Penrose Substation Outage

Implementation Plan Progress Update 31st May 2016

31st May 2016

Issue 1

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Recommendations from Transpower/Vector joint report – Progress update 31st May 2016

Recommendation	Action	Progress Update	Due Date	Status
Joint Recommendation 1 Transpower and Vector implement changes at Transpower's Penrose substation as part of the recovery works, including installing replacement cables in two trenches containing segregated ducts for each cable to effectively eliminate the risk of fire causing multiple cable failures.	Transpower/Vector will: • Agree new, separate cable routes through Transpower's switchyard (Completed);	New cable routes have been agreed.		Completed
	• Design a new permanent solution at the Penrose substation (completed);	Complete		Completed
	• Construct the new cable trenches by 30 June 2016; and	Construction of the new cable trenches is underway	30 June 2016	On Track
	• Complete all additional upgrade works by 30 November 2016.		30 November 2016	On Track
Joint Recommendation 2 Transpower and Vector review locations where power cables are installed in open air environments to identify any asset risks at the following locations: • Transpower/Vector points of connection (GXPs); • Vector's network; • Transpower sites; and take appropriate actions to mitigate these risks	Vector will: • Inspect all 133 sites on the Vector network where there are multiple cables in open air, including Transpower and third party substations, assess the consequences of failure, and identify actions to mitigate risks identified from the inspections (Completed);			Completed
	• Proactively apply a flame retardant coating to all in-air joints located at these 133 sites 15 February 2016;		15 February 2016	Completed
	• Complete all other actions identified to mitigate the risks for lower priority sites by 30 June 2016; and		30 June 2016	On Track
	• Amend its maintenance schedules to amend inspection cycles for all significant open air cable installations by 30 April 2016.	Additional consultation with Field Service Providers required and integrated into Standard ESM-301, now proceeding through final approval processes.	30 April 2016 Now 10 June 2016	Underway
	Transpower will: • Inspect all critical Transpower substations to identify cable joints in air, assess the consequences of failure, and identify actions to mitigate risks identified from the inspections (Completed); and	The inspection of critical Transpower sites was completed. Five sites (Central Park, Haywards, Otahuhu, Penrose and Whirinaki) were identified as having cable joints installed within building basements.		Completed
	• Complete all actions identified to mitigate the risks at critical sites by 31 May 2016;	Painting of intumescent paint on the Whirinak (WHI) cable is scheduled for completion by end of June 16. All other critical sites Initial mitigations are complete this was achieved by sand bagging the area around the joint or coating the cable in an intumescent paint. Transpower will now investigate long term mitigations or other alternative that align with Asset Management Principles.	31 May 2016 Now scheduled for June 16 and	underway

Recommendations from Transpower/Vector joint report – Progress update 31st May 2016

Recommendation	Action	Progress Update	Due Date	Status
		Haywards basement has also been fitted with a VORTEX fire suppression system which further reduces the fire risk in this basement. The installation of this system is a part of Transpower's ongoing Asset Management Plan to protect its critical sites and was not installed as a response to the Penrose Cable Fire incident		
Joint Recommendation 3 Vector review and update its relevant policies, procedures and practices with respect to cables, and cable joints installed in air.	Vector will: • Revise design standards that stipulate all new cable joints be buried direct, or where this cannot be achieved: ○ Minimum vertical and horizontal separation spacing limits shall be applied (Completed); and			Completed
	○ Joints shall be covered, enclosed or encased in such a way as to minimise the risk of damage to all other cables (Completed).			Completed
	• Revise design standards stipulating more stringent requirements implemented on ○ cable support structures (Completed); and			Completed
	○ Cable joint support structures by 15 April 2016.	New Standard established and progressing through final approval processes	15 April 2016 Now 10 June 2016	Underway
	• Revise maintenance standards implemented for high voltage cables: ○ Standard ESM301 Maintenance of HV Cables reviewed by 31 March 2016.		31 March 2016	Completed
Joint Recommendation 4 Transpower incorporate learnings from the Penrose cable fire into asset management practice, including design standards. Include mitigation of risks from failures of cable joints in open air.	Transpower's approach will be as follows: • Review and amend (if required) Transpower's cable specification to minimise collateral effects of fire by 31 March 2016; and	Transpower have reviewed the cable purchase specification TP.PS 03.01 & TP.PS 04.01. It was determined that no changes are required.	31 March 2016	Completed
	• Transpower will review its fire risk standard TP DS 61.06 to include a risk based approach to identifying and valuing substation asset fire risk. This will ensure a consistent, repeatable approach is used to evaluating risks and potential mitigations in site reviews. This standard will be updated by 31 March 2016. Transpower will assure that the standard is applied by monitoring the outputs of the site reviews.	Transpower Standard TP DS 61.06 has been updated and now includes guidance on identifying and assessing site risks as well as providing technical requirements new (green field) installation of cables in air to avoid the possible effects of fire caused by a failure and its subsequent spread. It also provides general guidance on the application of passive fire protection to the existing installations where cables are installed in air. The standard is now operational.	31 March 2016	Completed

Recommendations from Transpower/Vector joint report – Progress update 31st May 2016

Recommendation	Action	Progress Update	Due Date	Status
Joint Recommendation 5 Vector review and update its risk management framework, and risk identification processes.	Vector will: • Review and amend its asset risk management framework for each asset category (Completed);			Completed
	• Amend its procurement processes and contracts to request suppliers to make Vector aware of any significant issues with product failures by 30 June 2016;		30 June 2016	On Track
	• Create a dedicated role within its networks business focused on managing asset risk identification and management processes (Completed);			Completed
	• Complete its assessment of asset risk profiles at GXP's to ensure the criticality of assets is considered (Completed);			Completed
	• Complete its assessment of asset risk profiles at significant Zone Substations by 31 March 2016; and		31 March 2016	Completed
	• Review its risk identification processes to ensure any learnings from the incident are applied by 31 March 2016		31 March 2016	Completed
Joint Recommendation 6 Transpower update its standard operating procedures to apply key learnings from the incident.	Transpower will: • Review and update High Impact Low Probability (HILP) and Access & Occupancy Review processes by 30 June 2016	Transpower has also updated the High Impact Low Probability (HILP) risk review process. The improved process has been trialled and further refinements made. The new risk review process Is now operational. We have designed a customer site risk review process to ensure A & O Schedules are updated at all sites in order of criticality over the coming few years.	30 June 2016	On Track
Joint Recommendation 7 Vector update its standard operating procedures to apply key learnings from the incident.	• Amending its operating standard (EOS003) to include additional restrictions on reclosing on tripped circuits that contain sections of in-air cables (Completed);			Completed
	• Updating SCADA tiles to provide information to operating staff on the location of in-air joints (Completed);			Completed
	• Completing refresher training for all operating staff on the risks associated with in-air joints (Completed); and			Completed

Recommendations from Transpower/Vector joint report – Progress update 31st May 2016

Recommendation	Action	Progress Update	Due Date	Status
	• Vector will review its communications and existing access arrangements with the NZFS to identify opportunities for improvement by 31 January 2016.			Completed
Joint Recommendation 8 Transpower update its standard operating procedures to apply key learnings from the incident.	• Transpower will review its communications and existing arrangements with the NZFS, to identify opportunities for improvement. A workshop with the NZFS has been completed;	Workshop was held in November 2015.		Completed
	• Review the improvement opportunities generated from the NZFS workshop and instigate, rollout and communicate changes by 31 May 2016;	There has been a delay in receiving the finalised report from the NZFS. The final report was received from the NZFS on the 24th May 2016. Transpower are now scoping the recommendations and working on a delivery and communications plan with revised completion date.	31 May 2016 Now scheduled for 30 September 2016	Underway
	• Ensure that operating procedures are in place to minimise the risk that an operator could close onto a faulted transmission circuit cable section by 31 March 2016; and	No Change required. Transpower Operating Standard TP AOI 07.518 covers this.		Complete
	• Define and document major event management training based on CIMS model for the Grid Operators, Regional Service Managers or other first responders by 31 May 2016.	Training is underway. Transpower has provided CIMS level 2 Training to its Operational Response Personal. More detailed CIMS Level 4 Training has been scheduled for early June 2016. Emergency response standard TP.AG 47.08 is to be updated to reflect CIMS by the 30th June 2016.	31 May 2016 Now scheduled for 30 June 2016	Underway
Joint Recommendation 9 Transpower and Vector review contractual terms and management processes at points of connection to ensure key learnings from the incident are incorporated.	• Transpower has reviewed the standard contractual terms from the Benchmark Transmission Agreement (Schedule 6 – Access and Occupation), and considers that they are fit-for-purpose;	No Change here.		Complete
	• Vector has reviewed the contractual terms in the current agreements with Transpower;	No Change here.		Complete
	• Transpower and Vector will jointly undertake a review of asset management processes at the interface to be completed by 30 June 2016; and	Joint risk workshop was held between Vector and Transpower at Otahuhu on 7 April. Risk bow ties were developed and approaches to identifying and evaluating site risk was shared between parties.	30 June 2016	Complete
	• Transpower and Vector will jointly review the Access and Occupancy schedules (and the associated review mechanisms) by 30 June 2016.		30 June 2016	Complete

Recommendations from Transpower/Vector joint report – Progress update 31st May 2016				
Recommendation	**Action**	**Progress Update**	**Due Date**	**Status**
Joint Recommendation 10 Transpower improve the business process for assessing and agreeing to customer requests for access and occupation of Transpower land.	• Review the business process for assessing and approval to customer requests for access and occupation of Transpower land by 31 May 2016; and	Transpower have revised our A & O approval process to ensure all parties are clear about their accountabilities through the process and the requirement for the A & O Schedule to be updated as a part of the closeout stage, once the work is complete. This closeout process puts enhanced focus on providing quality As Built operational drawings which are in line with the established Industry Guidelines for the Use of Mutual-Interest Drawings. This process is currently being embedded through the business and will go live on 1 July 2016.	31 May 2016 Now scheduled for 1 July 2016	Underway
	• Ensure that a risk assessment is part of the process by 31 May 2016	Transpower has also updated the High Impact Low Probability (HILP) risk review process. The improved process has been trialled and further refinements made. The new risk review process is now operational.	31 May 2016	Complete
Joint Recommendation 11 Transpower establish an on-going process to provide assurance about the status and condition of customer assets on Transpower land and the potential risks to the grid.	• Establish an ongoing process to provide assurance about the status and condition of customer assets on Transpower land and the potential risks to the national grid. This process is to focus on critical sites, and to include agreement of risk mitigation plans with customers. This will be completed by 30 June 2016.	We have designed a customer site risk review process to ensure A & O Schedules are updated at all sites in order of criticality over the coming few years.	30 June 2016	On Track

Recommendations from the Electricity Authority report– Progress update 31st May 2016

Recommendation	Action	Progress Update	Due Date	Status
Recommendation 1 11.4 The detailed background, failure mechanisms and key lessons of the Penrose fire have potential values for other electricity lines businesses. The Authority recommends that Vector and Transpower share the findings of this inquiry and the investigation with other electricity lines businesses. 11.5 Where barriers exist to the sharing of information, Vector and Transpower must tell the Authority about the nature of the barriers and the limitations placed on information sharing.	Transpower and Vector will • Arrange an industry workshop to share the learnings from the Penrose Outage by 31 March 2016.	The Workshop was led by Transpower CEO Alison Andrew and Vector CEO Simon Mackenzie. A presentation outlining the event, the investigation findings, key learnings and progress to date was provided. Good feedback on the presentation and key learnings was provided by the attendees. Representatives from the following companies attended: • Transpower Limited • Vector Limited • Southpark Utilities Limited • The Lines Company Limited • Top Energy Limited • TrustPower Limited • Tuaropaki Power Company Limited • Unison Networks Limited • Waipa Networks Limited • WEL Networks Limited • Wellington Electricity Lines Limited • Westpower Limited • Winstone Pulp International Limited • Commerce Commission • Electricity Authority	31 March 2016	Completed
Recommendation 2 11.6 The Authority recommends that Vector reconsider how it prioritises risks for its asset management programme so that it gives priority to supply-critical network components. Vector should undertake this review immediately and implement recommendations on improvements before 31 March 2016.	Vector will: • Review its generic risk profile models for each of the nine key asset classes by 30 November 2015 (Completed);		30 November 2015	Completed
	• Review site specific risks at all Transpower supply (GXP) points by 20 December 2015 taking into account interdependency risk between specific Vector assets and inclusive of Transpower assets (Completed); and		20 December 2015	Completed
	• Collate and evaluate the risks at these GXPs and issue any required improvement works by 31 March 2016 • for its contractors to complete by 30 November 2016.		31 March 2016	Completed
			30 November 2016	On Track

Recommendations from the Electricity Authority report– Progress update 31st May 2016

Recommendation	Action	Progress Update	Due Date	Status
Recommendation 3 11.8 The Authority recommends that Vector and Transpower review their fire risk mitigation standards and asset management policies to better align with the key characteristics of specific installations. Vector and Transpower should undertake this review immediately and implement recommendations on improvements before 31 March 2016. 11.9 For example, a Transpower standard exists that considers fire risk in cable basements but it does not anticipate other in-air installations (ie in-air cable trenches) that have essentially the same characteristics and pose similar risk profiles.	Transpower will: • Transpower will review its fire risk standard TP DS 61.06 to include a risk-based approach to identifying and valuing substation asset fire risk. This will ensure a consistent, repeatable approach is used to evaluating risks and potential mitigations in site reviews. This standard will be updated by 31 March 2016 and Transpower will assure that the standard is applied by monitoring the outputs of the site reviews.	Transpower Standard TP DS 61.06 has been updated to reflect learnings from the Penrose Incident and the changes have been approved. The standard is now operational.	31 March 2016	Completed
	Vector will: • Review its standard ENG-028 (Electricity Network Guidelines: Fire protection for Zone Substations) by 30 April 2016; and	New Standard ESE-703 established following consultation with Field Service Providers and now approved.	30 April 2016	Completed
	• Review its standard ENS-195 (Maintenance of Zone Substation Fire Suppression Systems) by 31 March 2016.	New Standard ESM-603 established following consultation with Field Service Providers and now progressing through final approval processes	31 March 2016 Now 30 June 2016	Underway
Recommendation 4 11.10 To address explicitly the risk of fire ignition from cable joints, the Authority recommends that Vector and Transpower review their standards for existing power cable joints in in-air situations. For new installations, joints in in-air situations should be avoided where practicable. Vector and Transpower should undertake this review immediately and implement recommendations on improvements before 31 December 2015. 11.11 A number of relatively low cost fire mitigation solutions have been identified by the investigation in its survey of electricity lines businesses. These options should be fully considered and, where appropriate, implemented.	Transpower will: • Review and amend any Transpower cable specifications to minimise collateral effects of fire by 31 March 2016; and	Transpower have reviewed the cable purchase specification TP.PS 03.01 & TP.PS 04.01. When the purchase standards are used in conjunction with service specifications It was determined that no changes are required.	31 March 2016	Completed
	• Review fire risk standard TP DS 61.06 and add guidance checklists so that these can be used in site reviews by 31 March 2016	Transpower Standard TP DS 61.06 has been updated to reflect learnings from the Penrose Incident and the changes have been approved. The standard is now operational.	31 March 2016	Completed
	Vector will: • Identify all locations where records indicate the presence of multiple in-air circuits of significance and to physical inspect all sites.			Completed
Recommendation 5 11.12 The Authority recommends that Vector and Transpower pay greater attention to formalised asset management practices at all boundaries where assets connect to the grid. Vector and Transpower should undertake an immediate review of their asset management policies and implement recommendations on improvements before 31 March 2016.	Transpower/Vector will • Jointly undertake a review of asset management processes at the interface and this will be completed by 31 March 2016.	Joint risk workshop was held between Vector and Transpower at Otahuhu on 7 April. Risk bow ties were developed and approaches to identifying and evaluating site risk was shared between parties.	31 March 2016	Completed

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11.13 If the findings from the review indicate a systematic issue beyond Penrose substation, the Authority recommends that Vector and Transpower undertake a comprehensive review of asset management practices at all points of interconnection between their networks. In addition, Transpower should review asset management practices at all network asset boundaries.				
Recommendation 6 11.14 All of Transpower's access and occupancy arrangements and procedures through which third parties are allowed to locate assets and equipment at important substations must be fully reviewed and include a periodic compliance review. Transpower should undertake this review immediately and implement recommendations on improvements before 31 March 2016. 11.15 The Authority recommends that Transpower review its arrangements regarding access and occupancy, and compliance with those arrangements. Transpower should undertake this review immediately and implement recommendations on improvements to its standard contract before 31 December 2015. The Authority recognises that completion of individual contracts between Transpower and its customers may take some time to complete and some form of prioritisation may be required. 11.16 The inquiry found that the arrangements, through which Transpower had provided Vector with access to locate its cables in the Penrose trench were not well understood by either Vector or Transpower. For example, important schedules recording the cables in the trench were inaccurate and had not been updated, and approvals for locating additional cables in the trench had not been documented. These issues must be addressed and corrected in the review.	Transpower will • Complete a review of the Access and Occupancy application and approval process. Any improvements will be identified, and any required changes implemented by 31 March 2016.	Transpower have designed a customer site risk review process to ensure A & O Schedules are updated at all sites in order of criticality over the coming few years. We have also revised our A & O approval process to ensure all parties are clear about their accountabilities through the process and the requirement for the A & O Schedule to be updated as a part of the closeout stage, once the works is complete. This closeout stage puts enhanced focus on providing quality As Built operational drawings which are in line with the established Industry Guidelines for the Use of Mutual-Interest Drawings. This process is currently being embedded through the business and will go live on 1 July 2016.	31 March 2016 Now scheduled for 1 July 2016	Underway

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Recommendation	Action	Progress Update	Due Date	Status
Recommendation 7 11.17 The Authority recommends that Vector review its network planning standards with respect to the definition of a single credible contingency event relevant to the multiple power cables co-located within close proximity. Vector should undertake this review immediately and implement recommendations on improvements before 31 March 2016. 11.18 Thirty-eight power cables supporting 19 supply-critical circuits co-located within an in-air trench was a primary risk factor in the Penrose fire incident. The cable trench was effectively a single contingency risk for the 19 supply-critical circuits. Such supply-critical circuits should have had at least one level of redundancy inherent in the network design. 11.19 Included in the lengths of power cables were 11 kV power cables that Vector managed using a 'run to failure' maintenance approach. Locating 'run to failure' cables in an in-air situation in close proximity to other assets that have a higher standard applied to them was a critical factor in extent of supply disruption that resulted from the Penrose fire. Vector must reconsider the application of its network planning standards for these situations.	Vector will: • Review its current definition of a single credible contingency event in its planning standards by 29 February 2016;		29 February 2016	Completed
	• Review its current security standards with respect to single credible contingency events by 29 February 2016; and		29 February 2016	Completed
	• Review its asset management standards to minimise the likelihood of a cable joint failure creating a subsequent failure on a co-located cable circuit by 31 March 2016.		31 March 2016	Completed
Recommendation 8 11.20 Vector and the AECT should review the scope of the biennial State of the Network Reviews to ensure that the reviews achieve what was intended, and that any limitations are fully understood. 11.21 The Authority recommends that the scope of future State of the Network Reviews include	Vector will: • Review the current terms of reference as agreed with the Trust (Completed);			Completed
	• Propose any amendments (if required) to the Trust by 28 February 2016; and		28 February 2016	Completed

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supply-critical network components, and an assessment of how the associated risks are being managed. 11.22 Vector and the AECT should undertake the review immediately and include recommendations on improvements in the 2016 State of the Network review and report.	• Incorporate the revised terms of reference in the next review and report.	Process in place to incorporate when next engagement is completed.		Completed
Recommendation 9 11.23 An early post-event review involving Vector, Transpower and NZFS should have taken place. The lack of such a review has raised, at a late stage in the inquiry, important questions about communications and safety management during and after the fire. Resolution of inconsistencies between the perspectives of Vector, Transpower and NZFS could reveal important lessons and opportunities for improvement in emergency management procedures. 11.24 The Authority notes that in the final stages of this inquiry, Transpower has said that it is considering a safety review that will bring together Vector, Transpower and NZFS in a review of the safety and inter-agency aspects resulting from the Penrose fire. 11.25 The Authority considers that the review must include engagement with relevant field and office personnel from Vector, Transpower and NZFS, especially the onsite personnel involved on 5 October 2014. The results must be widely disseminated with relevant stakeholders. This review will provide opportunities to consider and improve safety and fire control management for emergency responses involving high-voltage electrical facilities. 11.26 The Authority recommends that the safety review be externally peer reviewed by an appropriate independent safety authority and the	Transpower will facilitate a workshop between the relevant parties to review the event by: • Drafting a workshop scope to encompass the recommendations (complete);	The workshop was held between Transpower, Vector and NZFS. The workshop covered the following: a) Assess the effectiveness of the response; b) Identify any learnings from the response that could be used to improve the effectiveness of the response for future incidents, including: • management of risks to personnel or equipment during the response; • identifying any policy changes, or the practical implementation of existing policy, arising from the response; and • identifying whether any additional information, plans, protocols, procedures, or the like would assist in responding to future incidents. Additional focus was a focused on the following; c) The roles and responsibilities of each party; d) The actions of each party, and; e) Interactions between the NZFS and Transpower/Vector (and their contractors)		Completed
	• Arrange for an external peer review by an appropriate independent safety authority and publish the outcomes by 31 March 2016; and	Harvey O'Sullivan was selected to complete the external peer review given his understanding of the New Zealand Electricity Sector compliance with technical legislation, particularly applying that to health and safety. Now the final report has been received from the NZFS, the outcome of the peer review is expected by 30June 2016	31 March 2016 Now scheduled for 30 June 2016	Underway
	• Attending the workshop (along with representatives from Transpower's/Vectors field contractors involved in the Penrose event) planned for 15 December 2015;	Complete	15 December 2015	Completed

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outcomes publicised by 31 March 2016.	• Commissioning an independent expert (as recommended by the NZFS) to act as the workshop facilitator (complete);	Robert Pope was selected as the NZFS Authorised Facilitator.		Completed