



TRANSPower

Keeping the energy flowing

Waikoukou
22 Boulcott Street
PO Box 1021
Wellington 6140
New Zealand
P 64 4 495 7000
F 64 4 495 6968
www.transpower.co.nz

4 March 2021

Dane Gunnell
Manager – Price-quality regulation
Commerce Commission
44 The Terrace
Wellington

Dear Dane

Bombay-Otahuhu Regional Major Capital Proposal: Response to Questions from the Commerce Commission dated 11 February

We welcome the opportunity to respond to the questions raised by the Commerce Commission on 11 February.

Commerce Commission **questions** are in *blue* font followed by Transpower's response in black. We have reordered the first two questions for ease of answering.

- 1. What is the indicative date for when the OTA-BOB line reaches its 'end of life', taking into account aspects such as safety, operational and financial considerations (i.e. the date that these assets need to be replaced if the line is to remain in service)? Please provide the key drivers and indicative dates separately for the OTA-WIR and WIR-BOB sections of this line.*

In Attachment B of our Proposal, we explained that extensive testing and monitoring of the BOB-OTA line has demonstrated that the condition of the conductor meets our replacement criteria now. Quoting from our Proposal:

"Until the conductor is replaced or removed, a programme of inspections and repairs is required on the BOB-OTA A line to manage the risk of failure. This is likely to be in the form of regular close aerial inspections and conductor repairs, as required. The difficulty with detecting defects on the conductor combined with the public safety implications, land use under the line and increasing demand on the transmission system is such that continuing to manage issues with inspection and corrective maintenance will be expensive. It will also not adequately address the risk of conductor failure in the medium to long-term."

The conductors on this line meet our replacement criteria due to corrosion. In order to extend the conductor life we are investing \$1m over the next two years to address the most significant conductor corrosion defects. However, our conductor condition inspections indicate that with further aging and defects emerging, this remedial work is not an economic solution for an asset nearing end of life.

In deciding how long this approach is plausible for, we consider factors such as:

- widespread degradation, raising risk of reliability,
- changing land use under and around this transmission line;
- an increasing joint failure risk; and

- an increasing risk of interruption to other services and infrastructure (e.g. roads and motorways).

Our assessment is that the BOB-OTA cannot be prudently and safely managed through spot, remedial repairs beyond 2024.

The OTA-WIR section of the line has a higher concentration of defects and our plan is to replace this section of transmission line first and we have sequenced our work programme to meet this timing. This work programme is:

- Complete the works at Bombay and commission the new 220kV connection by 30 June 2023.
- Having the Bombay works in place enables us to undertake and complete the OTA-WIR reconductoring by 30 Nov 2023.
- Dismantling of the BOB-WIR section of the line can then commence in early 2024 and is scheduled to be completed by 30 June 2025

2. What is the 'need date' for the transformer works at Bombay GXP for the purposes of:

- The BOB-OTA MCP (i.e. undertaken as enabling works for the OTA-WIR reconductoring)
- The forecast demand (i.e. for supplying Counties Power) – this may be an indicative range of dates to reflect forecast scenarios.

As described above, the need date for the Bombay works is 30 June 2023, as this then enables us to disconnect the Bombay-Wiri line and begin dismantling it in 2024.

Concurrently, load growth at Bombay is high and transmission constraints could potentially appear as early as 2022.

We refer you to our most recent [Transmission Planning Report](#), section 8.4.2.2:

Capacity constraints

The Wiri and Bombay loads are supplied via two 110 kV Bombay–Wiri–Otahuhu circuits and three 110 kV circuits from the Waikato region. Power generally flows from both the Otahuhu and Waikato ends into Wiri and Bombay. During low generation in the Waikato 110 kV system, more power flows from Otahuhu to Wiri and Bombay, potentially exceeding the n-1 capacity of the Otahuhu–Wiri section. We investigated this issue in the context of other related 110 kV issues in the Waikato and Central North Island regions.

We implemented variable line rating on the Otahuhu–Wiri Tee sections in 2015 to provide additional capacity and defer major investments. However, there is potential for n-1 capacity issues on the circuits during peak load periods from 2022.

Given implications and limited scope of further operational interventions, such as reconfiguring the 110kV network for N security operation at peak times, investment timing should be driven by the need date. This suggests the earliest projected demand need date is 2022 for our new 220kV connection at Bombay. In addition, the connection must be commissioned by the condition-based need date for the BOB-WIR line disconnection by 2024.

3. Can you confirm the estimated timing of when the Bombay and Wiri GXPs will change from Interconnection to Connection assets, resulting from the BOB-OTA MCP, and also the intended dismantling of BOB-WIR lines?

Currently, the Wiri GXP is a connection node and will remain as such when the BOB-WIR line has been disconnected.¹

The Wiri Tee (towers 117A and 117B) will become a connection node after the Bombay- Wiri line has been disconnected in the second half of calendar year 2024 (FY2024/25).² This will result in the OTA-WIR lines becoming a connection link for TPM charging purposes on 1 April 2026.

The Bombay GXP will remain an interconnection node until all 110kV transmission lines are disconnected from Bombay. At this stage the expected schedule is to decommission the BOB-MER 'A' and HAM-MER 'A' line by 2028 and the MER-TAK 'A' and HAM-MER 'B' line by 2032. The timing for the second line is condition dependent and may be brought forward, but we do not expect this to occur before 2028. We anticipate that the Bombay GXP will become a connection node for TPM charging purposes on 1 April 2032 following the expected disconnection of MER-TAK 'A' line, or as early as 2030 if that disconnection is advanced.

4. Can you confirm the project's impact on transmission charges for each of Vector and Counties Power (i.e. a comparison of before and after the BOB-OTA project)?
 - applying the current TPM to determine the annual connection and interconnection charges (please identify separately)
 - an indicative view on the changes that will occur to the [connection](#) charges under the new TPM

We have not yet applied for an amendment to the major capital project to deliver the OTA-WIR reconductoring, however we are preparing a grid output amendment to do so. At the time of writing, we would expect the major capex allowance to increase approximately \$16 million for those works. Using that figure, we have estimated the impact of both the Proposal and grid output amendment on Vector's and Counties Power's transmission charges. The following dates for completing works and the Pricing Year the changes would take effect are reflected in the tables that follow:

¹ For the purposes of the TPM, we stop directly charging the customer directly for connection assets once they are disconnected, as opposed to decommissioned.

² The line will be decommissioned in 2025.

Assumptions	Effective Date	Pricing change takes effect in PY	Comments
BOB works commissioned	Jun-23	2023/24	The BOB substation is currently an interconnection node. The BOB works are on the 220/110 kV level and assets created by this project are interconnection
OTA-WIR works commissioned	Nov-23	2023/24	The BOB-OTA line including the OTA-WIR section is currently interconnection. The OTA-WIR section will remain interconnection after the reconductoring
BOB-WIR line decommissioned	Jun-24	2025/26	Disconnection of the BOB-WIR section will reclassify the OTA-WIR line to connection, allocated to Vector at WIR including associated switchgear at OTA and proportion of the substation.
BOB-HAM decommissioned	Jun-28		
TAK-HAM decommissioned	Jun-32	2033/34	Disconnection of the BOB-HAM and TAK-HAM lines from BOB will change the classification of BOB to connection, allocated to Counties Power.

	Bombay Works (\$ change)								
	Vector			Counties Power			Total for Vector & Counties Power		
	Interconnection		Connection	Interconnection		Connection	Interconnection		Connection
	RCPD, MW	\$ '000	\$ '000	RCPD, MW	\$ '000	\$ '000	RCPD, MW	\$ '000	\$ '000
2022/23	1,614	0	0	100	0	0	1,714	0	0
2023/24	1,614	480	0	100	30	0	1,714	509	0
2024/25	1,614	487	0	100	30	0	1,714	517	0
2025/26	1,614	493	0	100	30	0	1,714	524	0
2026/27	1,614	668	0	100	41	0	1,714	709	0
2027/28	1,614	677	0	100	42	0	1,714	719	0
2028/29	1,614	687	0	100	42	0	1,714	729	0
2029/30	1,614	696	0	100	43	0	1,714	739	0
2030/31	1,614	706	0	100	44	0	1,714	750	0
2031/32	1,614	657	0	100	41	0	1,714	698	0
2032/33	1,614	666	0	100	41	0	1,714	707	0
2033/34	1,614	-97	191	100	-6	929	1,714	-103	1,120

	Bombay Works (cents/kWh change)					
	Vector		Counties Power		Total for Vector & Counties Power	
	Interconnection (cents/kWh)	Connection (cents/kWh)	Interconnection (cents/kWh)	Connection (cents/kWh)	Interconnection (cents/kWh)	Connection (cents/kWh)
	2022/23	0.0000	0.0000	0.0000	0.0000	0.0000
2023/24	0.0056	0.0000	0.0052	0.0000	0.0056	0.0000
2024/25	0.0057	0.0000	0.0053	0.0000	0.0056	0.0000
2025/26	0.0057	0.0000	0.0053	0.0000	0.0057	0.0000
2026/27	0.0078	0.0000	0.0072	0.0000	0.0077	0.0000
2027/28	0.0079	0.0000	0.0073	0.0000	0.0078	0.0000
2028/29	0.0080	0.0000	0.0074	0.0000	0.0080	0.0000
2029/30	0.0081	0.0000	0.0075	0.0000	0.0081	0.0000
2030/31	0.0082	0.0000	0.0077	0.0000	0.0082	0.0000
2031/32	0.0076	0.0000	0.0071	0.0000	0.0076	0.0000
2032/33	0.0077	0.0000	0.0072	0.0000	0.0077	0.0000
2033/34	-0.0011	0.0022	-0.0010	0.1633	-0.0011	0.0122

	Bombay Works (% change compared to total charges for that customer)								
	Vector			Counties Power			Total for Vector & Counties Power		
	Interconnection (%)	Connection (%)	Total (%)	Interconnection (%)	Connection (%)	Total (%)	Interconnection (%)	Connection (%)	Total (%)
	2022/23	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2023/24	0.30%	0.00%	0.28%	0.30%	0.00%	0.28%	0.30%	0.00%	0.28%
2024/25	0.31%	0.00%	0.28%	0.31%	0.00%	0.28%	0.31%	0.00%	0.28%
2025/26	0.31%	0.00%	0.29%	0.31%	0.00%	0.28%	0.31%	0.00%	0.29%
2026/27	0.42%	0.00%	0.39%	0.42%	0.00%	0.38%	0.42%	0.00%	0.39%
2027/28	0.43%	0.00%	0.40%	0.43%	0.00%	0.39%	0.43%	0.00%	0.40%
2028/29	0.43%	0.00%	0.40%	0.43%	0.00%	0.40%	0.43%	0.00%	0.40%
2029/30	0.44%	0.00%	0.41%	0.44%	0.00%	0.40%	0.44%	0.00%	0.41%
2030/31	0.44%	0.00%	0.41%	0.44%	0.00%	0.41%	0.44%	0.00%	0.41%
2031/32	0.41%	0.00%	0.38%	0.41%	0.00%	0.38%	0.41%	0.00%	0.38%
2032/33	0.42%	0.00%	0.39%	0.42%	0.00%	0.38%	0.42%	0.00%	0.39%
2033/34	-0.06%	1.67%	0.05%	-0.06%	100.77%	8.62%	-0.06%	8.66%	0.56%

OTA-WIR Works (\$ change)									
	Vector			Counties Power			Total for Vector & Counties Power		
	Interconnection		Connection	Interconnection		Connection	Interconnection		Connection
	RCPD, MW	\$ '000	\$ '000	RCPD, MW	\$ '000	\$ '000	RCPD, MW	\$ '000	\$ '000
2022/23	1,614	0	0	100	0	0	1,714	0	0
2023/24	1,614	112	0	100	7	0	1,714	118	0
2024/25	1,614	113	0	100	7	0	1,714	120	0
2025/26	1,614	0	390	100	0	9	1,714	0	399
2026/27	1,614	0	388	100	0	9	1,714	0	397
2027/28	1,614	0	386	100	0	9	1,714	0	395
2028/29	1,614	0	384	100	0	9	1,714	0	393
2029/30	1,614	0	382	100	0	9	1,714	0	391
2030/31	1,614	0	380	100	0	8	1,714	0	389
2031/32	1,614	0	379	100	0	8	1,714	0	387
2032/33	1,614	0	377	100	0	8	1,714	0	385
2033/34	1,614	0	375	100	0	8	1,714	0	383

OTA-WIR Works (cents/kWh change)						
	Vector		Counties Power		Total for Vector & Counties Power	
	Interconnection	Connection	Interconnection	Connection	Interconnection	Connection
	(cents/kWh)	(cents/kWh)	(cents/kWh)	(cents/kWh)	(cents/kWh)	(cents/kWh)
2022/23	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2023/24	0.0013	0.0000	0.0012	0.0000	0.0013	0.0000
2024/25	0.0013	0.0000	0.0012	0.0000	0.0013	0.0000
2025/26	0.0000	0.0045	0.0000	0.0016	0.0000	0.0043
2026/27	0.0000	0.0045	0.0000	0.0016	0.0000	0.0043
2027/28	0.0000	0.0045	0.0000	0.0015	0.0000	0.0043
2028/29	0.0000	0.0045	0.0000	0.0015	0.0000	0.0043
2029/30	0.0000	0.0044	0.0000	0.0015	0.0000	0.0043
2030/31	0.0000	0.0044	0.0000	0.0015	0.0000	0.0042
2031/32	0.0000	0.0044	0.0000	0.0014	0.0000	0.0042
2032/33	0.0000	0.0044	0.0000	0.0014	0.0000	0.0042
2033/34	0.0000	0.0044	0.0000	0.0014	0.0000	0.0042

OTA-WIR Works (% change compared to total charges for that customer)									
	Vector			Counties Power			Total for Vector & Counties Power		
	Interconnection	Connection	Total	Interconnection	Connection	Total	Interconnection	Connection	Total
	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
2022/23	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2023/24	0.07%	0.00%	0.07%	0.07%	0.00%	0.06%	0.07%	0.00%	0.07%
2024/25	0.07%	0.00%	0.07%	0.07%	0.00%	0.06%	0.07%	0.00%	0.07%
2025/26	0.00%	3.25%	0.23%	0.00%	0.98%	0.08%	0.00%	3.09%	0.22%
2026/27	0.00%	3.23%	0.23%	0.00%	0.97%	0.08%	0.00%	3.07%	0.22%
2027/28	0.00%	3.22%	0.23%	0.00%	0.95%	0.08%	0.00%	3.05%	0.22%
2028/29	0.00%	3.20%	0.22%	0.00%	0.94%	0.08%	0.00%	3.04%	0.22%
2029/30	0.00%	3.19%	0.22%	0.00%	0.92%	0.08%	0.00%	3.02%	0.22%
2030/31	0.00%	3.17%	0.22%	0.00%	0.91%	0.08%	0.00%	3.01%	0.21%
2031/32	0.00%	3.15%	0.22%	0.00%	0.89%	0.08%	0.00%	2.99%	0.21%
2032/33	0.00%	3.14%	0.22%	0.00%	0.88%	0.08%	0.00%	2.98%	0.21%
2033/34	0.00%	3.12%	0.22%	0.00%	0.86%	0.07%	0.00%	2.96%	0.21%

We add the following explanatory comments:

- As requested, these estimated charges have been determined under the current TPM, using the rates applicable for the pricing year effective April 2020, including capacity factors (RCPD) for that year.
- The connection methodology is not expected to change significantly under the TPM review.
- These estimated charges use the RCPD MW from the year to 31 August 2019, for all forward years. We have not attempted to forecast how RCPD values may change.
- Interconnection charges display a non-linear profile due to the revenue building blocks provided in Transpower's IM. Specifically, due to tax implications and the impact of a decreasing WACC return on assets with a decreasing book value over time.

5. Can you provide further detail on the modelled impact on resilience/reliability to the Wiri GXP from the MCP changes (specifically the impact of removing the OTA-BOB line)?

The double circuit BOB-OTA line serves Wiri via a tee from these two circuits. The line is described in two sections – OTA-WIR and BOB-WIR. Our analysis considered the resilience effect at Wiri of removing the BOB-WIR line section and is described in our cross-submission to the Commerce Commission’s Draft Decision regarding our Proposal – dated 21 January 2021.

The spreadsheet detailing those calculations is attached.

As mentioned in our cross-submission, that analysis focussed on a tower failure event on the OTA-WIR line and used data from our own historical database of such events in New Zealand. We excluded events caused by washouts or flooding as these are not relevant to the OTA-WIR line.

We considered longer duration outages (we assumed 3 days to restore supply in this case), because the existing grid configuration at Wiri requires manual intervention in the event of a double circuit outage on the OTA-WIR line. Although our response time would typically be significantly less, this could result in up to a 4 hour Wiri outage. Retaining the BOB-WIR line section would therefore not prevent outages of less than this duration at Wiri.

The Commission suggested two additions to our analysis:

- a) Lightning strikes resulting in double circuit failures and a permanent fault.

There have been some such occurrences nationally and these are recorded in our database, but the average time to restore supply (ignoring auto-reclosures and circuits switched back into service immediately) has been 109 minutes and the longest outage was 219 minutes. Therefore, such events would not contribute to the resilience value of retaining the BOB-WIR line and we have not determined the value.

- b) Events which cause conductor or insulator damage

We have reviewed our outage database for such events, with a potential to be high impact. There have been:

Event cause	Number of occurrences	Number of double circuit outages	Comment
Aircraft conductor collision	7	2	Average return to service was 17.3 hours
Other impacts with conductors (eg crane, truck)	18	0	-
Rifle fire damage	4	0	Second circuit was removed from service for repair for 2 cases

This gives us two relevant incidents across the 16,419 km line network over the last 22 years, or an average failure rate of 5.54e-6 /km/year.

For the 4km OTA-WIR spur, this equates to a probability of a 17-hour outage once every 45,000 years.

Compared to the tower failure risk (which we have assessed to be one 3-day outage every 5,500 years) these other risks are low. Inclusion of these rare events would not materially change our assessment of the benefits of retaining the BOB-WIR line section relative to the cost of doing so.

If you have queries relating to this letter, please do not hesitate to get in touch.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'John Clarke', written in a cursive style.

John Clarke

General Manager – Grid Development