SECURITY AND RELIABILITY COUNCIL

ACTION LIST

The following are actions to be completed after meeting number 33 on Thursday, 22 October 2020.

Action #	Meeting created	Action	Date for completion	Status
1	17	Secretariat to keep the SRC updated with the progress of Transpower's major capital project for voltage stability issues in the upper North Island. Updates of milestones should be provided until the investment decision is made.	As needed until investment decision made	**Completed.** The Commerce Commission has given approval of stage one the project. See updates section below.
4	30	Review and monitor the effectiveness of the system operator's processes for communicating risks to the industry, changes the Authority has made regarding risk, and assess the system operator on outcomes in the next Annual Review.	22 October 2020	**Complete.** Included in agenda item #12, where the draft review says reporting improvements have been sustained.
5		Report on the effectiveness of the system operator's improvements to its outage planning and real time management process in the next Annual Review	22 October 2020	**Complete.** Included in agenda item #12, where the draft review says their performance was greatly improved.
7	30	Secretariat to organise a cyber-security survey to be sent to participants for review in meeting 31	22 Oct 2020	**Complete.** Included as agenda item #08.
8	32	Secretariat to assess the impact of coincident risks and include this analysis by the March 2021 version of the risk register.	March 2021	**Not started.**
9	32	The secretariat will assess the discussion [Transpower's communication of reduced security and outages] and generate draft advice for the members to comment and edit.		**Completed.** Finalised advice is included as part of the correspondence.
10	32	The secretariat will distil the themes [strategy and priorities working session] and circulate amongst the SRC members for consideration in advice to the Authority and future development of the SRC's work programme.		**Completed.** Included as agenda item #13.

Action #	Meeting created	Action	Date for completion	Status
11	32	The secretariat to work with the Chair to amend the work programme.		**In progress.** Dependent on outcomes of action item #10.

1. Updates

This section provides information on matters that don't warrant a dedicated agenda item, such as updates on matters that have previously been discussed by the SRC.

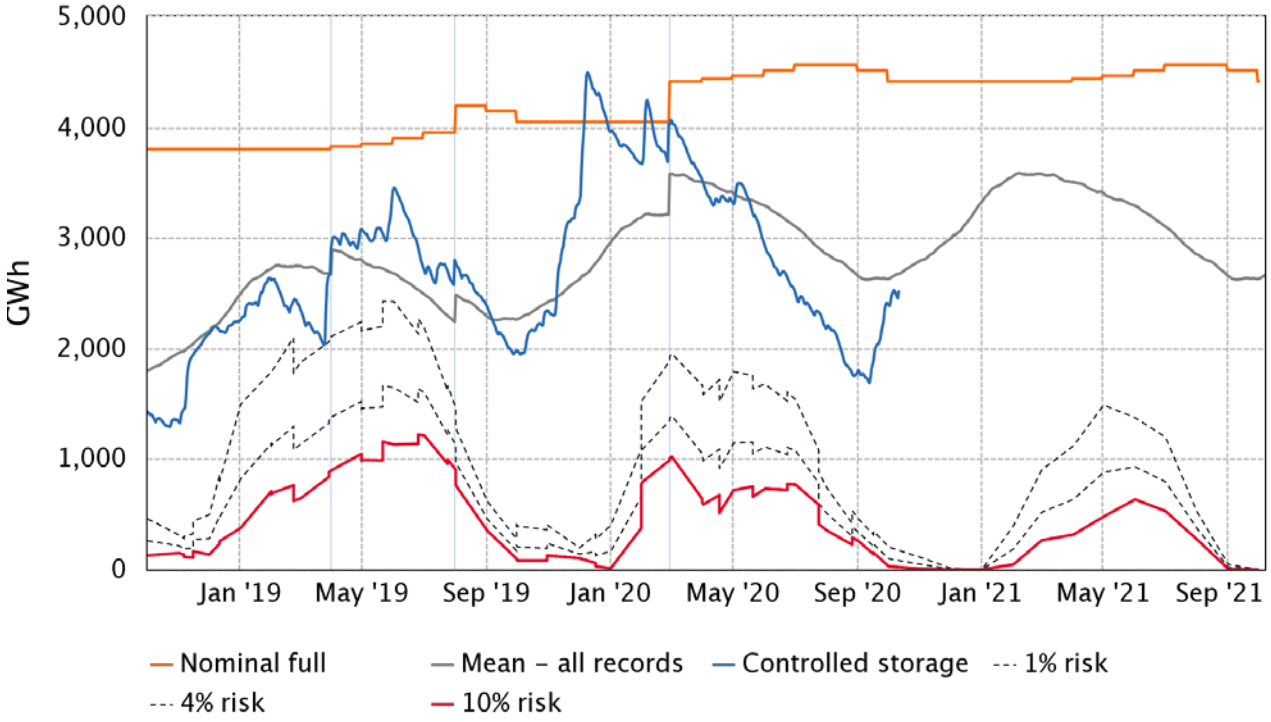
1.1 The current security of supply situation

1.1.1 As at 11 October 2020, national hydro storage was 57% of nominal full, which is 94% of mean storage for this time of year. On 8 October 2020, the system operator reported that:

> "Continued strong inflows have increased storage at five out of six controlled storage lakes over the past week, whilst the sixth, Lake Tekapo, only saw a minor decrease."
>
> "Lakes Manapouri and Te Anau are currently 143% and 155% of full respectively and therefore have begun to spill water despite Manapouri generation running near full capacity. This may somewhat inflate the storage figures as not all water that is present in the lakes will be captured as energy."

1.1.2 The system operator's electricity risk curves are presented in Figure 1 below, which is sourced from an Authority dataset.

Figure 1: New Zealand-wide electricity risk curves as at 11 October 2020



www.emi.ea.govt.nz/r/0sxcn

1.2 Transpower's major capital project for voltage stability issues in the upper North Island

1.2.1 The SRC has received various briefings and updates on Transpower's major capital project for voltage stability issues in the upper North Island. The Commerce Commission released the final decision approving the first staging project[1] from Transpower on 23 September 2020. This is the final update and action item #1 has been marked as completed.

1.2.2 The following excerpt summarises the key matters from the decision.

Figure 2: Excerpt from the Commerce Commission's decision to approve Transpower's project

The MCP relates to maintaining voltage stability in the WUNI region

X5 The MCP seeks our approval to invest $143.0 million in two dynamic reactive devices (**DRDs**) and a post-fault demand management scheme (**post-fault DMS**) as Stage 1 to maintain voltage stability in the WUNI region. For the same reason, the MCP also seeks our approval at Stage 1 to incur the costs of preparatory works to enable the procurement and installation of series capacitors in stage 2 of the Project (**Stage 2**). Transpower intends to submit a further major capex proposal for Stage 2 when this investment is needed.

X6 Transpower considers, and we agree, Stage 1 is needed because Transpower's studies show that, during periods of high demand, there are risks of widespread interruptions to supply due to large fluctuations in voltages in the transmission network. Such fluctuation in voltages can occur after an unplanned disconnection of a major component from the transmission network when the two 250 MW-Rankine generation units at Huntly Power Station (**Rankines**) are not in service during periods of high demand. An increase in peak electricity demand in the WUNI region could exacerbate voltage stability issues and risks under the above operating conditions.[6]

X7 The other, more significant driver of the investment need for Stage 1 is the effects on voltage stability in the WUNI region that could occur if Genesis Energy Limited (**Genesis**) removes the Rankines from normal service. Genesis has not announced its position on the Rankines' future, and in its submission on our draft decision, advised that the ongoing management of the Rankines will continue based on market conditions and expected market developments.[7] However, Transpower prepared and submitted the MCP on the basis of Genesis retiring the Rankines, without replacement, by the end of 2022.[8]

[1] 'staging project' is a project within a major capex project (staged)

X8 Since issuing our draft decision on Stage 1, Rio Tinto announced on 9 July 2020 that it will close Tiwai Point aluminium smelter (**Smelter**) by August 2021.[9] For the reasons we outline in this paper,[10] we consider that this announcement, combined with other recent market activities that we discuss, increases the likelihood of the Rankines' removal from normal service, reducing some of the uncertainty associated with the need for Stage 1. Our assessment shows that this is likely to happen once approximately 500 MW of additional generation can be transmitted into the WUNI region.

X9 The main benefit of approving Stage 1 is that it will ensure the transmission network has enough capacity to supply consumers in the WUNI region and to manage voltage stability effectively as demand grows and if the Rankines are removed from normal service. Without the Stage 1 investment, there would either be a need for rolling power cuts during times of high electricity usage or a heightened risk of the North Island power system collapsing.

6 As we set out in paragraphs B63 of B69 Attachment B, we consider Transpower's demand forecast is consistent with those set out in the Ministry of Business, Innovation and Employment's (**MBIE**) latest Electricity Demand and Generation Scenarios published in July 2019 (**EDGS**).

7 Genesis, *Re: Draft decision and reasons on Stage 1 of Transpower's Waikato and Upper North Island Voltage Management staged major capex project*, 9 July 2020, at pg. 1.

8 MCP, above n 2, at para 2.3. We note that Transpower also states at pg. 12 of the MCP that if a significant generation commitment – whether to Rankine life extension or to new generation – is made then Transpower will either seek an amendment to the MCP (if our decision on approval is still pending), or, if necessary, seek an amendment to the approved staging project to reflect a revised preferred option.

1.3 BlueScope Steel is working on a strategic review of its New Zealand operations

1.3.1 On 17 July, BlueScope Steel announced a review of the carrying value of the New Zealand and Pacific Steel segment. The objective of the review is to re-evaluate the footprint of the business to ensure its financial viability in a challenging operating environment, made more uncertain by public policy settings in carbon, trade and energy.

1.3.2 Low metal prices, ongoing cost pressures (including transmission pricing changes), and the mandatory operational shutdown due to COVID-19 have been cited as factors in the review decision.[2]

1.3.3 The company provided an update on its strategic review in its annual report in September:

> "Substantial progress has been made on a strategic review of the Company's operations in New Zealand that began during the second half. This review is targeting a reconfiguration of the business by delivering a change in product mix, cost and productivity improvements. Our intention is to deliver an appropriate level of profitability and sustainability by making the business more fit for purpose and fit for market.
>
> While we are confident we can deliver on this plan, in the event that the improvements are not achieved, the business may shift to external supply of products, and primary steelmaking operations at Glenbrook may cease.

2 From: https://www.energynews.co.nz/news-story/major-projects/54234/bluescope-reviewing-viability-nz-steel

A $197.0 million write-down was recognised in the New Zealand and Pacific Islands segment in the FY2020 financial results based on updated expectations of lower sustainable earnings in the longer-term from the current business model."

1.4 Norske Skog is reviewing the future of its Tasman newsprint mill at Kawerau.

1.4.1 The future of another major industrial operation is under review because of the COVID-19 pandemic. Norske Skog note "Norske Skog's EBITDA in the second quarter of 2020 was NOK 138 million, a decrease from NOK 379 million in the first quarter of 2020, mainly due to national restrictions on movement of goods and people following the outbreak of the corona pandemic. The restrictions had severe negative impact on operations due to a sudden and considerable drop in demand for publication paper". A quote from Newsroom said "Covid-19 has had a rapid, negative and likely irreversible impact on the industry in the region."

1.4.2 The press announcement can be viewed at https://www.norskeskog.com/Investors/Press-releases/English-press-releases/Demand-drop-due-to-corona-pandemic

1.4.3 A new item has been added to the risk register to cover this type of industry announcement.

1.5 New Zealand ranks highly for energy trilemma management

1.5.1 The World Energy Council has released the results of its 2020 'Energy Trilemma' report.[3] Overall, New Zealand continues to perform well, ranking tenth overall and first in Asia.

1.5.2 Energy security is one of the three elements of the 'energy trilemma', and the one of most relevance to the SRC. With results from 2000 indexed to 100, New Zealand's energy security rose to a peak of 110.3 in 2012 before declining to 95.5 in 2020. The World Energy Council attributes this "...to a decline in the diversity of primary energy supply and electricity generation since 2010." Results can be viewed at https://trilemma.worldenergy.org/#!/energy-index.

1.6 The system operator has provided two 'moderate incident' event reports to the Authority

1.6.1 The Authority launched a level 2 enquiry into two power system events reported on by the system operator's 'moderate incident' reporting.[4] Once those enquiries have progressed sufficiently, the secretariat will consider whether the issues warrant inclusion in a future SRC agenda.

1.6.2 The executive summary from each system operator report is duplicated below.

[3] From: https://www.energynews.co.nz/news-story/energy-policy/57902/nz-ranks-highly-energy-trilemma-management

[4] For more information about the Authority's three-stage process for market enquiries, refer to https://www.ea.govt.nz/monitoring/enquiries-reviews-and-investigations/our-three-stage-process/

System operator's executive summary of the 12 March 2020 Hutt Valley and Wairarapa region outage

1.6.3 There are three 220 kV/110 kV interconnecting transformers (Haywards T1, T2 and T5) and two 110 kV circuits (Haywards–Takapu Road 1 & 2) which provide the primary electricity supply to the Hayward's 110 kV network, with an additional 110 kV circuit (Mangamaire–Masterton 1) able to supply some load, but not all. The Haywards 110 kV assets are configured in a large vertical bus arrangement, with Bus A arranged above Bus B. This is the only Transpower substation to have this type of vertical configuration.

1.6.4 On 12 March 2020, the grid owner had an outage to undertake planned maintenance work on part of the Haywards 110 kV bus. At 08:16 during the switching sequence to enable the maintenance, the Haywards 110 kV bus tripped causing a loss of supply to 157.1 MW of load. This event disrupted many people and businesses in the Hutt Valley and Wairarapa region, with an estimated cost to consumers of approximately $4.5 million[5].

1.6.5 The event occurred at the end of a long switching sequence, when a circuit breaker bus coupler flashed over. The flashover was caused by human error. An instruction to isolate each side of the circuit breaker was missed, and the bottom terminal remained live. When the grid owner's switcher attempted to earth the isolated top terminal, the hanging lead of the portable temporary earth contacted the live bottom terminal. This resulted in a phase to earth fault causing an electrical explosion. Protection operated as designed, tripping all the circuit breakers connected to the 110 kV bus. No workers on site were harmed as a result of the incident.

1.6.6 The market and power system responded as expected given the location and amount of load lost. One aspect of the response to highlight is that with the loss of the Haywards 110 kV bus and associated synchronous condensers (SCs), the HVDC transfer limit is reduced. On the day of the event, the HVDC was operating in monopole as Pole 3 was out of service for reconductoring work. Had both poles been in operation at the time of the event, the reduction in transfer limit would have been much greater.

1.6.7 Given the location of the fault and the configuration the grid was left in, the full Wellington region restoration plan was not easy to adapt for the situation. Following the plan would have resulted in having to deviate from pre-defined switching sequences with the potential to introduce confusion and errors. Instead, a custom set of restoration plans were developed based on specialist knowledge and key operating principles. The custom plans were a collaboration between the National Coordination Centre (NCC) and the National Grid Operating Centre (NGOC). Both the NCC security coordinator and security support coordinator successfully implemented the plans in parallel with multiple NGOC grid asset controllers who had been made available to manage this event restoration.

1.6.8 The system operator successfully restored load to the Hutt Valley and Wairarapa region without extended power system or market impact. However, we acknowledge that improvements can be made in how we prepare for and undertake

[5] The cost to consumers it based on the value for expected unserved energy in Schedule 12.2 of the Electricity Industry Participation Code 2010 (Code), published 19 September 2019. The calculation is based on the supply lost and time taken to restore that supply for each grid exit point impacted; it does not capture any additional time taken by distributors to reconnect their end consumers.

a restoration of the Wellington region. The following four recommendations have been made to improve restoration performance:

- In order to ensure we provide the situational awareness that industry expects during an event, and to avoid the potential to distract from, or slow down our response effort, we will review and document how, when and what communications we provide during an event.
- In order to help minimise any additional impact to consumers due to a loss of supply event, we will make sure we continually review and understand load restoration priorities. We will document a process for reviewing contingency plans, including confirming the prioritisation of load restoration with distribution companies.
- In order to help minimise any additional impact to consumers due to a loss of supply in the Wellington region, we will review and update the region's contingency plan considering the load restoration priority information obtained from Wellington Electricity during the event.
- The use of SCADA Control Sequence Schedular (CSS) during restoration has the potential to reduce restoration times and therefore minimise the impact of loss of supply events to consumers. While there are limitations in the use of SCADA CSS today, we will develop a plan to investigate the feasibility of increasing the capability of the SCADA CSS application to include restoration of Wellington and other regions as appropriate.

1.6.9 As system operator, our view is there is opportunity to improve how the grid owner operates the HVDC and associated equipment during an event of this nature. The following three considerations have been identified and discussed with the grid owner as part of the investigation:

- Review the HVDC power limit calculations, with an aim of removing any unnecessary conservatism in the calculations associated with reduced asset availability in order to maintain maximum HVDC transfer and associated market benefit.
- Implement the alternative power source functionality for the HAY SC cooling supply, increasing their resilience during a loss of the HAY 11 kV station auxiliary supply and allowing higher levels of HVDC transfer and associated market benefit to be maintained.
- Review the HVDC AC filter switching priorities to maximise the dynamic absorption range of the HAY STATCOM when no SCs are available, providing improved automatic voltage management to the system operator.

1.6.10 Transpower's investigation, in its role as system operator, did not identify any breaches of the Electricity Industry Participation Code (Code) by the system operator or any other party.

System operator's executive summary of the 8 June 2020 Auckland outage

1.6.11 The Auckland area network comprises three primary 220 kV circuit paths running from Otahuhu Substation in the south to Albany Substation in the north. Linked to this 220 kV network by inter-connecting transformers are a number of parallel, lower

capacity 110 kV circuit paths. These include circuits owned by the local area distribution company, Vector.

1.6.12 On 8 June 2020, the 220 kV Albany – Wairau Road Circuit 4 (ALB-WRD 4), 110 kV Otahuhu – Mount Roskill Circuits 1 & 2 (OTA-ROS 1 & 2), and 220 / 110 kV Inter-connecting Transformer Otahuhu T4 (OTA T4) were all out of service to enable the Grid Owner to undertake scheduled work. These outages had been assessed under the Outage Planning Policy (SP-OC-759) and mitigation measures were in place. The most significant of these was to close the normally split Otahuhu 110 kV Bus. The normally open 110 kV Otahuhu – Penrose Circuit 2 (OTA_PEN 2) was also closed.

1.6.13 At 17:50, approaching the period of peak evening demand, 220 / 110 kV interconnecting transformer Henderson T1 (HEN T1) tripped. No equipment was overloaded as a result of the tripping, but the system was now on 'n' security in the area. This meant it was vulnerable to overloading equipment or losing load should anything else trip. The tripping also resulted in power flows in the west Auckland area changing. The most significant changes were to increase the loading on the sole remaining 220 / 110 kV interconnecting transformer at Henderson, T5 (HEN T5), and to the 110 kV Mangere – Mount Roskill Circuits 1 & 2 (MNG-ROS 1 & 2).

1.6.14 After ascertaining that HEN T1 would be out for some hours, the system operator duty security coordinator took steps to re-establish 'n-1' security in the area. The main issue to be resolved was the potential overloading of MNG-ROS 1 & 2 in the event any of a number of circuits in the Auckland area tripped. The solution opted for was to open the 110 kV Hepburn Road – Mount Roskill 1 & 2 circuits (HEP-ROS 1 & 2) and feed Mt Roskill Substation (ROS) solely from the MNG-ROS 1 & 2 circuits.

1.6.15 This resolved the majority of security issues but left the possibility that the tripping of one MNG-ROS circuit would overload the remaining one. There were two options to deal with this issue, both requiring action from the connected party Vector. The first option was for Vector to close in a parallel path to the MNG-ROS circuits through their network. They declined this option due to concerns over the performance of their power system protection in this configuration. This left the sole option as managing load at ROS.

1.6.16 The level of load management required at ROS to resolve the issue was approximately 28% of the then station load of 152 MW. Vector advised they could manage around 23 MW of this with controllable load but that the remaining 19 MW would require non-controllable load to be shed. A grid emergency was declared at 18:22 hours with Vector and the Grid Owner instructed to implement the plan. Vector reduced their controllable load within a few minutes but then took a further 12 minutes to shed the remaining non-controllable load. This was due to the fact the Vector Operator wouldn't shed the non-controllable load without discussing with their management, who in turn wanted to confirm the requirement with Transpower's Regional Services Manager (a grid owner role). The system operator will meet with Vector to discuss this event and clarify load shedding arrangements.

1.6.17 The Grid Owner was able to restore HEN T1 to service at 19:31. The HEP-ROS 1 & 2 circuits were then returned to service at 19:35, and all non-controllable load was restored by 19:43. Some management of controllable load was required through to 20:47 but this was necessitated by the scheduled outages, not by this event.

1.6.18 The event was managed via normal system operator business processes. The plan developed to restore security required significant load management at ROS. This was in the order of 28% of the 152 MW station load at the time, of which just over half was controllable load. This meant approximately 19 MW of non-controllable load was shed. It is the shedding of this non-controllable load, and the direct consumer impact this had, that makes this event worth looking into. With the exception of this, it was very much a routine event.

1.6.19 The investigation determined there were no Code breaches by the system operator or industry participants associated with the event. It has however raised questions as to the definition of the ‘moderate’ and ‘major’ incident criteria in the Significant Incident Reporting (PR-RR-770) process agreed with the Electricity Authority. It is recommended that these definitions be revised to consider the different consumer impact of shedding controllable versus non-controllable load.