

Decision and reasons on Transpower's Upper South Island Reliability Stage 1 Major Capex Proposal

Date: 13 February 2013

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Executive Summary

- X1 This paper sets out the reasons for our decision to approve Transpower's amended Upper South Island Reliability Stage 1 Major Capex Proposal and provides detail on our evaluation.
- X2 The Commerce Commission must approve major capex projects before Transpower New Zealand Limited is able to recover the capital expenditure for those projects from its customers. This requirement is set out in the Transpower Capital Expenditure Input Methodology Determination [2012] NZCC 2.

Transpower New Zealand Limited's proposal

- X3 Transpower New Zealand Limited has submitted a major capex proposal seeking approval for the following investments to improve reliability in the Upper South Island:
- X3.1 installation of a bus coupler at Islington substation to increase transmission capacity by approximately 95 megawatts;
 - X3.2 installation of ten load monitoring units at substations in the Upper South Island; and
 - X3.3 preliminary work for subsequent investments in the Upper South Island reliability development programme.
- X4 This investment is required because Transpower New Zealand Limited forecasted that the Islington substation will not be able to meet demand in the near future. Due to current uncertainties in trend in future demand, Transpower has undertaken to monitor demand and invest when necessary to meet its obligations under the grid reliability standards.¹
- X5 Our assessment of Transpower New Zealand Limited's major capex proposal is limited to an evaluation of the investment in the three items in paragraph X5.
- X6 Transpower New Zealand Limited also included another investment in its initial proposal. This investment was to improve the resilience of the Islington substation to high-impact low-probability events. At Transpower New Zealand Limited's request² we have not undertaken any evaluation of this proposed investment.

1 When demand exceeds N-1 transmission capacity, the core grid is deemed not to meet the requirements of the grid reliability standards set out in the Electricity Industry Participation Code.

2 As set out in the Transpower's letter to the Commerce Commission dated 27 September 2012.

Our decision

- X7 Our decision is to approve Transpower New Zealand Limited's major capex proposal for the reliability investment in the Upper South Island. The components applying in respect of our approval are listed in the following paragraphs.
- X8 The major capex allowance is \$4.99 million (in 2014/15 prices). Table X1 summarises the breakdown of the major capex allowance that Transpower is seeking.

Table X1: Summary of major capex allowance

| Base estimate 2011/12 (\$m) | Including P90 ³ uncertainties 2011/12 (\$m) | Including P90 Inflation | Major capex allowance ⁴ 2014/15 (\$m) |
|--------------------------------|--|-------------------------|--|
| 3.91 | 4.62 | 4.76 | 4.99 |

- X9 The approved major capex outputs are:
- X9.1 a new 220 kV bus coupler and associated switchgear at Islington substation. The bus coupler and switchgear are incorporated into the Christchurch Reactive Power Controller scheme;
 - X9.2 an additional discriminating zone (zone F) for the Islington 220 kV bus bar protection;
 - X9.3 10 load monitoring units installed in substations in the Upper South Island;
 - X9.4 solution study reports on two different configurations for Orari switching station, including cost estimates within +/- 30%;
 - X9.5 the initial stage of a detailed solution for the preferred Orari switching station configuration; and
 - X9.6 an area stage report of the transmission line route selection process, being the initial step in obtaining the required designation/consents.
- X10 The approval expiry date is the last working day of 2018.⁵

³ P90 is the 90th percentile cost. There is 90% probability that Transpower will complete the project within the P90 cost.

⁴ Includes P90 financing costs.

⁵ See paragraph C46 for further detail on how the Commerce Commission has given effect to the approval expiry date specified by Transpower.

- X11 The P50⁶ expected cost is \$4.51 million. See paragraph 1.18 for further details on Transpower New Zealand Limited's cost estimates for the major capex proposal.
- X12 Transpower New Zealand Limited plans to implement the major capex proposal as a number of work packages with different forecast commissioning dates. See paragraph 1.20 for further details on the commissioning dates proposed by Transpower for this major capex proposal.

Submissions and cross submissions on our draft decision

- X13 Genesis, MEUG and Meridian provided submissions on our draft decision. We acknowledge all submissions. The submissions are published on our website <http://www.comcom.govt.nz/upper-south-island-grid-upgrade/>.
- X14 All submitters agreed with our draft decision to approve stage 1 but also asked that Transpower needs to consider the issues that were raised in our paper and to consider the impact of transmission outages in future investments.⁷
- X15 Genesis Energy and Vector Limited provided cross submissions. All submissions are published on our website <http://www.comcom.govt.nz/upper-south-island-grid-upgrade/>.
- X16 Genesis supported Meridian's submission that Transpower should consider the impact of transmission line outages on the market when developing investment options for stage 2.⁸
- X17 Vector submitted that interested parties need to understand where the economic costs of investments are likely to fall. Vector also stated that due to uncertainty in the transmission pricing methodology (TPM), investment proposals at this time face more uncertainty than usual. Vector submitted that the Commission should consider the impact of the proposed TPM before approving major grid investments.⁹ We agree with Vector that stakeholders would be interested on the likely costs of investments. This was also submitted by MUEG.¹⁰ The TPM, however, does not affect the investment test as it is set out in the Capex IM, because the investment

⁶ The P50 is the 50th percentile cost. There is 50% probability that Transpower will complete the project within the P50 cost.

⁷ Genesis Energy's submission of Transpower's USI Reliability stage 1 MCP 24 January 2013, Meridian's submission of Transpower's USI Reliability stage 1 MCP 25 January 2013 and MUEG's submission on Transpower's USI Reliability stage 1 MCP January 2013, page 1 of each submission.

⁸ Genesis Energy's cross submission on draft decision and reasons paper on Transpower's USI MCP 24 January 2013, paragraph 1.

⁹ Vector Limited's cross submission on draft decision and reasons paper on Transpower's USI MCP 5 February 2013, paragraphs 4, 5 and 8.

¹⁰ MUEG's submission on Transpower's USI Reliability stage 1 MCP January 2013, page 1 of each submission, paragraph 2.

test considers market costs and benefits at a national level. Therefore, uncertainty in the TPM is not a reason to delay our decision.

- X18 In making our final decision, we have considered the submissions and cross submissions we received on our draft decision.

Our conclusion

- X19 In analysing the major capex proposal we have not seen any evidence that leads us to consider the proposal is inconsistent with the relevant Input Methodologies.
- X20 The Commerce Commission is satisfied that data, analysis and assumptions used by Transpower are fit for purpose.
- X21 We also consider that Transpower New Zealand Limited's proposed investment will promote the purpose of Part 4 of the Commerce Act by securing a low cost solution for the Upper South Island investment need. At the same time, the investment will allow Transpower to gather more information to allow it to better assess future investment in the Upper South Island development programme. The proposed investment will provide incentives for Transpower to invest in solutions that provide long term benefit to consumers. These benefits will be gained by ensuring the investments Transpower makes are based on the best available information.

Introduction

Purpose of this paper

- 1 This paper provides detail on our evaluation sets out the reasons for our decision to approve Transpower New Zealand Limited's amended Upper South Island Reliability Stage 1 Major Capex Proposal.

Major investment in the transmission network

- 2 Transpower New Zealand Limited (Transpower) may submit major capex proposals (MCPs) at any time during a regulatory period.¹¹
- 3 The Commerce Commission (the Commission) must approve MCPs before Transpower is able to recover the capital expenditure for those projects from its customers.¹² Approved major capex is then included in the Regulatory Asset Base (RAB) and Transpower is able to recover its investment under the individual price-quality path determination (IPP).

Transpower has proposed a major investment

- 4 Transpower notified the Commission of its intention to plan an MCP under the Electricity Governance Rules (EGR) in April 2011. It then updated its proposal to align in the most part with the Capex IM and sought approval for its investment to improve reliability in the Upper South Island (USI) on 29 June 2012.¹³
- 5 Transpower proposed this investment because of its forecast that the Islington substation will not be able to meet demand as early as 2014.¹⁴ Transpower sought approval to:
 - 5.1 install a bus coupler at Islington substation to increase transmission capacity by approximately 95 MW;
 - 5.2 install 10 load monitoring units at substations in the USI; and
 - 5.3 undertake preliminary work for investments at subsequent stages of the USI reliability development programme.

¹¹ Commerce Commission, "Re Transpower Capital Expenditure Input Methodology Determination [2012] NZCC 2" (31 January 2012), (Capex IM) clause 3.3.2(3).

¹² Capex IM, clause 3.3.2(1).

¹³ Transpower *Upper South Island Reliability Stage 1 Major Capex Proposal* (June 2012).

¹⁴ When demand exceeds N-1 transmission capacity, the network does not meet the requirements of the grid reliability standards (GRS) developed in accordance with the Electricity Industry Participation Code 2010 (EIPC).

- 6 These items above make up part of a programme currently estimated to cost \$174.9 million (in 2011/12 prices). This programme will upgrade the transmission network supplying the USI so that it continues to meet the required standard.¹⁵ In summary, the standard is that the grid can continue to operate with the loss of one component. Transpower is required to address this standard as part of its obligations under the Electricity Industry Participation Code 2010 (EIPC), administered by the Electricity Authority.¹⁶
- 7 Transpower New Zealand Limited also included another investment with its original proposal. This investment was to improve the resilience of the Islington substation to high-impact low-probability (HILP) events by:
- 7.1 undertaking earthquake strengthening work;
 - 7.2 improving fire protection; and
 - 7.3 modifying the low voltage alternating current system.
- 8 Transpower amended the initial proposal by requesting that we do not consider the HILP work at Islington substation.¹⁷
- 9 In this decision we are not considering any of the HILP investment. We are only considering the amended Upper South Island Reliability Stage 1 Major Capex Proposal (the Proposal).
- 10 Lists of all documents provided by Transpower as part of its MCP are provided in Attachment B of this document. Documents listed in this attachment include Transpower's proposal and attachments, documents containing additional information provided by Transpower during our evaluation, and the documents Transpower consulted on.

We can only approve or reject the proposed investment

- 11 The Commission can only approve or reject what Transpower has proposed. We cannot change what Transpower has proposed. Our decision to approve or reject is based on evaluating the proposal against the requirements of the Capex IM.

¹⁵ The N-1 criterion of the grid reliability standard (GRS) is that with all assets that are reasonably expected to be in service, the power system would remain in a secure state following the tripping of one of the transmission assets in the power system. The GRS is developed in accordance with the Electricity Industry Participation Code 2010 (EIPC).

¹⁶ Electricity Industry Participation Code (EIPC) clause 12.114(1)(b) requires Transpower to consider reasonable options to ensure that the grid meets the N-1 criterion in respect of interconnection assets.

¹⁷ Letter from Transpower, 27 September 2012. Transpower advised that it will ask the Commission to consider the HILP work at Islington substation at a later date, separate from the rest of this proposal.

- 12 The requirements are that the proposal must:
- 12.1 be consistent with the purpose of Part 4 of the Commerce Act (the Act);¹⁸
 - 12.2 be consistent with the Input Methodologies;¹⁹
 - 12.3 be fit for purpose of the Commission exercising its powers under Part 4;²⁰
 - 12.4 meet all of the other MCP specific criteria contained within the Capex IM;²¹
 - 12.5 satisfy the investment test;²² and
 - 12.6 comply with the consultation, information and certification requirements.²³

¹⁸ Capex IM, clause 6.1.1(2)(b).

¹⁹ Capex IM, clause 6.1.1(2)(b).

²⁰ Capex IM, clause 6.1.1(2)(c).

²¹ Capex IM, Schedule C.

²² Capex IM, Schedule D

²³ Capex IM Schedules I, G and Part 9 respectively.

Our decision is to approve the proposed investment

- 13 Our decision is to approve the proposed investment contained in the Proposal. In accepting the Proposal the following components proposed by Transpower therefore apply:
- 13.1 the major capex allowance (MCA);
 - 13.2 the major capex outputs;
 - 13.3 the approval expiry date;
 - 13.4 the P50 estimate of cost; and
 - 13.5 the commissioning date assumption.
- 14 This section sets out these components. The criteria used for our approval is set out in the next section.

Major capex allowance applying for the approved project

- 15 The MCA is the maximum amount that Transpower can recover from consumers.²⁴ The MCA is \$4.99 million (in 2014/15 prices). Table 1 summarises the breakdown of the MCA Transpower is seeking.

Table 1: Summary of major capex allowance

| Base estimate 2011/12 (\$m) | Including P90 uncertainties 2011/12 (\$m) | Including P90 inflation | Major capex allowance ²⁵ 2014/15 (\$m) |
|--------------------------------|---|-------------------------|---|
| 3.91 | 4.62 | 4.76 | 4.99 |

Major capex outputs applying for the approved project

- 16 The major capex outputs are specific items to be delivered by the project. The major capex outputs are:
- 16.1 a new 220 kV bus coupler and associated switchgear at Islington substation. The bus coupler and switchgear are incorporated into the Christchurch Reactive Power Controller (RPC) scheme;

²⁴ Transpower may ask the Commission to amend the MCA, in the future if actual efficient cost of the project exceeds the MCA. Capex IM, clause 3.3.4.

²⁵ Includes P90 financing costs.

- 16.2 an additional discriminating zone (zone F) for the Islington 220 kV bus bar protection;
- 16.3 10 load monitoring units installed in substations in the USI;
- 16.4 solution study reports on two different configurations for Orari switching station, including cost estimates within +/- 30%;
- 16.5 the initial stage of a detailed solution for the preferred Orari switching station configuration; and
- 16.6 an area stage report of the transmission line route selection process, being the initial step in obtaining the required designation/consents.

Approval expiry date applying for the approved project

- 17 The approval expiry date is the date past which Transpower will not be able to recover costs from consumers.²⁶ The approval expiry date is the last working day of 2018.²⁷

P50 estimate of cost applying for the approved project

- 18 The P50 is the estimated cost of the project, where the probability that the actual cost will not exceed this figure is 50%. The P50 is \$4.51 million (in 2014-15 prices).
- 19 Table 2 below summarises Transpower's cost estimates for the proposed investment and investment options.²⁸

Table 2: Transpower's P50 estimate of costs

| Estimated cost 2011/12 (\$m) | Community care 2011/12 (\$m) | Base estimate 2011/12 (\$m) | Expected cost P50 ²⁹ 2011/12 (\$m) | Expected cost P50 2014/15 (\$m) |
|---------------------------------|---------------------------------|--------------------------------|---|---------------------------------------|
| 3.91 | 0.0 ³⁰ | 3.91 | 4.23 | 4.51 |

²⁶ Transpower may ask the Commission to amend the approval expiry date if a delayed expiry date will be beneficial to the consumers: Capex IM, clause 3.3.4.

²⁷ In its proposal Transpower specified 2018 as the approval expiry date (Proposal, section 3.4). The Commission has given effect to this by approving an approval expiry date of the last day of this year.

²⁸ Transpower spreadsheet *Recalculation of USI MCA*.

²⁹ Includes scope and construction uncertainties.

³⁰ The community care fund has a total of \$4,289.08. This has not been shown due to rounding.

Commissioning date assumption applying for the approved project

20 The commissioning date assumption is the date when Transpower assumes that the last asset of the project will start to be in use. Transpower plans to implement the Proposal as a number of work packages with different forecast commissioning dates. The commissioning dates and our assessment of them are set out in Table 3.

Table 3: Transpower's proposed commissioning dates, reasons and our assessment

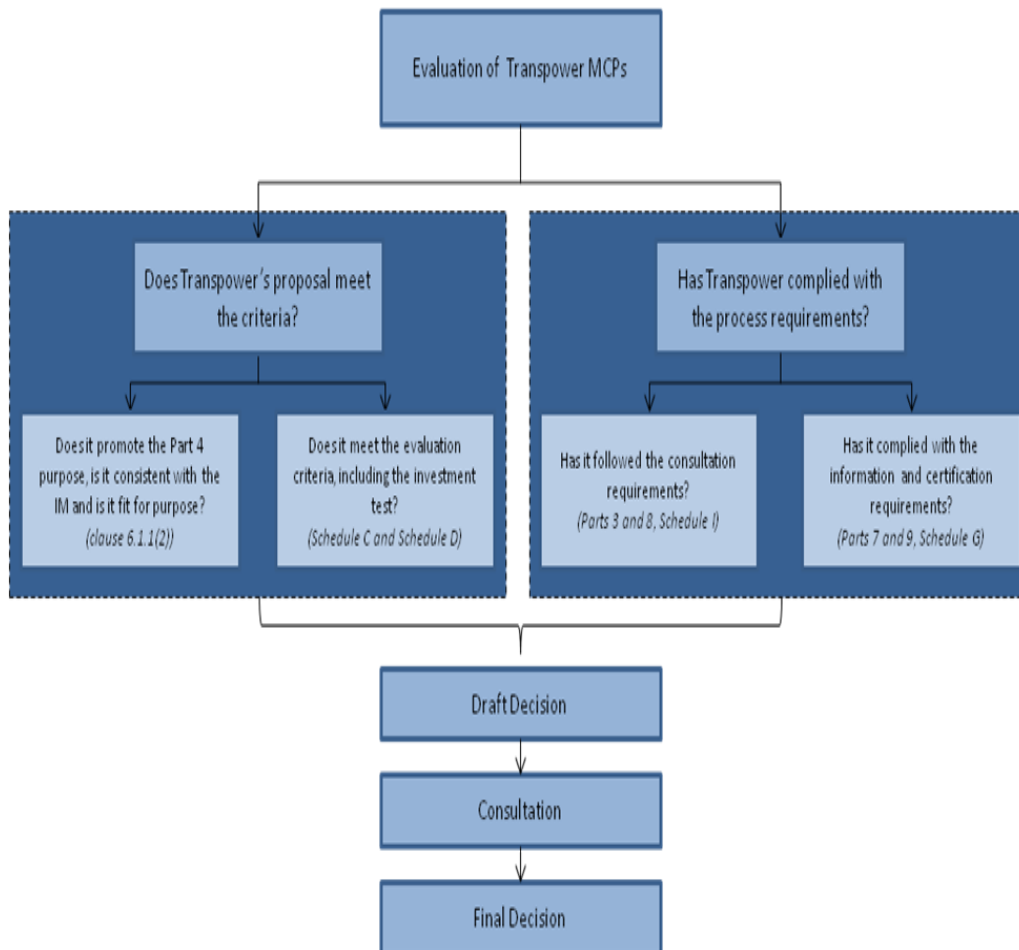
| Work package | Transpower's proposed commissioning date | Reasons for commissioning date | Commission's assessment |
|------------------------------|--|---|---|
| New bus coupler at Islington | Q2 2014 | Needed when Islington SVC is decommissioned and peak demand exceeds the N-1 transmission limit. | Transpower has undertaken to monitor demand growth and amend the need date ³¹ of this work package. |
| Load monitoring equipment | Q1 2014 | Work will be scheduled to fit in with other outages. | This approach appears reasonable and minimises the impact on customers. It depends on the availability of outages in summer 2013/14. |
| Preliminary work at Orari | Q1 2013 | Work needs to be undertaken before later stages of the USI reliability development programme are carried out. | Load forecast and Orion's feedback indicates that this work could be delayed. Transpower has undertaken to monitor demand growth and amend the need date for this work package. |

³¹ The need date is the estimated last date on which the outputs of a proposal are required to be commissioned and available for service.

Reasons for our decision

- 21 As set out in the Introduction, there are a number of criteria that the Proposal must meet. Figure 1 shows these criteria and the process set by the Capex IM. This section summarises the reasons why these criteria have been met.

Figure 1: Capex IM processes for major capex proposals



- 22 The criteria we have considered are below.
- 22.1 Is the Proposal major capex?
 - 22.2 Is the Proposal compliant with the Input Methodologies?
 - 22.3 Does the Proposal promote the purpose of Part 4 of the Act?
 - 22.4 Are data, analysis and assumptions in the Proposal fit for purpose?
 - 22.5 Does the Proposal meet the MCP evaluation criteria set in the Capex IM?
 - 22.6 Does the Proposal satisfy the investment test?

- 22.7 Does the Proposal meet the consultation, information and certification requirements of the Capex IM?

The Proposal is major capex

- 23 The Proposal is a major capex project that must be evaluated and approved by the Commission under the Capex IM.
- 24 A major capex project is a particular project of major capex undertaken to address a specific investment need.³² Major capex is defined, among other things, as capital expenditure which is forecast to be included in a programme whose aggregate forecast capital expenditure exceeds the base capex programme threshold.³³ The base capex programme threshold is currently \$5 million.³⁴
- 25 To meet the definition of major capex the aggregate forecast capital expenditure of a programme must exceed the base capex programme threshold.
- 26 The Proposal is being undertaken as part of a programme of work we have named the USI reliability development programme. This programme has an aggregate forecast capital expenditure of \$174.9 million (in 2011/12 prices). This exceeds the base capex programme threshold of \$5 million.

The Proposal complies with the Input Methodologies

- 27 In analysing the Proposal we have not seen any evidence that leads us to consider the Proposal to be inconsistent with the applicable Input Methodologies.

The Proposal promotes the purpose of Part 4 of the Act

- 28 We consider that Transpower's proposed investment will promote the purpose of Part 4 of the Act.³⁵

Data, analysis and assumptions in the Proposal are fit for purpose

- 29 We are satisfied that the Proposal is fit for purpose of the Commission exercising its powers under Part 4.³⁶

³² Capex IM, Part 1 definition of major capex project.

³³ Capex IM, Part 1 definition of major capex.

³⁴ Capex IM, Part 1 definition of base capex programme threshold.

³⁵ We discuss this in paragraph C7.

³⁶ We discuss this in paragraph C8.

The Proposal meets the major capex proposal evaluation criteria set in the Capex IM

- 30 We consider that the Proposal meets the MCP evaluation criteria set out in the Capex IM.³⁷
- 31 We have two concerns as a result of our evaluation:
- 31.1 The first relates to the analysis into the date the investment is needed by.
- 31.2 The second relates to the scope of the Orari switching station options that Transpower will investigate.
- 32 These concerns, and why we consider them resolved, are discussed below.
- 33 The date when the investment is needed is driven by demand in the USI. The demand forecast used by Transpower to determine this date is higher than observed demand. Its forecast is based on the assumption that the drop in demand due to the Christchurch earthquakes is temporary. However, earthquake recovery scenarios from the Christchurch Urban Development Strategy Group now indicate that the delay in recovery could be longer than first anticipated. Although this delay in recovery does not affect the need for the investment, the delay does affect the date on which the investment is likely to be needed. In particular, the delay could affect the date at which investments at subsequent stages of the USI reliability development programme are required.
- 34 However, approval of the Proposal would allow Transpower to commence the work necessary for a prudent response to demand growth. Transpower has also undertaken to monitor demand growth and review the date on which the investment is needed. We agree with Transpower's proposed approach.
- 35 Our concern with Transpower's inclusion in the USI reliability development programme of two switching stations at Orari is that this may not be the most economical way of mitigating HILP events. Our expectations of any subsequent proposal are that consistent with good engineering practice, a full cost benefit analysis will be undertaken to identify the most efficient way of mitigating HILP risk. Transpower has undertaken to investigate this further and this investigation is now reflected in the outputs for the Orari switching station work package in the Proposal.

The Proposal satisfies the investment test

- 36 We consider that the proposed investment contained in the Proposal satisfies the investment test.³⁸

³⁷ We discuss this in paragraphs C9 to C59.

- 37 To satisfy the investment test, proposed investments must be sufficiently robust under sensitivity analysis and have the highest expected net electricity market benefit.³⁹
- 38 Table 4 summarises the expected costs of the Proposal.

Table 4: Summary of costs – present value 2011-12 (\$m)

| Investment | Expected cost P50 ⁴⁰ | P90 estimate |
|--|---------------------------------|---|
| Proposal | 4.51 ⁴¹ | 4.99 |
| Investments in the USI reliability development programme | 174.9 ⁴² | Transpower will submit the next stage for approval at a later date. |

- 39 We have analysed the parameters used by Transpower in its sensitivity analysis of the investment test results. We are satisfied that the variables and ranges it has used are reasonable. We are also satisfied, based on these inputs, that the outputs of their sensitivity analysis are reasonable. As these show no significant changes in the ranking of the investment options, we consider that the proposed investment is robust under sensitivity analysis.⁴³
- 40 We are satisfied that Transpower has shown that the proposed investment has the highest net market benefits by considering both quantified and unquantified benefits.⁴⁴
- 41 We also consider that until Transpower obtains more accurate costs for Orari switching station it should not discard other options for further investment in the USI development programme. This does not affect our approval of the Proposal, since the investments contained in the Proposal are common to all leading investment options presented in Transpower's proposal.

³⁸ We discuss this in Attachment D.

³⁹ Capex IM, clause D1(1).

⁴⁰ Transpower did not calculate the expected net electricity market benefit as described in the Capex IM. Transpower has presented a figure labelled the expected net electricity market benefit in Table 3-15 in Proposal Attachment C.

⁴¹ Transpower spreadsheet – Recalc of USI MCP.

⁴² Proposal Attachment C Table 3-15. \$174.9 million includes the proposal's P50 estimate of \$4.51 million.

⁴³ Our analysis is set out in Attachment D of this document.

⁴⁴ The capex IM, clause D1(1)(c), allows that where two investments have similar expected market benefits (as assessed with quantified benefits) Transpower may selected the investment option taking account of both quantified benefits and a qualitative assessment of unquantified benefits.

The Proposal meets the consultation, information and certification requirements of the Capex IM

42 We consider that Transpower has met the consultation, information and certification requirements of the Capex IM.⁴⁵

⁴⁵ We discuss this in Attachment E of this document.

Attachment A: Acronyms, abbreviations and terms

Purpose of this attachment

- 43 This attachment provides an explanation of the acronyms, abbreviations and terms used in this paper in Table A1.

Table A1: Acronyms, abbreviations and terms

| Abbreviation | Definition |
|-------------------|---|
| Act | The Commerce Act 1986 |
| Capex IM | Transpower capital expenditure input methodology (Commerce Commission, <i>Re Transpower Capital Expenditure Methodology Determination [2012] NZCC 2</i> , 31 January 2012) available at http://www.comcom.govt.nz/transpower-input-methodologies/ . |
| Commission | The Commerce Commission. |
| EGR | Electricity Governance Rules 2003, now revoked and replaced by the EIPC and the Capex IM. |
| EIPC | Electrical industry participation code available at http://www.ea.govt.nz/act-code-regs/code-regs/the-code/ . |
| GRS | Grid reliability standard. A standard for the reliability of the transmission grid developed by the Electricity Authority (EPIC clause 12.55). |
| GWh | Means gigawatt-hours and is a measure of energy. |
| HILP | High impact low probability incidents. |
| Investment option | Investment option means all options considered by Transpower excluding the proposed investment. Investment option is defined in clause D2 of the Capex IM. |
| Investment test | Investment test means the tests specified in schedule D, Division 1 of the Capex IM. |
| MCA | Major capex allowance means the amount of major capex approved by the Commission in relation to a major capex project. |
| MCP | Major capex proposal. |
| MDS | Market development scenarios. |
| MED | Former Ministry of Economic Development. It is now the Economic Development Group of the Ministry of Business, Innovation and Employment. |
| Modelled project | Assets other than the investment option which are likely to be installed during the calculation period of the investment option. Refer to clause D9(4) of the Capex IM. |
| MW | Means megawatt (MW), which is a measure of power. |
| MWh | Means megawatt-hours and is a measure of energy. |
| Need date | The estimated last date on which the outputs of a proposal are required to be commissioned and be available for service. |

| Abbreviation | Definition |
|---------------------|---|
| NPV | Net present value. |
| NTS | Non transmission solution. |
| P50 cost estimate | The 50 th percentile cost. There is 50% probability that Transpower will complete the project within the P50 cost. |
| P90 cost estimate | The 90 th percentile cost. There is 90% probability that Transpower will complete the project within the P90 cost. |
| Proposed investment | Means the major capex project(s) that Transpower seeks approval for. |
| PV | Present value. |
| RAB | Regulatory Asset Base. |
| Rules | The rules related to major capex proposals set out in the Capex IM. |
| SoO | The Statement of Opportunities 2010, published by the former Electricity Commission in September 2010. The document is available at http://www.ea.govt.nz/industry/ec-archive/soo/2010-soo/ . |
| SRMC | Short run marginal cost. |
| Transpower | Transpower New Zealand Limited. |
| USI | Upper South Island. Transpower defines the Upper South Island as regions generally north of Waitaki. Timaru is included in USI and Twizel is not. |
| Voll | Value of loss load or cost of expected unserved energy. In this MCP, Transpower consulted on and has used \$24,200/MWh for Voll. This is the \$20,000/MWh set out in EPIC schedule 12.2 adjusted for inflation. |

Attachment B: Documents submitted by Transpower

Purpose of this attachment

- B1 This attachment provides a list of all documents provided by Transpower as part of its MCP:
- B1.1 Transpower’s proposal and attachments are listed in Table B1;
 - B1.2 Table B2 provides a list of all additional information provided by Transpower during our evaluation;
 - B1.3 Table B3 provides a list of documents that Transpower consulted on.

Table B1: Transpower’s proposal and attachments⁴⁶

| Document title |
|--|
| Upper South Island reliability Stage 1 Major Capex Proposal June 2012 (Proposal) |
| Upper South Island reliability MCP Stage 1 Attachment A – Options and Costing Report June 2012 (Proposal Attachment A) |
| Upper South Island reliability MCP Stage 1 Attachment B – Technical Analysis June 2012 (Proposal Attachment B) |
| Upper South Island reliability MCP Stage 1 Attachment C – Investment Test Analysis June 2012 (Proposal Attachment C) |
| Upper South Island reliability MCP Stage 1 Attachment D – Consultation on Options (Proposal Attachment D) |
| Upper South Island reliability MCP Stage 1 Attachment E - Islington Substation HILP Event Study June 2012 (Proposal Attachment E) |
| Upper South Island reliability MCP Stage 1 Attachment F – Meeting the Requirements of the Transpower Capital Expenditure Input Methodology June 2012 (Proposal Attachment F) |

⁴⁶ These documents can be seen on the Commission website at <http://www.comcom.govt.nz/upper-south-island-grid-upgrade/> and on Transpower’s website at <https://www.transpower.co.nz/projects/upper-south-island-grid-upgrade/upper-south-island-grid-upgrade-resources>.

Table B2: Additional information

| Date supplied and method | Document title | Description |
|---------------------------------|--|---|
| 1 August 2012 By email | Q3G Orari preliminary design cost details | Method used to cost the Orari preliminary design. |
| | Q1C Parameters for triangular distribution | Details of assumptions used for triangular distributions. |
| | Q13 USI demand forecast and need date | Transpower's explanation of its demand forecast and need date. |
| | Islington inflow far bus– half hourly data on electricity flowing into the USI | Details of electricity flow in the USI. |
| 6 September 2012 By email | USI grid output | Updated list of USI outputs. |
| | Community care fund explanation | Explanation on community care fund. |
| | Greenline booklet | Details of the Community Care Fund. |
| | Spreadsheet titled "Summary of approved major capex outputs" | Revised major capex outputs. |
| 27 September 2012 Letter | Recalc of USI MCA spreadsheet | Revised major capex allowance calculations. |
| | Upper South Island Reliability MCP Stage 1 | Letter sent from Siobhan Procter on the structure of the USI Reliability Stage 1 MCP. |

Table B3: Transpower's consultation material⁴⁷

| Document title |
|--|
| Request for Information and Options, Approach and Assumptions Document June 2011 (RFI) |
| Upper South Island Reliability Stage 1 Draft Major Capex Proposal for Consultation May 2012 (USI Consultation) |
| Upper South Island Reliability Stage 1 Attachment A- Options and Costing Report (USI Reliability Attachment A) |
| Upper South Island Reliability Stage 1 Attachment B- Technical Analysis (USI Reliability Attachment B) |
| Upper South Island Reliability Stage 1 Attachment C– Investment Test Analysis (USI Reliability Attachment C) |
| Upper South Island Reliability Stage 1 Attachment D- Summary of Submissions (USI Reliability Attachment D) |

⁴⁷ These documents are available at <https://www.transpower.co.nz/projects/upper-south-island-grid-upgrade/upper-south-island-grid-upgrade-resources>.

Attachment C: Our evaluation of Transpower's Proposal

Purpose of this attachment

- C1 This attachment explains how we have evaluated Transpower's Proposal against the requirements of the Capex IM.
- C2 The Commission must use two different types of criteria when making a decision on an MCP.
 - C2.1 The first is a set of general criteria that applies to the evaluation of base capex proposals, MCPs and amendments to MCPs.⁴⁸
 - C2.2 The second set contains criteria specific to MCPs.⁴⁹
- C3 Our analysis of the Proposal against each type of criteria is set out in the sections below.

Section one- general requirements are satisfied

- C4 We consider that the Proposal meets the general requirements the Capex IM sets for the evaluation of base capex proposals, MCPs and amendments to MCPs.
- C5 Under the Capex IM, the Commission must decide if Transpower's Proposal is consistent with the relevant Input Methodologies. We must decide if the proposal will promote the purpose of Part 4 of the Act. The data, analysis and assumptions used must also be fit for purpose.
- C6 In analysing the Proposal, we have not seen any evidence that leads us to consider the proposal is inconsistent with the relevant Input Methodologies.
- C7 We consider that Transpower's proposed investment will promote the purpose of Part 4 of the Act by securing a low cost solution for the USI investment need. Approval of the Proposal will also allow Transpower to gather more information for future investment in the USI development programme. The information gained will preserve options for selection of optimal larger scale investments at a later date. The proposed investment will also assist Transpower to invest in solutions that provide long term benefit to consumers by ensuring that the investments it makes are based on the best available information.
- C8 The Commission is satisfied that the Proposal is fit for purpose of the Commission exercising its powers under Part 4. We are making our decision using the information

⁴⁸ Capex IM, clause 6.1.1(2).

⁴⁹ Capex IM, Schedule C.

provided by Transpower. Much of the information in the Proposal was also provided in Transpower's consultation documents.

Section two- specific major capex proposal requirements are satisfied

- C9 The Capex IM requires that the Commission is satisfied:
- C9.1 with the proposed investment as a whole;⁵⁰
 - C9.2 with each of the proposed components that the MCP contains;⁵¹ and
 - C9.3 that the project passes the investment test.⁵²
- C10 The Capex IM provides evaluation criteria for some of the proposed components.⁵³ It also provides criteria for a general evaluation of the Proposal⁵⁴ and evaluation techniques the Commission can use.⁵⁵ We discuss our evaluation of each of these matters we must be satisfied with in the sections below.

We are satisfied with the Proposal as a whole

- C11 We are satisfied with the Proposal as a whole. This is due to our analysis of the general evaluation criteria for MCPs, and as a result of the other analysis in this paper.
- C12 To reach our view on general evaluation criteria for MCPs, we examined whether the project and the alternative options:
- C12.1 reflect good electricity industry practice;
 - C12.2 are technically feasible;
 - C12.3 are able to gain consents; and
 - C12.4 are reasonable in terms of assumptions around any outages planned.⁵⁶
- C13 We discuss our evaluation of each of these matters below.

⁵⁰ Capex IM, clause C1(2)(b).

⁵¹ Capex IM, clause C1(2)(a).

⁵² Capex IM, clause C1(2)(c).

⁵³ Capex IM, clauses C3 to C5.

⁵⁴ Capex IM, clause C3.

⁵⁵ Capex IM, clause C6.

⁵⁶ Capex IM, clause C2.

The Proposal reflects good electricity industry practice

- C14 We consider that the Proposal reflects good electricity industry practice. The findings of our evaluation are discussed below.
- C15 We agree with Transpower that installing a bus coupler to sectionalise the bus and increase transmission capacity is good electrical industry practice. This solution is cost effective, reliable, easy to implement, and uses standard equipment and design. It also integrates well with the existing network and has negligible operational risks.
- C16 We consider that along with the other development options identified by Transpower, constructing a switching station at Orari as part of the longer-term development programme also reflects good industry practice.
- C17 We have a concern that Transpower's plan for two switching stations at Orari may not be the most efficient option. Transpower's reason for proposing two switching stations at Orari is to mitigate the risk of HILP events disrupting supply to the USI. We consider that there are other economic solutions to mitigating HILP events that Transpower should investigate. These include a single switching station appropriately designed to mitigate or reduce HILP risks.⁵⁷ Our expectations of any subsequent MCP would be that, consistent with good industry practice, a full cost benefit analysis will be undertaken to identify the most efficient way of mitigating HILP risk. Transpower has undertaken to investigate this further and this investigation is now reflected in the outputs for the Orari switching station work package in the Proposal.

The Proposal is able to be implemented in terms of planning, consents and property rights

- C18 We have seen no evidence to suggest that the proposed project plan is unable to be implemented and are satisfied with this aspect of the general evaluation.
- C19 Some of the Orari preliminary work will be carried out on properties owned by other parties. This will involve negotiation with stakeholders and could take longer to complete than anticipated. All other work is within existing substations and there do not appear to be any additional barriers to obtaining any required consents.
- C20 Transpower has experience in negotiating with other landowners. It also has experience in obtaining relevant consents.

The outage assumptions used are reasonable

- C21 We are satisfied with the outage assumptions, having seen no evidence to suggest that the outage assumptions used in the Proposal are unreasonable.

⁵⁷ Among the options are facilities that by-pass the switching station during HILP events and establish through transmission to Islington. Another option is assessing the benefits of terminating only the LIV-ISL and TKB-ISL at Orari switching stations.

C22 Construction and commissioning constraints are relevant to installing the bus coupler. Transpower has indicated that outages are already planned.

We are satisfied with the Proposal components

C23 The Commission is satisfied with the Proposal components.

C24 The key factors in the Proposal that must be assessed are the components proposed by Transpower. They are the:

C24.1 MCA– the maximum amount that Transpower can recover from consumers;

C24.2 Approved major capex project outputs– specific items to be delivered by the project;

C24.3 Approval expiry date– the date past which Transpower will not be able to recover costs from consumers;

C24.4 P50 – the estimated cost of the project, where the probability that the actual cost will not exceed this figure is 50%; and

C24.5 Commissioning date assumption– the date when Transpower assumes that the last asset of the project will start to be in use.

C25 We discuss our assessment of the proposed components in the Proposal in the sections below.

Our evaluation of the major capex allowance component

C26 We have evaluated the major capex allowance component of the MCP and are satisfied with the value Transpower has proposed. We are also satisfied with the reasonableness of the underlying calculations and assumptions based on the evidence before us and given the size of the expenditure being considered.

C27 The Capex IM requires us to evaluate the major capex allowance proposed by Transpower and sets the criteria we must use.⁵⁸

C28 Transpower has requested approval from the Commission to recover actual costs up to \$4.99 million (in 2014/15 prices). Transpower’s estimate of the expected cost of the project (the P50) is \$4.23 million (in 2014/15 prices). Table C1 summarises Transpower’s calculation of the major capex allowance.⁵⁹

⁵⁸ Capex IM, clause C3.

⁵⁹ Source: Transpower spreadsheet ‘Recalc of USI MCA’.

Table C1: Calculation of major capex allowance

| Subproject | Expected cost | Inflation | Financing costs | Expected cost | Major capex allowance |
|-----------------|-------------------|-------------|-----------------|----------------------|-----------------------|
| | P50 2012 (\$m) | | | P50 2014/15 (\$m) | 2014/15 (\$m) |
| Bus coupler 6 | 1.72 | 0.06 | 0.07 | 1.85 | 2.09 |
| Load monitoring | 0.65 | 0.02 | 0.03 | 0.70 | 0.76 |
| Orari facility | 1.86 | 0.04 | 0.06 | 1.96 | 2.14 |
| TOTAL | 4.23 | 0.12 | 0.16 | 4.51 | 4.99 |

- C29 The major capex allowance of \$4.99 million (in 2014/15 prices) is equivalent to the P90 estimate of costs. The P90 estimate includes forecasted movements in exchange rates and inflation,⁶⁰ an allowance for scope changes, price changes and financing costs.
- C30 The exchange rate and inflation elements of the approval amount are washed-up. The underlying assumptions have been identified so that an accurate wash-up can occur.
- C31 Transpower has used the P90 estimate of costs for the maximum expenditure allowed and we agree with this approach.
- C32 We considered the appropriateness of using the P90 standard as the major capex allowance. Using a P90 standard, 10% of projects can be expected to exceed their estimated costs. A large difference between the P90 and P50 would require further examination into the P90.
- C33 The difference between the P50 and P90 standard is small for this Proposal, so we have not needed to examine more closely the issue of whether the P90 standard is appropriate. The difference between the P50 and P90 standard is shown in Table C2 below.

Table C2: Extent of potential cost over-runs without re-approval

| Work package | P50-P90 difference in base year (\$m) | P50-P90 difference 2014/15 (\$m) |
|-----------------|---------------------------------------|----------------------------------|
| Bus coupler 6 | 0.18 | 0.23 |
| Load Monitoring | 0.05 | 0.06 |
| Orari facility | 0.17 | 0.18 |

⁶⁰ For inflation and exchange rate changes, the approval amount is subject to a 'wash-up' which means these assumptions do not impact on the final amount of revenue Transpower is allowed to recoup.

| Work package | P50-P90 difference in base year (\$m) | P50-P90 difference 2014/15 (\$m) |
|--------------|--|----------------------------------|
| TOTAL | 0.40 | 0.47 |

- C34 Our view is that the financing cost has been accurately calculated using reasonable assumptions. The underlying assumptions are:
- C34.1 The spread of capital expenditure over the construction period has little impact for the Proposal;
 - C34.2 The financing cost is set at Transpower's current WACC; and
 - C34.3 Expenditure occurs at the end of the month.
- C35 We have no reason to believe that the capital expenditure profile Transpower provided is unreasonable. Due to value of the capital costs of this proposal, the effect of the cost of financing on the capital expenditure profile is negligible.
- C36 Transpower has also accounted for several risks within their estimation of P50 and P90 costs. These include:
- C36.1 scope risk;
 - C36.2 price risk; and
 - C36.3 timing risk.
- C37 Transpower has estimated scope, price and timing risk based on expert internal knowledge using a triangular distribution. These appear reasonable based on the evidence before us and given the size of the expenditure being considered.

Evaluation of the major capex outputs component

- C38 We are satisfied with the major capex outputs proposed by Transpower. Our evaluation of the major capex outputs is discussed below.
- C39 The Capex IM requires us to evaluate how the major capex outputs specified by Transpower match the purpose of the investment it proposed. The Capex IM sets the criteria the Commission must use for this evaluation.
- C40 The major capex outputs put forward by Transpower are:
- C40.1 a new 220 kV bus coupler and associated switchgear at Islington substation. The bus coupler and switchgear are incorporated into the Christchurch RPC scheme;
 - C40.2 an additional discriminating zone (zone F) for the Islington 220 kV bus bar protection;
 - C40.3 10 load monitoring units installed in substations in the USI;

- C40.4 solution study reports on two different configurations for Orari switching station, including cost estimates within +/- 30%;
 - C40.5 the initial stage of detailed solution for the preferred Orari switching station configuration; and
 - C40.6 an area-stage report of transmission line route selection process, being the initial step in obtaining the required designation/consents.
- C41 We consider that the major capex outputs adequately reflect the purpose of the investment because the:
- C41.1 sixth bus coupler and the additional 220 kV bus bar protection zone will increase the N-1 transmission limit of the USI grid by reducing the number of transmission circuits affected during faults on these sections of the grid;
 - C41.2 load monitoring equipment will provide information that allows Transpower to better understand the load in the USI and hence refine its load model for Stage 2 and future studies; and
 - C41.3 preliminary work for Orari switching station will allow Transpower to select the best option for future investment in the USI development programme.

Our evaluation of the approval expiry date component

- C42 We are satisfied with the approval expiry date proposed by Transpower.
- C43 The Capex IM requires us to evaluate the effect of the proposed approval expiry date and sets criteria we must use.⁶¹
- C44 Transpower's proposed expiry date is 2018. We interpret this to be the last working day of 2018.
- C45 Transpower states its reason for the proposed expiry date as:
- “an approval expiry date should be the point at which it is clear that if a project has not been commissioned, something has changed and it will not be commissioned”.⁶²
- C46 The effect of an approval expiry date is that Transpower cannot recover the costs of any assets commissioned after this date. This incentivises Transpower to complete the MCP, review the need for it or to seek to amend its approval expiry date within the required time.

⁶¹ Capex IM, clause C4.

⁶² Proposal, section 3.4.

C47 We are satisfied with Transpower's proposed approval expiry date as it has indicated commissioning dates are likely to be in the first half of 2014. Based on this, Transpower should have completed the project well before the approval expiry date. However, as stated above, the approval expiry date can be re-examined as required.

Our evaluation of the P50 estimate of cost component

C48 We are satisfied with the P50 estimate of costs proposed by Transpower. Our evaluation of the P50 estimate of costs is set out below.

C49 The Capex IM requires us to evaluate the proposed P50⁶³, but does not provide any specific evaluation criteria.

C50 Table C3 summarises Transpower's cost estimates for the proposed investment and investment options.⁶⁴

Table C3: Transpower's P50 estimate of costs

| Work package | Estimated cost 2011/12 (\$m) | Community care 2011/12 (\$m) | Base estimate 2011/12 (\$m) | Expected cost- includes scope and construction uncertainties 2011/12 (\$m) | Expected cost P50 2014/15 (\$m) |
|-------------------------------------|---------------------------------|---------------------------------|--------------------------------|---|---------------------------------------|
| Bus coupler 6 (excluding RPC) | 1.26 | 0.0 ⁶⁵ | 1.26 | 1.37 | 1.85 ⁶⁶ |
| Modification to RPC | 0.34 | 0.0 | 0.34 | 0.35 | |
| Load monitoring | 0.62 | 0.0 | 0.62 | 0.65 | 0.70 |
| Orari preliminary work | 1.7 | 0.0 | 1.7 | 1.86 | 1.96 |
| Total | 3.92 | 0.0⁶⁷ | 3.92 | 4.23 | 4.51 |

⁶³ Capex IM, clause C1(1)(f).

⁶⁴ Source: Transpower spreadsheet 'Recalc of USI MCA'.

⁶⁵ The bus coupler work package has a community care fund component of \$4,289.08. This has not been shown due to rounding.

⁶⁶ \$1.85 million includes the cost estimates of the bus coupler 6 and modifications to the RPC work packages.

⁶⁷ The community care fund has a total of \$4,289.08. This is has not been shown due to rounding.

- C51 We reviewed the calculations Transpower used and details of our assessment of the base estimate used to determine the P50 are in paragraphs D55 to D67.

Our evaluation of the commissioning date assumptions component

- C52 We are satisfied with the commissioning date assumptions proposed by Transpower. The findings of our evaluation are discussed below.
- C53 The Capex IM requires us to evaluate the commissioning date assumption, but does not provide any specific evaluation criteria.
- C54 Transpower plans to implement the Proposal as three independent work packages. These are installing bus coupler 6, installing load monitoring equipment, and undertaking preliminary works at Orari. Each work package has a different forecast commissioning date.
- C55 Transpower plans to commission bus coupler 6 by May 2014. Transpower has timed this commissioning of the bus coupler to coincide with the proposed date for decommissioning of the two Islington synchronous condensers and Islington SVC3.⁶⁸ This is also when demand is expected to reach the USI transmission limit based on Transpower's prudent forecast. The current industry prediction is that demand will not increase significantly over the next few years. Since the bus coupler needs to be installed before USI maximum demand reaches the N-1 transmission limit of the USI network, Transpower has undertaken to consider the need date for this investment in line with observed USI demand.
- C56 Transpower proposes to commission load monitoring equipment by March 2014. The commissioning dates for installing the load monitoring equipment are not critical. Therefore, we consider Transpower's proposed dates are reasonable, since the work has to be linked with planned circuit outages, which would be carried out in summer 2013/2014.
- C57 Transpower plans to complete the preliminary works for Orari by March 2013. Orion's submission on Christchurch demand growth indicates demand may be lower so the need for further investment in the USI development programme could be delayed. Transpower has undertaken to monitor demand growth and set an appropriate need date for this work package.
- C58 Since Transpower developed its proposal, industry participants believe that demand will not increase significantly and may even decrease over the next few years. Transpower has committed to review the timing of the work packages in line with observed trends in USI demand growth. We agree with Transpower's commitment to review the timing and the commissioning dates of the work packages in line with observed trends in USI demand growth.

⁶⁸ Proposal, sections 4.4.1 and 4.4.2.

Our evaluation of the investment test

C59 We provide details of how we have evaluated Transpower's Proposal under the investment test in Attachment D of this document.

Attachment D: Our evaluation of the Proposal under the investment test

Purpose of this attachment

- D1 This attachment provides details on how we have evaluated the Proposal against the investment test criteria set out in Schedule D of the Capex IM.
- D2 We have evaluated the Proposal and we are satisfied:
- D2.1 with the proposed investment test parameters;
 - D2.2 that the proposed investment satisfies the investment test; and
 - D2.3 that the proposed investment is robust to sensitivity analysis.

Layout of this attachment

- D3 This attachment contains two sections.
- D3.1 The first section summarises our evaluation of the investment test parameters.
 - D3.2 The second section summarises our review of the results of the investment test and sensitivity analysis.

Section one— our evaluation of the investment test parameters

- D4 We consider that, except for the demand forecast, Transpower has reasonably selected the investment test parameters.
- D5 We consider that Transpower’s demand forecast is optimistic and a lower rate of growth in demand will defer investments. However this does not affect our decision to approve the Proposal, because Transpower has undertaken to consider observed trends in demand when making investment decisions.
- D6 Our analysis of the parameters Transpower used in the investment test is discussed below.
- D7 The Capex IM allows Transpower some discretion to select the analysis parameters of the inputs into the investment test. These parameters are the:
- D7.1 calculation period;⁶⁹

⁶⁹ Capex IM, clause G4(5)(b).

- D7.2 demand and generation scenarios (comprising demand forecasts and generation scenarios);⁷⁰
- D7.3 discount rate;⁷¹
- D7.4 investment options;⁷² and
- D7.5 value of expected unserved energy.⁷³

Calculation period

- D8 Based on submissions during consultation, Transpower amended the calculation from a 20 year period starting on the commissioning date to the year 2050. We consider this calculation period is appropriate as there are on-going costs of refurbishing SVCs after 20 years of service.

Demand forecast

- D9 We consider that Transpower's demand forecast is optimistic because it does not allow for the decrease in demand due to the Christchurch earthquakes. Transpower has recognised this and advised us that it will monitor demand and plan investments in the USI reliability development programme accordingly. Transpower's approach seems reasonable and we consider that Transpower should be able to demonstrate that the timing for any preliminary works associated with the USI reliability development programme is optimal and takes into account all relevant factors.
- D10 The Capex IM requires Transpower to use either the demand forecast published in the Statement of Opportunities 2010 (the SoO)⁷⁴ or reasonable variations on this forecast based on the views of interested persons.
- D11 Transpower's peak demand forecast for the Proposal is based on its 2010 Annual Planning Report forecast.⁷⁵ Transpower consulted on its use of this forecast in June 2011 and industry participants indicated that the forecast was reasonable.
- D12 Transpower kept the 2010 forecast in its May 2012 consultation.⁷⁶ Transpower assumed then that the reduction in observed demand was temporary due to the effect of the Christchurch earthquakes and the Pike River disaster. Therefore,

⁷⁰ Capex IM, clause D4(1)(ii).

⁷¹ Capex IM, clause D7(3)(b).

⁷² Capex IM, clause 7.4.1(2).

⁷³ Capex IM, clause G4(5)(c).

⁷⁴ Published by the former Electricity Authority.

⁷⁵ Proposal Attachment A, Table 3-1.

⁷⁶ Proposal Attachment C, Table 2-4.

Transpower expected that demand would return to pre-earthquake levels within a few years.

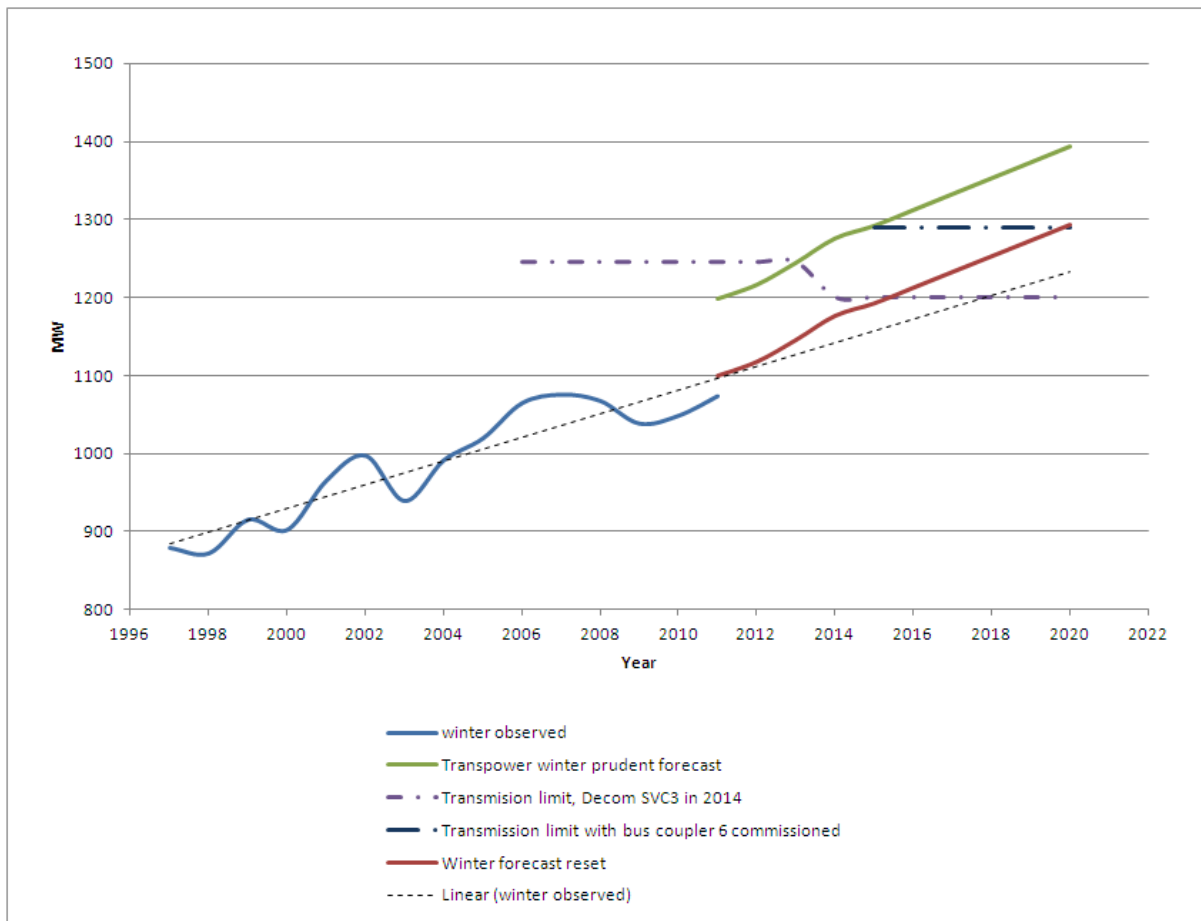
- D13 However, the earthquake recovery scenarios from the Christchurch Urban Development Strategy Group now indicate that it will be at least 2021 before the projected population matches the pre-earthquake forecasts.⁷⁷ This means that peak demand is unlikely to catch up with the 2010 forecast demand in the short term. This is due to the high proportion of domestic demand in the peak demand. Generally, peak demand occurs on very cold winter days either in the early mornings or evenings, and coincides with high domestic demand, particularly heating.⁷⁸
- D14 Figure D1 shows our analysis of the demand forecast. The observed demand for 2011 is about 120 MW lower than Transpower's forecast demand ('Transpower winter prudent forecast' in Figure D1), indicating that demand forecast is over estimated by 120 MW. To get a more realistic demand forecast based on current observed demand, we reset the 'Transpower winter prudent forecast curve' to the 'winter observed trend line'. This line represents the linear trend of the currently observed demand. The reset curve, referred to as 'Winter forecast reset' in Figure D1, shows that peak demand may not reach the 'transmission limit with bus coupler 6 commissioned' until about 2020.⁷⁹
- D15 The demand forecast affects the date the investment is needed, rather than whether the investment is needed at all. A lower demand effectively defers the requirement for further investment in the USI reliability development programme. We consider that, based on current observed demand and using Transpower's high demand growth rate, future investment in the USI reliability development programme may not be required until 2018. A lower rate of growth in demand would defer the date when the investment is needed even further.

⁷⁷ Orion submission, May 2012.

⁷⁸ SoO 2010, section 3.4.

⁷⁹ The transmission limit as a result of new bus coupler (less SVC3) would be 1290 MW, and the forecast demand in 2019 would be about 1274 MW.

Figure D1: Upper South Island demand forecast



Generation scenarios

- D16 A generation scenario is a hypothetical prediction of a set of generation developments within the electricity industry.
- D17 The Capex IM requires Transpower to use either the generation scenarios in the SoO (published by the former Electricity Commission) or reasonable variations of the scenarios based on the views of interested persons.⁸⁰
- D18 Transpower has modified the generation scenarios published in SoO for the Proposal. We consider that Transpower's modified generation scenarios are appropriate for this Proposal because the modified scenarios take into account publically available information and industry feedback. The modified scenarios reflect current generation development plans for the region until 2018. For the

⁸⁰ Capex IM D4(1)(a)(ii). The rules allow Transpower to modify the generation scenario. If Transpower modifies the generation scenarios, the Commission needs to be satisfied that the modifications are appropriate.

remainder of the USI reliability development programme, Transpower should use the scenarios current at the time of the analysis.⁸¹

D19 The key changes are:

- D19.1 some major hydro developments forecast by the SoO for between 2013 and 2018 are deferred until at least 2018;⁸²
- D19.2 9 MW of hydro development is committed at Stockton Plateau Hydro with a planned commissioning date of 2016; and
- D19.3 some additional wind generation is included in the Marlborough region with an earliest build date of 2018.⁸³

Discount rate for NPV

D20 Transpower used 7% as the discount rate for the Proposal. This is in line with the Capex IM, although Transpower can propose other rates.⁸⁴

Investment options considered by Transpower

D21 We consider that:

- D21.1 Transpower met the requirements of the Capex IM in terms of the number of options it is required to consider; and
- D21.2 The nine investment options selected by Transpower will reasonably deliver the system performance that Transpower seeks.

D22 The Capex IM requires that Transpower considers a number of investment options appropriate to the value of the estimated capital expenditure and the complexity of the investment need.⁸⁵ Transpower considered and consulted on 31 long list options.⁸⁶ These options can be classified into the following broad categories:

- D22.1 non-transmission solutions (requests for proposal);

⁸¹ It is likely that the Ministry of Business, Innovation and Employment will have published new electricity demand and generation scenarios that supersede those in the SoO 2010 by the time Transpower submits any proposal for future investment in the USI reliability development programme.

⁸² SoO 2010 forecasted an additional 46 MW generation at Arnold hydro power station between 2014 and 2018 and 73 MW of generation at Wairau hydro power station between 2013 and 2014. Trustpower has advised these will not be built until 2018. Refer to the letter titled "USI Proposal– Transpower and Trustpower Meeting dated 1 June 2012".

⁸³ Proposal Attachment C, section 2.1.

⁸⁴ Capex IM, clause D7(3)

⁸⁵ Capex IM, clause 7.4.1(2).

⁸⁶ RFI, section 5.

D22.2 re-configuration of existing assets; and

D22.3 new transmission assets.

D23 We reviewed Transpower's long list of options and the criteria Transpower used to determine its investment options, in conjunction with the results of Transpower's power system studies and demand and generation scenarios.

D24 Transpower refined its long list into a short list of nine investment options using the following screening criteria:⁸⁷

D24.1 fit for purpose;

D24.2 technical feasibility;

D24.3 practicality of implementation;

D24.4 good electrical industry practice;

D24.5 system security; and

D24.6 indicative cost.

D25 We consider that the screening criteria are reasonable because they are similar to those used by the Commission when evaluating a major capex proposal.⁸⁸

Value of expected unserved energy

D26 Transpower adjusted the published value of expected unserved energy or value of lost load (Voll), to \$24,200 and consulted on this.⁸⁹ We see no reason for Transpower to use other values.

Section two— our evaluation of the investment test

Purpose of this section

D27 In this section we present our review of Transpower's application of the investment test and why we consider that it complies with the requirements of the Capex IM. We discuss our evaluation of the expected net electricity market benefits, selection of the proposed investment and the results of Transpower's sensitivity analysis.

⁸⁷ Proposal, Table 6-2 and Proposal Attachment A - Table 5-1.

⁸⁸ Capex IM, clause C2.

⁸⁹ Proposal Attachment C, section 2.4. \$24,200 is the \$20,000 value for Voll in the EIPC adjusted for inflation.

We are satisfied with the results of the investment test

D28 We are satisfied that the:

D28.1 Results of the investment test are satisfactory; and

D28.2 The proposed investment is sufficiently robust to sensitivity analysis.

Criteria for satisfying the investment test

D29 The investment test is an economic test to determine that the proposed investment is the most economical investment option.

D30 A proposed investment satisfies the investment test if it has the highest expected net electricity market benefit and is robust to sensitivity analysis compared with other investment options.

D31 The net electricity market benefit:

D31.1 does not need to be positive for an investment proposed in order to meet the N-1 criterion of the GRS;⁹⁰ but

D31.2 needs to be positive for other investments.⁹¹

Proposal is to meet the N-1 criterion of the grid reliability standards

D32 Transpower has submitted the Proposal as an investment necessary to meet the N-1 criterion of the GRS.

D33 The Commission considers that Transpower has classified the Proposal correctly because the:

D33.1 USI peak demand is reaching the USI transmission capacity;

D33.2 proposed investment would increase transmission capacity and enable Transpower to meet increasing demand; and

D33.3 without this investment the system operator would operate the network to supply demand up to the N-1 transmission limit. The system operator may then shed any demand above the transmission limit and incur energy not supplied.

⁹⁰ EIPC 12.114 sets out that Transpower needs to maintain grid reliability standard N-1 criterion for interconnection assets and needs to consider reasonable options to meet this criteria when the criteria is in breach. N-1 means the transmission assets should be able to supply peak demand with one of the components used in the transmission of electricity out of service.

⁹¹ Capex IM, clause D1(1)(b).

How Transpower performed the investment test

- D34 The investment test requires Transpower to:⁹²
- D34.1 estimate the electricity market benefits or costs elements and project costs for each investment option under relevant generation and demand scenarios;
 - D34.2 calculate the net electricity market benefits for each investment option. Net electricity market benefit is the sum of the market benefits less sum of the market cost less the project cost;
 - D34.3 calculate the expected net electricity market benefit, which is the weighted average of the net electricity market benefits under each demand and generation scenarios; and
 - D34.4 select the investment option with the highest net market benefits as the proposed investment. In selecting the proposed investment, Transpower may consider unquantifiable benefits if the difference in expected net electricity market benefits between two or more investment options is within 10% of the aggregate project costs.
- D35 Transpower calculated the expected market benefits of the cost elements shown in Table D4 but not the expected market benefits resulting from the investment meeting the GRS. Transpower stated that the later net market benefits are the same for all investment options and hence excluded them from the calculations.
- D36 Transpower should present net electricity market benefits in its investment tests for future MCPs. Where costs or benefits are assumed to be the same for all investment options, these can be excluded from calculations. However, it is still necessary to do the analysis to demonstrate this.
- D37 An investment test that considers the net electricity market benefit will provide the economic rationale of each investment decision and enable the market to assess the effectiveness of the GRS.

How we reviewed the application of the investment test

- D38 In reviewing Transpower's application of the investment test, we considered whether Transpower:
- D38.1 reasonably estimated the expected net electricity market benefits including project costs and the electricity market benefits of all investment options under the relevant demand and generation scenarios;⁹³

⁹² Capex IM, clauses D1 and D2.

D38.2 selected the investment option using the criteria set out in the Capex IM D1 and D2;⁹⁴ and

D38.3 demonstrated that the proposed investment is robust to sensitivity analysis.⁹⁵

Transpower has reasonably estimated the net electricity market benefits

D39 We consider that, except for not calculating the benefits of meeting GRS, Transpower has reasonably included identifiable costs and benefits associated with the investment options. We also consider that Transpower's estimates of such costs and benefits are reasonable for the current stage of the proposal.

D40 Our analysis of Transpower's estimates of project costs and electricity market benefits is discussed below.

We are satisfied with the project costs

D41 We consider that Transpower's estimates of the projects costs are reasonable.

D42 The Capex IM defines project cost⁹⁶ as any of the following costs associated with a major capex project:

D42.1 capital expenditure;

D42.2 testing costs;

D42.3 commissioning costs;

D42.4 operating and maintenance costs;

D42.5 statutory costs;

D42.6 costs for seeking approval of investments; and

D42.7 other reasonable costs.

D43 For this proposal Transpower separated out operating and maintenance costs from Capital expenditure, testing, commissioning and consenting costs. We refer to the former set of costs as the capital costs of the investment options. We have assessed the operating and maintenance costs and capital costs separately.

⁹³ This is discussed in paragraphs D41 to D66.

⁹⁴ This is discussed in paragraphs D68 to D86.

⁹⁵ This is discussed in paragraphs D87 to D92.

⁹⁶ Capex IM, clause D5(2).

Operating and maintenance costs

- D44 We consider that Transpower estimated operating and maintenance costs for each investment option are reasonable.
- D45 Transpower presented the operation and maintenance costs in Table 3-4 of its Proposal Attachment C. These costs are replicated in Table D4 below. Operation and maintenance costs range from \$0.8 million to \$1.8 million and are significantly less than 1% of the capital costs. Therefore, we reviewed them at a very high level.

Capital costs

- D46 In the following sections we discuss our analysis of Transpower's:
- D46.1 estimate of common costs components;
 - D46.2 estimate of work package costs of the investment options; and
 - D46.3 expected capital cost of investment options.
- D47 When reviewing Transpower's cost estimates, we performed a desk top assessment to establish whether Transpower's cost estimates are reasonable. We attempted to form a view on the likely costs of the investment options rather than undertake the process for estimating costs. Estimating capital costs is a complex engineering process that requires producing conceptual designs, conducting site investigations and then deriving estimates of cost. Due to our simplified approach, we recognise that additional costs could arise during the implementation phase. We consider that our approach provides a reasonable view of the expected costs of the investment option.

Common cost components for the USI development programme

- D48 Transpower presented the estimated capital costs of the investment options in Table 3-2 of Proposal Attachment C.
- D49 The investment options have a number of common cost components such as SVC3 refurbishment, SVC replacement, new statcom, new synchronous condensers, new Orari substation and new 220 kV line.
- D50 Transpower estimated the capital costs by estimating the cost of each common cost component and then combining them appropriately to derive the capital costs for the investment options. Transpower's common cost components and our assessment of them are in Table D1.⁹⁷

⁹⁷ Source: Transpower spreadsheet Cost_USI MCP datafile cost summary.xls

Table D1: Estimated cost of each common cost component

| Common cost component | Transpower's estimate 2011/12 (\$m) | Commission's assessment |
|--|-------------------------------------|---|
| Bus coupler plus modifications to RPC | 1.7 | Reasonable, except that we have concerns over the cost of modifying the RPC. Refer to paragraphs D54 to D60. |
| Diesel generation in Orion's network | 2.9 | This cost is reasonable and probably underestimated, but does not affect the results. |
| SVC3 refurbishment | 11.1 | Refer to paragraph D51 and D52. |
| SVC3 replacement | 14.9 | Reasonable, based on previous projects. |
| New 220 kV SVC | 31.9 | Reasonable, based on previous projects. |
| New synchronous condenser at Islington | 25.2 | Reasonable, based on previous projects. |
| New 80 MVA statcom at Islington | 24.7 | Reasonable. The estimate is similar to Transpower's previous estimates. |
| Orari bussing | 58.2 | Needs further work as proposed by Transpower. |
| New 220 kV line into Islington | 500.0 | Reasonable as a high-level cost, since the line is not needed until 2028 or later, depending on summer peak demand. |

SVC3 refurbishment cost component

- D51 Transpower's estimated cost of \$11.1 million for the mid-life refurbishment of Islington SVC3 is approximately 74% of the cost of replacing it. Transpower has stated that the bulk of this work is to replace or refurbish the secondary systems and Transpower's contractor has estimated these costs based on site investigations.⁹⁸ SVC3 refurbishment costs are an atypical estimate based on the condition of the unit and it is difficult to assess its reasonableness. We have no reason to consider that the estimated costs are over-estimated.
- D52 We recommend that Transpower reviews the mid-life refurbishment needs and costs of SVCs and explores ways of reducing these costs to reasonable levels. We are concerned with the high cost of mid-life refurbishment of SVCs and possibly statcoms in the future. We also note that Transpower has a number of such devices in the network, which would result in significant costs either due to decommissioning the SVCs early or refurbishing them at their mid lives.

⁹⁸ Proposal, section 4.4.2

Estimated capital costs of the work packages in this Proposal

- D53 We consider that Transpower's estimated capital costs are reasonable given the proposed scope of the Orari switching station. We also consider that the capital cost of Orari bussing will reduce if Transpower builds a single switching station at Orari.
- D54 Table D2 summarises our assessment of Transpower's cost estimates for the various work packages of this Proposal.

Table D2: Proposal P50 estimate of costs

| Work package | Transpower estimate 2011/12 (\$m) | Commission's assessment |
|---|--|--|
| Bus coupler | 1.36 | Reasonable for installing the bus coupler and modifying the 220 kV bus bar protection scheme. |
| Reactive power controller (RPC) modifications | 0.36 | We consider that the costs are high and Transpower has undertaken to look at options to better manage such costs. Refer to paragraph D55 to D60. |
| Load monitoring costs | 0.65 | Reasonable. Refer to paragraph D61. |
| Orari preliminary studies | 1.86 | Reasonable. Refer to paragraphs D62 to D63. |
| Total | 4.23 | |

Reactive power controller modifications costs

- D55 We are concerned with the level of the RPC modification costs. Transpower has advised that when the sixth bus coupler is installed, the RPC needs to be modified to enable correct operation of all the reactive power equipment at Islington.
- D56 The estimated cost of this modification is \$359,000 with approximately \$290,000 of contractor costs. The contractor costs include modifying the existing software, factory and site testing, implementation, and updating the documentation.
- D57 The Commission considers that this cost is high. However, Transpower has advised that this cost is unavoidable because the vendor is holding the Intellectual Property Rights.
- D58 We also considered if this investment could be deferred until the later stages of the USI reliability development programme. Transpower has provided its justification for why this work package is a necessary part of this investment. Based on the

information Transpower provided, we see no reason to disagree with Transpower's proposal.⁹⁹

D59 It appears that Transpower will need to incur similar costs every time it installs equipment that affects the control logic of the RPC. We have raised this concern with Transpower because periodic/regular modification of the RPC could result in significant lifetime costs. There is a continuing need to install reactive power devices at Bromley and Islington substations in the foreseeable future. Transpower is also planning to install an RPC in the Upper North Island.

D60 Transpower has agreed to consider ways to control these costs. Options that Transpower has committed to explore include:

D60.1 grouping modifications to implement a set of changes concurrently;¹⁰⁰

D60.2 bringing modification expertise in-house; and

D60.3 looking at the lifetime costs of such projects.¹⁰¹

Load monitoring costs

D61 Transpower's estimated cost for installing ten load monitoring units is \$650,000, or \$65,000 per unit. Based on previous projects. We consider that this estimated cost is reasonable.

Orari preliminary studies costs

D62 Transpower has provided the following components of the Orari costs:¹⁰²

Table D3: Estimated cost of the Orari preliminaries components

| Cost component | Cost 2011/12 (\$m) | Commission's assessment |
|---|---------------------------|--|
| Consenting, including area stage report | 0.544 | Transpower has advised that the estimate covers preparation for consenting rather than obtaining the consents. |
| System studies report and initial detailed design | 1.317 | Refer to paragraph D63. |
| Total | 1.861 | |

⁹⁹ Transpower's email- Description of RPC (Simon Bell) dated 31 July 2012.

¹⁰⁰ For example, when Transpower installs the bus coupler it will modify the RPC to include equipment that is committed to be installed in the future.

¹⁰¹ Telephone conversation Stuart MacDonald, Transpower and Hazet Adam, Commerce Commission and Transpower emails Description of RPC (Simon Bell) dated 31 July 2012.

¹⁰² Transpower's spreadsheet 'Recalc of USI MCA'.

D63 Transpower has based the detailed design costs on assuming two switching stations at Orari. As discussed in paragraph C17, we consider that two switching stations may not be the most efficient way of mitigating HILP events. If Transpower selects a single switching station option, we expect the cost of the detailed design component to be in the order of \$700,000.¹⁰³ Transpower has undertaken to consider the most economic and technically acceptable option for Orari switching station. We expect Transpower to provide a comprehensive cost benefit analysis and options that identify the most efficient ways of mitigating HILP risk consistent with good engineering practice.

The electricity market benefits are reasonable

D64 The Capex IM defines electricity market benefits or cost elements as any benefits received or costs incurred by the consumers during the calculation period under all relevant demand and generation scenarios that affect net electricity market benefits.¹⁰⁴

D65 Transpower estimated electricity market benefits by considering the following elements:

D65.1 energy used by reactive support equipment;

D65.2 transmission losses; and

D65.3 avoided unserved energy N-2 events.

D66 Transpower has presented the electricity market benefits of the investment options in Tables 3-5, 3-7 and 3-8 of its Proposal Attachment C. These costs are replicated in Table D4.

D67 The electricity market benefits are significantly lower than the capital costs of investment option. They range from \$2.1 million to \$18.7 million. Therefore, we have only reviewed these electricity market benefits at a high level, and consider that they are reasonable.

¹⁰³ This estimate is based on Transpower's actual cost for the detailed design of Drury switching station.

¹⁰⁴ Capex IM, clause D5(1).

Table D4: Expected net electricity market benefits- NPV 2011/12 (\$m)

| Option | Development option | Benefits of meeting GRS ¹⁰⁵ | Electricity market benefits | | | Project costs | | Expected net electricity market benefit ¹⁰⁷ |
|--------|---|--|--|-------------------------|------------------------------------|---------------------------------|------------------------------|--|
| | | | Cost for energy used by reactive support equipment | Transmission loss costs | Avoided unserved energy N-2 events | Operation and maintenance costs | Capital costs ¹⁰⁶ | |
| 1 | BC6, refurb SVC3, Orari bussing | B | 4.4 | 0 | 1.7 | 1.5 | 171.1 | -178.7 + B |
| 2 | BC6, decom SVC3, Orari bussing | B | 1.1 | 0 | 1.0 | 1.3 | 171.4 | -174.9 + B |
| 3 | BC6, refurb SVC3, new SVCs | B | 7.8 | 0.5 | 1.8 | 1.1 | 167.9 | -179.1 + B |
| 4 | BC6, decom SVC3, new SVCs. | B | 5.7 | 0.5 | 1.8 | 0.8 | 167.0 | -175.9 + B |
| 5 | BC6, refurb SVC3, new sync cons, new SVCs | B | 16.2 | 0.5 | 2.0 | 1.1 | 180.1 | -199.9 + B |
| 6 | BC6, refurb SVC3, new statcoms | B | 9.0 | 0.5 | 1.5 | 1.2 | 161.6 | -173.6 + B |
| 7 | Diesel gen, decom SVC3, Orari bussing, new SVCs | B | 2.4 | 0 | 4.4 | 1.5 | 184.4 | -192.6 + B |
| 8 | Diesel gen, refurb SVC3, new SVCs | B | 8.6 | 0.5 | 3.6 | 1.3 | 182.3 | -196.4 + B |
| 9 | Diesel gen, refurb SVC3, new statcoms | B | 12.7 | 0.5 | 3.1 | 1.8 | 189.0 | -207.0 + B |

¹⁰⁵ Transpower did not present these benefits, but stated that they are the same for each investment option.

¹⁰⁶ Because the timing of investments within a development plan depends on generation scenarios, the NPV of the estimated capital cost of the development plan varies with the generation scenarios. For this reason, the NPV of the capital cost is the average of the capital cost for each of the five market development scenarios.

¹⁰⁷ The expected net market benefit does not include the benefits of meeting the GRS.

Transpower selected the investment option reasonably

- D68 We consider that Transpower has correctly selected option 2 as the investment option. We consider that option 2 has the highest net market benefits, taking into account the quantified and unquantified benefits of the investment options.
- D69 The Capex IM requires Transpower to select the investment option with the highest net electricity market benefit. When selecting the investment option with the highest net market benefit, Transpower may consider unquantified benefits of investment options if the difference in expected net electricity market benefit between the investments options is within 10% of the aggregate project costs.¹⁰⁸
- D70 Transpower has selected option 2 as the proposed investment (see Table D4 above) after considering both quantified and unquantified benefits and concluding that option 2 has the highest benefits. Transpower states:¹⁰⁹

“Hence having considered both the quantitative results and unquantified benefits qualitatively, we believe that Option 2 meets the requirements of clause c of the IT, from section 1.2.”

Our assessment of Transpower’s unquantified benefits

- D71 We consider that Transpower has reasonably demonstrated that investment option 2 has higher unquantified benefits than option 6 and 4 and therefore the highest net electricity market benefits.
- D72 When considering unquantifiable benefits of investment options, Transpower must demonstrate that:
- D72.1 the difference in expected net electricity market benefits between the investment options is within 10% of the aggregate project costs; and
 - D72.2 the electricity market benefits are unquantifiable either because the cost of calculating these benefits are disproportionately large compared to their value or the results have a high level of uncertainty.
- D73 Transpower performed a quantitative assessment of unquantified benefits of investment options 2, 4 and 6 to select the investment option. Investment option 6 has the highest quantified expected net electricity market benefit and would normally be considered as the proposed investment. However, the difference between the quantified expected net electricity market benefits of option 6 and option 2 is \$1.3 million, which is within 10% of the aggregate project cost of option 6.¹¹⁰ Similarly, the difference between the quantified expected net electricity market

¹⁰⁸ Capex IM clause D1(2).

¹⁰⁹ Transpower’s analysis of the unquantifiable benefits is in section 3.4 of Proposal Attachment C.

¹¹⁰ The aggregate project cost of investment option 6 is \$162.8 million.

benefits of option 6 and option 4 is \$2.3 million, which is also within 1% of the aggregate project costs of option 6. Since this is the case Transpower can use a qualitative assessment of unquantified benefits to assess if options 4 or 2 have higher expected net electricity market benefit compared to investment option 6. Transpower can then propose the investment option with the highest quantified and unquantified expected net market benefits as the proposed investment.

- D74 Transpower discussed unquantified benefits in section 7.5 of the Proposal and summarised its analysis in Table 7-4 of the Proposal. Transpower considered the following variables:
- D74.1 option benefit;
 - D74.2 robust to no generation development;
 - D74.3 consumer benefits through enhanced competition;
 - D74.4 minimisation of disruptions;
 - D74.5 diversity benefits;
 - D74.6 operational benefits not included in economic analysis; and
 - D74.7 alignment with long-term grid development.
- D75 We consider that the expected values of the benefits of all the above variables except the variable 'Robust to no generation development' cannot be calculated with an appropriate level of certainty.¹¹¹ We consider that 'Robust to no generation development' is a quantifiable variable. Therefore we consider that Transpower is permitted to consider unquantified benefits arising from all other variables listed above except 'Robust to no generation development'.
- D76 We discuss our views on Transpower's assessment of the unquantified benefits for options 2, 4 and 6 in the following paragraphs.
- D77 'Option benefit' considers if the investment options have the flexibility to be amended in the future if there are significant changes. Transpower assessed that all three options have similar option benefit. We consider that Transpower's assessment is reasonable. We also consider that option 2 will allow Transpower to invest in multiple phases and thereby improve its net electricity market benefits.
- D78 'Robust to no generation development' considers the benefits of the investment options if new generation does not appear as forecasted in the MDS. Transpower

¹¹¹ Capex IM clause D1(2)(b)(ii) states an electricity market benefit may be treated as unquantified where its expected value cannot be calculated with an appropriate level of certainty.

assessed that option 2 would be most economic in this case. We consider that the benefits of 'Robust to no generation development' can be quantified and therefore this variable does not meet the criteria for being considered under unquantified benefits. We also consider that Transpower does not need to quantify the benefits of this variable because Transpower has already considered five generation scenarios when estimating expected electricity market benefits.

- D79 'Consumer benefits through enhanced competition' assesses if any of the investment options will enhance competition. Transpower assessed that all three options have similar option benefit. We consider that Transpower's assessment is reasonable.
- D80 'Minimisation of disruption' considers which investment will have the least disruption to the community and landowners. Transpower assessed that options 4 and 6 will have the least disruption while option 2 will have the greatest disruption to the community and landowners. We consider this is reasonable because this is the only option that involves work in property currently owned by others. For this variable, options 4 and 6 are better.
- D81 'Diversity benefits' consider the extent to which the investment options improve diversity of supply. Transpower can achieve diversity of supply by judiciously locating assets to reduce the number of assets that could be damaged during high impact low probability events. Transpower has assessed that options 4 and 6 provide a better diversity of supply. We consider that Transpower's assessment is reasonable because unlike option 2, options 4 and 6 will allow Transpower to locate assets at different substations.
- D82 'Operational benefits not included in the economic analysis': Transpower has assessed that option 2 has two further operational benefits that are difficult to quantify. One is that it will improve system security during maintenance outages and the other is that it will provide Alpine energy an option of another GXP near Orari and thereby reduce its distribution costs. We consider that Transpower's assessment of both these benefits is reasonable.
- D83 The variable 'alignment with long-term grid development' considers if the investment option is consistent with Transpower's long term vision of the grid. Transpower assessed that option 2 increases transmission capacity without the need for reactive support devices and therefore is in line with the grid development plan.
- D84 We consider that transmission options that use conventional devices are better than those that include reactive support devices because reactive support devices are operationally complex. Transmission owners use reactive support devices because, in most cases, the cost of providing solutions with reactive support devices is cheaper than that of building new transmission lines or substations. But in this case, since the relative costs between the conventional solution (Orari substation) and reactive support solutions (statcoms or SVCs) are similar, we consider it is reasonable to select the option with conventional solution, which is investment option 2.

- D85 However, we note that the accuracy of the estimated cost of the second phase of option 2 is less accurate than that for option 6. Therefore, we consider that it is premature for Transpower to select a development option based on the present cost estimates.
- D86 We consider that until Transpower obtains more accurate costs for the Orari switching station it should not discard other options for further investment in the USI development programme. This does not affect our approval of the Proposal, since the investments contained in the Proposal are common to all leading investment options presented in Transpower's proposal.

Proposed investment is robust to sensitivity analysis

- D87 We are satisfied that the outputs of the sensitivity analysis, as presented by Transpower in Table 7-5 of the Proposal are reasonable.
- D88 We consider that the proposed investment is robust under sensitivity analysis. We assessed robustness by considering if options 6 and 2 provide the highest electricity market benefits under sensitivity analysis. The results show that while the ranking changes under some sensitivity parameters, for most parameters options 6 and 2 provide the highest electricity market benefits showing that these options are sufficiently robust under sensitivity analysis.
- D89 We also consider that the variables used for the sensitivity test and their ranges are reasonable (see Table D5).
- D90 The Capex IM requires that the selected option be robust to sensitivity tests and list the sensitivity test analysis parameters. The Capex IM also allows Transpower some discretion in selecting the values of these parameters.
- D91 Table D5 sets out the sensitivity analysis parameters applied by Transpower and our assessment of them.

Table D5: Sensitivity analysis parameters

| Variable and clause in schedule D | Included/not included in sensitivity analysis | Commission's assessment |
|--|---|---|
| D8(1)(a) forecast demand. | Included a low value to consider the current low growth rate. | Reasonable to consider low demand forecast since this affects the need dates for future investments and hence market costs of the investment options. |
| D8(1)(b) the size, timing, location, fuel costs and operating and maintenance costs, relevant to existing assets, committed proposals, modelled proposals and the investment option. | Included fuel +/- 20% diesel costs. | Reasonable. Fuel cost affects the economics of investment options. |

| Variable and clause in schedule D | Included/not included in sensitivity analysis | Commission's assessment |
|--|---|--|
| D8(1)(c) the capital cost of the investment option and modelled projects. | Included costs +/- 20%. | Reasonable. Generally aligns with the accuracy of the cost estimates. We note that the level of accuracy of Orari bussing is outside this range, but is acceptable since as part of this proposal Transpower will carry out further work to derive a more accurate estimate of costs. |
| D8(1)(d) the timing of decommissioning, removing or de-rating decommissioned assets. | Not included. SV3 decommissioning is an option. | Reasonable to exclude from sensitivity analysis. |
| D8(1)(e) the value of unserved energy (Voll). | Used \$12,100/ MWh and \$36,300/MWh. | Reasonable as this covers a wide range. The Capex IM also requires Transpower to use the Voll specified in EPIC clause 4 of schedule 12.2 (20,000/MWh). Since, this value is within the range considered by Transpower, we consider that Transpower does not need to repeat the sensitivity test using a Voll of 20,000/MWh. |
| D8(1)(f) discount rate. | Included as 4% and 10%. | As required in the investment test. ¹¹² |
| D8(1)(g) range of hydrological inflow sequences. | Not included. | Reasonable. Not relevant since the transmission system should be capable of meeting demand under worse hydrological inflow conditions. |
| D8(1)(h) relevant demand and generation scenario probability weightings. | Equal weighting used for generation scenarios used. | Reasonable. No reason to change weightings. Sensitivity analysis on demand forecast does not change the need of investment but it may change the timing of the investment. |
| D8(1)(i) competition benefits. | Not included. | Not applicable. |
| D8(1)(j) other variables that Transpower considers uncertain. | Included +/- 20% on exchange rates. | Reflects on the cost of the project. Since this is not an economic investment proposal, this variable is not required. |

¹¹² Capex IM, clause D8(3).

| Variable and clause in schedule D | Included/not included in sensitivity analysis | Commission's assessment |
|--|--|--|
| D8(1)(j) Other variables cost of losses. | Consider for cost of losses down to \$60/MWh. Transpower used cost of losses of \$120/MWh in its analysis. | Not that useful since cost of electricity generation and therefore the cost of losses is unlikely to reduce. |

D92 Transpower has presented the results of its sensitivity analysis in Table 7-5 of the Proposal. The results show that following.

D92.1 Overall, the ranking between options 2 and 6 do not change. Option 2 has higher expected net electricity market benefits than option 6 for high and low demand, lower capital cost or lower exchange rate and lower discount rate. For all other variables, option 6 provides the highest electricity market benefits;

D92.2 The expected net electricity market benefit of option 4 is higher than that of option 2, if the capital cost increases by 20%. We consider this does not rule out option 2 because Transpower will review the cost estimate, and therefore the expected net electricity market benefit, for option 2 as part of the Orari substation preliminary investigations;

D92.3 The expected net electricity market benefits of options 3 and 4 are higher than that of option 2, if the exchange rate increases by 20%. We consider this does not rule out option 2 because Transpower will review the cost estimate, and therefore the expected net electricity market benefit, for option 2 as part of the Orari substation preliminary investigations; and

D92.4 The expected net electricity market benefit of option 4 is higher than that of option 2 if the cost of losses is reduced to \$60/MWh. We consider that the cost of losses is unlikely to reduce in the long term, as forecast in the SoO. Therefore we consider that this result is not material to the relative ranking of options.

Attachment E: Compliance with process requirements

Purpose of this attachment

- E1 In this attachment, we explain how we evaluated Transpower's Proposal against the process requirements of the Capex IM.

Process requirements of the Capex IM

- E2 The Capex IM requires that Transpower's Proposal meets the consultation, information and certification requirements.¹¹³ The details of our evaluation of the individual requirements are shown below.

Consultation requirements

- E3 The Capex IM requires that Transpower must meet all the relevant consultation requirements in preparing the Proposal. These requirements include notifying the Commission of its intent to plan a major capex project. Transpower is required to agree on a consultation programme, an approach for considering non-transmission solutions and approval timeframes with the Commission. Transpower must publish, regularly review and update these matters.
- E4 Transpower first advised the Commission of its intention to investigate this proposal in April 2011, before the Capex IM came into effect. Transpower met the requirement to notify us, under the Capex IM, by sending a letter on 20 March 2012.¹¹⁴
- E5 Transpower and the Commission agreed on the formal consultation programme and approach for Transpower's initial long list consultation and request for proposals on non-transmission solutions in June 2011. We later agreed on the same details for the short list consultation and approval timeframes in April 2012, after the Capex IM came into effect. We published items relevant to this agreement on the Commission's website on 19 April 2012 and Transpower has also published relevant consultation documentation.¹¹⁵
- E6 Transpower and the Commission met regularly during the time between the notification and submitting the MCP and discussed the progress of the consultation.
- E7 We reviewed Transpower's Proposal and consultation documents against the agreed programme and approach. As a result of this review we consider that they consulted on the Proposal in accordance with the requirements.

¹¹³ Capex IM, Schedule I, schedule G and Part 9.

¹¹⁴ Letter from Transpower "Re: Upper South Island Grid Upgrade: 20 March 2012".

¹¹⁵ Transpower website <https://www.transpower.co.nz/projects/upper-south-island-grid-upgrade/upper-south-island-grid-upgrade-resources>.

Information requirements

- E8 The Capex IM requires that Transpower's Proposal meets the specified information requirements.
- E9 Transpower provides a table¹¹⁶ mapping the information required by the Capex IM onto information provided within its MCP.
- E10 We have reviewed this table against the Capex IM and are satisfied that Transpower's proposal has met the relevant information requirements.

Certification requirements

- E11 The Capex IM requires that Transpower's Chief Executive Officer (CEO) certifies the Proposal.
- E12 Transpower provided a certificate¹¹⁷ signed by the CEO.
- E13 We have reviewed this certificate against the Capex IM and are satisfied that it meets the relevant certification requirements.

¹¹⁶ Proposal Attachment F, section 7.

¹¹⁷ Proposal Attachment F, section 8.