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Decision and reasons on Transpower's Bombay Otahuhu Regional major capex project

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Contents

Executive summary

Our decision is to approve a major capex project from Transpower

X1 This paper sets out our decision to approve a major capex project (**Project**) proposed by Transpower New Zealand Limited (**Transpower**). The paper:

X1.1 summarises the major capex proposal Transpower submitted to us on 15 May 2020 (**MCP**);

X1.2 outlines the submissions and cross-submissions we received in our consultation on our draft decision to approve the Project (**draft decision**) and discusses how we have had regard to them in making our decision; and

X1.3 sets out our evaluation of, and decision to approve the Project, together with the reasons for our decision.

X2 The MCP – the 'Bombay Otahuhu Regional major capex project'[1] – seeks our approval to recover the costs of grid investment for the first phase of upgrading the transmission network supplying the Bombay-Otahuhu region (**region**). Transpower intends to seek our approval, at a later date, to recover the costs of the next phase of upgrading the Otahuhu-Wiri line section via an amendment to the major capex project output (**MCPO**) and major capex allowance (**MCA**) of this **MCP**.

X3 The grid investment will increase the capacity of the network supplying the region and improve the reliability of electricity supply to the **region**.

X4 Under the *Transpower Capital Expenditure Input Methodology Determination 2012* [2012] NZCC 2 (**Capex IM**), Transpower may only recover capital expenditure relating to a major capex project if we have first approved it.[2] Our approval regime under the Capex IM aims to strike the right balance between allowing stakeholders to scrutinise individual major capex projects, providing scope for other parties to provide alternative solutions, and enabling Transpower to undertake investment that promotes the long-term benefit of its consumers.[3]

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1 Transpower, *Bombay Otahuhu Regional major capex project* (the MCP), (May 2020), available at: https://comcom.govt.nz/regulated-industries/electricity-lines/electricity-transmission/transpower-capital-investment-proposals/transpower-major-capital-proposal/bombay-otahuhu-regional-major-capital-proposal#projecttab.

2 Clause 3.3.2(2) of the Capex IM, available at: https://comcom.govt.nz/__data/assets/pdf_file/0026/88280/Transpower-capital-expenditure-input-methodology-determination-consolidated-29-January-2020.pdf.

3 Commerce Commission, *Transpower Capital Expenditure Input Methodology Reasons Paper* (**2012 Capex IM reasons paper**), (31 January 2012), at paras 2.5.12 to 2.5.13, available at: https://comcom.govt.nz/__data/assets/pdf_file/0028/63883/Capex-IM-Final-Reasons-Paper-31-January-2012.pdf.

X5 On 28 November 2020, we issued our draft decision to approve the Project for consultation.[4] We have considered relevant matters submitters raised in our consultation and have set out our reasons to approve the Project in this paper.

X6 The MCP seeks our approval to invest $35.9 million to establish a 220kV electricity supply at the Bombay grid exit point (**GXP**) and to increase the capacity and reliability of transmission to the Bombay GXP. The two drivers behind the MCP are:

X6.1 primarily, the significant deterioration of the conductors on the 110kV Bombay-Otahuhu A line (**Bombay-Otahuhu A line**); and

X6.2 a forecast increase in demand growth in the Bombay-Otahuhu region requiring an upgrade in the capacity of the transmission network supplying the region.

X7 As we explain in Attachment B, increasing the capacity and reliability of supply to the Bombay GXP, and later the Wiri GXP, is part of what qualifies the Project as 'major capex' under the Capex IM. This is because that increase in the capacity and reliability of supply would be an enhancement or development of the grid rather than a replacement or refurbishment.

X8 The MCP also seeks our approval to incur the costs of preparatory works, including investigations and design for refurbishing the line, replacing the conductors and increasing the capacity (**reconductoring**) of the Otahuhu-Wiri section of the Bombay-Otahuhu A 110 kV transmission line (**Otahuhu-Wiri line**).

X9 The main benefit of approving the Project is that it will ensure the transmission network has enough capacity to supply consumers who are fed from the Bombay GXP. Approving the Project will also pave the way to **reconductoring** the Otahuhu-Wiri line. The conductors on the Otahuhu-Wiri line are corroding and **reconductoring** will ensure the line has the necessary reliability and capacity to supply consumers taking electricity from the Wiri GXP.

Our role is to evaluate and decide whether to approve the Project

X10 We must evaluate the MCP against the criteria and requirements of the Capex IM for major capex projects and make a decision on whether to approve or decline the Project.[5] Before making a final decision, we must consult and consider the views of interested parties on our decision.[6]

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4 The draft decision is available at https://comcom.govt.nz/regulated-industries/electricity-lines/electricity-transmission/transpower-capital-investment-proposals/transpower-major-capital-proposal/bombay-otahuhu-regional-major-capital-proposal.

5 Clauses 3.3.5(1) and (4). These provisions apply if we do not reject the MCP under clause 3.3.4 of the Capex IM.

6 Clause 3.3.5(5)(a).

X11 When we approve a project, as part of our decision, we must determine the project's:[7]

X11.1 MCA;[8]

X11.2 major capex incentive rate;[9] and

X12 we may also set a component of the **MCA** as an exempt major capex (**EMC**).[10]

Our decision is to approve the Project

X13 Having evaluated the MCP against the requirements of the Capex IM and considered the submissions and cross-submissions on our draft decision, our decision is to approve the Project.

Submissions on our draft decision

X14 We sought submissions on the draft decision by 17 December 2020 and cross-submissions on the submissions by 22 January 2021. **Transpower**[11] and Vector Limited (**Vector**)[12] submitted on our draft decision while **Transpower**[13] and Counties Power (**Counties**)[14] cross submitted on the submissions.

X15 We provide a summary of these submissions and cross-submissions in paragraphs 54 to 61.

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7 Clause 3.3.5(7).

8 Clause 1.1.5(2), 'major capex allowance' means the amount of major capex we approve in relation to an approved major capex project.

9 Clause 1.1.5(2), 'major capex incentive rate' means 15% or an alternative rate we specify in respect of an approved major capex project.

10 Clause 1.1.5(2), 'exempt major capex' means the amount of the MCA to which the major capex incentive rate does not apply which may be expressed by reference to a category of expenditure within a major capex project, as we determine under clause 3.3.5(7) of the Capex IM.

11 Transpower, *Submission Major Capex Project draft decision: Bombay-Otahuhu Regional Major capital proposal* (**Transpower submission**), 17 December 2020, available at*:* https://comcom.govt.nz/__data/assets/pdf_file/0019/230752/Transpower-submission-on-Bombay-Otahuhu-draft-decision-17-December-2020.pdf.

12 Vector, *Re: Bombay-Otahuhu Regional Major Capex Project* (**Vector submission**), 17 December 2020, available at: https://comcom.govt.nz/__data/assets/pdf_file/0020/230753/Vector-submission-Bombay-Otahuhu-17-December-2020.pdf.

13 Transpower, *Cross Submission Major Capex Project draft decision: Bombay Otahuhu Regional Major capital proposal* (**Transpower cross submission**), 21 January 2021, available at https://comcom.govt.nz/__data/assets/pdf_file/0019/233920/Transpower-Cross-submission-on-Bombay-Otahuhu-regional-major-capex-project-21-January-2021.pdf.

14 Counties, *Cross submission: Bombay-Otahuhu Regional Major Capex Project* (**Counties cross submission**), 22 January 2021, available at https://comcom.govt.nz/__data/assets/pdf_file/0027/233919/Counties-Power-Cross-submission-on-Bombay-Otahuhu-regional-major-capex-project-22-January-2021.pdf.

Our decision promotes the purpose of Part 4 of the Commerce Act 1986

X16 We are satisfied that the Project represents the investment option with the highest expected net electricity market benefit under the investment test in Schedule D of the Capex IM. Further, by enabling Transpower to deliver the right investment at the right time, our decision promotes the long-term benefit of Transpower's consumers – and the purpose of Part 4 of the Commerce Act 1986 (**Act**) – by ensuring Transpower provides services at a quality that reflects their consumers' demands.[15]

X17 Our detailed reasons for this decision are set out in Attachments A to E of this paper.

The components of our decision

X18 As part of our decision, we are approving:

X18.1 an MCA of $35.9 million (in 2022/23 prices); and

X18.2 a major capex incentive rate of 15%, which is the default incentive rate that we consider is appropriate for the Project.

X19 We are not setting any EMC.[16]

X20 Under our decision:

X20.1 the approved major capex outputs for the Project are:

X20.1.1 procuring, installing and commissioning two 150/175 MVA 220/110kV transformers at Transpower's Bombay substation;

X20.1.2 procuring, installing and commissioning a connection for these transformers to the 220kV Huntly-Otahuhu A line; and

X20.1.3 undertaking preparatory works, including additional investigation, consultation and design work, for **reconductoring** the Otahuhu-Wiri line; and

X20.2 the approval expiry date is 31 December 2028.[17]

Covid-19 and our decision

X21 In making our decision on the MCP, we have applied the criteria and followed the requirements of the Capex IM. Alongside this, we have considered the potential implications of Covid-19 on our decision.

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[15] Commerce Act 1986, s 52A(1)(b). The purpose of Part 4 is set out in section 52A of the Act. Our analysis of how the MCP promotes the purpose of Part 4 of the Act is set out in Attachment B of this paper.

[16] We provide more details on the reasons for revising the EMC at paragraphs C44 to C54 of Attachment C.

[17] See Attachment C for further detail on how we have given effect to the components of our decision.

X22 We are satisfied that Covid-19 will not impact on the timing (**need date**) of the Project because the need date is set by the condition of the conductors on the Bombay-Otahuhu line which have already reached the end of their service life.

X23 When assessing the electricity market benefits of the investment options, we took a conservative approach and assumed there would be no increase in demand until 2025 due to the possible effects of the Covid-19 pandemic. We discuss this further in Attachment D.

X24 Since releasing our draft decision, Transpower's assessment shows electricity demand in the region is increasing.[18] We have not revised our assessment of electricity market benefits to reflect the observed continued growth in demand. This is because a higher growth rate in demand will increase the magnitude of the electricity market benefits but will not affect the ranking of the investment options and therefore the proposed investment.

[18] Transpower "Bombay-Otahuhu Regional Major Capital Proposal: Response to Questions from the Commerce Commission dated 11 February", at pg. 2.

Introduction

Purpose of this paper

1 The purpose of this paper is to explain our decision to approve the Project.

How we have structured this paper

2 The body of this paper sets out our decision under the Capex IM and Attachments A to E provide the reasons and Capex IM criteria underpinning our decision. Specifically:

2.1 Attachment A sets out our evaluation criteria under the Capex IM which comprise the general criteria,[19] specific criteria,[20] and the investment test;[21]

2.2 Attachment B provides our evaluation of:

2.2.1 the MCP against the general criteria for capex proposals under the Capex IM; and

2.2.2 Transpower's consultation against the requirements of the Capex IM;

2.3 Attachment C provides our evaluation of the MCP against the specific criteria;

2.4 Attachment D provides our evaluation of Transpower's application of the investment test; and

2.5 Attachment E lists the acronyms, abbreviations and terms used in this paper.

Regulatory approval process to date

3 A summary of the steps Transpower has taken under the Capex IM's regulatory approval process is as follows:

3.1 on 2 October 2018, Transpower notified us under clause 3.3.1(1) of the Capex IM of its plan to develop an MCP that could be staged.[22] In its notification, as required by clause 3.3.1(1) of the Capex IM, Transpower:

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19 Capex IM, above n 2, at part 6.

20 At schedule C.

21 At schedule D.

22 Transpower's letter available at: https://www.transpower.co.nz/sites/default/files/projects/resources/bobmcp2.pdf. Transpower can split a major capex project into several staging projects if it considers that staging would allow it and us to:

a) set a more accurate level of funding for the project; and/or

b) better manage uncertainties in need and timing of the project.

3.1.1 included tentative timeframes for consulting on the long list of options, the short list of options and the date of submitting the MCP to the Commission;

3.1.2 advised that this major capex project could potentially be a staged project but Transpower needed to complete its investigations to identify any stages; and

3.1.3 stated that non-transmission solutions (**NTS**) will be considered as investment options in the investigation and the timetable will be adjusted as necessary to ensure our consideration of NTSs is robust;

3.2 in December 2018, Transpower consulted with stakeholders on its long list of options to meet the investment need[23] (**long-list consultation**)[24] and invited information on NTSs from interested parties as required by Schedule I of the Capex IM;

3.3 in June 2019, Transpower issued a request for proposals (**RFP**) on NTSs;[25]

3.4 in December 2019, Transpower consulted on its short list of investment options (**short-list consultation**)[26] as required by Schedule I3 of the Capex IM; and

3.5 on 15 May 2020, Transpower submitted the MCP to us for our approval of the proposed investment.[27]

4 On 27 November 2020, we invited submissions on our draft decision to approve the Project and invited cross-submissions on the submissions by 17 December 2020.

See Commerce Commission, *Transpower capex input methodology review - Decisions and reasons* (**2017/18 Capex IM review reasons paper**), 29 March 2018, at para 54, available at: https://comcom.govt.nz/__data/assets/pdf_file/0033/79926/Transpower-capex-IM-review-Decisions-and-reasons29-March-2018.PDF.

[23] Capex IM, above n 2, at cl 1.1.5(2), 'investment option' means a technically feasible solution, including an NTS, designed to facilitate or meet a specific investment need, other than an option fully funded under a new investment contract.

[24] Transpower, *Bombay Otahuhu Regional major capex project Long-list consultation and non-transmission solution request for information* (**long-list consultation document**), May 2019, available at: https://www.transpower.co.nz/sites/default/files/projects/resources/BOB-OTA%20Long%20List.pdf.

[25] Transpower, *Bombay Otahuhu Regional major capex project investigation Request for Proposal: Bombay-Wiri Non-transmission solutions,* June 2019, available at: https://www.transpower.co.nz/sites/default/files/projects/resources/RFP%20Non-transmission%20alternatives%20BOB-OTA%20region.pdf.

[26] Transpower, *Bombay Otahuhu Regional major capex project – consultation on short list of investment options* (**short-list consultation document**), December 2019, available at: https://www.transpower.co.nz/sites/default/files/projects/resources/BOB-OTA%20Short-list%20Consultation_0.pdf.

[27] Capex IM, above n 2, at cl 1.1.5(2), a 'proposed investment' is the investment option Transpower submits as an MCP to us for approval of a major capex project.

Counties, Transpower and Vector submitted and cross-submitted on our draft decision

5 Transpower[28] and Vector[29] submitted on our draft decision while Transpower[30] and Counties[31] cross submitted on the submissions.

6 We discuss the submissions and cross-submissions in paragraphs 55 to 59.

[28] Transpower, above n 11.

[29] Vector, above n 12.

[30] Transpower, above n 13.

[31] Counties, above n 14.

Our decision-making framework

Purpose of this chapter

7 This chapter provides an overview of the decision-making framework we have applied in reaching our decision on the Project.

Our decision-making framework

Capex IM

8 Regulation under Part 4 of the Act (**Part 4**) seeks to promote the long-term benefit of consumers of regulated services.[32] These regulated services include electricity transmission services provided by Transpower.

9 The input methodologies (**IMs**) under Part 4 are the upfront rules, processes, and requirements of Part 4 regulation. Their purpose is to promote certainty for suppliers and consumers in relation to the rules, requirements and processes applying to regulated services under Part 4.[33] The IMs apply to electricity transmission services provided by Transpower.

10 One of the IMs that applies to Transpower is the Capex IM.[34] The two major functions of the Capex IM are to provide for the scrutiny of Transpower's proposed and actual investments and to incentivise Transpower to deliver those investments efficiently.

Major capex projects

11 Under clause 3.3.2(2) of the Capex IM, Transpower may only recover its costs relating to a major capex project if we have first approved it.

12 Transpower submits an MCP to us.[35] If we do not reject the MCP,[36] we must either:[37]

12.1 approve the project; or

12.2 decline the project.

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32 Commerce Act, s 52A.

33 Section 52R.

34 Along with the Capex IM, Transpower is subject to the *Transpower Input Methodologies Determination 2010* [2012] NZCC 17 (**Transpower IMs**), which sets out IMs for: cost allocation, asset valuation, treatment of taxation, cost of capital, specification of price, the incremental rolling incentive scheme, and reconsideration of the price-quality path.

35 Capex IM, above n 2, at cl 3.3.3(1).

36 Clause 3.3.4, we may reject an MCP if it does not comply with the requirements in clause 7.4.1, or if Transpower has not complied with the requirements specified in clause 3.3.1 of the Capex IM.

37 Clauses 3.3.5(1)(a) and (b).

13 If we approve a project, we must also determine the MCA,[38] major capex incentive rate,[39] and any EMC.[40]

14 Before we can approve or decline a project, we must:

14.1 publish the MCP;[41]

14.2 evaluate the MCP in accordance with the evaluation criteria in the Capex IM, including any further information we have received in the evaluation process;[42] and

14.3 consult in the following ways: [43]

14.3.1 make and publish a draft decision or decisions on the MCP;

14.3.2 seek the written views of interested persons on anything published; and

14.3.3 seek the written views of interested persons on others' submissions.

15 We must evaluate an MCP against three sets of evaluation criteria in the Capex IM:

15.1 the general evaluation criteria for capital expenditure in Part 6;

15.2 the specific evaluation criteria for MCPs in Schedule C;[44] and

15.3 the investment test in Schedule D, Division 1.[45]

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38 Clause 3.3.5(7)(a).

39 Capex IM, above n 2, at cl 3.3.5(7)(b).

40 Clause 3.3.5(7)(c).

41 Clause 8.1.1(1)(a).

42 Clause 3.3.5(5)(b)(i)-(ii).

43 Clauses 3.3.5(5)(a) and 8.1.1(1)(a)(ii) to (iv).

44 Clause 6.1.1(4), as part of that Part 6 criteria, we must also evaluate an MCP in accordance with the specific criteria for major capex proposals in Schedule C of the Capex IM.

45 Clause C1(1) of Schedule C, we must evaluate whether the investment proposed in the MCP satisfies the investment test specified in Schedule D, Division 1 of the Capex IM.

Overview and background to the MCP

Purpose of this chapter

16 The purpose of this chapter is to provide background on the MCP. The chapter outlines:

16.1 what major capex projects are under the Capex IM; and

16.2 the content of and background to the MCP.

Major capex projects under the Capex IM

Major capex projects

17 A 'major capex project' is defined in the Capex IM to mean "a project of major capex undertaken to address or enable a specific investment need to be met, which may be either or both, a transmission investment or an NTS".[46] Major capex covers capital expenditure for large individual transmission grid enhancement projects that, given their nature and magnitude, warrant individual scrutiny and public consultation.[47] Specifically, under clause 1.1.5(2) of the Capex IM, 'major capex' means expenditure that:

17.1 is incurred to meet the grid reliability standards (**GRS**)[48] or provide a 'net electricity market benefit';

17.2 is forecast to have an aggregate capital cost exceeding the base capex threshold of $20 million;[49] and

17.3 is not incurred in relation to asset replacement, asset refurbishment, business support or information system and technology assets.

18 Clause 3.3.3(1) of the Capex IM requires Transpower to submit an MCP to us when it seeks approval for a major capex project.

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46 Capex IM, above n 2, cl 1.1.5(2).

47 Commerce Commission, *Transpower capex input methodology review - Decisions and reasons* (**2017/18 Capex IM review reasons paper**), 29 March 2018, at para 54, available at: https://comcom.govt.nz/__data/assets/pdf_file/0033/79926/Transpower-capex-IM-review-Decisions-and-reasons-29-March-2018.PDF.

48 Under clause 1.1.5(2) of the Capex IM, the GRS are standards developed under the Electricity Industry Participation Code 2010 (**Code**) for the reliability of the grid. Under clause 12.56 of the Code, the purpose of the GRS is to provide a basis for Transpower and other parties to appraise opportunities for transmission investments and transmission alternatives. The deterministic limb (or N-1 criterion) of the GRS is set out at clause 2(2)(b) of Schedule 12.2 of the Code (**N-1 criterion of the GRS**) and provides that with all assets that are reasonably expected to be in service, the power system would remain in a satisfactory state during and following the tripping of one of the transmission assets in the core grid.

49 See definition of 'base capex threshold' under clause 1.1.5(2) of the Capex IM.

19 If Transpower seeks approval for a major capex project, the aggregate forecast capital expenditure and forecast maximum recoverable costs for the major capex project must exceed $20 million.[50]

20 The Capex IM also sets out the information that Transpower needs to provide in its MCP and the associated certification of the information it provides.[51] The CEO of Transpower must certify that the information provided accurately represents Transpower's operations. The CEO certification must also state that the proposed investment was approved according to Transpower's director and management approval policies.[52]

21 Transpower may submit an MCP to us at any time during a regulatory period.[53]

What happens if we approve the Project

22 Under clause 2.2.3(2)(f) of the Transpower IMs, if we approve the Project, Transpower may, after commissioning the relevant assets, include the actual costs of the assets in its regulatory asset base. Transpower may then recover those costs under the IPP [54] as transmission charges allocated according to the transmission pricing methodology (**TPM**).[55]

23 Under clause 7.5.1(1)(c) of the Capex IM, Transpower has provided an estimate based on the currently applicable TPM of the increase in transmission charges from the expenditure relating to the Project.[56]

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50 See definitions of 'major capex' and 'base capex threshold' under clause 1.1.5(2) of the Capex IM.

51 Capex IM, above n 2, at cl 7.4.1 and Schedule G.

52 Clause 9.2.1.

53 Clause 3.3.3(3).

54 Clause 8 of the Commerce Commission IPP Determination (**IPP**) available at https://comcom.govt.nz/regulated-industries/electricity-lines/electricity-transmission/transpowers-price-quality-path/setting-transpowers-price-quality-path-from-2020. We note that:

a) any incentive amounts arising from the Project will be determined as part of calculating the major capex expenditure and output adjustment under clause B3(1) of Schedule B of the Capex IM and, under clause 31.1.3(h) of the IPP, will enter Transpower's EV account and roll over to affect Transpower's maximum allowable revenue at the next regulatory control period; and

b) under clause 8.3.2 of the IPP, major capex we approve becomes part of the maximum revenue that Transpower may recover for electricity transmission services in a pricing year by the Commission reconsidering the IPP under clause 3.7.4(4)(a) of the Transpower IMs.

55 The TPM is the methodology by which Transpower prices its transmission services developed in accordance with subpart 4 of Part 12 of the Code and specified in Schedule 12.4 of the Code.

56 MCP, above n 1, *Attachment F – Pricing implications by GXP and GIP*.

24 On 10 June 2020 the Electricity Authority issued new TPM guidelines to Transpower.[57] Transpower is using the new TPM guidelines to develop a proposed new TPM[58] to submit to the Electricity Authority by 30 June 2021 for its approval.[59]

25 The new TPM Transpower develops will classify the investment for the Project as a 'benefit-based investment' to which a benefit-based charge will apply.[60] The allocation of transmission charges under the new TPM may differ to that set out in Transpower's estimate under clause 7.5.1(1)(c) of the Capex IM.

26 We consider Transpower's estimate under clause 7.5.1(1)(c) of the Capex IM of the increase in transmission charges from expenditure relating to the Project is valid to the extent it is based on the TPM applicable at the time Transpower submitted the MCP. We also consider it is not feasible at this stage for Transpower to provide an estimate of charges based on the new TPM guidelines because the new TPM is still under development.[61]

27 The new TPM guidelines and the new TPM Transpower develops under them will not affect the regulatory approval process for assessing the MCP under the Capex IM or the amount Transpower can recover in transmission charges for the investment.

Background to the MCP

Overview of the transmission network

28 Figure 1 below shows the transmission network in the Bombay-Otahuhu region. Figure 2 shows a simplified line diagram of the existing transmission network supplying the Bombay-Otahuhu region compared with the network proposed under this MCP. The Huntly-Otahuhu A line, to which Transpower proposes to connect the Bombay GXP, runs through the Bombay GXP. This line would be diverted to allow construction and termination at Bombay substation.

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57 See Electricity Authority, *Transmission Pricing Review, Development, TPM decision and guidelines*, available at: https://www.ea.govt.nz/development/work-programme/pricing-cost-allocation/transmission-pricing-review/development/tpm-decision-and-guidelines/.

58 Under clause 12.89(1) of the Code, Transpower must develop its proposed TPM consistent with—
(a) any determination made under Part 4 of the Commerce Act 1986; and
(b) the Authority's objective in section 15 of the Act; and
(c) any TPM guidelines the Electricity Authority publishes under clause 12.83(b).

59 Under clause 12.88(1) of the Code, Transpower must submit a proposed new TPM to the Electricity Authority within 90 days (or a longer period that the Electricity Authority specifies) of a written request from the Electricity Authority. In its decision paper on the new TPM guidelines, the Electricity Authority directed Transpower to submit a proposed new TPM by no later than 30 June 2021 – see Electricity Authority, *Transmission pricing methodology 2020 Guidelines and process for development of a proposed TPM*, 10 June 2020, at Executive Summary pg. V, available at: https://www.ea.govt.nz/dmsdocument/26851-tpm-decision-paper.

60 Electricity Authority, *Transmission pricing methodology 2020 Guidelines*, 10 June 2020, at clauses 13 and 14 and at clause 69 definition of 'post-2019', available at: https://www.ea.govt.nz/dmsdocument/26850-tpm-2020-guidelines.

61 In its response to our question, Transpower stated that the estimated charges for Wiri and Bombay GXPs in its letter dated 11 February (above note 18) are unlikely to change under the new TPM.

29 The two GXPs supplying the Bombay-Otahuhu region are Bombay and Wiri. Wiri supplies Vector Limited's (**Vector**) distribution network and Bombay supplies Counties Power Limited's (**Counties**) distribution network.

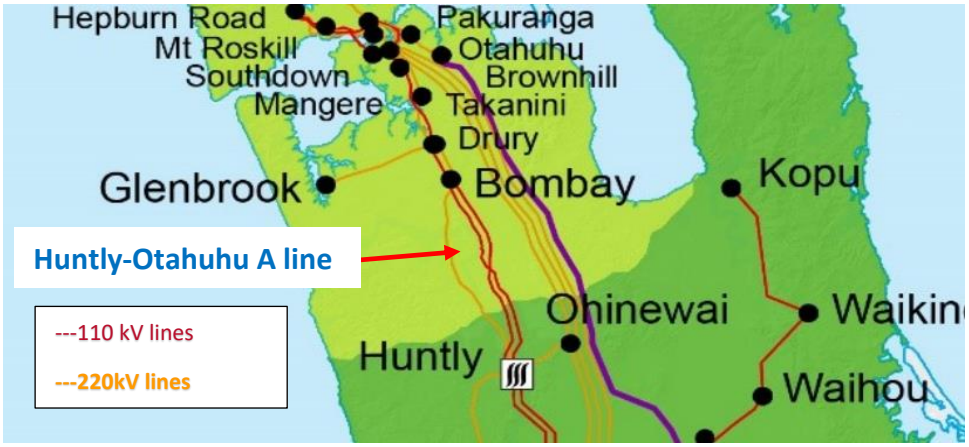
30 The region is serviced by three 110 kV lines:

30.1 one from Otahuhu substation. This line has two sections – the Otahuhu-Wiri line and the Bombay-Wiri section,

30.2 one from Arapuni Power Station (Arapuni line comprising Bombay-Meremere A line (**BOB-MER line**) and Arapuni-Hamilton A line (**ARI-HAM line**)); and

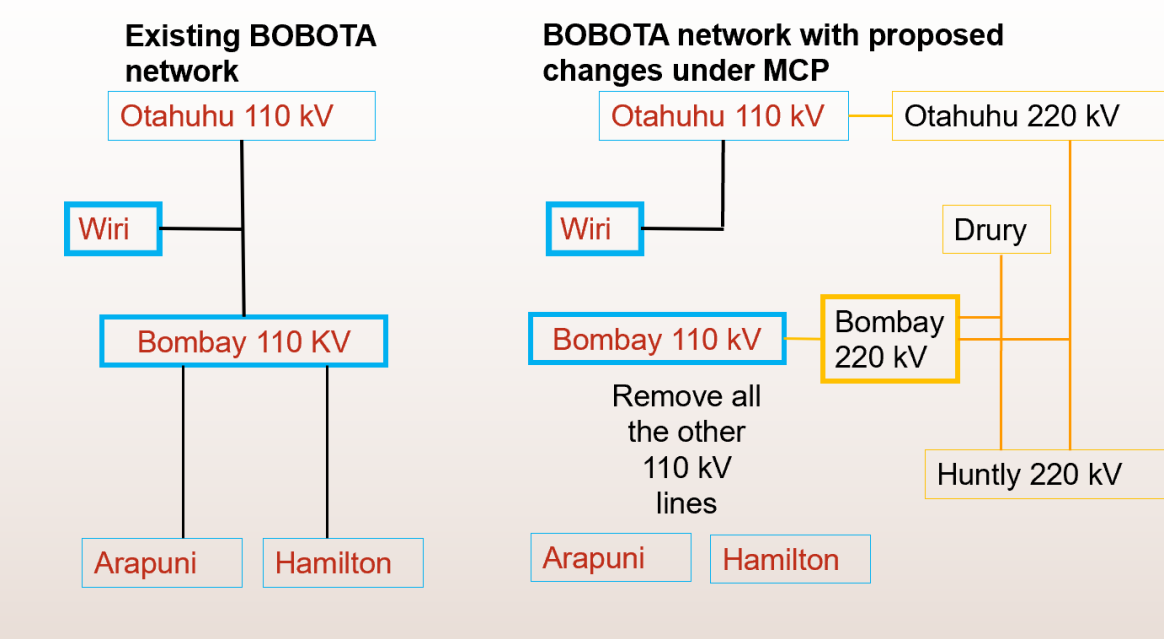
30.3 one from Hamilton substation (Hamilton line comprising Meremere-Takanini A line (**MER-TAK line**) and Meremere-Hamilton B line (**MER-HAM line**)).[62]

Figure 1: Transmission network in the Bombay-Otahuhu region



[62] The lines are named according to the substations or power stations **(stations)** they interconnected when the lines were first built. As the transmission network changes, two or more lines are combined or a line split to interconnect other additional stations, but the names of the lines remain unchanged. For this reason, the circuit name denoting the stations a line interconnects can be different from the name of the line.

Figure 2: Line diagram comparing the current and proposed transmission network in the Bombay-Otahuhu region



31 The Otahuhu and Hamilton lines have two circuits each. Together, five 110 kV circuits supply Bombay GXP.

32 Transpower states that the winter thermal rating of each circuit between Otahuhu and Wiri is 101 MVA and 76 MVA between Wiri and Bombay. The winter capacity of each of the Bombay-Hamilton and Arapuni-Bombay circuits is 62 MVA.[63]

33 The present peak demand at Wiri is about 85 MW and the peak demand at Bombay is approximately 80 MW.

The investment need, timing, and drivers

34 Transpower states that the investment need is to maintain a reliable supply in the Bombay-Otahuhu region. The two drivers of this need are:

34.1 primarily, the condition of the conductors on the Bombay-Otahuhu A line which require replacing because they have widespread corrosion and an increased risk of failure; and

34.2 an increase in demand growth forecast in the region requiring an upgrade in the capacity of the transmission network supplying the Bombay and Wiri GXPs.[64]

[63] MCP, above n 1, at pgs. 13-14.

[64] MCP, above n 1, at pgs. 7-8.

35 In terms of the first driver, Transpower has concluded that condition assessment and analysis undertaken show that the conductors on the Otahuhu end of the Bombay-Otahuhu A line require urgent intervention while conductors on the rest of the line are rapidly deteriorating. The poor condition of the conductors on the line determine the timing of the Project. Not removing these conductors from service would significantly increase the risk of conductor failure which will reduce the reliability of supply to Wiri GXP.

36 For the above reason, the timing of the Project is less dependent on demand growth. Even with no demand growth or reduction in demand, the Project needs to be completed as soon as practical. Accordingly, the primary driver for the Project and its need date is the deteriorating condition of the conductors on the Bombay-Otahuhu line – and the need to ensure a reliable supply in the Bombay-Otahuhu region – regardless of demand.

37 Although the key practical step in addressing the main driver for the Project is reconductoring the Otahuhu-Wiri line, this work is contingent on Transpower first providing a secure source of supply to the Bombay and Wiri GXPs.

38 Transpower states that it has considered the drivers for the Project simultaneously as there are synergies between them which enable an optimal solution overall compared to addressing them individually.[65] We agree that considering the two drivers simultaneously has resulted in the proposed investment having a higher expected net electricity market benefit than may have been the case if the two were considered separately.[66]

39 Transpower plans to deliver the Project by first reinforcing supply to Bombay GXP by installing and connecting the two 150 MVA 220/110kV transformers. Once completed, this reinforcement will allow Transpower to permanently supply Bombay GXP from the 220 kV and temporarily supply Wiri GXP from Bombay.

40 With Wiri GXP being supplied from Bombay, Transpower will then be able to remove the Otahuhu-Wiri line from service for upgrading and reconductoring. To deliver the reconductoring of the Otahuhu-Wiri line, it would then be open to Transpower to:

40.1 apply to us under clause 3.3.6(1)(c) of the Capex IM to amend the Project's approved MCPOs and MCA to cover the reconductoring; or

40.2 cover the costs of reconductoring as base capex under the IPP.

41 We discuss the Project's drivers under the respective subheadings below.

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[65] At pg. 13.

[66] For example, if Transpower restricted its assessment to addressing the condition of the conductors than the proposed investment could have been option 1 listed in Table D3. As shown in Table D7 this option has a lower expected net electricity market benefit than the proposed investment.

Condition of the Bombay-Otahuhu line meets Transpower replacement criteria

42 The key driver for the timing of the Project is the remaining life of the conductors on the Bombay-Otahuhu line.

43 Transpower has provided a detailed report on the condition assessment of the conductors on the Bombay-Otahuhu line.[67] Transpower also provided further details on the condition of the line in response to our questions. This included providing the results of the condition of conductors that Transpower assessed after preparing and submitting the MCP.

44 In summary, Transpower states that:[68]

44.1 there are 969 conductor corrosion defects at or below the replacement criteria. Many of these defects were identified since the MCP was prepared as this is when the New Zealand Transport Agency (**NZTA**) granted Transpower access to the sections of the line in the vicinity of the motorway;

44.2 until the conductors can be replaced, Transpower will need to manage the risk of failures of the conductors through increased inspections and repairing the worst sections of the conductors; and

44.3 it is investing approximately $520k in 2020/2021 to undertake patch repairs on the worst condition defects in seven spans to extend their lives. Further repairs may be required before reconductoring or dismantling occurs.

45 We are satisfied that Transpower has carried out appropriate inspection and testing to confirm that the conductors on this line have reached the end of their life. As mentioned in paragraph 35 above, there are sections of the line that will require significant monitoring and maintenance until the conductors are replaced.

46 We set out our detailed analysis of Transpower's condition assessment in paragraphs B70 to B79 of Attachment B. Based on this analysis, we are satisfied with the timing of the Project Transpower has proposed.

Transmission capacity and forecast load growth at Bombay and Wiri GXPs

47 The present demand in the region is about 165 MW. Prior to the Covid-19 pandemic, the regional demand was forecast to increase to more than 300 MW by 2040, as shown in Figure 3 and Figure 4 below.[69]

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[67] MCP, above n 1, Attachment B – conductor condition report.

[68] Transpower, *Response to request for information* (**RFI01***)*, pg. 3 available at https://comcom.govt.nz/regulated-industries/electricity-lines/electricity-transmission/transpower-capital-investment-proposals/transpower-major-capital-proposal/bombay-otahuhu-regional-major-capital-proposal#projecttab.

[69] MCP, above n 1, *Attachment C: Options and Costing report*, at pgs. 24-25.

Figure 3: Winter peak demand forecast for Bombay GXP

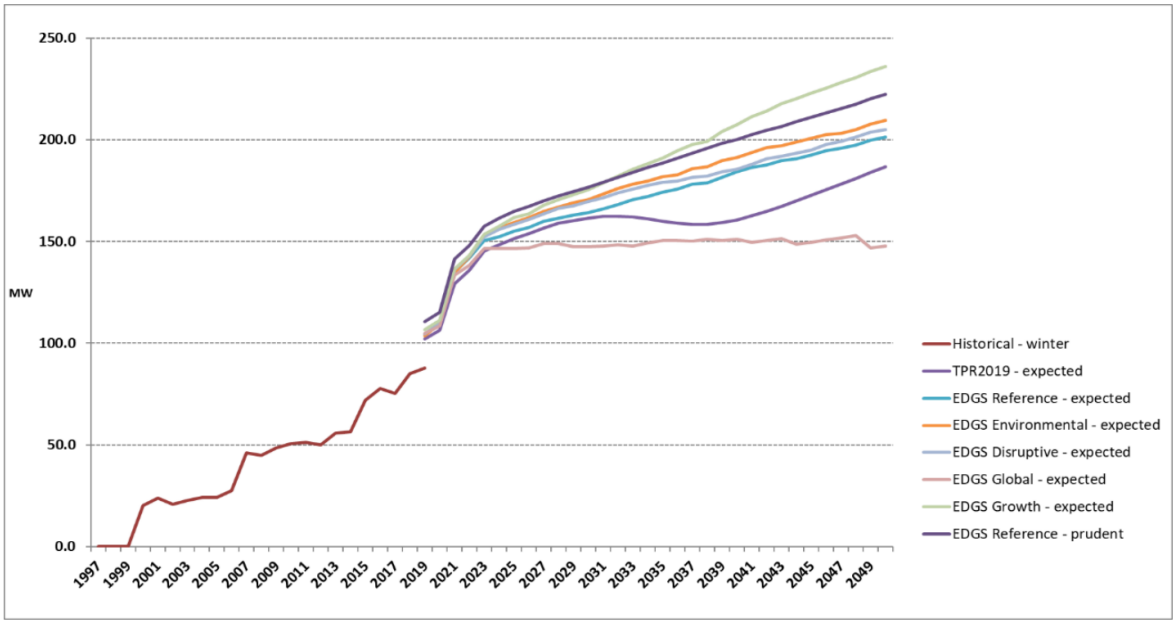
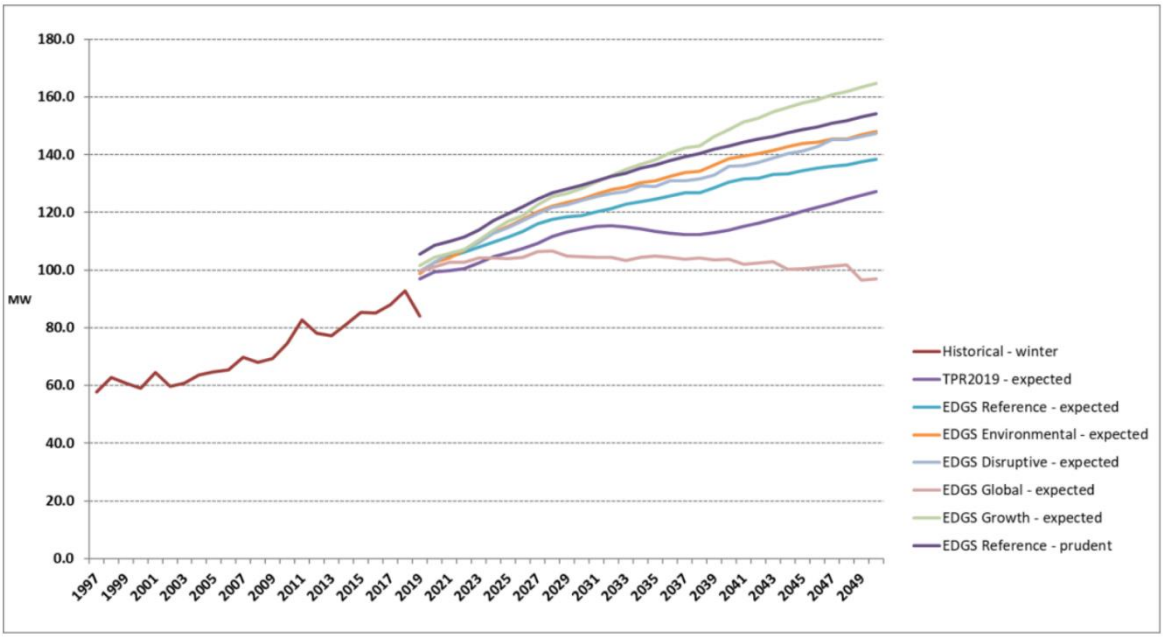


Figure 4 Winter peak demand forecast for Wiri GXP



48 Under normal operating conditions, Wiri is supplied from Otahuhu and most of the Bombay demand is supplied from Arapuni and Hamilton.

49 Transpower states that with low Waikato generation:[70]

[70] MCP, above n 1, *Attachment C: Options and Costing report*, at pgs. 13-14.

49.1 Bombay is supplied partly from Waikato and partly from Otahuhu;

49.2 the Otahuhu–Wiri circuits supply all the Wiri demand plus some of the Bombay load. The combined existing demand could exceed the capacity of those circuits at N-1 criterion of the GRS;[71] and

49.3 forecast demand growth means that the existing capacity of the Otahuhu–Wiri circuits will limit the ability to continue supplying Wiri and Bombay demand.

50 We agree that the N-1 limit of the GRS would be exceeded as demand grows in the Bombay-Otahuhu region. In response to our question post-submissions, Transpower[72] has advised that load growth at Bombay is high and transmission constraints could potentially appear as early as 2022.

51 We discuss our assessment of Transpower's demand forecast in Attachment D.

[71] The deterministic limb (or N-1 criterion) of the GRS is set out at clause 2(2)(b) of Schedule 12.2 of the Code and provides that with all assets that are reasonably expected to be in service, the power system would remain in a satisfactory state during and following the tripping of one of the transmission assets in the core grid.

[72] Above note 18, at pg. 2.

Our decision is to approve the Project

52 Our decision is to approve the Project.

53 In approving the Project, we evaluated and determined the following components:[73]

53.1 the MCA;

53.2 the EMC; and

53.3 the major capex incentive rate.

54 We also evaluated the following components proposed by Transpower:[74]

54.1 the MCPOs;

54.2 the approval expiry date; and

54.3 the commissioning date assumption.

Submissions and cross-submissions on our draft decision

55 In the following sections we provide a summary of the submission and cross-submissions and discuss their impact on our decision.

Submissions

56 Vector submitted that:[75]

56.1 Vector has significant concerns about the timing and engagement with this Project. This is especially as it is being commissioned at a time when Transpower is radically reforming its Transmission Pricing Methodology (**TPM**) for the grid.[76] Vector further submitted that "Transpower notes its implementation of the new TPM Guideline relies on a key relationship with the Commission's MCP";

56.2 the administration of the Capex and MCP by the Commission is intended to ensure stakeholders can effectively engage in the capex process to shape the investment decision so that the investment design meets the customer's interests. For the reasons we outline in paragraphs B31 to B32, we do not agree with Vector's submission on this;

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[73] Capex IM, above n 2, at cl 3.3.5(7) and Schedule C.

[74] Clause 3.3.5(6) and clause C1(3) of Schedule C

[75] Vector, above n 12.

[76] We note that the timing of the Project is dependent on the current condition of the conductors on the Bombay-Otahuhu line. Therefore, we are satisfied that the timing of the Project is correct, as we discuss in paragraphs B70 to B79.

56.3 the financial impact for Aucklanders under the new TPM for the MCP has not been discussed with Vector as part of the engagement process. We discuss this in paragraphs B40 to B41;

56.4 the decommissioning of the Bombay-Wiri line section will result in the loss of resilience to the Wiri GXP and that the calculations of electricity market benefits have not taken this into account adequately. We discuss this in paragraphs D77 to D79; and

56.5 it does not consider Transpower's New Investment Contract (**NIC**) as an effective alternative for maintaining the current resilience Vector has from the grid. We discuss potential alternatives to the NIC in paragraphs B33 to B35.

57 Transpower[77] expressed concerns about how we set the EMC and sought further information on this from us. We discuss this in paragraphs C42 to C48.

Cross-submissions

58 In its cross-submission,[78] Transpower provided high level calculations that confirm that the cost of retaining the Bombay-Wiri line section is significantly greater than the expected benefits the line would provide.

59 In its cross-submission, Counties:[79]

59.1 supported the major capex outputs but submitted that the costs should not be recovered from Counties consumers until such time that the upgrade was required by Counties because of a lack of capacity from the existing 110kV connection;[80]

59.2 supported Vector's concern on the loss of resilience to the Wiri GXP if the Bombay-Wiri line section is decommissioned and suggested that further investigation and engagement is required. We discuss this in paragraph 63; and

59.3 noted that Transpower should protect existing urban transmission corridors given that it will be almost impossible to obtain future overhead urban transmission corridors and there is limited existing transmission capacity. Counties emphasised that this is particularly true for South Auckland, which is one of the fastest growing areas in the country. Consequently, Counties

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77 Transpower, above n 11.

78 Transpower, above n 13.

79 Counties, above n 14.

80 Subsequently, Transpower advised that, under some operating conditions, demand is expected to exceed transmission capacity by 2022. [Above n 18]. On this basis we are satisfied that Counties' concerns would not be an issue because by the time Transpower plans to deliver the works at Bombay GXP in June 2023, Counties demand is forecast to exceed the capacity of the transmission network.

considers that Transpower should not prematurely decommission the 110kV Bombay to Wiri/Otahuhu line.

Summary of our consideration of the submissions and cross-submissions

60 Having considered the submissions and cross-submissions relating to our draft decision, and for the reasons we set out in Attachments B to D, we have decided to confirm our draft decision to approve the Project.

61 Our decision does not predetermine the future of the Bombay-Wiri line section. Both Vector and Counties have raised valid concerns about the potential decommissioning of the Bombay-Wiri line section. We acknowledge that this matter is important to both Vector and Counties and agree with Counties that Transpower, Counties and Vector can jointly develop a strategy for the future of the Bombay-Wiri line section.[81]

The approved component of the major capex project

62 The following sections describe the approved components of the Project. The Capex IM criteria applicable to, and the reasons behind, our decision are set out in Attachments A to E.

Major capex allowance

63 The MCA is the allowance for the Project and is based on the base estimate plus the fiftieth percentile of uncertainties.[82] Our decision is to set the MCA for the project shown in Table 1.

Table 1: MCA for Phase 1 $(millions)

P50 estimate 2019/20 prices	Inflation factors	Financing costs	MCA 2022/23 prices
32.7	1.2	2.0	35.9

64 Transpower has stated that $10.8 million of the proposed capex allowance has already been approved as base capex for RCP3.[83] If we approve the Project, the base capex allowance will be adjusted via the term 'g' as set out in clause B1 of Schedule B of the Capex IM.[84]

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81 Transpower has subsequently advised us that it has budgeted to keep this line section in service until 2024. We consider that this gives all parties sufficient time to agree on the future of the Bombay-Wiri line section.

82 Under clause 1.1.5(2) of the Capex IM, 'P50' means: the estimated aggregate project costs where the probability of the actual aggregate project costs being lower than that estimated is 50%.

83 MCP, above n 1, at pg. 35.

84 Under clause B1 of Schedule B of the Capex IM, the 'g' term is the aggregate amount of adjusted standard incentive rate base capex allowance *b* to which the base capex standard incentive rate *a* does not apply, if the expenditure was included in the standard incentive rate base capex allowance *d* or in approved base capex of listed projects *d'*, and where either base capex has expanded in scope and has become major capex or where base capex included in *d* or *d'* has cost elements that vary significantly due to factors beyond the control of Transpower.

Exempt major capex

65 Our decision under clause 3.3.5(7)(c) of the Capex IM is to not set an EMC. We provide further details in paragraphs C42 to C48.

Incentive rate

66 Our decision under clause 3.3.5(7)(b) of the Capex IM is to set the major capex incentive rate for the Project at 15%.

67 We are satisfied that the incentive rate of 15% would incentivise Transpower to seek efficiencies in delivering the Project. We consider that the rate (which is the default rate under the Capex IM) is appropriate for projects for which most of the construction work will occur in existing substations.

68 Accordingly, the incentive mechanism will apply based on the cost of the Project and the incentive rate, as follows:[85]

68.1 if the cost of the Project is less than the MCA, Transpower will be entitled to a reward based on the difference between the cost of the Project and MCA; or

68.2 if the cost of the Project exceeds the MCA, penalties based on the difference between the cost of the Project and the MCA will apply.

Major capex project outputs

69 The MCPOs are the specific grid outputs Transpower will deliver as part of this Project,[86] being:

69.1 procuring, installing and commissioning two 150/175 MVA 220/110kV transformers at Transpower's Bombay substation;

69.2 procuring, installing and commissioning a connection for these transformers to the 220kV Huntly-Otahuhu A line; and

69.3 undertaking preparatory works, including additional investigation, consultation and design work, for reconductoring the Otahuhu-Wiri line.

[85] Clause B3 of Schedule B of the Capex IM sets out the incentive scheme that will apply to the actual cost of delivering the Project.

[86] Under clause 1.1.5(2) of the Capex IM, a 'grid output' is the output in respect of a particular grid output measure, which is a measure that quantifies the output or benefit (where 'benefit' may include reduction in risk) delivered by the grid, investment in the grid, or expenditure facilitating or enabling future investment in the grid.

Approval expiry date

70 The approval expiry date is the date beyond which Transpower cannot recover the costs of any MCPOs Transpower has not commissioned by that date.[87] We have adopted the approval expiry date Transpower proposed in the MCP, being 31 December 2028.

71 We accept Transpower's view that, while this date is some time after the commissioning date assumption of 30 June 2023, it is appropriate in the current climate (where overseas procurement is affected by Covid-19) to allow for delays in planning and delivery as opposed to requiring Transpower to resubmit the MCP for approval.[88]

Commissioning date assumption

72 The commissioning date assumption is the date by which Transpower plans the last asset to be commissioned.[89] Transpower plans to deliver this Project as several work packages with different forecast commissioning dates.

73 Transpower has proposed the commissioning date for all assets as 30 April 2023.[90]

Attachments A to D of this paper set out the criteria applicable to, and the reasons behind, our decision

74 The reasons for our decision above are set out in Attachments A to D below. Specifically:

74.1 Attachment A sets out our evaluation criteria under the Capex IM which comprise the general criteria, specific criteria, and the investment test;

74.2 Attachment B provides our evaluation of:

74.2.1 the MCP against the general criteria for capex proposals under the Capex IM; and

74.2.2 Transpower's consultation against the requirements of the Capex IM;

74.3 Attachment C provides our evaluation of the MCP against the specific criteria;

74.4 Attachment D provides our evaluation of Transpower's application of the investment test; and

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87 Under clause 3.3.6(1)(d) of the Capex IM, Transpower may apply to us to amend the approved approval expiry date.

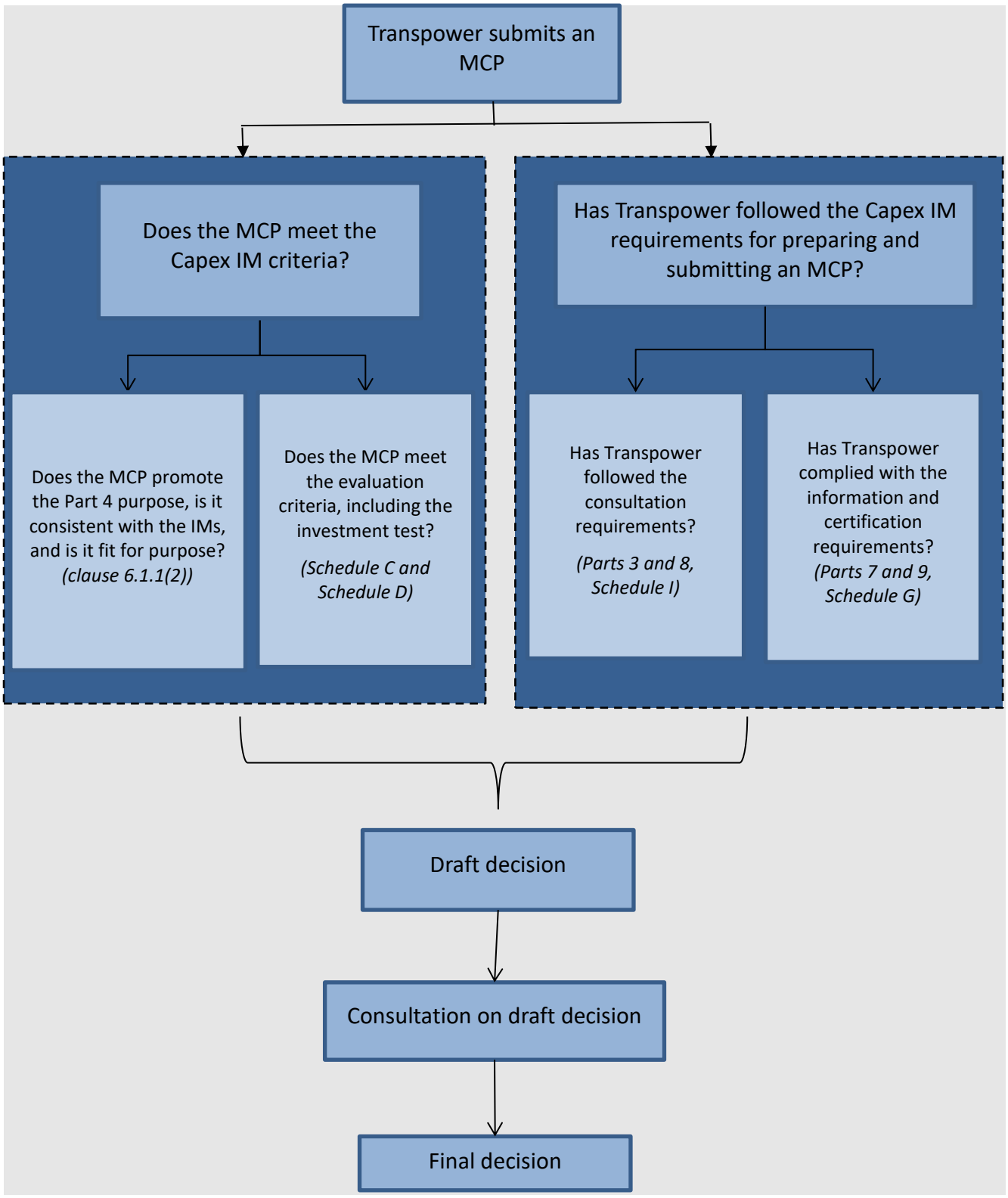
88 MCP, above n 1, at pg. 6 and footnote 5.

89 Definition of 'commissioning date assumption' under clause 1.1.5(2) of the Capex IM.

90 MCP, above n 1, at pg. 44.

75 Figure 5 below shows at a high level how our evaluation and decision fits into the Capex IM's regulatory approval process for major capex projects.

Figure 5: Capex IM regulatory approval process for major capex projects



Attachment A Evaluation criteria

A1 This attachment sets out the evaluation criteria against which we evaluated the MCP under the Capex IM.

A2 The Capex IM requires us to evaluate the MCP against three sets of criteria:

A2.1 the *general criteria* for evaluating all capex proposals in Part 6;

A2.2 the *specific criteria* for MCPs in Schedule C; and

A2.3 the *investment test* in Schedule D, Division 1.

General criteria for evaluating all capex proposals

A3 The general criteria for evaluating all capex proposals under the Capex IM are:

A3.1 whether what is proposed is consistent with the Capex IM and, where relevant, the Transpower IMs;[91]

A3.2 the extent that what is proposed will promote the purpose of Part 4 of the Act;[92] and

A3.3 whether, the data, analysis, and assumptions underpinning what is proposed are fit for the purpose of the Commission exercising its powers under Part 4 of the Act, including consideration as to the accuracy and reliability of data and the reasonableness of assumptions and other matters of judgement.[93]

Assessing whether what is proposed is consistent with the input methodologies

A4 The Transpower IMs provide for recoverable costs associated with major capex projects[94] and the revenue impact of such projects we have approved.[95] These provisions do not apply here because:

A4.1 the revenue impact of a major capex project is not a part of the regulatory approval process for such a project; and

A4.2 recoverable costs are associated with Transpower recovering the operating costs of an NTS, and the MCP does not propose an NTS.

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91 Capex IM, above n 2, at cl6.1.1(2)(a).

92 Clause 6.1.1(2)(b).

93 Clause 6.1.1(2)(c).

94 Transpower IMs, above n 34, at cl 3.1.3(1)(d).

95 Clause 3.7.4(4).

A5 The Capex IM sets out the requirements that Transpower must follow when developing and proposing a major capex project, and that we must follow when evaluating an MCP for such a project.[96]

A6 When assessing whether the MCP is consistent with the Capex IM, we evaluate the proposal's compliance with:

A6.1 the process requirements;[97]

A6.2 Transpower's consultation requirements;[98]

A6.3 the information requirements;[99] and

A6.4 certification requirements.[100]

The process requirements

A7 The Capex IM requires Transpower to notify us of its intention to plan a major capex project.[101]

A8 Transpower must agree the following with us:

A8.1 a consultation programme;

A8.2 an approach to considering NTSs;

A8.3 an application date; and

A8.4 an approval timeframe.[102]

A9 Together with Transpower, we must publish the matters agreed on in the above paragraph[103] and regularly review and update these matters. We may (after considering Transpower's views) amend any of these matters to ensure they remain appropriate and reasonable.[104]

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96 Part 3 of the Capex IM.

97 Capex IM, above n 2, at cl3.3.3.

98 Clause 8.1.3.

99 Schedule G.

100 Clause 9.2.1.

101 Clause 3.3.1(1) and (2).

102 Clause 3.3.1(3).

103 Clause 3.3.1(6).

104 Clause 3.3.1(7).

Transpower's consultation requirements

A10 The requirements for Transpower's consultation programme and its approach to considering NTSs are set out in clause 8.1.3 of the Capex IM.

A11 Transpower must consult with interested parties on the following matters: [105]

A11.1 the investment need;

A11.2 each demand and generation scenario variation;

A11.3 key assumptions;

A11.4 long list of options including any potential NTSs (ie, the long-list consultation); and

A11.5 short list of options including the results of the investment test (ie, the short-list consultation).

The information requirements in the MCP

A12 In the MCP Transpower submits to us, it must provide the following information:

A12.1 information on the investment need; [106]

A12.2 information on relevant demand and generation scenarios; [107]

A12.3 information relating to each investment option; [108]

A12.4 information relating to proposed investment; [109]

A12.5 MCPOs; [110]

A12.6 information on consultation; [111]

A12.7 information on NTSs;[112] and

A12.8 any additional supporting material Transpower reasonably considers is relevant to our decision on the major capex project.[113]

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[105] Capex IM, above n 2, at cl I1(1) of Schedule I.

[106] Clause G2 of Schedule G.

[107] Clause G3 of Schedule G.

[108] Clause G4 of Schedule G.

[109] Clause G5 of Schedule G.

[110] Clause G6 of Schedule G.

[111] Clause G7 of Schedule G.

[112] Clause G8 of Schedule G.

[113] Clause G9 of Schedule G.

A13 The Capex IM also requires that:[114]

A13.1 the number of investment options in an MCP is appropriate given the magnitude of the estimated expenditure and the complexity of the investment need associated with the proposed investment; and

A13.2 the specificity of information and the rigour and comprehensiveness of the analysis for each investment option described in an MCP must be commensurate with the estimated expenditure and complexity of that option.

Certification requirements for MCPs

A14 Transpower's CEO must certify in respect of an MCP that:[115]

A14.1 the information provided under Schedule G of the Capex IM was derived from and accurately represents, in all material respects, Transpower's operations;

A14.2 the proposed investment to which the information under Schedule G relates was approved in accordance with the applicable requirements of Transpower's director and management approval policies; and

A14.3 the MCP complies, in all material respects, with the information requirements set out in Schedule G.

A15 Our assessment of Transpower's compliance with the general criteria is set out in Attachment B, except for the section on Transpower's compliance with the consultation requirements under Schedule I1 of the Capex IM, which is discussed in Attachment E.

Specific criteria for evaluating MCPs

A16 The specific criteria for evaluating an MCP are set out in Schedule C of the Capex IM, and are outlined as follows:

A16.1 we must evaluate whether the proposed investment satisfies the investment test;[116]

A16.2 we must have regard to at least one of the following factors:

A16.2.1 whether the investment and investment options reflect GEIP, are technically feasible, can be implemented in terms of all

[114] Clause 7.4.1(2) and (3).

[115] Capex IM, above n 2, at cl 9.2.1.

[116] Clause C1(1).

application statutory planning and regulatory requirements, and can be integrated in the network and market operations;[117]

A16.2.2 whether the estimated time for construction, commissioning date and completion date are reasonable;[118]

A16.2.3 whether key assumptions around outage planning are reasonable;[119]

A16.2.4 the extent that Transpower has had regard to views of interested parties in consultations;[120]

A16.2.5 the impact of sensitivity analysis on the electricity market benefit of the proposed investment and investment options;[121]

A16.3 We must also evaluate Transpower's proposed:

A16.3.1 MCA;[122]

A16.3.2 MCPOs;[123]

A16.3.3 approval expiry date;[124]

A16.3.4 major capex incentive rate;[125]

A16.3.5 EMC;[126] and

A16.3.6 commissioning date assumptions.[127]

A17 The Capex IM lists evaluation techniques and approaches we may use in the specific evaluation but enables us to use any other technique or approach we consider appropriate in the circumstances.[128] We can also use any additional information that we consider relevant.[129]

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117 Clause C2(a).

118 Capex IM, above n 2, at cl C2(b).

119 Clause C2(c).

120 Clause C2(d).

121 Clause C2(e).

122 Clause C1(3)(a).

123 Clause C1(3)(d).

124 Clause C1(3)(e).

125 Clause C1(3)(f).

126 Clause C1(3)(g).

127 Clause C1(3)(h).

128 Clause C7.

129 Clause C7(f).

A18 We discuss our assessment of the MCP against the specific criteria in Attachment C and our evaluation of the MCP under the investment test in Attachment D.

Our discretion when making a decision on an MCP

A19 After evaluating an MCP, we can decide to either:

A19.1 approve the Project as proposed by Transpower;[130] or

A19.2 decline the Project.[131]

[130] Capex IM, above n 2, at cl 3.3.5(1)(a).

[131] Clause 3.3.5(1)(b).

Attachment B: Evaluation against general criteria for capex proposals

Purpose of this attachment

B1 In this attachment, we set out our evaluation of:

B1.1 the MCP against the general criteria for capex proposals set out in Part 6 of the Capex IM; and

B1.2 Transpower's consultation against the requirements of the Capex IM.

The criteria in Part 6 of the Capex IM

B2 The general evaluation criteria set out in Part 6 are:[132]

B2.1 whether what is proposed is consistent with the Capex IM;

B2.2 the extent to which what is proposed will promote the purpose of Part 4 of the Act; and

B2.3 whether the data, analysis, and assumptions underpinning what is proposed are fit for the purpose of exercising our powers under Part 4 of the Act.

What is proposed is consistent with the Capex IM

B3 To be consistent with the Capex IM, the proposed expenditure must be 'major capex' as defined in the Capex IM,[133] and Transpower must meet the notification, consultation, information and certification requirements that apply.[134]

B4 We are satisfied that the proposed expenditure is major capex and that Transpower met the Capex IM requirements on notification, consultation, information and certification. The details of our assessment of the individual requirements follow.

The proposed expenditure is major capex

B5 The Capex IM defines 'major capex' as expenditure that:[135]

B5.1 is incurred to meet the GRS or provide a net electricity market benefit;

B5.2 is forecast to have an aggregate capital cost exceeding $20 million; and

B5.3 is not asset replacement, asset refurbishment, business support, or information system and technology assets.

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[132] Capex IM, above n 2, at cl 6.1.1(2).

[133] Clause 1.1.5(2).

[134] Clause 3.3.1, clause 7.4.1, Schedule I, Schedule G, and clause 9.2.1, respectively.

[135] Clause 1.1.5(2).

B6 The proposed expenditure for the Project is consistent with the above definition because it:

B6.1 has a forecast expenditure greater than $20 million;

B6.2 involves installing new assets at Bombay GXP (and increasing the capacity and reliability of transmission to the Bombay GXP) and is therefore not asset replacement, asset refurbishment, business support, or information system and technology assets, as defined in the Capex IM; and

B6.3 is for expenditure that will be incurred to meet the GRS.

The proposed expenditure for the Project is needed to meet the GRS

B7 The transmission network in the Bombay-Otahuhu region is subject to the N-1 criterion of the GRS which provides that, with all assets that are reasonably expected to be in service, the power system remains in a satisfactory state during and following a single credible contingency event occurring on the core grid.

B8 Transpower states that under low generation conditions in the Waikato, the N-1 transmission capacity of the Bombay-Otahuhu circuits can be below the regional demand. Transpower states, and we agree, that the existing capacity of the circuits will limit the ability to continue supplying Wiri and Bombay demand at N-1 security.[136]

B9 The proposed expenditure is driven by:

B9.1 the poor condition of the conductors on the Bombay-Otahuhu line, and

B9.2 the increase in forecast demand in the region.[137]

B10 The poor condition of the conductors does not affect the GRS. However, the present constraints of supplying the region during low Waikato generation and increasing demand in the region support Transpower's proposal to increase the capacity of the network to meet the GRS.

B11 We are satisfied that this expenditure is required to meet the N-1 criterion of the GRS because the investment will ensure that, with all assets and generation reasonably expected to be in service, the transmission network will be able to supply the regional demand following the tripping of one of the transmission assets supplying the region.

[136] MCP, above n 1, at pgs. 13-14.

[137] At pgs. 7-8.

Transpower has met the notification requirements under the Capex IM

B12 We are satisfied that Transpower's notification of 2 October 2018 complied with clause 3.3.1(1) of the Capex IM.[138] This is because the notification advised us of Transpower's intention to plan the Project.

B13 Transpower's notification of 2 October 2018 also proposed the matters required under clause 3.3.1(3) of the Capex IM.

B14 In January 2019, Transpower agreed with us on a consultation programme including the long-list and short-list consultations, and an approach for Transpower to seek proposals on NTSs.

B15 Transpower and the Commission have published, regularly reviewed, and updated the matters under clause 3.3.1(2):[139]

B15.1 Our letter agreeing to the matters Transpower proposed is published on Transpower's website where Transpower has also published the relevant long-list and short-list consultation documents and submissions.[140]

B15.2 We have met with Transpower regularly since the notification and discussed progress and timelines along with other matters. In December 2019, Transpower and the Commission discussed a revised consultation and application programme.[141]

Transpower satisfied the consultation requirements

B16 The Capex IM requires Transpower to consult with interested parties on the following matters when preparing an MCP: [142]

B16.1 its investment need;

B16.2 each demand and generation scenario variation;

B16.3 key assumptions;

B16.4 a long list of options to meet each investment need; and

B16.5 a short list of investment options to meet each investment need.

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[138] Transpower's notification under clause 3.3.1(1) is available at: https://www.transpower.co.nz/sites/default/files/projects/resources/bobmcp2.pdf.

[139] Capex IM, above n 2, at cls 3.3.1(6) and (7).

[140] Our letter to Transpower of 18 January 2019 agreeing the matters under clause 3.3.1(2) of the Capex IM is available at: https://www.transpower.co.nz/sites/default/files/projects/resources/Letter%20to%20Transpower%20regarding%20agreed%20process%20for%20Bombay%20Otahuhu%20major%20capex%20project%20-%2018%20Jan%202019.pdf.

[141] Transpower's letter dated 2 October 2018 advising us of the revised timeframe is available at: https://www.transpower.co.nz/sites/default/files/projects/resources/bobmcp2.pdf.

[142] Capex IM, above n 2, at cl I1 of Schedule I.

B17 Transpower met its consultation requirements as follows:

B17.1 in December 2018, Transpower carried out its long-list consultation, which included information on the investment need, demand and generation scenario and key assumptions and invited information on NTSs;

B17.2 in June 2019, Transpower issued an RFP for NTSs; and

B17.3 in December 2019, in line with clause I3 of Schedule I, Transpower carried out its short-list consultation.

B18 Table B1 lists the documents that Transpower used in these consultations.

Table B1: Transpower's consultation documents

Document name and web location
Long-list consultation and non-transmission solution request for information December 2018
https://www.transpower.co.nz/sites/default/files/projects/resources/BOB-OTA%20Long%20List.pdf
RFI on NTSs - June 2019
https://www.transpower.co.nz/sites/default/files/projects/resources/RFP%20Non-transmission%20alternatives%20BOB-OTA%20region.pdf
Short-list consultation December 2019
https://www.transpower.co.nz/sites/default/files/projects/resources/BOB-OTA%20Short-list%20Consultation_0.pdf

Transpower's long-list consultation

B19 The Capex IM requires that Transpower's long-list consultation must:[143]

B19.1 describe the relevant investment need and its links to other relevant documents, such as the integrated transmission plan;

B19.2 set out the relevant demand and generation scenarios;

B19.3 specify any non-standard values or amounts of the calculation period or value of expected unserved energy for the investment test;

B19.4 specify any non-standard discount rate that it may use for the purpose of the investment test; and

B19.5 for each option, specify whether the option is a transmission investment or an NTS and describe its features.

[143] Capex IM, above n 2, at I2 of Schedule I.

B20 Transpower consulted on its long list of options, in line with clause I2 of Schedule I, on the matters included in detail in the consultation document. Specifically, Transpower asked whether:

B20.1 there were any other issues relating to the investment need;

B20.2 there are other viable components than the potential transmission solutions and NTSs;

B20.3 Transpower should consider any other criteria for evaluating the long list of options;

B20.4 the demand forecast assumptions were appropriate;

B20.5 any parties were aware of any new generation that could affect the peak demand at the Bombay or Wiri GXPs;

B20.6 Transpower's calculation period, value of lost load (**VoLL**), and discount rates proposed in the consultation document were appropriate; and

B20.7 there were any other market costs or benefits than those listed in the consultation document.

B21 Five stakeholders submitted in response to the long-list consultation. Transpower published an adequate summary of these submissions, noting that one submission was confidential.[144]

Transpower's RFP on NTSs

B22 In June 2019, Transpower issued an RFP for NTSs to:

B22.1 address the load shortfall between the existing capacity of the Bombay-Otahuhu A line and the forecast load demand at Wiri GXP; and

B22.2 economically defer the need for transmission investment at either Bombay or Wiri.

B23 Transpower advised us that the responses to the RFP are confidential so we have not evaluated them. We are satisfied that NTSs will not defer or mitigate the need for this Project because one of the drivers for the Project is the deteriorating conductors on the BOB-OTA line as discussed in paragraphs B70 to B79 below. Transpower summarised the responses to the RFP as follows:[145]

[144] Transpower, *Bombay Regional major Capex project investigation – Long list consultation summary*, February 2019, available at: https://www.transpower.co.nz/sites/default/files/projects/resources/Bob-Ota%20Long%20List%20Consultation%20Summary%20of%20submissions.pdf.

[145] MCP, above n 1, at pg. 32.

We had four respondent offers to the RFP, across a range of NTS solutions ranging from new embedded generation, assistance with developing a battery solution and demand-side management.

Our assessment of these offers found that they would either not be feasible physically or would not be feasible economically to satisfy the shortfall between the existing line capacity and the forecasted load growth, or defer transmission investment.

Transpower's short-list consultation

B24 The Capex IM requires that Transpower's short-list consultation: [146]

B24.1 describes the relevant demand and generation scenarios to be used for the investment test;

B24.2 provides information on the relevant key assumptions;

B24.3 describes each investment option, including its features, submissions on the option from the long-list consultation, and likely electricity market benefit or cost elements and project costs; and

B24.4 describes Transpower's preliminary application of the investment test.

B25 Transpower's short-list consultation included the following specific matters:

B25.1 seeking further information on the investment need (or the drivers of the project;

B25.2 discussion of its approach to derive the short list of options;

B25.3 seeking comments on the economic assumptions Transpower used in the Investment test;

B25.4 seeking comments on Transpower's analysis of and quantification of the cost and benefits of the project;

B25.5 seeking comments on Transpower's assessment of unquantified benefits of the project; and

B25.6 seeking agreement on the intended approach to determine the preferred option.

B26 Three stakeholders responded to the short-list consultation. Transpower summarised these submissions in the MCP.[147]

[146] Capex IM, above n 2, at Clause I3 of Schedule I.

[147] MCP, above n 1, at para 5.4.

Our evaluation of Transpower's consultation

B27 We assessed whether the information in the short-list and long-list consultations complied with the Capex IM requirements. We are satisfied that Transpower met the relevant requirements under Schedule I of the Capex IM.

B28 In the relevant sections of Attachment B to D, we have discussed how Transpower considered responses to the above consultations in developing the MCP.

Vector's concerns with the consultation

B29 Vector's[148] submission on our draft decision states that:

> Transpower notes its implementation of the new Transmission Pricing Methodology Guideline (TPM Guideline) relies on a key relationship with the Commission's MCP. The administration of the Capex Input Methodology and MCP by the Commission is intended to ensure stakeholders can effectively engage in the capex process to shape the investment decision so that the investment design meets the customer's interests.

B30 We respond to Vector's submission under the following three subheadings.

The Capex IM engagement process

B31 The objectives of the Capex IM engagement process are to provide transparency to customers and enable stakeholders to assess whether Transpower reasonably analyses all possible investment options and selects the proposed investment as the investment option with the highest expected net electricity market benefit.

B32 The Capex IM sets out the following requirements for Transpower to achieve the objectives of consultation.

B32.1 the Capex IM process sets out consultation requirements for Transpower so stakeholders can have input into the assumptions that forecast the need for a major capital investment. Transpower's consultation also allows stakeholders to propose a range of potential investment options to meet the investment need;

B32.2 the Capex IM then requires Transpower to consider the electricity market costs and electricity market benefits of a reduced set of technically feasible investment options and select the investment option with the highest net electricity market benefit as the proposed investment;

B32.3 under the Capex IM, the proposed investment is the investment option with the highest net electricity market benefit, the proposed investment can be different to the investment design that meets the customer's interests; and

[148] Vector, above n 12, at p. 2.

B32.4 the Capex IM requires a second consultation by Transpower (short list consultation) that allows stakeholders to comment on the major capex proposal before Transpower applies to us for approval.

Alternative to Transpower's new investment contract

B33 Our regulatory regime also does not prevent customers from pursuing a different investment design with Transpower through means other than the Capex IM if that is their preference. In our draft decision, we noted that Vector could contract with Transpower to retain the Bombay-Wiri line section.[149] In its submission, Vector expressed concerns about the terms of Transpower's NIC – particularly the five-year cost recovery timeframe in that contract.[150]

B34 In 2019, we amended clause 3.1.3(1)(c) of the EDB IM determination to extend the scope of the recoverable cost relating to charges for a NIC as defined in the Code.[151] The amendment enables an EDB to engage a third party under an arrangement the EDB negotiates with the third party to finance a NIC between the EDB and Transpower. If we approve the arrangement between the EDB and the third party, the EDB may recover the costs of the arrangement from its customers.[152]

B35 We consider that the amendment to clause 3.1.3(1)(c) removed a barrier to EDBs like Vector making necessary network enhancements and possibly to reducing the financing costs of enhancements (for example, where the rate of return that Transpower requires on its investment is greater than the EDB's alternative financing options).[153]

The allocation of transmission charges under the TPM is not part of the Capex IM's regulatory approval process for MCPs

B36 We also disagree with Vector's view that the allocation of transmission charges under the TPM is a part of the Capex IM's regulatory approval process for MCPs.

B37 In our final decision on Stage 1 of the Waikato and Upper North Island voltage management major capex project (**WUNI Stage 1**), we discussed similar points raised in submissions on our draft decision on that MCP which expressed uncertainty as to the potential impact of the TPM on the MCP and our decision, and had sought

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[149] Draft decision, above n 4, at para D61.

[150] Vector, above n 12, at p. 2 and 3.

[151] Commerce Commission, *Amendments to Electricity Distribution Services Input Methodologies Determination – Reasons paper* (**2019 EDB IM amendments reasons paper**), 26 November 2019, at para 3.66, available at: https://comcom.govt.nz/__data/assets/pdf_file/0022/191704/Commerce-Commission-Amendments-to-electricity-distribution-services-input-methodologies-determination-Reasons-paper-26-November-2019.pdf.

[152] 2019 EDB IM amendments reasons paper, above n 151, at para 3.67, 3.69, and 3.70. In August 2020, we published a letter to Orion New Zealand Limited setting out guidance and a summary of the approval process we expect to follow when considering whether to approve an arrangement for financing a NIC under clause 3.1.3(1)(c). The letter is available at: https://comcom.govt.nz/__data/assets/pdf_file/0021/224922/Orion-third-party-financing-of-new-investment-contract-letter-10-August-2020.pdf.

[153] Above n 151, at para 3.69.

clarification from Transpower on who the MCP's likely beneficiaries will be under the new guidelines.[154]

B38 The position we set out in that final decision, and which we reiterate here, is that the allocation of transmission charges under the TPM in its current and future forms is the Electricity Authority's responsibility and is not part of the Capex IM's investment test or criteria for approving a major capex proposal.[155] The focus of the Capex IM's regulatory approval process is instead on identifying and testing the investment option with the highest net benefit.

B39 Clause 7.5.1(1)(c) of the Capex IM requires Transpower to provide with an MCP an estimate of the expected increase in transmission charges due to the proposed expenditure. While this requirement applies based on the current TPM, rather than the TPM which Transpower is developing under the new TPM guidelines, Transpower has provided some details below on the likely impact on Vector's transmission charges of the approval and delivery of this Project.

Vector's concerns with the financial impact of the Project

B40 In response to Vector's submission on the impact of transmission charges resulting from this MCP, Transpower has provided some further details, which we summarise below(**Transpower's letter**):[156]

B40.1 Vector's transmission charge will increase by an estimated $480,000/year or 0.28% of its total transmission charges after the Project at Bombay GXP is commissioned;

B40.2 transmission charges are expected to vary from 2023/24 as the Otahuhu-Wiri line is re-conductored and other existing 110 kV lines supplying the region are progressively removed. Details on how the charges vary over the course of the Otahuhu Bombay regional network development and the potential impact of the new TPM on the charges are available in Transpower's letter; and

B40.3 Transpower has estimated the increase in Vector's transmission charges (compared to 2022) to settle at around $365,000/year in 2033.

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[154] *Decision and reasons on Stage 1 of Transpower's Waikato and Upper North Island Voltage Management staged major capex project* [2020] NZCC 20, (23 September 2020), at para 96, available at: https://comcom.govt.nz/__data/assets/pdf_file/0029/225497/2020-NZCC-20-Waikato-and-Upper-North-Island-Voltage-Management-major-capex-project-stage-1-Decisions-and-reasons-paper-23-September-2020.pdf.

[155] Above n 154, at para 96.

[156] Transpower, above n 19, at pg. 3.

B41 Transpower has undertaken to engage with Vector before applying for our approval of the next phase of the Project, which is to refurbish and reconductor the Otahuhu-Wiri 110 kV line, via an amendment to this MCP.

Transpower satisfied the information requirements under the Capex IM

B42 The Capex IM sets out the information that Transpower needs to provide in an MCP.[157] The MCP and the attachments to it that Transpower provided for this purpose are listed in Table B2 below.[158]

B43 Transpower provided a table mapping the information required under the Capex IM with the information provided in its MCP and the attachments.[159]

B44 We have reviewed the MCP and the attachments against the information requirements set out in clause G1 to G8 of Schedule G of the Capex IM and are satisfied that Transpower has met the information requirements.

Table B2: The MCP and attachments

Document title
Bombay Otahuhu Regional major capex proposal (the MCP) – May 2020
Attachment A: Compliance Requirements – May 2020
Attachment B: Condition Assessment Report – May 2020
Attachment C: Options and Costing Report – May 2020
Attachment D: Long-list consultation summery – May 2020
Attachment E: CEO certification – May 2020
Attachment F: Spreadsheet on pricing by GXP and GIP – May 2020
Attachment G – Loss Modelling report – May 2020

Transpower satisfied the certification requirements under the Capex IM

B45 Clause 9.2.1 of the Capex IM requires that, before Transpower submits an MCP to us, Transpower's CEO must certify the MCP according to requirements in that provision.

B46 Transpower provided a certificate signed by its CEO.[160]

[157] Capex IM, above n 2, at schedule G.

[158] These documents are available on our website at https://comcom.govt.nz/regulated-industries/electricity-lines/electricity-transmission/transpower-capital-investment-proposals/transpower-major-capital-proposal/bombay-otahuhu-regional-major-capital-proposal

[159] MCP, above n 1, *Attachment A: Compliance Requirements*.

[160] At *Attachment E: CEO certification*.

B47 We reviewed this certificate against clause 9.2.1 of the Capex IM and we are satisfied that it meets the relevant requirements.

Delivering the Project as proposed in the MCP will promote the purpose of Part 4 of the Act

B48 Under the general evaluation criteria, we must consider "the extent to which what is proposed will promote the purpose of Part 4 of the Act".[161] Alongside the investment test under Schedule D, we consider that this is an important test for an expenditure proposal under the Capex IM.

The purpose of Part 4 of the Act

B49 The purpose of Part 4 of the Act is to promote the long-term benefit of consumers in markets where there is little or no competition and little or no likelihood of a substantial increase in competition.[162] 'Competition' means 'workable or effective competition'.[163]

B50 To promote workable or effective competition that is to the long-term benefit of consumers, we must promote outcomes in regulated markets that are consistent with outcomes produced in workably competitive markets. Section 52A(1) of the Act specifies the following four outcomes produced in such markets that we must promote so that regulated suppliers, including Transpower:

B50.1 have incentives to innovate and invest;

B50.2 have incentives to improve efficiency and provide services at a quality that reflects consumer demands;

B50.3 share the benefits of efficiency gains with consumers, including through lower prices; and

B50.4 are limited in their ability to extract excessive profits.

The Capex IM and the purpose of Part 4

B51 The Capex IM was enacted under section 54S of the Act as part of the umbrella of requirements set by Part 4 of the Act. The Capex IM has been designed,[164] reviewed,[165] and refined,[166] to promote the purpose of Part 4 under section 52A of the Act.

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[161] Capex IM, above n 2, at cl 6.1.1(2)(b).

[162] Commerce Act, s 52A(1).

[163] Section 3(1).

[164] 2012 Capex IM reasons paper, above n 3, at para 1.3.7.

[165] 2017/18 Capex IM review reasons paper, above n 3, at para X13.1.

[166] Commerce Commission, *Transpower Capital Expenditure Input Methodology Amendments Determination 2018* [2018] NZCC 8, available at: https://comcom.govt.nz/__data/assets/pdf_file/0033/88278/2018-NZCC-8-Transpower-capital-expenditure-input-methodology-amendments-determination-2018-25-May-2018.PDF.

B52 Clause 6.1.1(2)(b) of the Capex IM restates the test noted above by requiring us to evaluate the extent to which what the MCP proposes will promote the purpose of Part 4.

Delivering the Project according to the MCP will promote the outcome under section 52A(1)(b) of the Act

B53 Under section 52A(1)(b) of the Act, we consider that Transpower delivering the Project according to what the MCP proposes will promote the purpose of Part 4. This is because doing so will provide Transpower with incentives to improve its efficiency and provide services at a quality that reflects consumer demands. We expand on this below.

Delivering the Project will materially improve the quality of supply

B54 Consistent with section 52A(1)(b) of the Act, delivering the Project will enable Transpower to provide services at a quality that reflects consumer demands. We consider consumers in the Bombay-Otahuhu region expect a level of service from Transpower that involves minimising the number and duration of interruptions to, or restrictions on, their electricity supply.[167]

B55 As outlined in this attachment and in Attachment C, we agree with Transpower's analysis of the MCP's investment need – which is to maintain the security of supply to Bombay-Otahuhu region – and we are satisfied that the proposed investment is necessary to meet this need.

B56 Specifically, by addressing the deteriorating transmission lines supplying Bombay and Wiri and increasing the capacity of the transmission network supplying the Bombay GXP, Transpower will:

B56.1 significantly reduce the risk of interruptions to supply caused by network failure, ensuring the reliability of the transmission network; and

B56.2 mitigate the need to curtail demand when demand exceeds the N-1 capacity of the existing transmission network.

[167] For example, in its submission on the long-list consultation, Counties Power states Bombay GXP supplies a significant portion of Counties Power's customers, with significant residential and industrial grown forecast in the short to medium term. It is important that security of supply to Bombay GXP is maintained (see Counties Power, *BOB-OTA Investigation -Long-List Consultation RFI Response* (**Counties long-list consultation response**), 22 February 2019, at para 1, available at: https://www.transpower.co.nz/sites/default/files/projects/resources/BOB-OTA%20Investigation%20-%20Long-List%20Consultation%20RFI%20Response%20-%20Counties%20Power.pdf).

The MCP will promote section 52A(1)(b) of the Act if it provides for Transpower to deliver the right investment at the right time

B57 Based on our evaluation set out in Attachments B to D of this paper, we consider that the MCP proposes delivery of the right investment at the right time. For the reasons outlined below, we consider that in doing so, this will promote section 52A(1)(b) of the Act.

B58 Major capex projects provide assets that have long lifetimes, typically 50 years or longer in the case of transmission investments, such as transmission lines.[168] Selecting the proposed investment for an MCP requires Transpower to undertake a robust analytical and consultative process under the Capex IM to determine the right investment option as the MCPOs. The MCPOs Transpower proposes to meet the investment need therefore materially affect:

B58.1 the size of the MCA Transpower seeks; and

B58.2 the outcome of the investment test under Schedule D of the Capex IM.

B59 The timing of an investment also determines the scale of the electricity market benefit and cost elements it delivers to consumers.[169] If an investment is made before the optimal time, then consumers will pay for assets that are not needed to provide the level of service consumers demand at that time. Alternatively, if an investment is deferred then the level of service provided could be negatively affected.

B60 The analysis above illustrates that an MCP that proposes to deliver the right investment at the right time will provide benefits and accordingly incentivise Transpower to improve its investment efficiency and provide services at a quality reflecting consumer demand. Alongside our evaluation under Attachments B to E, the following paragraphs set out our analysis of whether the MCP provides for Transpower to deliver the right investment at the right time.

We are satisfied that Transpower has proposed the right transmission investment

B61 In selecting the MCP's proposed investment, Transpower considered and consulted on a wide range of investment components including NTSs. The investment components included demand side response, energy storage, building new GXPs, transmission network reconfiguration, building new transmission lines, cabling, upgrading existing networks and reconfiguring or reinforcing the distribution network in the region.[170]

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[168] A proposed investment may also include an NTS, though compared to a transmission investment, an NTS arrangement is more likely to be of a shorter duration.

[169] Under clause D4(1) of Schedule D of the Capex IM, 'electricity market benefits and cost elements' are any of the benefits or costs listed in that provision and received by consumers during the calculation period under the relevant demand and generation scenarios.

[170] Long-list consultation document, above n 24, at pgs. 13 to 19.

B62 Transpower then prepared a short list of components using the following criteria:[171]

B62.1 fit for purpose;

B62.2 technical feasibility;

B62.3 practical to implement;

B62.4 good electricity industry practice (**GEIP**);[172]

B62.5 system security; and

B62.6 indicative cost.

B63 We are satisfied with the criteria Transpower used to select a short list of components. Counties[173] also considered the criteria appear suitable while Vector[174] submitted that Transpower should include lowest and ongoing costs to affected parties among the criteria. As discussed in paragraphs D103 and D105, we note that the proposed investment also has the second lowest capital cost.

B64 Using the short-listed components as building blocks, Transpower prepared a list of investment options. The seven investment options are listed in Table D3 of Attachment D.

B65 We are satisfied that the shorted-listed options provide a reasonable number of investment options for further analysis and testing under the investment test.[175] This is because the investment options:

B65.1 cover a range of potential solutions including retaining the existing transmission lines;

B65.2 would meet the current and future needs of supplying the Bombay GXP; and

B65.3 would meet the current and future needs of supplying the Wiri GXP after the Otahuhu-Wiri line is reconductored.

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171 MCP, above n 1, *Attachment C: Options and costing report*, at pgs. 9-10.

172 Under clause 1.1.5(2) of the Capex IM, the definition of 'good electricity industry practice' is that specified in clause 1.1(1) of the Code, which is: "the exercise of that degree of skill, diligence, prudence, foresight and economic management, as determined by reference to good international practice, which would reasonably be expected from a skilled and experienced asset owner engaged in the management of a transmission network under conditions comparable to those applicable to the grid consistent with applicable law, safety and environmental protection. The determination is to take into account factors such as the relative size, duty, age and technological status of the relevant transmission network and the applicable law."

173 Counties long-list consultation response, above n 167, at pg. 2.

174 Vector, *BOB-OTA Investigation – Long list review* (**Vector long-list consultation response**), 22 February 2019, at pg. 1, available at: https://www.transpower.co.nz/sites/default/files/projects/resources/Vector%20submission%20BOB-OTA%20long%20list.pdf.

175 Capex IM, above n 2, at cl 7.4.1(2).

B66 The Capex IM requires Transpower to apply the investment test to select the investment option with the highest expected net electricity market benefit as the proposed investment.[176]

B67 The investment test under Schedule D of the Capex IM is a net benefit test that uses a range of future scenarios of the electricity market to identify the investment option with the highest expected net electricity market benefit. The test is designed to identify the most dynamically efficient investment option. This option then becomes the proposed investment put forward to us in an MCP.

B68 We consider the investment test enables the selection of the right investment based on the available information and corresponding assumptions about the future composition of the power system. Based on our evaluation in Attachments C and D, we are satisfied with Transpower's application of the investment test and Transpower's choice of the proposed investment as the right investment for the MCP.

B69 Transpower's analysis shows that the technically viable solution with the highest expected net electricity market benefits is to supply the Bombay GXP from the 220 kV network.

<u>We are satisfied that the timing for the Project is right</u>

B70 The timing for the Project is determined by the need to address the deteriorating conductors on the Bombay-Otahuhu A section.

B71 Transpower states that inspection and testing has identified widespread conductor corrosion and numerous conductor defects beyond Transpower replacement criteria and general conductor degradation is indicating that accelerated corrosion is occurring on the conductors. Transpower considers that these defects make the conductors susceptible to high risks of failures and states that:[177]

B71.1 Cormon testing and close aerial surveys support the conclusion that the conductors have reached replacement criteria and must be replaced to ensure continued safe operation;[178]

B71.2 there are 969 conductor corrosion defects for which the tensile strength is less than 80% of the original tensile strength. Many of these defects were identified since the MCP was prepared as this is when NZTA granted Transpower access to the sections of the line in the vicinity of the motorway;

[176] Clause D1.

[177] RFI01, above n 68, at pg. 3.

[178] MCP, above n 1, at pg. 15.

B71.3 until the conductors can be replaced, Transpower will need to manage the risk of failures of the conductors through increased inspections and repairing the highly risky sections of the conductors;

B71.4 it is investing approximately $520k in 2020/2021 to undertake patch repairs on the worst condition defects in seven spans, to extend the life; and

B71.5 further repairs may be required before reconductoring or dismantling occurs.

B72 The conductors on the Bombay-Otahuhu A line are ACSR conductors. ACSR conductors have zinc-coated, steel-core wires surrounded by aluminium strands that conduct electricity. The steel core wires provide about 62% of the mechanical (tensile) strength of the ACSR conductor while the aluminium strands provide the rest of the tensile strength.[179]

B73 As these conductors age, the coating surrounding the core starts to deplete or perforate leading to corrosion. Once the coating on the steel core corrodes, the aluminium strands start to corrode. Aluminium corrosion builds up aluminium oxide on the outside of the conductor and in advance stages of the corrosion, the conductor starts to bulge.

B74 Aluminium corrosion decreases the electricity conducting area of the conductor and increases the current flowing in the steel core wires. Under electrical load, this leads to overheating of the conductor, annealing, and ultimately, tensile failure. For this reason, it is important to replace corroding conductors before a material drop in their tensile strength.

B75 Transpower has set the replacement criteria for ACSR conductors as when their tensile strength reduces by 20% or when there is a 15% loss of section area of the aluminium wires in the conductor.[180] The loss of section area causes a localised heating effect that anneals the steel core of the conductor and reduces its tensile strength.

B76 While the above replacement criteria are based on reduction in tension strength and section area, it is not possible to measure these on site. Transpower identifies the condition of the conductors through inspections and testing. The methods include:

B76.1 close visual surveys from an aircraft (traditionally helicopters, increasingly drones), which identify conductor bulges, build-up of corrosion product or areas showing discolouration (markers) on the outside of the conductor. Markers indicate onset of internal corrosion; and

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[179] MCP, above n 1, *Attachment B: conductor condition report*, at pg. 4.

[180] Transpower, **RFI01** above n 68, at pg. 4. Transpower states that industry practice differs according to the locational differences on the effect of corrosion on the conductors. Transpower uses a similar criterion as Hydro One in Canada (Transpower, dated 18 June 2020).

B76.2 Cormon testing, which uses a line-crawling robot that assesses the condition of the coating on the inner steel-core wires. The Cormon test estimates the remaining thickness of zinc coating on the steel core wires of ACSR conductors that can be used to predict where conductor bulging might occur.[181]

B77 Transpower provided the results of its condition assessment report for this line in Attachment B of the MCP and updated results in response to our question (RFI01). In conclusion, Transpower states, and we agree based on the information provided in the report, that:[182]

B77.1 close aerial surveys have identified widespread corrosion, including significant conductor bulging which indicate that aluminium losses have reached Transpower's replacement criteria at many points along the line;

B77.2 conductor sample testing[183] has confirmed that galvanic corrosion is occurring, and strength and cross-sectional area losses meet Transpower replacement criteria;

B77.3 Cormon testing has identified numerous locations of advanced galvanising loss, in addition to the corrosion, that is visible in close aerial surveys; and

B77.4 these corrosion defects are widespread and the conductors will continue to degrade. Accelerated corrosion testing has confirmed that aluminium corrosion rates accelerate significantly once galvanic corrosion is occurring.

B78 Based on the information Transpower has provided us, we are satisfied that the conductors on the Bombay-Otahuhu A line need to be replaced and their present condition is the main driver for the timing of the Project.

[181] MCP, above, n 1, *Attachment B: conductor condition report*, at pgs. 7-8.

[182] Above n 1, *Attachment B: conductor condition report*, at pg. 12.

[183] A conductor sampling test involves laboratory testing of samples of conductor taken from the line.

Attachment C: Evaluation against specific criteria

Purpose of this attachment

C1 This attachment sets out our evaluation of the MCP against the specific criteria set out in Schedule C of the Capex IM, as required under clause 6.1.1(4) of the Capex IM.

Our approach to evaluating the specific components of the MCP

C2 There are three parts to our evaluation under Schedule C:

C2.1 evaluating the MCP against specific criteria in clause C1(1) and C1(3);[184]

C2.2 having regard to one or more of the general factors under clause C2, and the specific factors relating in individual MCP components under clauses C3 to C6, in evaluating the MCP; and

C2.3 employing an evaluation technique under clause C7 in evaluating the MCP.

C3 We describe the three parts to our evaluation under Schedule C in greater detail under the relevant subheadings below.

The specific criteria we must consider in evaluating an MCP

C4 Our specific criteria for evaluating an MCP under Schedule C of the Capex IM can be broken down as follows:

C4.1 *investment test*: clause C1(1) requires us to evaluate whether the MCP's proposed investment satisfies the investment test in Schedule D of the Capex IM;[185] and

C4.2 *specific components*: clause C1(3) requires us to evaluate, to the extent applicable to the proposed investment, specific components of the proposed investment.

C5 Under clause C1(3) of Schedule C, the specific components of a proposed investment that we must evaluate depend on whether it includes an NTS.[186] The MCP's proposed investment is a transmission investment and does not include an NTS. Accordingly, the relevant MCP components we must evaluate are:[187]

C5.1 MCA (clause C3);

C5.2 approval expiry date and commissioning date assumptions (clause C4);

C5.3 MCPOs (clause C5); and

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[184] Clause C1(2) sets out the criteria for the assessment in clause C1(1).

[185] We discuss the results of the investment test in Attachment D.

[186] Capex IM, above n 2, at cl C1(3) of Schedule C exhaustively sets out the components that we must evaluate to the extent applicable to the transmission investment or NTS.

[187] Clause C1(3) of Schedule C.

C5.4 major capex incentive rate (clause C6).

C6 Our evaluation of these MCP components and how we tested the MCP against the requirements of Schedule C are outlined below in the order listed above.

Factors we must have regard to in evaluating an MCP

C7 In evaluating the specific criteria, Schedule C specifies factors we must have regard to and techniques we may use:

C7.1 *General factors to have regard to*: clause C2 requires us to have regard to at least one of the general factors listed in clause C2(a) to (e) when evaluating an MCP. These factors are:

C7.1.1 whether the proposed investment and investment options:

a) reflect GEIP,

b) are technically feasible,

c) can be implemented in terms of statutory process and regulatory consents, and

d) can be integrated into the system and market operations;

C7.1.2 whether the estimated time to deliver the Project is reasonable compared to the proposed commissioning date;

C7.1.3 whether key assumptions around outages are reasonable,

C7.1.4 the extent to which, in complying with the consultation programme or approach to considering NTSs, Transpower had regard to views of interested parties; and

C7.1.5 the impact of the sensitivity analysis on electricity market benefit or cost elements of the proposed investment and investment options.

C7.2 The general factor we have had regard to in evaluating the MCP is to assess the impact of sensitivity analysis on electricity market benefit or cost elements of the proposed investment and investment options.[188] We have selected this factor because it is an integral part of the investment test, as outlined in Attachment D. In practice, this requires us to be satisfied that the proposed investment and investment options are sufficiently robust to sensitivity analysis.

[188] Capex IM, above n 2, at cl C2(e) of schedule C =.

C7.3 Our choice of one general factor to have regard to in evaluating the MCP reflects the relatively low complexity of the issues and options associated with the MCP's investment options and proposed investment. The investment options and the proposed investment are standard transmission network solutions that Transpower has significant experience with.[189]

C7.4 *Factors to have regard to in evaluating the components of the MCP*: clauses C3 to C6 each specify a list of factors; we must choose at least one factor from each list to have regard to in evaluating the specified components of the Project.

C7.5 The relevant Project components under these provisions are, respectively, the MCA; the proposed approval expiry date; the proposed MCPOs; and the proposed major capex incentive rate.

C7.6 We set out the respective factors we have had regard to under clauses C3 to C6 in our evaluation below of each of the Project components.

The evaluation techniques we may use in evaluating the MCP under Schedule C

C8 Under clause C7 of Schedule C, in evaluating the MCP, we may employ one or more of the following evaluation techniques:

C8.1 powerflow analysis and dynamics in the grid (clause C7(a));

C8.2 detailed critiques of conceptual designs to estimate cost and time estimates (clause C7(b));

C8.3 analysis and review of costs and benefits associated with the MCP's proposed investment and investment options (clause C7(c));

C8.4 critiques of market development scenarios used in the MCP (clause C7(d));

C8.5 unit rate benchmarking (clause C7(e)); and

C8.6 any other technique or approach we consider appropriate in the circumstances (clause C7(f)).

[189] 2012 Capex IM reasons paper, above n 3, at para 6.10.15. In the 2012 Capex IM reasons paper, we outlined our long-term objective for the major capex approval regime as being "to limit [our] review to whether or not Transpower has adhered to the stipulated processes. Not replicating Transpower's planning function will minimise regulatory costs and reinforce Transpower's role as the primary grid planner and ensure. The Commission will, however, in testing adherence to the stipulated process, review and challenge Transpower's application of the process, the investment test, and any assumptions used to develop its proposal. The Commission will need to be fully satisfied by the evidence provided by Transpower."

Clause C1(1) – evaluation of whether the proposed investment satisfies the investment test

C9 We are satisfied that the proposed investment meets the investment test under Schedule D of the Capex IM. Specifically, we are satisfied:

C9.1 with the values Transpower has used for the parameters of the investment test;

C9.2 that the proposed investment has the highest expected net electricity market benefit, and this is positive; and

C9.3 that the proposed investment is sufficiently robust to sensitivity analysis.

C10 We employed the technique under clause C7(c) of Schedule C to assist our evaluation: an analysis and review of Transpower's calculation of the costs and benefits associated with the proposed investment and investment options in the MCP. We consider this evaluation technique complements our analysis of Transpower's application of the investment test and assessment of the benefits and costs of each investment options in Attachment D.

C11 Our evaluation of Transpower's application of the investment test is outlined in Attachment D.

Clause C3 – evaluation of the MCA

C12 Transpower has requested an MCA of $35.9 million, in 2022/23 prices. Table C1 summarises the components of the MCA.

Table C1: Summary of the components of the MCA

MCA component	Amount ($million)
Base estimate	29.364
Uncertainties	3.350
P50 estimate of cost (real) (**P50 estimate**)	32.714
CPI	1.219
IDC	2.013
MCA	35.946

The MCA appears reasonable

C13 We consider that the 'base estimate' component of the MCA is reasonable based on the underlying calculations and reports Transpower provided us. We are also satisfied that the other components of the MCA are reasonable.

C14 In coming to this conclusion, we are mindful that estimating the capital costs of a project is a complex engineering process that requires producing conceptual designs, conducting site investigations, scoping the project and then preparing a scope by

work packages, estimating the quantity of work for each work package and using unit rates to estimate the cost of each work package.[190]

C15 In reviewing the estimated costs, we sought to form a view on whether Transpower had scoped the works, estimated the quantities, applied the unit costs, and derived uncertainties in a reasonable manner. We outline our approach to assessing the MCA and the analysis we have done to this effect in the following paragraphs.

Our approach to evaluating the MCA

C16 Under clause C3 of Schedule C, we must consider at least one of the following factors when evaluating the MCA:

C16.1 how Transpower used the MCPOs, key drivers, key assumptions, and cost modelling to determine the P50 and MCA (clause C3(a));[191]

C16.2 the capital costing methodology and formulation, including unit rate sources, the method used to test the efficiency of unit rates and the level of contingencies included (clause C3(b));

C16.3 the impact of forecast costs on other costs of Transpower, including the relationship with operating expenditure (clause C3(c));

C16.4 mechanisms for controlling actual capital expenditure with respect to the MCA (clause C3(d)); and

C16.5 the efficiency of the proposed approach to procurement of goods and services (clause C3(e)).

C17 We considered the factors under clause C3(a) and (b) because they best enable us to form a view on whether Transpower's estimated cost of the project and the subsequent derivation of the MCA are reasonable.

C18 Our assessment discussed below covers clause C3(a) and (b) together to avoid repetition.

How Transpower used the MCPOs to determine the MCA

C19 Transpower derived the MCA according to the components shown in Table C1, using the following general approach:

C19.1 determined the base estimate and uncertainties;

C19.2 used triangular distribution to derive the P50 costs in 2019 prices;

[190] Examples of work packages include site excavation, fencing, installing security lights, constructing the foundation for the equipment, and installing the MCPOs' primary assets.

[191] Under clause 1.1.5(2) of the Capex IM, 'P50' means estimated aggregate project costs where the probability of the actual aggregate project costs being lower than that estimated is 50%.

C19.3 forecasted exchange rates and forecast inflation from 2019 to 2023; and

C19.4 forecasted financing costs.

C20 Transpower derived the base estimate by estimating the cost of delivering the three MCPOs of this Project. The three MCPOs, listed in paragraph C59, can be summarised as:

C20.1 substation work at Transpower's Bombay GXP (**substation works**);

C20.2 lines work connecting Bombay GXP to a 220 kV line running near the Bombay GXP (**lines works**); and

C20.3 investigations for reconductoring the Otahuhu-Wiri line.

C21 Transpower engaged engineering consultants to prepare two Solution Study Reports (**SSRs**) – one for the substations works and the other for the lines work.[192] The SSRs present the results of the engineering investigations that look at the practical steps of implementing the Project. The two SSRs identified the key inputs (including work packages and quantities) required to estimate the costs of delivering the respective MCPOs.[193]

C22 We assessed Transpower's work packages and are satisfied that these reflect the work packages necessary to deliver projects of this nature.

C23 The quantities for each of the work packages are based on conceptual information and detailed assumptions on ground conditions, potential routes for cables, and the characteristics of the equipment that will be installed. We are satisfied that these quantities appear reasonable.

C24 Based on our assessment of the SSRs, we are satisfied with the approach Transpower has used to derive the base estimate for each MCPO. There is a clear link between the cost estimate and each MCPO. This link is particularly useful if Transpower needs to amend an MCPO in the future, or if there is a post-project adjustment due to changes in the MCPOs.[194]

The capital costing methodology

C25 We evaluated the base estimate of Project cost using the technique of the capital costing methodology and formulation under clause C3(b) of Schedule C.

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[192] Transpower estimated the equivalent cost of investigations for reconductoring the Otahuhu-Wiri line in-house.

[193] In addition to the SSR, Transpower provided us its costing spreadsheets that included unit costs, estimated quantities of the work packages, and associated uncertainties and the derivation of the MCA.

[194] For example, if Transpower decides to change the rating of the transformers at Bombay GXP, there would be a post-project adjustment to the MCPOs and costs that can enter Transpower's regulatory asset base.

C26 The main inputs into the base estimate are the results of the SSRs and the expected overheads.[195] The SSRs determine:

C26.1 the scope of works required to deliver the Project, disaggregated by itemised work packages (**work packages**), and

C26.2 the quantities associated with the work packages (**quantities**).[196]

C27 The SSRs do not include any allowances for overheads or uncertainties.

C27.1 Transpower estimated the cost of overheads using the costs in similar previous projects; and

C27.2 Transpower has included the following uncertainties in the MCA:

C27.2.1 uncertainties in the identified work packages or quantities (**scope risks**) because SSRs are produced before the detailed design stage so the quantities are best estimates at the SSR stage of the Project; and

C27.2.2 risks in delivering a project (**project risks**), such as delays due to weather, constructability issues, environmental and property risks.

C28 Transpower used work packages, quantities, unit costs, overheads and allowance for risk to derive the P50 estimate using the following methodology:

C28.1 using the SSR quantities to derive two other sets of quantities for each work package – the 'lower' and 'upper' quantities, which reflect the range of variation in quantities Transpower has observed for such projects;

C28.2 using Transpower's Enterprise Estimation System (**TEES**) as the source for unit costs for the work packages and the above quantities, Transpower estimated the lower, estimates based on SSR quantities (**SSR estimate**) and upper estimates for each work package (**works estimates**);

C28.3 deriving lower, mid, and upper estimates for overheads and project risks (**overhead estimates**);

C28.4 summing the overhead estimates and works estimates to derive three sets of estimates for calculating the P50 estimate of cost. We refer to the SSR estimate plus the mid overhead estimate as the 'base estimate'; and

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[195] Overheads include Transpower's and consultants' engineering support during delivery, project management, customer liaison costs, consenting costs and indirect contractor costs etc.

[196] An example of a work package is to install 110 kV cable at Bombay and the associated estimated quantity is 0.6 km of cable.

C28.5 applying triangular distribution to the three sets of estimates to derive the P50 estimate.

C29 We are satisfied that the above methodology provides an MCA based on the P50 estimate of project costs as required by the Capex IM.[197]

C30 We are satisfied with Transpower using the triangular distribution to derive the P50 estimate. We are also satisfied with the lower and upper quantities Transpower has used. The variation between the these and the base quantities are in the range expected of such estimates at this phase of the Project's life cycle.

Unit rate sources, the method used to test the efficiency of unit rates

C31 TEES includes a database of Assembly costs which is the source of the unit costs Transpower used in its costing methodology. The Capex IM requires us to evaluate the unit rates[198] and the method used to test the efficiency of unit rates.[199] We assessed how Transpower derives and updates its unit rates as follows:

C31.1 as part of the most recent IPP reset, we evaluated TEES and assessed how Transpower keeps the unit costs in TEES current.[200] The same process is used to keep current the unit cost in Assemblies.[201] We were satisfied that Transpower had a sound process for keeping the unit costs current. For example, Transpower updates external labour and material rates based on the actual costs incurred in completing a project;

C31.2 as part of the IPP reset, we set reporting requirements on Transpower that will allow us to assess the efficiency of Transpower forecasts and the unit costs;[202] and

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197 Capex IM, above n 2, at cl G5(2)(c).

198 Clause C7(e) of Schedule C refers to unit rate benchmarking. Here we have considered how Transpower keeps its unit rates current.

199 Clause C3(b) of Schedule C.

200 Commerce Commission, *Transpower's individual price-quality path from 1 April 2020 – Decisions and reasons paper* (**RCP3 IPP decisions paper**), (29 August 2019), at Attachment H, available at https://comcom.govt.nz/__data/assets/pdf_file/0028/170398/Transpower-IPP-for-RCP3-Decisions-and-reasonspaper-29-August-2019.PDF.

201 An Assembly is a package of work with one or more cost items underneath it. Transpower considers that Assemblies can provide the level of more granular and site-specific costs required to estimate the cost of the Project.

202 RCP3 IPP decisions paper, above n 200, at paras H28 to H36. The reporting requirements we set for Transpower are set in our section 53ZD notice relating to cost estimation, available at: https://comcom.govt.nz/__data/assets/pdf_file/0037/188785/Transpower-s53ZD-notice-Cost-estimation-24-February-2020.pdf.

C31.3 as part of evaluating Transpower's *Waikato and Upper North Island voltage management major capex proposal*, we evaluated the unit costs in TEES. In analysing the unit costs, we asked Transpower to provide us with randomly selected Assembly costs. We tested whether Transpower correctly used these costs in its cost estimation for the MCA. Based on our sample testing, we were satisfied that:[203]

C31.3.1 the current unit costs in TEES are reflected in Transpower's cost estimation; and

C31.3.2 the Assemblies are sufficiently granular for the purpose of estimating the cost of the MCP.

The level of contingencies included in the base estimate

C32 As discussed above, there are two types of risks. Scope risk is due to uncertainties in estimating the quantities for the work packages. Project risks allow for variations in prices, stakeholder liaison, environmental considerations, and timing risks.

C33 Allowing for the above uncertainties recognises that not all works can be identified at this early phase, contractor prices can vary, project delivery can be affected due to availability of equipment outages and delayed due to external events such as weather.

C34 We consider these risks have a reasonable possibility of materialising and have therefore accepted them in the MCA. This allows Transpower to recover these costs should they materialise.

C35 We are satisfied that the value of the uncertainties is reasonable and consistent with clause G5(2)(c) of Schedule G of the Capex IM, which requires the proposed MCA to be a P50 of the capital cost and the estimated probability distribution of the P50.

C36 The level of contingencies Transpower included in the base estimate is $3.350million (in 2019/20 prices), which we consider is appropriate for this Project.

Exchange rate and inflation assumptions

C37 The exchange rate and general inflation elements of the MCA are subject to the wash-up mechanism, which means these assumptions do not impact on the calculation of incentives or the final amount of revenue Transpower can recover.[204]

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[203] Transpower's *Waikato and Upper North Island Voltage Management Major Capex Proposal,* (December 2019), is available at: https://www.transpower.co.nz/sites/default/files/projects/resources/WUNIVM%20Major%20Capex%20Proposal.pdf. Our evaluation of the TEEs unit costs for that proposal is set out in our final decision and reasons paper on the proposal: *Decision and reasons on Stage 1 of Transpower's Waikato and Upper North Island Voltage Management staged major capex project* [2020] NZCC 20, (23 September 2020) at para C78 of Attachment C, available at: https://comcom.govt.nz/__data/assets/pdf_file/0029/225497/2020-NZCC-20-Waikato-and-Upper-North-Island-Voltage-Management-major-capex-project-stage-1-Decisions-and-reasons-paper-23-September-2020.pdf.

[204] Capex IM, above n 2, at cl B3(1) of Schedule B.

C38 Transpower provides its underlying assumptions on the exchange rate and general inflation elements, shown below in Tables C2 and C3, to allow an accurate wash-up to occur.

Table C2: Exchange rate used to calculate the MCA

Currency	Exchange rate
AUD	0.9582
EUR	0.5924
JPY	71.326
SEK	6.3397
USD	0.6561

Table C3: Forecast inflation rate used to calculate the MCA

Year	2017	2018	2019	2020	2021	2022	2023	2024	2025
Rate	1.74%	1.50%	1.67%	1.60%	1.90%	2.10%	2.00%	2.00%	2.00%

Financing costs assumptions

C39 Transpower has calculated its financing costs using:

C39.1 the assumption that expenditure occurs at the end of each month; and

C39.2 the same principles used in Transpower's base capex proposal.[205]

C40 The capital expenditure profile of the Project is the 'S' curve typical of such projects. Most expenditure will occur towards the commissioning phase of the 220 kV transformers due their high costs. These costs are fixed under contract at an early point.

C41 Site preparation works that are done in the early stages of the construction phase of the Project are where variations in scope or delays, and corresponding increased costs, are most likely.

Our decision on exempt major capex under clause 3.3.5(7)(c) of the Capex IM

C42 EMC can be set for portions of the MCA that reflect uncertainties. The contingency allowance provided for in the MCA covers uncertainties in scope and project delivery.

[205] Under clause 1.1.5(2) of the Capex IM, the 'base capex proposal' is the information Transpower submits to enable us to determine the components of the IPP under clause 2.2.2 of the Capex IM.

C43 In our draft decision, we set out our view that an EMC is appropriate to manage the potential adverse effect of the allowance for uncertainties in the MCA.[206] An EMC can effectively incentivise Transpower to seek efficiencies and manage the cost of contingencies when delivering the Project. We proposed an EMC for the value of the uncertainties equal to project delivery risks included in the MCA.

C44 Under our draft decision, Transpower would have been entitled for rewards if the Project cost came out lower than the MCA minus the EMC ($33.1m = $35.9m - $2.8m).

C45 Submissions and cross-submissions on the draft decision called for a greater amount of engagement between Transpower and Counties and Vector in delivering the Project.

C46 We agree that a higher level of engagement would be beneficial but are mindful that this may incur additional costs. We consider that, because of the likely higher level of engagement, some of the estimated costs included as contingencies in the MCA would no longer be purely random.

C47 The resulting additional costs would be funded from the allowance for uncertainties in the MCA which increases the likelihood of the Project cost exceeding the MCA-EMC threshold for incentives that we proposed in our draft decision. For this reason, we consider that readjusting the reward/penalty balance will provide a more workable incentive setting.

C48 Therefore, our decision is to retain the MCA from our draft decision and reduce the EMC. This is because we cannot reasonably determine an EMC due to the uncertainties around estimating the additional costs resulting from higher levels of engagement.

C49 This revised EMC setting lifts the threshold in the MCA to which Transpower would be entitled to rewards under the incentive scheme to $35.9m and provides an incentive for Transpower to deliver the Project within the P50 estimate of the Project's expected cost. While there is a greater chance of Transpower incurring costs outside its control, removal of the EMC will increase the incentive for Transpower to find savings within its control.

Our view on Transpower's submission on the EMC

C50 Transpower raised the following matters in its submission on the draft decision:[207]

C50.1 Transpower supported our principle of exempting from the incentive mechanism uncertainties in project cost that are outside of Transpower's control (**project uncertainties**). However, Transpower expressed concerns that the MCA and EMC settings do not exempt all the uncontrollable costs.

[206] Commerce Commission, above n 4, at par C45.

[207] Transpower, above n 11.

C50.2 Transpower considers that if the project delivery uncertainties are exempt from the incentive mechanism, then the MCA should include the total expected cost of these uncertainties rather than the P50 estimate as required by the Capex IM.

C50.3 Transpower argues that including the total estimated amount of project delivery uncertainties will provide a symmetric setting of the incentive mechanism and is more equitable for both Transpower and consumers; and

C50.4 Transpower considers that the setting we proposed in our draft decision, which is based on the P50 estimate of the project uncertainties in the MCA, is asymmetrical. Transpower argues that if the relevant project uncertainties do not eventuate, Transpower would not be entitled to any reward, but if the cost of the project uncertainties exceed the P50 estimate, Transpower would be penalised.

C51 For the above reasons, Transpower submitted that we should either not set an EMC until the next Capex IM review, or, we should clarify how the ex-post major capex expenditure and the ex-post major capex project output adjustments are to be calculated. Transpower sought clarification on what categories of expenditure are to be included in the EMC and whether the EMC must be capped at the level of our determination.

C52 While our decision is to not set an EMC, the rationale behind it is to better cover the greater likelihood of increases in the cost of the Project (arising from the additional engagement described above).

C53 We acknowledge the points raised by Transpower in its submission on the application of the EMC and its interaction with MCA, and we intend to analyse and address in greater depth in our next review of the Capex IM.

Clause C4 – evaluation of the proposed approval expiry date

C54 Transpower proposes an approval expiry date[208] of 31 December 2028.[209]

C55 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 deliver the Project within the approval expiry date or apply for an amendment to that date under clause 3.3.6(1)(d) of the Capex IM.

C56 In evaluating Transpower's proposed approval expiry date under clause C4 of Schedule C, we must have regard to at least one of the six factors listed in that provision.

[208] Under clause 1.1.5(2) of the Capex IM, the approval expiry date means the date on which the approval given by the Commission in respect of a major capex project under clause 3.3.5 expires.

[209] MCP, above n 1, at pg. 34.

C57 We tested Transpower's proposed approval expiry date against the factor set out at clause C4(c): the effect of the proposed approval expiry date and the commissioning date assumption in the MCP.

C58 In selecting its proposed approval expiry date, Transpower stated that:[210]

> We have proposed an approval expiry date of 31 December 2028, which is after the commissioning date assumption of 30 April 2023. We have proposed this extra period to allow for any delays in procurement and consenting. If this happens it will be efficient to have a reasonable window during which we will not have to re-apply for investment approval.

C59 Transpower has allowed five and half years between the Commissioning date assumption and the expiry date. The main reason for the significant difference between the commissioning assumption and expiry date is to allow for potential delays in procurement and consenting.[211]

C60 We agree that the delays identified by Transpower could occur and on this basis consider that Transpower's proposed approval expiry date is reasonable.

Clause C5 – evaluation of the major capex project outputs

C61 In evaluating Transpower's proposed MCPOs under clause C5 of Schedule C, we must have regard to at least one of the four relevant factors listed in that provision.

C62 We tested Transpower's proposed MCPOs against the factor set out at clause C5(a): the extent to which the MCPOs reflect the nature, quantum and functional capability of the transmission investment assets to be commissioned.

C63 As outlined at paragraph C18 above, the MCPOs proposed for the Project are:[212]

C63.1 procuring, installing and commissioning two 150/175 MVA 220/110kV transformers at Transpower's Bombay substation;

C63.2 procuring, installing and commissioning a connection for these transformers to the 220kV Huntly-Otahuhu A line; and

C63.3 undertaking preparatory works, including additional investigation, consultation and design work, for reconductoring the Otahuhu-Wiri line.

C64 The nature and functional capability of the proposed investment is to improve the reliability and the capacity of the transmission assets that currently supply the Bombay-Otahuhu region. The proposed investment would establish new assets to supply the Bombay GXP, and as a subsequent amendment refurbish and upgrade the section of the transmission line supplying Wiri GXP.

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[210] At pg. 34.

[211] MCP, above n 1, at pg. 34.

[212] At pg. 13.

C65 We are satisfied the MCPOs Transpower proposes adequately reflect the nature and functional capability of the proposed investment.

Clause C6 – evaluation of the major capex incentive rate

C66 The major capex incentive rate we set under clause 3.3.5(7)(b) of the Capex IM determines the reward (or penalty) that Transpower receives (or bears) depending on how the actual cost of delivering a major capex project compares to the project's MCA.[213] As noted above, the EMC is the amount of the MCA to which the major capex incentive rate does not apply.[214]

C67 Under clause 1.1.5(2) of the Capex IM, the major capex incentive rate is 15% – the default rate – or an alternative rate we specify after considering a request from Transpower.

C68 In evaluating Transpower's proposed major capex incentive rate under clause C6 of Schedule C, we must have regard to at least one of the two factors listed in that provision. We analysed Transpower's proposed major capex incentive rate against the factor in clause C6(a): the magnitude of the cost of the Project relative to the cost of other major capex projects.

C69 The estimated cost of the Project is in the lower end of the costs of previously commissioned major capex projects since Transpower's first regulatory control period, which range from $22 million to $853 million.

C70 Transpower has proposed:[215]

C70.1 a major capex incentive rate of 15%; and

C70.2 that we do not set any EMC.

C71 Our decision under clause 3.3.5(7)(b) of the Capex IM is to accept Transpower's proposed major capex incentive rate of 15% for this MCP.

[213] Clause B3(1) of Schedule B of the Capex IM determines how the major capex incentive rate applies to an approved major capex project.

[214] Capex IM, above n 2, at cl 1.1.5(2).

[215] MCP, above n 1, at pg. 44.

Attachment D: Evaluation of the investment test

Purpose of this attachment

D1 In this attachment we present our review of Transpower's application of the investment test. We discuss our evaluation of the parameters Transpower used for the investment test, the expected net electricity market benefits, Transpower's selection of the proposed investment and the results of Transpower's sensitivity analysis.

Criteria for satisfying the investment test

D2 In deciding whether to approve a major capex project, clause C1(1) of the Capex IM requires us to evaluate whether the proposed investment satisfies the investment test.

D3 The investment test set out in Schedule D of the Capex IM is a net benefit analysis using discounting of expected costs and benefits in the electricity market over a range of demand and generation scenarios and a defined calculation period. The investment test is used to identify the investment option with the highest expected net electricity market benefits as the proposed investment.[216]

D4 Under clause D1(1) of Schedule D, a proposed investment satisfies the investment test if it has the highest expected net electricity market benefit and is robust to sensitivity analysis when compared with other investment options.

D5 The net expected electricity market benefit:[217]

D5.1 does not need to be positive for an investment proposed to meet the N-1 criterion of the GRS; but

D5.2 needs to be positive for any other proposed investment.

D6 When selecting the proposed investment, Transpower may consider unquantified electricity market benefits or cost elements if the difference in expected net electricity market benefits between two or more investment options is within 10% of the aggregate project costs.[218]

We are satisfied with Transpower's application of the investment test

D7 Under clause C1(1) of Schedule C of the Capex IM, we are satisfied:

D7.1 with the parameters Transpower used in applying the investment test;

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[216] 2012 Capex IM reasons paper, above n 3, at para 7.2.1. We note that in our 2017/18 Capex IM review, we decided to retain the investment test criteria and approach in the 2012 Capex IM – see 2017/18 Capex IM review reasons paper at para 194.

[217] Capex IM, above n 2, at cl D1(1)(b).

[218] Clause D1(1)(c)(ii) and (2) of Schedule D.

D7.2 that Transpower's proposed investment satisfies the investment test; and

D7.3 that Transpower's proposed investment is robust to sensitivity analysis.

D8 We outline our analysis behind these findings below.

How the investment test is performed

D9 In carrying out the investment test, Transpower must: [219]

D9.1 estimate the electricity market benefits or cost elements and project costs for each investment option under each relevant generation and demand scenario;[220]

D9.2 calculate the net electricity market benefits for each investment option under each relevant generation and demand scenario. Net electricity market benefit is the sum of the electricity market benefits less the sum of the electricity market costs including the project cost; and

D9.3 calculate the expected net electricity market benefit, which is the weighted average of the net electricity market benefit under each relevant demand and generation scenario.

D10 As part of carrying out the investment test, Transpower must also test whether its proposed investment is sufficiently robust under sensitivity analysis.[221] This assesses whether the proposed investment is robust to changes in some of the key assumptions.

How we evaluated Transpower's application of the investment test

D11 Under the Capex IM, we reviewed Transpower's application of the investment test by considering whether:

D11.1 the expected net electricity market benefits need to be positive, which is required if the proposed investment is other than to meet the N-1 criterion of the GRS such as removing network constraints or facilitating new generation;

D11.2 the parameters of the investment test are appropriate and whether Transpower consulted on the parameters it has applied;

D11.3 Transpower reasonably estimated the expected net electricity market benefit of each investment option;

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[219] Capex IM, above n 2, at cl D2 of Schedule D.

[220] The terms 'electricity market benefit or cost element', 'project cost', and 'relevant generation and demand scenarios' are defined in clause D4(1), (2), clause D3(4) of Schedule D.

[221] Above n 2, at cl D1(1)(a) of Schedule D.

D11.4 the proposed investment is the investment option with the highest net electricity market benefit; and

D11.5 the proposed investment is robust to sensitivity analysis.

D12 We present a summary of our evaluation in the rest of this attachment.

The expected net electricity market benefits of the proposed do not need to be positive

D13 Under clause D1(1)(b) of Schedule D of the Capex IM, Transpower has submitted the MCP to meet the N-1 criterion of the GRS. We agree with this expenditure objective, as discussed in paragraphs B7 to B11 above.

D14 The investment test requires the proposed investment to be the investment option with the highest net electricity market benefits, including assessing unquantifiable benefits if necessary. The expected net electricity market benefit does not need to be positive as the proposed investment has been submitted to meet the N-1 criterion of the GRS.

D15 Our review of the investment test shows that the expected net electricity market benefit is positive, and the electricity market benefits are significantly higher than the estimated project costs.

Our evaluation of the parameters of the investment test

D16 The Capex IM allows Transpower some discretion in selecting the analysis parameters of the inputs into the investment test. Transpower is required to consult on the values of the inputs it uses.[222] These parameters are the:

D16.1 demand and generation scenarios (comprising demand forecasts and generation scenarios);[223]

D16.2 discount rate;[224]

D16.3 calculation period;[225]

D16.4 cost per megawatt hour used to determine the value of expected unserved energy;[226] and

D16.5 investment options.[227]

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[222] Capex IM, above n 2, at cl I4.

[223] Clause G3(1) of Schedule G.

[224] Clause G4(5) of Schedule G.

[225] Clause G4(5)(b) of Schedule G of Schedule G.

[226] Clause G4(5)(c) of Schedule G.

[227] Clause 7.4.1(2).

D17 For the reasons we outline below, we are satisfied that Transpower has reasonably selected the investment test parameters.

Demand and generation scenarios

D18 The Capex IM requires Transpower to use the Ministry of Business, Innovation and Employment's (**MBIE**) published *Electricity demand and generation scenarios July 2019* (**EDGS**) demand and generation forecasts or reasonable variations to those forecasts, having had regard to the views of interested persons on these variations.[228]

D19 EDGS does not forecast demand or generation development by region or GXP, but instead provides national level forecasts.

D20 Table D1 shows the peak demand forecasts for the five EDGS scenarios and Table D2 shows the energy demand forecasts for the five EDGS scenarios.[229]

Table D1: July 2019 EDGS scenarios and peak electricity demand forecast (MW) in 2050

EDGS scenario	New Zealand	North Island
Reference	8,462	5.726
Growth	9,831	6,649
Global	7,062	4,806
Environmental	9,640	6,474
Disruptive	10,205	6,949

Table D2: July 2019 EDGS scenarios and electricity demand forecast (TWh)

EDGS scenario	2017	2035	2050
Reference	39.7	48.4	56.7
Growth	39.7	52.0	65.1
Global	39.7	44.1	46.7
Environmental	39.7	54.3	66.5
Disruptive	39.7	55.2	70.5

D21 Transpower is unable to use EDGS' forecasts as above because the investment test specifically requires forecasts for Bombay and Wiri GXPs. To overcome this lack of information, under clause D3(2) of Schedule D of the Capex IM, Transpower

[228] Capex IM, above n 2, at cls D3(1) and (2) of Schedule D. Under clause I1(1)(b) of Schedule I of the Capex IM, Transpower must consult on each demand and generation scenario variation.

[229] MBIE, *Electricity demand and generation scenarios July 2019* (**EDGS**), at pgs. 23-24, available at https://www.mbie.govt.nz/dmsdocument/5977-electricity-demand-and-generation-scenarios.

forecasted and consulted on reasonable variations having regard to the EDGS forecasts.

D22 We present our evaluation of the demand and generation forecasts Transpower used in the investment test below.

Our assessment of electricity demand forecasts

D23 There are two types of electricity demand forecasts: peak demand and energy demand. Both are often referred to as electricity demand forecasts.

D24 Peak demand forecasts are used to predict the need date and future investments of modelled projects. The need dates of modelled projects affect the electricity market cost of investment options.[230]

D25 Energy demand forecasts are used to calculate the expected electricity market benefits of the investment options.

D26 As mentioned above, Transpower had to derive reasonable forecasts for the Bombay and Wiri GXPs and consult on these for the investment test.[231]

D27 Figure D1 and Figure D2 show the winter peak demand Transpower consulted on as part of its long-list of consultation.[232] Counties supported the forecast stating that the demand forecast for Bombay GXP is in line with its own forecasts.[233]

[230] Under clause D8(4) of Schedule D of the Capex IM, a 'modelled project' means assets, other than those that are part of an investment option-

(a) which are likely to exist-

(i) as part of a demand and generation scenario; and

(ii) during the calculation period for any investment option based on that scenario; and

(b) for which the likelihood, nature and timing of their existence are affected by an investment option proceeding.

[231] Above n 1, *Attachment C: Options and Costing report*, at pgs. 23-24

[232] Transpower Long-list consultation, above n 24, pg. 23.

[233] Counties long-list consultation response, above n 167, at pg. 2.

Figure D1: Bombay GXP winter peak demand used in the long-list consultation

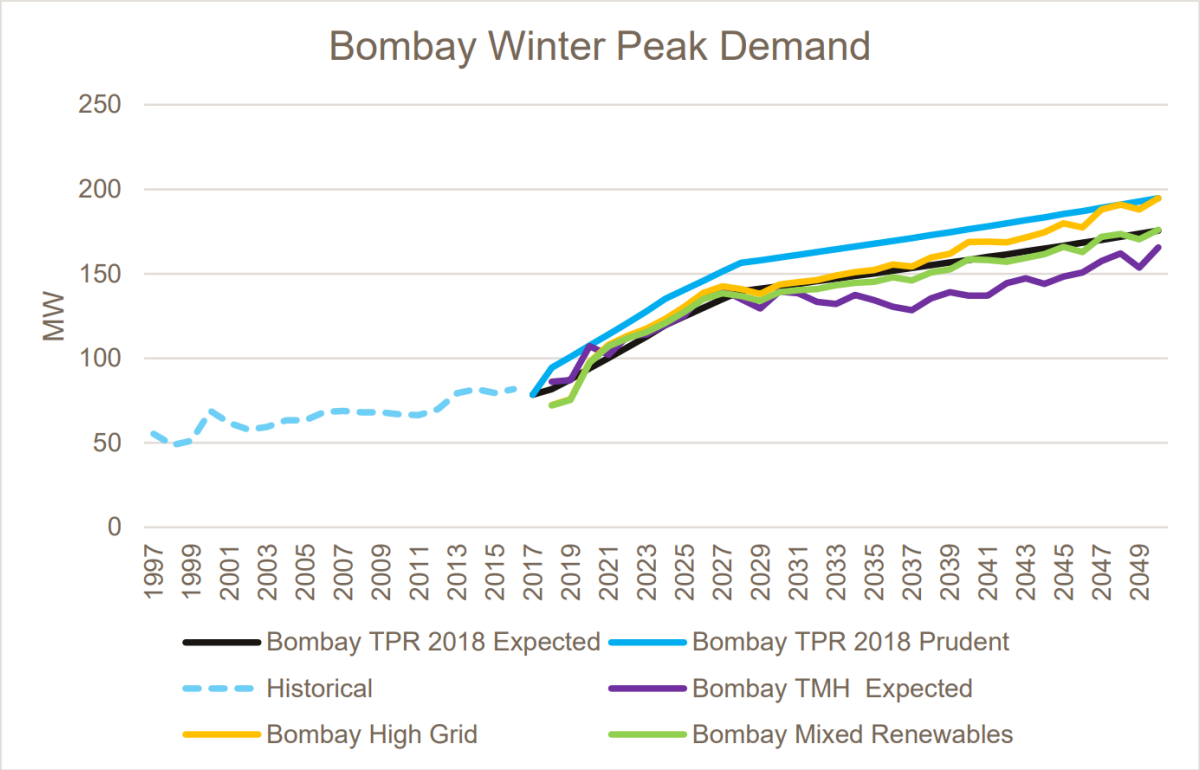
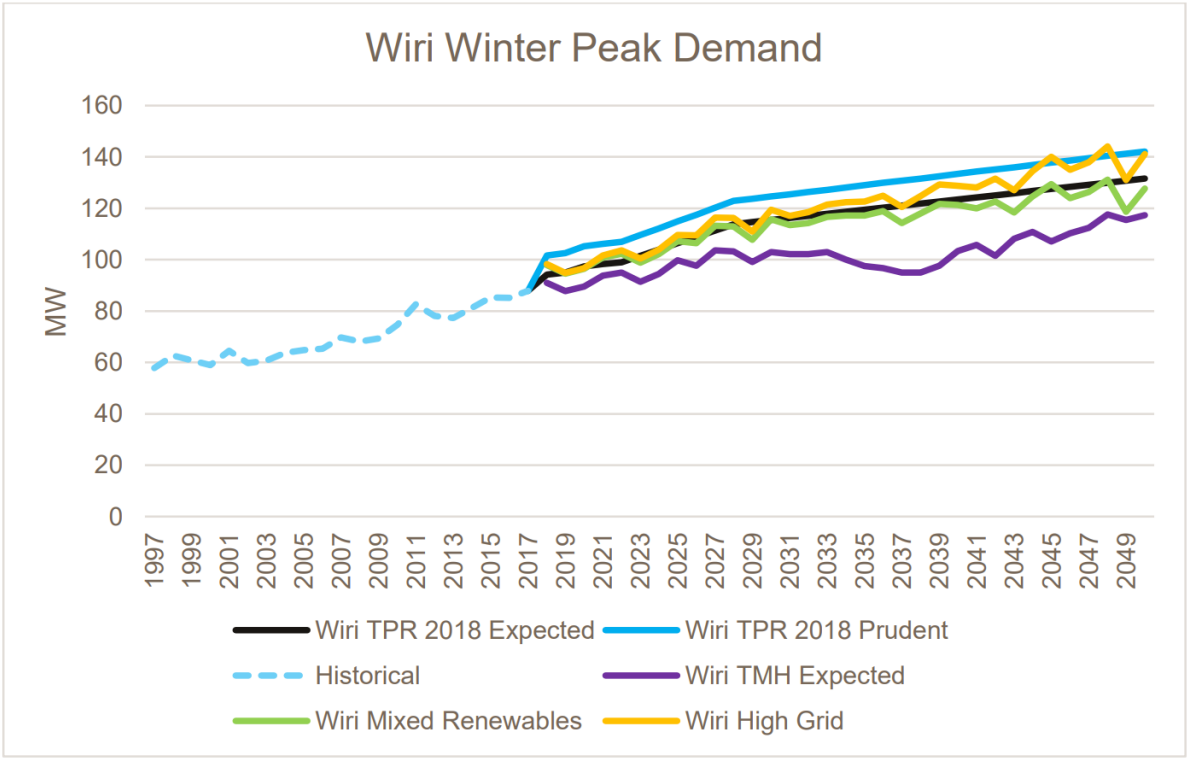


Figure D2: Wiri GXP winter peak demand used in the long-list consultation



D28 The current EDGS was published in 2019 which is after Transpower's long-list consultation in 2018. Transpower updated the demand forecasts as part of its short-list consultation.[234]

D29 Figure D3 and Figure D4 show the updated demand forecasts included in Transpower's shortlist consultation[235] and in the MCP.[236] Transpower states that:[237]

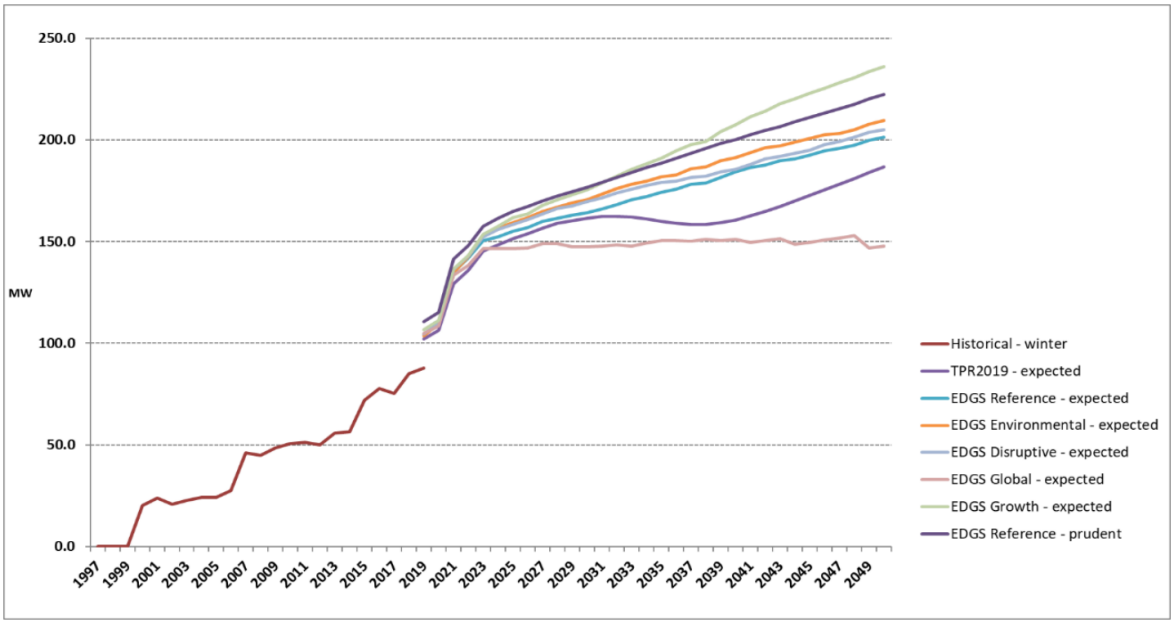
D29.1 the updates reflect actual demand observations and new information received since 2018;

D29.2 the 2019 peak demand forecasts include bottom-up assumptions of uptake in emerging technologies from the 2019 EDGS;

D29.3 Transpower used the EDGS scenarios in its analysis for determining the need date of MCPOs and in calculating unserved energy benefits and dispatch cost benefits; and

D29.4 Transpower used the expected version of its forecasts to determine the benefits in its analysis such as to estimate the dispatch costs and unserved energy and the prudent version to determine need dates. The prudent forecast is based on peak winter evening usage to ensure with a 90% probability that demand will fall within this level.[238]

Figure D3: Distribution of Bombay GXP peak demand forecasts



[234] MCP, above n 1, *Attachment C: Options and Costing report*, at pg 24.

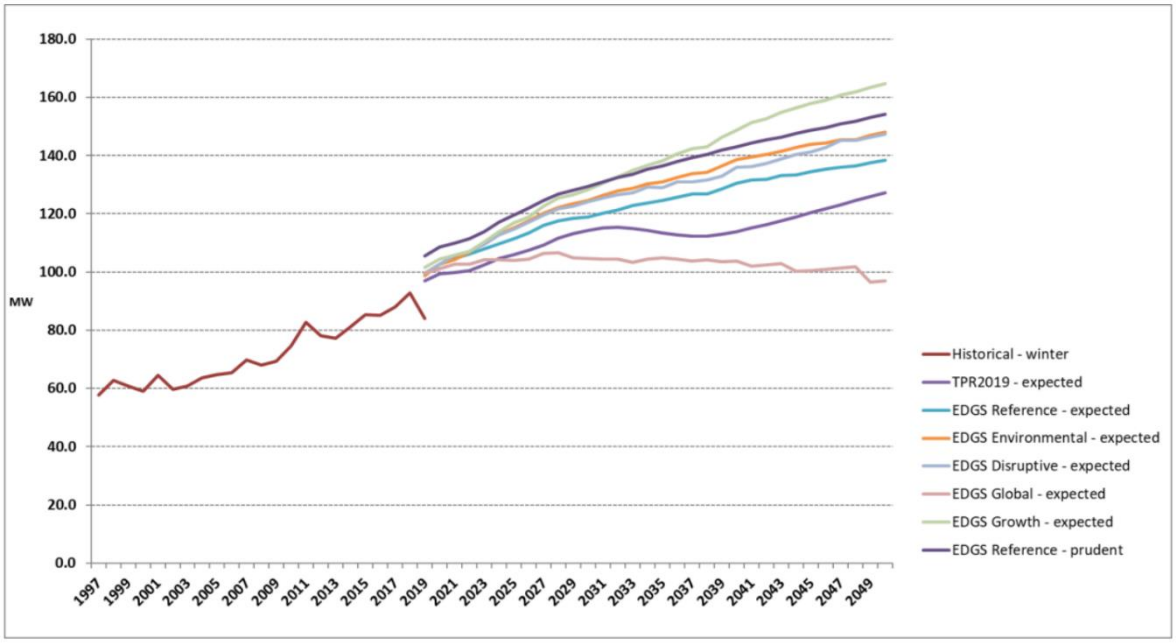
[235] Short-list consultation document, above n 26, at pg 21.

[236] Above n 1, at pgs 24-25.

[237] At pg 25.

[238] At pg 24.

Figure D4: Distribution of Wiri GXP peak demand forecasts



D30 Transpower consulted on the updated demand forecasts in the short-list consultation document.[239] In response to Transpower's short-list consultation:

D30.1 Counties stated that the demand forecast for Bombay GXP is in line with Counties forecasts;[240] and

D30.2 while Vector did not comment on the demand forecast at Wiri GXP, it submitted that demand at the Wiri GXP is growing quickly and provided details on some of the areas of growth.[241]

D31 We note that:

D31.1 the revised demand forecast shows a significant step increase in demand until 2023. We consider that this is unlikely to occur within such a short period, mainly due to the impact of Covid-19;

D31.2 the above may impact the electricity market benefits and the electricity market costs, and we have considered this when assessing the electricity market benefits; and

[239] Above n 26, at pg 21.

[240] Counties Power, *Bombay-Otahuhu Regional Major Capex Project Investigation – short list of investment options response*, (21 February 2020) (**Counties short-list consultation response**), at pg. 1, available at:https://www.transpower.co.nz/bombay-otahuhu-regional-investigation#downloads.

[241] Vector, *Bombay-Otahuhu Regional Major Capex Project Investigation*, (21 February 2020) (**Vector short-list consultation response**), at pg. 1, available https://www.transpower.co.nz/bombay-otahuhu-regional-investigation#downloads.

D31.3 since the main driver for the Project is the deteriorating condition of the conductors on the Bombay-Otahuhu line, demand forecast does not affect the need date of the Project.

Our assessment of the generation scenario

D32 A generation scenario is a hypothetical prediction of a set of generation developments within the electricity industry. Generation scenarios are used to determine the timing and need date of the Project and future modelled projects.

D33 EDGS forecasts generation expansion and decommissioned generation but does not provide information by location that is needed for use in the investment test. EDGS forecasts a mixture of wind, solar, geothermal, gas and hydro generation. Apart from geothermal and gas generation, none of the new generation outlined in EDGS would affect the peak demand at Bombay and Wiri GXPs.[242]

D34 In its long-list consultation, Transpower asked whether stakeholders were aware of any new generation that would affect peak demand.[243] In response:

D34.1 Counties submitted that it was not aware of any proposed generation that would directly affect peak demand at Bombay GXP;[244] and

D34.2 Vector stated that it was difficult to say, given the uncertainty of adoption rates of new technologies during the calculation period.[245]

D35 We consider that it is unlikely that any generation that could affect the Project would be built in the Bombay-Otahuhu region in the foreseeable future. We are satisfied that, like demand, new generation in the region will not affect the need date for the Project.

Discount rate for net present value

D36 Transpower used the standard rate of 7% as the discount rate for the MCP and sensitivity tested this with 4% and 10% discount rates[246] in line with clause D7(3)(b) and (c) of Schedule D of the Capex IM, respectively.

Calculation period

D37 The Capex IM sets a calculation period of 20 years from the date of commissioning of the last asset but allows for an alternative period if significant electricity market

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[242] For generation to affect peak demand, it much be schedulable so that it can be brought into service when required. Wind generation and solar generation are not schedulable. There is no scope to build a hydro power station on the demand side of the Bombay or Wiri GXP.

[243] Long-list consultation document, above n 24, pg. 24.

[244] Counties long-list consultation response, above n 167, at pg. 2.

[245] Vector long-list consultation response, above n 174, at pg. 1.

[246] MCP, above n 1, *Attachment C: Options and Costing report*, at pg. 22.

benefits or costs element are expected to arise or be incurred after the default period.[247]

D38 Transpower used a calculation period out to the year 2050 to capture the costs and benefits over the expected life of the proposed investment. Transpower consulted on this as part of its long-list consultation.[248]

D39 Counties and Vector supported using a calculation period that finished closer to the expected life of the proposed investment. [249, 250]

D40 Under clause G5(11)(b) of Schedule G of the Capex IM, Transpower must provide the reasons for selecting a period other than 20 years. Transpower gave the following reasons for using the longer calculation period:[251]

> We have calculated costs and benefits over a 32-year calculation period from 2019-2050, as proposed in both our long-list and short-list consultations. This was in order to capture the costs and benefits over the useful life of the proposed investments. The dispatch benefits, in particular, are significant and a 32-year calculation period better reflects their long-term value. We consider this an appropriate trade-off between assessing benefits over the economic life of the investment and over-weighting future benefits with their inherent uncertainty.

D41 We agree that it is appropriate to capture the expected net electricity market benefits of the investment options over a longer period because of the significantly long lives of the assets that will be installed by the Project. On this basis, we are satisfied with Transpower's proposal to extend the calculation period to 2050.

Value of expected unserved energy

D42 Transpower selected and consulted on a non-standard value of expected unserved energy (or VoLL) equal to $26,400/MWh for Bombay and $27,800/MWh for Wiri.[252] Under the definition of 'value of expected unserved energy' in clause 1.1.5(2) of the Capex IM, these values are non-standard because they are higher than the 2004 value of $20,000/MWh specified in clause 4(a) of Schedule 12.2 of the Code.

D43 In its long-list consultation, Transpower advised that it had used the above VoLL values based on a recent Transpower study[253] estimating the VoLL for each GXP.[254]

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247 Capex IM, above n 2, cl 1.1.5.

248 Long-list consultation, above n 24, at pg. 24.

249 Counties long-list consultation response, above n 167, at pg. 1.

250 Vector long-list consultation response, above n 174, at pg. 1.

251 Above n 1, *Attachment C: Options and Costing report*, at pg. 23.

252 Clauses I2(2)(c) and I3(3)(d)(iii) of Schedule I of the Capex IM require Transpower to consult in its long-list and short-list consultations on a non-standard value of expected unserved energy Transpower proposes to use. In the short-list consultation, Transpower must also explain why the non-standard value is appropriate.

253 Transpower's VoLL study results are available at www.transpower.co.nz/VOLL2018.

254 Long-list consultation document, above n 24, at pg. 24.

D44 Transpower consulted on the above values along with values of $13,000/MWh and $39,000/MWh Transpower used in its sensitivity analysis. Counties agreed that the VoLL of $26,400/MWh was appropriate for Bombay GXP.[255]

D45 We accept Transpower's approach and use of the non-standard VoLL values set out above in paragraph D42. This is because, compared to using a single VoLL for the whole country under the Code, using a VoLL for a specific GXP better represents the economic value that a mix of consumers supplied from that GXP experience from an interruption to supply.[256]

Investment options Transpower considered and consulted on

D46 The Capex IM requires Transpower to consider and include in its MCP several investment options appropriate to the value of the estimated capital expenditure and the complexity of the investment need.[257]

D47 Table D3 below shows the investment options that Transpower considered for detailed analysis. The seven investment options can be summarised into the following two broad categories:

D47.1 refurbish and/or upgrade the existing 110 kV lines and dismantle lines that may not be needed; and

D47.2 establish a new 220 kV source of supply in the Bombay-Otahuhu region.

D48 We are satisfied that:

D48.1 the seven investment options Transpower considered in its short-list consultation meet the above requirement under the Capex IM; and

D48.2 the investment options Transpower considered in its short-list consultation are technically feasible options that would meet the MCP's investment need.

[255] Counties long-list consultation response, above n 167, at pg. 2.

[256] Some of these attributes are mix of consumer (commercial, industrial, residential etc), duration of the interruption, time of interruption such as the season, weekday or weekend and the time of day.

[257] Capex IM, above n 2, at cl 7.4.1(2).

Table D3: Investment options

Option number	Investment option	Description	PV of costs (2019 prices $m)
1	Maintain existing network	• Reconductor Otahuhu-Wiri line (similar capacity) • Reconductor Bombay-Wiri line section (similar capacity) • Install post-contingency automatic load shedding at Wiri and/or Bombay • Maintain Hamilton-Meremere B and Meremere-Takanini A lines • Maintain Bombay-Meremere A and Hamilton-Meremere A lines	55.6
2	New 220 kV connection at Bombay and supply Wiri from Otahuhu	• Reconductor Otahuhu-Wiri line (similar capacity) • Install post-contingency automatic load shedding at Wiri • Install 2 x 220/110 kV transformers at Bombay and connect to Otahuhu-Huntly 220kV line (new Bombay 220kV connection) • Dismantle Bombay-Wiri line section • Dismantle Hamilton-Meremere B and Meremere-Takanini A lines • Dismantle Bombay-Meremere A and Hamilton-Meremere A lines • Install a new bus at Hamilton substation	37.0
3	New 220 kV connection at Drury and supply Bombay via 110 kV from Drury and supply Wiri from Otahuhu	• Reconductor Otahuhu-Wiri line (similar capacity) • Install post-contingency automatic load shedding at Wiri • Install 2 x 220/110 kV transformers at existing Drury switching station • Reconductor Bombay-Drury line section and connect at Drury (increased capacity) • Dismantle Drury-Wiri line section • Dismantle Hamilton-Meremere B and Meremere-Takanini A lines • Dismantle Bombay-Meremere A and Hamilton-Meremere A lines • Install a new bus at Hamilton substation	53.0
4	Increase capacity of Otahuhu-Wiri line and maintain the other lines	• Reconductor Otahuhu-Wiri line (increased capacity) • Reconductor Bombay-Wiri line section (similar capacity) • Install post-contingency automatic load shedding at Bombay • Maintain Hamilton-Meremere B and Meremere-Takanini A lines • Maintain Bombay-Meremere A and Hamilton-Meremere A lines	34.5

Option number	Investment option	Description	PV of costs (2019 prices $m)
5	**Increase capacity of Otahuhu-Wiri and new 220/110 kV supply at Bombay via Otahuhu-Huntly line**	• Reconductor Otahuhu-Wiri line (increased capacity) • Install 2 x 220/110 kV transformers at Bombay and connect to Otahuhu-Huntly 220kV line (new Bombay 220kV connection) • Dismantle Bombay-Wiri line section • Dismantle Hamilton-Meremere B and Meremere-Takanini A lines • Dismantle Bombay-Meremere A and Hamilton-Meremere A lines • Install a new bus at Hamilton substation	37.6
6	Increase capacity of Otahuhu-Wiri line and new 220/110 kV supply at Drury to supply Bombay	• Reconductor Otahuhu-Wiri line (increased capacity) • Install 2 x 220/110 kV transformers at existing Drury switching station • Reconductor Bombay-Drury line section (increased capacity) • Dismantle Drury-Wiri line section • Dismantle Hamilton-Meremere B and Meremere-Takanini A lines • Dismantle Bombay-Meremere A and Hamilton-Meremere A lines • Install a new bus at Hamilton substation	53.7
7	Increase capacity of Otahuhu-Wiri line, and new 220/110 kV supply at Bombay, retain Bombay-Wiri line	• Reconductor Otahuhu-Wiri line (increased capacity) • Install 2 x 220/110 kV transformers at Bombay and connect to Otahuhu-Huntly 220kV line (new Bombay 220kV connection) • Reconductor Bombay-Wiri line section (similar capacity) • Dismantle Hamilton-Meremere B and Meremere-Takanini A lines • Dismantle Bombay-Meremere A and Hamilton-Meremere A lines • Install a new bus at Hamilton substation	56.9

D49 In developing the above investment options, Transpower consulted on and considered 30 long-list '*components of potential investment options'* to address the investment need, including transmission solutions and NTSs.[258] Transpower considered *components of potential investment options* because, due to the nature

[258] Long-list consultation document, above n 24, Table 4.1 at pgs. 13-19.

of this investment, more than one component could be required to form an investment option.

D50 Transpower classified the long-list options into the following broad categories:[259]

D50.1 NTSs, including generation, post contingency automatic load shedding, batteries and demand response;

D50.2 solutions within the distribution network;

D50.3 new transmission options; and

D50.4 refurbish, enhance, modify and/or upgrade existing assets.

D51 In response to Transpower's consultation on the long list of options:

D51.1 Counties submitted it would prefer to retain the Bombay GXP and consider another GXP at Drury in the future to reduce the high-impact, low probability (**HILP**) risk related to GXP failure;[260]

D51.2 Vector submitted that Transpower consider the option of a new 110/33kV GXP in the vicinity of Jerry Green St, Wiri, supplied from Otahuhu or Mangere and decommission the Wiri GXP;[261, 262] and

D51.3 Contact submitted that if the preferred option is a transmission solution, Contact would support an increase in transmission capacity to remove transmission constraints and to meet current and future demand at Bombay and Wiri GXPs.[263]

D52 In response to Transpower's invitation for information on NTS, included in the long-list consultation document, Contact submitted:[264]

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[259] Above n 24, Table 4.1 at pgs. 13-19.

[260] Counties long-list consultation response, above n 167, at pg. 1.

[261] Vector long-list consultation response, above n 174, at pg. 1.

[262] Transpower subsequently assessed this option but excluded it from the short list of options because of its cost. Transpower's analysis showed that the present value of the cost of this option is $129 million, which is significantly more expensive than the costs of the short-listed investment options. Refer MCP, above n 1, *Attachment C: Options and Costing report*, at pg. 17.

[263] Contact, *Long-list consultation: Bombay-Otahuhu regional Major Capex Project Investigation*, (7 February 2019), at pg. 1, available at: https://www.transpower.co.nz/sites/default/files/projects/resources/201902017%20BOB_OTA%20long%20list%20consultation.pdf.

[264] Contact, above n 263.

> Contact currently supplies energy to many sites in the Wiri and Bombay areas which have the potential to provide demand response for transmission and other market needs. The information provided by Transpower in the RFI document indicates that demand response could play a valuable role in deferring Transpower capital investment for 2-3 years, and Contact would certainly be interested in participating in an RFP process for transmission alternatives.

D53 We reviewed Transpower's long list of investment options. We are satisfied that the long list reflects an adequate number and a reasonable range of potential solutions that can meet investment need by the need date of the Project.

D54 Transpower refined its long list into a short list of seven investment options using the following criteria:[265]

D54.1 fit for purpose;

D54.2 technical feasibility;

D54.3 practical to implement;

D54.4 GEIP;

D54.5 system security; and

D54.6 indicative costs.

D55 Transpower consulted on the above short-listing criteria in its long list of options.[266] In response:

D55.1 Counties submitted that 'the criteria listed appears to be suitable';[267] and

D55.2 Vector submitted that the criteria should include 'Lowest initial and ongoing costs (including transmission charges) to affected parties and Transpower should be mindful of technology stranding risk when making its investment planning'.[268]

D56 We are satisfied with the approach Transpower used to develop the short list of options. Transpower has used similar criteria for other major capex proposals and the approach provides a realistic short list of investment options. The criteria are consistent with aspects of the evaluation criteria of the investment options set out in clause C2 of Schedule C of the Capex IM.

D57 Transpower consulted on its short list of options and its application of the investment test in December 2019. As part of its short-list consultation, Transpower outlined its approach to deriving the short list of options.[269]

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[265] MCP, above n 1, *Attachment C: Options and Costing report,* at pgs. 9-10.

[266] Long-list consultation document, above n 24, Table 4.1 at pg. 20.

[267] Counties long-list consultation response, above n 168, pg. 1.

[268] Vector long-list consultation response, above n 174*,* at pg. 1*.*

[269] Short-list consultation, above n 26, at pgs. 28-35.

D58 In response to the short-list consultation:

D58.1 Counties: [270]

D58.1.1 agreed with Transpower's approach to deriving the short list of options;

D58.1.2 expressed concerns with including load shedding as a solution for load growth; and

D58.1.3 considered that a 220 kV bus should be taken into consideration instead of tee connections.

D58.2 Meridian noted Transpower's plan to address any generation constraints at Karapiro and Arapuni power stations via 'special protection schemes' and advised that the capacity of Karapiro power station would increase to 112.5 MW after an upgrade scheduled to be completed in 2024;[271] and

D58.3 Vector submitted that removing the Bombay-Wiri 110kV circuits would leave Wiri GXP with significantly reduced resilience[272] compared to the current network arrangement and that Transpower should develop an option that would maintain the current level of security at Wiri.[273]

D59 Transpower subsequently added an investment option retaining the Bombay-Wiri line section.[274] Transpower's analysis showed that this option has a lower net electricity market benefit and is more costly than the proposed investment.

D60 We agree that the option of retaining the Bombay-Wiri 110 kV line section does not pass the investment test.

D61 In response to our draft decision, Vector submitted that: [275]

> Vector also has considerable concern that the proposed benefits of the project – including increased reliability fail to account for the loss in resilience from the new grid configuration. The decommissioning of the Bombay-Wiri 110KV circuits will limit the alternative supply options available to Transpower to supply the Wiri region.

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[270] Counties short-list consultation response, above n 240, at pg. 1.

[271] Meridian, *Bombay-Otahuhu Regional major capex project investigation consultation on short List of Investment Options*, (25 February 2020), at pg. 2, available at: https://www.transpower.co.nz/bombay-otahuhu-regional-investigation#downloads.

[272] Retaining these circuits will allow Transpower to supply Wiri from Bombay during a double-circuit outage event on the Otahuhu-Wiri line. See MCP, above n 1, at pg. 18.

[273] Vector short-list consultation response, above n 241, at pg. 1.

[274] Refer to option 7 in Table D3 below.

[275] Vector, n 13, at pg 2.

> Both Transpower and the Commission have suggested the MCP is an improvement for reliability given the new upgrading of the supply to Otahuhu will increase to 220KV. However, we see considerable risk with the de-commissioning of assets that were being used to supply a high growth corridor in Auckland.
>
> The separate alternative supply alternative to Wiri provided Auckland with far greater resilience to manage the impacts of significant climate events which have the potential to impact critical network elements such as transmission towers. Indeed, the effects of climate change can already be seen in recent natural events such as the recent damage to the Auckland harbour bridge and the 2016 state-wide blackout in South Australia where two tornadoes in quick succession were able to knock out transmission towers and disrupt transmission circuits supplying the South Australian grid. Under the MCP, Wiri will be solely supplied by a double circuit on single towers located in close proximity to the motorway.

D62 **Counties**[276] cross-submitted that it supports the concerns raised by Vector with regard to the decommissioning of the Bombay to Wiri/Otahuhu line and believes the nature of the concerns raised, especially the potential risk to service if an unprecedented (but growingly common) event were to impact customers on Vector's southern network, and as such, further engagement and investigation is required.

D63 In our draft decision, we stated that "it is open to Vector to contract separately with Transpower to retain the Bombay-Wiri line if resilience is an important consideration for Vector. This is something Vector and Transpower could negotiate before Transpower dismantles the line, and is not subject to the Capex IM".

D64 In response to our reference to a contract with Transpower, **Vector**[277] submitted that Vector does not consider the NIC as an effective alternative for maintaining the current resilience we have from the grid.

D65 As discussed in paragraphs B33 to B35, there are other financing alternatives that Vector can explore.

Our evaluation of the expected net electricity market benefits of each investment option

D66 In performing the investment test, Transpower must calculate the following for each investment option included in the MCP:

D66.1 the electricity market benefits and electricity market costs under the relevant demand and generation scenarios;

D66.2 the net electricity market benefit under the relevant demand and generation scenarios; and

D66.3 the expected net electricity market benefit.

[276] Counties, n 14, at pg 2.

[277] Vector, n 12, at pgs. 2–3.

D67 Under Schedule D of the Capex IM:

D67.1 'electricity market benefit element' means any of the market benefits received by consumers during the calculation period under the relevant demand and generation scenario that will affect net electricity market benefits;[278]

D67.2 'electricity market cost element' means any of the market costs incurred by consumers during the calculation period under the relevant demand and generation scenario that will affect net electricity market benefits;[279]

D67.3 the 'net electricity market benefit' is, in respect of an investment option applied to a demand and generation scenario, its aggregated quantum of each electricity market benefit or cost element less its aggregated quantum of each project cost;[280] and

D67.4 the 'expected net electricity market benefit', in respect of an investment option, is the weighted average of the net electricity market benefit under each relevant demand and generation scenario.[281]

D68 In evaluating Transpower's application of the investment test, we have assessed whether Transpower reasonably estimated the above elements for each investment option in the MCP

D69 Table D4 summarises the results of the investment test determined by Transpower.[282] This table shows the capital cost of new investments, the costs of refurbishing sections of the 110 kV lines connecting Bombay GXP with Hamilton and Arapuni GXPs (**Southern lines**), the dismantling costs of the 110 kV lines, and the estimated unserved energy costs as cost elements. The estimated unserved energy costs are shown relative to options 5, 6 and 7. These options include upgrading the Otahuhu-Wiri line.

Table D4: Transpower's calculation of the electricity market costs and electricity market benefits ($ million 2019 prices) of each investment option

	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7
Capital cost of investment options	33.6	**37.0**	53.0	34.5	**37.6**	53.7	56.9

[278] Capex IM, above n 2, at cl D4(1) o.

[279] Clause D4(1)

[280] Clause D2(2).

[281] Capex IM, above n 2, at cl D2(1).

[282] MCP, above n 1, *Attachment C: Options and Costing report*, at Table 9, pg. 29. Note that Transpower's formula for calculating the total cost in Table 9 is incorrectly stated, but the result is correct.

	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7
Refurbishing cost of lines South of Bombay	22.0	0	0	22.0	0	0	0
Dismantling 110 kV lines	0.0	6.4	5.5	0.0	6.4	5.5	3.4
Operating costs	4.7	0.7	0.9	4.7	0.7	0.9	1.3
Dispatch cost difference (benefit)	0.0	22.0	22.0	1.4	22.0	22.0	22.0
Estimated unserved energy costs	0.5	1.6	1.6	0.3	0.0	0.0	0.0
Total costs	60.8	**23.8**	39.1	60.1	**22.8**	38.1	39.6
Net benefit (relative to base case)	0.0	37.1	21.8	0.7	38.0	22.7	21.2

Our evaluation of Transpower's calculations of the electricity market benefits

D70 Clause D4(1) of the Capex IM provides a list of the electricity market benefits that Transpower may consider in the investment test.

D71 Transpower considered and assessed the following categories of electricity market benefits as the most relevant to the MCP's proposed investment:[283]

D71.1 'estimated unserved energy costs';[284] and

D71.2 reduction of transmission losses by considering dispatch cost difference.[285] Dispatch cost difference is the present value of dispatch costs (the variable fuel costs of generation) as modelled across the different options.[286, 287]

[283] MCP, above n 1, *Attachment C: Options and Costing report*, at pgs. 22-28.

[284] At Table 6, pg. 26.

[285] Capex IM, above n 2, at cls D4(1)(g) and D4(1)(e).

[286] MCP, above n 1, *Attachment C: Options and Costing report*, at pg. 27.

[287] Transpower calculated dispatch cost difference using the North Island short-run marginal cost of generation for the corresponding load block, month, and inflow sequence. The cost difference represents the total cost difference due to transmission loss savings and displacing expensive thermal generation.

D72 Transpower estimated the expected costs of unserved energy and reduction in transmission losses at peak demand rather than for each demand scenario for the following reasons:

D72.1 while the 'estimated unserved energy costs' varies with peak demand assumptions, Transpower considered that using demand in the sensitivity analysis adequately covers the impact of costs due to changes in demand; and

D72.2 the 'reduction of transmission losses' is not affected by the demand scenarios because there are no material changes in generation during the calculation period.

D73 We consider that the above categories of electricity market benefits and costs are relevant to the investment options. Transpower has calculated the 'estimated unserved energy costs' as the present value of the economic cost of an interruption to electricity supply.[288] This approach assumes that the system operator will supply demand above the N-1 limit of the circuits and demand will be curtailed if there is a fault on one of the circuits.

D74 In assessing Transpower's application of the investment test, we calculated the 'estimated unserved energy costs' in terms of 'avoided cost of involuntary demand curtailment'. We consider that this approach provides a better indication of the expected market benefits provided by each of the investment options. This is because the approach estimates the cost of involuntary demand curtailment if the existing network capacity is retained and reflects Counties submission expressing its concerns with including load shedding as a solution for load growth discussed in paragraph D58.1.2.

D75 We estimated the value of 'avoided cost of involuntary demand curtailment' using the following approach:

D75.1 we forecasted demand using the 2019 actual demand for the Bombay and Wiri GXPs available from the Electricity Authority's Electricity Market Information data;[289]

D75.2 we used the North Island growth rates in EDGS to forecast growth at Wiri and Bombay GXPs;[290]

D75.3 to allow for the curtailing impact of Covid-19 on electricity demand growth, we assumed there will be no growth in electricity demand until 2025 and demand in the region will remain at current levels. We have made this

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288 MCP, above n 1, *Attachment C: Options and Costing report*, at pg. 29.

289 Electricity Authority, *Market Insights*, The Electricity Market Information, available at: www.emi.ea.govt.nz.

290 EDGS, above n 229, at pg. 24.

assumption for the purposes of calculations and if the actual demand differs from the forecasts then the results of the analysis are unlikely to change;

D75.4 we assumed that any demand above the transmission capacity will be curtailed; and

D75.5 we assessed the demand that is expected to be curtailed for each scenario and used Transpower's proposed non-standard VoLL values outlined above at paragraph D42 to estimate the expected 'avoided cost of involuntary demand curtailment' due to the proposed project. We note that we will not necessarily use Transpower's GXP based VoLL when assessing future MCPs. This is because VoLL depends on a range of factors and we would decide on the VoLL on a case by case basis.

D76 Table D5 shows our assessed expected market benefits. Since our estimated expected 'avoided cost of involuntary demand curtailment' is more than seven times the dispatch cost difference, we did not assess Transpower's calculation of the dispatch costs and instead used Transpower's estimates in our assessment of 'Total expected market benefits'. The Total expected market benefits for each option is the average of the net electricity market benefit under each relevant demand and generation scenario.

Table D5: Expected electricity market benefits ($m 2019 prices)

	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7
Avoided cost of involuntary demand curtailment	0.0	108.4	108.4	166.1	166.6	166.6	166.6
Dispatch cost difference (benefit)	0.0	22.0	22.0	1.4	22.0	22.0	22.0
Total expected market benefits relative to option 1	0.0	130.4	130.4	167.5	**188.6**	188.6	188.6

D77 **Vector**[291], in its submission stated that it also has considerable concern that the proposed benefits of the project – including increased reliability, fail to account for the loss in resilience from the new grid configuration. The decommissioning of the

[291] Vector, n 12, at pg. 2.

Bombay-Wiri 110kV circuits will limit the alternative supply options available to Transpower to supply the Wiri region.

D78 In response to Vector's submission, Transpower[292] provided a high-level assessment of the benefits of retaining the Bombay-Otahuhu line section. Transpower's assessment shows that the benefits of retaining the line are much less than the cost of retaining it. We have assessed Transpower's calculations and agree with their assessment of the benefits of keeping the line section.

D79 Since we note that Counties, Transpower and Vector can jointly agree on a strategy for the Bombay-Wiri line section, we consider that Vector can discuss its assessment of the benefits of retaining this line with the affected parties.

Our evaluation of Transpower's assessment of the electricity market costs

D80 Clause D4(1) of the Capex IM provides a list of the electricity market cost or benefit elements that Transpower can consider in applying the investment test. Transpower identified the following electricity market cost elements:[293]

D80.1 capital cost of the investment options;

D80.2 cost of expected modelled projects during the calculation period under the relevant demand and generation scenario; and

D80.3 operating and maintenance costs of all potential investments over the calculation period.

Evaluation of the capital costs of the proposed investment

D81 We discuss our approach to evaluating the capital cost of the proposed investment in paragraphs C19 to C41 of Attachment C.

Evaluation of the capital costs of other investment options

D82 The capital costs of the other investment options include the following cost components:

D82.1 cost of reconductoring the existing 110 kV lines;

D82.2 cost of upgrading (increasing the capacity of) the existing 110 kV lines;

D82.3 cost of a new 220 kV connection at Drury;

D82.4 cost to increase the capacity of Otahuhu-Wiri line; and

D82.5 cost of retaining the Bombay-Otahuhu A line.

[292] Transpower, above n 13.

[293] MCP, above n 1, *Options and Costing report*, at pgs. 24 to 28.

D83 We reviewed the costs that Transpower used for the above cost components based on costs of similar projects, noting that there is less information available on the costs of these options.

D84 We are satisfied with the costs Transpower has used except for the cost of reconductoring the Otahuhu-Wiri line. For the Otahuhu-Wiri line, the unit cost of reconductoring with a modern equivalent conductor[294] is much higher than the unit costs for reconductoring other lines.[295] Transpower advised that the reasons for the higher unit costs are:

D84.1 the Otahuhu-Wiri line has significant underbuild[296] and would require specialist equipment (CSS) for the reconductoring. This will require strengthening the line's towers both for stringing with the modern equivalent conductor and the larger conductor options;

D84.2 the costs of strengthening the towers and the CSS increases the unit cost of reconductoring this line; and

D84.3 since this line is about 5km, the cost of overheads increases the unit rate compared to longer lines.

D85 We are satisfied with the capital costs Transpower has used in the investment test.

Evaluation of the estimated costs of modelled projects

D86 Modelled projects are assets that are not part of the investment option but are likely to exist during the calculation period and the likelihood, nature and timing of the future assets are affected by the investment option proceeding.[297]

D87 The modelled projects for options 1 and 4 are to refurbish the Southern lines, comprising:[298]

D87.1 BOB-MER line that carries part of the Arapuni-Bombay circuit;

D87.2 ARI-HAM line that carries part of the Arapuni-Bombay circuit;

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294 A modern 'equivalent conductor' is a modern conductor with the similar rating and specification as the conductor installed now.

295 Transpower has assessed the unit rate for reconductoring with a modern equivalent conductor as $1.2 million per km and the cost of upgrading as $2.5 million/km for all lines connecting to the Bombay GXP. The exception is the unit rate of reconductoring the Otahuhu-Wiri line with a modern equivalent conductor is $2.3 million. The unit cost of reconductoring the Otahuhu-Wiri line to a higher capacity would be similar to the equivalent unit costs for the other lines.

296 Underbuild are structures built underneath or close to the transmission line.

297 See above n 230 for the definition of 'modelled project' under clause 1.1.5(2) of the Capex IM.

298 In many cases transmission lines have different names to the circuits they carry. The lines are physical structures and the name usually reflects the two stations to which the lines originally interconnected. The circuit names denote the stations that are connected. Circuit names change as new stations are built and connected, whereas the lines names remain unchanged.

D87.3 MER-TAK line that carries part of the Bombay-Hamilton circuits; and

D87.4 MER-HAM line that carries part of the Bombay-Hamilton circuits.

D88 Transpower has advised it may need to undertake the following work within the calculation period of the investment test:[299]

D88.1 the BOB-MER A line: the line is approximately 16km from Bombay to Meremere. Only one circuit is currently in use, and, if retained, only one circuit would be reconductored. The line's towers and foundations would require an upgrade to meet design standards. The $20.4m estimate used in the investment test for Transpower's short-list consultation reflects the planning-level costs of installing Goat conductors at $1.3m/km for largely rural 110kV single circuit towers with some wet ground areas, which have higher foundation and access costs;

D88.2 ARI-HAM A line: Transpower's 2019 *Transmission Planning Report* noted the probable outcome was to connect this line to Hamilton substation and dismantle the section between Hamilton and Bombay. Transpower's costings do not fully reflect the costs of retaining this line in perpetuity. The only included cost is connecting to Hamilton for $1.5m. Parts of this line were built in 1927 and it would need a substantial rebuild to meet current design criteria. Transpower considers it unlikely that refurbishing or rebuilding the line would be economically viable; and

D88.3 MER-TAK A & HAM-MER B lines: the cost estimate of $14m is to undertake tower and foundation remediation on these lines after 2030. However, Transpower will potentially decommission these lines around 2030. Until then, maintenance will be limited to activities necessary to keep the lines serviceable. By 2030, if the lines are to be retained, the condition of these lines is expected to have reached a point at which significant intervention will be required.

D89 The modelled projects for investment options 2, 3, 5, 6 and 7 are dismantling the Southern lines.[300] The Southern lines will be not be required to supply Bombay GXP once the Project is commissioned so the timing of these modelled projects is independent of any electricity demand and generation scenarios.

D90 We are satisfied with Transpower's assessment of the cost of the modelled projects. These costs are included in the investment test as 'Dismantling 110 kV lines' and shown in Table D4 above.

D91 Table D6 summarises the estimated capital cost of investment options and modelled projects listed in paragraph D87.

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[299] Transpower email (Re: BOBOTA meeting from Jeff Edhouse) dated 13 October 2020.

[300] MCP, above n 1, *Attachment C: Options and Costing report*, at pgs. 20-21.

Table D6: Cost of refurbishing the 110 kV lines ($ million in 2019 prices)

Circuit/substation	Line	Length km	Year of intervention/ works	Expected capital or refurbishment cost $m 2020 prices	Expected dismantling cost $m 2020 prices
Cost components for Investment options					
New 220/110 kV connection at Drury	Deviate section of the Bombay-Wiri line into Drury	NA	2023	27.75	NA
Increase capacity of Otahuhu-Wiri	Bombay-Otahuhu (Otahuhu-Wiri line)	5	2024	12.7	NA
Otahuhu-Wiri	Bombay-Otahuhu (Otahuhu-Wiri line)	5	2024	11.6	NA
Bombay-Wiri	Bombay-Otahuhu (Bombay-Wiri line)	25	2024	23.9	3.8
Model projects					
Arapuni-Bombay circuit refer to paragraphs D87.1 and D87.2	Bombay-Meremere A Hamilton-Meremere A	83	2026	21.9	2.6
Bombay-Hamilton 1 & 2	Meremere-Takanini A Hamilton-Meremere B	77	2030	14	3.2

Evaluation of operating and maintenance costs

D92 Transpower based its estimate of the operating and maintenance costs (**O&M**) of each investment option on its experience and historical data, estimating an O&M cost of $2,000 per km of line per annum.[301] This rate is consistent with Transpower's average O&M cost for such lines.

D93 We are satisfied that the unit rate for O&M is reasonable.

D94 We are also satisfied that the above electricity market cost elements are relevant to the investment options.

Review of the net electricity market costs

D95 As mentioned above in paragraph D67, the 'net electricity market benefit' is, in respect of an investment option applied to a demand and generation scenario, the

[301] MCP, above n 1, *Attachment C: Options and Costing report*, at pg. 27.

aggregated quantum of each electricity market benefit or cost element (minus) less its aggregated quantum of each project cost.[302]

D96 In assessing Transpower's calculation of the 'net electricity market benefit' we note that:

D96.1 the electricity market costs are the same for each electricity demand and generation scenario because the electricity market costs for this MCP are independent of the electricity demand and generation scenarios;

D96.2 therefore, for each investment option, we can estimate the net electricity market benefit by subtracting the relevant project cost and the electricity market costs from the average of the electricity market benefits determined for each demand and generation scenario; and

D96.3 since the scenarios have equal weighting, the net electricity market benefits and the expected net electricity market benefits are the same.

D97 Table D7 shows our assessment of the net electricity market costs for each of the seven investment options.

Our review of the expected net electricity market benefit of each investment option

D98 The primary function of the investment test is calculating the expected net electricity market benefit of each investment option.[303] The 'expected net electricity market benefit' in respect of an investment option is the weighted average of the net electricity market benefit under each relevant demand and generation scenario.[304]

D99 Transpower performed the investment test as described above except it calculated unserved energy costs relative to that of investment option 1. Because electricity markets costs are independent of EDGS, Transpower also simplified the calculation of the 'expected net electricity market benefit' for each investment option as 'expected electricity market benefit' less 'expected electricity market costs' less the 'capital costs'. This assumes that all the EDGS scenarios are equally weighted.

D100 Table D7 below set out the results of our evaluation of Transpower's application of the investment test to the investment options.

D101 The results show that option 5 has the highest expected net electricity market benefit. Transpower selected option 5 as the proposed investment for the MCP based on its calculations of the expected net electricity market benefit and using unquantified benefits.[305] Our results show that consideration of unquantified

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302 Capex IM, above n 2, at cl D2(2) of Schedule D.

303 Clauses D1(1), D2(1), and D3(1) of Schedule D.

304 Clause D2(1) of Schedule D.

305 MCP, above n 1, at pgs.31-32. Clause D1(c)(ii) of the Capex IM allows consideration of unquantified benefits in addition to quantified benefits if Transpower wants to select an option that does not have the highest expected net electricity market benefits.

benefits is not required because Transpower is selecting the option with the highest expected net electricity market benefit.

Table D7: Expected net electricity market benefits ($m 2019 prices)

	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7
Expected electricity market benefits[306]	0.0	130.4	130.4	167.5	188.6	188.6	188.6
Expected Electricity market costs	26.7	7.1	6.4	26.7	7.1	6.4	4.7
Capital cost of investment options	33.6	**37.0**	53.0	34.5	**37.6**	53.7	56.9
Expected net electricity market benefits	-60.3	86.3	71.0	106.3	**143.9**	128.5	127.0
Transpower's expected net electricity market benefits relative to base case and with post contingency load shedding	0.0	37.1	21.8	0.7	**38.0**	22.7	21.2

Transpower's selection of the proposed investment is consistent with the Capex IM

D102 We are satisfied with Transpower's selection of option 5 as the proposed investment for the MCP since this investment option has the highest expected net electricity market benefit under the Capex IM.

D103 In response to Transpower's long-list consultation, Vector submitted that Transpower should include lowest and ongoing costs to affected parties among the criteria.[307] We note that option 2 has a slightly lower cost than option 5.

[306] Expected net electricity market benefits are relative to option 1.

[307] Vector long-list consultation response, above n 174, at pg. 1.

D104 The difference in costs is because in option 2 Transpower would investigate the scope and costs of replacing the conductor on the Otahuhu-Wiri line with a modern equivalent. In option 5, Transpower would investigate upgrading the capacity of the line with a larger conductor.[308]

D105 Consequently, option 2 has a lower cost than option 5 and we are mindful that Vector may prefer option 2 for this reason. Our approval of option 5 does not exclude Vector from pursuing its preference for option 2 with Transpower if that is the case. This is because, if we make a final decision to approve this MCP, that would not cover the costs of reconductoring the Otahuhu-Wiri line.

D106 We note that:

D106.1 Transpower can provide post-contingency load shedding via a special protection scheme (**SPS**), which would allow it to operate the Otahuhu-Wiri line above the N-1 limit and shed load if one of the circuits fails while the demand is above the N-1 limit. Because of the short length of this line, Transpower considers that the probability of failure of this circuit is low;

D106.2 an SPS would significantly reduce the difference in the expected net electricity market benefits between option 2 and option 5. Transpower has calculated that difference at $1.6 million; and

D106.3 a disadvantage of option 2 is that demand would have to be restricted to a lower level compared to option 5 when one the circuits on the Otahuhu-Wiri line is out for maintenance or is otherwise out of service.

The proposed investment is robust to sensitivity analysis

D107 The Capex IM requires Transpower to perform a sensitivity analysis to test whether the proposed investment is robust to some of the key assumptions.[309] The Capex IM also lists the parameters that must be varied to assess whether the results of the investment test are robust to variations.[310] These parameters reflect the key assumptions that can have a significant impact on the results of the investment test.

D108 Transpower has provided the results of its sensitivity analysis in the MCP Options and Costing report.[311]

D109 Table D8 below sets out the parameters Transpower applied for its sensitivity analysis and our assessment of them. As set out in Table D8, we are satisfied that the parameters Transpower used for its sensitivity analysis are reasonable.

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[308] The MCPO for option 2 is to investigate the scope and costs of reconductoring the Otahuhu-Wiri line with a modern equivalent conductor.

[309] Capex IM, above n 2, at cl D7 of Schedule D.

[310] Clause D7(1) of Schedule D.

[311] MCP, above n 1, *Attachment C: Options and Costing report*, at pgs. 30-31.

D110 The summary of Transpower's sensitivity analysis is available in Table 10 of the MCP Options and Costing report.[312] We assessed the robustness of the proposed investment to sensitivity analysis by considering whether option 5 provided the highest electricity market benefit under most of Transpower's parameters.

D111 Transpower's results show that options 2 and 5 retain the highest expected net electricity market benefits for all parameters of the sensitivity analysis. On this basis, we are satisfied that Transpower's sensitivity analysis confirms that the proposed investment is robust to sensitivity analysis.

Table D8: Parameters Transpower used for sensitivity analysis and our assessment

Parameter under Schedule D of the Capex IM	Included/not included in sensitivity analysis	Our assessment
Clause D7(1)(a) – forecast demand	Performed analysis for high Bombay regional demand and low Bombay regional demand	The two parameters did not affect the value of the expected net electricity market benefit.
Clause D7(1)(b) the size, timing, location, fuel costs and operating and maintenance costs, relevant to existing assets, committed projects, modelled projects and the investment option in question	Not included	Reasonable since these parameters are not relevant to the investment options.
Clause D7(1)(c) – the capital cost of the investment option in question and modelled projects	Included as upper range and lower range of capital cost estimate	Reasonable. The results do not affect the ranking of the options.
Clause D7(1)(d) – the timing of decommissioning, removing or de-rating of decommissioned assets	Not included	Reasonable since the timing of the decommissioning of the 110 kV lines does not affect the market costs of the investment options.
Clause D7(1)(e) – the value of unserved energy	Tested with the VoLL of +50%	Reasonable and did not affect the ranking of the investment options.
Clause D7(1)(f) – discount rate	Included as 4% and 10%	Reasonable and did not affect the ranking of the investment options.
Clause D7(1)(g) – range of hydrological inflow sequences	Not included	Reasonable. This parameter could affect losses, but the impact would be marginal.
Clause D7(1)(h) – relevant demand and generation scenario probability weightings	Not included	Reasonable. There is no valid reason to test with different scenario ratings.
Clause D7(1)(i) – competition effects of the investment option in question	Not included	Reasonable. There is unlikely to any significant competition benefits.

[312] At pg. 31.

Parameter under Schedule D of the Capex IM	Included/not included in sensitivity analysis	Our assessment
Clause D7(1)(j) – other variables that Transpower considers uncertain	Not included	Reasonable given that there are no other parameters that significantly affect the results of the investment test.

Attachment E: Acronyms, abbreviations, and terms

Purpose of this attachment

E1 This attachment lists the acronyms, abbreviations, and terms used in this paper in Table E1 below.

Table E1: Acronyms, abbreviations, and terms

Abbreviation	Definition
2012 Capex IM reasons paper	Commission's *Transpower Capital Expenditure Input Methodology Reasons Paper*, 31 January 2012
2017/18 Capex IM review reasons paper	Commission's *Transpower capex input methodology review - Decisions and reasons* paper, 29 March 2018
ACSR	Aluminium conductor steel reinforced – a type of conductor used on electricity lines
Act	Commerce Act 1986
ARI-HAM line	Arapuni-Hamilton A line that carries part of the Arapuni-Bombay circuit
BOB-MER line	Bombay-Meremere A line that carries part of the Arapuni-Bombay circuit
Capex IM	*Transpower Capital Expenditure Input Methodology Determination 2012* [2012] NZCC 2
CEO	Chief Executive Officer
Code	Electricity Industry Participation Code 2010
Commission	Commerce Commission
Consumer	means a person that consumes or acquires regulated goods or services
Contact	Contact Energy Limited
Counties Power	Counties Power Limited
Covid-19	Coronavirus or SARS-CoV-2 virus
CSS	Catenary Support System, which is a system used to replace wires on transmission lines
Customer	means any generator, EDB, consumer, or other entity in New Zealand that is connected, or applies to be connected, to the grid
EDGS	Electricity demand and generation scenarios as published by MBIE in July 2019 at: https://www.mbie.govt.nz/building-and-energy/energy-and-natural-resources/energy-statistics-and-modelling/energy-modelling/electricity-demand-and-generation-scenarios/
EMC	Exempt major capex means the amount of the MCA to which the major capex incentive rate does not apply, as determined by the Commission
GEIP	Good electricity industry practice as defined in clause 1.1.5(2) of the Capex IM
GRS	Grid reliability standards under Schedule 12.2 of the Code
GXP	Grid exit point
HILP	High impact, low probability (eg, in relation to a risk)

Abbreviation	Definition
IMs	Input methodologies under Part 4 of the Act
IPP	*Transpower Individual Price-Quality Path Determination 2020* [2019] NZCC 19
Lines works	The Project's major capex output covering lines work connecting Bombay GXP to a 220 kV line running near the Bombay GXP
Long-list consultation	Transpower's consultation on its long list of options to meet the investment need of the MCP
Long-list consultation document	Transpower's *Bombay Otahuhu Regional major capex project Long-list consultation and non-transmission solution request for information*, May 2020
MCA	Major capex allowance means the amount of major capex approved by the Commission in relation to a major capex project
MCA-EMC	The major capex allowance minus the exempt major capex
MCP	Transpower's major capex proposal – *Bombay Otahuhu Regional major capex project*, May 2020
MCPO	Major capex project output
MER-HAM line	Meremere-Hamilton B line that carries part of the Bombay-Hamilton circuits
MER-TAK line	Meremere-Takanini A line that carries part of the Bombay-Hamilton circuits
MBIE	Ministry of Business, Innovation and Employment
MW	Means megawatt, which is a measure of power
MWh	Means megawatt hours and is a measure of energy
N-1 criterion of the GRS	The GRS standard at clause 2(2)(b) of Schedule 12.2 of the Code that provides that with all assets that are reasonably expected to be in service, the power system would remain in a satisfactory state following the tripping of one of the transmission assets in the core grid
Need date	The date by which the Project must be delivered to meet the investment need
NIC	Transpower's New Investment Contract
NTS	Non-transmission solution
NZTA	New Zealand Transport Agency
O&M	Operating and maintenance costs
Otahuhu-Wiri line	Otahuhu-Wiri section of the Bombay-Otahuhu A 110 kV transmission line
Overhead estimate	Cost estimates for Project overheads and risks
Part 4	Part 4 of the Act
Project	The Bombay Otahuhu Regional major capex project proposed in this MCP
Project risk	Uncertainty quantified and included in the MCA reflecting risks in delivering the Project
Quantity	Quantity associated with each work package used to derive the scope of works and base estimate of the Project cost

Abbreviation	Definition
Reconductoring	Replacing the wire and increasing the capacity of the Otahuhu-Wiri line
RFI 01	Transpower's response to our request for information #1
RFP	Request for proposal
Scope risk	Uncertainty quantified and included in the MCA reflecting uncertainties in the identified work packages or quantities for the Project
Short-list consultation	Transpower's consultation on its short list of investment options for the MCP
Short-list consultation document	Transpower's *Bombay Otahuhu Regional major capex project – consultation on short list of investment options*, December 2019
Southern lines	the 110 kV lines connecting Bombay GXP with Hamilton and Arapuni GXPs
SPS	Special protection scheme provided by Transpower
SSR	Transpower's Solution Study Reports providing analysis for the MCP
SSR estimate	Cost estimates based on work packages and quantities identified in the SSR.
Stations	Power station or substation, depending on the context
Substation works	The Project's major capex output covering the substation work at Transpower's Bombay GXP
TEES	Transpower's Enterprise Estimation System
Transpower	Transpower New Zealand Limited
Transpower IMs	*Transpower Input Methodologies Determination 2010* [2012] NZCC 17
TPM	Transmission pricing methodology is the methodology by which Transpower prices its transmission services developed in accordance with subpart 4 of Part 12 of the Code and specified in Schedule 12.4 of the Code
TWh	Terawatt hours and is a measure of energy
Vector	Vector Limited
VoLL	Value of expected unserved energy, which under clause 1.1.5(2) of the Capex IM, is: (a) the 2004 value of $20,000/ MWh currently specified in clause 4(a) of Schedule 12.2 of the Code; or (b) another appropriate cost per megawatt hour.
Works estimate	Cost estimate based on work packages and their associated quantities and excludes overhead estimates.
Work package	An itemised package of work inputs that, together with other such packages, comprises the scope of works from which the base estimate of the Project cost is formed.