



21 November 2017

Dr Mark Berry
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Dear Mark

As requested, please find a summary of our high level earthquake readiness business case to follow.

Wellington Electricity intends to submit a Customised Price Path (CPP) as described in the Commerce Commission's discussion paper, "Our proposed approach to assessing Wellington Electricity's proposal for additional expenditure to improve its resilience and response to a major earthquake", dated 14 November 2017.

This letter is intended to provide additional context and further information on the proposed expenditure.

Context

Electricity provides an essential service for our community; it is the lifeblood for society's welfare and essential for a thriving economy. Losing it for a prolonged period of time can have a devastating impact on people's quality of life. At a most basic level, access to fresh water, lighting, cooking, refrigeration, heating and communication would be seriously compromised without electricity, often with no viable substitute for most families or people living alone.

Since the 2010-11 Canterbury earthquakes, we have been proactively assessing how we can reduce the impact on consumers from the damage to our network should a major earthquake occur in Wellington.

The Kaikoura earthquake in November 2016 sharpened everyone's awareness of Wellington's unique vulnerabilities. It heightened the need for a thorough examination of the region's preparedness to plan and respond appropriately to a disaster situation precipitated by a major earthquake

One of the unique vulnerabilities of the region that is now better understood is the impact that a major earthquake could have on our region's transport links. These could be so badly damaged that the region could be effectively split into seven 'islands', five of which are within Wellington Electricity's distribution network.

If that were to happen, it would make restoration efforts extremely challenging as it would severely restrict the movement of people and equipment into, and throughout the region. The restricted ability for people to move out of the region also makes the timely restoration of electricity supply even more important as communities would need to initially recover at home.

Our ability, as a key lifelines utility, to respond effectively and efficiently under a major earthquake scenario depends on having the right equipment stored in the right places within the region. Having such readiness spares would help to reduce delays in restoring electricity that would otherwise negatively impact our communities and businesses.

Proposed Readiness Initiatives

To ensure we are investing for the long-term benefit of our consumers, we have assessed the earthquake risk of damage to our network and developed appropriate readiness solutions to reduce that risk.

We have ensured these are prudent and sensible investments which are economically robust using conservative assumptions about the quantum of potential benefit.

A summary of our proposal is shown in the table below.

| Risk being addressed | Proposed short term initiatives | Capex (\$m) | 3 years Opex (\$m) | Total |
|---|--|--------------|--------------------|--------------|
| 33 kV Cable faults | Emergency hardware | 4.74 | 0.67 | 5.41 |
| Loss of transformers and switchgear | Mobile substations and switchboard | 4.73 | - | 4.73 |
| 11 kV Cable and equipment faults | Critical emergency spares | 4.94 | - | 4.94 |
| Preventing damage to equipment in buildings | Seismic reinforcement of significant buildings | 10.40 | - | 10.40 |
| Maintaining data and communication links | Communication Systems | 5.26 | 0.50 | 5.76 |
| TOTAL | | 30.07 | 1.17 | 31.24 |

Table 1 – Proposed Initiatives

The first three initiatives shown above were chosen based on the \$26 million net benefit (benefit minus cost) they provided relative to other options. The benefit is the improvement in restoration times that each option offers against the current state. These improvements are a combination of the repair time and the time it would take to transport equipment into the region under our current state – i.e. if we don't have adequate spare equipment in the right location.

The majority of benefits from the spare overhead line and cable equipment arise from a reduction in the time it would take to transport spare equipment to where it is required. However, there are also significant benefits from reducing the repair time from moving to mobile and portable substation options.

The proposal to seismically strengthen our significant buildings is being primarily driven by an impending change to our seismic building standard to bring all zone substation and critical important buildings up to 67% of NBS. This standard is consistent with peer utilities.

The proposal to add three data centres and improve our communications systems is driven by the recognition that restoration efforts can only begin if we have adequate communication links and access to critical systems and tools. A delay in the restoration of an initial 60% of lost electricity supply is valued at around \$110 million a day. Add to this the compounding effect of our communities and businesses being without power for days on end, and one can see there is significant value that could be lost from not addressing this relatively simple problem.

Further Detail

Further detail on the short term initiatives is shown below.

Emergency Hardware (\$5.41M) includes:

- equipment required to construct around 19 km of emergency overhead power lines in the event of part of our 91km of 33kV fluid filled cables being damaged. It will improve electricity restoration times by between 2 and 12 weeks;
- 33 kV XLPE (plastic – modern equivalent) cable spares which will be stored in the CBD and has the potential to save two weeks in equipment transport time compared to our current state..

Mobile Substations and Switchboard (\$4.73M) includes:

- two mobile 10 MVA substations which will be held ready for deployment. One will be located in the CBD and the other in the Hutt Valley region;
- one 11kV mobile switchboard which will enable the restoration of the electrical load at substations damaged by liquefaction and/or ground shaking.

When deployed with the emergency overhead lines, these options have the potential to reduce power restoration time in the Hutt Valley from 16 weeks down to 4, and from 14 weeks down to 8 in the Wellington CBD.

Critical Emergency Spares (\$4.94M) includes:

- three sets of cable fault location equipment, over 1,000 cable joint repair kits and over 4,000m of 11kV cable for repairs;
- critical distribution switchgear and transformers including 12 transformers and 30 units of switchgear to replicate damaged or inaccessible supply points.

By storing the above equipment in various locations across the region, we are confident that we could reduce the significant outage impacts from 11kV cable failure. This investment is especially important for our ability to quickly restore critical loads across the region.

Seismic Reinforcement Of Significant¹ Buildings (\$10.40M) includes:

- strengthening over 90 substation buildings to at least 67% of the New Building Standard (NBS).

Learning from Orion’s experience after the 2010/2011 earthquake sequence led us to consider a further increase in strengthening standards for earthquake-risk buildings to 67% of the NBS. Our current programme addresses “earthquake prone” buildings (i.e. <34% NBS), and we are proposing to extend that programme to strengthen all significant substation buildings.

The strengthening of our substation buildings to this standard will ensure equipment contained within them is available for service after an event. Major substation equipment is difficult to move within the region and has long (6-12 month) replacement lead times. Stronger buildings will also make access far easier (and safer) which will, in turn, expedite the restoration of power.

Assuming a similar ratio of avoided asset replacement costs as Orion², this \$10 million strengthening work would avoid an equipment replacement cost of between \$50-\$80 million on our network after

¹ Significance is based on criteria including public and worker safety, network criticality and the type of connected load.

² \$5-6m of reinforcement spending protected \$50-60m of substation equipment (Resilience Lessons: Orion’s 2010 and 2011 Earthquake Experience report by the Kestrel Group, September 2011).

a major earthquake. It would also avoid the additional cost of delays arising from equipment from overseas suppliers.

Communications Systems (\$5.76M) include:

- installing three data hubs to ensure that the critical network systems we need for restoration information are accessible should telecommunications links fail between islanded regions after an earthquake;
- improving voice radio communications systems for maintaining operational control.

Housing data hubs in a simple shipping container that can be located at three separate sites provides both diversity and redundancy. It also reduces personnel and public safety risks – avoiding entry into damaged buildings to access emergency systems and data.

Communication with field workers and restoration crews is vital for safety (for crews, public and property). It also allows the control room to build a picture of both damage and network availability ahead of restoration processes. An independent radio network allows us to respond without reliance on public communications system, which may be compromised for long periods. The communications systems investment is a key enabler because it allows us to safely start the restoration process by:

- public safety patrols & isolation requests;
- communicating earthquake damage assessments;
- planning the prioritisation of recovery options;
- resource planning; and
- commencing the planned sequence of restoration activities.

This initiative is seen as an enabler of the other initiatives in that it allows us to effectively assess earthquake damage, prioritise options for recovery, plan our response, and execute these plans.

Summary

The business case demonstrates the proposed spend of \$31.24 million (including opex spend of \$1.86 million over next three years) will significantly improve the readiness for Wellington Electricity to return supply to its customers. The investments can be delivered over the next three years to benefit our customers as soon as possible.

As a lifelines utility, we follow a systematic approach to reduction, readiness, response, and recovery planning so we can look to continuity of operation albeit at a reduced level, following a major disruption.

Bringing critical spares into the region to assist earthquake response readiness in the knowledge that transport links will be cut off for some time (up to 12 weeks) is a prudent step in being able to meet our lifelines obligations to respond and recover following a major disruption.

Our business case clearly demonstrates that it is in the best interests of consumers to make further investment in the readiness capability of the electricity network now, to ensure we can safely restore supply to essential services in the shortest possible timeframe. This will provide social benefit to our communities and wider economic benefits by enabling business continuity.

Should you have any further questions, please do not hesitate to contact me directly.

Yours faithfully

A handwritten signature in dark ink, appearing to read "G Skelton". The signature is fluid and cursive, with a large initial "G" and a long horizontal stroke at the end.

Greg Skelton
CHIEF EXECUTIVE OFFICER