Transmission Tomorrow – Our Strategy

December 2018
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Transpower operates at the very heart of the New Zealand economy, providing connections that power our way of life. We are trusted with the stewardship of the national grid and with the complex job of operating the New Zealand power system.
Foreword

*Te Mauri Hiko - Energy Futures* examines what New Zealand’s energy future could look like. It highlights significant opportunity for New Zealand to decarbonize our economy and the critical role electrification will play in this. It also highlights significant change with the potential doubling of electricity demand by 2050 as well as new technology, more complex power flows and changing customer and consumer expectations. All of this forms the context in which we develop and refine our strategy.

*Transmission Tomorrow – Our Strategy* updates the previous work done on Transmission Tomorrow to reflect the scenarios and significant changes that we foresee in Te Mauri Hiko. It integrates our choices and distils the five key strategic priorities that Transpower needs to focus on to unlock New Zealand’s energy future.

Focusing on these strategic priorities can support a bright future – a future in which we enable the decarbonisation of the New Zealand economy, safely and affordability, and with sustained financial returns to the people of New Zealand. It is up to all of us to take up the challenge, work together across our business and the wider energy sector to enable that positive future.
Focusing on these strategic priorities can support a bright future - a future in which we enable the decarbonisation of the New Zealand economy, reliably and affordably, and with sustained financial returns to the people of New Zealand.
Executive summary

Our Strategy provides context for long-term planning of the national grid and management of the New Zealand power system. It forms part of our strategy and performance framework, providing a link between our why, our plans and our performance.

We have updated our framework and our strategy, building on *Transmission Tomorrow* in light of *Te Mauri Hiko*. In 2018 we developed *Te Mauri Hiko*, in response to an amplification of trends around climate change and the ability for electrification to decarbonize the economy. This highlighted the potential doubling of electricity demand by 2050 so we have updated *Transmission Tomorrow* and our strategy to align with and enable this view of our potential energy futures.

Figure 1: Our Strategy and Performance Framework
Transmission Tomorrow – Our Strategy focuses on four key areas:

- exploring our value proposition, key aspects of our social licence to operate and key trends that influence our long-term planning
- building on the context and scenarios outlined in Te Mauri Hiko about New Zealand’s potential energy futures
- framing the five strategic priorities that guide our focus and our long-term plans
- describing the connection from our five strategic priorities through to our plans and performance.

Our business today – value proposition and licence to operate

Transpower has a successful business providing services of value. We operate as part of an integrated supply chain, so we must consider the value proposition of the electricity system as a whole and of our grid and system operation services within that wider system.

Our value proposition encompasses these aspects:

- customers and consumers choose to connect to the power system, and we successfully perform valuable functions as part of that system
- we connect generators to distribution companies and large users over long distances, providing open access and helping to balance supply and demand
- we enable low-cost (and sustainable) energy through a cost effective grid and power system.

As well as offering valuable services, it is important to sustain confidence in our conduct. These are the areas of particular focus for our business:

- **Safety** – our activities inherently present significant public and worker safety hazards.
- **Corridors** – we have assets on over 10,000 properties, and our network traverses 30,000 properties.
- **Environment** – our activities have significant visual and other environmental impacts.
- **Incumbency** – we are an established player, and our services have strong natural monopoly characteristics.

- **Security** – major interruptions or power crises can seriously harm confidence in our services.

- **Corporate scale** – we are a large commercial organisation in New Zealand terms with significant reach.

- **Social policy** – energy systems balance affordability, reliability and sustainability objectives.

**Key trends and influences**

Faster change and increasing uncertainty gives rise to long-term planning challenges. Analysis revealed five factors that are expected to strongly influence the future of electricity in New Zealand: climate change; the possibility of increasing economic, political and security uncertainty; new technologies that are disrupting the energy industry; population growth and urbanisation; and New Zealand’s unique combination of energy circumstances.

**Scenarios**

Many forces with the potential to affect New Zealand’s energy future remain uncertain. Some forces are global and outside New Zealand’s control. The world may have to navigate a future disrupted by climate change, a reversal of globalisation, or stalling technology development. Other forces are local, such as policy choices and investment decisions.

In *Te Mauri Hiko* we considered 4 demand scenarios and 4 supply scenarios to understand New Zealand’s possible energy futures. These gave us a perspective on a base case and alternatives, highlighting both common issues and challenges as well as variations and uncertainties. All of these scenarios highlight the critical role that Transpower and the national grid will continue to play as it evolves to include more two-way network flows, a broader set of assets and controls behind the meter and shifting focus from reliability to resilience. Grid electricity is complementary to distributed generation and distributed energy resources in ensuring reliable, affordable supply that can support the decarbonisation of the New Zealand economy.
Our choices
Transpower has some unique and distinguishing factors that inform the strategic choices that we make. These include our focus on New Zealand, the essential network infrastructure we operate under monopoly arrangements, our regulatory oversight and our nature as a state-owned enterprise.

Given these characteristics, we have distilled key choices that guide our strategy. In particular, we manage growth in our regulatory asset base, focus on our core business, define our preferred network boundaries, evolve our services and plan alongside our regulators.

Our strategic priorities
Based on our why, our context and our choices, we have developed five strategic priorities that respond to the challenges and opportunities. These strategic priorities are crucial to ensuring we sustain our value proposition and respond to the key trends and influences, harnessing the opportunities:

1. Play an active role in enabling New Zealand’s energy future.
2. Sustain our social licence to operate.
3. Match our infrastructure to need over time.
4. Evolve our services to meet customers’ needs.
5. Accelerate our organisational effectiveness.

Our Plans and Performance
Our five strategic priorities are operationalized through our key planning processes. These include the Business Plan, Integrated Transmission Plan and SO ICT Roadmap. These plans include both setting targets and identifying critical initiatives to advance and deliver on our strategic priorities. Their multi-year horizons ensure a balance of focus on the short, medium and long-term. We track and measure our performance through a mix of key performance indicators (KPIs) and key results indicators (KRIs), covering safety, relationships, customers, sustainability, financials and people.

Overall
Transpower is faced with a context of significant change over the coming years and decades. We describe an exciting energy future for New Zealand that requires Transpower to focus on 5 key strategic priorities. These will need to cascade into our detailed planning processes and performance monitoring and tracking.
This document outlines the situation, our work, and the issues we want to discuss with you. Your input sharpens our focus and helps progress our strategy to power Auckland’s future.

In November 2017, we will release some possible options we have developed for our future work. We will invite your engagement on these from November through to June 2018. We are eager to understand how you see these options affecting you, your work and future plans, and our communities across the Auckland region.

Next steps

Our Auckland Strategy is an iterative process with planned engagement through each phase. We will also be talking to our regulators about how these options fit within the regulatory framework we operate in. Some options and some proposals may require third party financial support, or variations to normal components considered in regulatory cost-benefit analysis.
Introduction

Our business operates at the very heart of New Zealand, powering our economy and way of life. At Transpower our enduring focus is that *we’re for New Zealand*. This underpins why we do what we do. Our *Te Mauri Hiko – Energy Futures* work examined the fast-changing context with climate change and climate policies, global economic and political uncertainty, accelerating adoption of new technologies, and New Zealand’s unique energy circumstances.
This document, *Transmission Tomorrow – Our Strategy*, builds on the context of *Te Mauri Hiko – Energy Futures*. It represents a significant update on our previous work on *Transmission Tomorrow*, as we recognize the amplified trends around climate change and electrification are likely to lead to a potential doubling of demand by 2050. Transpower has a significant role to play in enabling and responding to this energy future, which looks quite different from today, and builds on the "changing load" world contemplated in Transmission Tomorrow. We develop and refine our strategic priorities for long-term planning of the national grid in our role as grid owner, and management of the New Zealand power system in our role as system operator. The delivery and progress of these plans then drives our performance, measured against our six categories in which we track and measure success.

Figure 1: **Our Strategy and Performance Framework**

There are three main parts to this document:

**Part A: Our business today**  
– an exploration of our value proposition, key aspects of our licence to operate and key trends that influence our long-term planning.

**Part B: Our future**  
– Drawing on *Te Mauri Hiko*, we consider scenarios for the future and identify five strategic priorities.

**Part C: Conclusions, our plans and performance**  
– draws key conclusions from the preceding analysis and discusses how the five strategic priorities drive our planning and performance.
Part A: Our business today

In this section, we describe our business today and identify trends and developments that could materially impact our future plans. We describe:

- our value proposition – the characteristics that support demand for our services
- our licence to operate – focus areas for sustaining public confidence in our operations
- key trends – five current trends with the potential to impact on our future.
A1. **Our value proposition**

We have a viable business because:

- consumers choose to connect to the power system, and we successfully perform valuable functions as part of that system
- we connect generators to distribution companies and large users over long distances, providing open access and helping to balance supply and demand
- we enable low-cost (and sustainable) energy through a cost effective grid and power system.

We have identified key aspects of the value proposition for the electricity system and for our grid and system operator activities as well as the additional value that comes from the combination of these activities. These are the key aspects that underpin our business in the eyes of our customers and end users.

**Electricity system value proposition**

**Our power system is reliable**

Most customers benefit from a reliable supply of energy by being connected to the national electricity system. Across all customers on all distribution networks, average availability is 99.96%.\(^1\)

\(^1\) This figure includes both planned and unplanned outages and both transmission and distribution. Note that the figure for Waipa in the graph includes two large planned transmission maintenance outages in 2014.

This equates to, for an average household, less than 4 hours of non-supply per year and around two interruptions per year.

For customers who generate their own electricity, having a connection to the national grid provides a highly reliable backup. Customers who choose to disconnect entirely take their own responsibility for the reliability of their supply. These customers need to consider their own level of redundancy to build into their system and have to make their own arrangements for restoring supply if any components of their system fail.
Our power system is cost competitive

There are two lenses under which we consider the cost competitiveness, firstly global comparisons and secondly relative to local alternatives.

In terms of global comparison, the recent Electricity Price Review found that New Zealand’s average residential price was in the lower half of all OECD countries in 2016. Overall this suggests that the New Zealand electricity system is globally competitive.

Figure 3: Comparison of global residential electricity prices

It is also critical that our power system is cost effective relative to other local alternatives. One alternative is for fully independent electricity supply, for example based on solar panels and batteries. In order to provide reliability to get through cloudy days and winter this system would need to be significantly overbuilt which would currently make it much more expensive than the comparable reliability of grid provided electricity. The power system that we provide includes diversity and depth than enables reliable power supply and a broad range of pricing and market access.

We also focus on ensuring that Transpower’s services as grid owner and system operator are as efficient as possible to underpin a cost-effective power system. Comparisons here are challenging but we use independent reports and reviews to examine this.

Our power system provides options

For households and most businesses, connection provides access to practically unlimited peak capacity and total energy. Consumers can change their usage — by installing new appliances or changing how they run them — without having to worry about whether they have enough energy. People can use the power system to trade energy with others near and far and can access a wide range of retail and other services.
New Zealand also has the scope to be able to produce more renewable generation, supporting the decarbonisation of the New Zealand economy by displacing other forms of energy with a higher carbon footprint. Our grid has a key role to play in this.

More broadly, the power system has been built up over generations using assets and resources that can continue to power New Zealand for many generations to come.

**Grid value proposition**

New Zealand’s largest energy users connect directly to the grid to power their production, distribution networks across New Zealand connect to source energy for their customers and large generators connect to provide energy to consumers nationwide.

The national grid provides electrical transmission between 162 locations from Bluff to Marsden. Energy is received at 56 locations and energy is supplied to 132 of these locations. The key qualities that make grid connection attractive are:

- **Our grid is reliable** – across all points, we deliver ~99.9966% availability\(^4\) (18 minutes of non-supply per year). For most customers, we achieve, on average, under three interruptions per decade.\(^5\) This is around 10 times more reliable than experienced by a typical distribution customer and underpins modern lifestyles, production methods and continuing electrification.

- **Being grid connected is cost competitive** – grid-connected customers get full access to national energy wholesale markets. This includes access to wholesale prices through the grid network that can enable significant demand flexibility to be met in a relatively unconstrained way.

- **Our grid provides options** – the grid provides practically unlimited access to capacity and energy for most users and can usually absorb any generation that is surplus to a customer’s own needs. A customer with a new facility can size their connection to suit and, in most cases, will be able to achieve relatively unconstrained access to New Zealand’s lowest-cost generation sources. Connected customers can access retail and wholesale markets that provide diverse options for buying and selling energy and ancillary services.

- **Our grid is a sustainable choice** – the grid has been built up over generations and uses assets and provides access to resources that can continue to operate for many generations to come. The grid provides access to highly renewable, low-carbon energy and offers the potential to decarbonize the New Zealand economy by displacing other fuels with a higher carbon footprint.

- **Our grid balances electricity nationwide** – the grid enables regions to export surplus energy or gain access to the lowest-cost sources of energy produced in other regions, in real time, across seasons and into the future.

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3. Based on average carbon intensity for the year ended 30 June 2015. CO2-e refers to carbon dioxide equivalent.
4. Year to 30 June 2015.
5. Our performance target for important and generator sites with dual-circuit supply is three interruptions per decade.
System operator value proposition

We provide a single national system operator service, sitting alongside our grid business. In our role as system operator, we operate the high voltage power system and wholesale market to provide secure, economic supply of electricity to meet grid-delivered demand at all times.

These are the key qualities that make this service attractive:

- **We enable competitive access** — the system operator service provides bid-based access to the market. As well as supporting efficient use of resources to meet electricity demand, this enables competitive generation investment (and retirement).
- **We enable effective utilisation** — we continue to evolve our system operation tools, processes and expertise to enable the grid to be pushed hard within defined limits, getting the most value out of the available assets.
- **We ensure reliability** — the system operator service ensures supply continuously matches demand at all points across the grid and assists with ensuring longer-term supply of capacity and energy to meet demand.

Transpower provides both the system operator service and the grid owner service. The value proposition of providing these together is significantly beyond the value proposition of separately providing each service. This has been reviewed and validated in independent reviews and reports. In particular

- **We are cost effective** — the access to resources and expertise from our wider business enables us to leverage deep technical knowledge and to significantly reduce the cost of system operation. This includes significant cost savings from collocation and shared resources.
- **We leverage synergies** — as a single organisation providing grid and system operator services, Transpower is able to share information, pool resources and systems and integrate support services. These synergies were highlighted by the Ministerial Electricity Market Review (2009) which recommended “reject[ing] establishing an independent system operator for cost reasons and to avoid the potential loss of synergies between system operations and grid operations.”
- **We unlock expertise** — providing both services enables a level of expertise and foresight that can enable New Zealand’s energy future. This avoids duplicating capability to test thermal constraints, stability constraints and other transient studies for the purposes of planning outages and any other interactions with the market. As an integrated business Transpower can attract top talent and capability to advise on these topics as well as contributing to a broader discussion on New Zealand’s energy future.
A2. **Our social licence to operate**

Historically, much of our social licence to operate stems from being the only supplier of a nationally significant, essential service. We need to maintain this as consumers will increasingly have other choices.

This section identifies areas where we particularly need to work hard to sustain confidence in our conduct:

- **Safety** – our activities inherently present significant public and worker safety hazards.
- **Corridors** – we have assets on over 10,000 properties, and our network traverses 30,000 properties.
- **Environment** – our activities have significant visual and other environmental impacts.
- **Incumbency** – we are an established player, and our services have strong natural monopoly characteristics.
- **Security** – major interruptions or power crises can seriously harm confidence in our services.
- **Corporate scale** – we are a large commercial organisation in New Zealand terms with significant reach.
- **Social policy** – energy systems balance equity, security and sustainability objectives.

**Safety**

Operating safely is Transpower’s number one priority. Given the nature of electricity, our work and our assets, constant vigilance is required to ensure the safety of our people, service providers and the public. We already have a strong safety culture, and we aim for continual improvement towards zero harm.

It is critical that Transpower demonstrates this priority and maintains a strong reputation for safety. Factors like operating the grid closer to limits, adding capacity to substation sites that have been built around by urban development and performing maintenance near and above housing built under our lines all increase the challenge and its importance.

**Corridors**

Ninety-three percent of our 12,000 km network is over land for which our rights exist only by virtue of statute (the Electricity Act 1992), with most of the remainder through registered easements (7%) and property owned outright (0.2%). Relying on the Electricity Act to enter private property is not ideal, and we strive to maintain excellent relations with the landowners who host our assets.

The Electricity Act does not protect our network from inappropriate development near or beneath our assets and does not ensure that maintenance and upgrading activities will be permitted. In 2009, a National Policy Statement for Electricity Transmission was promulgated under the Resource Management Act 1991. It is driving a long process of councils updating their district plans to provide for the grid and its activities and protect the grid from third-party developments and is presently being reviewed. Given the strong future demand for electricity it is critical that corridors are protected and available for New Zealand’s energy future.
Environment

Our network is highly visible to local communities. Some groups believe our transmission assets reduce the visual appeal of an area, while other groups have concerns about electric and magnetic field (EMF) exposure. In addition to our work being highly visible, much of what we do has the potential for environmental impacts on land and waterways (through access tracks and substations) and neighbours (through substation noise).

The impacts of our activities are usually local, while their benefits are typically realised nationally or by a wider community and over generations. Historically, New Zealanders have been strongly influenced by national or community benefits in terms of their willingness to tolerate local impacts, but commercialisation of the sector together with societal shifts (such as urbanisation) have eroded this goodwill to some extent.

Incumbency

We are an established player in a sector that is experiencing change and new options. In addition, transmission services have strong natural monopoly characteristics, reinforced by statute in the case of our system operator service. Incumbents are often perceived as being complacent and having the system stacked in their favour, while monopolies are often subject to suspicion of overspending, underdelivering, conservatism and lack of responsiveness to customers. It is important that we operate with integrity and transparency.

The industry’s regulatory framework helps establish legitimacy to our costs, charges and service levels and brings a greater level of scrutiny than might otherwise exist.

For the grid area of our business, regulation also supports investment (by setting an allowable return and providing an enforceable pricing methodology) and provides processes for setting target service and expenditure levels, reliability planning standards and access arrangements. For the system operator area of our business, regulation provides governance arrangements for market operations, and hence the system operator service, and supports our funding.

Electricity transmission (at least the backbone grid) and system operation are likely to remain monopoly services, with largely the same characteristics that motivate existing regulatory arrangements. As such, our services are likely to remain regulated, and we can expect regulators to continue to focus on alignment between our commercial incentives and long-term national economic objectives.

Security

Large or prolonged power interruptions severely harm our reputation and credibility and shake confidence in New Zealand’s electricity infrastructure more broadly. The 31-hour blackout in the north-eastern United States in 2003, affecting 50 million people, was estimated to have cost $9 billion. The smaller, 6-hour Auckland outage of 2006 affecting 700,000 people was estimated to have cost $70 million, while the 2014 outage at the Penrose substation that affected 73,000 people over more than a day (in some cases) is estimated to have cost some $50–70 million.6

Power crises can also harm confidence in the sector as a whole. Management of New Zealand’s hydro resources through dry periods has often motivated community concern and political intervention, both before and since the electricity market was introduced in 1996.

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6 Electricity Authority estimate.
Corporate scale

With equity of about $1.6 billion and an asset base of $4.6 billion, Transpower is a large corporate citizen in New Zealand terms. Transpower employs around 780 people directly, equating to about 1.5 million hours of work a year. Much of our day-to-day work is undertaken by contractors and subcontractors who make up an additional 1.6 million hours of work per year. We therefore play a critical role in accessing, supporting and growing the capability and capacity needed in the broader industry to support New Zealand’s energy future.

In the year to June 2018, we paid over $548 million to suppliers and contractors, $107 million in salary and wages to our employees and $95 million in income tax. We also paid a dividend to our shareholder, the New Zealand Government, of $165 million.

Our large commercial footprint and community impact means we have to ensure we are a good, socially responsible corporate citizen.

Social policy

The electricity sector has transitioned over the past few decades from centrally funded and governed to commercially funded and governed, with a mix of ownership types and the introduction of the electricity market. Some of these developments were contentious, and there remain public concerns regarding affordability, reliability, environmental sustainability and the role of government.

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7 A market capitalisation of $1.6 billion is within the top 31 companies listed on New Zealand’s stock exchange (NZX) and similar to that of the telecommunications network company Chorus ($2 billion).
A3. Key influences

This section describes five key factors identified in *Te Mauri Hiko* with significant influence on the future of electricity in New Zealand, and hence our business:

- **Climate change** — increasing concerns will drive more aggressive policies to cut emissions
- **Economic, political and security uncertainty** — the potential for global political and social unrest can have a significant impact on an open, trade-based economy like New Zealand
- **Disruptive technologies** — technology offers significant opportunity, from electrification driving demand, to the ability to smooth demand through batteries and networks, through to new technology to manage and maintain the network.
- **Population growth and urbanisation** — New Zealand continues to experience strong population growth and a continued concentration in key urban areas which will drive demand and change its geography.
- **New Zealand’s unique energy circumstances** — the combination of a winter demand peak, an isolated grid and high existing renewable generation makes New Zealand unique and requires special attention.

Climate Change

*Increasing concerns over climate change will influence more aggressive policies in New Zealand to cut emissions.*

Climate change is a serious threat and already underway. It influences both the policy settings for energy in New Zealand and also the natural and social environment in which we operate.

We can expect increasing policy action worldwide to reduce greenhouse gas emissions.

We should expect more aggressive policies in New Zealand, with a focus on both further increasing the proportion of renewable generation and electrification to decarbonise other parts of the economy, including through the effects of the carbon price. There will also be increasing social pressure supporting the move to renewable energy sources. Compared to most countries, New Zealand has high (and increasing) use of renewable generation in the electricity sector. We also have significant undeveloped renewable resources. Likely targets of any domestic climate change policy would be the transport sector and industry process heat. These 2 sectors account for 72% of...
New Zealand’s energy demand (see Figure 4). Te Mauri Hiko outlines a base scenario in which decarbonising these sectors reduces overall greenhouse gas emissions by 40% (see Figure 5). This will require significantly more electricity and while New Zealand has significant further renewable generation resources that could be developed, this will require a supportive regulatory environment, the ability of the system to handle more intermittent supply sources and the robustness of the system against the effects of climate change.

Figure 5: Te Mauri Hiko highlights the potential for electrification to decarbonize the New Zealand economy

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Economic, political and security uncertainty

The world also faces the potential for growing economic, political and security uncertainty. This creates an environment of policy uncertainty and demand uncertainty in New Zealand with the risk of significant change to the regulatory framework.

In addition to climate challenges, the world also faces the potential for growing economic, political and security uncertainty. A future disrupted by any of these factors might experience materially less electricity demand driven by lower or negative economic and population growth, slower electrification of transport and process heat, and a shortage of resources available to transform the electricity system.

It is not the purpose of our strategy to express a particular view on the prospects for the global economy or any economic measures such as employment or growth. However, for the purpose of scenario development, a range of outcomes was considered, including the electricity and energy related impacts associated with a range of financial outcomes, including recessions and financial crises.

The same approach was taken in considering the energy implications of political and social tensions which, again, are likely to be affected by a range of environmental outcomes, including climate change and over-allocation of natural resources. These potential environmental outcomes will flow through into migration patterns. Protectionist policies aiming to increase self-sufficiency and to defend threatened industries may cause a reversal of globalisation and weaken ties between nations.
There is also the possibility that New Zealand experiences significant changes in regulations. This could be in response to perceived issues relating to the affordability, sustainability or reliability of electricity and could substantially change the industry landscape. The perception of possible regulatory change is itself a risk, as it could lead to investment uncertainties or delays.

**Disruptive Technologies**

*Changes in consumer technologies and their uptake will change the profile of demand, creating challenges and opportunities. At the same time networked digital devices in homes, businesses and networks offer potential for a more efficient supply chain.*

Developments in technology support the ability to transform and steer the world towards a brighter future. The impacts of technological developments are diverse and uncertain, especially over longer time frames, but we have identified 10 impacts that are important to the evolution of New Zealand’s energy system which are shown in Figure 6.

Figure 6: *Te Mauri Hiko identified 10 technologies disrupting the energy sector*
There is an increasing penetration of networked digital devices across the electricity supply chain, from generation through transmission, distribution, homes and businesses. This is steadily increasing the potential for efficiency gains through better information, remote interrogation and automated control.

The biggest potential gains are at the end-user and distribution network levels and at a whole-of-system level. In the near to medium term, the biggest potential is in moving energy use from peak times to off-peak times. In the long term, the greatest potential benefit is from harnessing distributed storage. Both of these developments present significant opportunities for consumers to gain more utility at lower cost. There is also potential for improvements in the way we operate the grid, manage our assets and operate the power system.

All of these new technologies and changes will need to be enabled and underpinned by changes in capability and capacity, not only in Transpower but across the sector more broadly.

**Population Growth and Urbanisation**

*New Zealand continues to become more urbanised with most of the population growth projected to occur in the upper North Island.*

Our base scenario forecasts in Te Mauri Hiko expect that, by 2050, another 1.3 million people will be living in New Zealand and that most (92%) of this increase will be across just five regions. It is expected that Auckland alone will account for over 60% of this growth.

Smaller centres are likely to face the challenge of sustaining infrastructure for comparatively small consumer numbers, while larger urban centres will need to accommodate new network connections and pressure on peak demand.

Growth in population and economic activity in Waikato, Bay of Plenty and Auckland reinforces the predominantly south-to-north flows that have driven development of the New Zealand power system. Urban growth increases the value of our corridors for other purposes and can be expected to increase friction over future reconductoring and new investments, especially in Auckland.

*Figure 7: Transpower’s grid backbone compared to projected population growth by 2045*
New Zealand’s circumstances relating to energy and electricity are globally unique – no other country in the world has the same energy characteristics as New Zealand.

New Zealand also has a stronger incentive to electrify than most other countries because most generation is, and can continue to be, from non-fossil fuel sources. Many other countries lack a strong endowment of low-emission generation potential and in those countries, electricity is much more likely to continue relying on generation using fossil fuels.

Where other countries will use solar matched to air conditioning to smooth seasonal peaks in electricity demand, New Zealand uses the greatest amount of electricity during winter. As solar will be significantly less effective in winter, but electrification will grow, the size of the winter supply shortage is expected to increase with the penetration of solar. New Zealand will continue to be exposed to winter and dry-year supply shortage risks because of continued reliance on existing hydro assets and the variability of solar and wind.

Finally, New Zealand is isolated from the rest of the world and therefore cannot rely on connection with foreign grids and collaborative load-sharing arrangements. These unique circumstances make it clear there will be need for a customised solution to meet New Zealand’s future demand for electricity. New Zealand must invest resources in innovation and adopt new technologies, as related to energy development – we do not have the luxury of time to follow the lead of others.
Part B: Our future focus

Part A identified our value proposition and the key influences that could impact our future. In this section, we develop scenarios to explore the wide range of possible futures, and lay out our choices to form five key strategic priorities.
B1. Future scenarios

Te Mauri Hiko - Energy Futures extensively investigates how the key influences could lead to a range of different scenarios. A base scenario is identified and other scenarios are developed to explore the implications of uncertainties.

The base case scenario includes a strong pathway to mitigating greenhouse gas emissions by electrifying transport and industrial heat systems and processes. The effects of climate change continue to increase – there are more droughts in the east, more rain in the west and more frequent severe weather events. In the demand base case, New Zealand’s electricity demand is estimated to more than double by 2050. The conclusion that New Zealand should plan for material demand growth may be surprising, as demand has been roughly flat for the last decade. The major difference between the last 10 years and the next 30 years will be significantly more electrification – the shift from energy sources such as coal, gas and oil to renewable electricity (see figure 8).

The base case energy supply scenario includes significant new utility generation from wind, geothermal and solar as well as the substantial growth of distributed solar PV generation. Daily demand peaks are met by an ample supply of batteries that are deployed alongside solar PV installations and EV battery capacity.

Figure 8: Te Mauri Hiko estimated electricity demand by sector

When developing strategic priorities and plans, Transpower also considers how outcomes might be altered if alternative scenarios emerge, and planning scenarios will be updated to reflect lessons from Te Mauri Hiko – Energy Futures. Three alternative demand and three alternative supply scenarios were developed to ensure a robust examination of a wide range of possible electricity futures. Figures 9 and 10 compare the 3 alternative supply scenarios with the base case, “Clean NZ”. Figures 11 and 12 compare the alternative demand scenarios to the base scenario, “NZ Inc.”.
What is the process heat in New Zealand (PHiNZ) initiative?

PHiNZ is a joint initiative of the Ministry of Business, Innovation and Employment (MBIE) and the Energy Efficiency and Conservation Authority (EECA).

PHiNZ aims to work with industry and other stakeholders to improve the energy efficiency of supplying and using process heat, and increase the amount of renewable energy used to supply process heat.

Process heat is the energy used as heat mainly by the industrial and commercial sectors for industrial processes, manufacturing, and warming spaces. This is often in the form of steam, hot water or hot gases. Around half of New Zealand's process heat demand is met by burning coal or natural gas.

What is process heat?

Process Heat – Overview

In 2016, the energy sector accounted for 39.8%, or 31.3 million tonnes, of New Zealand's gross greenhouse gas (GHG) emissions. Of this, supplying process heat accounted for around 8.3 million tonnes of carbon dioxide (CO$_2$) equivalent. As a result, process heat made up 28% of all energy-related GHG emissions and is the second largest source of energy-related emissions behind transport.

The process heat energy demand was 199 petajoules or around 35% of total energy used in New Zealand in 2016. Around half of the process heat demand was met by burning coal or natural gas, the remaining demand was largely met by electricity, bioenergy, using geothermal energy directly, and liquid fossil fuels (e.g. diesel).

Key facts:

• Process heat accounted for 35% of New Zealand's energy consumption.
• Around 55% of process heat demand was supplied by burning fossil fuels, mainly coal or natural gas.
• Around 68% of process heat was made using boiler systems.
Figure 9: Te Mauri Hiko supply scenarios

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Amount of distributed solar?</th>
<th>Peakers retired?</th>
<th>Main source of new utility generation (exc. geothermal)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clean NZ</td>
<td>Medium</td>
<td>Yes</td>
<td>Wind</td>
</tr>
<tr>
<td>Peakers Permitted</td>
<td>Medium</td>
<td>No</td>
<td>Wind</td>
</tr>
<tr>
<td>Mass Solar</td>
<td>High</td>
<td>Yes</td>
<td>Solar</td>
</tr>
<tr>
<td>Big South</td>
<td>Medium</td>
<td>Yes</td>
<td>Hydro</td>
</tr>
</tbody>
</table>

Excludes geothermal which is developed under all scenarios as the most attractive baseload generation source.

Figure 10: Te Mauri Hiko future electricity energy supply by scenario

Figure 11: Te Mauri Hiko demand scenarios

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Disruptive climate change avoided?</th>
<th>World remains integrated?</th>
<th>Future tech adopted?</th>
<th>NZ growth?</th>
</tr>
</thead>
<tbody>
<tr>
<td>NZ Inc</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Vibrant Haven</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓ ✓</td>
</tr>
<tr>
<td>Mobilise</td>
<td>✓</td>
<td>✓</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>Struggling Alone</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>× ×</td>
</tr>
</tbody>
</table>

Disruptive climate change is experienced when our way of life is challenged by the state of the environment. It could come about as a consequence of triggering a series of adverse climate feedback loops or tipping points that leads to “abrupt” climate change or as the result of steady temperature and impact growth.
Overall the scenarios highlight a range and variety of possibilities that enable Transpower to plan and to take account of uncertainty. All these scenarios serve to highlight the common characteristics that we need to grapple with – in the future the grid and power system operations will become more important and more complex. Growing demand from electrification, combined with disruptive technologies will enable decarbonisation and higher utilisation and resilience but will also require new systems and services. To enable this energy future, the capability and capacity needed by Transpower and across the broader energy sector will also need to change substantially.

We will see the mainstream commercialisation of distributed solar, electric vehicles and energy management systems.

**Our Trajectory from here**

The recent history of flat demand growth, the future of the Huntly Rankine units, potential transmission pricing methodology changes and climate change policy all create uncertainty for investors. This impacts on investment plans including large renewable resource development.

This all creates a climate of investment uncertainty for generators, so we can expect incremental just-in-time generation investment by a range of investors. The amount of intermittent generation, and its share of overall generation, is likely to increase over time. Accordingly, we will need to respond to a higher volume of smaller, more urgent generation connection and commissioning requests.

We will see the mainstream commercialisation of distributed solar, electric vehicles and energy management systems. These will start to significantly change the profile of demand and operation of the system with solar and batteries as well as other distributed energy resources enabling load to be partially flattened within a day but also adding additional intermittency. Despite growth in distributed supply, there will also be significant growth in grid energy demand. In the short and medium term we do not expect these batteries and distributed energy resources to be sufficient to flatten the daily or annual load curve, however it has an important potential to shave off peaks and it is critically important that it doesn’t accentuate existing peaks and troughs.

While our primary assets will still have multi-decade lives, our electricity system will increasingly include new technology assets as well with shorter renewal cycles (for example, 5 years for software, 10 years for telecommunications assets). As a result, there will be more remotely controllable devices and more electricity data available. This should increase scope to manage assets and operate the grid and distribution networks more efficiently.
Even with overall energy demand increasing significantly, changing demand profiles may collapse the niches in which some generation units operate.

We will need to consider the sequencing and outage headroom of large transmission investments – some regional investments may be avoidable given new transmission alternatives. However the scale of demand growth is likely to significantly exceed the opportunity for transmission alternatives and smoothing so additional transmission will likely be required. This is especially true with the changing nature and location of generation and demand.

Many of our existing assets will need significant investment in the next couple of decades. The assets of greatest concern are the conductors on some of our key 220 kV lines, many of which are built over urban areas. We need to sequence them carefully to manage our and our contractors’ resources, to avoid volatility in our transmission charges and to ensure sufficient capacity headroom to enable the grid outages required for the work.

Further future opportunities exist. New tools leveraging our data using learning algorithms such as artificial intelligence will increasingly play a role in managing the network as a complement to the distributed energy resources in individual homes and businesses. The increasing storage in the network could eventually create a network with extensive storage in which the grid’s role shifts. This would create new opportunities for resilience and redundancy.
B2. Our choices

Our future scenarios are useful in allowing us to make observations about the future need for grid services, but on their own, they are not particularly useful for grid planning because of the range of possible outcomes. As a set, they demonstrate the uncertainty we face in the future but do not guide us in how we should manage that uncertainty.

The scenarios in section B1 describe the shape of the world we foresee. This needs to be combined with our strategic posture or choices which is outlined here. In particular there are 5 key choices that guide our decisions: managing growth in our regulatory asset base; focusing on our core business; defining our preferred network boundaries; evolving our services; and planning alongside our regulators.

Manage growth in our regulatory asset base

We position investment in Transpower as generating relatively low-risk bond-type cash-flows. Key aspects of this are that we:

- emphasise return on investment (ROI) as our primary financial measure of success rather than annual profitability
- focus on ROI across a regulatory control period (RCP) and relative to the benchmark for the RCP
- set a dividend level at the outset of each RCP that is constant across the RCP and review when we have a clear picture of likely RCP outturn.

We will carefully manage any growth in our regulatory asset base (RAB) to hold our costs at a competitive level and to mitigate the risk of adverse regulatory change, noting that we should:

- manage grid assets on a sustainable basis. Where there is a long-term need we should plan for a long-term service through maintenance and upgrades so that we don’t store up mounting costs or performance problems for future decades
- look at new and emerging transmission alternatives to support the core grid. This includes the use of our demand response programme and consideration of batteries and distributed energy resources
- programme work that is heavily dependent on system headroom (e.g. reconductoring and any reconfiguration in Auckland) over a multi-decade timeframe – optimising the programme rather than individual projects. This may involve carrying out some works earlier than we would if we optimised on a project-by-project basis
- be willing to invest in economic projects that have offsetting benefits in terms of downward pressure on delivered energy costs – e.g. through reduced losses, access to lower-cost generation resources, or reduction in distribution network costs – or that grow demand for grid-supplied energy.

Our primary tools for managing RAB growth are:

- improving risk management sophistication. The majority of our investments are directed at mitigating risks (e.g. asset lifecycle management, delivering service performance, safety or environmental outcomes) so we will continue to grow our tools and capabilities in this area to ensure investment is well targeted and proportionate (for example through new systems to measure and manage asset health)
- improving our ability to make decisions in an uncertain environment. This includes ensuring that our decisions are informed by richer and more nuanced reading of our external environment, planning further ahead and more holistically and with greater stakeholder engagement, exploring preparatory steps or investments we can take to open up options for responding rapidly at a later date
• using a range of top-down planning tools to sense check, balance and refine the plans we develop using our traditional bottom-up planning tools

• focusing on efficiency gains. We continuously look for targeted and systematic changes that will reduce our costs and reduce pressure to invest, and we build value for money into our culture

• unlocking innovation across our business to help ensure cost-effective delivery of valued services. This includes innovation in the way we define the services we are delivering; the way we use service targets to drive expenditure; the technologies (including information and analysis) we use to get more value from our assets and to manage investment pressures; assets and systems we deploy to reduce costs and enhance services; commercial partnerships and agreements we use to manage risk, enhance efficiency and support electrification. We will look for strategic partnerships when considering transmission alternatives such as batteries.

To complement our long-term, low-risk outlook we will adopt a balanced stance towards regulatory incentives. Incentive frameworks provide an opportunity to modestly enhance returns if we produce socially desirable outcomes (lower costs, sustainable asset management, valued services). We should treat incentives as reinforcing our objectives rather than as objectives in their own right. We are more interested in the long-term health and credibility of the incentive frameworks than in short-term opportunities to make windfall gains.

Focus on our core business

The extent of change anticipated in coming years means there may be attractive new opportunities that could complement our existing businesses. We will put in place more structured arrangements for collating, assessing, ranking and executing business development opportunities. When assessing and ranking opportunities we will consider:

• Storage technologies beyond our network are a key driver of the Te Mauri Hiko — Energy Future — contributing to load flattening and enabling a future shift from reliability to resilience

• Exploring steps now to facilitate expansion of renewable energy supply in the future could be a low regrets path.

Storage and distributed energy resources create many opportunities that complement our existing core. Transmission deferral is only one of the benefits of installing batteries at end-premises (see Figure 13), and unlikely to be the most valuable benefit, other than in limited cases where a costly transmission investment is imminent. Opportunities in this space that complement our core business will require a clear understanding of the customer value proposition and potentially partnering with others.
Electrification is a key trend in *Te Mauri Hiko — Energy Futures* and may present further opportunities to complement our core business. Likewise, big data and new tools around automation and artificial intelligence also offer opportunities in our core business. We look to take advantage of these tools as they emerge.

Overall, we choose to focus on areas with a strong incremental ROI, and a sizeable opportunity where we can leverage unique Transpower capabilities, create positive impact on our core business and the value proposition of the New Zealand electricity system and attract and retain talent. We seek to avoid diverting key resource from the business, harming our social license to operate, our key relationships, or increasing the group cost of capital.

**Define our preferred network boundaries**

Over time we have been retracting, where appropriate, the boundary of the national grid by transferring assets to our customers. We will confirm the network we wish to hold long-term and work with customers on options to transfer other parts of the network to them over time. This allows a structured approach that is in the best interest of New Zealand. The portion of the network slated for long-term hold is likely to be in excess of 90% by value.

Asset transfers are broadly value neutral, so the key consideration for evaluating long-term hold is whether we are the best owner due to enduring cost, development and operational advantages.

On the cost view we seek to hold in the long term where we have fleet efficiencies (purchasing, parts and spares, expertise) Regional efficiencies (service provider contracting) and we seek to transfer where we do not have strong fleet efficiencies, customer does, or fleet efficiencies aren’t a strong consideration. We also seek to transfer where the customer can invest and maintain to lower cost standards (e.g. due to their access to outage mitigation options).
From a development perspective we seek to hold where we benefit from retaining network development options or retaining the assets may facilitate industry developments that enhance the power system (e.g. better enables new renewables) and to transfer where the customer gains useful network development options (e.g. ability to form ring route).

For an operational perspective we seek to hold where the customer lacks capability or capacity to safely and effectively operate the assets and to transfer where the customer has access to mitigation options (e.g. back feed or batteries).

Tools for managing towards transfer of assets that we do not wish to hold long-term are:

- managing capital expenditure (without compromising safety or short or long-term performance) – under current arrangements it is financially unattractive for distributor customers to acquire assets unless their book value reflects depreciation of at least 50%.
- commercial terms for customer-driven investments – as described earlier, we should ensure we are recovering full risk-adjusted costs for customer-driven investment in assets that are not long-term holds.
- service targets – points of service that we do not wish to hold long-term should not be managed towards higher service performance than the customer themselves would target
- write-down – in limited cases, where there is a clear national benefit, we should consider writing down the value of assets for transfer.
- aligning incentive arrangements – we will engage with the Commerce Commission on improving incentives for distributor acquisition of assets where there is a clear consumer benefit to distributor ownership, but current incentives do not support transfer.

When executing asset transfers we will also consider opportunities to strike a transfer price in excess of book value. Any gain on sale is recycled through nationwide interconnection charges, so the effect is to access and redistribute some of the incentive benefits otherwise captured by the acquiring distributor.

**Evolve our services**

We are shifting to a more services-driven approach across our business. Key features of this are:

- moving from a state where service outcomes emerge indirectly as an outcome of decisions we make, to a state where service targets inform the decisions we make across our business – including in relation to grid asset management, ICT asset management and system operations
- driving towards least-cost (i.e. least-expenditure) solutions for delivering target service outcomes
- taking a holistic view of how we deliver service outcomes – considering options across our business (e.g. grid build, grid services, operations and ICT) and across the supply chain (e.g. considering actions that distributors, end users, generators or others could take)
- continuously improving our services framework so that it covers attributes of our services that are valued by customers and end consumers strengthening our ability to bring a comprehensive “services story” into our transmission and system operator processes. This includes how we codify service outcomes and set targets, how we demonstrate service targets are driving our plans, and how we show the trade-off between service targets and prices for customers and end consumers
- improving the customer experience of working with Transpower and challenging ourselves to develop new service offerings.
A more services-driven approach will take time to fully develop and implement, but we will take an iterative approach – not waiting for perfection before moving in this direction. This involves accepting the services framework and targets we already have and taking opportunities to differentiate asset management based on our service targets. Our services-driven approach conflicts with elements of our regulatory arrangements built around traditional deterministic planning standards and investment-by-investment evaluation of net market benefits. We will adopt as service-based an approach as we can within current rules, while working to adapt rules to more consistently fit with the approach we believe is required for the future. We will work to establish a better link between service categories and transmission pricing.

**Plan alongside our regulators**

Our current regulatory approach is to be firm and direct but also open and principled in our dealings with the Commerce Commission, the Electricity Authority (EA) and policy makers. This reflects a view that focusing on ongoing business improvement under principled regulatory settings, rather than through regulatory opportunism, is the long term value maximising strategy for Transpower. This approach:

- recognises the Commerce Commission and EA represents consumers’ interests and accepts they have a legitimate role holding Transpower to account.
- aims to build trust, credibility and respect. This mitigates risks of the Commerce Commission or EA exercising discretion unfavourably. We aim for a respectful relationship where we both refrain from opportunism and gaming.
- encourages adherence to ‘the rules’ rather than relying on informal solutions. The Commerce Commission has greater scope than us to depart from the rules, so a rules-based approach provides us with protection.
B3. **Our Strategic Priorities**

In Section B1 we discussed scenarios for what our Energy Future may look like. In Section B2 we considered our choices and approach. In this section we describe our strategic priorities.

Given our expectation of electrification and our choices to carefully manage our assets, focus on our core, evolve our services and plan with our regulator, we can define the five key strategic priorities that we need to focus on. These are;

- Play an active role in enabling New Zealand’s energy future
- Sustain our Social License to operate
- Match our Infrastructure to need over time
- Evolve our services to meet customers’ needs
- Accelerate our organisational effectiveness.

**Strategic priority 1:**

**Play an active role in enabling New Zealand’s energy future**

Te Mauri Hiko describes a future vastly different from today, in which electricity decarbonises the economy while meeting and supporting economic and population growth.

In the near term, uncertainties in demand, carbon policy and emerging technology uptake are creating new challenges and opportunities for industry participants. Successful adaptation by distribution and generation businesses and successful accommodation of new technologies will be important in the medium term. Overall, there is tremendous and increasing opportunity for the sector to deliver more value at lower cost by leveraging information, automation and storage technologies across the supply chain. A system-wide view will be required to make the most of these developments, and we are well placed to contribute.

We will play an increasingly active role in working with the industry on the evolution of market and security-of-supply arrangements, and we will support successful integration of new consumer and industry technologies into the power system. We will continue to support effective design and operation of regulatory arrangements for our business and for distributors and look for new ways to work with our distributor customers on adapting to the changing environment.

**Strategic priority 2:**

**Sustain our social licence to operate**

As a large business with a positive long-term future, it is essential that we continue to focus on sustaining confidence in our operations. Sector transformation, new technology and increasing distributed generation may strain some of the existing goodwill that we enjoy, and we will need to adapt and respond to these changes.

We will sustain our focus on worker and public safety as a top priority, continue to deliver world-class grid security and reliability and continue our constructive and transparent approach to economic regulation.
We will also focus on the opportunities in environmental sustainability and decarbonisation. In our own business we continue to improve our environmental sustainability with a focus on reducing greenhouse gases, building climate change resilience and managing our impacts, and protecting heritage and culture. More broadly, we can support a low carbon future through enabling the shift in New Zealand’s energy use from oil and coal to highly renewable electricity.

It is critical that we retain the social licence from landowners, iwi and local communities as we will continue to need corridors for our transmission assets, especially with transmission growth. We believe in a collaborative approach and will actively engage with our stakeholders.

**Strategic priority 3:**

**Match our infrastructure to need over time**

Our grid and system operator services are both asset intensive. We manage hundreds of thousands of assets valued at more than $5 billion and requiring over $400 million of maintenance, replacement and enhancement expenditure each year. We need to become better at anticipating and rapidly responding to changes and asset management must be a core business competence. Examples of new challenges include accommodating rapid generation connection and commissioning, planning ahead for new renewables developments, and evolving our market systems. Given the anticipated growth in electricity demand as well as new technologies we need to ensure we are providing the right level of infrastructure at each moment in time which involves planning for growth, maintenance and renewal. This works best where we are able to take a total cost perspective (including the balance of opex and capex) and engage with communities to coordinate infrastructure and expectations, as we have done with our Auckland strategy.

We are focused on improved asset management to optimize our maintenance and renewal plans. This includes improving the way we collect and process information on the condition and criticality of our grid assets and feeding this information into an improved decision process. We are improving our works scheduling, grid outage management, procurement and management of suppliers. We are also revising our asset management processes for the information systems that support our system operator service.

Modern economies have a growing dependence on reliable electricity supply, and some communities struggle with affordability. Economic growth and increasing electrification will continue to support the need for grid-supplied electricity, so we need to continue to carefully manage our costs and evolve our services to remain as affordable as possible. This includes cost-reduction projects and business process improvements while ensuring we understand and manage asset risk profiles and enable growth. We will anticipate changes in the way New Zealanders use electricity, and we will adapt our grid and system operator services as these changes occur.
Strategic priority 4:

Evolve our services to meet customers’ needs

We provide an essential link in New Zealand’s electricity supply chain. The growth of distributed generation and storage technologies will affect the services demanded from the grid as well as the opportunities to deliver energy. This is a substantial challenge and opportunity and we need to substantially evolve our services to ensure we can deliver on this.

This involves reshaping the existing services we provide as well as supporting and developing new products and services. Our existing services need to be reshaped in a program of service excellence, bringing a stronger customer lens to what we do. This could include delivering faster connection services or providing a breadth of service quality/reliability options, such as a shorter asset life or lower standard of service. New products and services could include the support or development of new demand response services and platforms to enable energy delivery from batteries and other distributed energy resources. We will consider how we can leverage our insights and expertise to enable New Zealand’s energy future, through partnerships and new services with our customers.

Strategic priority 5:

Accelerate our organisational effectiveness

Te Mauri Hiko sets out a future that will demand a different set of skills and capabilities from what we have today. With our breadth of reach and connection in the industry we have a role to play in fostering and preparing capability and capacity to support New Zealand’s energy future. At the same time, we need to continue to focus on cost-effectiveness improvements, enable our transformation and deliver organisational development efforts.

We have redesigned our business operating models, revised our organisation structure and begun work to embed and improve our updated processes. We have work under way to enhance our risk management, continuing to improve our asset management and to further develop our people capabilities – increasing aspiration, improving engagement and lifting performance. We are reviewing and will improve our management systems for recruitment, induction, development and succession. Each year, we will shape operational plans and set individual targets that align with our revised priorities and higher aspirations.
Part C: Conclusions and our plans and performance

This section draws key conclusions from the preceding analysis and connects our 5 strategic priorities to our long-term plans and our performance measures.
C1. **Conclusions**

*Our services have enduring value...*

The most important conclusion is that Transpower’s grid and system operator services will continue to offer value for New Zealand into the foreseeable future. This means that we should continue to plan and operate on the basis that we have a long-term sustainable business providing valued services.

*...with growing demand unlocking decarbonisation...*

Electricity is an attractive, versatile and low-carbon fuel, and New Zealand has a growing population and economy. This means that, even with increasing energy efficiency and local, small-scale generation, we should plan for substantial, growth in demand for grid-supplied energy. Fortunately, new technologies such as home automation systems are beginning to increase the scope to flatten demand profiles and serve more energy without increasing capacity.

*...with distributed energy resources increasingly changing our grid and system operations...*

In our long-term horizon, battery or other storage technologies installed within homes and businesses, vehicles, distribution networks and grid substations could fundamentally alter our business by covering short-term imbalances in supply and demand. The resilience and flexibility of this wider system will require new tools and operations.

For our grid business, the widespread use of distributed energy resources such as batteries and home automation systems will de-peak demand curve which enables higher efficiency for grid assets. However, it could also make it harder to schedule outages. Eventually distributed resources may enable us to design and operate assets on the basis that outages will not interrupt supply if we can restore service before batteries are depleted. This shifts our priority from achieving very low failure rates to ensuring we can quickly restore supply, that is, from reliability to resilience.

*...meaning that engagement in shaping the future of the industry as a whole is of increasing importance to our business...*

Technologies, retail and distribution business models and consumer choices will change significantly in coming years, bringing new challenges and opportunities for our business. Delivering the best value for New Zealand from our assets will increasingly depend on information flows, technical standards and co-ordination mechanisms (including price signals) that span the entire sector. We need to work collaboratively and engage with the wider industry to shape these changes for the good of New Zealand.

*...and we will need to maintain our core focus on cost and risk while evolving new capabilities*

While we expect significant changes in the future, we will still be in the business of carefully and safely managing long-lived assets and complex systems that provide essential services to New Zealand communities. We will need to closely manage costs and become more innovative while sustaining a focus on good asset stewardship and risk management.
C2. **Our Plans**

The insights above reinforce our five strategic priorities distilled in Section B. These strategic priorities will require significant focus, attention and initiatives across the whole of Transpower. At the same time, they will be brought to life as part of our key business planning processes, in particular our Business Plan, Operating Plans, Integrated Transmission Plan, and SO ICT Roadmap.

Our Business Plan describes Transpower’s plans and their financial implications. The Business Plan is developed over 6 months starting in December and is signed off at the May Board meeting each year. The Business Plan details the revenue, spending, resourcing and investment for each part of our business and the financial targets we plan to meet for the next 10 years. As part of the Business Plan we also highlight a short-term focus initiative that is part of our agenda for each of our strategic priorities. Our Operating Plans are developed to support the Business Plan and there is generally one operating plan per division. These detail the financial targets for a business area as well as the key initiatives that relate to our strategic priorities that the business area is focused on. The Operating Plan has a single year focus and is refreshed each year.

Our Integrated Transmission Plan (ITP) describes the plans we have for our transmission network over the coming 15 years. The Integrated Transmission Plan is updated and published each year. Every fifth year it forms our proposal for a Regulatory Control Period. The ITP contains 3 key supporting documents – the Transmission Planning Report (TPR), Grid Outputs Report and Asset Management Plan (AMP) - and is the result of consultation and discussion. The Transmission Planning Report focuses on the changing capability of the grid - detailing our plans for transmission line and substation changes, upgrades, additions and enhancements over the coming 15 years. Our Grid Outputs Report outlines all of our service levels and incentives. The Asset Management Plan covers the renewal and refurbishment of our existing assets including our information systems as well as summarizing our future expansion plans.

Our SO ICT Roadmap describes our plans to develop the system operator service. This includes investing in systems to maintain resilience and investing in functional initiatives to maintain existing system operator service levels in the face of expected changes and evolution of the market.

Ultimately the success of our strategy is in the coordinated implementation of key initiatives that support and progress each priority, so it is these critical business planning processes that ensure we deliver on our strategy. All of these depend on capability – requiring that Transpower has the people, skills, systems and processes to deliver.

C3. **Our Performance**

The five strategic priorities that drive our planning will also ultimately drive our performance, so we have established key targets and areas to track. We aim to have a mix of forward and current indicators, allowing us to show trajectory as well as results. We have identified six key areas of success: People; Customers; Relationships; Safety; Sustainability; and Financials.

We track each of these areas each month and report on them in our annual report. All Transpower employees also have their own performance goals on a quarterly basis. These measures are set by their manager. Our strategy and performance framework is intended to provide line of sight for employees so that they can connect their own individual performance and success to Transpower’s performance and success.
C4. **Next steps**

In *Transmission Tomorrow – Our Strategy*, we have captured a view of our business today – exploring the value proposition for the power system and for our grid and system operator services and identifying aspects of our social licence to operate. Leveraging *Te Mauri Hiko*, we have examined external trends that may impact our business. In the face of considerable uncertainty, we have developed scenarios that point to the grid continuing to offer valuable services and the opportunity for New Zealand to decarbonize through electrification leading to substantial growth in electricity.

Following on from our choices we have identified five strategic priorities to ensure we shape and adapt to the future to deliver to our why. Each year, we will use the strategic priorities to drive our business planning processes. The priorities provide a framework for discussing strategic issues with our shareholder and for guiding and coordinating initiatives and our operating plan.

Our strategy also provides a resource that we will use to support engagement with our stakeholders, including central and local government, regulators, suppliers and service providers, industry partners and the landowners and communities that host our assets. We expect our strategy, built on the context of *Te Mauri Hiko*, to endure for several years unless there is a significant unforeseen change in our operating environment.