An assessment of Orion's ViSION project as an innovation project

An expert report

David Reeve

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Executive summary

Background: Orion recognizes the critical need to gather and utilize low voltage visibility data to optimize their network amidst advancing technologies and the emergence of bi-directional electricity flows. This approach is essential for all Electricity Distribution Businesses (EDBs) as they transition to intelligent Distribution Network Operators (iDNOs). iDNO capabilities are vital for monitoring, forecasting, and managing energy flows securely, sustainably, and cost-effectively.

ViSION Project: Orion's "Visibility and System Insights for the Orion Network" (ViSION) project is a foundational step in their transition to an iDNO. The project focuses on data gathering and integration to improve the visibility of the low voltage (LV) network and provide advanced power systems analysis. This initiative aims to enhance electricity lines services, either reducing costs or improving supply quality for consumers.

Innovative Approach: ViSION represents a new technological and methodological approach to electricity lines services in New Zealand. By integrating 5-minute operational data from smart meters with LV transformer monitoring and network topology data, Orion aims to deliver improved and cost-effective electricity lines services. The initial trial at the Milton substation will provide critical insights for further improvement.

Data Challenges: The project involves processing large amounts of data from external providers, necessitating new processes and approaches. The first stage of ViSION will address data processing and analysis challenges, providing valuable learnings for other EDBs, particularly those using the same smart meter data provider.

Benefits of Transitioning to an iDNO: Completion of the ViSION project is a precursor to numerous benefits, including:

- Better understanding of network constraints for targeted investment.
- Optimization of existing feeder capacity, aiding electrification and decarbonization.
- Increased renewable generation hosting capacity while maintaining network stability.
- Identification of unregistered low carbon technologies for safety validation.
- Improved outage management and customer service.
- More accurate and timely connection quotes.
- Enhanced fault level management and quicker fault repairs.
- Facilitated market participation in flexibility services.
- Extended asset life through targeted maintenance.
- Reduced electrical losses and more accurate loss reporting.

Consequences of Not Transitioning: Without transitioning to an iDNO, Orion would face significant challenges:

- Reacting to network constraints after they appear, leading to poor customer supply and higher costs.
- Prohibitively expensive widespread network reinforcement.
- Missed opportunities for network optimization and cost savings.

Assessment Against Criteria: Innovation: ViSION is an innovation project, introducing new technology and approaches to network management.

Cost Reduction: The project aims to reduce the cost of electricity lines services through better information and efficiencies.

Quality of Supply: ViSION is expected to significantly improve the quality of supply for consumers by addressing various power quality issues.

General Application: The project's results and learnings will be shared widely, benefiting other EDBs and informing their technology investments.

Conclusion: With 41 years of relevant experience, I am confident in my qualification as a Suitable Specialist. In my opinion, Orion's ViSION project meets all criteria for being an innovation project, promising significant benefits for Orion and other EDBs in New Zealand.

Signed

David Reeve

Director

1. Background

Orion has recognised the benefits of securely gathering low voltage visibility data and utilising it to optimise their network in the face of technology advances and the emergence of electricity flows both ways across the network. Orion also recognises that all EDBs face the same issue and the approach Orion takes would be applicable to other EDBs.

Orion recognises that EDBs will need to become intelligent Distribution Network Operators (iDNOs) to accommodate new technologies into electricity networks. iDNO capabilities will be essential to monitor, forecast and manage the bi-directional flow of energy in a secure, sustainable, and cost-effective manner.

A foundational part of Orion's transition to an iDNO, is its 'Visibility and System Insights for the Orion Network' (ViSION) project and it is this that is the subject of their application to the Commerce Commission for funding an innovation project. Other future steps in Orion's transition to an iDNO may be the subject of future allowance applications.

The first stage of ViSION is focussed on data gathering and integration, establishing improved visibility of the LV network and advanced power systems analysis and insight. This is a critical step to unlock potential benefits and improve electricity lines services at either a lower cost to consumers and/or a higher quality of supply to consumers.

In the Commission's most recent Electricity Distribution Services Input Methodologies Determination an innovation project is defined as:

> "a project that is focussed on the creation, development or application of a new or improved technology, process, or approach in respect of the provision of electricity lines services in New Zealand"

The ViSION project is a new technology and approach to the provision of electricity lines services in New Zealand. By accessing 5-minute operational data from a third-party holder of smart meter data and combining it with LV transformer monitoring data and network topological data Orion intends to deliver improved electricity lines services and more cost effectively than if it does not evolve. The trial on the Milton substation is critical to learn how to do this and how to improve further.

The scale of data involved and having to ingest it from an external provider requires new processes and approach. The first stage of the project aims to learn how to process and analyse the data and these learnings would be applicable to other EDBs especially those who have the smart meter data collected by the same smart meter provider. In ViSION Orion is working through some of the challenges associated with receipt of enormous amounts of third-party data.

The learnings and progress that Orion has made in the development of systems and processes to reduce third-party data issues, such as duplication and security issues, will by itself be valuable for other EDBs as they too move into the 'big data' phase.

1.1 Suitable specialist

A key requirement of the innovation project funding application is a report is that it is signed by an Engineer or Suitable Specialist.

A Suitable Specialist is a person (or persons) having specialised knowledge or skill based on training, study, or experience.

I believe I meet the requirement of Suitable Specialist. I have 41 years of experience in the electricity industry. The first ten of those were in distribution (Te Awamutu Electric Power Board). After moving into generation and electricity markets, I retained exposure to network matters, especially transmission, and have worked at, or participated in:

- Common quality
- Network investment and economics
- Congestion management
- Special protection schemes
- Future Security and Reliability, and
- Network pricing.

In recent years I have been the lead author on reports for Transpower and the Electricity Authority on Distributed Energy Resources. I was part of Electricity Networks Aotearoa project on modelling future Network Supply Points peak demand that reconciled to a national level and the Climate Change Commission's demonstration path.

The experience of most relevance for this work was as lead author on two papers for the ENA:

- Low voltage monitoring – a primer and guideline, David Reeve, and Ben Barton (October 2020)
- Business case for investment in low voltage network monitoring, David Reeve, Gary Blick, and Ben Barton (November 2020)

2. Factual and counterfactual

2.1 If Orion moves to an iDNO model

Orion characterises the ViSION project as being a foundational part of Orion's shift to being an iDNO. It says:

> "Once ViSION is fully implemented and other future steps in our transition to an iDNO are complete, there are numerous benefits that will result."

So, these benefits can't be solely attributed to the ViSION project, but completion of the ViSION project is a precursor to achieving these benefits. The potential benefits are:

- developing a better understanding of existing areas of network constraint to inform targeted network investment.
- identification and release of latent capacity from the network to optimise the utilisation of an existing feeder. That released network capacity can then be used to assist wider electrification and decarbonisation initiatives, without building new expensive network.
- an ability to host an increased amount of renewable generation while maintaining network safety, stability, and resilience, by seamlessly maximising the two-way throughput of energy across our network.
- the capacity to identify unregistered low carbon technologies associated with segments of LV feeders for further safety investigation and validation.
- improve outage, customer and safety outcomes. For instance, identify poor voltage conditions before a customer does.
- improved ability to issue cost-effective and more timely connection quotes.
- further reduction in fault levels through smart switching in the network as constraints on the network are identified before faults occur, and where faults do occur restore load to customers quicker and undertake timelier repair of faults.
- better enable market participation in flexibility and other services through such measures as ability to create LV capacity heat maps.
- increase asset life and improve condition-based asset management through maintenance targeted to assets with increased loading.
- reduce electrical losses, as well as improve our ability to calculate and report losses more accurately. Most losses on an EDBs network occur on the low voltage network and measured data will enable better understanding of where these losses are occurring.

2.2 If Orion does not proceed to an iDNO model

Orion identifies several factors that support the view that its iDNO programme will ultimately lead to a higher quality of supply for customers and lower cost for customers than would otherwise be the case. Some of these are:

a) If Orion does not transition to being an iDNO it will need to either continue to react to low voltage network constraints as they appear or commission a widespread reinforcement programme to significantly increase capacity in the low voltage network.

   a. The first option of continuing to react after constraints appear will significantly negatively impact customer supply, likely slow decarbonisation, not enable response to customer need, reduced safety, and most likely lead to both resource constraint and ultimately increased pricing.

   b. The second option of widespread reinforcement would be prohibitively expensive. Orion's low voltage network is estimated to have a replacement value of over $600m. Widespread reinforcement of the network would therefore likely cost hundreds of millions of dollars.

b) Numerous transformation roadmaps around the world have been commissioned by regulators, industry bodies and electricity networks. Orion is unaware of any that do not state the fundamental need to improve low voltage visibility and insights and indeed neither am I.

c) Perhaps the most comprehensive New Zealand study produced, relevant to the cost-benefit of ViSION and an EDB transitioning to being an iDNO, was our 2020 report on the "Business Case for Investment in Low Voltage Monitoring". That report concluded the net benefit to EDBs of a scenario where monitors are installed on 10% of low voltage transformers in New Zealand, would result in a net NPV benefit of between $306 and $317 million.

d) A high-level assessment undertaken by Orion on two counterfactual approaches to data collection on the low voltage network showed that these alternative approaches both resulted in poorer quality of supply for customers and/or greater ultimate cost for customers compared to the approach taken under the first stage of ViSION. The two counterfactual approaches are:

   a. not obtain smart meter operational data but instead rely wholly on low voltage transformer monitoring rolled out to near 100% of low voltage transformers combined with improved network topology information.

b. not invest in low voltage transformer monitoring and instead rely wholly on smart meter operational data and improved network topology information.

We note that our 2020 business case only considered low voltage monitoring. However, that was because that was the scope for that paper. I agree that combining LV monitoring, smart metering operational data, and improved network topology information will gives the best results.

There is another potential counterfactual where LV networks are surveyed, and the detailed information used to build full LV network models. However, the data capture and modelling are likely to be very expensive and error prone. The resulting model would be correct at a point in time and would need to be continually updated to be useful. Power system insight tools would still need to be applied and more complex assessment of power quality would not be possible, and neither would the outage management aspects of the dynamic ViSION project.

Orion also notes that there is also no 'evolutionary new technology' on the horizon that will mean a cheaper solution to their data needs is available. I am also not aware of such an alternative technology.

3. Assessment against criteria

I offer my opinion on how the ViSION project performs against the criteria for innovation project funding.

3.1 The proposed project is an innovation project

In my opinion the ViSION project is clearly an innovation project. A number of aspects of the project have not been done in New Zealand, such as the processing of smart metering operating data and the power system insight component using international third-party software services. We note there are some similarities between Vector's PRISMED application, but different approaches are being used between PRISMED and ViSION. Notably PRISMED primarily utilised smart meter consumption data rather than the smart meter operational data used in ViSION. In my opinion the joint learning from both will be very valuable.

There are two dimensions to the ViSION innovation as well. One is the technology being applied to network management, but the other is the tendering approach and the use of third-party services for future network management. This approach may prove to be the best way for many networks, especially smaller networks, to access this technology. If ViSION helps streamline the process for accessing this technology, as well as demonstrate how it can be used to both lower costs and improve service then it will prove very valuable.

3.2 The purpose of the proposed project delivers electricity lines services at a lower cost to consumers

The purpose of ViSION is to inform a pathway for Orion, and potentially others, to become an iDNO. An iDNO would undoubtedly reduce the costs of electricity lines services. Better information must lead to some cost efficiencies. However, my view is that the cost savings are likely to be significant.

Of course, as described in section 2, the ViSION project by itself does not deliver the full benefits but is a critical step on the path to delivering benefits (however, I expect that there would be some immediate learnings that would be broadly applicable to lines services that would yield some benefits). Nevertheless, the purpose of ViSION is to enable lower cost lines services in the future.

Orion noted our 2020 paper on the business case for LV monitoring in which we assessed an 'expanded' deployment of 10% of networks would yield an NPV of $306 – $317 million. In this paper we also stated that 100% deployment would have a negative NPV. I would add a few clarifications to these numbers.

First, when this report was written there was no international evidence for actual realised benefits. We thought that up to 10% deployment could yield net benefits because learnings from the 10% could be extrapolated to the rest of the network. Therefore, there was no obvious benefit resulting from the cost of 100% deployment. However, an outcome of ViSION (and similar projects like PRISMED) could

be to demonstrate that there are extra benefits realisable from full deployment, in which case the full deployment scenario could have net benefits easily greater than $300 million.

Second, with little available information on the likely benefits we were quite careful in our economic assessment. We described the evaluation as both limited (not considering all benefits) and conservative. For example, in our paper we identify that we hadn't valued safety benefits but were sure there would be safety benefits.

Third, our assessment was only for LV monitoring. A project that includes LV monitoring, smart metering operational data, and network topology inputs (as ViSION does) is likely to deliver greater expected benefits both because benefits are more likely to be achieved and because more accurate information should improve the resulting benefits.

3.3 The purpose of the proposed paper delivers higher quality of supply to consumers

In my opinion the greatest benefits of being an iDNO are likely to be through the higher quality of supply to customers. Assessments of economic benefit for customers are difficult. In the absence of an observable benefit function then customer benefits are assessed either through estimates or on an equivalent cost basis to achieve the same benefits. The only customer benefit estimate included in our 2020 business case (as opposed to cost savings) was the $20,000/MWh Value of Lost Load (VoLL). In that assessment we assumed, from SAIDI statistics, that unknown outages could be reduced by 50% (because they become more likely to be identified) and that faults from defective equipment and vegetation could be reduced by 10%. Again, there are some clarifications to be made here.

First, the statistics we necessarily relied on are only reported for down to 11kV. In the LV network the ratio of unknown faults, defective equipment, and vegetation could be higher than other sources of faults yielding higher benefits. The ViSION project will, at the very least, make LV issues directly observable.

Second, in our 2020 study we only assessed the quality benefit of reduced outages. Customers could also have issues related to voltage quality, system strength, harmonics, and other power quality issues. There is no information on whether these are even general issues for consumers at the moment. These effects could be hidden as customers could have malfunctioning equipment where it is never obvious that the problem is the power supply. The ViSION project should give a first indication on whether these issues are prevalent or rare. Regardless of either result the certainty is valuable. It should be noted that, even if there aren't problems now, problems could arise with increasing penetration of power electronics (batteries, rooftop solar, EV charging, air-conditioning/heat pumps, etc.)

Third, our assessment in 2020 used a prevailing value for VoLL of $20,000/MWh. A result of the electrification of more of New Zealand's economy for process heat and transport could mean that a much higher implied value of VoLL for future cases should be used.

Fourth, if the power system insights from ViSION do show the potential for significant improvements for the quality of lines services, then the case for 100% deployment would become strongly positive

with large net benefits. This is because this kind of monitoring needs to be comprehensive and dynamic.

3.4 The innovation project will be of general application to the activities of other EDBs

As Orion has identified that it will be sharing results more widely:

> "Orion will share its ViSION learnings with other EDBs through such means as final reports to the Commerce Commission, industry papers, conferences, our upcoming 'platform as a service' RFP, and general collaboration and assistance."

Then I am certain that the ViSION project will be of general application to the activities of other EDBs.

In my opinion the general applications that should be relevant are:

1. Indication of the insights achievable and, therefore, the urgency with which other EDBs should investigate similar technology,
2. Early learnings of low voltage issues that might have immediate application to other EDBs asset management,
3. Indications of the prevalence of any complex power quality issues (e.g. voltage quality, system strength, harmonics, etc.), which at least either informs confidence in customer service or the need for investigation to other EDBs (noting that ongoing monitoring as new technology is connected to networks is also valuable),
4. The pros, cons, learnings, and pitfalls of procuring and managing smart metering operating data,
5. The pros, cons, learnings, and pitfalls of procuring third party services for power system insight (which I think may be particularly valuable for smaller EDBs),
6. An evidential basis for the business case for the deployment of similar technology in other EDBs.

4. Conclusion

I consider that I have the relevant experience and expertise to be considered a suitable specialist.

In my opinion Orion's proposed ViSION project meets all of the IM criteria for being an innovation project.

References

Reeve, D., & Barton, B. (2020). *Low voltage monitoring – a primer and guideline.* Sapere Research Group.

Reeve, D., Blick, G., & Barton, B. (2020). *Business case for investment in low voltage network monitoring.* Sapere Research Group.

Appendix A - Meeting the IM Determinations criteria for innovation project allowance.

Criteria set out in Schedule 5.3 of the Determination and its amendment

(c) the non-exempt EDB received a signed report from an engineer or suitable specialist, where the engineer or suitable specialist stated in their opinion that-

(i) the proposed project is an innovation project;

(ii) the purpose of the innovation project is either:

A. delivering electricity lines services at a lower cost to consumers; or

B. delivering electricity line services at a higher quality of supply to consumers; or

C. delivering electricity lines services at a lower cost to consumers and at a higher quality of supply to consumers; and

(iii) the benefits of the innovation project will be of general application to the activities of that non-exempt EDB or of other EDBs; …

Appendix B – Full Curriculum Vitae for David Reeve

David Reeve, Director, Sapere Research Group

Sapere Research Group Ltd
Level 20, 151 Queen Street
PO Box 2475
Auckland 1140, New Zealand
mobile: +64.21 597 860
email: dreeve@thinksapere.com

Bio/Summary

Most recently David has been working in the low carbon development of electricity systems, including both the economics of electrification (including hydrogen), but also the development and integration of low emissions technology, including grid-scale solar, Distributed Energy Resources, Battery Energy Storage Systems, and the integration of new technology into transmission and distribution networks.

David is a former General Manager. He has a background in electrical work, engineering and operations. As he has taken on increasingly commercial roles he has specialised in bridging the gap between commercial expectations and technical limits. His commercial experience includes some time heading the regulatory function for Mighty River Power and managing key technical relationships and commercial strategy with Transpower (New Zealand's grid owner) and the distribution companies.

David started as an engineer with Te Awamutu Electric Power Board but then moved into generation, specialising in hydroelectric operations. He moved from complex hydro dispatch to planning, analysis and hydro-economics. He continued this experience into geothermal and wind energy and has done multiple business cases and valuations on renewable power developments. He has broadened his experience into solar as well.

David has extensive electricity market, operations and trading experience in New Zealand. He made the switch from operations to the electricity market with ECNZ and has had extensive electric market experience since then including participating on a number of governance and technical groups. He has also had significant advisory experience in Singapore and Philippines.

David was General Manager Metrix (Mighty River Power's metering business) during a period of significant change as the asset management and meter reading business prepared for smart metering. David also had roles and consulting work projecting major project capex and in corporate risk management, providing an independent review of trading, asset and project risk to energy company boards.

Education

Institution:	Waikato Polytechnic

City/Country:	Hamilton, New Zealand
Qualification:	NZCE: Electrical
Subjects Covered:	Generation and Distribution, Electro-technology, Electronics
Date Completed:	1990

Institution:	INSEAD Business School
City/Country:	Fontainebleau, France
Qualification:	Young Manager's Programme
Subjects Covered:	Residential business unit manager's course
Date Completed:	2002

Present Positions

Director, Sapere Research Group, April 2014 – Present.

Director, Whiteboard Energy Ltd, June 2012 – Present.

Previous Professional Experience

Sapere Research Group Limited

Director

- Review of residential price forecast adjusting for location and profile effects.
- Review of connection charges for a geothermal power station.
- Advice to New Zealand utilities on distribution pricing for a regulatory submission.
- Review of operational costs and synergies of a business unit within a major New Zealand utility company, and a follow up project on costs of separation.
- Technical advice to a major energy user in New Zealand on a submission on transmission pricing.
- Advice to the Electricity Commission of Tonga on the regulatory price reset for Tonga Power Limited.
- Review of a regulatory CBA for a major New Zealand energy company.
- Research into the origins of fixed price/capacity pricing in electricity tariffs for a New Zealand utility and advice on alternative options for New Zealand's low fixed charge tariff.
- A business case for the improvement of demand forecasting for a New Zealand utility
- Two reports for the drivers and influences on electricity demand for two New Zealand utilities.
- A report on the metering environment and potential for advanced metering infrastructure in Australia for a New Zealand utility
- Two reports on the benefits and costs associated with electricity retailing for two potential new entrants in New Zealand.
- Advice on hydroelectric operations and flood routing related to an insurance claim in the Republic of Ireland.
- Advice to a small merchant generator on transmission pricing
- Advice to a generator on the potential market impacts of new technology (Distributed Energy Resources).
- Paper for the Electricity Authority on Distribution Locational Marginal Pricing, identifying what can currently be done, where modelling technology is going and what could be achieved.

- Support to the Te Ahi O Maui geothermal and Maranga Ra solar projects on the electrical connection and the commissioning and engineering plans for Electricity Industry Participation Code compliance.
- Paper for the Productivity Commission on the Marginal Abatement Curve for decreasing levels of GHG emissions to 2050 in the electricity sector, including the implications and potential barriers in transmission and distribution.
- Follow up paper for the Productivity Commission on a proposed pump storage hydro scheme (Lake Onslow), reviewing the technical and operating detail from a submission, investigating, at a high level, the feasibility, economics, investment attractiveness and resource consenting issues for the project.
- Advice to the Electricity Authority, and the Innovation and Participation Advisory Group, on distribution, the problems and benefits of Distributed Energy Resources, what the future might look like and what might be the initial transition steps needed.
- Market readiness assessment for Philippines Electricity Market Corporation, for new electricity market rules.
- Support for a New Zealand infrastructure company in planning to meet low emissions targets for its operations.
- Advice to National Grid Corporation of the Philippines on their regulatory reset application.
- A strategic evaluation of three small hydroelectric power stations for a New Zealand utility company.
- Advice on connection and code compliance for the proposed Maranga Ra solar farm.
- A review of a proposed renewable energy portfolio for a New Zealand water utility.
- A report for Transpower on the potential take up and integration of Distributed Energy Resources in New Zealand through cost-reflective incentives.
- White paper and business case for New Zealand electricity network's Network Transformation Roadmap on low voltage monitoring.
- Pre-work on business case for New Zealand Government's NZ Battery project to establish sustainable storage for dry period risk.
- Assessment of potential future risks in transmission and distribution from decarbonisation and new technology based on industry scenarios
- Business case for the Electricity Authority for the value of coordinated DER
- Papers for a major energy company on what it means to offer efficiently for various asset types
- Reviews of various generation investments for various clients
- Joint team modelling future peak demand at each Network Supply Point reconciled nationally and to the Climate Change Commissions demonstration path for the ENA
- Cost modelling, including opportunity costs, and revenue forecasting for various use cases for Battery Energy Storage Systems and Water Heater load control for various clients
- Paper on code integration for Battery Energy Storage Systems for a major energy company
- Review of national distribution connection processes and costs to inform the Electricity Authority's Part 6 review for including load: for Charge Point Operators (a sub-group of Drive Electric)
- Various trading risk reviews, including a simplified portfolio model to inform a trading strategy, for various clients

Reunion Asia Pacific Limited

Principal

- Development of integration package for renewable intermittent generation to the National Energy Market of Singapore
- Development of integration package for demand exchange to the National Energy Market of Singapore
- Development of guidelines and incentive scheme for a Singapore electricity futures market
- Review of instantaneous reserve procurement arrangements to National Energy Market of Singapore to better facilitate the entry of large high efficiency CCGTs
- Development of, advice to and expert support for a temporary trading function within Transpower (New Zealand's grid owner) to facilitate the commissioning of the inter-island HVDC link using market based mechanisms
- Reviewing business strategies for an electricity retailer
- Recommendation of company and portfolio wide risk management metrics and approaches for a major generator
- Advice to two New Zealand companies on transmission pricing, including representing one on an advisory group
- International comparative review of refurbishment costs for hydro-electric generation
- Commercial and technical advice on complex connection problem to the New Zealand electric power system for a new entrant load
- Review of construction and operations risks and O&M costs for a build-own-operate-transfer proposed hydro-electric development in Fiji
- Qualitative and quantitive forecast of the New Zealand electricity market including supply, demand and behavioural dynamics and the implications on price
- Review of electricity retail market in New Zealand for potential new entrant

Mighty River Power Limited

Enterprise Risk Strategist

- Oversight of corporate risk position with matrix reporting structure to Directors, CEO and Investment Manager
- Forecast major project capital spend
- Internal commercial and risk challenge on major development projects (predominantly geothermal and wind)
- Led commercial and risk analysts
- Managed external company valuation project
- Responsible for corporate insurance programme
- Risk review of all major contracts
- Led or participated in multiple acquisition and divestment transactions ranging from NZD5m to NZD250m+ in New Zealand and Philippines
- Represented company on multiple electricity market committees and projects
- Member Transmission Pricing Advisory Group and Transmission Pricing Technical Group

Mighty River Power Limited

General Manager Metrix

- Responsible for the asset management and capital replacement of 200,000+ metering installations in Auckland and the upper North Island

- Responsible for meter reading and the provision of data to retailers
- Specific responsibility to develop corporate strategy for business or divest
- Managed the transition of the business to prepare for smart metering

Mighty River Power Limited

Industry Strategy Manager

- Managed regulatory strategy and submissions
- Managed relationship with Transpower and distribution companies
- Represented company on multiple electricity market committees and projects
- Member NZEM Rules Committee and Real-Time Dispatch Working Group
- Member Transport Working Group (voluntary Electricity Governance Board combined rulebook development on transmission and distribution assets, standards and pricing)
- Member Frequency Standards Working Group, Frequency Development Working Group and Policy and Procurement Working Group under the Multi-lateral Agreement on Common Quality Standards

Mighty River Power Limited

Power Management Manager

- Led the team responsible for dispatch of Waikato River hydro-electric power scheme and spot trading of company's sales and purchase obligations to the New Zealand Electricity Market (24/7 operation)
- Technical and valuation advice to the Resource Consent renewal project for the Waikato River hydro-electric power scheme and other sundry projects

Electricity Corporation of New Zealand Limited

Performance and Reporting Analyst

- Introduce commercial measures and reports to manage and improve the total conversion efficiency of the Waikato River hydro-electric power scheme
- Supervisory assistance to Control Centre Manager during significant events such as multiple machine failure and flooding

Electricity Corporation of New Zealand Limited

Control Centre Operator

- On shift roster performing remote control, supervision and economic dispatch of eight hydro-electric power stations on the Waikato River from a brand new SCADA control room in Hamilton

Te Awamutu Electric Power Board

Assistant Engineer/Switching Supervisor

- On call supervisor of high voltage switching and fault restoration
- Responsible for surveying and designing major projects for the reconductoring, pole change and conversion to underground programmes
- Responsible for surveying, designing, pricing and contracting major service line projects for customers

- Ran the project to assess the Optimal Replacement Cost of the distribution lines using the building block approach in response to the Separation Of Lines and Energy Charges regulations
- Responsible for O&M for Control Room including SCADA and ripple injection plant

Te Awamutu Electric Power Board

Surveyor/Draughtsman

- Responsible for construction plans, as-built drawings and filing of engineering records
- Responsible for surveying, designing, pricing and contracting minor service line projects for customers and filing of all commercial contracts
- Responsible for the electrical installation for the new Control Room

Te Awamutu Electric Power Board

Electrical Apprentice

- Various electrical works including domestic, commercial and industrial wiring, transformer refurbishment, minor faults, underground and overhead lineman, electrical workshop, meter testing and related activities

About Sapere

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'Sapere' comes from Latin (to be wise) and the phrase 'sapere aude' (dare to be wise). The phrase is associated with German philosopher Immanuel Kant, who promoted the use of reason as a tool of thought; an approach that underpins all Sapere's practice groups.

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For more information, please contact:

David Reeve

Mobile: 021 597 860
Email: dreeve@thinkSapere.com

Wellington	Auckland	Sydney	Melbourne	Canberra
Level 9 1 Willeston Street PO Box 587 Wellington 6140	Level 8 203 Queen Street PO Box 2475 Shortland Street Auckland 1140	Level 18 135 King Street Sydney NSW 2000	Office 2056, Level 2 161 Collins Street GPO Box 3179 Melbourne 3001	PO Box 252 Canberra City ACT 2601
P +64 4 915 7590 F +64 4 915 7596	P +64 9 909 5810 F +64 9 909 5828	P +61 2 9234 0200 F +61 2 9234 0201	P +61 3 9005 1454 F +61 2 9234 0201 (Syd)	P +61 2 6100 6363 F +61 2 9234 0201 (Syd)

www.thinkSapere.com

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