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Dear Dane

Transpower's individual price-quality path for the next regulatory control period: issues paper

We welcome the opportunity to submit on the Commerce Commission's paper published 7 February 2019, *Transpower's individual price-quality path for the next regulatory control period: issues paper.*

In this cover letter, we discuss our engagement with customers and stakeholders, our asset management improvement journey and our efforts to improve our cost efficiency. We provide more detailed feedback in the body of this submission, summarised on pages 8-9, with supplementary material in the appendices. We include our responses to the requests for information that the Commission asked us to provide in this submission and other points arising from our review of the issues paper.

We strive to engage extensively and meaningfully with customers and stakeholders

We have been working hard to extend our engagement with customers and stakeholders and bring what we learn through the engagement process back into our planning and decision-making. Our key engagement initiatives over the past five years have been:

- **Engagement on strategic issues** – our Transmission Tomorrow, Auckland Strategy and Te Mauri Hiko efforts have successfully engaged a broad set of stakeholders, including our direct customers, on important, strategic issues. These efforts are crucial for clarifying our strategic context and for laying the foundation for the strategy that will drive our longer-term planning.
- **Transparency of plans and planning process** – we provide extensive planning information, and aim to make this material accessible and relevant. We go beyond our disclosure requirements in terms of the coverage and accessibility of the information we publish, and in our efforts to engage through regional planning forums and stakeholder workshops.
- **Planning Inputs** – we have used survey techniques to elicit information on the value consumers place on reliability and we use that information in our planning. We have also worked closely with distributors and our supply chain partners, on matters such as regional development and contingency planning for N-security sites.
- **Grid Outputs** – we consulted in multiple stages to determine the dimensions of service quality that matter most to our customers and to define suitable measures and performance standards.
- **RCP3 direction** – we published our draft RCP3 proposal for consultation, sought stakeholder feedback on key choices and trialed a new approach to communicating high-level price-quality

trade-offs. This engagement complemented our wider RCP3 engagement and, as set out in our RCP3 proposal document, helped shape our proposal.

We will continue to evolve our approach to engagement

Many of the issues we seek input on are technical and complex and involve long planning horizons, so we recognise the need to continually evolve the way we engage. As examples, we have formed a Consumer Advisory Panel; we communicated outcomes to stakeholders from consultation on our processes for Transmission alternatives; and we intend to consult at the early stages of our RCP4 preparations on how we can improve our proposal engagement process.

It is not just the quality of our engagement processes that matters, but also how insights on customer preferences shape our planning, operations and investment decisions. The issues paper frames this challenge as follows:

> *"…we expected Transpower to develop a customer engagement model where customer preferences drive the grid output targets, where appropriate, and where those targets define the expenditure proposal. This includes providing for transparent engagement on the trade-off Transpower's customers have to make in weighing-up the amount of risk they are prepared to accept in exchange for the price they have to pay…"*

We agree with this comment. We have considerably enhanced how we align planning and operations to customers' service preferences for RCP3. We recognise we have more to do. In practice, some of our challenges include:

- Much of what determines the service standards we will deliver in RCP3 is outside of our proposed RCP3 base capex work. Service standards and performance are predominantly outcomes of earlier choices, such as the configuration of the grid and the assets used to deliver services, and outcomes of major projects and customer investments so are only weakly influenced by the levers we can apply in a five-year timeframe. In this context, often the most meaningful engagement we can have is on the direction of travel (hold, improve or reduce performance) rather than the absolute level of performance.
- The performance of the grid is dependent on complex interactions and events at times outside our control. In our view, what matters to customers most is the overall service they receive. Any modelling would have to attempt to capture these complexities, making the modelling of service targets and linking that to investments a complex task.
- Where we can make a partial quantification of risk versus expenditure, the result is not something that can easily be expressed in a way that all stakeholders can readily engage on. For example, we can estimate how a change in the replacement rate of an asset class influences annualised loss expectancy (ALE) to help inform our prioritisation efforts; but multi-factor ALE figures (reflecting safety, environmental, reliability and cost risks) are not an intuitive tool for customer engagement. These tools require deep technical expertise to interpret and understand the wider context in which they are applied, and then to be translated into meaningful outcomes for customer engagement.

For RCP3 we have taken practical steps to provide insights on our overall proposal in a way that aims to be accessible to our stakeholders and reflect our current maturity. The steps include communicating asset management trade-offs in accessible terms (e.g. Auckland strategy, deliverability, and reconductoring), integrating value of lost load (VoLL) estimates into our asset management toolsets, and framing price-quality trade-offs that shed light on the likely impact (on price path and specific outputs) of expenditure at the margin of our proposal.

Using more complex tools for consultation and explaining expenditure decision requires careful consideration of a range of factors and further discussion with our stakeholders.

Our asset management journey

We share the Commission's view that development and integration of asset health and criticality modelling remain important priorities for Transpower. We agree that having a good understanding of asset health is a cornerstone of effective asset management and, where asset health models are practical and useful, they should be developed and used. We also remain mindful that our takeholders need to be confident that our asset management practices and resulting expenditure plans are prudent and efficient.

Our current asset management maturity

In our view, the issues paper does not sufficiently reflect our current state of maturity in this area. We have made significant improvements to our condition data, asset health models, criticality and decision-making processes during RCP2. Our capability compares well with our international peers, and we are committed to continuing to enhance and mature our asset health and criticality modelling while also meeting other priorities.[1] However, we recognise we have more to do.

Further developments in asset management

We intend to continue developing our systems, knowledge, and methodologies in risk-based asset management to enhance our decision making. As a prudent, customer-focussed business, we must ensure improvements deliver value that outweighs the cost of those improvements. As we discuss further in our submission, there are a number of factors we need to consider when deciding how best to invest to improve asset management practices.

Asset risk modelling is one of several tools in our toolset

We recognise that the Commission and our customers are interested in understanding that we are prudently investing in enhancing our asset management and, in many cases, are interested in the specific tools and techniques we are developing. We also consider that there is merit in continuing to improve our asset health and criticality modelling, and assessing to what extent we integrate these models to enhance our understanding of network risk.

We would welcome a regular, qualitative engagement during RCP3 to ensure we keep the Commission and our stakeholders informed of our improvement plans.

Improving cost efficiencies

Consistent with our efficiency incentive arrangements, our proposal uses a base-step-trend approach for most operating expenditure. The approach strips away the complexity of bottom-up forecasts so that areas of change are transparent and can be focused on.

The base-step-trend approach relies on projecting forward from a base year (2017/18 in our case) and assumes that the base year represents a prudent and efficient starting point (after adjusting for one-off factors). Under our incentive settings, stripping our prospective efficiency gains, would undermine the incentive to continuously pursue and achieve cost efficiency gains.[2]

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[1] For primary assets and transmission lines assets, the Independent Verifier assessed our risk forecasting as being mature and well developed (page 124, Independent Verification report). It found that our present practice with respect to Asset Health and Risk modelling was consistent with Good Electricity Industry Practice.

[2] We note that in several areas we have elected voluntarily to factor prospective gains into our proposal. This includes factoring in expected efficiency gains from benefits driven ICT capex. We have also factored productivity gains into our forecasts and take on the risk of whether such gains occur economy wide, and whether we can keep pace with these gains.

We agree it is important for the Commission to examine evidence that we respond to efficiency incentives, to be able to have confidence in our base amount and to assess steps and trends.

The issues paper suggests that relying on revealed costs may be premature:

> *"…the opex IRIS has only been in place since the start of RCP2 and it is unlikely Transpower's financial outcomes have yet 'revealed' all potential efficiencies…*
>
> *…historical opex has been relatively constant…rather than the decreases that might be expected if Transpower was realising efficiencies…"*

In response, we make the following observations.

- The opex IRIS has been in place since the start of RCP1[3] – i.e. for six years rather than three. The IRIS also operates alongside more strategic incentives to contain costs and is a successor of earlier incentives.
- We do not consider that 'revealing all potential efficiencies' is an expected end-point of incentive regulation, as this is an essentially static view. In practice, the efficient frontier is unknown and moves over time. A firm responding to incentives will always be seeking and testing ways to step closer to the frontier.
- It is not possible to link an observation about the high-level trajectory of operating expenditure with a conclusion about cost efficiency, because efficiency changes operate against a backdrop of other cost movements.

Given the factors above, we consider that an appropriate approach to assessing whether we respond to incentives and achieve efficiencies is to look at what we have been doing to innovate and drive costs out of our business. We established a Transformation team and Project Management Office, and engaged independent consultants Third Horizon, to support a benchmarked efficiency programme and track improvements. We have clear evidence of:

- sustained focus on cost containment and budget control,
- major change programmes directed at enhancing effectiveness and efficiency and identifying and executing specific cost reduction initiatives,
- significant and sustained efforts to secure the best pricing from our suppliers and service providers,
- strategic shifts in our in-house resourcing to ensure value for money, and
- integration of cost management objectives into our strategies and decision-making tools.

Overall, we are confident that the base amount in our opex forecasts is prudent and efficient and that a continued reliance on a revealed cost approach to regulation is in the long-term best interests of New Zealanders.

[3] The IRIS mechanism was modified at the start of RCP2 to make the incentive strength constant (at roughly 1/3) throughout each Regulatory Period.

Conclusion

We appreciate the engagement we have had with the Commission and our customers and stakeholders as we have developed our RCP3 proposal. We continue to be available to provide further information as required.

Yours sincerely

Alison Andrew
Chief Executive

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4. Submission at a glance

In this section we summarise key points of our submission and set out the structure of the remainder of our proposal.

Consultation

- We have extended our engagement with customers and stakeholders and have taken significant steps in bringing what we learn through engagement back into our planning and decision-making, including for our RCP3 proposal.
- We are developing detailed plans for engaging with our customers and stakeholders during RCP3, including our Consumer Advisory Panel.
- We intend to build on our RCP3 engagement for the RCP4 reset, including seeking early feedback from stakeholders on this engagement process.

Quality standards and grid output measures

- We consider that quality standards for service measures GP1, GP2 (number and average duration of unplanned interruptions), AP1 and AP2 (percentage availability of HVDC and selected HVAC circuits) should not be linked to the incentive values (target or collar) but should be set at a separately determined value suitable for triggering the Commission's compliance activities.
- We would like to discuss the setting of trial quality standards for service measure CS1 (customer service/event communication). We suggest trial standards, as we believe it is too soon under our new survey process to commit to meaningful quality standards. It will take more time to build an appropriate dataset.
- We propose that the revenue-linked asset health measures for RCP3 be non-mechanistic. This will allow for variations between actual and forecast asset health scores where there are justifiable reasons for changes.

Asset management

- We share the Commission's view that development and integration of asset health and criticality modelling remain important priorities for Transpower.
- In our view, the issues paper does not sufficiently reflect our progress in this area. The Independent Verifier found that our capability compares well with our peers overseas and we are committed to continuing to enhance and mature our asset health and criticality modelling alongside other important priorities.
- We would welcome a regular, qualitative engagement process during RCP3 to ensure we keep the Commission and our stakeholders informed regarding our improvement plans.

Base capex forecast

- We provide comment on two aspects of our base capex forecast: Enhancement and Development (E&D); and HVDC and Reactive Assets.

Enhancement and Development

- E&D requirements are difficult to predict owing to the changing needs of the network, driven by factors such as our customers' future electricity needs and regional economic growth.
- Our forecast is based on a funding envelope that provides flexibility and accounts for changes to future network enhancements and development.

- We have considered the use of the Base Capex allowance adjustment mechanism set out in the Capex IM. Based on our interpretation of the Capex IM at the time of our proposal submission, we have been unable to find any of our current projects that would qualify using this mechanism. The Independent Verifier drew the same conclusion.
- Following the submission of our RCP3 proposal, the Commission clarified its interpretation of the Capex IM. In its view, the base capex allowance adjustment mechanism is more flexible than our interpretation and the Independent Verifier's.
- We welcome continued engagement with the Commission to align our interpretation of the Capex IM and identify the regulatory outcome that best addresses our stakeholders' needs and our concerns.

HVDC and Reactive projects

- We consider our approach to assessing the condition of HVDC and Reactive assets is prudent and efficient. We do not agree that the absence of formal asset health models means our forecasts are not fit-for-purpose, as use of manufacturer guidance, specialist in-house capability and engagement with international peers means our forecasts are supported by robust asset information.
- We consider that the appropriate mechanism for securing approval for the HVDC pole 2 mid-life refurbishment programme is the RCP3 base capex proposal.

Operating expenditure

- The work done within the Asset Management and Operations portfolio enables all work on the grid: it ensures the need of the grid is met, and that the grid is operated safely.
- We consider our proposed expenditure is prudent and efficient and is essential to allow us to continue to improve the maturity of our asset management practices, deliver works on the grid and to operate our network.
- Our proposal captures the benefits of efficiency and innovation initiatives achieved to date**.** We are incentivised under the incentive scheme that applies to us to continue to seek efficiencies.
- We welcome the Commission's broader questions asking stakeholders to consider our overall resourcing. In some places, the Commission has focused on FTEs. We do not think such a narrow focus is suited to assessing the prudency and efficiency of our opex proposal.

Deliverability

- Our proposed delivery adjustments strike a prudent balance between two opposing risks: over-funding and under-delivery.
- Business improvements will assist with the delivery of our RCP3 work programme, including ensuring service providers have sustainable contracts providing appropriate incentives to invest in required capacity and capability.

Revenue path

- If the Commission chooses to adopt our proposal to smooth the revenue path, one of the choices relates to whether it should also smooth revenue across, not just within regulatory periods. Changes across period occur, for example, due to changes in WACC.
- In our view, the best approach is a revenue path that *fully* recognises changes in WACC at the start of each regulatory period. Attempts to smooth out these changes across periods are likely to create unintended consequences and may decrease the stability of the revenue path over time.

Submission detail

The remainder of our submission is structured as follows:

- Consultation (section 5)
- Quality standards and grid output measures (section 6)
- Asset management (section 7)
- Base capex forecast (section 8)
- Operating expenditure (section 9)
- Deliverability (section 10)
- Revenue path (section 11)

For some areas we provide further supporting detail:

- Quality standards and grid output measures (appendix A)
- Asset management (appendix B)
- Operating expenditure (appendix C)
- Deliverability (appendix D)
- Error correction (appendix E)

5. Consultation

Commission question
The Commission asked us to provide in our submission a detailed explanation of Transpower's ongoing engagement with its customers throughout the regulatory period, including its customer engagement strategy.[4]

Customer and stakeholder engagement is core to Transpower's commitment to ensuring that the grid meets the needs of all electricity consumers now and for the future.

As a regulated business we have a series of requirements for engagement under specific requirements in Transpower's Capital Expenditure Input Methodology (Capex IM) and Part 12 of Electricity Industry Participation Code. We generally go beyond these requirements and engage in good faith on the matters that we understand are important to our customers and stakeholders.

5.1 Stakeholder engagement during RCP3

Engagement is a core part of the way we do business every day. While we do not have a formal engagement strategy document, we are developing more detailed plans for stakeholder engagement during the final years of RCP2 and in RCP3. We will develop a formal engagement strategy document for RCP4.

We will document how we currently engage and how we see that evolving in response to industry, customer and stakeholder expectations and any regulatory changes. We will provide information for customers and stakeholders on how they can engage with us on the work we do and the service we deliver during RCP3. This will give customers and stakeholders visibility of our business-as-usual work (BAU), major capital projects (MCPs), strategic work and the reset process for RCP4.

Our approach will be based on existing regulatory and engagement processes for large capital projects (listed projects, MCPs and base capex projects over $20m) and Part 12 of the Electricity Industry Participation Code, our own process for transmission alternatives for base capex and continuing established processes for investment projects under way.

For engagement on our RCP4 reset, including our grid output measures,[5] we will set clearly defined objectives and measures of effectiveness. Overall, we think the engagement process followed for the RCP3 reset went well. Early in the RCP4 reset process, we plan to engage with our customers and stakeholders on our approach to engagement for RCP4, seeking their ideas on how we can improve before finalising the details of our engagement plan. We will also draw upon and develop the approach used in our first engagement paper on RCP3 service performance measures (October 2016). In response to this paper, we received feedback on the proposed engagement process.

[4] Paragraph 4.29

[5] Schedule A of the Capex IM sets out the Commission's scope for evaluating the proposed grid output measures: A5 (a) the extent to which the proposed grid output measure is a recognised measure of risk…performance…; A6 (a) the extent to which the proposed revenue-linked grid output measure is a recognised measure of grid outputs that are valued by consumers.

5.2 Our approach to engagement

We engage with our customers and stakeholders in a range of ways, but always with the intent of being timely and meaningful.

Although many of our engagement activities, e.g. forums, are public we recognise much of our engagement activity is bilateral and not public, yet still very important. We engage as part of the usual process of running our business on a day to day basis. We also engage on major strategic issues, and we have engaged specifically in relation to the development of our RCP3 Proposal. In summary, our engagement routes are:

- **BAU**: customer and stakeholder engagement is part of the way we do business. Whilst our specialist customer and stakeholder engagement expertise resides in our External Affairs team, a lot of engagement occurs in other parts of the business. We carry out engagement activities that support our BAU planning and operations, including on MCPs, listed projects, and base capex projects over $20m.
- **Strategic**: We engage on major issues e.g. Transmission Tomorrow, Te Mauri Hiko, solar energy, battery storage, the Auckland Strategy.
- **RCP3 Regulatory Reset**: We carried out a series of engagement with our customers and stakeholders seeking their feedback on our Draft RCP3 Proposal in August 2018. Prior to this, we completed three separate rounds of engagement (consultation papers and forums) on our service performance measures for RCP3 and pilot reporting on our asset health measures.[6]

We use issue-appropriate channels for our engagement, including:

- **Face-to-face –** including the annual working-level engagement on inputs to our Transmission Planning Report (TPR), customer and regional demand forecasts and expectations,
- **Media and communications updates** – (e.g. regular news media releases, financial market publications, and social media), convening industry forums three to four times per year, and participating in various working groups (e.g. in relation to resource management, industry regulations and codes of practice, environmental sustainability and health and safety),
- **Consultation** – including on major and listed projects. We undertook value of lost load (VoLL) surveys to improve the economic basis for our reliability targets by helping us estimate how much consumers are willing to pay to avoid unplanned interruptions, and we recently communicated outcomes to stakeholders from consultation on our processes for transmission alternatives,
- **Publishing and sharing information** – for example: pricing updates, annual regulatory disclosures, Asset Management Plan (AMP), Grid Outputs Report (previously the 'Services Report'), Transmission Planning Report (TPR) comprising our grid reliability report (demand and generation and each GXP) and Grid Economic Investment Report under Part 12. We participate in relevant industry forums such as Downstream Conference and the EEA Conference.

We have established the Consumer Advisory Panel ('the panel') to give us independent advice on consumers' perspectives that we can factor into our planning. The panel comprises eight members and an independent facilitator who have been carefully selected to represent the diversity across our consumer base. The first meeting of the panel was held in November 2018, and it will meet at least three times per year.

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[6] This approach is outlined in section 2.3.7 of our RCP3 proposal document (detail on the services performance measures refresh process can be viewed in Appendix B of the Grid Outputs Report). The Independent Verifier acknowledged the content and methodology of our engagement for the RCP3 reset was sound and has been "moderately effective to date" (Section 4.3.3).

The Commission has been invited to attend the second meeting, to be held in March 2019. This provides an opportunity for the Commission to talk to the panel directly about its RCP3 evaluation process and how consumers can be more actively involved in the reset process.

We have also recently established an External Affairs division, bringing together our Customer, Communications and Stakeholder teams, to provide governance around our relationships with customers and stakeholders.

6. Quality standards and grid output measures

In this section we comment on the following matters raised in the issues paper:

- quality standards (used for regulatory compliance purposes),
- the possibility of a normalisation mechanism for service interruption measures, and
- the possibility of recalibrating asset health output targets during RCP3.

6.1 Quality standards for GP1, GP2, AP1 and AP2

Commission issue
The Commission queries whether quality standards for service performance measures GP1, GP2, AP1 and AP2 should be set at the incentive collar values or some other value.[7]

We consider that quality standards should not be linked to the incentive values (target or collar) but should be set at a separately determined value suitable for triggering the Commission's compliance activities.

As highly reliable systems, the performance outcomes observed for transmission grids can vary significantly from year to year without indicating underlying changes in reliability. For example, a point of service may experience two interruptions in one year while still achieving its performance standard of three interruptions per decade.

The incentive settings are designed to balance multiple considerations, including the need for symmetry between the cap value and the collar value. This does not automatically yield a collar value that is suitable for use as a quality standard. The risk with using the collar value is that threshold may be too low, triggering unnecessary need for Commission investigation.

We are at the early stages of developing options for deriving quality standards for our proposed service performance measures and look forward to engaging with the Commission on this matter further.

6.2 Quality standard for CS1

Commission issue
The Commission notes it is considering applying a quality standard to service measure CS1 for the first time.[8]

CS1 (customer service/event communication) focusses on post-event customer communications. The surveys allow us to monitor our ongoing performance and identify possible areas for improvement in the timeliness of our event information and communications.

We are open to discussing trial quality targets for service measure CS1. We suggest trial standards, as we consider it is too soon under our new survey process to commit to meaningful quality standards.

[7] Paragraph 5.82.3

[8] Paragraph 5.82.5

Following feedback on our post-event customer survey process (separate to the RCP3 process), we have streamlined the survey process to be simpler and only issued twice per year. Further to section 3.2.3 of the Grid Outputs Report 2018, we have recently received the results of the first surveys under the new process run in November 2018 (post RCP3 Proposal submission).

Whilst the responses from the first survey were good, the response rate was lower than anticipated so we would like to run our new survey process twice more before forming any quality standards. The next surveys are due to be run mid-2019 and late-2019, which would be too late for the Commission's evaluation process or the start of RCP3. Trial quality standards could commence part way into the regulatory period.

6.3 Normalisation mechanism for GP1 and GP2

Commission issue
The Commission notes it is considering a possible normalisation mechanism for service performance measures GP1 and GP2 (number and average duration of unplanned interruptions), for example, to address the impact of force majeure events.[9]

We support a normalisation mechanism applied to GP1 and GP2, to take into account uncertainties that are beyond our control and which affect a proportion of our performance results.

As mentioned in section 3.4 of the Grid Outputs Report 2018, there are causes of interruptions, such as wilful damage and extreme weather events, that are difficult to predict and expensive to mitigate across the entire grid. The correlation between investment and impact on performance measures can be variable.

6.4 Non-mechanistic, revenue-linked asset health measures

Commission issue
Do you agree that there should be a mechanism to recalibrate the proposed asset health targets during RCP3 (either annually or periodically) to take account of the ongoing work that Transpower is proposing to continually improve the asset data used in the measures, so that the proposed measures reward Transpower principally for its management of the assets?

For RCP3, we propose non-mechanistic, revenue-linked asset health output measures.[10]

Non-mechanistic means the methodology or mechanism for assessing whether a target is met (or whether an incentive should be attached) allows for variations between the actual and forecast asset health scores where there are justifiable reasons for the change. The principle behind this approach is that an incentive regime should encourage and reinforce a regulated supplier to behave and act in the interest of consumers (i.e. it should reinforce doing the right thing).

A non-mechanistic approach allows for material changes in the grid, such as divestments or new assets, as well as improvements in the health modelling and condition assessment techniques that can improve the accuracy of our predictive deterioration rates.

[9] Paragraph 5.82.7

[10] See section 2.4.2 RCP3 Proposal Document.

Asset Health is one of several key inputs into our new decision-making processes, aimed at understanding and managing the current and future risk profile of the grid. We consider asset health measures:

- as leading indicators for equipment failure-related service interruptions,
- but only suitable for a grid output measure incentive when applied in a non-mechanistic manner.

We have proposed Asset Health Measures that will help us to:

- understand the condition of our assets and the probability of these assets failing today and in the future
- address potential problems caused by assets near the end of their useful life through asset refurbishment and replacement, or by other means
- provide our stakeholders and the regulator with a view of the state of our assets, highlighting potential work required to improve the condition of the grid.

The Commission states that a non-mechanistic approach may involve recalibrating the targets during RCP3 (para 5.72 of the issues paper). This is likely to require a regular re-opening of the IPP, which would be complex and costly.

We consider that a more straightforward approach would involve redefining the number 'm' that feeds into the incentive calculation, which would require a minor change to the Capex IM.[11] We propose that the definition of the term 'm' could be refined e.g. to (addition in bold):

> *"output achieved during the disclosure year in respect of the revenue-linked grid output measure in question,* ***as adjusted in relation to an asset health grid output measure, for justified differences from target, such that the difference from target (m-n) in the calculation of the grid output adjustment term 'i' excludes justified differences.***"

We have included additional, supplementary information on quality standards and grid output measures in Appendix A.

[11] Capex IM Schedule B2 (1).

7. Asset management

Commission question
The Commission has asked us to explain how and when we intend to develop our asset health and criticality framework into risk-based tool.[12] It is interested to understand in particular:

- any technical reason why Transpower cannot have a functional network risk model informing network risk, investment strategy, and likely future performance by the end of RCP3
- whether we have any plans to integrate our asset health and criticality modelling to the extent that we can begin to understand network risk and ultimately be able to communicate this network risk to stakeholders and connected parties.

As discussed in our cover letter, we share the Commission's view that development of asset health and criticality modelling remain important priorities for Transpower. We agree that having a good understanding of asset health is a cornerstone of effective asset management and that where asset health models are practical and useful, they should be developed and used.

We also remain mindful of our stakeholders' need to be confident that our asset management practices, and therefore our expenditure plans, are prudent and efficient. As a prudent customer-focused business, we must ensure improvements deliver value that outweighs their cost.

There are a number of factors we need to consider when deciding to invest in asset management improvements. Technical considerations are only one of several types of considerations, and asset risk modelling is one of several tools in our toolset.

Linking performance measures to planning is complex and we are on a maturity journey. In line with other transmission businesses, we have developed an incremental approach we believe is appropriate for Transpower's business.[13] As we work through the complexities and our maturity evolves, the link between planned investment and likely performance outcomes is expected to become stronger and more transparent.

We intend to improve our asset management maturity over RCP3, which includes exploring the definition of an asset management approach to network risk and evaluating how such an approach could be implemented. We are not aware of any international peers that have made this complex, bold step, but we welcome a regular, qualitative engagement process during RCP3 to ensure we keep the Commission and our stakeholders informed about our improvement plans.

Appendix B provides supplementary information on:

- the factors we consider to ensure our asset management investments are cost effective, and
- the collection and quality assurance of asset condition data.

[12] Table 5, page 47.

[13] In our 2018 Grid Outputs Report we discuss the links between grid performance and planning (page 23-24).

8. Base capex forecast

In this section we comment on two aspects of our base capex forecast: Enhancement and Development (E&D); and HVDC and Reactive Assets.

8.1 Enhancement and Development: use of base capex adjustment mechanism

Commission issue
Transpower is proposing that the Commission approve an envelope of E&D expenditure. A different option would be for Transpower to use the base capex adjustment mechanism in the Capex IM, which would bring the projects into the base capex allowance as the projects become more certain in need, cost and timing, especially those projects predicted to occur later in the RCP3 period.

At paragraph 7.35.1 of the issues paper, the Commission has asked us to explain our reasons for proposing an envelope of E&D expenditure rather than making using of the base capex adjustment mechanism. The Commission has also clarified its interpretation of the base capex adjustment mechanism in the Capex IM.

Our response to this question is in two parts

- We explain our reasons for proposing a scenario-based E&D forecast in our RCP3 proposal. These reasons are based on our interpretation, as well as the Independent Verifier's, of the base capex adjustment mechanism definition in the Capex IM at the time of the RCP3 submission.
- Our initial thoughts on the Commission's interpretation of the Capex IM of the base capex adjustment mechanism, which appears to be more flexible than our interpretation and the Independent Verifier's.

We welcome continued engagement with the Commission to align our interpretation of the Capex IM and identify the regulatory outcome that best addresses our stakeholders' needs and our concerns.

8.1.1 Scenario based E&D forecast in our RCP3 proposal

We considered the base capex allowance adjustment mechanism, introduced in the Capex IM review, when developing our RCP3 E&D forecast, and again following feedback from the Independent Verifier. However, based on our understanding of the mechanism at the time we were not able to find any current projects that mechanism could be applied to.[14]

E&D requirements are difficult to predict owing to the changing needs of the network, driven by factors such as our customers' future electricity needs and regional economic growth.[15]

[14] The Independent Verifier's E&D verification assessment states that "Having regard to these criteria, we have not identified any projects for possible inclusion in the low capex incentive adjustment mechanism."

[15] This can be illustrated with reference to the list and scope for projects we have delivered/ are expecting to deliver during RCP2, which differs significantly from those included in our RCP2 allowance. Demand and supply side uncertainty have resulted in significant changes to network E&D needs.

We did not find it possible to identify E&D projects with sufficient certainty to a level of detail that would allow the base capex allowance adjustment mechanism to be used.

For near-term projects (2-3 years out), we have sufficient certainty on costs and the triggers have either already been met or we are confident they will be met. This removes the need for the base capex allowance adjustment mechanism.

In contrast, setting triggers and a pre-set amount for longer term E&D projects involves:

- identifying the possible issues and opportunities on the transmission system many years in advance, and
- doing detailed options analysis to determine a credible range of options.

Unlike under our interpretation at the time of submitting our RCP3 proposal, our proposed approach does not leave us exposed to the risk of underfunding uncertain, but expected, E&D base capex projects.

8.1.2 A more flexible interpretation of the Capex IM

Following the submission of our RCP3 proposal, the Commission clarified its interpretation of the Capex IM. In its view, the base capex allowance adjustment mechanism is sufficiently flexible to allow the Commission to set a pool of expenditure (based on undefined E&D projects) which would be added to a base capex E&D allowance once certain trigger conditions are met.

Our proposed approach to E&D forecasting was intended to address the issue with forecasting under uncertainty and appropriately balance the risk between customers and Transpower. We are open to other solutions that may achieve the same outcome.

Possible options outlined by the Commission include the following triggers:

- the change in uncertainty of a single project and/or groups of projects and programmes, or
- the progression of a project's business case and the resulting progression to a pre-defined stage in Transpower's approval process.

To provide further views, we would need further information on implementation details.

- Given the detailed, robust work that went into developing our E&D approach, we assume that the 'E&D capex baseline' would be based on the forecasting information in chapter 4 of our RCP3 proposal document.[16]
- The Commission may envisage different information requirements to go with different triggers – we want to explore with the Commission what process and information requirements would go with different options.

Prior to a different approach being decided, we would like to ensure that the base capex allowance adjustment mechanism achieves similar (or better) outcomes for our customers than our proposed scenario-based E&D forecasting approach.

[16] The E&D capex baseline is the E&D allowance to be included as part of the base capex allowance.

8.2 HVDC and Reactive Assets

Commission issues
The Commission notes the substantial uplift in the HVDC and Reactive Assets asset category in RCP3 when compared to RCP2 and raises two issues:[17]

- **Issue 1**: …the Verifier identified that Transpower has no asset health models for these assets. By not understanding asset health yet predicting expenditure to replace and/or refurbish assets, there is likely to be expenditure forecasting error.
- **Issue 2**: To reduce the uncertainty that we are approving too much or too little in this expenditure category we are considering whether Transpower should be directed to use an alternative expenditure approvals path.

8.2.1 HVDC asset management

In summary, our view on issue 1 is as follows:

- We consider that our approach to assessing the condition of HVDC and Reactive assets and managing these assets is prudent and efficient. This approach involves more intensive monitoring and engineering attention than less critical assets with larger populations.
- We do not agree that the absence of our own formal asset health models suggests we do not understand the health of these assets or that our forecasts are subject to forecasting error.
- Our plans are supported by robust asset information based on manufacturer guidance, specialist in-house capability and engagement with international peers through the HVDC Interconnectors Owners Group and the Siemens HVDC User Group.

8.2.2 Regulatory approval mechanism for HVDC Pole 2 mid-life work

In our response we have assumed that the Commission's consideration of whether to require use of an alternative expenditure approval path relates to our planned HVDC Pole 2 mid-life work. In this context, our view on issue 2 is as follows:

- We consider that we have sufficient certainty of scope, timing and costing for the HVDC Pole 2 mid-life refurbishment to be approved as RCP3 base capex.
- The key criterion in the Capex IM for a project to be considered as listed is timing uncertainty. The start date and time frame over which this overall programme of work is to be delivered is known.
- The need date for the programme of work is the mid-life of the Pole 2 era assets, which is during RCP3. To get the expected benefits of midlife refurbishment— to maintain a similar level of reliability as the current level—the individual projects making up the programme need to be completed close to the mid-life of the assets, not earlier or later. [18]
- The Pole 2 mid-life refurbishment involves around 50 projects grouped together as a programme of work. Options analysis and planning has to be done sequentially as we do not have the

[17] Para 7.32.2.

[18] The business base for VBE (which is part of the overall programme of work) has been approved and work is in progress for 2020 commissioning.

capacity to do all the work at once, as would be required for a listed project. We also need to consider limited specialist supplier resources.

Below we provide further information on our approach to managing HVDC and Reactive assets.

8.2.3 Further information on HVDC and Reactive Assets, and management of these assets

We manage the HVDC assets to ensure high levels of reliability, availability, and resilience, consistent with our service measures. The HVDC system comprises complex, unique and specifically customised assets for our operating conditions and environment. The system is operated and maintained according to both the design parameters and international asset management practices specified by the equipment manufacturers.

In our view, asset health modelling is not the best approach for lifecycle management of HVDC assets.[19]

- The diverse and bespoke nature of HVDC assets results in small asset populations within Transpower and around the world. An approach that involves more intensive engineering attention is therefore appropriate for these assets.
- Most of the assets that comprise the HVDC system are routinely tested to provide a constant view of condition and integrity. The results from these routine tests, combined with telemetry data in real time, enable our asset management team to make well informed and timely maintenance and renewal decisions.[20]
- The best practice management approach for the HVDC assets, is to determine remaining life through analysis using manufacturer information, real-time monitoring, inspections, age and international experience.[21]

Below, we provide further relevant context on the planned Pole 2 mid-life refurbishment.

Works planning

The planning work to progress the Pole 2 mid-life refurbishment involves two stages:

- **Overall work programming** – this stage involves whether considering whether the mid-life refurbishment work overall is prudent and efficient. Given the critical nature of the Pole 2 assets, delaying life extension work beyond RCP3 increases the asset failure risk and would lead to under-utilisation of the new assets when Pole 2 retires. The need for Pole 2 mid-life work is long term and strategy driven.[22]

[19] In our view asset health and condition modelling is also not the best approach for supporting large dynamic reactive support investment decisions as the diverse and bespoke nature of these assets results in small asset populations. Transpower has planned in our RCP3 proposal control and protection system replacement along with auxiliary system refurbishment, which is common practice within the industry.

[20] We have a specialist in-house team with expertise in HVDC and Power Electronics, that determines condition and any interventions. Technical advice is often sought from manufacturers. We also collaborate with an international network of HVDC asset owners. This gives us a good understanding of our HVDC assets.

[21] Associated HVDC assets that fit within our wider asset classes, for example the overhead HVDC line and circuit breakers, are included within our asset health models.

[22] We sought feedback from our customers and stakeholders on two options to account for the planned Pole 2 work in RCP3 in our HVDC Availability service measure ('AP1'): to either allow for the Pole 2 midlife work outages or exclude the Pole 2 work outages. On both occasions - June 2018 and August 2018 - there was unanimous support for an adjusted target to allow for the Pole 2 midlife work outages.

- **Detailed planning** – this stage involves a detailed options assessment to decide how and when the required work is delivered, including which regulatory mechanism we use to seek expenditure approval. This is the current stage.

Forecast expenditure
The proposed Pole 2 mid-life refurbishment accounts for $54.8m of the overall $104.1m proposed RCP3 base capex for HVDC and Reactive assets.

Condition and need
The majority of Pole 2 assets require replacement or refurbishment work to extend their operational life to 50 years. Pole 2 was commissioned in 1992, so assets will be 28-33 years old during RCP3. Delaying life extension work beyond RCP3 increases asset failure risk.

Based on international practice and CIGRE guidelines for life extension of HVDC systems (WG B4-54 – 649), we are confident that a life extension of 15-20 years is achievable. However, most Pole 2-era assets are not expected to last more than 50 years, so delaying refurbishment will lead to under-utilisation of the new/refurbished assets, as the longer the delay, the shorter time-frame to utilise the refreshed assets before the retirement of Pole 2.

The proposed Pole 2 mid-life refurbishment also aims to maintain the high availability target of 98.5% into RCP4 and beyond. Without this refurbishment, the probability of forced outages exceeding the 0.5% per year target would increase significantly with the ageing of Pole 2 era assets.

Proposed regulatory expenditure approval process
We have proposed this work as part of our base capex proposal as the scope and need for the work are sufficiently certain.

9. Operating expenditure

The work in the Asset Management and Operations (AM&O) portfolio enables all work on the grid ensuring the need of the grid is met, and that the grid is operated safely. We consider our proposed expenditure is prudent and efficient, and essential to allow us to continue to improve the maturity of our asset management practices, deliver works on the grid and operate our network.

In this section we:

- respond to a Commission request for further information on whether we have documentation that discusses our business transformation — from an organisation that delivers large capital projects, towards one that principally maintains its assets— and staffing roles over time and maintaining the workforce in preparation for expected future work, and
- reiterate the work we have done to asses that expenditure in 2017/18 is prudent and efficient and hence a reasonable starting point for our expenditure forecast.

We believe the Commission's comments on the efficiency of our current and forecast expenditure also need to be considered in the wider setting of the incentive regime that applies to us under individual-price-quality incentive regulation. This context is summarised is the cover letter to this submission.

9.1 Asset Management and Operations portfolio staffing strategy

Commission question

The Commission states in the Issues paper that while the proposed FTE level in the AM&O portfolio remains constant and the base level opex for the portfolio reflects historical spend, it is considering whether Transpower's shift in focus from an organisation that undertakes major capex works to one that maintains and renews its network requires constant FTE levels.

The Commission has also asked us to provide additional information on how the proposed expenditure within the AM&O portfolio fits into its preparation for future challenges (including the need to deliver the increased level of work expected in RCP4 and subsequent RCPs) and to the extent it is not commercially sensitive, to share it with stakeholders so they may provide their views in cross-submissions.[23]

In this section, we provide the information requested, as well as additional information that is important to understand the wider context of our resourcing decisions. The key points in our response follow.

- Prudent and efficient asset management decisions need to be appropriately resourced.
- The Grid Operating Model (GOM) implemented in 2016 is designed to be responsive to changes in work volume, complexity and focus, as required.
- The work needed to address the forthcoming challenges is varied. The (ongoing) business transformation programmes implemented during RCP3 are summarised in the RCP3 proposal document. We do not have a detailed 'masterplan'-type document on how we intend to meet challenges, but have summarised the key changes in our RCP3 proposal document.
- We welcome the Commission's broader questions asking stakeholders to consider our overall resourcing. In some places, the Commission has focused on FTEs. We do not think such a narrow

[23] Paragraphs 8.26 to 8.29.

focus is suited to assessing the prudency and efficiency of our opex proposal. We meet our resourcing requirements through a combination of insourcing and outsourcing. Over time, we change the mix of insourced and outsourced activities to meet work demands.

- With regard to staffing roles and changes over time, as part of the GOM, we continually evaluate the overall resourcing requirements to meet the grid need cost effectively and efficiently.

9.1.1 Prudent and efficient asset management decisions need to be appropriately resourced

Resources (people) are needed to make good asset management and works delivery decisions, which affect all grid and non-grid expenditure portfolios. Asset Management and Operations is an input to efficient and prudent asset management and enables cost improvement in other areas (i.e. network capex works and maintenance portfolios).

9.1.2 Grid Operating Model adapts to need

In 2015/16 we implemented the grid operating model (GOM). This involved a comprehensive restructure of the asset management and service delivery parts of our organisation. As part of this, we made a range of changes, including to processes, policies and service provider arrangements.

Management's view was that we could improve how we worked across the business to deliver our key business functions more cost efficiently and effectively. The GOM was introduced to deliver a step-change improvement in asset management maturity. The changes to our operating model were key to our improvement journey.[24]

As part of the GOM, we continually evaluate the overall resourcing requirements to meet the grid need and to ensure this is done cost effectively and efficiently. The capability and capacity required to meet the Grid need involves internal staff, consultants/contractors and field service delivery staff. Our overall resourcing requirement changes as asset management matures and our focus changes over time, to meet business and customer requirements.

The (ongoing) business transformation programmes implemented during RCP2 are summarised in the RCP3 proposal document in section 2.2.1.

9.1.3 Focus on overall resourcing need

We welcome the Commission's broader questions asking stakeholders to consider our overall resourcing (e.g. para 8.27 and 8.34.3). In some instances, the Commission has focused on FTEs.[25] We do not think such a narrow focus is suited to assessing the prudency and efficiency of our opex proposal. In Appendix C, we provide our reasons for this view.

9.1.4 Documentation of resourcing to meet future challenges

The work needed to address the forthcoming challenges is varied. We have not prepared a detailed 'masterplan'-type document for planned changes, as we don't believe this would be a suitable

[24] Note that the GOM programme of work was not principally aimed at helping Transpower to move from an organisation that undertakes major capex works to an organisation that maintains and renews its asset base. This can be illustrated with reference to grid base capex and opex which is similar in RCP1, 2 and 3.

[25] For example, the Commission notes at para 8.26 that AM&O FTE levels have been constant over time.

vehicle to assess our resourcing needs for the 7-year + planning horizon in the Integrated Transmission Plan.[26]

As we describe in 6.2.2 of the RCP3 proposal document, while the mix of activities in this portfolio is expected to change, we expect the overall volume of work (and hence expenditure) during RCP3 to be similar to our current volume of work.[27]

As part of the AM&O portfolio's asset planning function we will continue to embed and evolve our asset management tools and processes to improve our asset management capability, to improve cost effectiveness and efficiency.

We expect to increase effort in the following key areas during RCP3.

- We expect to increase the number of strategic investigations and we also expect these investigations to become increasingly complex. The focus on strategic asset management will ensure we can respond in a timely manner to the changing energy futures set out in Transmission Tomorrow and Te Mauri Hiko. The strategic investigations are required partly in response to our changing external environment, and partly because our improved asset management capability will be directed towards longer-term asset management challenges such as Auckland Strategy work, reconductoring and tower painting.
- We expect we will require an increase in the number and complexity of pre-capex investigations to deliver the larger renewal capex programmes from RCP4 onwards.
- We want to invest to understand one of our biggest challenges – the forecast significant growth in reconductoring and tower painting programmes. These programmes pose significant challenges in terms of costs, deliverability and system impact.
- We will continue to embed and evolve our asset management tools and processes to improve our asset management capability, to improve cost effectiveness and efficiency.
- Where appropriate, we intend to develop our asset health and criticality modelling.

9.2 Efficiency of 2017/18 base year

Commission issue
The Commission states that *apart from establishing consistency with the historical average, Transpower does not further elaborate on whether such typical costs are efficient.*[28]

Our proposal goes beyond assessing consistency with historical trends. Below we summarise the evidence we provide in the RCP3 proposal document:

- a review of the efficiency and innovation initiatives during RCP2 (section 2.2.1), which have significantly changed the way we manage our assets and deliver work,

[26] A reason for adopting base-step-trend forecasting approach for Asset Management and Operations was to avoid a bottom-up forecast of resourcing needs. In our view, such an approach would not result in a more accurate forecast.

[27] Our Asset Management and Operations opex forecast reflects certain expected efficiency savings in opex forecasts (resulting from benefits driven ICT capex) and ongoing productivity improvements. (see Table 38 in section 6.2.5 of the RCP3 proposal document).

[28] Para 8.23

- the Independent Verifier's high-level benchmarking of overhead personnel per $ of opex (section 6.2.4),[29]and
- a historical trend analysis, normalised for a change in work focus (we concluded that the 2017/18 expenditure is in line with previous years).

[29] As explained in section 6.24 of the RCP3 proposal document, the verifier concluded that its high-level benchmarking *"[s]hows that Transpower is comparable with TasNetworks, which has similar network characteristics as described in the benchmarking section 3 with regards boundary with electricity distribution, and who have a relatively small in-house workforce and therefore need to plan work for external service providers."* Synergies Economic Consulting (2018). Independent Verification Report -Transpower's RCP3 Expenditure Proposal (2020-25). Chapter 8 (Opex forecast verification), Section 8.6, page 334.

10. Deliverability

Commission question
Several of the questions the Commission addressed to us relating to deliverability seek to understand better our proposed deliverability adjustments.

To provide context to our detailed responses to these questions (Appendix D), in this section we discuss the type of efficiency gains that may affect deliverability during RCP3.

10.1 The RCP3 deliverability adjustment balances two types of risks

Our delivery adjustments strike a prudent balance between two risks:

- **over-funding due to under-delivery**– if we do not make an adjustment to our proposed expenditure the risk increases that our allowance is higher than the value of work we are able to deliver. This risk is moderated by our incentive arrangements (which automatically return two-thirds of any underspend).
- **under-delivery** – if we make a deliverability adjustment then we heighten the risk that the allowance is inadequate to fund the work programme that, based on our best knowledge at this time, would be optimal.

There is considerable uncertainty regarding the balance of these two risks given the scale and complexity of our work programme, and the extended time horizons involved. Our proposed deliverability adjustments represent our best current view of these two opposing risks, and are about transparently communicating these uncertainties to our stakeholders.

The risk balancing decision is difficult. We think we have reached a balance that is realistic, informed by robust analysis, and responsive to consultation input.

10.2 Types of efficiency gains may help resolve deliverability issues

In our proposal, we recognise that future efficiency gains may help resolve the deliverability issue.

To illustrate, we distinguish between three types of efficiency improvements (also set out in the diagram below):

- **Efficiencies that increase capacity headroom.** Some of these efficiencies will release capacity that could be used to deliver additional work, but only if we have enough funding headroom.
- **Efficiencies that increase funding headroom.** These efficiencies will not assist with deliverability but will release funding headroom. In the normal course of events, the expectation is that these gains are shared in line with incentive arrangements rather than used to deliver additional work.
- **Efficiencies that increase capacity and funding headroom.** The expectation is that the cost saving element of these improvements is shared in line with incentive arrangements rather than used to deliver additional work.

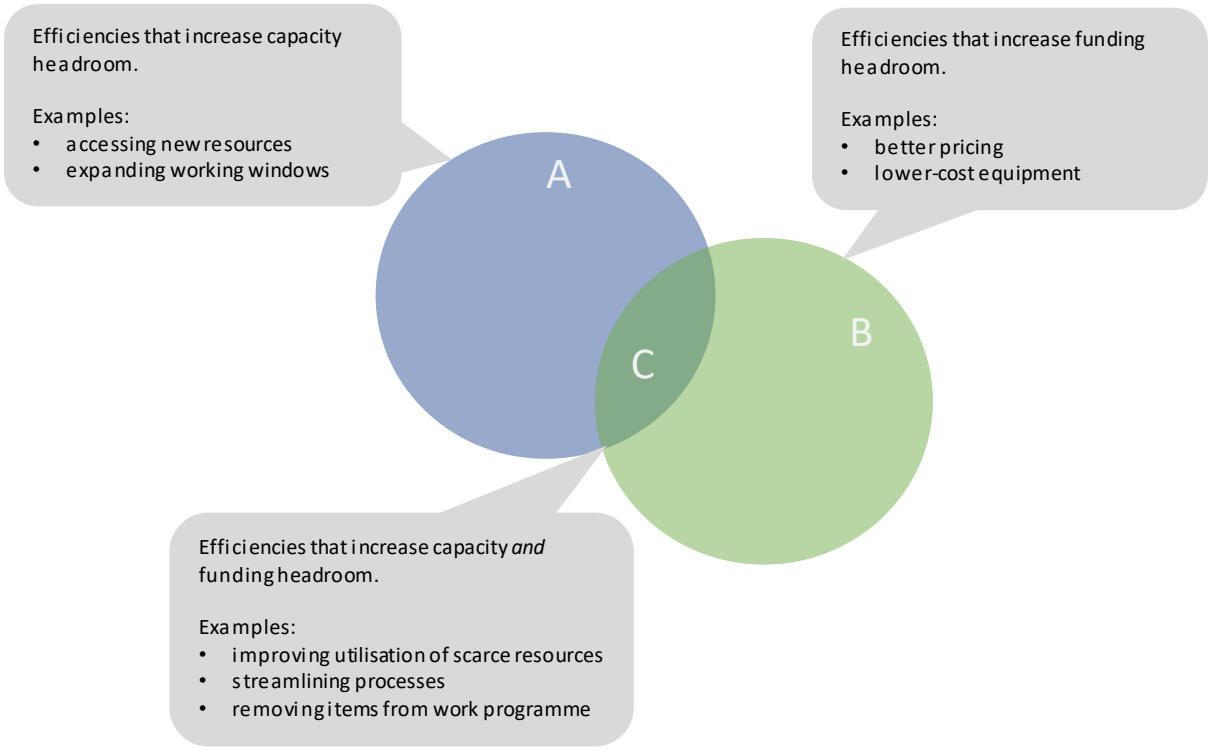

Figure 1: Types of efficiency affecting works delivery

We expect our ongoing business improvement efforts will continue to unlock all three types of efficiency improvements through the remainder or RCP2 and into RCP3. For example, we:

- continue to work on improving the flow of work from asset planning to programming, scheduling and execution,
- ensure service providers have sustainable contracts providing appropriate incentives to invest in required capacity and capability (balanced against other commercial objectives),
- are advancing our maintenance planning with a view to further optimise the timing and scope of maintenance activities,
- continue to refine our strategies, and standard operating procedures.

Our proposal indicates a willingness to reinvest funding released by efficiency gains into delivering additional work made possible by capacity efficiency gains. The scale and timing of any such gains is uncertain, and it is likely that we will find it difficult to achieve all three goals – expanding capacity, reducing costs and delivering the optimal work programme. In this context, our view is our proposal represents not only a prudent and realistic approach but also a favourable proposition for our customers.

We have included additional, supplementary information on the deliverability of our RCP3 proposal in Appendix D.

11. Revenue path

Commission question
The Commission has asked stakeholders whether it should do anything in the design of the revenue path to address the step changes in Transpower's total forecast revenues in transitioning from RCP2 to RCP3 and/or RCP3 to RCP4.

If the Commission chooses to adopt our proposal to smooth the revenue path, one of the choices relates to whether it should also smooth revenue across, not just within regulatory periods. Changes across period occur, for example, due to changes in WACC.

In our view, the best approach is a revenue path that *fully* recognises changes in WACC at the start of each regulatory period. Attempts to smooth out these changes across periods are likely to create unintended consequences and may decrease the stability of the revenue path over time. Below we explain our reasons for this view.

11.1 Calculating the revenue path

The approach we have taken to calculate the slope of the revenue path starts by calculating the revenue path using a constant WACC across all RCPs – in this case the WACC for RCP2, because that is the current WACC. The slope of the revenue path is then set so as to give a smooth transition from one year to the next, both within and between RCPs. The result of this first step is a revenue path with a slope that reflects the increase in the underlying revenue building blocks. We consider that this is an important characteristic: that there is a 'natural' revenue path that reflects the underlying revenue building blocks.

The next step is to apply a forecast of WACCs to the respective RCPs. This step moves the revenue path in each RCP up or down parallel to the step 1 revenue path (i.e. the one based on the WACC for RCP2). The reason the change in WACC results in a parallel shift in the revenue path is that the change in WACC affects all years of an RCP by a similar amount. Under our approach we think of the revenue as following one of a set of these parallel natural revenue paths, each of which corresponds to a different forecast WACC setting.

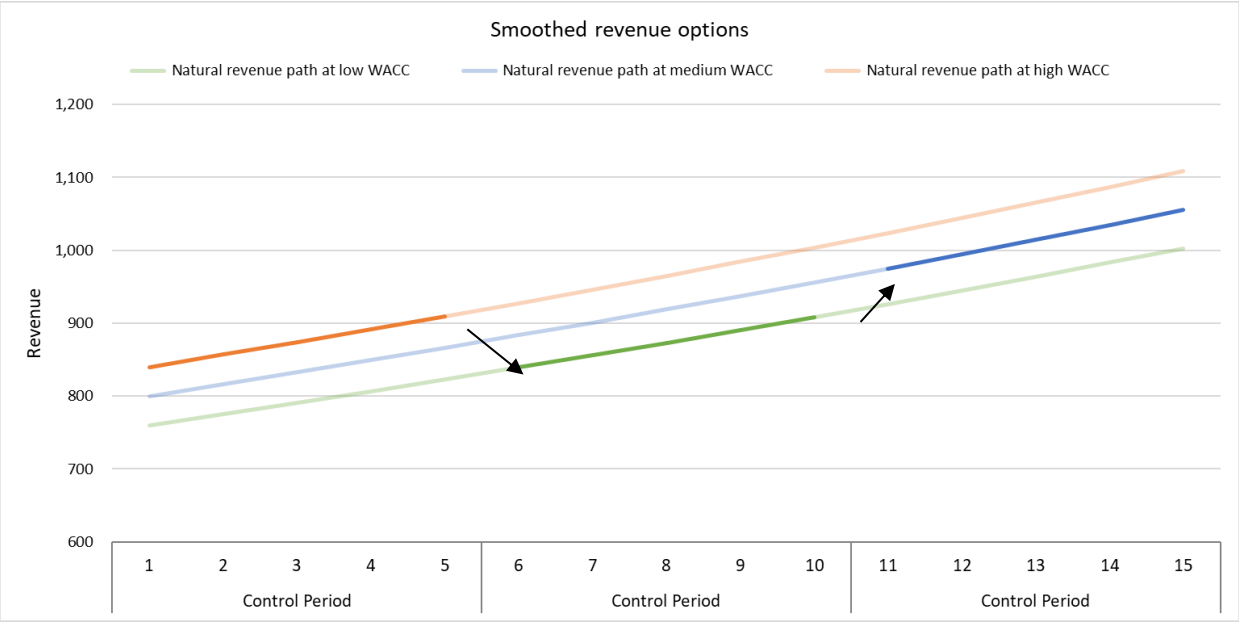

Figure 2: Smoothed revenue options – low, medium and high WACC

We propose that changes in WACC are recognised at the start of each RCP by switching to the natural revenue path that corresponds to the new WACC (e.g. orange to green, for a lower WACC in the figure above). This results in a step change from one RCP to the next.

11.2 Is there an alternative path?

Adopting an alternative revenue path in an attempt to smooth away the effect of a changing WACC will set the revenue on a path which would be less reflective of underlying building blocks and which entails the risk of bigger steps changes or mismatches at the end of the RCP.

An important point here is that an increase or decrease in the WACC causes a step change in every year in the following RCP regardless of whether or not the revenue path is smoothed. This is not a feature of revenue smoothing.

We can illustrate the effect of a change in the WACC with a 3 RCP example, where the WACC in the middle RCP differs from the others.

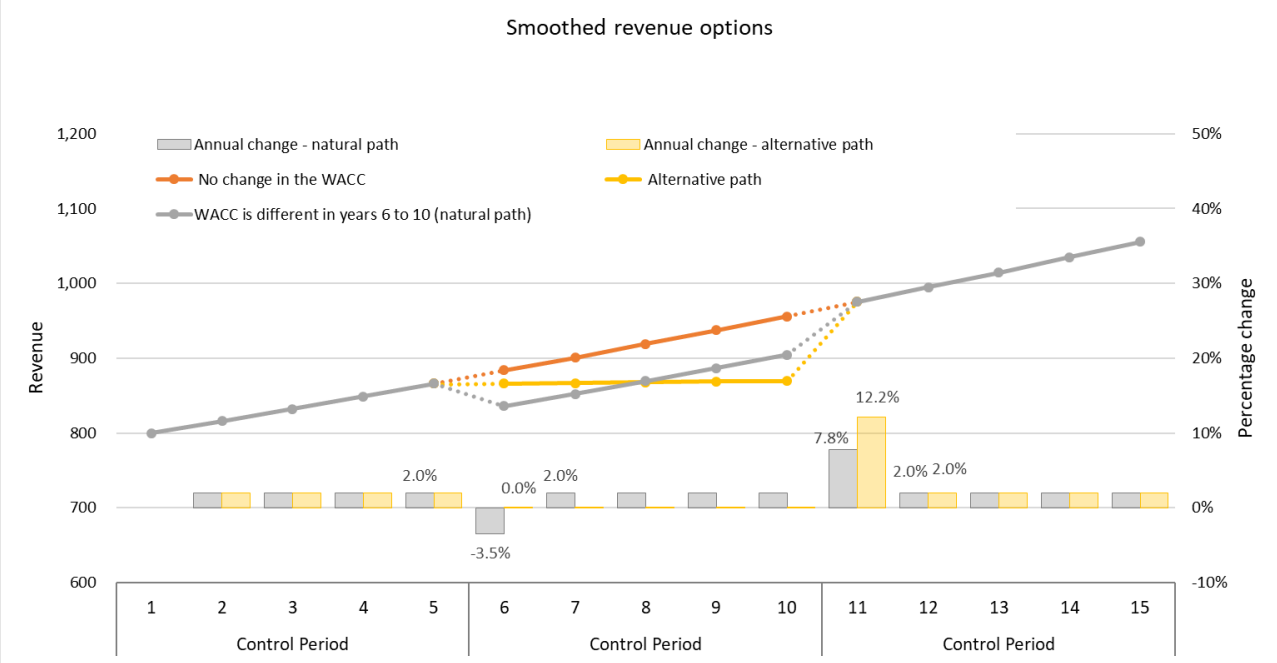

Figure 3: Smoothed revenue options – natural and alternative paths (part 1)

In the chart above, the 'alternative path' line shows what happens if we attempt to smooth away the step caused by the change in WACC from year 5 to year 6. To ensure that Transpower and its customers are economically neutral with respect to the chosen slope of the revenue path, the alternative revenue path must have the same Net Present Value as the natural path. The result is a path that, in effect, pivots about the middle year of the RCP (i.e. the grey and yellow lines have the same value in year 8).

If we increase the revenue at the start of the RCP, in order to smooth the path from the previous RCP (see the yellow line in year 6), then the revenue at the end of the RCP has to decrease (see the yellow line in year 10). This decrease causes a much bigger step up to the natural revenue path in the transition between RCPs from years 10 to 11 (i.e. 12.2% compared to 7.8%). It also means that the revenue follows a path that is not reflective of the growth of the underlying building blocks. In this example the revenue growth is 0% throughout the RCP, despite the growth of the revenue building blocks of 2%.

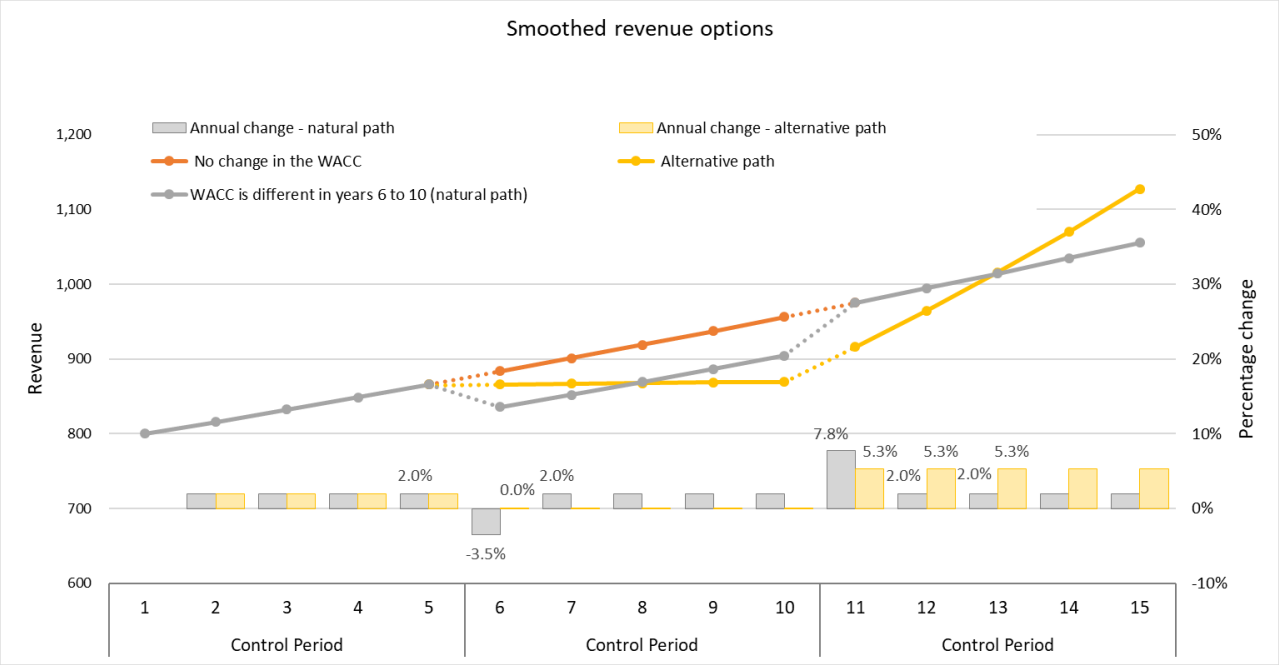

Figure 4: Smoothed revenue options – natural and alternative paths (part 2)

The increased step up in revenue from year 10 to year 11 could, in turn, be smoothed away by increasing the growth rate in years 11 to 15 in the chart above. However, that again causes the revenue to follow an 'unnatural' path, where it is higher in year 15 than it would have been if there had been no change in WACC in the period from years 6 to 10. The growth in the underlying revenue building blocks in years 11 to 15 is still 2%, but the revenue now follows a path that increases at 5.3% per year.

We consider that this revenue volatility cannot be the outcome of a fit-for-purpose revenue smoothing methodology.

If we were to adopt this alternative path, the volatility and the increased steps between RCPs would still exist even if we are able to predict the future WACCs with complete accuracy. In reality, there is significant uncertainty in relation to the WACC in future RCPs, because much can change in 5 years. We also therefore consider that this type of alternative revenue path entails a greater level of risk of bigger steps changes or mismatches at the end of each RCP.

Appendix A. Quality standards and grid output measures

This appendix provides supplementary information for section 6.

Historical performance mapped against proposed targets

Commission question
The Commission noted that the Independent Verifier was not able to verify that the proposed RCP3 service performance measure targets were consistent with historical data. The Commission asked us to provide this analysis as part of our submission.[30]

Details relating to how our proposed RCP3 measures would have performed in RCP2 and before can be found in our Regulatory Template RT02 (Output Incentives Model).[31] Key sheets of that template are:

1. Performance incentives summary
3. Incentive calcs – GP
4. AP2 – historical performance

The AP2 and GP sheets summarise the targets, caps, collars and incentive rates for the various grid output measures, together with the performance results of the proposed RCP3 measures if they had been applied historically and a calculation of the subsequent financial gain or loss that would have applied.

Assessing how Transpower would have performed historically with the proposed RCP3 measures will be slightly misleading

In the case of Grid Performance (GP), the targets have been calculated by modifying the historic average to account for expected differences between past and future. For this reason, the proposed RCP3 target is not precisely the historic average. The main issue with using precisely the historic average is due to the number of interruptions caused by equipment failure:

- from 2000 to 2017 (inclusive) the average number of interruptions caused by equipment failure was 30.2 per year, however
- from 2000 to 2009 (inclusive) it was 38.5 per year, and
- from 2015 to 2017 (inclusive) it was 14.3 per year.

We consider this shows a trend toward improved Grid Performance. Our proposed target is based on an average over the 2015 to 2017 period. However, the other interruption causes do not display a robust trend over time. For this reason, we based the GP1 targets on an 18-year average of interruptions *not* due to equipment failure and a 3-year average of interruptions due to equipment failure.

[30] Paragraph 5.58.

[31] www.transpower.co.nz/sites/default/files/uncontrolled_docs/RT02%20Output%20Incentives%20Model_.xlsx

In the context of the caveat above, we provide the numbers at an aggregated level for GP1 and GP2:

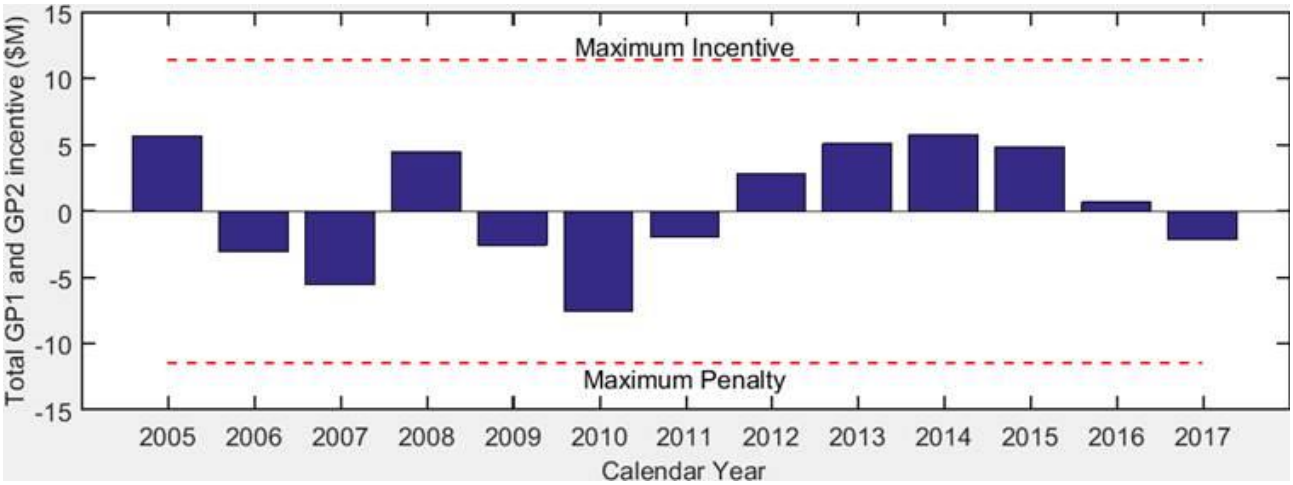

Figure 5: Total GP1 and GP2 incentive ($m)

Within our Regulatory Template RT02, it is possible to dive deeper into the disaggregated data. Historical data on interruption duration shows particularly strong fluctuations and a large positive skew in the distribution. This places the average duration of an interruption (which is what we chose as the target) higher than the median (or p50) duration of an interruption. The most prominent example of this occurs for GP2, in the N-1 security category. We wish to emphasise that the Capex IM restricts the incentive arrangement to being symmetrical about the target (which does not suit a skewed distribution). For this reason (specifically for GP2, N-1 security), we more frequently achieve below the target (better performance) than we achieve above the target (worse performance). However, we are comparatively far more likely to exceed the collar than we are to get close to the cap.

Sheet 3 (Incentive calcs – GP) and sheet 4 (AP2 historical performance) also include the historical results for the GP1, GP2 and AP2 measures and include colour-coding so that it is easy to see whether the result was above the RCP3 target, below target, or below the collar level (which in RCP2 is being treated as a quality standard breach). The colour coding is as follows:

x	= breach of the collar
x	= worse than target
x	= better than target

Figure 6: Key for Figure

The table below replicates that information in relation to GP1 and GP2:

	Number (#)												
Row Labels	Cap	Target	Collar	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
N-1 Security High Economic Consequence	-	7	14	33	13	2	13	21	6	6	3	4	3	4	11
N-1 Security Material Economic Consequence	7	24	41	68	35	28	23	40	33	18	27	15	13	20	30
N Security High Economic Consequence	4	6	8	5	5	7	4	10	5	5	2	4	4	5	9
N Security Material Economic Consequence	9	23	37	33	49	24	37	11	36	25	26	11	22	10	16
N-1 Security Generator	5	9	13	20	15	8	11	15	19	12	20	8	7	15	7
N Security Generator	6	12	18	15	17	22	29	16	13	6	15	12	6	6	10

	Duration (min)												
Row Labels	Cap	Target	Collar	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
N-1 Security High Economic Consequence	30	92	154	66	227	37	75	266	127	28	22	30	27	96	69
N-1 Security Material Economic Consequence	36	61	86	46	58	66	77	69	56	97	84	62	46	94	83
N Security High Economic Consequence	-	103	206	55	36	80	124	136	42	89	16	497	447	119	68
N Security Material Economic Consequence	-	140	280	544	50	55	75	96	53	145	39	68	343	1,189	249
N-1 Security Generator	50	174	298	152	61	225	116	109	374	439	113	123	473	108	104
N Security Generator	11	93	175	45	34	18	160	309	254	90	64	77	208	96	84

Figure 7: Application of proposed RCP3 targets to historical performance for GP1 and GP2

With respect to quality standard breaches, statistically we expect the collar for at least one GP1 or GP2 measure will not be met each year during RCP3. In this context, we support a revision of the quality standards for service measures GP1, GP2 (number and average duration of unplanned interruptions), AP1 and AP2 (percentage availability of HVDC and selected HVAC circuits).

Incentive strength for performance measures

Commission question
The Commission asked us to provide the analysis we have undertaken to determine the incentive strength (i.e., 50% of value of lost load (VoLL)) for the proposed performance measures. [32]

Regulatory Template RT02 (Output Incentives Model) includes a calculation of the effective, average incentive strength of the non-generator GP1/GP2 settings as a percentage of VoLL.[33]

When we were working on the incentive settings we wanted to ensure the incentive strength did not exceed VoLL, because that would create the incentive to spend more than VoLL in order to avoid a cost to consumers equal to VoLL.

However, we were equally aware that the incentive calculations (for example, the average numbers of interruptions and durations and the average loads) resulted in lots of averaging in the incentive strength calculation and that if we were to target an incentive strength *equal to* VoLL, then there would be a significant risk of over-signalling.

The choice of 50% of VoLL is our professional judgment, balancing the three interrelated incentive settings: the incentive strength, the cap-collar spread and the revenue at risk.

50% of VoLL was a number that was sufficiently material to be meaningful, without being so close to VoLL as to risk over-signalling. Part of that consideration was also that the total revenue at risk that resulted from the combination of incentive strength and cap-collar spread was considered appropriate, at about 2% of regulated transmission revenue. A small adjustment was made to the cap-collar spread to fix the revenue at risk at exactly 2% for a 50% incentive strength.

[32] Paragraph 3.19.3.

[33] www.transpower.co.nz/sites/default/files/uncontrolled_docs/RT02%20Output%20Incentives%20Model_.xlsx

Appendix B. Asset Management - supplementary information

This appendix provides supplementary information to section 7.

Factors considered to ensure cost effectiveness of asset management improvements

As explained in section 7, we intend to continue developing our systems, knowledge, and methodologies in risk-based asset management to enhance our decision making across all asset classes. However, as a prudent, customer-focussed business, we must ensure improvements deliver value that outweighs their cost. There is a range of factors we need to consider when deciding to invest in asset management improvements.

In our view, some of the factors that need to be considered when prioritising improvements are:

- **Asset health only addresses condition-based risk**. Asset health modelling is focussed on estimating the likelihood of assets failing due to deterioration in their physical condition. This is a significant driver of our asset renewal investment but is not the only driver. Service interruptions from equipment failure only account for approximately 30% of the events. Modelling future performance measures and communicating these to stakeholders is therefore very complex. In addition, asset health models are not appropriate for assessing risk for some assets, and time or number of operations may be more appropriate.

- **Asset deterioration and failure are not (and never will be) fully understood**. Asset health models codify expert knowledge of the ways in which various assets deteriorate over time. They can only be as good as the state of that expert knowledge, which, despite our best endeavours, will always be incomplete. This is not an issue that Transpower can resolve, as it reflects the state of engineering knowledge globally as well as Transpower's unique knowledge of New Zealand conditions. Transmission assets are built to be very robust, so deterioration is slow, and failures are rare. This is a good thing, but it also means that knowledge of deterioration and failures accumulates relatively slowly.

- **Criticality modelling is evolving**. Our criticality modelling is advanced but nonetheless provides only a point-in-time approximation of the consequences of the failure of key assets. This is suitable for supporting systematic, replicable asset management decision-making and will have scope for incremental improvement over time, but it is not clear that a further step to yet more complex modelling and its application across all asset classes would deliver benefits that outweigh the costs involved.

- **Data quality needs to be commensurate with the modelling methods**. We have made significant improvements in our management of asset data, including improving quality assurance processes. This has produced an initial uplift in data quality that will continue to feed through to improved asset knowledge over time as more assets have their condition assessed. The rate at which we gather condition data is optimised based on numerous considerations, including – the cost of inspection, the impact of testing on asset risk, the rate of asset deterioration. Notwithstanding these improvements, we need to be mindful that the value of sophisticated models will be limited by the quality and availability of data.

- **It is not cost-effective to optimise based on need-date alone.** Asset health is a way of estimating the optimal time to replace an asset – i.e. late enough to avoid unnecessary replacement and early enough to avoid escalating risk of failure. In practice, we schedule assets

for replacement (or refurbishment) with an understanding that modelling is uncertain, and that shifting timing may be needed to maintain a viable service provider service and can reduce the overall cost of our capital programme (e.g. by levelling workloads) or improve service performance (e.g. by bundling several replacements into one outage).

It is important to recognise that asset health and criticality are useful tools, but they operate alongside other tools, techniques and capabilities to support our ability to manage the grid effectively. It is important that we balance improvement efforts across all toolsets and focus on how we integrate each tool into our decision-making processes.

In some cases, asset health and criticality would be excessive, or would not be the right tools for the job. For example, for some low-value assets the cost of acquiring suitable condition data would be disproportionate relative to the cost of the assets. In other cases, asset health and criticality are fit-for-purpose now and there is better value in focussing scarce specialist expertise and organisational capacity for change on other aspects of asset management.

In developing and evolving our plans in risk-based asset management during RCP3, we will consider all potential options, including methodologies and approaches that are not yet fully mature (e.g., artificial intelligence, such as machine learning, and alternatives to traditional criticality and health modelling).

Asset condition data

Commission question
The Commission asked us to provide information on the collection and quality assurance of asset condition data.[34]

In our RCP3 proposal document, on page 32, we note that we have invested in improving our collection and management of asset data, so that we can make decisions based on data that is more complete and easily accessible. On page 108, we note there will be a need for additional predictive maintenance activities during RCP3, including investment to better understand asset health and to identify critical asset data.

Transpower recognises the importance asset data has on supporting better decision-making to optimise our asset lives and manage our risks. To this end, throughout RCP2, we have significantly improved our asset information governance and invested in improving our collection and management of asset data, so that we can make decisions based on complete and accessible data.

We recognise we still have some way to go to get the right data at the right time, right first time, into our systems easily. This challenge is significant, but necessary, to bring our data, standards and processes to an internationally leading level. Of the 32 asset classes, we have addressed 20, with the balance to be completed before the end of RCP2.

In the example of Capacitors and Reactor Assets, we have recently implemented an improved condition assessment process that includes standards, collection practices and data completion and quality improvements. This process, along with others, has been reviewed by an international expert and ensures we are collecting the right data, at the right quality, at the right time. We have established a baseline, and now require a series of condition data points to determine trends and deterioration curves for this class to derive the full value of this data.

Since July 2017, we have introduced better guidance on Condition Assessment (CA) in the Stations area for service provider field staff, with condition assessment photo guides and asset specific

[34] Page 47, table 5.

guidance on rating. This is useful for driving consistency across service providers and for new service provider staff. These procedures also form part of the training material used by Grid Skills when training service providers on asset maintenance. In the Lines and Towers area we are implementing a field mobility app to deliver digital workbooks for CA work order completion. This will improve efficiency, simplify the capture, recording and reporting process and ensure timely, quality data. We expect that stations will also adopt this new technology in the future.

There are various assurance levels and steps by the various parties throughout the process to ensure CA data quality. For example: service providers have their own quality assurance requirements when gathering the CA, field assessors provide oversight of CA, the CA is reviewed by the Service Delivery Managers when closing out work orders and the Asset Information Management team checks the CA against defined business rules on entry. Finally, the asset feedback register is a mechanism that allows for observed errors in our specification and CAs to be flagged and remedial action taken. We are working hard get these processes working effectively, and recognise that there is still more we have to do.

The Transpower Assurance Framework as mandated in the Transpower Risk Management Policy applies a 'three lines of assurance' model.

- The first line of assurance is where the internal control measures and management controls are applied and employed by Operational Management. In the case of CA, Transpower Service Delivery Management perform operational management, validation, approval and close out of work orders, and associated contract management.
- The second line provides an oversight function that assures that the first line is effective, and includes quality assurance, functional assurance and Control Self-Assessment. Quality Assurance within this second line incorporates system, documentation and field audits of Service Providers to ensure condition assessment works are appropriately planned, resourced, carried out correctly and consistently with appropriate competencies, and with outcomes that align to Transpower requirements and practices.
- The third line involves periodic independent internal or external assurance of Transpower processes.

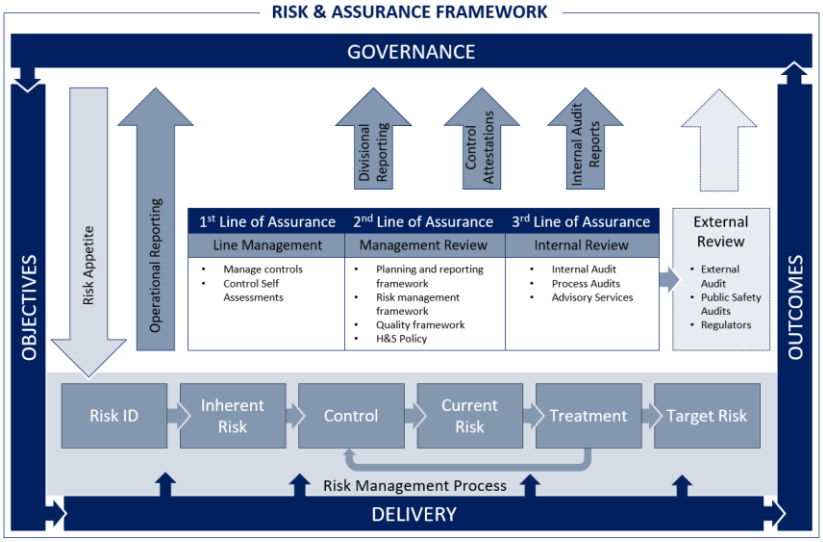

Figure 8: Risk and Assurance Framework

In summary, improvements by Transpower to system configurations, upload validation and oversight reporting, along with moving to hand held device mobile data entry are driving stronger governance and closing the loopholes for poor data to enter our systems. We have made considerable progress but still have many areas for improvement.

Appendix C. Operating expenditure – supplementary information

This appendix provides further information to complement our discussion of the Commission's FTE assessment in section 9.

Overall, a focus on Asset Management and Operations (AM&O) FTEs places emphasis on a narrow component of Transpower's business and resourcing strategy. In our view, what primarily matters is the efficient resource cost of delivering a given set of works, irrespective of whether the resource content is delivered from insourced/employed resources (i.e., FTEs) or outsourced/contingent resources.

In addition, grid capex is not the sole driver of AM&O activities and cost. Investment in the right activities (and appropriate FTE levels) is driven by business requirements to operate the grid, maintain it, plan for changes in the grid and deliver those changes.

The focus on FTEs ignores the external contracting resources (i.e. contingent resources) that we use to manage peaks and troughs in workload and respond to changes in market conditions (i.e. the contingent component of our overall workforce).

In this appendix we:

- show the current FTE make-up of the AM&O, showing that only 60% of current FTEs relate to capital expenditure,
- show how FTE levels have not remained constant following the 'big-build' phase of RCP1, and explain the key drivers of changes,
- explain how a focus on FTEs in isolation ignores the overall resourcing requirement.

Asset Management and Operations FTE make-up

In the Issues paper the Commission effectively compares our FTE resourcing with network capex.[35] The chart below shows the current make-up of the Asset Management and Operations FTE resources by function.

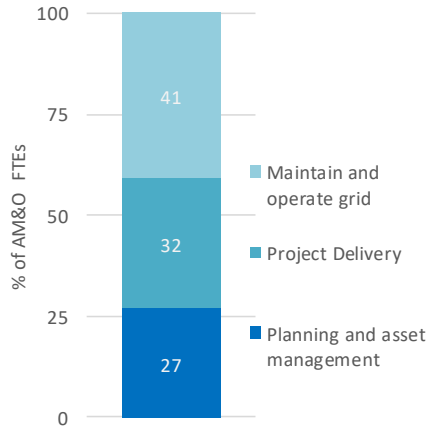

Figure 9: Current make-up of Asset Management and Operations FTE resources by function

The current broad-make up of AM&O FTEs illustrates that over 40% of FTEs work on maintaining and operating the grid, and only about 60% of FTEs work on matters that are directly relate to network capex. While there is a relationship between overall capex and overall AM&O FTEs, the strength of

[35] Para 8.26.

this relationship should not be overstated - a significant portion of work is not related to network capex activity.

A focus on FTEs ignores the overall resourcing requirement

An assessment that uses FTEs as a proxy for effort or expenditure in the AM&O portfolio is incomplete and may give a misleading view of the issue the Commission wishes to assess. What matters is the total resource pool (including contingent workforce) required to achieve our outcomes, including insourced services (FTEs), contractors and outsourced services that perform AM&O portfolio functions. This mix changes over time as required, including to manage peaks and troughs in workload, and to respond to market conditions and customer requirements.

Changes in FTE resourcing levels and make-up over time

The Commission suggests in its request for information and para 8.26 that AM&O FTE levels have been (relatively) constant over time. The figure below provides additional information to Figure 95 of the independent verification report. We added an additional data point (2010/11) and describe key changes in FTEs. The figure illustrates how the resourcing quantity of FTEs — including after the major build phase — and the make-up has changed over time.

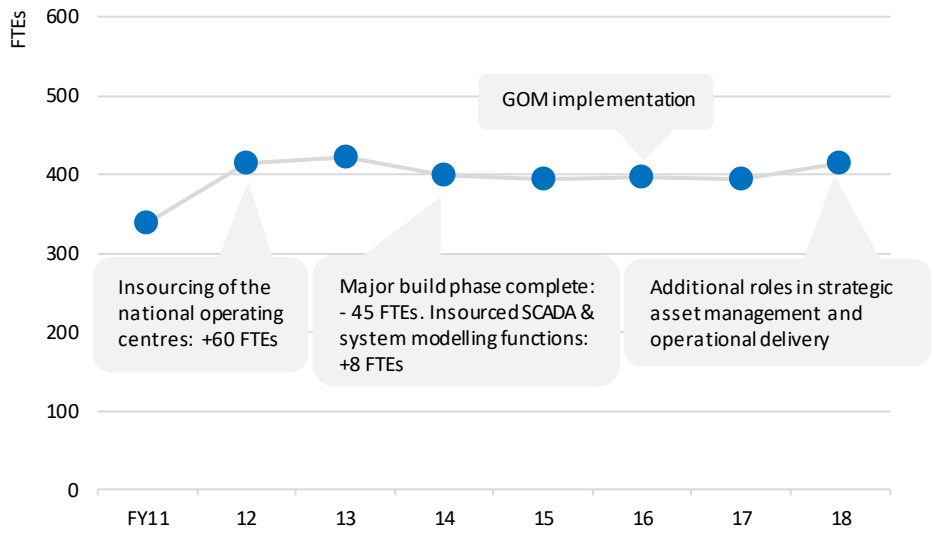

Figure 10: Asset Management and Operations FTE changes over time

Below we summarise the key changes.

- In 2010/11 we in-sourced the national operating centres, increasing our FTE resourcing. This was done to improve service quality and delivery and reduce the overall cost of these functions significantly.
- During RCP1, we completed a large volume of major capex with work peaking in 2011/12 (as illustrated in the capex profile below).
- By 2013/14 the major project teams relating to that work were dis-established as the projects finished, reducing FTEs by 45. At the same time, we insourced SCADA & system modelling functions, adding 8 FTEs to our workforce.
- After the implementation of the Grid Operating Model (GOM), the overall FTE count remained flat even though we implemented and enhanced our asset management capabilities.

- We recently established additional roles in strategic asset management and operational delivery.

As illustrated in the figure below, the build phase involved a significant portion of major capex projects that finished towards the end of RCP1.

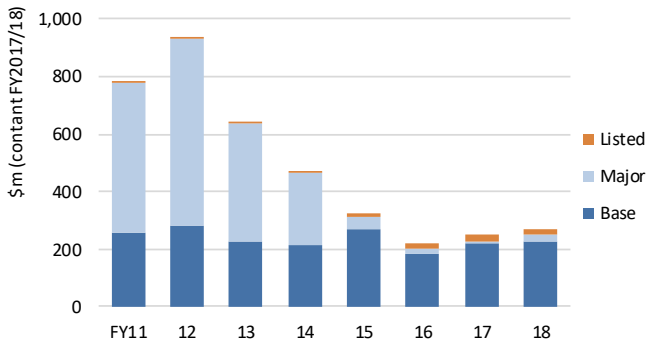

Figure 11: Historical base capex

Major capex projects, such as those delivered during RCP1, are generally turn-key projects that require relatively limited input from Transpower employees (on a per dollar basis) compared to other projects that require detailed investigations and planning and delivery (e.g. specialised work on substation management system and protection). Changes in work mix mean that the relationship between expenditure and labour input changes over time.

Appendix D. Deliverability – supplementary information

This appendix provides supplementary information for section 10.

Deliverability efficiency gains

Commission question
The Commission asked us to provide more details on how we intend to achieve the efficiency gains that would enable us to undertake all the works we consider necessary in RCP3, notwithstanding the deliverability adjustments.[36]

In section 10 we explain that our proposal balances risks of over-funding and under-delivery.

If we set funding in line with our current view of the optimal work programme, then there is a risk we may underspend. Two-thirds of underspending would be returned to our customers through our incentive arrangements, but we would retain some benefit. To mitigate the risk of retaining an unearned benefit, we have proposed to make a deliverability adjustment to our allowances. A corollary of this is an increase in the risk of under-delivery. This is because we may manage to resolve capacity constraints sufficiently that funding headroom becomes the limiting factor.

Our proposal indicates an intention to continue pursuing efficiency gains, which may release capacity headroom, funding headroom or both.

In the normal course of events, any funding headroom released through efficiency gains should be shared through our incentive arrangements. However, we have indicated a willingness to contemplate reinvesting funding headroom into delivering more work. In practice, this will only occur if timely efficiency gains are realised and any associated capacity headroom resolved.

The nature of business improvement is such that we cannot lay out now how we expect capacity and funding headroom gains to crystalise during RCP3. Our proposal reflects our current level of efficiency, which incorporates many of the early gains from efficiency initiatives developed over recent years. Future efficiency gains will arise from the maturing of past initiatives, execution of new initiatives, and the ongoing processes of innovation and refinement that drive continuous business improvement.

The key improvement processes we can point to now, and which are likely to have a bearing on deliverability, are as follows.

- Enhanced work packaging and optimisation. This can result in improved resource utilisation.
- Enhanced tools for understanding the resource demands of our work programme. This can help identify and address pinch points earlier.
- Our efforts to ensure service providers have sustainable contracts that provide appropriate incentives to invest in required capacity and capability (balanced against other commercial objectives). This helps balance cost and flexibility.
- Our move to working with project need windows in our core planning systems, rather than point estimates of the optimal need date. This better communicates the scope for delivery optimisation.
- Enhanced outage planning, which reduces programme disruption and churn.

[36] Paragraph 9.11

These are complex, interrelated processes that require sustained effort to improve over time. We are pleased with our improvements to date and are confident we can make further gains over time. We have been transparent and stringent with respect to our delivery adjustment. Additional funds in this area would certainly provide a greater degree of certainty with respect to delivery of the optimal work programme.

RCP3 impact of works deferred from RCP2

Commission question
The Commission asked us to provide our view on whether deliverability in RCP3 will be further impacted by any works deferred into RCP3 from RCP2, and to explain the extent of that deferral and the resulting impact on network risk.[37]

In our proposal document we explain that *"[w]hile our RCP3 forecast is expressed in expenditure rather than commissioned terms, any projects yet to be commissioned in the remaining years of RCP2 that may roll into RCP3 are assumed to result in a corresponding expenditure amount to roll out into RCP4. We have adopted this treatment of potential roll ins/roll outs for all forecasts in our proposal."*[38]

We acknowledge the perspective raised by the Commission. In practice, we consider the scale of this issue is small when compared to the overall funding allocation.

To put this in context, this issue only relates to the uncertainty in our forecast of the portion of work that will be in train as we move from one RCP to the next. To illustrate with indicative figures, if 20% of each year's work programme relates to work that might span into the following year (the rest either having a short duration or starting too early in the year) and if our forecasts have an uncertainty of +/- 15% for that work, then the scale of the potential change in rollover is approximately (0.15 x 0.2 =) 3% of our annual work programme, or 0.6% of our proposed RCP3 allowance.[39]

As shown above, the scale of this issue is small in terms of regulatory outcomes. That said, there is business value on paying close attention to how projects rollover from one year to the other, as we do not want rollover to compound over time and disrupt work programmes by driving excessive replanning.

Our Asset Management Plan provides more specific information on delivery considerations, including uncertainty, for each asset class. Our capital programme management tracks delivery risks continuously and we have executive-level governance processes in place to manage trade-offs that can arise across portfolios as work programmes evolve.

Assessing and communicating the risks of deliverability adjustments

Commission question
The Commission asked us to explain how and when we intend to develop our asset health and criticality framework such that it can be used to quantify the risk associated with project

[37] Paragraph 9.18

[38] Page 65, footnote 48.

[39] These figures are indicative only, but are suitable for providing perspective on the scale of the issue.

delivery timing changes and associated deliverability adjustments (including for consultation on such proposed adjustments).[40]

Our focus is on better understanding and communicating uncertainty, rather than developing more precise estimates. Most asset degradation and failure processes are too gradual and complex for there to be scope for precise estimates of risk. There is more value in making sure we are realistic about uncertainty so that we do not drive inefficient programme delivery. In most cases, the run rate, targeting and optimisation of our renewal programmes is more important than the precise timing of individual interventions.

From 'need date' to 'need window'

A key change that will allow us to better explain the implication for risk is the explicit use of 'need windows'.

There is a need window for all projects rather than a specific replacement date. This is due to the uncertainties associated with collected data, modelling and underlying asset deterioration and failure processes. Depending on several factors such as the asset type and its location the size of the window will differ. Providing we are deferring work whilst remaining within a defined delivery window there would not be a material change in risk that requires any form of additional consultation.

For other comments on the key factors we will consider in developing our asset health and criticality please refer to section 7.

Improvements during RCP2

Since developing our RCP2 proposal in 2013, we have made improvements in our approach to risk, asset and cost management, together with a maturing of our strategic planning capability. Our risk and asset management practices include systematic tools such as our asset health and criticality frameworks, targeted tools such as risk bow-tie analysis and processes for clearly linking decision-making through from strategy to planning and into delivery.

The Independent Verifier found that our present practice with respect to Asset Health and Risk modelling was consistent with Good Electricity Industry Practice.

Approach for RCP3

For our RCP3 submission, we developed and used a solution prioritisation process to help enable better cost-risk trade-offs. Our proposal document, at section 2.3.3, describes our solution prioritisation approach. This process prioritised investment solutions through a cross-portfolio challenge process. Over 80% of our proposed RCP3 renewal capex was reviewed using a mix of project and portfolio scenario analysis to identify opportunities for improved cost-risk decision making and potential areas for deferrals. We will continue to refine this approach using the latest asset condition information to inform our health models and assessments, which combined with criticality can provide a risk-based score for specific assets where these models exist. This allows us to better understand the impact on our risk profile for different investment options and assess the impact of any decision to defer capex for these assets.

During the Solution Prioritisation exercise, investment options were analysed and assessed to optimise the overall cost of the grid expenditure forecast and inform some of the cost-risk trade-offs that became part of the price-quality testing stage described in section 2.3.6 of our proposal document.

[40] Paragraph 9.16.3, footnote 239.

We included the findings as part of the price-quality testing in our consultation document. We will continue to assess how to effectively engage with customers on matters such as these in the future as this is the first time we have tried this approach.[41]

Maintenance opex deliverability adjustment

Commission question
The Commission notes the adjustment for maintenance opex is a lump-sum adjustment, i.e. not allocated to individual categories in the maintenance portfolio, but will be allocated when maintenance works become more certain.

The Commission is interested in our view on how this might play out and wants to understand, for example, to what extent this adjustment might affect the preparatory works necessary to better understand the ageing conductor issue.[42]

Overall RCP3 maintenance opex requirement

Our unadjusted total maintenance expenditure forecast for RCP3 is $552 million. When reviewing the forecast, we recognised that over a typical period there are likely to be constraints or specific circumstances in delivery such that we cannot complete all specified work. This led to a deliverability adjustment of $29 million resulting in a proposed expenditure of $523 million. As per our main proposal document (Section 2.3.4, 3.4 and 6.1.4) we aim to deliver the full scope of identified maintenance work by reinvesting efficiency gains and re-prioritising planned work, but there is uncertainty as whether this will be achieved.

Below we describe how this adjustment may affect each of our four maintenance types.

Preventive[43]

Ongoing improvement initiatives (preventive maintenance optimisation and Reliability Informed Maintenance processes) will continue and may identify further optimisation opportunities during RCP3. [44] These opportunities can involve removing activities from our maintenance schedules, which can have the dual benefit of reducing costs and releasing capacity.[45]

[41] We also prepare other documents as part of our annual planning processes that are used to inform and consult with our customers. These include the Transmission Planning Report (TPR), Asset Management Plan (AMP) and Grid Outputs report along with on-going discussions with our customers on upgrade plans within their networks, customer funded investments and replacement of connection assets.

[42] Paragraph 9.9.

[43] Routine servicing or inspections to prevent failure or understand asset condition.

[44] Over the initial years of RCP2, we carried out risk-based optimisation of our preventive maintenance activity for some asset types, which has impacted the volume and mix of work we carry out. The resulting reduction in overall activity will continue into RCP3 and beyond.

[45] Revised schedules can also create new maintenance activity peaks, and of course changes to preventive maintenance have to be approached with caution to avoid creating future uneconomic or undeliverable increases in corrective maintenance or asset renewal.

Predictive[46]

We expect the majority of the deliverability adjustment to be applied to predictive maintenance. We expect to mature our tools and processes, resulting in opportunities for improved cost-risk trade-offs allowing us to defer work (while managing risk to acceptable levels).

The preparatory works for the increase in age-related re-conductoring work—the Commission's issues paper example —will go through the same process as other maintenance work.

Transmission lines were identified as an area where forecast work volumes increase to a level that we consider will exceed service provider capacity to deliver. We are in the very early states of identifying opportunities for improvements in predicting and planning for our ageing conductor fleet. We aim to be able to reduce the resource requirements of the work and mitigate potential resource constraints.

Proactive[47]

It is not expected that proactive maintenance would be impacted by the deliverability adjustment.

Corrective[48]

Corrective maintenance will not be impacted by the deliverability adjustment. However, significant increases in corrective work may impact our ability to deliver other maintenance work types.

[46] Maintenance performed based on known equipment condition before its condition deteriorates into an unsatisfactory state (e.g. outside service specification). Unlike corrective maintenance, this work occurs prior to failure.

[47] Activities driven by either tactical or strategic reliability analysis.

[48] Fault response or maintenance work undertaken on equipment or systems to return it from an unsatisfactory or failed condition back to a serviceable condition (e.g. within specification).

Appendix E. Error corrections

We identified the following errors in the issues paper for which we would like to provide corrections.

Issues paper reference	Error	Correction
Paragraph 5.22.1	Transpower has proposed a new customer service/event communications measure CS1.	CS1 is new but rationalises/replaces RCP2 trial measures: PMD1, PMD2, and PMD3.
Paragraph 5.28	Measures GP1, GP2, AP1 and AP2 have been based on historical data	The proposed GP1 and GP2 targets are primarily based on long-term historical averages, adjusted for our more recent improved equipment-related performance and for further expected changes until the end of RCP3.
Paragraph 7.32.4	ICT capex: the benefits-driven expenditure comprises 32% of the total proposed program total expenditure and is linked to 62 projects predicted to result in operational savings, capex deferral and stakeholder/customer relationship improvements. We will test the benefits-driven projects' expenditure justifications in this asset category.	The correct figures (as set out in the RCP3 proposal document at section 7.2.1) are 25% benefits-driven projects and 75% lifecycle, risk mitigation and compliance projects.
Paragraph 10.22, Table 15	Information in table that sets out step changes in total forecast revenues between RCPs (nominal)	The percentages in the column headed "RCP3 to RCP4 (if we used the estimated RCP3 WACC in RCP4)" are the percentages that result from our forecast of the RCP4 WACC – i.e. where the vanilla WACC changes from 5.50% to 5.67% between RCP3 and RCP4. If the forecast RCP3 WACC is used in RCP4 (i.e. no change in WACC) then the step change for HVAC is 2.7% - close to the 2.6% for the remainder of the period and the step change for HVDC is 1.8%. We calculate that the percentages for HVAC and HVDC in the column headed "RCP3 to RCP4 (if we used the RCP2 WACC in RCP4)" should be 12.6% and 10.5% respectively.

Issues paper – error corrections