

**BEFORE THE HEARING PANEL APPOINTED
BY THE OTAGO REGIONAL COUNCIL**

UNDER The Resource Management Act
1991 (**Act** or **RMA**)

IN THE MATTER of an original submission on the
Proposed Regional Policy
Statement for Otago 2021 (**PRPS**)

BETWEEN **POWERNET LIMITED**

Submitter 0511

AND **OTAGO REGIONAL COUNCIL**

Local Authority

EVIDENCE IN CHIEF OF MARK ZWIES ON BEHALF OF POWERNET LIMITED



GALLAWAY COOK ALLAN LAWYERS
SELFENAME
SELFE2EMAIL

P O Box 143
Dunedin 9054
Ph: (03) 477 7312
Fax: (03) 477 5564

Table of Contents

1. Executive Summary	2
2. Introduction	2
3. Scope of Evidence	3
4. OJV's Otago Electricity Distribution Network	4
5. Network Development Planning	6
6. Planned Upgrades	8
7. Milton Area Capacity Upgrade	8
8. Urban Development Growth – Wākatipu	9
9. Naseby GXP 66kV Upgrade.....	10
10. Importance of ESTI and SEDI	11
11. Current Resource Management Challenges	12
12. Conclusion	13
Appendix 1: OJV's Area of Supply	14

1. Executive Summary

- 1.1 PowerNet Limited (**PowerNet**) is an electricity distribution business (**EDB**).
- 1.2 Its role is to distribute electricity from grid-exit points (**GXPs**) that form part of the National Grid and deliver it to customers. This requires operating, maintaining, upgrading and developing an efficient and safe electricity distribution network.
- 1.3 PowerNet was incorporated in 1993 has a network management contract with OtagoNet Joint Venture (**OJV**). PowerNet is jointly owned by OJV and The Power Company Ltd. OJV is the disclosing entity for the electricity lines businesses that convey electricity to much of rural Otago, areas of Frankton and part of Wanaka, supplying approximately 19,428 customers. PowerNet (through the contract with OJV) manages this network in Otago.
- 1.4 PowerNet is continuously maintaining and upgrading the existing network to meet growth demand and the changing needs of customers. The need to protect and enable this infrastructure is a key issue for the region. The provisions of the proposed Otago Regional Policy Statement for Otago 2021 (**PRPS**) has a considerable influence on how OJV delivers this network, as these provisions influence the lower order district level planning provisions and their associated resource consenting requirements.
- 1.5 I am supportive of the relief sought by the three electricity distribution businesses in Otago, being PowerNet along with Network Waitaki Limited (**Network Waitaki**) and Aurora Energy Limited (**Aurora**). I consider this relief to be important in enabling the continued delivery of a safe, protected, reliable and efficient electricity distribution network for the people, businesses and communities of Otago.

2. Introduction

- 2.1 My name is Mark Lindsay Dennison Zwies.
- 2.2 I have been in the role of Engineering Manager (Networks) at PowerNet since 2015.
- 2.3 My experience includes over 22 years' engineering and asset management experience in the New Zealand electricity transmission and distribution sectors, and over 13 years' experience with the third largest electricity distribution network managing its electrical assets.

- 2.4 In my role, I am responsible for the planning of our electrical networks and determining how we need to invest in the network to develop, operate, maintain and dispose of the assets to meet the needs of our customers and any new developments that occur within the regions we manage.

3. Scope of Evidence

- 3.1 I have been authorised by PowerNet to provide evidence on its behalf in support of its submission 0511 on the PRPS. In particular, this evidence will:

- (a) Describe the current OJV network in Otago;
- (b) Set out the network development plans and obligations it currently has;
- (c) Discuss the importance of the OJV's Electricity Sub-Transmission Infrastructure (**ESTI**) and Significant Electricity Distribution Infrastructure (**SEDI**);
- (d) Discuss the current challenges faced by OJV in Otago, and
- (e) Provide a conclusion.

- 3.2 In preparing this evidence I have reviewed the evidence of Mr David Patterson and Ms Joanne Dowd lodged in support of a submission by Aurora,¹ another EDB which operates an electricity distribution business throughout Dunedin, Central Otago and Queenstown Lakes Districts. For the purpose of setting out the background of what PowerNet does, the regulations it is subject to and the broad nature of the distribution network I adopt the explanation contained in the following sections of Mr Patterson's and Ms Dowd's evidence:

- (a) Evidence of Mr Paterson on behalf of Aurora Energy Limited:
 - (i) Section 4 Electricity Distribution in Otago
 - (ii) Section 5 Lifeline Utility
- (b) Evidence of Ms Dowd on behalf of Aurora Energy Limited, section 11 Regionally Significant Infrastructure

¹ Evidence of Mr Patterson and Evidence of Ms Dowd dated 23 November 2022 (OS0315).

4. OJV's Otago Electricity Distribution Network

- 4.1 PowerNet is the equivalent of the fifth largest network company in New Zealand, delivering electricity to around 73,000 consumers, made up of households and businesses. OJV is an electricity lines business that is operated and managed by PowerNet that conveys electricity to much of rural Otago, areas of Frankton and part of Wānaka, supplying approximately 19,428 customers on behalf of seventeen energy retailers.
- 4.2 The map contained in **Appendix 1** provides an overview of OJV's network in Otago.
- 4.3 OJV network spans three geographically distinct areas:
- (a) Otago: The northern rural Otago area bounded by Waitati, Shag Point, Falls Dam and Lake Mahinerangi, and the southern rural Otago area bounded by Taieri Mouth, Beaumont, Waipahi, and the MacLennan Range.
 - (b) Frankton: The area between Lake Hayes, the Frankton arm of Lake Wakatipu and Jacks Point, consisting of several non-contiguous sections as the area is serviced by both Lakeland Network Limited (which has assets that are owned by OJV that are managed by PowerNet) and Aurora.
 - (c) Wānaka: A small area northeast of Wānaka and south of the Clutha River, which is embedded within the Aurora network.
- 4.4 The topography across the network is varied, comprising dry flat plains, rolling hills and mountainous areas in the inland Central Otago area that includes townships of Naseby and Ranfurly, the gold mine at Macraes Flat and stretches as far south as Middlemarch, Clarks Junction and Hindon. The East Otago area is characterised by rolling countryside which includes the townships of Waitati, Waikouaiti and Palmerston. Flat plains and rolling hills characterise the South Otago areas, which include the townships of Milton, Balclutha, Owaka and Clinton. In the Frankton and Wānaka areas, the topography comprises areas of flat / undulating land surrounded by mountains and lakes.
- 4.5 The network which spans rural Otago is predominantly made up of overhead lines (poles and conductors) due to the low population density of customer connections which would make undergrounding both expensive and impractical. Industrial loads make up a significant proportion of the load, in particular the gold mine at Macraes Flat which consumes approximately one third of OJV's total electricity volume. The remaining load is predominantly farming along with domestic load concentrated in regional towns.

- 4.6 The Frankton/Lake Hayes network is entirely underground and supplies a proportion of the newer residential and commercial developments in the area. It is predominantly supplied via a 22 kV cable.
- 4.7 The Frankton area network is relatively new with the first assets being installed in 2003. However, the overhead line assets that form the backbone of the Otago rural network are relatively old. Most of these assets are in reasonable condition, but significant line replacement work will continue to be required.
- 4.8 In summary, OJVs current ESTI and distribution network in Otago comprises:
- (a) 32 zone substations, where electricity is managed and transformed from sub-transmission voltages (33kV or above) down to lower voltages for distribution (below 33kV);
 - (b) Approximately 47 km of 110 kV line, 75 km of 66 kV line, and 584 km of 33 kV line, which is almost entirely overhead except for a short cable runs at GXPs and zone substations. This network also includes a large number of zone substations that are required due to the long distances of these lines.
 - (c) Approximately 3338 km of high voltage 11kV overhead lines and underground cables which connect the zone substations with local distribution substations, and kiosks with transformers to distribute the electricity further into local communities;
 - (d) 4399 distribution substations/transformers, which in rural areas are typically pole mounted on the overhead network.
 - (e) Approximately 477 km of low voltage overhead lines and underground cables, which along with a variety of ground mounted equipment, including cabinets and boxes, manage the supply of power to individual locations.
- 4.9 PowerNet feeds electricity through its network from Transpower GXPs at Balclutha, Naseby and Halfway Bush. The rural Otago area supplied by the Balclutha, Naseby and Halfway Bush GXPs. The Frankton/Lake Hayes area is supplied by the Transpower Frankton GXP and a small embedded² network northeast of Wanaka.

² Distribution generation, or embedded generation, refers to a range of technologies and scales, including small-scale systems such as photovoltaic modules, small wind turbines and micro-hydro schemes to generate electricity.

4.10 The network also takes energy from the following three generators with capacity greater than 1 MW:

- (a) The 12.25 MW Paerau hydro scheme was built by Otago Power Limited in 1984 and then sold to Trustpower as a result of the enactment of the Electricity Industry Reform Act 1998. Paerau's generation is injected into the Ranfurly zone substation at 66kV bus which also feeds the Oceana Gold's Macraes Flat mine load.
- (b) The Pioneer Generation Limited (PGL) 1.25 MW Falls Dam hydro scheme is connected to the 33kV network at Oturehua. PGL owns the equipment to enable connection onto the OtagoNet 33kV line.
- (c) The Southern Generation Limited Partnership (SGLP) 8.0 MW Mount Stuart wind scheme is connected to the 33kV network on the Glenore-Lawrence line. SGLP owns the equipment to enable connection onto the OtagoNet 33kV line.

4.11 In addition, a small number of distributed generation connections exist which are only a few kW each in size. These generators are generally domestic solar installations which due to their generation profiles (tied to sunlight conditions) have negligible effect on GXP loading.

4.12 An overview of the Otago sub-transmission network that is operated by PowerNet, including the zone substations, Transpower substations and lines network (110kV, 66kV and 33kV lines) in the Otago region can be seen in **Appendix 2**. The map in **Appendix 3** shows the sub-transmission network as well as the 11kV overhead lines as a form of comparison.

5. Network Development Planning

5.1 As part of its annual asset management planning process, OJV monitors the existing network assets and ensures these assets are operating within the limits imposed by capacity constraints and service level requirements. Regular updating of demand forecasts enables predictions for future network operation and the need for network development or expansion. For the management of existing assets, forecast expenditure for maintenance and planned renewal of assets is planned with the objective of keeping the public safe and maintaining the reliable supply of electricity to our zone substations, all while minimising supply interruptions. Because these assets have a typical lifespan of 40-60 years, the assets require ongoing upgrading or replacement works throughout this lifespan.

- 5.2 In addition to management of the existing network, OJV undertakes a detailed planning process to determine new developments required for the network. This is also set out in its asset management plans. For the most part, development is driven by identified 'triggers' which include regulatory changes, customer and stakeholder demand (referred to as growth-based development triggers) or internal strategic initiatives, such as a security standard which drives developments to maintain a certain level of resilience. All triggers are effectively extrinsic and are undertaken to supply electricity to end-users and support the resilience of existing connections.
- 5.3 These trigger events may directly dictate a development requirement; for example a connection request from an intending industrial customer requiring an increase in network capacity to match their additional load requirements. The trigger may also be less direct, for example when load growth exceeds a threshold for increased security of supply. When a trigger event occurs or is predicted to occur, OJV will identify a range of options to bring the asset's operating parameters back to within the acceptable range of capacity and within service level requirements.
- 5.4 In addition to customer demand pressures, other factors may trigger the need for upgrades or development, including:
- (a) Gradual elimination of coal as a heating source and replacing this with electricity;
 - (b) The wider range in weather variations forecast has a potential impact on demand, in particular these events can increase peak demand;
 - (c) Major industry continuation or growth with a marked load change in isolated locations, such as milk processing plants;
 - (d) Increasing uptake of electric vehicles.
- 5.5 By way of example, the below table summarises³ OJVs typical development triggers and network solutions:

³ Source OtagoNet Asset Management Plan 2021-2031, publicly disclosed in March 2021.

Development	Trigger Point	Typical Network Solution
Extension	New customer requests a connection outside of the existing network footprint; often within network area but not immediately adjacent to existing infrastructure.	New assets are required to extend the network to the new customer. Additional capacity may also be need to be built into the nearest existing network and upstream assets depending on customer size.
Capacity	<p>Load exceeds capacity rating of network assets (or encroaches on spare capacity required to be maintained) or voltage drops below acceptable levels; i.e. below 0.94pu at customer's premises.</p> <p>Proactively identified through network modelling and monitoring load data from meters or MDIs but may occasionally manifest as overload protection operation, temperature alarms or supply quality complaints.</p>	<p>Replace assets with greater capacity assets. May utilise greater current ratings or increase voltage level (extension of higher voltage network, use of voltage regulators to correct sagging voltage or introduction of new voltage levels).</p> <p>Alternative options are considered prior to these capital intensive solutions but generally provide a means to delay investment; may be network based such as adding cooling fans to a zone substation transformer or non-network e.g. controlling peak demand with ripple control.</p>
Security and Reliability	<p>Load reaches the threshold for increased security as defined in OJV's security standard set out under section 4.1.6.</p> <p>Customers especially large businesses may request (and be willing to provide a capital contribution for) increased security.</p>	<p>Duplicating assets to provide redundancy and continued supply after asset failures.</p> <p>Increase meshing/interconnection to provide alternative supply paths (backups).</p> <p>Additional switching points to increase sectionalising i.e. limit amount of load which cannot have supply reinstated by switching alone after fault occurrence.</p> <p>Automation of switching points for automatic or remote sectionalising or restoration.</p>

5.6 The current Asset Management Plan describes numerous projects that are planned over the next five years. There are 15 development projects for the first year, and a further 7 are planned for years 2-5. The next section of this evidence describe some key projects planned by OJV.

6. Planned Upgrades

7. Milton Area Capacity Upgrade

7.1 An industrial customer has indicated that they are evaluating an expansion project which would require significant additional capacity in the Milton area. The prospective additional load would exceed the current capacity of Transpower's Balclutha GXP and the 33 kV lines which feed into to Milton. Transpower's 110 kV lines that supply Balclutha GXP also have capacity limitations whereas there are two 220 kV lines passing through the area with additional capacity available.

- 7.2 A review of the feasible options indicate a requirement for a new GXP near Milton to be supplied by Transpower's 220 kV National Grid lines. Additionally, a combination of new ESTI lines and existing line and substation upgrades would be necessary to supply the industrial sites.
- 7.3 Additional capacity may be required in a relatively short time frame. Therefore OJV considers the best options to meet this demand is to purchase land to develop this GXP in conjunction with Transpower. This process will require planning approval from Clutha District Council likely through the designation of the site for the purpose of a GXP. There is an open question about whether such a proposal would have the benefit of the National Policy Statement on Electricity Transmission given that this project is being advanced by OJV and would form part of the ESTI Network, despite being development in conjunction with Transpower. Accordingly, it is important that this infrastructure have elevated importance in the PRPS.

8. Urban Development Growth – Wākatipu

- 8.1 Rapid growth in the Wākatipu Basin indicates that a new zone substation will be required in the long term to provide capacity and supply security to this network. Available options to increase capacity and security of supply in this area include:
- (a) Plans for a future zone substation to service expected growth, including obtaining a suitable site.
 - (b) Upgrade the capacity of Remarkables substation and forgo the diversity a second substation would provide.
- 8.2 Given population forecasts for the Wākatipu Basin, establishing a new substation is considered by OJV to be the most prudent and long-term solution. Planning is underway to obtain a new substation site in the Wākatipu Basin. This new substation will be considered Regionally Significant Infrastructure, as it is part of the ESTI. It is therefore important to ensure that appropriate provision is included in the PRPS to enable ESTI, while achieving appropriate environmental outcomes. It is imperative to OJV's ability to obtain the necessary planning approvals for this proposal in what is expected to be a sensitive environment.

9. Naseby GXP 66kV Upgrade

- 9.1 OtagoNet has two 33 kV lines providing supply to the Ranfurly substation from the Naseby GXP. The Maniototo area is supplied from Ranfurly at 33kV and two major customers, Oceana Gold and Trustpower (the Paerau hydro power scheme) are supplied at 66 kV.
- 9.2 The load capacity of the 33 kV lines from Naseby is marginal, as is the capacity of the 66/33 kV interconnecting transformers. Transpower replaced the Naseby GXP transformers in 2020, and the upgraded lines provide sufficient capacity for the OJV lines to Ranfurly to be upgraded to 66 kV. This will remove the capacity constraints of the present configuration for the current planning period and beyond.
- 9.3 OJV has identified the following development options to address the marginal load capacity of the 33 kV lines from Naseby:
- (a) Upgrade the Naseby-Ranfurly lines to 66 kV.
 - (b) Upgrade the 33 kV Naseby-Ranfurly lines and upgrade the Ranfurly interconnecting transformers.
 - (c) Do nothing and accept the capacity constraints.
- 9.4 This project will require establishing a new overhead ESTI or upgrading existing overhead lines over rural farmland in Central Otago, which will inevitably require resource consent. While the location of the line(s) has not yet been determined, it is expected that much of this area will be mapped as an Outstanding Natural Landscape. Wherever possible, establishing the line(s) within areas identified as being environmentally sensitive will be avoided. However, there will likely be locational or operational constraints associated with this project, due to the need to connect to the existing infrastructure, that means sensitive areas cannot be avoided.
- 9.5 This project would be considered development of ESTI and RSI. Ensuring the PRPS does not present policy road blocks and is enabling of this type of project via consenting pathways that recognise the importance of this infrastructure to the community, even where located within a sensitive environment, is critical to OJVs operations.

10. Importance of ESTI and SEDI

- 10.1 As set out in the evidence of Mr Watson and Mr Paterson, the ESTI is the backbone of the electricity distribution network forming part of the fabric of the region, underpinning network capacity and transporting electricity between zone substations for distribution around the Otago region. It is critically important to Otago's electricity network.
- 10.2 As I have discussed in the Naseby - Ranfurly lines upgrade development plans earlier in my evidence, OJV are continuing developing and upgrading the ESTI network to meet demands for increased capacity in the network, primarily as a result of population and industrial/commercial growth and intensification. Further, OJV's ESTI supports other Regionally Significant Infrastructure that is identified in the Proposed RPS.
- 10.3 As I have discussed, all OJVs existing ESTI is currently operated at either 66kV or 33kV. As with Network Waitaki's infrastructure, this sub-transmission network is predominantly overhead lines apart from some short lengths of underground cable which are usually located at the GXPs.
- 10.4 As you have heard from Mr Watson and Ms Dowd, it is critically important that the ESTI is able to operate safely and efficiently. A failure on the ESTI network can affect several zone substations, and therefore result in a power outage for a large number of customers. Therefore, recognising the importance of this infrastructure to the community by defining it as Regionally Significant Infrastructure, and including provisions that protect and provide for this infrastructure is appropriate, in my view.
- 10.5 I understand that a definition for Significant Electricity Distribution Infrastructure (**SEDI**) was included in the partially operative Regional Policy Statement for Otago 2019. The notified PRPS did not include such a definition and so PowerNet's submission sought to reinstate it, coupled with a method to require the identification and some level of protection of SEDI infrastructure within District Plans.
- 10.6 I understand that SEDI is to provide some recognition of parts of the distribution network that have elevated importance and warrant protection over and above the remainder of the distribution network. Those parts of the distribution network that are intended to be captured by the definition of SEDI are lines that are, for instance, the only means of conveying electricity to a community, or that supply an essential service or emergency services such as hospitals and airports.

10.7 I have considered the recommended definition for SEDI in terms of OJV's distribution network and consider that this definition would likely apply to the following assets in Otago:

- (a) The 11 kV line that supplies electricity to Balclutha Hospital;
- (b) The 11 or 22kV lines connecting communities, such as Naseby and Dunback, which are located off the main road and reasonably difficult to get to and the Taieri Mouth network, as that connects into Aurora's East Taieri 3 SEDI network; and
- (c) The 11kV distribution lines that supply electricity to the Clutha District Council's wastewater, water supply and stormwater infrastructure.

10.8 I consider that including a mechanism that recognises the important role some parts of the electricity distribution network has for the community is an important addition to the Proposed RPS. Ensuring this SEDI is protected (in District Plans) is important to ensure that the needs of the communities which rely on these lines are also protected.

11. Current Resource Management Challenges

11.1 I have read the evidence of Mr Watson, and in my experience, the current resource management challenges facing Network Waitaki align very closely with those facing OJV. These include:

- (a) Retaining the ability to operate, maintain, upgrade and develop infrastructure within an environment with increasing layers of regulation;
- (b) Protection of infrastructure from incompatible land uses and reverse sensitivity effects; and
- (c) Ensuring consistency in planning frameworks across all the territorial districts within which OJV operate.

11.2 Providing a planning framework which achieves appropriate environmental outcomes while enabling the operation, maintenance, upgrading and development of the electricity distribution network is critical to OJVs operations. Within Otago, OJVs assets are located within five different district councils' jurisdictions, being the Clutha District, Central Otago District, Queenstown Lakes District, Waitaki District and Dunedin City. Therefore, the policies included in the Proposed RPS are of heightened importance, as they will guide

the development of provisions for this infrastructure within the District Plans within Otago, as these plans are reviewed.

11.3 I consider that the relief sought by Megan Justice in her evidence will establish an appropriate policy framework to protect and provide for the electricity distribution network in Otago, including in sensitive environments where is a functional or operational need to do so, that can be implemented through the District Plans. In my view, having a consistent approach that is enabling of the electricity distribution infrastructure network in Otago's District Plans, and that does not have any road blocks that prevent proposals from being considered via a resource consent or notice of requirement process, will greatly assist PowerNet in its role of supplying electricity to the community.

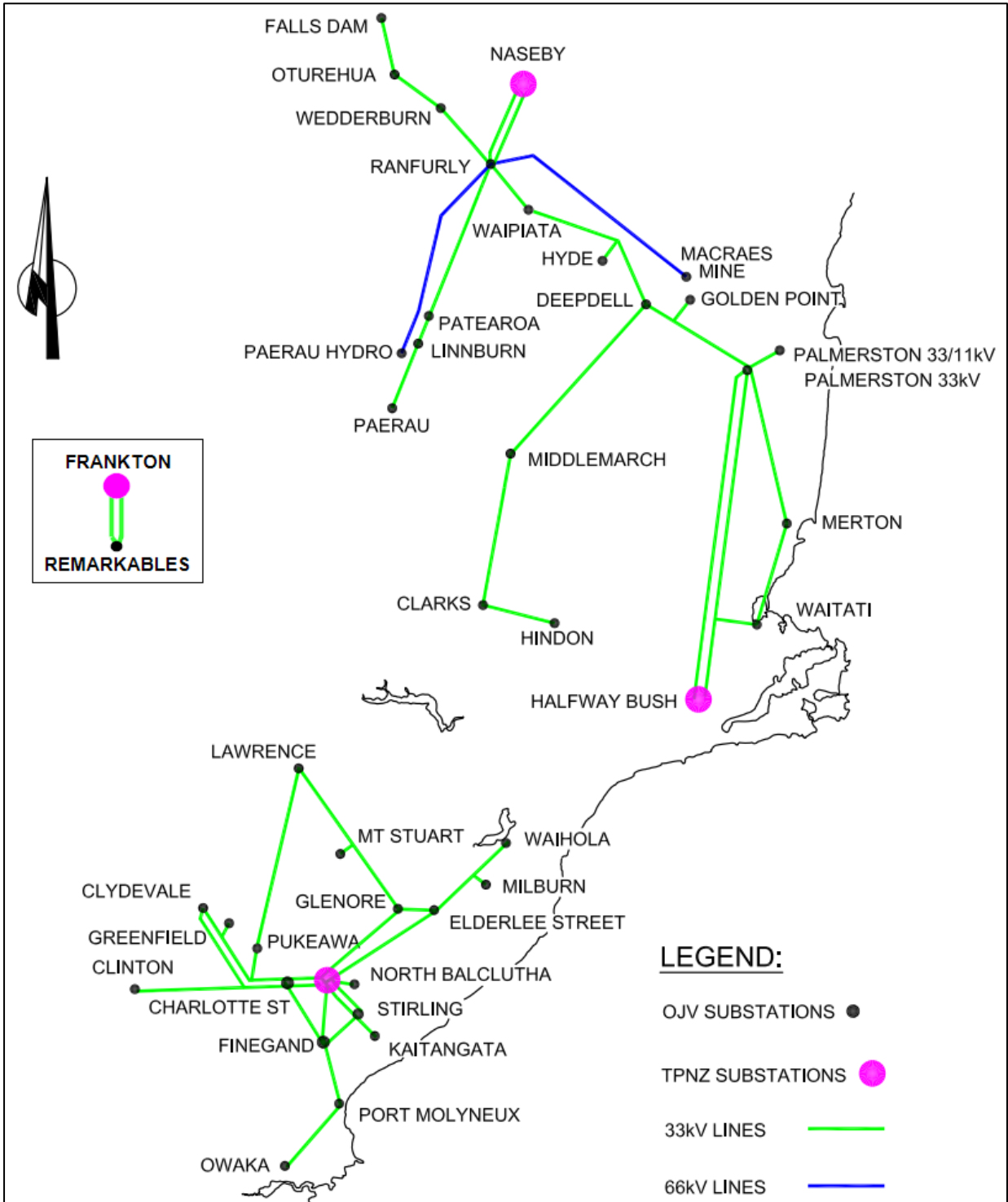
12. Conclusion

12.1 OJV continues to see considerable growth across much of its electricity distribution network in Otago. Safeguarding the existing network to ensure security of supply and supplying new developments with electricity is OJV's primary role. Ensuring the necessary resource management approvals for works on the network are obtained in a timely and efficient manner is necessary to perform this role. The PRPS has a key role in establishing objectives, policies and methods that facilitate the protection and on-going operation, maintenance, upgrade and development of the electricity distribution network in Otago. Having provisions that appropriately recognise the importance of this infrastructure will assist PowerNet with supplying electricity to Otago's communities.

Dated 23 November 2022

Mark Zwies

Appendix 2: OJV's ESTI in Otago



Appendix 3: OJV's ESTI and 11kV Lines in Otago

