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FOREWORD

Our Integrated Transmission Plan (ITP) outlines our plan for New Zealand’s grid, and what we’re doing to ensure we’re providing a cost-effective transmission service to meet our customers’ changing needs.

We recently entered phase two of our transformation programme, helping us to operate more efficiently, innovatively and better prepare us to navigate the challenges and opportunities ahead, powering New Zealanders now and into the future.

Building on success of our first phase, we’ve achieved significant savings and introduced more effective, better ways of working and a comprehensive safety improvement programme to improve the behavioral safety of our workforce and increase focus on our critical risks.

Since launching Transmission Tomorrow in 2016, we’ve developed company-wide strategic priorities and a new, unified framework to put us well on our way to preparing our next regulatory control period submission to the Commerce Commission (RCP3) in 2018.

Currently we are refining our RCP3 plans to develop a clear view on how we can achieve our targets. This process will draw on the asset management and risk assessment capability we have been developing through our transformation programme.

This ITP document sits within our new ‘one framework’ which links our purpose and values to our strategies and plans, driving consistency and a ‘line of sight’ across all our activities, resulting in connected improvements.

Tu mai Aotearoa - we’re for New Zealand.

Alison Andrew
Chief Executive
September 2017
1. INTRODUCTION

The Integrated Transmission Plan (ITP) is a suite of documents that describe our plans for our regulated transmission business. It consists of this Narrative which provides an overview of our plans and a roadmap to the more detailed descriptions contained in the following three supporting documents:

- **The Asset Management Plan (AMP)** documents our management approach, processes, and investment requirements by asset class covering our grid, ICT and business support assets.
- **The Transmission Planning Report (TPR)** describes the enhancement and development investment requirements for the grid.
- **The Services Report** describes our output and performance objectives. The 2017 Services Report also includes the outcomes from our stakeholder engagement process to define the regulated measures for our next regulatory control period (RCP) known as RCP3.

The ITP document structure is illustrated in Figure 1.

This 2017 Narrative is for the period from 2018 to 2030. It provides an introduction and overview of the 2017 ITP. It explains who we are, our plans, business objectives, strategies, and approach to decision-making. It also provides a summary of our forecast expenditure and service outputs.

Building on the 2016 ITP, this year’s ITP reflects the journey we have been on and describes the progress we have made in many areas across the business.

It has been developed with the dual aim of communicating technically complex material in a manner that is clear and understandable, while also aligning with our regulatory reporting requirements. As such we hope you find it both informative and useful.

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1. It excludes, for example, services delivered by, and costs funded through our system operator service.
2. The AMP, TPR, Services Report and ITP Schedules are available at https://www.transpower.co.nz/industry/regulatory-control-periods/rcp2/updates
3. For readability, unless otherwise stated, the dates used in this document represent the financial year ending in June. For example, the financial year spanning July 2017 to June 2018 is simply referred to as 2018.
STRUCTURE OF THIS DOCUMENT

We outline who we are, our role within the electricity industry, and our key stakeholders in the next section. In Section 3 we provide an overview of our plans, showing how they have evolved, and how we currently view our revenue requirements out to 2025. Section 4 provides an overview of the services we provide, the changing environment in which we operate, and the strategic priorities we have identified in Transmission Tomorrow. Sections 5 and 6 provide more detail about our strategic and management frameworks, while Section 7 provides more detail on our expenditure plans. Section 8 provides an overview of our service performance. Regulatory compliance and detailed expenditure schedules are included as separate attachments to this document.

Figure 2 illustrates the structure of this document.

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The ITP Narrative

1. Introduction
2. Who We Are
3. Overview of Our Plans
4. Powering New Zealanders: Today and into the Future
5. Our Strategic Framework
6. Our Management Approach
7. Our Expenditure Forecast
8. Our Service Performance

Figure 2: Structure of the ITP Narrative
2. WHO WE ARE

We’re here for the benefit of New Zealanders. We own and operate the National Grid (the grid), an essential service to which nearly everyone is connected. The grid is the high voltage transmission network, which transports the lowest cost source of electricity generation to demand centres across New Zealand. Our purpose reflects this and emphasises safety, our drive to find smart solutions, and a long-term perspective.

We connect New Zealanders to their power system, through safe, smart solutions for today and tomorrow.

The services we provide are easy to take for granted. The power system is an integral part of modern life. Within regulatory and commercial parameters our role is to deliver and operate a safe, reliable, and cost-efficient transmission grid that meets the needs of New Zealanders. Figure 3 illustrates our place in New Zealand’s electricity chain.

Figure 3: New Zealand’s Electricity Chain
// WHO WE ARE

There are two key parts to our business: grid owner and system operator. As grid owner, we own and operate the grid. As the System Operator, we are responsible for managing the real-time power system and operating the wholesale electricity market. The ITP covers our role as grid owner. As such, it excludes services delivered by, and costs funded through our system operator service.

As depicted above, there are a number of stakeholders that we interact with in our roles as grid owner and system operator, including the Commerce Commission (the Commission) and Electricity Authority. We discuss our stakeholders further in this section.

OUR NETWORK

The grid extends from Kaikohe in the North Island to Bluff in the South Island. As grid owner, we manage approximately $5 billion of transmission assets, including $674 million of high-voltage direct current (HVDC) assets and $179 million of telecommunications assets.

We have 169 substations across the North and South Islands and 11,238 km (route length) of overhead transmission lines. We have 68 km of underground high-voltage alternating current (HVAC) cables and 114 km of submarine HVDC cables. Our information and communications technology assets include 1,355 km of fibre optic cables, 80 km of submarine fibre optic cables, 304 physical servers, 99 firewalls, 3 data centres and 978 routers and switches.

Figure 4: Our Network in 2017
OUR STRUCTURE

We are a State-Owned Enterprise, with an independent Board. Together with our service providers, we plan, design, maintain and operate the grid and provide corporate and enabling services such as Information and Communications Technology (ICT). We are structured into nine divisions with accountability for each component of our business operations, as illustrated in Figure 5 below.

[Diagram: Our Organisational Structure]

OUR STAKEHOLDERS

As part of the wider electricity chain, we work in co-ordination with generators, distribution companies, retailers and technology providers to power New Zealand homes and businesses. Accordingly, a key part of our business is effectively engaging with our stakeholders to ensure that we continue to provide reliable, cost-effective, and safe services. Below is an overview of our main external stakeholders.

- **Customers**: our ultimate customers are end-use electricity consumers across New Zealand (end users). These include residential, commercial and industrial end users that are served through the networks of 29 distribution companies (distributors). These 29 distributors together with 6 grid-connected generators and 11 mainly large industrials make up our directly connected customers.

- **Communities**: the management of our assets can have a significant impact on communities throughout New Zealand. It is important that we consult effectively with communities at an early stage when planning our activities so we can better understand potential impacts and mitigate these as far as practicable.

- **Landowners**: we often require access to private land to undertake work on our assets. Constructive relationships with landowners are therefore essential. We are committed to working transparently with landowners and occupiers when undertaking our activities.
// WHO WE ARE

- **Service Providers:** we outsource field maintenance, capital project construction and several other technical roles to a group of service providers. They are key stakeholders in the maintenance and development of the grid.

- **Our Regulators:** our services are mainly regulated by two bodies. The Commerce Commission regulates our transmission service revenues, works with us to set service measures, and governs revenue incentive arrangements. The Electricity Authority (EA) sets reliability standards and governs our pricing methodology and grid access framework. Additionally, we have other regulatory and legislative responsibilities which are enforced through bodies such as Worksafe, the Ministry of Business, Innovation and Employment, Local Authorities, and the Financial Markets Authority.

- **Our Shareholder:** we operate as a State-Owned Enterprise and are owned by the New Zealand Crown, which seeks confidence that financial returns will be commensurate with investment risk and reflect the preservation of business value. The Crown seeks to ensure that we are an effectively managed business with appropriate governance processes.

**OUR COMMITMENT TO ENGAGE**

Maintaining effective stakeholder relationships is an important part of who we are. We operate an essential service that nearly everyone is connected to, either directly (generators, distributors, and large users), or indirectly through distribution networks.

We regularly meet with our direct customers and stakeholders through industry workshops, face to face meetings and project work. We recognise our central role in an uncertain future, which means we are increasingly working with the wider industry on the evolution of the market, security-of-supply arrangements, and the integration of consumer and industry technologies. This includes, for example, leading the discussion around the announced exit of key thermal generation plants, the publishing of documents, providing commentary through the media, and engaging with the industry through face to face discussions.

Our grid is highly visible for surrounding landowners and communities. We recognise that we are heavily reliant on the good-will of landowners and communities for our social licence to operate our grid. It is important that we sustain landowner and community confidence through our work and our actions. All landowners are contacted as part of any work on their property, and we conduct surveys every two years to understand satisfaction levels.
3. OVERVIEW OF OUR PLANS

In this section we provide an overview of our plans and show how they have been evolving. We also provide an update on the sizing of our plans for our next regulatory period.

In the following chapters we provide more details about the services we provide, the challenging environment in which we operate, and the strategic and management frameworks we use to support our plans.

REGULATORY CYCLE

Before a Regulatory Control Period (RCP), we must submit an ITP to the Commission summarising our expected expenditure over the 10 years beginning at the start of the RCP. We are also required to provide annual updates.

This is our third update to the ITP we developed in 2013 to support our proposal on funding baselines[^4] for RCP2, which covers our expenditure from 2016 to 2020. In 2018 we will complete a new ITP to support our proposal for RCP3 funding baselines for expenditure from 2021 to 2025. We now have three years of RCP2 delivered or in delivery, and are scoping our work programme for the final two years of RCP2. We are well advanced through the first phase of sizing our funding baselines for RCP3, and are developing projections into RCPs 4 and 5, from 2026 to 2030 and 2031 to 2035, respectively.

<table>
<thead>
<tr>
<th></th>
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<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Delivered</td>
<td>Delivered</td>
<td>In Delivery</td>
<td>Scoping</td>
<td>Early Sizing</td>
<td>Projection</td>
<td>Projection</td>
<td></td>
</tr>
</tbody>
</table>

In 2018 we will complete the process of sizing RCP3 funding baselines and will have extended our programme scoping horizon into the early part of RCP3.

UPDATE ON RCP2 PLANS

The following table shows overall movement in our RCP2 plans.

<table>
<thead>
<tr>
<th>UPDATE</th>
<th>RCP2 OPEX</th>
<th>RCP2 BASE CAPEX</th>
<th>OTHER CAPEX[^1]</th>
</tr>
</thead>
<tbody>
<tr>
<td>$ million, 2016/17 prices</td>
<td>Commissioned value</td>
<td>Spend</td>
<td>(Spend)</td>
</tr>
<tr>
<td>2013 ITP (INITIAL PROPOSAL)</td>
<td>1378</td>
<td>1157</td>
<td>1251</td>
</tr>
<tr>
<td>FUNDING BASeline (RCP2 DETERMINATION)</td>
<td>1348</td>
<td>1099[^2]</td>
<td>1103</td>
</tr>
<tr>
<td>2015 ITP UPDATE</td>
<td>1340</td>
<td>1192</td>
<td>1217</td>
</tr>
<tr>
<td>2016 ITP UPDATE</td>
<td>1266</td>
<td>1105</td>
<td>1095</td>
</tr>
<tr>
<td>2017 ITP UPDATE</td>
<td>1270</td>
<td>1130</td>
<td>1196</td>
</tr>
<tr>
<td>MOVEMENT RELATIVE TO 2013</td>
<td>-8%</td>
<td>-2%</td>
<td>-4%</td>
</tr>
</tbody>
</table>

[^1]: This includes major projects and unapproved listed projects.
[^2]: This figure is derived from a figure approved in nominal terms. All other figures are modelled from source.

Table 1: Movement in our RCP2 Plan since Our Initial Proposal, $ million (2016/17 prices)

[^4]: We use the term ‘funding baselines’ to refer to Opex and Base Capex allowances. This terminology better reflects the operation of our regulatory arrangements (i.e. the allowances are incentive baselines rather than limits).
Across RCP2 we are now expecting our operating expenditure (Opex) will be 8% or more below our 2013 forecast. We have also significantly closed the gap between our 2013 forecast of capital expenditure (Capex) and our funding baseline. On a commissioned basis, our forecast is now materially in line with the funding baseline. Through our regulatory arrangements, these gains translate into downward pressure on transmission prices.

The table also shows Other Capex which relates to Major Capex Projects and unapproved listed projects. These are subject to individual approval by the Commission, and are not part of the funding baseline.

The following chart highlights overall movement in the commissioning profile for RCP2 Base Capex along with the associated funding baseline. The total Capex profile is shown by the grey line.

Figure 6: Base Replacement and Refurbishment and Base Enhancement and Development Capex compared to Funding Baseline, and Total Capex including Other Capex, $ million (2016/17 prices)

While our forecast for the period is materially in line with our funding baseline, work is weighted towards the latter part of the RCP because:

- several factors, discussed in our last ITP, impacted delivery in 2016
- grid enhancement investments have become weighted toward the end of the RCP.

Since preparing these figures the Commerce Commission has approved an $10 million uplift to our funding baseline associated with reconductoring lines between Wilton and Central Park in Wellington.
The following table highlights portfolios and projects with the largest movements relative to our 2016 ITP update, along with the RCP2 funding baseline.

<table>
<thead>
<tr>
<th>PROJECT or PORTFOLIO</th>
<th>RCP2 FUNDING BASELINE</th>
<th>2017 ITP VALUE</th>
<th>MOVEMENT FROM 2016 ITP</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$ million</td>
<td>$ million</td>
<td>$ million</td>
</tr>
<tr>
<td>BASE ENHANCEMENT AND DEVELOPMENT</td>
<td>100</td>
<td>75</td>
<td>20</td>
</tr>
<tr>
<td>TRANSFORMERS</td>
<td>84</td>
<td>100</td>
<td>11</td>
</tr>
<tr>
<td>SUBSTATION MANAGEMENT SYSTEMS</td>
<td>38</td>
<td>57</td>
<td>14</td>
</tr>
<tr>
<td>BUILDINGS AND GROUNDS</td>
<td>27</td>
<td>29</td>
<td>-7</td>
</tr>
<tr>
<td>ACS LOW VOLTAGE AC AND SUBSTATION EQUIPMENT</td>
<td>5</td>
<td>5</td>
<td>-2</td>
</tr>
<tr>
<td>ACS DISCONNECTORS &amp; EARTH SWITCHES</td>
<td>12</td>
<td>4</td>
<td>-4</td>
</tr>
</tbody>
</table>

Table 2: Portfolio Capex with the Largest Movement since 2016 ITP, $ million (2016/17 prices)

There are a mix of drivers for the changes above, which illustrate both the uncertainties in our work programme and the extent to which we actively refine and optimise our work programme within an RCP:

- **base enhancement and development (E&D):** E&D investments are those that increase the capability in the grid. Uncertainty in our operating environment (for example, changes in demand patterns, uptake of new technologies or new information about existing asset condition) can impact the timing or nature of our plans significantly in this area. We anticipate that several projects that were forecast during RCP2 may now be deferred until RCP3. However, some work has moved forward. Since last year’s ITP we have added plans for a new Stratford interconnector.

- **transformers:** as with other assets, we aim to actively manage our transformers to ensure they achieve a high level of reliability and operate safely at least life cycle cost. We have extended the life of some existing transformers through maintenance and investment, reducing the need for the replacement of transformers during the period. However, this has been offset by a higher cost per unit than was assumed in the funding baseline for those transformers that have required replacement.

- **substation management systems:** there has been an increase in planned upgrades to Substation Management Systems to implement new technology and replace aging control systems, resulting in increased resiliency and capability.

- **buildings and grounds:** there has been a delay in planned work at Penrose Substation to upgrade the old Control Building due to the discovery of asbestos. We are developing a programme of work to ensure we respond safely to the identification of asbestos across our buildings and assets.

- **low voltage ac and substation equipment:** a number of outdoor junction box replacements have been deferred to RCP3 following evaluation of their condition.
RCP2 UNCERTAINTIES, RISKS AND CONSTRAINTS

Across our investment programme, key uncertainties, risks and constraints include:

- optimising interventions – we have found that as we update condition information and improve our strategies, prioritisation processes and supporting tools (including asset health forecasting and risk analysis) our plans naturally evolve. This drives reprioritisation across asset classes and re-optimisation between Capex and Opex interventions. This has been particularly evident in our transformer programme.

- scoping unique and innovative projects – some types of investment are inherently bespoke (such as grid enhancement, ICT and reconductoring projects) and therefore have high scope and cost uncertainty compared to mature volumetric programmes. Other programmes are new or novel (such as substation management systems) such that scope and costing take time to stabilise.

- maturing cost estimation – our enterprise cost estimation has matured considerably since 2013 and will continue to improve. We have enhanced our cost estimation function and are steadily improving consistency and reliability of inputs (e.g. capture of cost data from completed projects) and application (e.g. use of centralised cost information across our planning activities). Our RCP2 proposal under-estimated unit costs for several programmes (including outdoor to indoor conversions and grillages).

- cost escalation – some of our key input costs are relatively uncertain and can have a material impact on overall costs. Our funding baselines are adjusted for actual movement in CPI and foreign exchange rates, but not for other forecast escalators such as construction labour, civil works, steel and aluminium.

- industry developments – grid development is driven by opportunities or requirements to adapt the transmission network to changing demand or generation. This programme is sensitive to individual decisions (e.g. to retire generation or expand production), broader trends driving demand (as described in Transmission Tomorrow) and the outcome of detailed power system modelling and option analysis.

- asset data – our knowledge of our assets, particularly relating to their condition and failure rates is evolving. As data gaps are filled and data quality improves it may lead to changes in our plans. This is a key focus area to support our asset management and risk frameworks.

- planning and delivery pipeline – there is a complex series of interconnected processes that lead from an identified need (or opportunity) to a delivered project. We have made considerable improvements to our planning and delivery pipeline that support closer alignment between scoped plans and delivered works.

- planning and delivery constraints – key constraints on delivery can include scarce internal resources (such as power system planners and protection engineers), scarce external resources (such as protection technicians), overall capacity (in our business, service providers and key suppliers), procurement of key inputs (such as transformers), network outage availability, land access (including planning consents) and weather conditions.

SERVICE OUTCOMES

The following table summarises network performance to date.

<table>
<thead>
<tr>
<th>PERFORMANCE ELEMENT</th>
<th>INCENTIVE OUTCOME ($ million)</th>
<th>Min/Max</th>
<th>2016</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interruptions</td>
<td></td>
<td>-3.93/3.93</td>
<td>3.93</td>
<td>0.03</td>
</tr>
<tr>
<td>Restoration</td>
<td></td>
<td>-4.06/4.06</td>
<td>2.64</td>
<td>-0.15</td>
</tr>
<tr>
<td>HVDC Availability</td>
<td></td>
<td>-1/1</td>
<td>0.40</td>
<td>0.14</td>
</tr>
<tr>
<td>HVAC Availability (Key Circuits)</td>
<td></td>
<td>-1/1</td>
<td>-1.0</td>
<td>-1.0</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>-9.99/9.99</td>
<td>5.97</td>
<td>-0.97</td>
</tr>
</tbody>
</table>

Table 3: Service Outcomes for 2016 and 2017, $ million (nominal)
Network performance is inherently volatile, and challenging to predict due to the influence of external factors such as weather conditions, the timing of rare events (for example, concurrent faults in highly reliable equipment) and the influence of asset condition, network configuration and contingency arrangements. 2016 was a relatively benign year, while 2017 presented more challenging conditions. Notable events from 2017 include:

- we experienced three interruptions to high priority sites (against an incentive target of two), including an interruption at Bromley due to wildfires in the Port Hills near Christchurch. We restored supply rapidly for these events, outperforming our restoration targets.
- we experienced 20 interruptions at generator sites (against an incentive collar of 16). Four of these events were due to heavy snowstorms in the Hawkes Bay, and five were due to birds persistently nesting in equipment serving the Maraetai hydro stations on the Waikato River. We are implementing mitigations for both risks.

For availability of HVAC, the target for RCP2 has proven difficult to meet. To respond, we have worked to an internal target that better balances need for HVAC availability with the need for lines to be de-energised for planned maintenance. We will refine this target for RCP3 so that it better reflects this balance.

For HVDC, we have exceeded the availability target. However, performance has been affected by our recent decision to suspend live line work. This decision, if confirmed, may have some effect on our ability in future to achieve our availability targets.

Further information about our service performances measures and targets is provided in Section 8.

**PRICE PATH UPDATE**

The following chart compares the transmission revenue paths set in 2014 with our latest update. We present HVAC and HVDC paths, because HVDC costs are recovered separately. We update our revenue paths annually to ensure we do not over or under-recover relative to the cost we incur.

![Price Path HVAC and HVDC](image)

*Figure 7: Price Paths for HVAC and HVDC Assets, $ million (nominal)*

We expect the current pricing year (which started on 1 April 2017) is likely to be the peak for HVAC charges across RCP2. Our HVAC revenue path is lower overall than originally forecast, reflecting changes in the timing of grid investment and correction of a minor error in the calculation of Opex incentive credits.

Our HVDC revenue path is tracking slightly higher than originally forecast, reflecting the final determination of incentive outcomes from the end of RCP1.
OVERVIEW OF OUR PLANS

RCP3 SIZING UPDATE

We are part-way through the process of sizing RCP3 funding baselines for our December 2018 proposal. This ITP reflects the substantial progress we have made at enhancing the way we plan, and captures the initial application of new decision frameworks to around 60% (by value) of our asset classes.

Table 4 provides an overview of our key planning stages for RCP3.

<table>
<thead>
<tr>
<th>Timeframe</th>
<th>Phase</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>To December 2017</td>
<td>Completing initial preparation of RCP3 plans, including updating asset strategies and applying asset planning tools.</td>
<td>Base version of the RCP3 plan.</td>
</tr>
<tr>
<td>To April 2018</td>
<td>Plan review to produce a lower-cost plan and clear information on trade-offs between spending profile and outputs. Optimising plan and testing deliverability.</td>
<td>Second RCP3 plan with lower costs and clear trade-offs.</td>
</tr>
<tr>
<td>To June 2018</td>
<td>Production of the final version of the plan that balances outputs and spending.</td>
<td>Final version of the RCP3 plan.</td>
</tr>
<tr>
<td>To November 2018</td>
<td>Completing quality assurance, documentation and pre-submission engagement.</td>
<td>Compelling, compliant and well supported proposal.</td>
</tr>
<tr>
<td>December 2018</td>
<td>Submit Proposal</td>
<td></td>
</tr>
</tbody>
</table>

Table 5: Status of the Sizing Process for our HVAC Network

By December 2017 we will have developed a good first view of the level of expenditure needed in RCP3 to cost-effectively sustain our services. By June 2018 we aim to have tested options for varying overall expenditure to target differing performance outcomes. This RCP sizing process will be new and should provide improved insight for stakeholders into the trade-offs between transmission price path and investment outcomes and risk.

As an enabling step for the sizing process described above, we have developed a method for smoothing transmission revenues across RCP3. We intend to consult on this later in 2017 and implementation, if supported by stakeholders, will rely on the Commerce Commission accepting the methodology and implementing smoothing in our price path rules for RCP3.

We are still refining our bottom up view of RCP3, reflected in the 2017 AMP. A substantial amount of work has occurred over the past year in developing new planning frameworks, tools and strategies to support our plan. As mentioned, approximately 60% of our grid asset expenditure has been planned using our new processes. We are now working on applying it to the remaining expenditure which will lead to further refinement of our plan. Further refinement will also occur as we consider key uncertainties, risks and constraints, similar to those listed earlier in relation to RCP2. This also applies to RCP4, which to date has been sized at a higher level.

As we develop our first view of RCP3 funding baselines, we have been considering both the level of investment suggested by our initial bottom-up planning (reflected in the AMP) and a top-down view of a possible lower level of investment. The status of the sizing process for our HVAC network is summarised below.
## Table 5: Status of the Sizing Process for our HVAC Network

The following chart presents our current forecast of the target HVAC price path, based on the target HVAC Capex level above, and using three categories:

- underlying – excludes major projects and large reconductoring (listed) projects
- replenishment – excludes major projects only
- full – includes all investment.
// OVERVIEW OF OUR PLANS

The price path ultimately set for RCP3 will be sensitive to the outcome of our sizing process, allowable return, regulatory reset, RCP2 performance, and Major Capex programme.

For completeness, the following chart presents our current forecast of HVDC price path\(^6\).

Half of the decrease between RCP2 and RCP3 is due to completion of a long-running process of recovering historic under-payments. The balance is due to a lower allowable return, Opex savings, asset lifecycle\(^7\) and other factors.

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\(^6\) Our base case forecast does not include any Major Capex or Listed Projects for our HVDC link, so we have not presented underlying or replenishment price paths.

\(^7\) There is relatively low diversity in the age profile of HVDC assets and a high proportion of the value of the assets relates to electronics and other shorter lived assets. This results in a more distinct saw tooth revenue profile.
### 2017/18 FOCUS AREAS

Each year we set several company-wide company focus areas that advance our roadmap for implementing Transmission Tomorrow, which we discuss more in the following section. Our 2018 company focus areas are summarised below.

<table>
<thead>
<tr>
<th>Strategic priority</th>
<th>2018 Company focus area</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce costs and evolve services</td>
<td>Roadmap to service excellence</td>
<td>Develop a roadmap to understand what “service excellence” means for Transpower and what we need to do to become a more services-driven business. This will set the foundation for a step-change in service excellence.</td>
</tr>
</tbody>
</table>
| Active role in shaping industry future   | Network pricing                 | We are a key player alongside the Electricity Authority in three network pricing reforms:  
  - Transmission pricing  
  - Distributed generation  
  - Wholesale electricity (real-time) |
| Social licence to operate                | Health and safety framework     | Fresh look at our health safety framework and processes.                                                                                     |
| Matching build to need                   | Auckland strategy               | Dedicated cross-functional team looking at how we maintain our network and support Auckland’s growth aspirations alongside other infrastructure providers. |
| Asset management                         | RCP3 proposal                   | Sizing our RCP3 funding baselines and quality targets and engaging stakeholders in preparation for our December 2018 reset proposal.       |
| Organisational effectiveness             | Second phase of transformation  | Programme of work to better prepare ourselves for the years ahead. Pulls together service excellence and safety framework (above) with an efficiency programme and work on long-term contracting strategy, technology and innovation and culture. |

Table 6: Company Focus Areas for 2018
4. POWERING NEW ZEALANDERS: TODAY AND INTO THE FUTURE

Like any business we need to develop a realistic view of the future to ensure we continue to provide reliable, cost effective, and safe services that meet our customers’ changing needs. We face a rapidly changing environment as new technologies emerge, business models evolve, and our direct customers and end use consumers find new and innovative ways to realise the benefits these changes bring. This means that the benefits provided by being connected to the grid will change over time. In 2016, we published Transmission Tomorrow which discussed the transition from services that are centred on reliability through to services supporting “behind the grid” capability.

Within this context, this section explains the services we provide today, and how we see these services transitioning over time.

POWERING NEW ZEALAND TODAY

Our grid enables all New Zealanders to enjoy reliable access from the lowest cost sources of electricity. Our Services Framework describes the services we provide today. These are:

1. **Reliable Grid.** We look to keep interruptions to a very low level, and to restore supply quickly when there is an interruption.
2. **Grid Availability.** We keep sufficient grid capacity and resilience available to allow New Zealand’s lowest cost sources of supply to be used to meet demand.
3. **Event Communications.** When supply is interrupted, we need to communicate well with our customers so we can achieve the best outcomes for end users.
4. **Grid Access.** We work with our customers to connect their assets to the grid, and to plan and deliver changes to their grid connection.
5. **Site Access.** We need to safely host the equipment of our customers on our sites and provide for safe access to that equipment when required.
6. **Information Provision.** We provide planning and other information to assist connected parties in making informed investment decisions.

Our Services Report provides more detail about our service framework and our current RCP2 service performance measures. A summary of our performance against key measures is provided in Section 8.

Currently, we are in the process of developing new performance measures for RCP3. Customer and stakeholder feedback is an important part of this process and we have appreciated the feedback we have received from our customers and stakeholders over the last 12 months through formal submissions, focus group meetings, and industry and regional workshops. In response to this feedback we believe there is an opportunity to refine some existing measures, to remove measures that have received little support, and to develop some new measures, such as an “adherence to the outage plan” measure, to better measure our performance. This is discussed further in our Services Report.
POWERING NEW ZEALAND INTO THE FUTURE

In 2016, we published Transmission Tomorrow to provide a perspective on what the emergence of new and innovative technologies and new business models might mean for us and for the wider electricity industry.

The change in such things as climate change policy, distributed storage, grid technologies, urbanisation, and electrification all contribute to the changing environment. The speed in the development of these areas will drive the pace of changes in the industry overall. Considering how these might evolve and combine resulted in us considering the potential changes within three sequential states:

1. **Evolving generation.** After years of steady demand growth and investment in generation and grid capacity, we are in a period of flat demand and changeover in the mix of generation.

2. **Changing load (2020+).** Maturing and more mainstream adoption of emerging technologies such as electric vehicles, solar photovoltaics, home and network batteries, and automation systems for homes and businesses with powerful energy management capabilities.

3. **Extensive storage.** Eventually, perhaps around 2040, there will be a game changing transition when the capability emerges to fully leverage batteries (or other storage systems) that have made their way into our homes, businesses, vehicles, and distribution networks. This ‘behind the grid’ capability begins to substitute for reliability of the grid. In this state, loss of grid supply doesn’t impact end users, provided we can restore supply before distributed storage runs too low.

Each of these states provides its own set of challenges for us to ensure we continue to provide the services that our customers seek. At a fundamental level, our business will change over time from providing 24/7 reliability and real-time balancing to providing a resilient battery-charging service. It indicates that our priority will change from achieving very low failure rates in our network to ensuring we can quickly restore supply. This essentially moves the transmission service from reliability to resilience.

A key take-out from Transmission Tomorrow, and from our experience, is that while the power system of tomorrow will look very different from the power system of today, we still have a vital role to play in enabling and adapting to the operating environment changes. 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, households and businesses. Accordingly, we have a continual focus on reducing costs and becoming more innovative while sustaining a focus on good asset stewardship and risk management. We see there are six key strategic priorities that are required to face the challenges ahead. These are:

1. Reduce costs and evolve our services to remain competitive.

2. Play an active role in shaping the industry’s future.

3. Sustain our social licence to operate.

4. Match our infrastructure build to need over time.

5. Improve our asset management.

6. Develop our organisational effectiveness.

The strategic priorities identified in Transmission Tomorrow have been integrated into our approach to conducting business, and the processes we use to evolve and improve our delivery of services to our customers.

For more information about our perspective on the evolution in the environment and the impact that this may have on the industry please refer to our Transmission Tomorrow publication.

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8  https://www.transpower.co.nz/resources/transmission-tomorrow-2016-0
5. OUR STRATEGIC FRAMEWORK

Our business is guided by our purpose and strategic priorities, described in Transmission Tomorrow, our suite of corporate strategy documents that link our strategic priorities to our day to day activities, and our annual planning cycle. How we go about our business is underpinned by our behaviours. Figure 10 illustrates this structure.

Figure 10: Our Strategic Framework

There are several givens that establish the context for our activities. These are that we are a State-Owned Enterprise, are New Zealand focused, operate essential network infrastructure within an evolving landscape, and operate under regulatory oversight.

Keeping these givens in perspective sets the context for the choices that we make in aligning our activities with our purpose and the strategic priorities identified in Transmission Tomorrow. Beneath Transmission Tomorrow sits our corporate strategy suite. The strategy suite consists of our overarching Corporate Strategy and several functional strategies that guide us. These are our:

- Grid Strategy
- ICT Strategy
- Customer Strategy
- People Strategy.

Together these ensure that the strategic priorities from Transmission Tomorrow are reflected through to the business. Each of these strategies is summarised below.
Our Grid Strategy
Our grid strategy is encapsulated within our Grid Business Strategic Plan that provides a linkage between Transmission Tomorrow, our Corporate Strategy, and a suite of Grid Asset Management documents. Our grid strategy provides direction on how we ensure that the grid provides reliable, cost effective, and safe electricity transmission services for all New Zealanders. It establishes five key principles that we apply when building, developing, and maintaining the grid. The five key principles are:

<table>
<thead>
<tr>
<th>Safety</th>
<th>As our foremost priority, we will continue to prioritise the safety of our staff, service providers, and the public</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service Performance</td>
<td>We are refining our performance measures to ensure they remain relevant to stakeholders, and setting targets for continuing improvement in asset and grid performance</td>
</tr>
<tr>
<td>Cost Performance</td>
<td>We are continuously challenging ourselves to improve our cost performance through efficiency initiatives and optimisation, allowing us to deliver our service targets at lower cost</td>
</tr>
<tr>
<td>Customers and Stakeholders</td>
<td>We will continue to strengthen our relationships with communities across New Zealand, operate safely and effectively on private and public land, and reduce our impact on the environment</td>
</tr>
<tr>
<td>Asset Management Capability</td>
<td>We will continue to develop our skills, knowledge, competencies, systems and tools to ensure we achieve our safety, service performance, and cost reduction objectives. Information is a strategic asset which is actively managed.</td>
</tr>
</tbody>
</table>

Table 7: Key Principles of Our Grid Strategy

These principles are reflected through the approach we take to managing our assets, discussed further in Section 6.

Our ICT Strategy
Our ICT Strategy provides the connection between Transmission Tomorrow, our Corporate Strategy, and our ICT business processes and assets. To achieve this, we have established five ICT strategic objectives. These are:

<table>
<thead>
<tr>
<th>Business focused solutions</th>
<th>Deliver cost effective, fit for purpose ICT systems and services aligned to Transpower’s business objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reliability and resilience</td>
<td>Design, maintain and protect critical system reliability and resilience through separation from enterprise systems</td>
</tr>
<tr>
<td>Strategic sourcing</td>
<td>Manage strategic outsource relationships for scale and deep expertise</td>
</tr>
<tr>
<td>Information management</td>
<td>Increase the value and knowledge obtained from our information assets</td>
</tr>
<tr>
<td>Security</td>
<td>Deliver operational integrity through a risk based approach to security management</td>
</tr>
</tbody>
</table>

Table 8: Our ICT Strategic Objectives

The rate of technology change means that we need to continually develop and refine our ICT capability so we can adapt and respond to changes in our business requirements and to efficiently use new and emerging technologies. As a result, our approach for delivering our strategic objectives within the business environment is through systematic capability planning and lifecycle management. The capability plans and lifecycle management supports a balanced investment approach that allows us to continue to support our current systems, improve our business, and introduce leading investments in parallel.
Our Customer Strategy

Our direct customers represent the connection between the grid and end users, the people and businesses that use electricity. Continuing to develop and improve our customer service capability orientation is a significant priority for us. Our Customer Strategy establishes key principles and strategic objectives for our interaction with our direct customers. The strategy describes what we are doing and going to do, and provides the basis for maturing our relationships. The application of the strategic objectives is aligned with our performance targets, and they reflect the strategic priorities set out in Transmission Tomorrow. The strategic objectives are:

<table>
<thead>
<tr>
<th>Delivering services that meet customer and Transpower needs</th>
<th>Defining and delivering on agreed service levels with our customers, and within the specified regulatory requirements. This involves developing an efficient balance between risk and cost, ensuring predictable outcomes for our customers and providing information that supports informed decision making.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delivering value for money</td>
<td>Seeking opportunities to add value to customers, through simplifying systems and processes, improving our works and outage planning, providing quality technical information and good communications, and enabling development through appropriate investments.</td>
</tr>
<tr>
<td>Moving relationships with customers to partnerships</td>
<td>Engaging with our customers to understand their needs, drivers and priorities, and theirs. This involves being clear in our communications with customers, defining and agreeing on our respective obligations, having a responsive service culture underpinned by a commercial focus, seeking opportunities that deliver efficiencies to both our customers and ourselves, and demonstrating professionalism and objectivity in our actions.</td>
</tr>
<tr>
<td>Planning for tomorrow</td>
<td>Understanding the needs of customers and consumers as well as the evolution of technology, regulatory and behavioural trends in New Zealand and internationally.</td>
</tr>
</tbody>
</table>

Table 9: Our Customer Strategic Objectives

Our People Strategy

Our People Strategy establishes our key principles and strategic objectives for managing our workforce capability. It has been informed by global HR trends, as well as global and national urbanisation trends. Our People Strategy objectives are:

<table>
<thead>
<tr>
<th>Invest in and harness diversity and inclusion</th>
<th>We will harness diversity and drive inclusive behaviours with the objective of increasing organisational performance through increased capability, and engagement.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adapt and build strategic capabilities</td>
<td>We will define, source, and develop the most important strategic skills required to deliver on our business objectives.</td>
</tr>
<tr>
<td>Build enduring leadership capability</td>
<td>We will build our leadership capability to retain talent and ensure we continue to have a sustainable business.</td>
</tr>
<tr>
<td>Use workforce data and insights to inform our people strategies and to source and develop the best</td>
<td>We will use workforce data, including social data, to drive better workforce planning, including talent mapping through predictive modelling, talent sourcing, and organisational development.</td>
</tr>
<tr>
<td>Cultivate an environment where people are highly engaged and exhibit our desired behaviours</td>
<td>We will continue to build a highly engaged workforce to drive outcomes such as productivity, safety, innovation, employee retention, customer loyalty and satisfaction.</td>
</tr>
</tbody>
</table>

Table 10: Our People Strategic Objectives

It is envisaged that this strategy will act as the intellectual scaffolding and roadmap to shape our direction, within which we will develop specific people capability and initiatives.
6. OUR MANAGEMENT APPROACH

We have structured the business in alignment with the key functions we undertake, to ensure there is accountability and delivery of results. In doing so we strive to encourage a collaborative environment and clarity of our purpose. Below we describe each of our primary functional areas, management of grid assets, ICT assets, and our business support and corporate functions. It also includes a summary of how we manage risk and our corporate planning processes.

GRID ASSET MANAGEMENT

In July 2014, we became one of the first electricity companies in New Zealand to achieve certification against the international asset management specification PAS 55. In 2015, PAS 55 was withdrawn and replaced with the ISO 55000 standard. We are currently moving towards the application of ISO 55000 principles and standards within our business.

Our approach to asset management is established within a suite of grid-related asset management documents that provide alignment between our strategic direction and our ‘day-to-day’ processes and activities. This structure is set out in our asset management system which provides direction for the main activities of our grid business. Our asset management documents (as described in the AMP) cover both replacement and renewal activities for each grid asset class, and the enhancement and development work which is described in detail within the TPR.

Figure 11 illustrates the key elements of this system. It shows the alignment between business drivers, our strategies and plans, the need for feedback and continuous improvement, and our focus on delivering customer value.
// OUR MANAGEMENT APPROACH

Our Grid Business Strategic Plan describes our asset management system, and five key principles that link Transmission Tomorrow through to our asset class strategies and plans. The application of these strategic principles establishes specific requirements for our management approach of each asset portfolio and network development. The detailed planning for our asset portfolios is described within our Portfolio Management Plans and then implemented in accordance with our Programme Management Framework and Field Service activities.

Grid Divisions

We have three grid divisions, which are collectively responsible for the delivery of the grid business outcomes. The divisions are:

- **Grid Development** which identifies the need for grid development, replacement and renewals required to meet reliability and service standards over the next 20 to 30 years. This includes developing solutions that are economically efficient, producing the AMP, continually improving our approach to asset management and development, reviewing our planning to realise savings, and the application of innovation to meet a changing environment.

- **Grid Projects and Customers, Stakeholders and Environment.** Grid Projects manages the delivery of our projects and programmes. We strive to consistently apply and improve our project planning, project management, stakeholder engagement, procurement and construction skills to improve the quality and reliability of the assets while reducing costs. The Customers, Stakeholders and Environment team develops and maintains effective engagement with our customers to ensure outcomes that meet customer and Transpower needs.

- **Grid Performance** which ensures our grid assets continue to deliver electricity well to New Zealand through the efficient and effective delivery of maintenance solutions, and the operation of our grid assets.

Auckland Development and Transformation Division

We have established a division to consider development in Auckland. The Auckland region continues to grow strongly and we need to ensure we have a network that supports this growth. This is coupled with many of our assets aging in the region. Over the next decade or two, significant maintenance work will be needed to replace the overhead conductors on many of the grid lines in Auckland. Rather than approaching the replacement of conductors in the Auckland region as separate projects over several years, we are looking at developing a strategy for the full programme of work required for Auckland. The Auckland Strategy Project will answer the question: based on what we know of our future and what Auckland sees in its future, how can we best manage our Auckland network into that future? This is an opportunity to look at the connected nature of our upcoming projects, and decide overall what is the best electricity transmission strategy for New Zealand’s largest commercial and population centre into the future.

This division also has responsibility for driving a new phase of transformation within Transpower. The transformation programme aims to better prepare us for future challenges and opportunities through initiatives to improve our efficiency, evolve our understanding of service excellence, and increase our agility.
ICT ASSET MANAGEMENT

The rate of technology and business change requires us to continually develop and refine our ICT capability. We see the need to focus on utilising technology in a way that builds our business capability within a changing environment in a manner that is sustainable, resilient, secure, and increasingly efficient over time. Our approach to achieving this is established within a suite of ICT asset management documents and processes which is illustrated in Figure 12.

ICT Model, Architecture Principles and Policies, and Portfolio Plans

To deliver our five strategic goals we have moved from a traditional ‘run, grow, transform’ ICT model to a ‘life cycle, benefits driven, leading’ business investment approach. By defining our ICT capability in this manner, we can classify and prioritise initiatives to meet business challenges as they emerge, and face the challenges outlined in Transmission Tomorrow.

Our Architecture Principles and Security Policies provide the standards and enforce the approach approved in the ICT Strategy, and are applied to the design, creation, and operation of our information system solutions.

We operate five core ICT asset portfolios. These are: Transmission Systems, Asset Management Systems, Corporate Systems, Shared Services, and Telecommunication Network and Security Services. Together the five portfolios cover the range of services delivered within our ICT function. For each ICT portfolio, we have developed a prioritised capability plan that supports balanced investment, allowing continued support for our current systems, while in parallel innovating and improving our business. The outcome of this process is an overall ICT roadmap which provides an integrated picture of all the prioritised and accepted initiatives by financial year. This provides the basis for the forecast ICT expenditure.

The expenditure requirements for ICT are summarised in Section 7. For more supporting information on each portfolio and a more detailed explanation of our management approach, expenditure drivers, and uncertainties and risks refer to our 2017 AMP.
**IST Division**
Information Services and Technology (IST) is the division that executes the ICT Strategy, in close collaboration with the business. This division provides technology solutions and services plus the technology insights necessary for the ongoing alignment of ICT and Transpower services.

**CORPORATE AND BUSINESS SUPPORT**
Critical to the operation of our business is corporate and business support. A key highlight in this area over the next year is moving our head office to a new building. Our new building has been designed to encourage collaboration and flexibility, and building a culture with increased discussion, debate and working together in line with our corporate values and behaviors.

**General Counsel, Corporate Services and People Divisions**
The General Counsel division is responsible for provision of corporate governance services, supporting the Transpower Board, leading legal advice and preparing corporate compliance documents.
The Corporate Services division manages our facilities, finance, strategy and regulatory planning, regulatory affairs and pricing and treasury functions.
The People division delivers corporate communications, health and safety, human resources and technical training.

**HOW WE MANAGE RISK AND ASSURANCE**
Managing risk is an essential and critical component of our business. Nothing is ever risk-free, so as a business we work hard to understand the risks we face and the potential implications. Managing risk is an integral element of good governance. It’s not a standalone activity, but integrated to everything we do, to ensure that as a business we deliver our strategic objectives. All officers, staff, contractors and consultants are responsible for managing risk.

Within Transpower, we manage risk and assurance activities through:
- Our Integrated Risk and Assurance Policy, framework, guidelines, methodologies and tools
- Our Three Lines of Defence assurance programmes, which are day to day operational management; functional oversight through governance and advisory groups, policies and procedures; and independent objective assurance
- A systematic approach to risk management
- Integration of risk management activities into core decision making functions
- Governance reporting

The risk management approach and practices we use are consistent with *AS/NZS ISO 31000:2009 Risk management: principles and guidelines* (ISO 31000) and are updated in line with changes to the standard as they occur.

**Risk management methodologies and tools**
We use three different risk assessment methodologies. All our practices are consistent with ISO 31000 and international practice. The methodologies are:
- **Conventional qualitative risk assessments.** This is used by most organisations and relies upon the use of a risk matrix that considers the collective impact of the control environment by making a qualitative assessment of the difference between inherent risk and current risk. We implement this conventional approach through recording risks in a risk register and tracking them over time. These are used at both a corporate and project level.
- **Bowtie risk analysis.** Bowtie risk analysis visualises risk into an easy to understand diagram that flows from causes (set out on the left of the diagram) to the risk event (in the centre) to the unwanted consequences (set out on the right). Bowties create a clear distinction between preventative controls and mitigating controls. We use Bowties in understanding and mapping specific asset related and functional risks as described further in the 2017 AMP.
OUR MANAGEMENT APPROACH

- **Semi-quantitative risk assessment (SQRA).** SQRA is a further enhancement to Bowtie analysis. It takes a qualitative assessment and turns it into a quantitative value. The approach assigns a financial value to risks which are then annualised (i.e. $/year) to determine an Annualised Loss Expectancy (ALE). Insurance companies use a similar approach to determine insurance premiums.

A description of these methodologies and guidance on when to use each approach are maintained as part of our risk documentation. We publish our Bowties internally in a centralised location for general viewing, and all those responsible for the risk function across Transpower can access our Risk Management System (RMS). The RMS contains our asset and organisational risk registers, Bowtie risk assessments, Control assessments and risk reporting.

OUR PLANNING PROCESSES

The principles and strategic objectives set out in our strategies are applied within our planning processes. We undertake planning on a continual basis, with ongoing assessment of investment needs, and capability and delivery requirements. We bring these planning processes together annually with our Business Plan to confirm targets, priorities, and budgets. As a State-Owned Enterprise, we also prepare a Statement of Corporate Intent (SCI) each year that provides a public account of our plans for the next three years. Together, the SCI and our annual Business Plan establish the core business activities for the following 12 to 24 months. The investment plans and expenditure forecasts incorporated within this ITP align with our 2017 Business Plan.

The planning process is designed to provide improved transparency of trade-offs between expenditure profile and outputs. Section 3 provides an overview of our planning stages for RCP3. It is intended to give the Commission and other stakeholders confidence that our proposal is well tested, balanced and suitable for approval.
7. OUR EXPENDITURE FORECAST

In this section we provide a breakdown of our bottom-up expenditure forecasts. Our forecast expenditure is categorised for reporting and management purposes into five categories. These are:

- **Grid Asset Portfolio Expenditure.** This covers the renewal expenditure for our grid assets. A detailed description of the Grid Asset Portfolio expenditure is contained in our AMP.

- **Grid Enhancement and Development (E&D).** E&D expenditure incorporates the forecast Base and Major Capex required for the development of the grid. This is described in detail within our TPR.

- **ICT Expenditure.** Our ICT expenditure covers our infrastructure, server hardware and applications that interface with the grid and support our corporate processes and systems. A detailed description of our ICT expenditure is contained in our AMP.

- **Business Support Expenditure.** Our business support assets cover non-critical substation buildings, our office buildings, vehicle fleet, and office equipment. A detailed description of our Business Support expenditure is contained in our AMP.

- **Corporate Expenditure.** This covers our corporate costs, personnel and supporting activities. Our Corporate expenditure is described further in the sections below.

Figure 13 illustrates the structure of our expenditure categories by type.

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**GRID ASSET PORTFOLIO EXPENDITURE**

Our grid asset class programmes include some of our largest expenditure by value, and include such activities as transformer replacements, outdoor to indoor conversions, and tower painting. The application of new grid planning processes has resulted in several key changes to our RCP2 and RCP3 expenditure forecasts.

We have also continued with our focus on finding innovations and savings within our portfolios. To date our portfolio savings programme, designed to help us drive cost savings in our everyday work by development and implementation of innovation, has resulted in a reduction of $26m in our Capex forecast has resulted in a reduction of $26m in our Capex forecast in RCP2. Many of the changes resulted in enduring savings and the forecast presented are net of these savings.

After accounting for these savings, our current bottom up plan suggests an overall increase in investment requirements over the remainder of RCP2, and RCP3. The increase is primarily driven from:

- A rebalancing of our forecasts across asset classes driven from the refinement of our asset health and criticality modelling determining the need for additional works in some asset classes

- An update of forecast unit costs of asset replacements based on the actual costs of works completed

- The required refresh of our assets in such items as substation management systems and the midlife refurbishment of the Pole 2 control system of the HVDC

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9 Note all Capex is reported on a commissioned basis in 2017 figures as per our business plan, based on actuals to March and forecasts from April to June.
The increasing need for painting of towers driven by recoating of previously painted towers

The forecast requirements for reconductoring into RCP3 and RCP4

An increasing Opex forecast from optimising the balance between Capex and Opex, ultimately reducing the need for earlier capital investment in our assets.

As highlighted in Section 3, a significant amount of refinement to our plan has occurred since the 2016 ITP. New planning frameworks, tools and strategies have been applied to approximately 60% of our RCP3 grid asset expenditure. However, further refinement will occur as this extends to the remaining expenditure, and we further consider key uncertainties, risks and constraints. RCP4 has been sized at a higher level and will be subject to even more refinement.

Below is a summary of our proposed expenditure for RCP2 and RCP3 compared with the figures in the 2016 ITP. Based on our current bottom up Base R & R Capex forecasts we expect to commission assets with a total value of $0.9 billion during RCP2 and $1.1 billion in RCP3. However, as outlined in Section 3, we are considering both a bottom up and a top down view for RCP3. An indicative top down, and as yet untested, view of RCP3 is also presented by the dashed line in the figure below. We also expect our current bottom up estimate for RCP4 will move closer to the indicative line as we further develop and refine our planning. The bottom up detail behind the asset portfolio expenditure is set out in our 2017 AMP.

Figure 14: Grid Replacement and Refurbishment Capex, Actual and Forecast, $ million (2016/17 prices)
Listed projects

Listed projects represent replacement projects or programmes that are listed by the Commission as part of their individual price path determination. For RCP2 the Commission listed five projects. We can apply to have our Base Capex funding baseline amended to reflect the costs of these projects.

We have made one listed project application to the Commission relating to reconductoring the Central Park-Wilton line\(^{10}\) and are on track to make two further submissions relating to the Oteranga Bay-Haywards line and the Bunnythorpe-Wilton A line\(^{11}\). The Brunswick-Stratford B line, which is a listed project for RCP2, has been delayed while we review the long-term system need for that section of the grid and possible solutions that may not require the reconductoring of this line.

The listed projects for RCP3 have been identified and we are going through a review of the scope and timing of the reconductoring to ensure projects are correctly categorised as either Base Capex or listed projects for our RCP3 proposal. Three potential projects: Otahuhu-Whakamaru A & B, Albany-Henderson A, and Bombay-Otahuhu A, are also being considered by our Auckland Strategy team. So far we consider Bombay-Otahuhu A is likely to be listed. However, there is still a reasonable degree of uncertainty regarding all three projects.

For RCP4 the listed projects are based off the condition data and health modelling presently available. More work will be done to confirm the scope and timing of these projects. Based off our modelling we are expecting an increase in the volume of listed projects in RCP4 from RCP2 and RCP3.

Figure 16 illustrates the forecast listed project and major reconductoring expenditure compared with that reported in the 2016 ITP.

\(^{10}\) Since preparing these figures the Commerce Commission has approved this project resulting in a $10 million uplift to our funding baseline.

\(^{11}\) This line accounts for 2 listed projects. We only intend to make 1 listed project application.
ENHANCEMENT AND DEVELOPMENT EXPENDITURE

Our E&D expenditure is separated into two categories:

- **Base Capex.** These are projects or programmes that are under or equal to $20m and included in our RCP funding baseline.
- **Major Capex.** These are projects over $20m which require individual approval by the Commission.

A detailed explanation of E&D expenditure is included within our TPR. A summary of each expenditure category is described below.

**Base Capex**

As we progress through RCP2 and onto RCP3, we fully expect that our plans will evolve as system conditions change, we gather new information, and refine our analysis. Other external drivers such as input costs and industry developments, will also become clearer.

Leading into RCP3, the significant uncertainties within the planning period make it difficult to accurately forecast which System Needs will eventuate. To account for this we have developed two E&D expenditure scenarios for RCP3:

- a high expenditure scenario with a cost of $115 million. This assumes $40m of RCP2 expenditure can be deferred into RCP3. It also assumes $65m for projects identified in the TPR, and $10m for unidentified projects that might occur as a result of changes in demand and generation assumptions.
- a low expenditure scenario costing $65 million. This assumes $27m for high certainty projects likely to go ahead, $33m for projects identified in the TPR (two thirds of the high scenario), and $5m for unidentified projects.

More details of the projects and the derivation of the scenarios is provided in Chapter 4 of the TPR. As we do not know which of these scenarios is more likely we have used a mid-point of the scenarios at $90m as the baseline forecast of Base Capex. This compares to an RCP2 funding baseline of $100 million and a current RCP2 forecast of $75 million.\(^\text{12}\)

Figure 17 illustrates the forecast base E&D expenditure compared with that reported in the 2016 ITP.

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12 Note, while the RCP2 forecast of $75m includes $11m relating to corridor management, the current $90m forecast is exclusive of corridor management, for which an additional $5m is forecast.
Major Capex Projects are investments with an expected cost of greater than $20 million that change the capability of the grid.

As with Base Capex E&D there is considerable uncertainty in the medium term over how much of this type of investment will be required due to uncertainty over such things as: the decisions of major industry players (e.g. the closure date of the Rankine units at Huntly, and the future of the Tiwai aluminium smelter), future load growth, future growth in distributed generation and storage, and generation development. As such, our business planning approach necessarily makes assumptions regarding future events.

Within our planning horizon there are four major sequences of potential grid enhancement investments. These are:

- **Waikato and Upper North Island (WUNI).** As demand grows in the upper North Island, investment may be required to maintain reliable supply in Waikato, Auckland and Northland. This will be influenced by the timing of the closure of Genesis Energy’s “Rankine Units”.

- **Upper South Island (USI).** As demand grows in the Upper South Island investment may be required to maintain reliability in Canterbury, Marlborough and the West Coast;

- **South Island Renewables (SIR).** If the aluminium smelter at Tiwai closes investment may be needed in the lower South Island, inter-island link and central North Island to enable surplus renewable generation to reach demand centres.

- In addition, there is the potential that new industrial demand may drive the need to increase the capacity of our 110 kV network in south Waikato. As such, there is considerable uncertainty in future requirements for additional grid capacity.
For our plan this year we have developed a base case scenario to represent one possible future development path within the electricity industry where investments sequences occur slowly. The base case assumes that:

- The exits are linked and deferred, i.e. the aluminium smelter at Tiwai stays open and consequently that provides enough support for the Huntly unit closures to be deferred by 10 years.
- We have certainty in 2019 that the largest WUNI investment commitment can be deferred until 2028. This may occur due to the Huntly closures being deferred or due to other options being able to defer this investment.
- Upper North Island demand growth is slow and we can defer investment
- USI net demand growth is slow, such that a new switching station is all that is needed within our planning horizon
- The planned HVDC mid-life refurbishment work is deferred beyond our planning horizon to align with HVDC upgrades that may be driven by Tiwai closing

Figure 18 illustrates the forecast Major Capex compared with that reported in the 2016 ITP.

Figure 18: Major Capex, Actual and Forecast, $ million (2016/17 prices)

While, we have adopted these assumptions in putting together our forecasts we will continue to investigate and monitor these issues. In particular, we consider it is prudent to continue to investigate the WUNI investment stream in case Genesis decides to close the Rankine units at Huntly in 2022 as they review their position. Each Major Capex Project is individually submitted to the Commerce Commission for approval. We endeavour to provide the Commission with indicative timings for submissions to assist with workload planning and expectations. A fuller list of approved and unapproved Major Capex Projects along with indicative timings is set out in Chapter 4 of the TPR and in the ITP Schedules.
ICT MANAGEMENT

We have aligned our forecast investments with improvements to business capabilities and outcomes. Our approach to ICT investments is to utilise emerging trends in the market to efficiently refresh our existing systems, improve integration and consolidation of systems. Overall, we consider there is significant potential in future years to further enhance our business and our processes to incorporate such things as extending our use of cloud based services, further enhancing our use of big data and analytics, reviewing and monitoring of advancements such as intelligent systems, industrial digital platforms, and pervasive networking.

Figure 19 illustrates our forecast ICT capital expenditure, in comparison with the 2016 ITP.

Figure 19: ICT Capex, Actual and Forecast, $ million (2016/17 prices)

Based on our refined ICT Capex forecasts we expect to commission assets with a total value of $168 million during RCP2. This is $2 million below the ITP 2016 forecast for Capex. The changing profile is mainly due to timing changes in large projects and emerging requirements, including the need for increased security.

Overall the trend in our forecast expenditure is downward as we look to take advantage of technology developments and progress in cloud based services for our non-critical functions, along with reducing lifecycle refresh costs of our systems throughout RCP3. However, we expect overall expenditure to increase through to the middle of RCP3, due to several large individual projects. These projects include the renewal of our TransGO communications network, and lifecycle replacement of our undersea fibre cables.

In some cases, it is difficult to predict with certainty what technologies we will commission over the ITP period or the exact techniques that we will use to deliver them. Maintaining a degree of flexibility has the advantage of allowing us to consider emerging, cost-effective technologies and to adopt them if they are sufficiently mature. Accordingly, we will continue to refine our forecasts over the period.

In total, we expect to invest $168m during RCP2, and $200m during RCP3 in our ICT systems and infrastructure.
ICT Operational Expenditure

ICT Opex includes telecommunications and equipment leases, outsourced support and maintenance fees, and software licences. Our forecast ICT Opex expenditure is shown in Figure 20.

![ICT Operating Expenditure](image)

Figure 20: ICT Opex, Actual and Forecast, $ million (2016/17 prices)

We expect to incur a total of $195 million ICT Opex during RCP2. This is $14 million below the 2016 ITP forecast, which equates to a 7% reduction. The reduction reflects our continued focus on improving the overall efficiency of the business targeting cost savings wherever possible, despite upward cost pressures within the market. Since our 2016 ITP we have implemented changes to our network support model through insourcing roles where appropriate, renegotiating key contracts and rationalising how our operating centres function. This has driven our Opex profile down for the 2017 ITP forecast.

The benefits of the lower cost base will flow to RCP3 with lower expenditure levels and we expect that RCP3 expenditures will be broadly constant from the end of RCP2.

BUSINESS SUPPORT

Business support assets comprise non-critical substation buildings, our office buildings, vehicle fleet, and office equipment. Overall, we expect our business support expenditure to be consistent across the period with a downward trend as we continue to refine our procurement approach. Following the consolidation of our two leased Wellington offices to a redeveloped site at 22 Boulcott Street in October this year, we expect the overall level of business support expenditure to level out to business as usual. In the medium term, we are looking to use technology developments by updating our vehicle fleet to hybrid and electric vehicles, and following a review, the sale of unnecessary non-critical buildings. Our forecast expenditure is shown in Figure 21 below. In total, we expect to invest $30m in RCP2 and $18m in RCP3 for our business support assets and infrastructure over the planning period.
Figure 21: Business Support Capex, Actual and Forecast, $ million (2016/17 prices)

CORPORATE

Our corporate costs cover operational personnel and other business related costs. We expect to incur a total of $577 million Corporate Opex during RCP2. This is $7 million below the 2016 ITP forecast, which equates to a 1.2% reduction.

Our ITP forecast reduced our expenditure level below our RCP2 funding baseline. This reflected our successful transformation programme which realised several efficiencies across our operations. Our 2017 ITP forecast re-affirms our expectation of savings during the ITP period and maintaining a spend profile below the funding baseline.

We expect that RCP3 expenditures will be broadly in line with our 2019/20 expenditure. This reflects our continuing cost reduction efforts.

Figure 22: Corporate Opex, Actual and Forecast, $ million (2016/17 prices)
8. OUR SERVICE PERFORMANCE

In this section we summarise our revenue-linked service performance measures. Further information is available in our Services Report.

REVENUE-LINKED MEASURES
For RCP2 the Commerce Commission determined revenue-linked grid output measures, grouped into three areas:

- Reliable grid measures
- Grid availability measures
- Asset health (works delivery) measures.

The Commerce Commission set a target, cap, collar, and incentive rate for each of the revenue-linked measures. The cap and collar set the range of performance within which we are penalised or rewarded. Below we report on our performance relative to the defined target, cap and collar.

RELIABILITY MEASURES
There are three reliable grid measures:

- the number of unplanned interruptions each year
- the average duration of unplanned interruptions each year (in minutes)
- the 90th percentile duration of unplanned interruptions each year (in minutes).

A key feature of our reliability measures is that each point of service is categorised into service categories. This recognises that customer expectations and interruption impacts vary across the country, so we should not have a one-size-fits-all approach. For RCP2 we assigned all points of service to one of five categories: High priority, Important, Standard, Generator and N-security. A target, cap and collar is associated with each of these categories.

Table 11 reports on our performance relative to these targets, caps and collars.
// OUR SERVICE PERFORMANCE

### Table 11: Grid Reliability Performance versus Target, Cap and Collar

As noted in Section 3 our reliability performance is challenging to predict due to the influence of external factors, such as weather conditions and other events such as fires. Notable events from 2017 include:

- Three interruptions to high priority sites, including an interruption at Bromley due to wildfires in the Port Hills near Christchurch.
- 20 interruptions at generator sites. Four of these events were due to heavy snowstorms in the Hawkes Bay, and six were due to birds persistently nesting in equipment serving the Maraetai hydro stations on the Waikato River. We are implementing mitigations for both risks.
- Average duration and 90th percentile duration for important points of supply was affected by the shooting of insulators on the Kaikohe-Maungatapere line that affected supply to Kaikohe.
- Average duration and 90th percentile duration for N-security points of supply were due to interruptions at Blackpoint, Culverden and Castlehill. The Blackpoint interruption has heavily influenced the overall results. It was caused by a transformer fault and it took almost 10 days to restore supply. Restoration and performance of N-security sites has been a focus, with a programme of work underway to ensure each site has a plan in place for restoration and continuity.
AVAILABILITY

Grid availability is important as it can affect access to the lowest-cost mix of generation. The two grid availability measures set for RCP2 are:

- the availability of our inter-island high-voltage direct current (HVDC) system
- the availability of selected high-voltage alternating current circuits (HVAC). For RCP2, we selected 27 circuits based on the potential effect on the electricity market of an outage of that circuit

<table>
<thead>
<tr>
<th>Category</th>
<th>2016</th>
<th>2017</th>
<th>Target</th>
<th>Cap</th>
<th>Collar</th>
</tr>
</thead>
<tbody>
<tr>
<td>HVDC (AP1)</td>
<td>98.9</td>
<td>98.6</td>
<td>98.5</td>
<td>99.5</td>
<td>97.5</td>
</tr>
<tr>
<td>HVAC (AP2)</td>
<td>99.0</td>
<td>99.0</td>
<td>99.6</td>
<td>100.0</td>
<td>99.2</td>
</tr>
</tbody>
</table>

Table 12: Grid Availability Performance versus Target, Cap and Collar

As noted in Section 3, while we achieved our HVDC availability target, performance has been affected by our recent decision to suspend live line work. This decision, if confirmed, may have some effect on our ability in future to achieve our availability targets.

The HVAC availability target for RCP2 has proven difficult to meet and may be further impacted by our decision regarding live line work. In response, we have worked to an internal target of 98.7% that better balances need for HVAC availability with the need for lines to be de-energised for planned maintenance. We will refine this target for RCP3 so that it better reflects this balance.

ASSET HEALTH VOLUMETRIC TARGETS

The Commerce Commission has set works delivery measures for six of our asset classes:

- the number of towers painted
- the number of grillages commissioned
- the number of insulators commissioned
- the number of outdoor circuit breakers commissioned
- the number of transformers commissioned
- the number outdoor to indoor conversions commissioned

For the first three measures the target, cap and collar change by year. We report our performance against these measures in Table 13. Actual values are provided for 2016, a provisional value for 2017, and our current forecast values are reported for 2018-2020.

15 The 2017 provisional number is based on information collated while producing our business plan. It contains a forecast from April to June 2017.
## OUR SERVICE PERFORMANCE

<table>
<thead>
<tr>
<th>Category</th>
<th>Year</th>
<th>Performance</th>
<th>Target</th>
<th>Cap</th>
<th>Collar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of towers painted (AH1)(^{16})</td>
<td>2016 actual</td>
<td>461</td>
<td>427</td>
<td>467</td>
<td>387</td>
</tr>
<tr>
<td></td>
<td>2017 provisional</td>
<td>517</td>
<td>523</td>
<td>563</td>
<td>483</td>
</tr>
<tr>
<td></td>
<td>2018 forecast</td>
<td>451</td>
<td>517</td>
<td>557</td>
<td>477</td>
</tr>
<tr>
<td></td>
<td>2019 forecast</td>
<td>548</td>
<td>558</td>
<td>598</td>
<td>518</td>
</tr>
<tr>
<td></td>
<td>2020 forecast</td>
<td>563</td>
<td>555</td>
<td>595</td>
<td>515</td>
</tr>
<tr>
<td>Number of grillages commissioned (AH2)(^{16})</td>
<td>2016 actual</td>
<td>271</td>
<td>339</td>
<td>370</td>
<td>308</td>
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<tr>
<td></td>
<td>2017 provisional</td>
<td>416</td>
<td>396</td>
<td>427</td>
<td>365</td>
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<tr>
<td></td>
<td>2018 forecast</td>
<td>384</td>
<td>408</td>
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<td></td>
<td>2019 forecast</td>
<td>287</td>
<td>390</td>
<td>421</td>
<td>359</td>
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<tr>
<td></td>
<td>2020 forecast</td>
<td>267</td>
<td>377</td>
<td>408</td>
<td>346</td>
</tr>
<tr>
<td>Number of insulators commissioned (AH3)(^{16})</td>
<td>2016 actual</td>
<td>852</td>
<td>1532</td>
<td>1647</td>
<td>1417</td>
</tr>
<tr>
<td></td>
<td>2017 provisional</td>
<td>951</td>
<td>1466</td>
<td>1581</td>
<td>1351</td>
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<tr>
<td></td>
<td>2018 forecast</td>
<td>984</td>
<td>1402</td>
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<td>2019 forecast</td>
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<td>2020 forecast</td>
<td>1360</td>
<td>1375</td>
<td>1490</td>
<td>1260</td>
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</tbody>
</table>

\(^{16}\) Reference for the performance measure e.g. number of towers painted is referenced as AH1 or Asset Health Measure 1.

Table 13: Count of Towers Painted, Grillages Commissioned, Insulators Commissioned by Year versus Target, Cap and Collar

For the last three measures the target, cap and collar relate to the whole of RCP2. We report our performance against these measures in Table 14.

<table>
<thead>
<tr>
<th>Category</th>
<th>2017 ITP Forecast</th>
<th>Target</th>
<th>Cap</th>
<th>Collar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of outdoor circuit breakers commissioned (AH4)(^{17})</td>
<td>154</td>
<td>141</td>
<td>153</td>
<td>129</td>
</tr>
<tr>
<td>Number of transformers commissioned (AH5)(^{17})</td>
<td>18</td>
<td>26</td>
<td>28</td>
<td>24</td>
</tr>
<tr>
<td>Outdoor to indoor conversions commissioned (AH6)(^{17})</td>
<td>14</td>
<td>15</td>
<td>16</td>
<td>14</td>
</tr>
</tbody>
</table>

\(^{17}\) Reference for the performance measure e.g. number of outdoor circuit breakers commissioned is referenced as AH4 or Asset Health Measure 4.

Table 14: Count of Outdoor Circuit Breakers Commissioned, Transformers Commissioned, Outdoor to Indoor Conversions Commissioned for RCP2 versus Target, Cap and Collar

The grillage encasement strategy has been through a significant review and update since the 2016 AMP and the result of this has been a reduction in the volume of work forecast to be completed in RCP2. The structures and insulators replacement program is constantly reviewed taking into account new condition assessment data and refinements to health modelling. Because of this the forecast for insulator replacement in RCP2 has reduced. The reduction in the number of transformers commissioned also reflects the use of new planning frameworks and tools that have seen us defer some of this work to deliver cost savings.