eea Electricity Engineers' Association

Professional Development

Annual Power Engineering Exchange

APEX | 2025

ENGINEERING TOMORROW'S ENERGY FUTURE

11TH NOVEMBER 2025

8.30am to 6:00pm

CONNETICS

11 ISLINGTON AVENUE, CHRISTCHURCH

AGENDA AND ABOUT THE PRESENTERS

NOTES

ABOUT THE PRESENTERS

8.30am **Registration, Arrival Tea and Coffee**

8.50am **Welcome from Hayley Head, EEA and William Thomas, Meridian APEX Chair**

9.00am **Alice Fahy, Meridian Energy**

Alice is a Graduate Electrical Engineer at Meridian Energy, having joined the Generation Electrical Engineering team in Twizel in early 2025. She holds a Bachelor of Electrical and Electronic Engineering with First Class Honours from the University of Canterbury. Alice's work focuses on supporting the maintenance and development of generation assets, contributing to the design, implementation, and commissioning of electrical systems across Meridian's hydro generation sites. She enjoys the practical, hands-on aspects of engineering and the opportunity to work closely with operational teams in the field.

Powering the Pipeline: Turning Interest into Industry Talent

The electricity sector faces a paradox: while the demand for skilled professionals has never been greater, the pathways to develop and retain this talent are under strain. Recent recruitment data highlights this tension. Meridian received 1,875 applications for just 15 intern roles, a dramatic increase from previous years. Interestingly, many applications showed clear signs of AI assistance; yet, the most compelling candidates were those whose submissions retained the authenticity and enthusiasm qualities that AI struggles to replicate.

This surge in interest reflects a broader trend: the electrical engineering program at UC is expected to reach full capacity in 2026, marking a strong recovery since the Christchurch earthquakes. However, this growth has created a bottleneck. Many students are unable to secure the two internships (800 hours) required for graduation, delaying entry into the workforce at a time when the industry urgently needs them. This presentation explores the implications of these trends for workforce sustainability and resilience in the electricity sector. How can industry and academia collaborate to ensure that growing interest translates into qualified professionals ready to deliver the safe, reliable, and sustainable energy future we all depend on?

9.25am **Sam Eardly, AECOM**

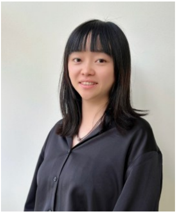
Sam is an Electrical Engineer in AECOM's Transmission and Distribution Team with three years of experience. He has worked on various projects in the HV, and some in the LV space with special interest in Earthing, Protection & Power Systems Quality with a practical and analytical approach. Sam has mentored students for the Aruhiko Power Engineering Excellency Trust and has contributed to academic and industry research undertakings while studying his undergrade degree, B.E.(Hons).

The headaches and saving graces of upgrading public health electrical infrastructure

Upgrading public health electrical infrastructure is like open-heart surgery; crucial, delicate, and not for the faint-hearted. This presentation lifts the curtain on the most persistent headaches and seldom, but well celebrated joys encountered while revitalizing aged public health power systems in complex brownfield environments. Rather than theory, this paper draws on actual project experience to spotlight battles with unreliable as-builts, asbestos surprises, client expectation shifts, procurement paradoxes, and the communication gymnastics required across fragmented vendors and management structures.

You will hear the frontline stories of navigating feasibility studies, evolving plant conditions, shifting scopes, and cost uncertainty. Discover how robust delivery strategy, creative coordination, and clear vendor interfaces can rescue timelines and budgets; even when it feels like everyone wants everything, everywhere, all at once. From the first feasibility design to the seventh stage of PM "grief," this talk shares practical lessons learned, key pitfalls, and a handful of hard-won victories for early professionals. This "for dummies" survival guide for public health upgrades shows that success is about people, process, and perseverance, not just electrons and electromagnetic fields. Whether wrangling integration, troubleshooting interfaces, or simply powering through adversity, this session delivers insights for those ready to tackle their next infrastructure challenge.

9.50am **Helen He, ElectroNet**



Helen is an Assistant Engineer in ElectroNet's Distribution team, based in Auckland. She has contributed to a diverse portfolio of projects, including secondary systems design and SCADA integration for the Kaiwera Downs Wind Farm Stage 2, as well as protection studies, secondary design, and customer connections across Auckland's distribution network.

Passionate about renewable energy and innovation, Helen thrives on cross-disciplinary collaboration to deliver resilient, sustainable solutions. She is committed to advancing New Zealand's clean energy future through practical engineering and forward-thinking design.

Engineering Tomorrow's Energy Future through Multi Stakeholder Collaboration: The Kaiwera Downs Wind Farm Stage 2 Electrical Design & Installation

Transitioning to a low-carbon electricity system requires not only advanced technology but also effective collaboration across the industry. This presentation explores the Kaiwera Downs Wind Farm Stage 2 project in Southland, where multiple stakeholders are collaborating to deliver a 155 MW wind-farm development. Mercury Energy, the project developer, has partnered with Transpower for grid integration, Vestas as turbine supplier, Higgins for civil works, and ElectroNet for the complete electrical design and installation.

As a Graduate Engineer in ElectroNet's Distribution team, I have been actively involved in the substation design scope - supporting protection, control, and SCADA integration alongside senior and principal engineers. Other ElectroNet business units are delivering the collector network design, primary equipment installation, and commissioning planning. This multi-market and multi-organisation approach demonstrates how engineering collaboration can enable sustainable, customer-centric energy solutions and build resilient infrastructure.

A key challenge has been aligning protection philosophies across organisations, requiring early decision-making, clear communication, and shared digital tools to maintain a single source of truth. Discussion points include managing technical interfaces, coordinating construction and commissioning schedules, and applying digital engineering approaches to optimise performance and reduce delivery risk. Lessons from KD2 will inform future renewable projects and the next generation of engineers.

10.15am **Amalu Philip, Transpower**

Helen is an Assistant Engineer in ElectroNet's Distribution team, based in Auckland. She has contributed to a diverse portfolio of projects, including secondary systems design and SCADA integration for the Kaiwera Downs Wind Farm Stage 2, as well as protection studies, secondary design, and customer connections across Auckland's distribution network.

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Current Practices in Power System Model Validation Process

Dynamic modelling is a cornerstone of Transpower's mission to engineer a reliable, secure future-ready power system. As system operator, Transpower relies on accurate time-domain simulations to support real-time grid operations, contingency planning, and market coordination ensuring the grid remains resilient amid evolving energy demands and increasing renewable integration. Under the Electricity Industry Participation Code, asset owners are required to submit validated, accurate models of their assets. These models are essential for assessing system stability, verifying asset behaviour, and supporting regulatory compliance. Transpower's modelling team verifies the functionality, accuracy, and interoperability of these models across multiple simulation platforms. This presentation outlines the current modelling process, focusing on the development, validation, and initialisation of key dynamic models. It highlights commonly used tools, data integration workflows, and validation methodologies. Challenges such as model convergence, parameter sensitivity, and cross-platform compatibility are discussed, along with recent collaborative efforts to resolve initialisation anomalies with asset owners. The presentation also proposes enhancements to improve model accuracy, automation, and standardisation. By refining modelling practices and sharing lessons learned, the session aims to support a more resilient, flexible, and decarbonised power system, while fostering industry-wide dialogue on future modelling directions.

10.40am **Morning Tea**

11.00am **Lydia Kerr, Electra**

Lydia is in her first year as a Network Graduate Engineer at Electra, having graduated from the University of Canterbury in 2024 with a Bachelor of Electrical and Electronic Engineering (Hons) and a minor in Power.

She has gained experience working in the Sub transmission team and has recently begun getting involved with Secondary Systems and OT engineering.

How Old Do Our Transformers Really Feel? Nature vs Nurture

Asset management is critical to power system reliability and resilience. Power transformers, often described as the heart of the system, are essential—without them, the network cannot function. Monitoring and maintaining their health is therefore a key part of asset engineering.

Like any manufactured equipment, transformers have an estimated design life, typically around 35 years. However, experience at Electra, as in many parts of New Zealand, shows that power transformers often last 50 years or more. Over time, a transformer may follow a 'normal' life path or deviate due to external factors or manufacturing variations, affecting its effective age.

This is where the Transformer Age Index Model (TAIM), developed by Dr. Nad Moodley, becomes useful. TAIM provides a visual representation of a transformer's Health Index relative to its expected design life. Building on this model, and in collaboration with Ying Wang from Consulink, we developed a customised version for Electra's power transformer fleet—offering a clear, data-driven view of how our transformers are aging biologically versus chronologically.

11.25am **Benjie Cummins, Transpower**

My name is Benjie Cummins and I am a Graduate Power Systems Engineer at Transpower, based in Wellington. I have worked at Transpower for 8 months.

Some projects I have worked on are compliance assessments, AUFLS testing, and generation commissioning.

Effects of Ramping Intermittent Generation on the Grid

The increasing penetration of variable renewable energy sources, such as wind and solar, introduces significant operational challenges for power systems. Among these, ramp events (rapid changes in generation output) pose a critical risk to frequency management. This paper examines the characteristics and drivers of ramp events within the New Zealand electricity system, focusing on their occurrence, magnitude, and temporal patterns under current operating conditions. Ramp events are classified by underlying causes, including resource-driven variability, network and dispatch constraints, and system disturbances.

This study also provides a high-level view of existing frequency control measures and an evaluation of their effectiveness against foreseeable near-future ramp events. Lessons from international System Operators like EirGrid and AEMO, who manage higher levels of intermittent generation than New Zealand, inform potential future measures. This paper provides suggestions for New Zealand's electricity system to ensure it remains resilient and reliable as it transitions to greater renewable integration.

11.50am **Fiona Hamilton, Meridian Energy**

Fiona Hamilton is a Graduate Mechanical Engineer currently in the second year of her graduate program. She completed her Bachelor of Engineering degree from the University of Canterbury. After completing her studies, she joined Meridian, beginning her career with a year based in Twizel. During this time, she focused on Meridian's hydro generation assets-a focus she has continued since relocating to Christchurch.

Fiona has contributed to a variety of projects across individual sites and took the opportunity to work on this modelling project to understand more about the overall Waitaki scheme.

Project Wolsno: Futureproofing the Waitaki Scheme

As New Zealand's electricity system faces increasing volatility driven by rising demand, the impacts of climate change, and the growth of intermittent generation-the need for a more resilient energy infrastructure becomes critical. Meridian Energy's hydro assets, currently operated primarily for baseload generation, are approaching the end of their operational life. This presents a timely opportunity to reassess their role within the evolving energy market.

To address this, Meridian Energy has launched Project Wolsno, which aims to determine how the Waitaki hydro scheme can best support the country's changing energy needs. The project focuses on identifying the optimal balance between generation capacity, efficiency, and operational flexibility.

Within Project Wolsno is the development of a modelling framework known as WETA-the Waitaki Economic and Technical Assessment. WETA is designed to rapidly evaluate a wide range of upgrade options provided by an original equipment manufacturer (OEM). Each of these options across the hydro chain, are assessed against potential revenue outcomes.

This presentation outlines the methodology behind the development of the WETA model, including the selection of suitable modelling software, the structure of the hydro chain model, and the key data inputs and assumptions used for calibration and validation.

12.15pm **Kavish Lal and Sarah Song, Counties Energy**

My name is Kavish Lal, and I am the network reliability engineer for Counties Energy. I graduated from Auckland University of Technology in 2023 with a Bachelor of Engineering Technology in Electrical Engineering degree. I started as a graduate design engineer in 2023, designing small 5-Lot connections to large subdivisions. I recently transitioned into the network reliability engineer role. A core focus is to promote continuous improvement of asset reliability and performance throughout both our network and organisation. This means fully understanding how the network is performing, why it is performing that way, and being across the details.

Sarah is a Design Engineer at Counties Energy, specializing in network design and practical solutions that keep the distribution network working safely and reliably. She holds a bachelor's degree in mechanical engineering and has six years of professional experience across both mechanical and electrical engineering. Sarah started out in mechanical engineering before moving into electricity distribution, where she has worked for the past four years. In her role, she helps maintain and improve infrastructure, making sure designs meet standards, and supports future growth by applying practical, sustainable approaches that suit the needs of the network.

Historical Long Spans Investigation

Long spans don't fail overnight. These deteriorate over time and during weather events, increases the likelihood of outages causing customer irritation. Counties Energy has taken proactive steps to ensure that day never comes.

Data points from LiDAR and ROAMES flagged over 1,900 spans longer than 150 m across the network, many on critical backbone lines. Fault history showed 166 of 190 key sites breaching AS/NZS7000:2016 regulations. These spans pose significant risks and have the potential to cause major customer outages and SAIDI impacts, highlighting the need for a clear plan. To mitigate this, a multi-year remediation program begins in FY26, using sag-tension analysis and structural load calculations to tailor solutions to site conditions. The program includes:

- Replacing aging poles with 12.4–13.65 m concrete poles designed for 45 m/s winds.
- Installing H-structures on spans over 150 m, reducing pole top bending moments by up to 25%.
- Re-tensioning conductors to restore 0.3–1.2 m of clearance.
- Reconfiguring or upgrading hardware to extend service life by 20–30 years.

Investing $500k, the programme goes beyond compliance. It reduces outage probability, standardises isolation points and strengthens weak sections to support growth, ensuring safety, resilience and long-term reliability for customers as the network expands.

12.40pm **Lunch**

1.15pm **Stijo Stephen, Electra**

Stijo holds a bachelor's degree in Electrical and Electronics Engineering from Visvesvaraya Technological University, India. He joined Electra in February 2024 as a Graduate Electrical Engineer within the Asset Management Team, where he gained hands-on experience across Network Asset, Planning & Development, and Service Delivery.

His past projects included analysing asset reliability, enhancing redundancy within DC auxiliary systems, and supporting the upgrade of the 33 kV overhead bus at Foxton Zone Substation using Vista modular switchgear. In April 2025, he was promoted to Asset Engineer in the Sub-Transmission area.

Next-Generation Zone Substations: Safe, Reliable, and Modular

Electra is modernizing New Zealand's distribution infrastructure by replacing conventional overhead systems with ground-mounted modular solutions on the primary side of its zone substations. Following comprehensive studies, including consultant evaluations and site assessments, Electra selected the S&C Vista Green switchgear as the preferred modular solution. Foxton Zone Substation has been chosen as the pilot site, with two additional substations scheduled to follow.

The compact, fully enclosed switchgear enables faster installation, reduced downtime, enhanced safety, and improved weather resilience. It also minimizes environmental impact and incorporates personnel and wildlife protection measures, supporting long-term safety and operational performance. Additionally, the Vista switchgear offers a hermetically sealed CO_2 option in addition to the traditional SF_6 switchgear, reducing global warming potential by 97%.

This modular approach sets a new benchmark for addressing key challenges in electricity distribution, allowing staged upgrades with minimal supply interruptions, improving resilience to technical and environmental demands, and aligning operational safety with sustainability objectives. The Foxton substation upgrade, scheduled for completion by December 2026, will serve as a reference model for future upgrades across New Zealand's electricity network.

1.40pm **Vinod Rodrigo, Transpower**

Vinod is a second-year Graduate Engineer at Transpower New Zealand, working in the National Grid Assets Programme. He graduated from the University of Waikato in 2023 with a Bachelor of Mechatronics Engineering. During his service provider placement with Northpower, he designed and developed TempSense, a real-time conductor temperature monitoring system used in sagging operations. Vinod's work combines embedded systems and mechanical design to deliver practical solutions for asset management and grid reliability. He is the recipient of the Tū Mai Aotearoa Individual Award (Q2 2024).

TempSense: Enhancing Transmission Line Sagging Operations through Real-Time Conductor Temperature Monitoring

Sagging of transmission lines is a critical process in ensuring the safe and reliable operation of the power grid. Traditional methods for measuring conductor temperature during sagging rely on ad hoc solutions such as taping BBQ probes to sample conductors, with readings relayed over walkie-talkies. These methods are slow, inefficient, and prone to error, particularly as conductor temperature can change rapidly with weather conditions.

To address this challenge, I developed TempSense, a custom device package consisting of a conductor holder, transmitter, and receiver. The conductor holder contains a sample ACSR GOAT conductor and an earthwire and is carried up by the crew to the top of the tower or pole, where it magnetically secures itself to a steel surface. The transmitter, equipped with a precise probe, locks into the holder to capture accurate conductor temperature readings, which are then transmitted in real time over distances of up to 2 km to the receiver on the ground. TempSense V1 was successfully trialled by Northpower during sagging operations from November 2024 to April 2025, improving efficiency and allowing crews to focus on critical rigging tasks. Feedback from field engineers inspired upgrades in TempSense V2, including an internal antenna, charging visibility, and live temperature plots.

This presentation will demonstrate how graduate-led innovation can enhance safety, efficiency, and confidence in critical grid operations, contributing to a more resilient and digitally enabled electricity industry.

2.05pm **Vatsal Gajjar, Powerco**

Vatsal Gajjar is a graduate engineer who has a Bachelor of Electrical/Electronic Engineering from Auckland University of Technology.

He has been at Powerco for over two and a half years, rotating into different teams and developing skills as an engineer.

Generator Template

As the number of ICPs on Powerco's network grows, the resulting increase in load places greater constraints on existing equipment. Traditional solutions such as overhead lines and express feeders are often costly, while alternatives like solar and wind can also be expensive. In response, generator installations have emerged as an effective option, prompting Powerco to develop a standardised generator template.

The template development explores both gas and diesel generator options, evaluating efficiency, performance, transportability, the operational requirements, including black start capability and peak lopping across several scenarios. Powerco has adopted a mixed-methods approach that combines engagement with manufacturers, consultation with internal and external stakeholders, and lessons learned from past projects.

Currently, Powerco is focused on establishing clear technical requirements and assessing generators most suitable for the above conditions and also hybrid solutions such as batteries and solar. The end goal is to deliver a robust suite of standard generator drawings and guidelines that can be applied consistently across projects, enhancing efficiency, resilience, and long-term network planning.

2.30pm **Thomas Mander, Transpower**

Thomas joined Transpower in August 2024 after completing his Electrical Engineering degree at the University of Canterbury. Over the last 12 months Thomas has had the opportunity to work in several teams as part of the Power Systems Engineering Graduate Programme. These teams were:

Engineering Assurance – Thomas was exposed to the commissioning process and managed the System Operator's test plan process.
System Planning – Thomas helped to: Write the Northland Chapter of the Transmission Planning Report; Complete Concept Assessments; Run Fault Level Studies.
Market Operations – Thomas was tasked with investigating the accuracy of wind forecasting.

Special Protection Schemes in System Planning

Special Protection Schemes (SPS) are increasingly relied upon in system planning to manage capacity constraints and defer major infrastructure investments. SPS's can be cheap and effective for new generation projects in areas with limited growth. However, relying on them increases complexity in operating the grid.

I will present a case study of a proposed SPS for Northland's 110kV network. This involved installing line protection at Wellsford and tripping the parallel Henderson-Wellsford circuit during a Henderson-Wellsford contingency. The proposed SPS would increase capacity to Northland by ~28%. It was compared to the following options:

- Load shedding during a contingency.
- Circuit reconductoring which would increase capacity to Northland by ~38%.

Factors influencing investment decision that will be discussed in this case study include:

- The uncertainties in long-term load forecasting.
- The rapid inflation of Transmission asset cost.
- The SPS altering the grid, raising the risk of a Marsden Interconnecting Transformer (ICT) overloading.
- The security benefit associated with new line protection.

I will assess the trade-offs for SPS's which highlight Transpower's System Planning team's process for 'Engineering Tomorrows Energy Future'.

2.55pm **Afternoon Tea** *** Cast your vote for the People's Choice Award ***

3.15pm **Dazzle Johnson, Powerco**

Dazzle Johnson completed her mechatronics engineering degree, conjoint with computer science, at the University of Auckland in 2020. She then began a PhD in mechatronics engineering with the Industrial Artificial Intelligence research group.

In 2025, she shifted into the electricity distribution industry, joining Powerco as a Graduate Engineer, to explore how her background could be applied in a new context.

Towards Automating Power Quality Analysis in an Evolving Network

The growing uptake of solar, batteries, and electric vehicles is changing how electricity flows through distribution networks, creating new challenges for monitoring and maintaining power quality. Powerco is deploying increasing numbers of smart meters and power quality devices to address these issues proactively, but this also generates rapidly growing volumes of data. While the data has significant potential value, it is becoming too large and complex to analyse manually.

This work explores how automation and machine learning can assist engineers in making sense of power quality data. Using real event data from Powerco's network, we test methods that can automatically group and classify events such as abnormal transformer tap changes. The approach combines clustering techniques with a feedback loop including subject matter experts, ensuring that automation supports expert judgement.

The results demonstrate how this evolving system can reduce manual workload, surface unusual events, and improve the efficiency of power quality analysis across the network.

3.40pm **Praveen Niranjan, Beca**

Praveen Niranjan is a second-year graduate power systems engineer at Beca. He studied Mechatronics Engineering at the University of Canterbury. A summer internship at Openstar—a New Zealand start-up pursuing nuclear fusion—sparked his interest in clean energy and led him into the power sector. At Beca, Praveen has worked on a range of renewable and grid projects across New Zealand and Australia, developing skills in analysis, design, and delivery. He is motivated by practical, scalable solutions that accelerate the energy transition and enjoys collaborating across disciplines to turn emerging technologies into reliable, real-world outcomes.

Protection of Windfarms in Australia and New Zealand:

Australia's generation mix is shifting quickly under economic, engineering, and environmental pressures, with wind and solar now substantially cheaper and quicker to deliver. New Zealand already has a high share of renewables (hydro and geothermal) and plans to add substantial solar, wind, and grid scale batteries over the next decade. As wind generation grows in both countries, effective wind farm protection systems are important and have increased in complexity. However, the differences between each country's power system affect the protection philosophy, the application, and the challenges that may arise.

Drawing on first-hand Australian project experience, the presentation will explore:

- The key components of a wind farm and its connection point, and how protection is expected to perform under fault conditions.
- The key differences in grid code, policy, and operational practices between Australia and New Zealand.
- How these differences pose design challenges when protecting a wind farm in New Zealand.

4.05pm ***** Cast your vote for the People's Choice Award *****

AWARDS AND SOCIAL FUNCTION

4.20pm **Awards Results** — Joint EEA / CIGRE Best APEX Presentation Award **and** People's Choice Award

Closing Comments — APEX Chair

4.30pm to 6.00pm **Social Function**

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YOUNG ENGINEER OF THE YEAR AWARD

EEA 2025 Young Engineer

The award winner is award winner Gavin Austin from Ergo Consulting.

Increasingly our young engineers are playing a significant role in shaping the future of our industry.

The EEA wishes to recognise their contribution to our industry and is asking companies and individuals to identify and nominate from within their business, candidates for the EEA Young Engineer of the Year Award. The 2025 award winner will represent New Zealand at the IEC Young Professionals Programme being held in Erbil, Iraq, on February 25-26, 2026 . IEC General Meeting in 2026 is scheduled for November 14-20 in Hamburg, Germany,

The award will be presented to a young engineer who is judged to have demonstrated great achievement and leadership within the electricity supply industry, community and stakeholders.

The entrant must be aged under 35 as at 31st December 2025, and have a tertiary-level engineering or technology qualification and be an individual member of the EEA or staff member of a Corporate Member.

EEA SCHOLARSHIPS

The Electricity Engineers' Association (EEA) is proud to support every year a number of students into engineering careers, help them raise their profile and **recognise the young talents that will contribute to the future of our electricity supply industry**.

We award five undergraduate scholarships annually, in partnership with the University of Canterbury (x2), the University of Auckland (x2) and the Auckland University of Technology (x1). The scholarships are tenable for a period of one year, for a value of NZ$5,000 each.

This initiative is part of the EEA's commitment to the future development of engineers and engineering education in New Zealand and to the ongoing professional development of its members in all sectors of the industry.

Visit https://eea.co.nz/courses-and-careers/scholarships/ to find out more about EEA Scholarships.

STUDENT & GRADUATE

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