Keynote

Josie Boyd
Chief Operating Officer - Contracting, Northpower

Josie joined Northpower in 2011 and was General Counsel for a number of years. From her background in legal and operation Josie took on responsibility for Northpower's electricity network in 2017. Prior to this Josie worked in New Zealand and the UK in a range of private practice and in house corporate roles in the utilities, construction and professional services industries.

Josie currently leads Northpower's Contracting business, responsible for its overall performance as we continue to grow and diversify our services.

Guest Speaker

Allen Keogh
Tactical Engineering & Estimation Group Manager – Transpower

With thirty years' engineering experience, Allen Keogh has seen significant change in how clients and organisations have adopted, developed, and refined their focus on sustainability and now are zeroing in on how they can contribute to a decarbonised economy. As those who design the future, engineers have a key role to play in shaping the thinking of others to build things that will function long into the future and can be decommissioned in a net-zero lifecycle approach. Sharing his learnings about how decarbonisation considerations have become front and centre, Allen will draw on his wealth of experience from product engineering through to technical project engineering, as well as his current context working as a senior manager for a centre of expertise.

Panel Discussion Panellists

Simon Hall | Facilitator
Chair, Mechanical Engineering Group

Simon is a Fellow of Engineering New Zealand and chair of the Mechanical Engineering Group. He has over 20 years' experience in mechanical engineering design; spanning across product design, machine design, plant design and project engineering. In his most recent role, Simon has been exploring applications for AI in mechanical engineering design.

Tim Greene,
CEO, Calibre Design

Tim is the CEO of Caliber Design, a mechanical engineering consultancy specialising in analysis, seconded engineering design and project engineering resource. Caliber has positioned itself as a 'fast follower' of AI, where responsible, best-practice use of AI is encouraged; and Tim has led the charge by closely following the development of AI and passing on his learnings to Caliber's engineering team.

Mathieu Duguay
Business Director - Industrial Digital, Beca

Mathieu is a senior leader at Beca and leads the Industrial Digital team for the New Zealand market, helping clients in their adoption journey of new technology. Mathieu is passionate about energy efficiency and is a sustainability practitioner. He is one of the co-founders of Maestro, Beca's machine learning energy optimization and predictive maintenance tool which help industrial refrigeration operators reduce their baseline energy cost by up to 33%. Mathieu leads the commercialisation efforts of Maestro having designed, built and delivered the predictive analytics and insights platform. Business Director - Industrial Digital & Maestro Co-Founder.

Associate Prof. Minh Nguyen
Head of Department Computer Science & Software Engineering, AUT

Associate Professor Minh Nguyen, currently leading the Department of Computer Science & Software Engineering at Auckland University of Technology, specializes in areas like Artificial Intelligence and Computer Vision. With a rich history of contributions in academia and several industrial collaborations, Minh has been pivotal in integrating advanced AI solutions in various applications. His work not only pushes the boundaries of technological applications in software engineering but also in real-world scenarios like waste management, enhancing both efficiency and sustainability.

Matt Lythe
Managing Director, Lynker Analytics

Matt leads Wellington based technology company Lynker Analytics – a New Zealand company with specialist expertise in Artificial Intelligence (AI), geospatial analytics and data infrastructure. An environmental scientist, Matt manages a team that specialises in the development of AI solutions to extract new insights about the earth's surface and built environment from satellite, airborne, terrestrial and marine sensors. Matt is a member of the AI4Good Council – an international group of innovators promoting technology solutions that advance the UN's Sustainable Development Goals. He also served for two years on the New Zealand AI Forum Executive Council. He holds a Master of Science from Auckland University and has over ten publications in peer reviewed journals.

Presenters Abstract Summary & Bio's

Wernher Roding. B.E., MSc
Beca – Principal Electrical Engineer

Wernher is a Principal Electrical Engineer at Beca with experience in electrical and control systems engineering. After completing his M.Sc. in renewable generation in the UK, Wernher returned to New Zealand where he has worked in R&D, manufacturing and engineering consultancy. As a consultant, he has been involved with a number of multidisciplinary projects in the main sectors of Transportation, Water and Wastewater, Industrial and Power Generation. His role on the Low Emission Ferry Programme is Low Voltage Design Lead with responsibilities including charging equipment specification and integration, cable design and ancillary equipment power supply design.

Abstract Title: Enabling Auckland's Transition to an Electric Ferry Fleet

As part of a mission to create a transport future for Auckland that is cleaner, quieter and more comfortable for all, Auckland Transport (AT) has established the Low Emission Ferry Programme. This ambitious program will see Auckland have one of the largest low-emission electric ferry fleets in the Southern Hemisphere by 2030. To operate effectively the ferries, require resilient, fast and high-power battery charging of up to 3.3 MW per site requiring novel technology, distribution and control solutions. This presentation provides an overview of the programme, discusses the project challenges and solution development using a iterative process involving AT (the owner), Beca and Tonkin + Taylor (the design team), ABB (charging equipment supplier), Brian Perry Civil (the constructor), Vector (the utility) and multiple stakeholders within a collaborative programme team.

Technical challenges that will be discussed include managing intermittent load profiles causing network peaks, availability of sufficient network power supplies and planning, designing and constructing installations close to and above water, constructing and operating in some of Auckland's most high-profile public locations, and non-typical earthing systems. The new technology being adopted, and its application, is being delivered while the relevant international standards are being developed. This creates additional complexity with respect to validating regulatory compliance and ultimately demonstrating a safe installation for maintainers, operators, and the public transport users of Auckland.

Daniel Müller
Debulec Limited - Principal Electrical & Industrial Engineer

With over a decade of specialised experience in applying and implementing ISO/IEC 81346, Daniel is a seasoned electrical and industrial engineer committed to enhancing technical system structures across multiple industries. At Debulec Limited, he has leveraged his understanding of this international standard to streamline processes and improve documentation clarity and consistency, ensuring seamless communication and interoperability within complex projects. Daniel's career spans a diverse range of sectors, including building and construction, downstream oil & gas, industrial manufacturing, and aircraft flight testing and telemetry. This extensive background has provided him with a unique perspective on the practical applications of ISO/IEC 81346, allowing Daniel to tailor solutions that meet specific industry needs while adhering to global standards. As a dedicated advocate for the benefits of ISO/IEC 81346, Daniel continues to drive its adoption and implementation, helping organisations achieve greater levels of interdisciplinary technical excellence and operational success over the whole project life cycle.

Abstract Title: ISO/IEC 81346 Reference Designation Systems

Understanding ISO/IEC 81346: A Comprehensive Guide to Structuring Technical Systems
In today's complex engineering landscape, the need for standardized and efficient methods of structuring and referencing technical systems is more critical than ever. My upcoming presentation will delve into ISO/IEC 81346, the international standard that provides a universal framework for structuring industrial, infrastructure, and building systems. This standard is pivotal for enhancing communication, improving documentation, and ensuring interoperability across various engineering disciplines.

The presentation will cover the key principles and applications of ISO/IEC 81346, focusing on its systematic approach to classification, designation, and reference of objects within a system. We will explore how this standard supports the creation of clear and consistent documentation, facilitates better project management, and integrates seamlessly with other standards and methodologies. Additionally, practical examples will be provided to illustrate its implementation in real-world scenarios, highlighting its benefits in terms of efficiency and error reduction.

Attendees will gain a comprehensive understanding of the standard's structure, its components, and its significance in modern engineering practice. This session is essential for professionals seeking to enhance their technical documentation skills and improve the overall organization and management of complex systems. Join us to unlock the potential of ISO/IEC 81346 and elevate your engineering projects to new levels of clarity and precision.

Vinay Karanam
Principal Consultant

Dr. Vinay Karanam is an independent professional consultant with over 200 satisfied clients across the globe. With expertise encompassing renewable energy, net-zero carbon strategies, non-linear analyses, thermal hydraulics and multi-scale material modelling, he is a Chartered Mechanical Engineer in India and a Fellow of the Institute of Engineers India. He is also a Fellow of Institute of Managers and Leaders, Australia New Zealand. Dr. Vinay is a well-known name in the nuclear fission and fusion industry and has been an invited speaker at several distinguished research and academic institutes around the world. Dr. Vinay is currently the secretary and treasurer of Mechanical Engineering Group (MEG).

Abstract Title: Integrating IoT for Optimal Climate Control and Cost Efficiency

The rapid advancement of the Internet of Things (IoT) has opened new avenues for enhancing home automation, aiming to create smarter, more efficient living environments. This paper presents a custom-built IoT system designed for home integration, focusing on weather prediction and automated scheduling of heaters, lights, and ventilation systems. The primary objective is to optimize performance and minimize energy costs through intelligent, data-driven decision-making.

Our system employs advanced weather forecasting algorithms to predict temperature fluctuations and environmental conditions. By integrating these predictions, the system can pre-emptively adjust home heating, lighting, and ventilation settings. This proactive approach ensures that homes remain comfortable while significantly reducing energy consumption. The integration of machine learning models further refines the system's efficiency, learning from past patterns to enhance predictive accuracy and operational efficacy over time.

Key features of the system include:

- Weather Prediction Integration
- Automated Scheduling
- Energy Efficiency
- User-Centric Design
- Scalability and Adaptability

The implementation of this IoT system involves several interconnected components: sensors for real-time data collection, a central hub for processing and decision-making, and actuators for executing control commands. The central hub leverages cloud computing resources to handle complex data analysis and machine learning processes, ensuring robust performance and scalability. Preliminary results from real-world deployments indicate a substantial reduction in energy consumption, with users reporting enhanced comfort and convenience. The system demonstrates the potential to transform home automation by seamlessly blending technological sophistication with practical usability.

Summarily, the proposed IoT solution represents a significant step forward in smart home technology, providing an intelligent, efficient, and user-friendly approach to home climate control. Future research will explore additional features and improvements, including integration with renewable energy sources and further enhancements in machine learning capabilities to anticipate user needs with even greater precision.

Daniel Martin, ***MEPM (Auckland), B.Eng.(Hons) Elec, C.P.Eng***
Essential Energy - Senior Substations Engineer

Dr. Dan Martin is chartered professional engineer with over twenty years of experience, and a focus on power engineering, leadership and asset management. He is a chartered member of Engineering New Zealand, a senior IEEE member and a registered professional engineer of Queensland. He is currently the Treasurer of CIGRE New Zealand and their A2 power transformers and reactors convener. He is a senior engineer at Essential Energy, which is a state-owned electricity infrastructure company in Australia, working in zone substations. He has a Master of engineering project management from University of Auckland, a PhD from University of Manchester in electrical engineering, and a Bachelor of electrical and electronic engineering from University of Brighton.

Abstract Title: Preparing our grid for solar farms - power transformers

Many solar farms are now being connected to the grid. For this to be successful connection is required with the legacy utility substations, which were not designed for this. Affordability is a key concern where the industry must be mindful of cost increases to the community, and so in this case to retain as much of the substation technology as possible. In NSW a study was conducted how to identify which utility power transformers could be used with both reverse power flow, determine which transformers could be used, understand extra stresses which could require more maintenance, and understand the economics of refurbishment verses replacement. An analytical approach was taken to identify which assets were suitable. In this presentation an overview will be given of this study, applied to a New Zealand context.

Luke Mainwaring, ***BEng Electrical Electronic Engineering, MSc Power Distribution, EMBA Executive Management in Business administration, CEng (MIET)***
POWERCO - Engineering Manager Substation Design and Commissioning

Luke is an ex-steel working Electrical apprentice that has navigated his career from through being an electrician, student, graduate, practicing engineer at a hot mill, and a few consulting companies and Watercare, and now his current role is the Engineering Manager, Substations and Protection at Powerco. He actively contributes to industry development through his involvement with organizations like the Institution of Engineering and Technology (IET), Engineering New Zealand, and has a position on the board of VEENZ. His passion lies in training and mentoring individuals within the industry and is enthusiastic about establishing practical training facilities to further enhance skills and knowledge of others in the industry.

Abstract Title: Bridging the Practical Skills Gap in the New Zealand Power Industry

(An introduction to the Electrical Professional Practical Training Association)
The ability to provide consistent Power to New Zealand is under threat. You will see on the news and in magazines information regarding Transpower's concerns about their ability to keep the power on and implement decarbonisation at the same time. Further, achieving the required timescales is going to be very difficult and perhaps unlikely. This issue isn't just limited to our transmission network but also our distribution network and generation.

One part of this issue we are facing is the lack of technical people within the industry which can be classed as the "skills gap" and in particular the "practical skills gap". During the presentation, examples will be given of how a lack of technical knowledge, and a lack of critical thinking has cost the relevant unnamed companies millions of dollars and in some cases the upper levels of management aren't even aware. In response to this, several industry members have refused to stand by and let this practical skills gap and lack of knowledge and experience go un-checked.

The EPPTA (Electrical Professional Practical Training Association) is a part way solution to the skills gap problem. The association has been growing over the last three years, aiming to help with the provision of practical training for the Power Industry, working with all concerned to create a win win situation for all stakeholders affected by the skills gap. This presentation is on how the organisation has been progressing from conception, our journey so far, proposing a practical training centre for the industry, and where we are heading in the future. So hop on board and share our experience of our contribution towards "keeping the lights on".

Sarayu Govinda, *BEng, MEng*
Fisher and Paykal - Product Development Engineer

Sarayu is a mechanical engineer currently working as a product development engineer at Fisher and Paykel Appliances, Auckland. After her master's in Automobile Engineering, Sarayu worked in Automobile sector with Cummins, India for about 3.5 years, mostly on Stress analysis of engine components using Finite Element Methods (FEM), before moving to New Zealand last year. She is an active member of SWE (Society of Women Engineers) and am passionate about STEM Education, which led me to volunteer as an ambassador for the Rocket Challenge, Wonder Project and inspire the next generation to take up STEM careers.

Abstract Title: Lowering GHG Emissions using Advanced High Strength Steel

In New Zealand, high competition and stringent environmental regulations are pushing the automotive industry to enhance vehicle performance while reducing emissions. With traditional approaches to optimizing engine parameters nearing their limits, the focus has shifted towards innovative solutions like efficient transmission systems, advanced materials, and eco-friendly fuels. This study presents a simulation-based exploration of using Advanced High-Strength Steel (AHSS) for commercial truck chassis frames to achieve weight reduction and lower emissions, addressing the local industry's need to meet carbon reduction goals.

By utilizing Finite Element Analysis (FEA), the performance of AHSS under laden conditions for truck chassis side members was assessed. The study also examines different cross-sectional designs for the chassis frame, validating the results with analytical calculations. The findings highlight the potential for AHSS to significantly reduce vehicle weight, which directly contributes to lower fuel consumption and greenhouse gas (GHG) emissions, aligning with New Zealand's sustainability objectives. The importance of material selection, optimal cross-section, and design adjustments in reducing the carbon footprint of commercial vehicles is emphasized in this work, supporting the country's efforts toward a greener transportation sector.

Robert Banks, ***BE (Mech) CPEng***
Beca - Senior Technical Director

Robert is a Senior Technical Director at Beca and chair of the Ventilation Engineering Group. A building services engineer, Robert has 40 years' experience in the design, operation and asset management of large buildings including hospitals, prisons, data centres, laboratories, commercial office buildings, hotels and stadiums. Robert's experience includes due diligence reviews, technical advisory and asset management advice for a wide range of building uses.

Abstract Title: Building energy, emissions and electrical grid impact.

The building and construction sector is a significant producer of New Zealand's greenhouse gas emissions. Sustainable design practices such as Green Star and NABERS are reducing both embodied and operational carbon in new buildings. Zero Carbon Design and commitments to use 100% renewable energy sources in some buildings are driving decarbonisation of building services systems. However, while building energy demands are reducing, the building electrical load is increasing as fossil fuels are replaced by electricity. Despite improvements in design standards, there is inefficiency in the operation of buildings, largely as increasingly complex building services control systems drift from their required set points. A typical result is energy waste as incorrect or unstable control settings cause simultaneous heating and cooling.
The building winter heating peak occurs at daily building start up which coincides with the daily morning residential peak adding to the electrical grid peak. The electrical grid peak substantially exceeds renewable electricity generation capacity and requires fossil fuel electricity generation, defeating the purpose of decarbonising buildings.

This presentation establishes the case for Automated System Optimisation of building services control systems. It appears possible by overlaying automated system optimisation on existing building management systems in the largest existing commercial buildings, the peak electrical grid demand could be almost immediately reduced by many tens of megawatts, most of which would be fossil fuel generated, so flattening the daily generation demand curve and increasing the renewable generation percentage. Building automated system optimisation overlay is low cost with a quick payback from energy savings, and a rollout would substantially reduce investment in required additional grid generation capacity which would take years to build.

Michael Cahill
Rockwell Automation – Independent Contractor

As an independent contractor, Michael Cahill specialises in assisting businesses in utilising technology to enhance value and foster innovation. With over 30 years of experience in manufacturing and supply chain optimisation, Michael's approach to transformation begins with acquiring a comprehensive understanding of clients' business operations and identifying their areas of greatest potential. Once value is recognised and desired outcomes are agreed upon, he collaborates with clients to develop executable strategies tailored to their specific needs.

At the core of Michael's strategy is the principle of "adopt and adapt." This philosophy applies to various aspects, including business process optimisation, the adoption of best practices, and the implementation of international standards such as ISA 95, GS1, and B2MML. His approach has proven effective both as an end user, where he successfully implemented a global traceability solution, and as a vendor, guiding clients to harness the power of cloud applications.

Michael is passionate about empowering organisations to navigate the complexities of modern manufacturing and supply chain environments, ultimately driving their operations towards greater efficiency and success.

Abstract Title: The Future is Now: Empowering Industry with 2024 Smart Manufacturing Insights
Dive into the findings of the 2024 State of Smart Manufacturing report from Rockwell Automation and NHP. Drawing on a comprehensive 2024 global survey of 1,500+ manufacturers, this session unveils pivotal trends shaping the industry's future, highlighting the critical balance between growth and quality, the untapped potential of data, and the escalating adoption of technologies like AI to foster resilience, agility, and sustainability.

Discover actionable insights that address some of the most pressing challenges in today's manufacturing landscape:
- Strategies for enhancing workforce attraction and retention.
- Navigating the digital technology landscape for optimal adoption.
- Overcoming supply chain disruptions with innovative solutions.
- Implementing effective risk mitigation and compliance strategies.

Join us to gain valuable perspectives that will empower you to navigate the complexities of the modern manufacturing environment, driving your operations towards greater efficiency and success.

Steven Wallace, *BE (Hons) Electrical*
Simply Energy - Senior Technical Advisor

Steven is a Senior Technical Advisor at Simply Energy, helping large process heat users switch to sustainable energy solutions. With 14+ years in distribution, he connects engineering decisions to energy market opportunities for optimal cost and carbon savings. Steven's experience includes asset management, electrical design, and project management, gained at PowerNet where he was responsible for producing The Power Company Asset Management Plan. He also worked as an Electrical Design Engineer at Decom.

Abstract Title: Navigating New Zealand's energy transition with Flexible Energy Solutions
As large energy consumers shift away from fossil fuels, the demand for electricity in New Zealand will grow significantly, prompting substantial investments in our electricity infrastructure. Meeting this increased demand cost-effectively presents a significant challenge for our energy sector. This paper explores how Flexible Energy Solutions encompassing variable capacity, innovative connection arrangements, and flexibility are becoming pivotal tools in facilitating the energy transition. These solutions, marked by adaptive energy management, aim to meet fluctuating energy demands efficiently, leveraging resources to minimise costs and reduce operational expenses for operators and consumers.

Variable Capacity
'Variable capacity ' describes electricity fluctuations in Electricity Distribution Networks (EDBs), affected by asset capabilities and demand peaks. Despite EDBs' surplus capacity outside peaks, consumers struggle to access it due to infrastructure

limitations. Innovative connection methods and operational flexibility are essential to utilise this capacity.

Innovative Connection Arrangements
This paper introduces three tiers of variable capacity, with increasing levels of complexity and implementation cost.
1. Seasonal ratings: Summer \| Shoulder \|Winter
2. Time-banded: Peak \| Shoulder \| Off-peak \| Night
3. Dynamic operating envelope: This term describes the flexible range in which an energy system or network can operate efficiently and effectively. Adopting variable capacity can benefit both electricity distribution networks (EDBs) and large energy consumers. EDBs can enhance asset utilisation, increase energy throughput, and generate additional revenue from their existing assets. Meanwhile, large energy consumers can reduce their carbon emissions sooner, accelerate their transition to net zero, and ensure their economic viability. Key challenges exist for both EDBs and consumers. EDBs must ensure their assets are protected against overload, develop equitable pricing strategies, and understand the implications of future load growth on network operations.

Flexibility
Flexibility allows continued operation during peak periods when electrical capacity is most heavily constrained and can be achieved for the lowest cost through a combination of electricity, storage, and dual-fuel systems.

Birendra Grewal, *BEng, MEng, MBA, FIMarEST, CMEngNZ, CEng(UK)*
Babcock International - Vibration Specialist

Birendra is a seasoned engineering professional with more than 22 years of experience in marine engineering. He has led complex MRO operations, implemented sustainable maintenance strategies, and enhanced asset reliability, specialising in optimisation of maintenance systems and mitigating risks. He holds an MTech in Mechanical Engineering from IIT Bombay, an MBA in Business Sustainability, and an PG Diploma in AI & ML from BITS Pilani. He is a Chartered Member of Engineering New Zealand, Chartered Engineer (UK), Chartered Marine Engineer and Fellow of IMarEST, committed to lifelong learning, continuous improvement, climate action, and developing high-performing teams.

Abstract Title: Supercavitation for Reducing Carbon Footprint of Marine Transport

We explore the potential of supercavitation technology to enhance marine transport, emphasising sustainable and efficient solutions for marine transport. Supercavitation occurs when a vapor bubble forms around a submerged object, dramatically reducing drag and enabling higher speeds with lower energy consumption. Through numerical simulations and computational fluid dynamics (CFD) modelling, we investigate the performance of supercavitating bodies, including flat plates, cylinders, and conical shapes, under various flow conditions. Turbulence models such as k-ω and k-ε are employed to solve the governing Navier-Stokes equations, highlighting the impact of cavitation on hydrodynamic efficiency. Supercavitation technology could significantly reduce fuel consumption, aligning with global efforts to promote sustainability in maritime industries. The applications of the technology include supercavitating propellers and hull designs, which could revolutionise civilian marine transport by enabling high-speed ferries, cargo vessels, and personal watercraft with reduced environmental footprints.

Beyond speed and energy efficiency, supercavitating technologies offer the promise of decreased maintenance costs due to reduced wear from water resistance and biofouling. This aligns with the broader goals of sustainable shipping, reducing greenhouse gas emissions, and promoting eco-friendly transport solutions. Overall, the findings support the integration of supercavitating designs into the next generation of marine transport systems, with the potential to transform marine logistics and passenger transportation, while addressing both economic and environmental challenges.

George Wang *CPEng NZ*

With over 30 years of experience in electrical engineering, George Wang began his career as a marine electrical engineer, specializing in marine power stations, electrical control systems, and HVAC automation. Since 2004, his focus has shifted to electrical building services in New Zealand, where he has

developed expertise in electrical design for commercial and industrial projects. In recent years, George sought to expand his skill set into the factory automation sector, reconnecting with his roots in industrial engineering. This led to an opportunity to work with a large, modern New Zealand factory, where he applied his extensive background in electrical design and automation. During this period, George encountered the integration of cutting-edge AI technologies within the manufacturing environment, which sparked his interest in exploring the potential of AI in factory automation.

Abstract Title: Integrating AI and Automation in Modern NZ Factories: Insights and Opportunities

During a recent contract with a state-of-the-art New Zealand food production facility, George had the opportunity to apply his extensive experience as a senior marine electrical engineer, specializing in automation. This engagement allowed George to bridge the gap between traditional electrical design and modern factory automation, a rare perspective that many electrical designers and maintenance electricians do not often have the chance to experience.

George's presentation will explore key concepts for advancing factory automation using AI, including Industry 4.0, the Industrial Internet of Things (IIoT), Digital Twins, Manufacturing Execution Systems (MES), and platforms like Microsoft Azure, NVIDIA Omniverse, and Siemens Tecnomatix. He will provide an overview of the current automation landscape in advanced New Zealand factories, focusing on SCADA, PLC systems, and maintenance software like IBM Maximo Manage. Additionally, George will share observations and recommendations on how AI integration could further enhance efficiency, productivity, and adaptability in such environments. This session will offer a comprehensive view of the future of AI-driven automation in New Zealand's industrial sector, aiming to inspire and inform engineers, designers, and industry professionals.

Adrian Ferguson *Fergusonz Ltd*

Adrian's diverse background includes mechanical & manufacturing, product design and project engineering. He has taught electrical, mechanical and civil students at degree and diploma level as an engineering academic and has some water industry related infrastructure asset management experience. He has Polytech & university qualifications in mechanical engineering & business. Whilst coming from a mechanical background, Adrian's interest in electrical engineering and engagement with both the MEG and the EEG springs partly from insatiable curiosity about all things engineering and also from a belief that mechanical and electrical engineering seldom exist in isolation from one another.

Abstract Title: Prescribed Electrical Work & EWRB Registration for Electrical Engineers

The pathway for electrical engineers to attain electrical registration with the EWRB to enable them to do Prescribed Electrical Work (PEW) is well established but not particularly well known by many electrical engineers. This has led to some confusion and frustration amongst both graduate and professional electrical engineers. There have also been some changes to prescribed classes of registration and requirements for competence programmes which commenced in September 2024, with more commencing in 2025 & 2026. This presentation aims to shed some light on these issues, and to present some anecdotal information about how the registration process is working for electrical engineers.

Topics covered will include:

- Recent changes for electrical worker licensing, plus forthcoming changes.
- Requirements for registration with EWRB as an electrical engineer, and limits on associated work.
- Comparisons between registered electrical engineers and other registration classes.
- Endorsed classes of registration for electrical engineers including mining, hazardous areas & supervision.
- Supervision for electrical engineers seeking EWRB registration
- 2023 competency programme requirements.
- Certified Designs

Gerhard Benade
BEng (Mechanical); MEng (Mechanical/Aeronautical) (Cum Laude)

Gerhard has been a Professional Engineer for more than 30 years with a BEng (Mechanical) and a MEng (Mechanical/Aeronautical) (Cum Laude). Currently he is about halfway with a PhD specialising in aircraft gas turbine design technology development. He has more than 25 years' experience in the design of aircraft and power system gas turbine components as well as other related turbomachinery i.e. pumps, turbines and fans. Industries that Gerhard has worked in include aviation propulsion (15 years), nuclear powerplant (6 years), renewable powerplants (wind, solar, hydro, biogas and biomass) (5 years). Gerhard has been in New Zealand now for a period of six years and has consulted to the steel manufacturing industry. He has also been a member of the Royal Aeronautical Society for more than 20 years.

Abstract Title: Aviation decarbonization: the hard yards

Aviation has over the past 120 years become an indispensable part of virtually every country's economy. As of 2023, aviation was responsible for around 2.5% of all man-made CO2 emissions equalling that of Japan. Due to the substantial efficiency improvements in jet aircraft as well as capacity and range increases, aviation has experienced massive growth. To counteract the effect of an increase in CO2 emissions, a huge multi front effort is occurring regarding aircraft technology improvement. Conventional jet engine companies such as General Electric, Rolls Royce and Pratt and Whitney are spending billions of dollars on projects to improve engine efficiency. Alternative aviation fuels are being investigated amongst others are SAF (Sustainable Aviation Fuel) and hydrogen.

The has huge impact on aircraft design to ensure adequate fuel storage and achieve equivalent payload-range characteristics. For short haul or regional flights hybrid-electric or even fully electric propulsion is under consideration. In the light aircraft or GA (General Aviation) sphere fully electric aircraft are already on the market. In December 2023 Air New Zealand announced the purchase of battery-powered electric aircraft – BETA's ALIA CTOL for postal services. In this presentation, the road ahead for aviation up to 2050 with the stated goal of carbon net zero emissions will be covered including the most important technologies currently under consideration.

Abstract Title: The role of nuclear power in decarbonizing electric power generation

As the world faces the dual challenge of increasing energy demand and reducing carbon emissions, nuclear power is emerging as a critical component of the global energy transition. With its capacity to provide stable, large-scale, and low-carbon electricity, nuclear energy offers a viable solution to achieving long-term sustainability goals. This presentation will examine the evolving role of nuclear power in electricity generation, focusing on recent technological advancements, including small modular reactors (SMRs) and next-generation nuclear technologies. We will explore how these innovations address traditional concerns around safety, waste management, and cost-efficiency, positioning nuclear energy as a sustainable option alongside renewables.

We will also discuss the global policy landscape, highlighting the key drivers and challenges influencing nuclear power adoption across different regions. This includes an analysis of nuclear energy's integration with other low-carbon technologies, the need for robust regulatory frameworks, and the role of international cooperation in driving innovation. The session aims to provide a comprehensive understanding of how nuclear power can complement renewable energy sources, ensuring a balanced and resilient energy mix for the future. It will be valuable for policymakers, engineers, and industry stakeholders seeking to navigate the complexities of the global energy landscape.

Byran Leyland, *MSc, Listening, FIMechE, FIEE(rtd)*
Sole Operator – Consultant

Bryan Leyland has more than 60 years' experience in power systems in New Zealand and overseas. He has been involved with virtually every type of power generation including wind, tidal, solar and hydropower. He has in-depth knowledge of the New Zealand power system and the problems it now faces. He has presented more than 100 papers on hydropower and power systems and been session chairman at many conferences in

New Zealand and overseas.

Abstract Title: Net Zero by 2050: the dream and the reality

Achieving net zero by 2050 poses many challenges. A major one is finding sufficient people to do all the engineering and construction necessary. Other challenges include finding the resources of money and materials needed for the construction of up to 12,000 MW of new wind and solar power and the new transmission lines that will be needed. But perhaps the biggest one is finding a new long term, low-cost large-scale energy storage technology that can absorb surplus energy when it is available and deliver it when it is needed. Something like 4000 MW and 4000 GWh will be needed. Without it, massive shortages in dry years and during system peaks are inevitable along with price spikes when we are short of power and price crashes when there is a surplus.

The paper will discuss this in detail and then assess the benefits and costs. It will also point out that the problem can be solved by adopting nuclear power and developing more geothermal and hydropower and extending the use of gas during dry years.