive or confidential publicly available if the **Commission** considers the matters are not commercially sensitive or that **Chorus** has no right to confidentiality; and

(b) affects **Chorus's** rights or remedies for breach of any right to confidentiality.

3.9.6 Consequences of timeframes not being met by the Commission

(1) If the 60 working days timeframe in clause 3.9.1(1) is not met by the **Commission**—

(a) the values determined by the **Commission** under clause 3.9.3(1) are the amounts included in the **qualifying application** under clause 3.9.1(2)(c); and

(b) the relevant **commissioning dates** relating to each **value of commissioned asset** determined by the **Commission** under

clause 3.9.3(2) are the dates included in the **qualifying application** under clause 3.9.1(2)(e).

(2) There are no consequences if the 20 working days timeframe in clause 3.9.4(3) is not met.

(3) Notwithstanding subclause (2), the **Commission** will, as soon as practicable after it believes that the timeframe applying to the **Commission** is not likely to be met or has not been adhered to, notify **Chorus** of the new timeframe that applies.

7.4.2 Other IM amendments

1. In-period updating of price-quality path for approved ICPs

Clause 3.1.1

Delete clause 3.1.1(11)(d):

~~(d) any **individual capex allowance** determined in respect of the **regulatory period** that corresponds with that **regulatory year** that was determined after that **regulatory period** commenced;~~

Re-number the remaining paragraphs of clause 3.1.1(11) accordingly.

Clause 3.9.1

Insert new clause 3.9.1(4):

(4) The **Commission** must reconsider and amend a **regulated provider's PQ determination** if the **Commission** determines an **individual capex allowance** under clause 3.7.28.

Clause 3.9.2

Insert new clause 3.9.2(6):

(6) If the **Commission** determines an **individual capex allowance** under clause 3.7.28, it must publish **notice** on its website as soon as practicable thereafter of its intention to reconsider and amend the relevant **PQ determination**.

Clause 3.9.8

Amend clause 3.9.8 as follows:

(1) Subject to subclause (2), ~~If~~if the **Commission** is satisfied under clause 3.9.2(5) that a **reopener event** has occurred, then the **Commission** must have regard to at least the following matters when deciding whether to amend the relevant **PQ determination**:

...

(2) The **Commission** must amend the relevant **PQ determination** if it has determined an **individual capex allowance** under clause 3.7.28.

Clause 3.9.9

Amend clause 3.9.9 as follows:

(1) Subject to subclauses (2) and (4), if the **Commission** decides that the **PQ determination** should be amended, the **Commission** may amend the price path and the quality standards to take account of part or all of the net effects of the **reopener event** on costs, revenues, and **PQ FFLAS** quality outcomes.

...

(4) If the **Commission** has determined an **individual capex allowance** under clause 3.7.28, the **Commission** must amend the **PQ determination** to include all of the impact of the **individual capex allowance** on **forecast allowable revenue** for the relevant **regulatory period** or **regulatory periods**.

2. Depreciation commencing in year of commissioning

Clause 2.2.5

Amend clause 2.2.5(2)(b) as follows:

(b) a **core fibre asset** with a **FFLAS commissioning date** in the **disclosure year** in question, ~~its value of commissioned asset; and~~ the value determined in accordance with the formula-

value of commissioned asset – unallocated depreciation

Clause 2.2.8

Insert new clause 2.2.8(3):

(3) For the purpose of subclause (1), in the case of a **fibre asset** with a **FFLAS commissioning date** in the **disclosure year** in question, a **regulated fibre service provider** must determine 'unallocated depreciation' and 'depreciation' using a **depreciation method** consistent with **GAAP**, unless:

(a) an alternative depreciation method is applied for some or all **fibre assets** in accordance with clause 3.3.2(5); or

(b) a different depreciation method is applied for some or all **fibre assets** in accordance with clause 3.3.2(6).

Re-number the remaining subclauses of clause 2.2.8 accordingly.

3. Timing of annual benefit of Crown financing

Clause 2.4.10

Amend clause 2.4.10 as follows:

(1) In respect of **regulated fibre service providers** subject to both information disclosure regulation and price-quality regulation in regulations made under s 226 of the **Act**, 'annual benefit of Crown financing building block' for a **disclosure year** is calculated as the sum of the amounts calculated in accordance with the following formula for each day of the **disclosure year**—

$$(A \times B) + (C \times D),$$

where-

(a) A is the amount determined in accordance with the following formula:

((proportion of 'B' that is senior debt × **cost of debt** for that **disclosure year**) + (proportion of 'B' that is subordinated debt × (**cost of debt** for that **disclosure year** + 0.41%)) × E;

(b) B is the amount of **Crown financing** outstanding in respect of the **regulated provider** (or related party as referred to in section 164 of the **Act**) ~~on the first~~at the start of the day in

question ~~of the **disclosure year**~~ that is debt (whether senior or subordinated);

(c) C is the amount determined in accordance with the following formula:

((0.75 × **cost of equity** for that **disclosure year**) + (0.25 × **cost of debt** for that **disclosure year**)) × E; ~~and~~

(d) D is the amount of **Crown financing** outstanding in respect of the **regulated provider** (or related party as referred to in section 164 of the **Act**) ~~on the first~~at the start of the day in question ~~of the **disclosure year**~~ that is equity~~.~~; and

(e) E is determined in accordance with the following formula:

1 ÷ number of days in the **disclosure year**.

Clause 3.5.11

Amend clause 3.5.11 as follows:

(1) For the purposes of specifying a price-quality path, "annual benefit of Crown financing building block" for a **regulatory year** in a **regulatory period** is determined as the sum of the amounts calculated in accordance with the following formula for each day of the **regulatory year**—

$$(A \times B) + (C \times D),$$

where-

(a) A is the amount determined in accordance with the following formula:

((proportion of 'B' that is forecast to be senior debt × **cost of debt** for that **regulatory period**) + (proportion of 'B' that is forecast to be subordinated debt × (**cost of debt** for that **regulatory period** + 0.41%))) × E;

(b) B is the forecast amount of **Crown financing** outstanding in respect of the **regulated provider** (or related party as referred to in section 164 of the **Act**) ~~on the first~~at the start of the day in question ~~of the **regulatory year**~~ that is debt (whether senior or subordinated);

(c) C is the amount determined in accordance with the following formula:

((0.75 × **cost of equity** for that **regulatory period**) + (0.25 × **cost of debt** for that **regulatory period**)) × E; and

(d) D is the forecast amount of **Crown financing** outstanding in respect of the **regulated provider** (or related party as referred to in section 164 of the **Act**) ~~on the first~~at the start of the day in question ~~of the **regulatory year**~~ that is equity~~.~~; and

(e) E is determined in accordance with the following formula:

1 ÷ number of days in the **regulatory year**.

4. Change to definition of notional deductible interest

Clause 2.3.1

Replace clause 2.3.1(7) with the following:

(7) For **regulated fibre service providers** subject to both **information disclosure regulation** and **price-quality regulation**, 'Notional deductible interest' means the value determined for the **disclosure year** in accordance with the following formula:

sum of all **opening RAB values** × **leverage** × **cost of debt** – Crown financing deductible interest

where:

Crown financing deductible interest is calculated for the **disclosure year** using the following formula:

Senior debt outstanding × **cost of debt** for that **disclosure year** + subordinated debt outstanding × (**cost of debt** for that **disclosure year** + 0.41%) + equity outstanding × (0.25 × **cost of debt** for that **disclosure year**)

Senior debt outstanding is the amount of **Crown financing** outstanding as of the last day of the preceding **disclosure year** that is that is senior debt;

Subordinated debt outstanding is the amount of **Crown financing** outstanding as of the last day of the preceding **disclosure year** that is subordinated debt; and

Equity outstanding is the amount of **Crown financing** outstanding as of the last day of the preceding **disclosure year** that is equity.

Insert new clause 2.3.1(7A):

(7A) For **regulated fibre service providers** subject only to **information disclosure regulation**, subject to subclauses (8)-(9), 'Notional deductible interest' means the value determined for the **disclosure year** in accordance with the following formula:

(sum of all **opening RAB values** – Crown financing outstanding) × **leverage** × **cost of debt**

where:

Crown financing outstanding is the amount of **Crown financing** outstanding as of the last day of the preceding **disclosure year**.

5. Connection capex to include customer incentives capex

Clause 1.1.4

Amend clause 1.1.4(2) as follows:

connection capex means **capital expenditure** approved by the **Commission** as part of the **connection capex baseline allowance** or the **connection capex variable adjustment** and directly incurred by **Chorus** in relation to connecting new **end-user** premises, building or other access points where the **communal fibre network** already exists or will exist at the time of connection, and includes:

(a) **UFB initiative brownfield** connection expenditure;

(b) **UFB initiative greenfield** and **infill** connection expenditure; ~~and~~

(c) **Chorus** initiated migration from **copper fixed line access services** to **PQ FFLAS**; and

(d) customer incentives for **PQ FFLAS**;

6. Wash-up for CPI in opening year of regulatory period

Clause 3.1.1

Amend existing clause 3.1.1 as follows:

(11) 'Actual allowable revenue', for a **regulatory year**, means the sum of forecast **building blocks revenue**, forecast **pass-through costs** and the **wash-up amount**, adjusted, as specified by the **Commission** for the purposes of calculating a **wash-up accrual** or **forecast wash-up accrual**, to include the modelled impacts on **forecast allowable revenue** (for a **wash-up accrual**) or forecast of modelled impacts on **forecast allowable revenue** (for a **forecast wash-up accrual**) (whichever is applicable) for that **regulatory year** of: ...

(f) subject to subclause (13), the difference between:

(i) any forecast **CPI** values referred to in a **PQ determination** for the purposes of calculating **forecast allowable revenue** under subclause (2) for that **regulatory year**; and

(ii) the corresponding actual **CPI** values for that **regulatory year**; and ...

(13) For the purpose of paragraph (11)(f), and subject to subclause (14), where no forecast **CPI** value is referred to in a **PQ determination** for the first **regulatory year** of a **regulatory period**, then the forecast **CPI** value is deemed to be referred to by the **PQ determination** and is calculated as equal to the product of the forecast **change in CPI** for:

(a) the first **regulatory year**, and

(b) each prior **regulatory year** for which a forecast **CPI** value formed part of a **change in CPI** calculation for that **regulatory year** at the time the **PQ determination** was made,

where—

the product of the **change in CPI** across *n* **regulatory years** is calculated as:

$$(1 + change\ in\ CPI_t) \times (1 + change\ in\ CPI_{t+1}) \times$$

$$\ldots\ (1 + change\ in\ CPI_{t+n}) - 1$$

'**change in CPI**' for **regulatory year** is calculated in accordance with the following formula—

$$\frac{CPI_{Mar,t} + CPI_{Jun,t} + CPI_{Sep,t} + CPI_{Dec,t}}{CPI_{Mar,t-1} + CPI_{Jun,t-1} + CPI_{Sep,t-1} + CPI_{Dec,t-1}} - 1$$

where—

$CPI_{q,t-n}$ is **CPI** for the quarter ending in *q* in the 12-month period *n* years prior to **regulatory year** *t*, calculated using the most recent Reserve Bank Monetary Policy Statement available before 30 June of year *t-1*.

(14) Subclause (13) does not apply in respect of the first **regulatory year** of the **first regulatory period**.

(15) Where subclause (13) deems a forecast **CPI** value to be referred to by a **PQ determination** then in calculating the modelled impact on **forecast allowable revenue** of the item in subclause (11)(f), any impact that is

also attributable to washing-up forecast **CPI** values for actual **CPI** values under paragraph (11)(a) must only be accounted for once.

7. Confirming the scope of Crown financing wash-up

Clause 3.1.1

Amend clause 3.1.1(11)(b) as follows:

(b) the difference between:

(i) ~~the~~ forecast amounts of **Crown financing** outstanding on the first day of the **regulatory year** that are senior debt, subordinated debt or equity for the purposes of calculating the 'annual benefit of Crown financing building block' for that **regulatory year**~~, as determined~~ under clause 3.5.11; and

(ii) the corresponding actual amounts of senior debt, subordinated debt or equity outstanding on the first day of~~'annual benefit of Crown financing building block' for the **disclosure year** that corresponds with~~ that **regulatory year**~~, as determined under clause 2.4.10~~;

8. Cost allocation definition changes

Clause 1.1.4

Amend clause 1.1.4(2) as follows:

asset value	means: (a) in respect of a core fibre asset, the unallocated ~~opening~~ closing RAB value; and (b) in respect of a **UFB asset**, the value determined in accordance with Schedule B;

9. Addressing stranding risk

Clause 3.3.5

Amend clause 3.3.5(2) as follows:

(2) The annual ex-ante allowance for asset stranding is the amount determined in accordance with the formula-

$A \times B$

where-

(a) A is ~~0.001~~ specified in a **PQ determination**; and

(b) B is the average of-

(i) the sum of **opening RAB values** for each **regulatory year** of the **regulatory period** for all **core fibre assets** and the **opening RAB value** for the **financial loss asset**;

(ii) the sum of **closing RAB values** for each **regulatory year** of the **regulatory period** for all **core fibre assets** and the **closing RAB value** for the **financial loss asset**.