Approaches to Infrastructure: Pricing Study: Part 1 - Economic design

A report for the New Zealand Infrastructure Commission - Te Waihanga

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Context for this report

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Te Waihanga - the New Zealand Infrastructure Commission (Te Waihanga) has commenced a programme of work to develop an economic framework for pricing infrastructure to provide a principled, sector-agnostic baseline for future policy analysis. The economic framework for pricing infrastructure is intended to be applied across the four key infrastructure sectors (the four sectors) - land transport, water, telecommunications (telco) and energy.

To support the development of the economic framework for pricing infrastructure, Te Waihanga commissioned the Approaches to Infrastructure Pricing Study (the Pricing Study), which comprises four components:

1. **Economic framework design.** Developing the economic framework for pricing infrastructure - focused on proposed Pricing Goals and Principles.
2. **Current pricing analysis.** Undertaking analysis of the current system settings of the four sectors, to build understanding of current pricing performance against the proposed Pricing Goals and Principles.
3. **Equity exploration.** Considering the equity implications of the proposed Pricing Goals and Principles.
4. **Information assessment.** Identifying the data sources available for information on infrastructure pricing and pricing practices in New Zealand.

Each component of the Pricing Study contributes to the development of the final economic framework for pricing infrastructure, and will be combined to provide a single reference point for the Pricing Study. This report is focused on Part 1: Economic framework design.
A list of key terms used in this report can be found in Appendix B.

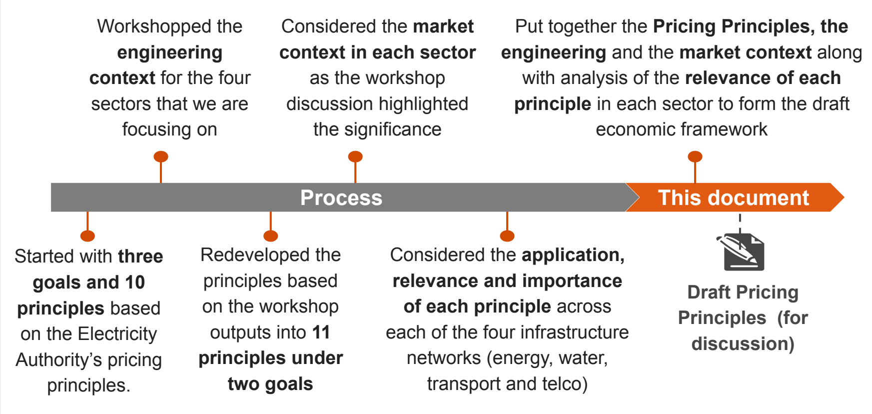
Purpose and scope of this report

This document is the first deliverable of the Pricing Study project. It comprises the draft economic framework which is the starting point for the development of the framework through the rest of work programme, comprising:

- the current pricing analysis
- data identification
- equity exploration.

In turn, these pieces of work will shape and refine the final set of Pricing Principles. That is, the development of the framework will be iterative.

In developing the draft framework, we have already undergone an iteration on our original proposed Pricing Principles, as shown below. The engineering and market context for this development has been captured within the framework.



Content of this report

This report consists of four sections, as described below.

1

Draft economic framework

Introduction and approach to economic framework design - section overview

Focus of this document

This document consists of four parts which together form the draft economic framework

- **An outline of the two Goals and eleven Pricing Principles,** set under the two goals to the right of the page, we have developed using the principles from the energy sector as a starting point. These are for discussion, feedback and agreement with Te Waihanga.
- **The engineering context for** the four infrastructure sectors (land transport, water, telecommunications (telco) and energy) which are the subject of this framework.
- **The market context** in each sector to frame the sector analysis.
- **The application, relevance and importance of each principle** across each of the four infrastructure sectors.

Background to the economic framework design

Rautaki Hanganga o Aotearoa - the New Zealand Infrastructure Strategy 2022-2052 (the Strategy) describes the actions required over the next 30 years to ensure New Zealand's infrastructure is well-positioned to meet the challenges and opportunities that lie ahead. Within the Strategy, providing better infrastructure through pricing - to better reflect need and provide for options and spread the load on our infrastructure more evenly - was identified as an area that could have the greatest impact over the next 30 years on transforming New Zealand.

Since the release of the Strategy, Te Waihanga has commenced a programme of work to develop an economic framework for pricing infrastructure, intended to be applied across the four key infrastructure sectors (the four sectors) - land transport, water, telco and energy. To support the development of the economic framework for pricing infrastructure, Te Waihanga commissioned the Pricing Study, which comprised four components of work:

1. Economic framework. Developing the economic framework for pricing infrastructure - focused on proposed Pricing Goals and Principles.
2. Current pricing analysis. Undertaking analysis of the current system settings of the four sectors, to build understanding of current pricing performance against the proposed Pricing Goals and Principles.
3. Equity exploration. Considering the equity implications of the proposed Pricing Goals and Principles.
4. Information assessment. Identifying the data sources available for information on infrastructure pricing and pricing practices in New Zealand.

Proposed Pricing Goals and Principles context

Background on proposed Pricing Goals and Principles

The economic framework for pricing infrastructure was informed by:

- An initial draft of Pricing Principles drawing on the established principles for energy distribution pricing, adapted and expanded for cross-sector application
- Engagement with subject matter experts and sector stakeholders, including workshops with subject matter experts to consider the engineering, technical, economic, regulatory and policy drivers behind pricing as well as testing of proposed Pricing Goals and Principles with Te Waihanga and sector stakeholders.

The economic framework for pricing infrastructure comprises:

- **Two proposed Pricing Goals.** These enable the categorisation of the 11 proposed Pricing Principles into two groups - to support ease of communication and a cross-sector understanding of the economic framework for pricing infrastructure.
- **11 proposed Pricing Principles.** These distill the critical economic concepts needed to address each of the two Pricing Goals within the context of natural monopoly industries whose outputs are foundational to a prosperous society.

The proposed Pricing Goals and Principles used as a basis for the current pricing analysis are defined on pages 8 to 10. Note the version of the proposed Pricing Goals and Principles adopted for this analysis are not considered final. Rather, the results of the current pricing analysis are intended to inform further iteration.

Goals underpinning the eleven draft Pricing Principles and why they were chosen

Goal 1: Harness or emulate the benefits of market competition to provide long-term value to users

Competitive markets provide long-term value to users by driving suppliers to offer higher quality services at lower prices over time. This occurs through collective price-searching behaviour by suppliers, influenced by mechanisms including:

- free entry and exit in the market
- free movement of factors of production
- symmetry of information between users and suppliers
- the presence of many sector participants.

In natural monopoly industries, well-designed price regulation can substitute for these market mechanisms to create shared value in the long run for suppliers and users. The focus of this goal is to ensure that sector-wide revenues are appropriately sized and allocated compared to costs, while also motivating activity that generates value in the long-term.

Goal 2: Incentivise efficient and socially optimum use of new and existing assets

Infrastructure assets have long lives. At any time, the additional infrastructure being built equates to a tiny fraction of the existing asset base. The way we use that asset base can vary widely and have significant effects on costs, quality, and other users and non-users. This goal is about signalling the effects of usage choices to the user, and addressing other issues without obscuring that signal.

Proposed Pricing Goals and Principles Overview (1 of 3)

Goal 1: Harness or emulate the benefits of market competition to provide long-term value to users

Pricing should promote outcomes consistent with the outcomes of competitive markets, such that suppliers:

1. Have incentives to invest in assets, technologies, operational methods, or configurations that improve efficiency, resilience, and quality of supply in ways that reflect user demand	Incentives created by pricing rules should allow suppliers to capture part of the value of research and development (R&D) and investment in innovation, such that investments that provide long-term value to users are attractive to suppliers when weighed against the whole of life costs.
2. Have incentives to take on investment risks as well as appropriate signals of which risks are worthwhile to stakeholders.	Investment risk should be aligned with the potential for financial reward and the ability to mitigate risk or prevent its realisation. This is a finance principle that relates to pricing via its role in capital expenditure cost recovery. Conversely, pricing arrangements should not allow undue risk to fall on parties who do not have the ability to mitigate it, prevent its realisation, or be appropriately compensated for it.
3. Share the benefits of efficiency, quality, or resiliency gains from investment with users and other stakeholders.	In a competitive market, the value created by investments or innovation would be shared with users and other stakeholders through lower prices and higher quality services. In publicly provided or private natural monopoly sectors alike, pricing rules should emulate the pressure of competition to differentiate quality or lower price as capabilities improve.

Pricing should:

4. Allow sector participants to be rewarded for preventing or overcoming economically non-rational investment or usage by other sector participants.	Pricing mechanisms should not assume perfect rationality on the part of market participants, but recognise the role of cognitive biases in human decisions and design pricing rules that minimise the potential for those biases to impede efficient outcomes. This principle recognises that some sector participants may specialise in minimising the economic losses from cognitive biases and may earn a return for doing so.
5. Prevent excessive exercise of market power by sector participants throughout the supply chain, both as suppliers and users.	Excessive means enabling extraction of economic rents at the expense of stakeholders without commensurate long-term benefit to those stakeholders. For a supplier, this is the power to raise price by restricting quantity sold. For a user, this is the power to lower price by the implied threat of withholding large demand quantities.

Proposed Pricing Goals and Principles Overview (2 of 3)

Goal 2: Incentivise efficient and socially optimum use of new and existing assets

6. Prices should signal the economic costs of availability, connection, and use of the network by: • being less than or equal to the cost to replicate the service or bypass the network • being greater than or equal to the cost that would be avoided by supplier if it no longer provided services to the user group • reflecting the effects of usage levels on economic costs • reflecting the differences in quality or service levels provided	To the extent possible in practice, pricing rules should not allow cost signals to be obscured by the complexities of asynchronous costs and benefits, the order of user connection to the network, political decisions, or other factors unrelated to the cost of provision. This principle asserts the need for prices to signal costs on each of the three levels of provision, which is most relevant for non-privatised sectors. It also provides limits to how prices should be permitted to vary in the absence of genuine market competition, which is most relevant for privatised sectors.
7. Prices that signal economic costs may be adjusted by intervention to signal the external costs and benefits of availability, connection and use to the extent that this incentivises socially optimal behaviour.	Where connection to, use of, or augmentation of a network places costs or benefits on others, such as taxpayers, future generations, other users, or bystanders, pricing rules should encourage positive and discourage negative effects. Externality components of prices should not exceed the value of the external costs or benefits being priced. This principle is a departure from established practice intended to address sustainability, equity, and efficiency objectives.
8. Prices should allow users to make trade-offs between the quality, timing, or level of service they receive and the price they pay.	Where network costs or externalities are created by the actions or inaction of users, the first pricing priority should be to mitigate those costs by charging those users directly. Where usage levels are not creating additional costs, charges should be determined by the level of benefit received. This way, users can choose to use less (or shift use) of a network service if they are price-sensitive, or more of it (without time consideration) if they have a high willingness to pay (WTP).

Proposed Pricing Goals and Principles Overview (3 of 3)

Goal 2: Incentivise efficient and socially optimum use of new and existing assets (cont)

9. Where prices that signal economic costs would prevent a subset of users from accessing a minimum level of service, relief may be applied in ways that do not distort price signals for suppliers or other users.	When prices are altered from market-equilibrium levels, the quantity demanded changes. These changes are considered distortions if they are not part of the intended outcome of the intervention. This principle recognises that the primary role of pricing is to signal costs and WTP to users and suppliers. Interventions to alleviate the burdens of a subset of users may cause more harm than good if they impede that purpose. Access for all to a minimum level of service is a critical goal of infrastructure provision, but pricing is not the only tool available to address that goal. There are other direct and indirect methods to achieve this goal. Setting a minimum level of service would be a social policy decision.
10. Where prices would otherwise under-recover costs, shortfalls should be made up by price adjustments that least distort network use.	Deviations from usage-based pricing should be designed to achieve their outcome as directly as possible with minimum indirect and/or undesirable outcomes.
11. Prices should be developed transparently and with regard to what can reasonably be expected of suppliers and users given the practical challenges of implementation in each sector.	Regulation of a natural monopoly is intended to replicate the outcomes of a competitive market. However markets adjust naturally as users and suppliers are free to respond at will. Consideration therefore needs to be given to providing for flexibility and pragmatism in regulatory regimes in order to apply regulations efficiently in practice and to be able to communicate the calculation of any charges in a way an ordinary person may understand.

2

Engineering Concepts

Engineering concepts

Overview

The information set out on the following pages provides an overview of the engineering context behind the physical infrastructure of the energy, water, transport and telco networks.

The purpose is to discuss how the physical components of the infrastructure influence the implementation of the Pricing Principles in each sector. Design decisions heavily influence network utilisation and drives cost and performance and meets customer needs.

Engineering concepts - Concept 1 (1 of 2)

	Energy	Water	Transport	Telco
Concept 1: Description of the network **Network design** Network architecture is a key driver of cost and service performance. The level of redundancy in a utility or transport network is influenced by the criticality of assets. It reflects a risk based approach to the provision of essential services. It is typical for the most critical assets to be designed with sufficient redundancy (eg: additional capacity, duplicate assets or assets which can be repurposed) to lower the risk of significant and widespread service disruption. Less critical assets will have less redundancy, as asset failure will not have such an impact on users. This is a price-quality trade-off which is inherent in network design.	Electricity infrastructure is designed to take large scale generation at a limited number of locations into the national grid (grid) for transmission. The grid provides for high voltage transmission up and down the country and delivers energy to over 200 Grid Exit Points (GXPs). Electricity Distribution Businesses (EDBs) each connect to the grid via a small number of GXPs connecting the region they serve. The substations connecting the EDB's network, and the transformers within it, step down the high voltage electricity to distribute the electricity to end users at an appropriate voltage. Some large industrial customers connect directly to the grid. The grid consists of high voltage transmission lines, transmission towers, substations/transformers, data and control systems, high voltage direct current (HVDC) cables and tracks for access. Most of the grid was built 50 - 70 years ago and the assets would be expected to have an average remaining life at commissioning of around 80 years. The network is mainly overhead.	Water infrastructure is designed to take fresh water from a large catchment (lake, river or dam) and pipe this to a treatment plant where it can be brought to drinking standard. From the treatment plant it is distributed through a piped network under pressure to consumer connections. Keeping the network at the required pressure to move the appropriate volumes through the pipes requires pumps which run on electricity. In addition to pipes and pumps, throughout the network there are reservoirs which hold the treated water until it is required by users. There are also valves which are used to control the flow of water, these generally can be accessed from above ground. Fire hydrants also are an important part of the water network. Wastewater networks operate in the opposite way to water networks. Wastewater is taken from the user connection into the sewer system.	Roading, rail and active mobility (walking and cycling) are the key systems that make up the land transport network. The roading network is broken down into state highways and local roads which are owned, funded and operated differently. Public transport (PT) is operated by local government. Roading infrastructure consists of roads, pavements, streetside parking, signage, control systems, bus stops, streetlights and drainage features. The stormwater network plays an integral role is supporting the transport networks. State highways are classified in five different ways which determine the allocation of assets and services on each part of the network. Road and rail infrastructure has a long useful life but requires frequent maintenance and refurbishment (e.g resealing). The network consists of 11,000 km of state highways, 80,000 km of local roads and 4,000 kim of rail track. Road and rail infrastructure interact at rail crossings and these have numerous safety implications.	There are three main types of telecommunication infrastructure: fixed line, mobile and satellite. Fixed lines include fibre and legacy copper infrastructure. Fibre infrastructure is usually described from a network architecture point of view, being: Layer 0 which consists of poles, buildings, manholes, pits, and ducts; Layer 1 which is the actual fixed line of either copper or fibre network; Layer 2 which is the control system or electronics used to operate the network. The fibre industry also refers to layers when describing the various functions of end-to-end telecommunication. This is in reference to the Open Systems Interconnection (OSI) model. The 'backhaul' is the intermediary link between the core and edge of the network. The backhaul service is broken up into inter-regional, intra-regional and local backhaul. Backhaul is provided predominantly over fibre now that users are switching away from copper.

Engineering concepts - Concept 1 (2 of 2)

Concept 1: Description of the network

Asset Management Practices

Key concepts such as the identification of the criticality of assets within the network, and an ongoing condition assessment programme to track remaining useful life and likelihood of failure of assets is core to managing risk. A comprehensive programme of actively managing this risk is a sign of asset management maturity. The energy sector, being the most mature in its pricing approach, is also the most mature in its asset management practices.

Good asset management practices lead to efficient expenditure on networks, by optimising whole of life costs coupled with high performance and reduced risk of outage.

Energy

Distribution networks consist of high and low voltage lines, poles, conduits, control systems, transformers. A indicative average life of assets at commissioning is 45 - 55 years and the current average remaining life across networks is approximately 35 years.   Key engineering differentiators in distribution networks are whether lines are mainly underground or overhead, the circuit length, and the number of connections.

Gas infrastructure is similar to electricity in terms of network design but the assets are very different. Gas is extracted from the Taranaki region and carried through two transmission pipelines to Northland in the north, Wellington in the south and to Tauranga, Gisborne and Hawkes Bay in the east. Gas Distribution Businesses (GDBs) connect to transmission through delivery gates and distribute gas to users in their region. Assets consist of varying pressure main pipelines, service pipes, stations, line valves and special crossings. Across assets there is an indicative average remaining life of around 30 years. Most gas infrastructure assets are buried but for safety and performance reasons are regularly monitored for condition.

Water

Depending on the size of the network, the sewers may connect into a main or central interceptor sewer (MIS/CIS) which carries the waste to a treatment plant where the water is treated and discharged back into the environment (either on land or sea). Solid waste is disposed of by a number of methods.

Stormwater has traditionally been collected and discharged in a similar manner to wastewater but without treatment. In many cases the storm and waste networks have previously been combined. There are a number of reasons to consider wastewater and stormwater networks in tandem, even though in the main they are considered now to be separate systems.

Most water and wastewater network assets are buried and may be difficult to access. Much of the nation's networks contain assets over 100 years old, which is past the designed for useful life. However, buried assets often continue to deliver their service albeit with quality or performance issues, which may be undetected. Condition assessment of buried assets is problematic and without proactive assessment using cameras or other technology, often condition is not known until the point of failure.

Transport

The type of road influences design considerations. While state highways and arterial roads are designed for connectivity inter and intra regionally, local streets are designed with a focus on community and living interactions. The active mobility network is a subset to the roading infrastructure. Design decisions are largely dependent on environmental factors such as proximity to vegetation, rather than network utilisation.

Railway infrastructure includes rail tracks, stations, level crossings, control systems and signals, bridges and tunnels.

Currently New Zealand's railways are designed for both heavy freight and light-weight passenger carriages, which creates some inefficiencies in network utilisation. The two major passenger networks are Auckland and Wellington metro rail. The freight network is much more widespread, with 3500 km of national rail routes stretching between Whangarei to Bluff.

Telco

The lifespan of assets varies greatly depending on each part of the network. Fibre cables are expected to have a 20 -30 year life. Layer 0 assets have 30-50 year useful life. Buried assets, such as ducts, are expected to last indefinitely unless disturbed. Network electronic (Layer 2) assets have much shorter useful lives of between two and 15 years, reflecting the pace of technological change.

For mobile networks it is useful to describe the network in terms of active and passive infrastructure. Passive infrastructure includes the towers onto which antennae are attached. Active infrastructure is that which sends the signals. In order to have a high level of coverage the towers need to be distributed across the country and often in remote locations. Electricity is required at the tower site in order to operate the active infrastructure. Towers can host multiple networks of active infrastructure.

The overhead nature of mobile infrastructure can leave it vulnerable to the environment more than fibre which tends to be buried.

Engineering concepts - Concept 2 (1 of 2)

	Energy	Water	Transport	Telco
Concept 2: Performance and network utilisation that affect the useful life, maintenance, quality and performance of the network	Infrastructure utilisation in the energy sector is driven by the profile of consumer demand. In the electricity sector this is dominated by residential demand. Households consume the highest amounts of energy during mornings (7 - 11 a.m.) and evenings (5 - 9 p.m.) This demand creates weekday peaks at around 8 a.m. (as businesses start as well) and at 6 p.m. (when businesses are closing). There is a seasonal impact to utilisation, where demand is typically highest in winter. The evening winter peak has historically been the annual peak. There are two key utilisation issues for quality and performance: peak capacity loading and overall redundancy (ability for the energy to take an alternative flow path). There are three key challenges for quality and performance of electricity networks going forward: the overall increase in demand from electrification of the economy, the potential for electric vehicles (EVs) to add to the nightime peak and increased number of weather events causing outages which potentially also place higher demands on other parts of the network.	Utilisation of water assets is driven by demand. Utilisation of stormwater assets is driven by environmental factors (eg: rain). Utilisation of wastewater assets is driven by demand in dry weather and the environment in wet weather. Water demand follows a similar diurnal curve to electricity, dominated by morning and evening peaks in household usage. However, the seasonal pattern differs with highest demand in summer, due to irrigation. Regional impacts to demand may be high, as can commuting times. For example, morning peaks in particular will be earlier, the further from a city centre the demand is. Rainfall patterns will influence seasonal demand. Intuitively, dry weather wastewater network utilisation follows water utilisation. During wet weather Infiltration and ingress (I&I) of stormwater tends to dominate flow (by up to six times). Operating pressure of the water network is a key driver of maintenance, quality and performance.	Utilisation of transport networks is driven by demand. Peaks in urban roads and rail are driven by commuters. Changes in school and work patterns (as evidenced during COVID lockdowns and during school holidays) demonstrate this. Peaks on state highways are generally driven by holidaymakers. Environmental issues and safety can further contribute to constraints on roads. Rail is less impacted by these but if it is then the consequence is generally higher. The type and volume of use on road networks is key in determining useful life, maintenance, quality and performance. The type of use on roads can be proxied by ‘axle loading’. The impact of a truck is significantly greater than that of a car, which in turn is significantly higher than a bicycle. Utilisation of non-road pavements (footpaths and cycleways) is not what drives maintenance or useful life. Maintenance costs and the quality of non-road pavement infrastructure is driven by environmental factors such as tree root intrusion and weather events.	Utilisation in telco is driven by demand, and particularly demand for data at speed. Data speeds are generally not governed by the fibre itself but the Layer 2 assets. User perceptions of quality and performance are changing at pace. Maintenance costs are not impacted by use but ‘hands in the network’, (third party interference) and costs are generally for reactive maintenance. Distances from the exchange also play a role in speed achieved. There is current trend to reconfiguration of network for brownfield growth. Mobile performance can degrade with high utilisation due to network congestion. A queueing delay occurs when there is an influx of communication and data requests. Changes in technology (which are driven by increasing user performance demands) are the primary drivers of costs. The demand is generally coupled with a WTP.

Engineering concepts - Concept 2 (2 of 2)

	Energy	Water	Transport	Telco
Concept 2: Performance and network utilisation that affect the useful life, maintenance, quality and performance of the network	Additionally ‘dry year’ risk poses a network issue in terms of possibly having to control demand (e.g ripple control or even black out). Main drivers of maintenance tend to be environmental and non-utilisation based. Vegetation management is a major cost and reactive maintenance is driven by weather. This in turn is driven by the proportion of the network that is above ground. Gas demand is concentrated in industrial use which makes it flat for the majority of the day, but residential use of gas may relieve the electricity peak by providing heat for water, space and cooking at the times when most households are undertaking these activities. In the gas sector, the lack of certainty in the future of gas may cause a series of issues relating to maintenance, quality and performance. A decrease in demand may result in Gas Pipeline Businesses (GPBs) being unable to recover costs due to the cascading impacts of disconnections and a lack of WTP for remaining customers. There is a risk of significant asset stranding in the gas sector.	There is an optimum range. Too high and pipes will burst, too low and delivery will be weak or slow which is undesirable for the user and water quality will be negatively impacted. Blockages and breaks drive the maintenance, quality and performance of wastewater networks in dry weather. Capacity drives maintenance, quality and performance in wet weather. It is pipe material and groundwork that are a key determinant in useful life and therefore maintenance, quality and performance. There are numerous legacy issues. Cast iron pipes tend to have long lives and can continue to operate in poor condition but rust may cause quality issues for drinking water. These were the predominant material up to the mid 20th century. Asbestos cement (AC) was the main replacement material in the 1960s and these tend to fail catastrophically. Earthenware or clay pipes were common historic materials for the waste and storm networks. These tend to break and crack but can continue to operate, which causes environmental costs but doesn’t necessarily impact utilisation performance.	Disruption is costly to the roading and rail network and this includes planned maintenance. Quality and performance measures are safety and time, (particularly consistency of time) to travel. Generally it is considered that the longer the journey distance, the more that rail use is preferred over road use. This is also the case when rail as PT provides better consistency of time over travelling by road. The rail/road interface is heavily regulated which constrains rail schedules to minimise disruption to road users in the interests of safety rather than time. The mixed use of rail (from both heavy freight and light-weight passenger carriages) causes a level of underutilisation of the network as the two different uses don’t align well.	In mobile networks, tower maintenance is a key cost and 5G will require additional antenna to be put on structures. This is governed by structural capacity of the tower (i.e., the tower may require strengthening or replacement) to accommodate the new antenna. Chosen sites for towers (which are dictated by coverage capacity) will also need to work for backhaul, power, electromagnetic energy (EME), radio frequency (RF) and consenting. Generally tower sites need inspection and preventative maintenance, like corrosion removal on structures, vegetation management, and access track maintenance.

Engineering concepts - Concept 3

	Energy	Water	Transport	Telco
Concept 3: The extent to which whole of life cost/benefits are outweighed by the need to deliver a solution quickly and to meet capital constraints, and whether policy and funding arrangements influence the network design	In practice the electricity sector is constrained in this respect by its asset management maturity. EDBs can be very large businesses, which have good access to capital and capability and have the ability to make effective whole of fleet decisions based on asset condition and criticality. Smaller regional EDBs may have not have the scale in terms of human resource, data, or access to capital to make optimum whole of life asset decisions. However, this is not a political or policy issue. Transpower must have its investment proposals agreed to by the Commerce Commission each regulatory period. Major capex projects must be approved separately. This regulatory regime also places strong emphasis on sound asset management practices. Government policy is currently playing a major role in gas networks with the threat of bans on new connections one driver of uncertainty in the sector and likely to be causing an emphasis on focusing on opex solutions rather than new investment.	As ultimate asset owners of the public network, local and regional councils have a keen interest in life-cycle costing (LCC). If the owner is designing the network itself, this is a key design criteria, particularly with pumped or mechanical design. If the network is being designed by a private party for vestment to council, there is more of an emphasis on capital cost but ultimately the council will be the consenting authority so is unlikely to accept a solution that is not cost effective in the longer term. There is a recent increase in the number of small developments building and operating micro networks and choosing not to vest assets with Council. This signals a sector that does not necessarily incentivise efficient network use. With aging water assets across NZ and the push for urban uplift (green and brownfield) putting further strain on these networks, the industry and therefore, network design has become heavily influenced by policy and is heavily reliant on funding arrangements. In particular there is significant influence of which parts of the networks are being renewed or re-designed to address the housing crisis.	The recent weather events in the North Island that have damaged or destroyed transport infrastructure have presented the opportunity to reconsider design and placement of networks. Any rebuild strategy following a natural disaster such as Gabrielle needs to be considered in terms of the wider network cost and benefit, particularly in regard to the short and long term priorities. The need to rebuild is likely to be more common over the coming years and this needs to a consideration. Transport infrastructure requires land and this can have numerous political and policy implications far beyond the need for the infrastructure. Additionally land transport is currently a major emitter of carbon which also raises a number of political and policy issues and considerations. How PT may be explicitly included in decision making could be an influence in future design.	Telco is a competitive market and relatively unaffected by policy settings. User WTP drives service solutions and a bigger risk than escalating late in life opex is demand risk due to new technologies. The commercial viability of paying for infrastructure in the first few years of life is likely to be a primary driver of decisions.

Engineering concepts - Concept 4

	Energy	Water	Transport	Telco
Concept 4: The extent to which there is a gap between the current design standards and the technological frontier, and whether the gap is closing as well as the factors that are influencing the gap	Technology is expected to play a major role in changing the way the network is operated and innovation is likely to be centred in data acquisition and control systems. Making grids ‘smart’ is where the frontier in the electricity sector is heading. Demand side participation in load control and management, alongside in-network storage solutions (e.g. batteries) will present a more complex but more resilient way to manage networks. As we face more frequent outages due to weather events there is likely to be more investment in remote areas in micro-grid standalone solutions. The gas sector is hindered by uncertainty in the future of the sector. There is appetite to invest is repurposing the networks but the timeliness of the commercial reality of this is a major issue.	Each council has its own design standards that are at a bare minimum and are based on NZ4404 and New Zealand Building Code (NZBC), neither of which are updated regularly. Traditionally innovation has been driven from Industry rather than asset owners. To introduce new systems or products a supplier needs to get on approved register list with councils. Without a proven track record this is difficult. There are huge possibilities in the areas in biogas generation and nutrient recovery from waste water which are generally unexplored.	Design of the road and rail infrastructure itself is mature and technology is not a driver of innovation in these assets. Although there is appetite to have more options for project delivery and asset types (e.g. to use sustainable materials like timber for bridges). Where there is a frontier opportunity (much like in the electricity sector) is in control systems, including dynamic tolling. Smart, dynamic road user charges along with public transport options offer improved user experience and real time revenue generation. Smoothing and optimising the use of the infrastructure through network efficiencies, user-centric design, options or alternatives, resilience and time certainty will relieve congestion and delay the need to extend capacity.	Limiting factors in fibre are the Layer 2 electronics and Customers Premises Equipment (CPE) Layer 0, 1 and Layer 2 materials are all from global vendors (Ericsson, Alcatel-Lucent, Hexatronic, Nokia, Sika etc), which offer world-class technology. Competition is driving technological advancement at pace New Zealand is considered to have a high standard of fixed line infrastructure due to the Ultra Fast Fibre (UFF) rollout. In the mobile networks, global vendors are rolling out active equipment in New Zealand for the 5G upgrade which is at the frontier in this segment but will soon need to make way for 6G.

Engineering concepts - Concept 5 (1 of 2)

	Energy	Water	Transport	Telco
Concept 5: Other characteristics of the design and delivery of physical infrastructure which are relevant to cost recovery and pricing	Distributed Energy Resources (DER) along with the potential for commissioning of large new renewable electricity generation (in particular offshore wind) are the main issues needing consideration from both a network design, cost recovery and pricing perspective. DER may remove some of the reliance on networks in a macro sense (the grid in particular) and/or may cause the distribution networks to operate in ways in which they weren't designed, for example by causing the energy to flow in the opposite direction. Solar panels are likely to be the most disruptive in the short term by injecting into the network in the middle of day but with the connection still requiring load at peak when the sun isn't shining. Batteries have the ability to change this. The treatment of in-network batteries, operated by the EDB, is contentious from a regulatory point of view. Although, it may provide the EDB the opportunity to manage load within the network better, it also presents an opportunity to participate in the market by storing energy at a low price and dispatching it into a high pre period.	The quality of drinking water degrades with time. It needs to reach the user within days of leaving the treatment plant. Even if it does reach the user in this timeframe, if the condition of the pipes delivering it is poor then the quality may be compromised. Therefore the network plays just as much of a role in the quality of the water as the source and the treatment. Reservoirs play an important role in the operation of a water network. They may hold a number of days storage, allowing for management of outages in the piped network. Reservoirs are located at high points topographically in the network, to allow for gravity feeding from them. The strategic value of the land on which these are placed is unlikely accounted for. Catastrophic failure of a reservoir (e.g. bursting in an earthquake) would be of high consequence and it is likely given the age of most of this fleet that there is significant risk associated with the condition of these assets. Replacement or refurbishment would involve a large amount of investment and could not be staged.	User behaviour in response to climate change is likely the biggest issue facing the transport sector when considering design, cost recovery and pricing. The uptake of EVs may not in itself alter the use of the road network but is likely to drive additional infrastructure requirements in regard to charging capability. Alternative fuels like hydrogen, particularly for heavy transport will introduce the same sort of additional infrastructure requirements but with a greater level of complexity.	Resilience is a key issue in telco, with networks often being a single Point of Interconnection(POI) to POI connection, offering no redundancy. Diversification in routing, similar to the electricity network will provide some of this. Satellite options should be considered in addition to this. In Australia, we are now seeing dual fibre cable network. The first is a direct network between cities and the second provides regional connectivity. This is demonstrative of how embedding productive design characteristics in to the network can increase cost efficiency. The demand for data is rising exponentially and this is driving continual competition which has been beneficial for users. There is an ever present asset stranding risk in telco, as new technology arrives at pace, and users move to the latest offering. .

Engineering concepts - Concept 5 (2 of 2)

	Energy	Water	Transport	Telco
Concept 5: Other characteristics of the design and delivery of physical infrastructure which are relevant to cost recovery and pricing	In the gas sector, the Climate Change Commission's (CCC) recommendation to ban new connections, even though this has not been taken up by the Government, presents the potential for a large amount of residential peak load to be added to the North Island electricity demand. Currently the gas sector is supporting the electricity sector directly in providing thermal capacity for generation. But the likely material, indirect impact of reduced demand of peak electricity through direct gas use in homes is not something that has been given much attention.	Regional differences in stormwater catchments differs on a catchment basis. Factors that affect the quality and performance of the network include: the size of the catchment area, the ratio of pervious to impervious surface area, weather events, and the quality and quantity of engineered systems. The interaction of the performance of stormwater networks with the performance of wastewater and transport networks should not be overlooked. Many water connections are unmetered, making any kind of use based pricing impossible.		.

3

Market context

Market context

Overview

The information set out on the following pages provide an overview of the ownership, market structure, governance and market benefits as these apply across the energy, water, transport and telco sectors.

The purpose of this section is to provide context for how different market structures influence or constrain the implementation of the Pricing Principles.

Market context

	Energy	Water	Transport	Telco
1. Ownership	Transpower owns and operates the grid, and Transpower is wholly owned by the Crown. There are 29 EDBs with a mixture of ownership, but a high proportion of public or consumer trust ownership, meaning financial distributions are made to users or the community (eg: ratepayers). There is one gas transmission business, Firstgas, and four GDBs, Firstgas, Powerco, Vector and Gasnet. Gasnet is wholly in public ownership through Council, Vector is a publicly listed company and the others are in private ownership.	Most water infrastructure is currently owned by local government entities and operated for the benefit of the entity's residents and ratepayers. There are around 70 entities currently operating water services. This is set to change under three waters reform. However, there no appetite for privatisation and water is planned to stay in public entity ownership for the public benefit.	The ownership of the transport network is split between central and local government. Waka Kotahi (New Zealand Transport Agency) is a Crown Entity, which owns and operates the state highway network and local governments own their regional and local roads. There is no imperative to make a financial return. The rail network is owned and operated by a state owned enterprise (SOE), KiwiRail. As an SOE, Kiwirail has a profit motive, although its performance is monitored on behalf of Shareholding Ministers by Treasury's Commercial Operations team.	Chorus owns most of the fibre network in New Zealand but there are other local fibre companies (LFCs). Chorus is a publicly listed company on the NZX, two of the other three LFCs are ultimately in public ownership and one is in private ownership. Mobile providers are constrained by spectrum allocation and there are three main providers: Spark, Vodafone, 2 Degrees, Other smaller retailers rent/lease network services from these main providers Cell towers (passive infrastructure) are owned by one of two private companies.
2. Market structure	Generators, gas producers and energy retailers all operate in a competitive market with regulated oversight. Electricity users pay for the energy they consume, their use of their particular EDB network and their use of the grid, through a single bill from their retailer. Transpower charges EDBs and EDBs charge retailers for both the transmission and distribution components of their customer's connection. Retailers are not obligated to pass through these costs specifically to the individual customer and retail prices reflect their market offerings. Gas consumers also pay their retailer.	Water is operated as a monopoly public service on a local/regional basis. There is no uniform structure to the market in terms of pricing. Some are charged on a purely volumetric basis, and some on a Uniform Annual Charge (UAC) through their rates. There may be competitive non-network options at the fringes of networks or greenfield development sites. Health or local regulations may prevent users from bypassing an existing network.	Both road and rail networks are default monopolies but are competition for each other. Due to the public nature of transport infrastructure, competitive procurement and political pressures control for pricing and funding decisions. Waka Kotahi provides regulatory oversight to all users in the land transport system, and the nature of the structure promotes transparency and accountability.	Apart from LFC monopolies, telco is a competitive market. LFCs cannot charge different prices geographically, despite varying costs. Prices have decreased in the last 20 years, which is demonstrative of the highly competitive retail environment. While there is an incentive for passive infrastructure sharing (e.g. cell towers), high barriers to entry exist. Recently, 2 Degrees, Spark and Vodafone sold their towers to overseas investors, and entered in to long term right of use agreements. Mobile networks are constrained by spectrum allocation but are otherwise in competitive markets.

Market context

	Energy	Water	Transport	Telco
3. Governance	As transmission and distribution networks are natural monopolies they are regulated for price and quality unless owned by the consumers who benefit from them and governed by elected representatives of those consumers. All EDBs are subject to a regulatory monitoring regime which assesses whether price and quality performance is appropriate.	Regulations vary from Council to Council but water services are covered under the Local Government Act. Under a Auckland Supercity amendment of the Local Government Act, Watercare cannot make a profit which limits it to cost recovery.	Waka Kotahi regulates and delivers on land transport policies, however the Ministry of Transport (MoT) ultimately oversees all policy. The governing board of Waka Kotahi is appointed by the Minister of Transport, to ensure the operation, development and funding are in accordance with the Land Transport Management Act 2003.	Local and intra-regional backhaul services provided by Chorus and LFCs are captured under Part 6 of the Telecommunications Act., Whereas inter-regional backhaul that is provided by multiple providers is therefore competitive and not requiring of regulation. Retail service performance is monitored without being price regulated.
4. Beneficiaries	Energy infrastructure facilitates a market - and the benefits are two-way: to consumers and suppliers of energy. Both sides of the market are users of the infrastructure. The new Transmission Pricing Methodology (TPM) explicitly accounts for benefits to demand and supply customers separately. Although they could be classified as users, it is also relevant to identify that all other networks are beneficiaries of the electricity network.	Water infrastructure provides a service - the benefits are one way. Users (the consumers of water) are the beneficiaries of water and wastewater networks. Other beneficiaries are public health and the environment. Stormwater infrastructure also provides a service. Users of stormwater infrastructure are not limited to connected customers but also the public in general. The transport network is also key beneficiary of stormwater infrastructure.	Transport infrastructure provides a service - the benefits are one way. Beneficiaries may be direct or indirect users of the networks. Indirect users are those that receive goods and services or social connection via the transport network or travel on public transport.	Telco infrastructure facilitates a market - the benefits are two-way. This is a shift away from the historic model where fixed telephone lines were a public service. The commodity being traded is data. The evolution of this sector has been pronounced in last generation and is demonstrative of a shift from a monopoly provider of a service to a competitive market.

4

Sector analysis

Market context

Overview

The information set out on the following pages provide an overview of the high level context for each principle in energy, water, transport and telco sectors. We consider the relevance and importance of the current approach to pricing within each sector and the impact of emerging themes and trends.

Goal 1: Harness/emulate the benefits of market competition to provide long-term value to consumers

Pricing should promote outcomes consistent with the outcomes of competitive markets, such that suppliers:

	Energy	Water	Transport	Telco
1. **Have incentives to invest in assets, technologies, operational methods, or configurations that improve efficiency, resilience, and quality of supply in ways that reflect user demand.**	• Current 'marginal generator' pricing model for energy is effective to incentivise new renewable generation build but the incentives are not necessarily aligned for networks • Allowable revenue is based on return on capex, so innovations requiring increases in opex are not rewarded • There are explicitly incentives for investing in resilience • EDBs should implement effective demand side management in order to defer investment • The gas sector has little incentive to invest currently	• Long lived water assets have stranding risk depending on how regions develop and populations migrate • Being allowed to charge for higher quality of service currently does not happen because most water investment comes from rates and a policy constraint may exist • Metering data is fundamental. A current problem is that demand cannot always be measured which severely constrains options • There is little incentive offered to network operators for R&D	• Effectively the government defines how much users should pay, which is a policy decision, not a pricing one. The cost to users does not reflect demand • Road providers are incentivised to provide a particular level of service based on public demand. There is little incentive to innovate other than to achieve budget envelopes • Tolls aim to find the balance between WTP and the amount of capital costs to fund. But these only apply to new roads where there is an alternative	• Prices for most telco services are set by competitive market interactions • The incentive on suppliers is through competitive pricing to earn a margin • Fibre is monitored/price regulated to earn an acceptable return on assets plus recovery of opex

Importance scale:

Not so important — Very important

Goal 1: Harness/emulate the benefits of market competition to provide long-term value to consumers

Pricing should promote outcomes consistent with the outcomes of competitive markets, such that suppliers:

	Energy	Water	Transport	Telco
2. **Have incentives to take on investment risks and appropriate signals of which risks are worthwhile to stakeholders.**	• Good signals through nodal pricing in electricity on where to take investment risks • Removal of Avoided Cost of Transmission (ACOT) payment requirement to DG may send the wrong signal • WACC pricing model compensates investors for risk • Asset stranding is the major risk in the gas sector and there is little incentive as yet to invest in repurposing the network for green alternatives	• Risk and reward is poorly aligned, and capex is rarely captured • Building in advance of demand not incentivised, therefore the risk is seldom taken • Most innovation is derived from suppliers who then have to work hard to get buy-in from Councils or developers	• User WTP is the main signal and this is seldom exercised for road infrastructure. This presents an opportunity in transport. • What is worthwhile to stakeholders is generally determined by policy rather than by users • Investment risk is taken on by central government	• Prices are set commercially to reflect a risk-adjusted return. Telco takes on significant uptake risk (risk of stranded assets) and this is reflected in higher prices and margins observed on new technology services • Margins typically reduce down to cost recover as the service becomes more mainstream and reduces risk
3. **Share the benefits of efficiency, quality, or resiliency gains from investment with users and other stakeholders.**	• The backward looking benefit based assessment in the TPM may not incentivise development by stakeholders other than Transpower • The key driver ensuring benefits are shared through lower prices is regulation	• Public ownership for public benefit - intrinsic • Efficiency gains are passed on to customers through price • Key drivers ensuring the sharing of benefits in water are the targets set by owners	• Public ownership for public benefit - intrinsic • Efficiency gains are passed on through an increased work programme and therefore service outcomes, not through prices • Key drivers are the budget constraints set by owners and funders	• Overall demand for data is going up, with 'all you can eat' models dominating. The competitive market incentivises innovation • High end products are initially priced at a premium (as there is a higher WTP), then over time it becomes the baseline product.Technological benefits are shared over time in the product development process as the technology is disseminated

Importance scale:

Not so important — Very important

Goal 1: Harness / emulate the benefits of market competition to provide long-term value to consumers

Pricing should:	Energy	Water	Transport	Telco
4. **Allow sector participants to be rewarded for preventing or overcoming economically non-rational investment or usage by other sector participants.**	• Retail service providers absorb wholesale price fluctuations and offer simplified pricing plans to retail users. • Signal what the economic cost of the network is so that users can make an efficient consumption and investment decisions e.g. a consumer installing solar with the intention to reduce their high peak prices is non rational as solar does not help at peak times	• Fixed pricing (either daily or UAC) dissuades bypassing the network. This also drives inefficient use • Volumetric pricing creates the incentive to use the network efficiently	• Congestion pricing provides the signal to the user about when and where to travel should be made (you can save that cost by making a more rational decision) • Parking costs and/or time limits can also drive more rational use of the networks e.g. currently there is not a lot of universal demand management for parking as a signal as to whether or not someone should travel by car	• Signal what the economic cost of the network is so that others can make a decision on what is efficient • Creating differentiated competitive products signals the price and quality trade-offs • Consumer decisions around what product to invest in • No obvious substitute • A current trade off exists between fixed line and wireless (mobile)
5. **Prevent excessive exercise of market power by sector participants throughout the supply chain, both as suppliers and users.**	• Energy networks are natural monopolies.The Commerce Act 1986 provides for regulation of these networks to derive long-term benefit for consumers by prohibiting behaviour that is inconsistent with competitive market outcomes • Competition in retail and wholesale markets limits excessive market power. • Some competition at the fringes - embedded networks and non network solutions • The reducing cost of DER may put users in a position of market power	• If public ownership is maintained, this is a very small issue. However even though users do not get overcharged, quality standards are imposed which is a form of market power	• Like water there is no market power in terms of cost but there is in terms of quality • There is some incentive to provide a good level of service through competitive procurements • Policy influences funding, local and central govt decisions not the user • Road (and air/sea) options ultimately restrict rail pricing by providing an alternative and therefore some implicit competition • Design standards are in place to protect users, particularly from a health and safety perspective	• Telco is highly competitive between suppliers and technology is effective in preventing overuse of market power • Fibre is regulated under Part 2 and Part 6 of the Telecommunications Act 2001, which promotes the long-term benefit of end-users in the marke • Fibre networks are also subject to Open Access and Equivalence of Inputs obligations to ensure that networks can not discriminate in wholesale markets

Importance scale:
Not so important — Very important

Goal 2: Incentivise efficient and socially optimum use of new and existing assets.

	Energy	Water	Transport	Telco
6. **Prices should signal the economic costs of availability, connection, and use of the network by:** ● being less than or equal to the cost to replicate the service or bypass the network ● being greater than or equal to the cost that would be avoided by supplier if it no longer provided services to the user group ● reflecting the effects of usage levels on economic costs ● reflecting the differences in quality or service levels provided	● Prices are designed to recover fixed costs and signal avoidable costs for each customer group ● Variable components to prices and the move to applying some form of ToU reflect the impact of usage on costs and facilitate the potential for the user to respond ● Price differentiation occurs between residential, commercial and industrial customers to reflect specific supply requirements ● Impacts of high levels of network usage is signalled through controlled rate pricing. It provides retail users the option for lower charges by reducing consumption at pre-specified times ● There are several implementation challenges: ie ○ The differential in signal needs to be tested for response, and this can be iterative. If the differential is too low then the it may be ignored, if too high then this may distort use unnecessarily ○ Some retailers are still not passing this signal through to users, meaning they are unable to respond and EDBs are unable to monitor and measure impact	● As a public service, it is likely that users are not charged in a way that reflects the cost of providing the service to them. ● Universal metering would be a minimum requirement before this principle could be applied in this sector. Metering happens currently in some areas, but not widespread ● Metering data allows the ability to understand the impact of use on economic costs. E.g Watercare distinguishes charges between commercial or domestic customers ● Quality and performance can only be distinguished between user groups based on location (e.g all users in a street). This is likely to be an inappropriate user grouping mechanism. ● The increasing trend to develop, own and operate micro water networks at the fringes of networks would indicate the true economic cost is signalled. This could have the impact of relieving an already constrained system and/or increasing the burden on the existing users	● Unlikely to apply to transport because it is a shared infrastructure network built for all users	● Telcos price to achieve the highest return in the competitive market, rather than for cost recovery (with the exception of anchor products) ● Fibre and mobile providers need to offer compelling propositions to consumers to avoid substitution to another telco network ● Key challenge is the possible substitution between fixed line and mobile broadband (Or even satellite e.g StarLink) ● The price quality trade off is explicit in contract and price, designed to reflect the differing WTP ● Pricing is based on bandwidth at the consumer level or per connection. Generally higher use of bandwidth proxies higher WTP ● Quality of supply is largely unaffected by capacity. Therefore pricing does not explicitly align with the economic cost. The real cost of the network is in the kilometers in extends.

Importance scale:

Not so important — Very important

Goal 2: Incentivise efficient and socially optimum use of new and existing assets.

	Energy	Water	Transport	Telco
7. **Prices that signal economic costs may be adjusted by intervention to signal the external costs and benefits of availability, connection and use to the extent that this incentivises socially optimal behaviour.**	• In the energy sector it may be justified to signal cost of emissions.	• In the water sector it may be justified to signal cost of environmental outcomes and public health.	• There are multiple externalities impacting transport. Safety, emissions, carbon emissions, air quality, time risk, stormwater contamination are some of these. • Congestion pricing would signal economic costs associated with congestion. • There is a signal on emissions with clean car rebates but more cars potentially means more congestion so they may be competing externalities.	• A primary externality in telco is equity. • There may be restricted access to the network due to geographical discrepancies. There has been grant funding from the Telecommunications Development Levy has been used to fund rural broadband, where network operators have not previously invested • Emissions driven by large data warehouses are potentially a new key emerging externality.
8. **Prices should allow users to make trade-offs between the quality, timing, or level of service they receive and the price they pay.**	• Where network infrastructure is shared and common levels of service and quality are provided, price-quality tradeoffs are difficult • Major users are likely to have options for price and quality which can be provided, including additional security or interruptible load arrangements • In practice urban networks have higher quality of service than rural or remote rural networks. This does not always result in lower prices for rural networks, because costs of supply are greater for lower density supply	• Different service levels may be appropriate in different locations, such as urban and rural areas, or for different uses of water • Trade waste customers receive different service levels given the unique nature of their requirements	• Tolling allows the consumer to pay for the travel time they are saving • Congestion pricing allows the consumer to avoid paying if they are flexible with time or mode • A potential initiative could be to charge more to use the motorways than local roads (similar to tolling) • Road and rail provide alternative options to each other	• Competitive markets result in a range of product and services and transaction costs of switching are relatively low • There are multiple pricing options for users - based on broadband speed, quality and quantity (which is being phased out)

Importance scale:

Not so important — Very important

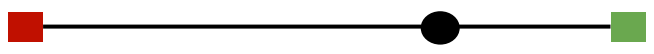
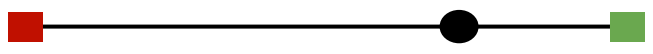
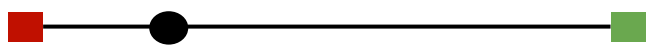
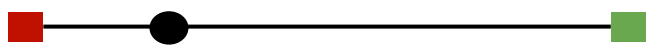
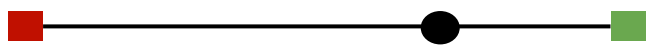
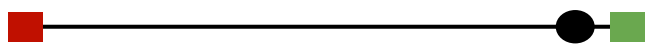
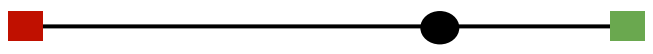
Goal 2: Incentivise efficient and socially optimum use of new and existing assets.

	Energy	Water	Transport	Telco
9. **Where prices that signal economic costs would prevent a subset of users from accessing a minimum level of service, relief may be applied in ways that do not distort price signals for suppliers or other users.**	• Low Fixed Charge (LFC) regulations in electricity, which are now being phased out, are an important cautionary tale in implementing social policy through pricing. • The concept of energy hardship and the policy work that is being invested into defining this is an important reference case in determining what a minimum affordable level of service is • Where metered based pricing exists, pricing structures e.g. fixed vs variable allow for non-distortionary adjustments e.g. to fixed charges, while preserving economic signals e.g. variable charges	• Where metered based pricing exists, pricing structures e.g. fixed vs variable allow for non-distortionary adjustments e.g. to fixed charges, while preserving economic signals e.g. variable charges • Social policy work will be required to determine a water sector comparator to 'energy hardship' and its mitigation.	• There is effectively open access to the road network with enforcement action (police or debt collection) the only remedy to non-payment • Legislation means that you can only apply tolling to new infrastructure where a free alternative exists	• Currently the industry offers social offerings for libraries, schools etc to relieve access issues. • The telecommunications service obligations (TSO) regulatory framework enables specific telco services to be available and affordable

Importance scale:

Not so important — Very important

Goal 2: Incentivise efficient and socially optimum use of new and existing assets.

	Energy	Water	Transport	Telco
10. **Where prices would otherwise under-recover costs, shortfalls should be made up by price adjustments that least distort network use.**	• By allowing EDBs and retailers to increase fixed charges, this principle is gaining traction • The Residual Charge component of the TPM is also consistent with this principle • Gas distribution networks (residential and small commercial users) have traditionally had lower fixed charges as gas is a fuel of choice and this encourages uptake • This may change as assets are subject to heightened stranding risk 	• Some charges are fixed regardless of use, limiting ability for price adjustments • The sector is moving away from a uniform annual charge model towards utility pricing model • Cost recovery may not occur, however this may change with more accurate and frequent metering 	• Some charges are fixed regardless of use, limiting the ability for price adjustments • Cost recovery may not occur, however this may change with potential changes to the fuel tax 	• Telco is not a cost-recovery model, so less relevant • Mobile and broadband prices are largely fixed (apart from international fee). Throttling instead of pricing adjustments is used • All residual due to the fact that there are not many capacity constraints to signal through pricing - barely signalling use at the retail end 
11. **Prices should be developed transparently and with regard to what can reasonably be expected of suppliers and users given the practical challenges of implementation in each sector.**	• Each EDB and gas distribution network is required by the EA to publish their annual Pricing Methodology which discloses how each customer group has had prices determined • The TPM is transparent and therefore consistent with this principle 	• Highly opaque with some charges driven by Council budget allocations rather than cost recovery or utilisation 	• Highly relevant and transparent but not necessarily well explored by users e.g. Registration fee components are broken down on invoices • Cost related to choice of fuel is easily understandable e.g. Road User Charges (RUC) for diesel or exemptions for EVs • This is potentially because these are added costs, above standard charges 	• Telco networks are regulated under Part 6 of the Telecommunications Act 2001 which provides transparency over pricing and costs • The purpose of disclosure regulation is to ensure sufficient information is available to interested persons. 

Importance scale:

Not so important  Very important

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Appendices

Appendix A: Restrictions

This document has been prepared for and only for Te Waihanga in accordance with the Consultancy Services Order dated 16 January 2023.

This document is draft and does not constitute final PwC advice.

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Appendix B: Glossary

Users	Direct users of infrastructure services or intermediate goods contributing to infrastructure service provision.
Suppliers	Businesses, government entities, or individuals providing any part of an infrastructure network or service. This includes asset owners, retail service providers, government planners and purchasers, etc.
Costs/benefits of availability	All costs or benefits of bulk network provision not attributable to individual user connections or usage levels. Includes bulk capacity augmentation to accommodate new users or higher peak usage, as well as general overhead.
Costs/benefits of connection	Costs or benefits of physically connecting a user or group of users to a network, as well as costs of building and maintaining assets required for user access to a network. Includes usage monitoring equipment.
Costs/benefits of use	Variable network costs or benefits associated with usage levels.
Stakeholders	Anyone with an interest in an infrastructure network, including those involuntarily affected by it or its users now or in the future.
Sector participants	Either suppliers or consumers within a given infrastructure sector.
Socially optimal behaviour	Consumption of infrastructure services in forms and at levels that lead to the most efficient use of resources and maximize overall welfare in society. To achieve socially optimal behaviour, the benefits of any increment in consumption of a given service should outweigh its costs for society, accounting for both private and external costs and benefits