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24 July 2019

Hazet Adam
Senior Analyst
Commerce Commission
44 The Terrace
PO Box 2351
Wellington 6140

External advice on temporary over-voltages for the Waikato and Upper North Island Voltage Management investigation

Dear Hazet,

The purpose of this letter is to share a summary of the external advice we have received to support the Waikato and Upper North Island Voltage Management (WUNIVM) investigation.

Throughout the WUNIVM investigation we have received regular independent advice from Power Systems Consultants (PSC) to gain a greater understanding of international best practice in managing system stability. Given the complexity around the over-voltage component of voltage stability we also engaged Zia Emin, Chairman of CIGRE Study Committee on System Technical Performance, in December 2018 to provide an external review of our processes and methodologies. This opinion sought to inform and confirm that our approach to studying and managing over-voltages is aligned with that of other international transmission network operators. The opinion is attached for your reference, and the WUNIVM investigation is in accordance with this opinion.

In addition to the points raised in the opinion, we would like to raise attention to the following.

- The analysis Transpower undertook into over-voltage (presented in the short-list consultation) is aligned with the recommendations provided.
- Transient over-voltages are dependent on the degree of shunt compensation – in particular, the ratio of static vs dynamic. This is particularly relevant in the New Zealand context, and not discussed in Zia's opinion. High-levels of static shunt compensation can also produce high over-voltages.
- The voltage waveform will be distorted during over-voltage conditions. Three ways to assess over-voltages (in order of highest to lowest reported voltage) are the peak voltage, the RMS voltage of the distorted waveform, or the power frequency component of the distorted waveform. The WUNIVM investigation used the power frequency component to assess over-voltage, which from Zia's opinion is the usual approach used by other utilities.

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Based on the information obtained from discussions with Transpower and other international utilities, the review found that Transpower's approach to analysing for transient over-voltages is in line with other international utilities.

Yours sincerely,

Stephen J Jones
Strategic Asset Manager, Grid Development
Transpower