TRANSPOWER

Replacing a live substation

Over the last year, Transpower has been undertaking an $11 million project to replace large amounts of equipment within the Karapiro substation – while it continues to supply power from it. It's much the same as when you renovate your house while still living in it – you just have to manage a few work-arounds. A core crew of around 10 from Northpower and Spartan are carrying out the work on behalf of Transpower and the project will take another year to complete.

Transpower's GM of Grid Delivery Mark Ryall says the company understands there can be significant community disruption when this sort of work is undertaken, particularly when day-long power outages are needed.

"Unfortunately there is no avoiding the need for the work to get done. Some of the equipment is around 70 years old and reaching the end of its serviceable life. An investigation carried out in 2015 identified the most economic option was to significantly overhaul the substation but in a way that improves safety and security of supply.

"Safety in the context of Karapiro substation is about safety of our crews who maintain it. When built some 70 years ago, we didn't have the standards we have today around distances for maintenance. At voltages this high you only need to be near something, not touching, to be electrocuted or severely burned. Today, we design our substations with much greater distances between equipment to allow that maintenance to happen while parts of the substation are still live", Mark said.

"What we're doing at Karapiro is reconfiguring how all the high voltage circuits connect into the substation. This substation has had 72 years of things being added to it – which is typical of any network facility. Our predecessors would have had no idea of how the site would develop when built. At some point you have to bite the bullet and actually rework it to meet the needs of today and have it better prepared for the future. So that's what the project is about."

Having the substation live while the work is happening has proven to be a challenge. Transpower know that they can't just turn off a community for the months needed to do the work which would otherwise be the case for those in Matamata, Tirau and Putaruru. Instead, they have built a new bypass so that those communities' supply at Hinuera will come from Hamilton rather than the usual Karapiro substation. It's a temporary solution because electricity is having to travel twice as far to get to where it's needed – but better well-travelled power than no power at all for those affected.

This bypass will be used several times over the life of the project to minimise outages at Hinuera. It will be livened for the first time at the end of this month, which will require an all-day outage for Hinuera and the communities connected to it.

An all-day outage just to make the connection may seem a long time, but is critical to the safety of crews, Mark explains.

"When you work in a live substation you need to give yourself time to prepare everything appropriately, do the work, and cover any unforeseen event that might arise while always managing the multiple checks and assurances that keep our crews safe. Equipment connected at this voltage is also generally large and bulky – so it's not like the guy you see up a power pole in your street.

Quite large bits of kit - insulators, conductors, tensioning equipment are used, and all that takes time to deploy, install and connect.

“Finally, there is time needed to take the outage and then again to restore power. So in this case the actual work will be around 5 hours with the rest being made up of the switching needed by ourselves and the connected customer, PowerCo, to power the line down at the beginning and restore power at the end.”

The project is not Transpower’s only game in town. The Greater Waikato region is an important part of the national grid. It is a major energy producing area, generating a third of New Zealand’s renewable electricity.

Over the next three years we will be investing over $250 million refurbishing and futureproofing significant parts of the network, particularly around substations. There are similar types of refurbishment projects underway or planned for substations at Kopu, Waihou, Waikino, Cambridge, Hinuera, Te Awamutu and Hangatiki. Karapiro remains the largest project though due to the complexity of the refurbishment.

The Karapiro work is expected to be complete by the end of June 2021. There will need to be two final outages for the Hinuera circuit before it is once again connected back into the refurbished substation. While these will be again long days without power for the local community – it will be the final act in what has been a big project to virtually replace a complete substation while live.

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