

2021 Conference

November 24-26

Building partnerships for end to end renewable power systems





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For additional information, please contact: CIGRE New Zealand Conference Committee 022 137 6413 | cigrenz2021@gmail.com

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ACKNOWLEDGMENTS

The CIGRE New Zealand National Committee (NZNC) expresses its deep appreciation to the following sponsors who are supporting CIGRE NZ 2021 Conference

CIGRE NZNC also extended its gratitude to organizations, individuals, and volunteers who have contributed to this conference and to the University of Auckland Computer and Engineering Department for its digital and organisational expertise in hosting the conference.



ABOUT CIGRE

CIGRE (International Council on Large Electric Systems) is a permanent, non-governmental and non-profit international association.

Based in France, CIGRE was founded in 1921. CIGRE is an international organization dedicated to the development of the power supply sector through the identification and the development of solutions to industry issues. With members in more than 80 countries, it is the leading worldwide organization on Electric Power Systems, covering their technical, economic, environmental, operational, organisational, and regulatory aspects.

CIGRE counts more than 3,500 experts from all around the world working actively together in structured work programmes coordinated by the CIGRE 16 Study Committees, overseen by the Technical Council. Their main objectives are to design and deploy the end-to-end power system for the future, optimize existing equipment and power systems, respect the environment, and facilitate access to information.

CIGRE NEW ZEALAND NATIONAL COMMITTEE

The New Zealand National Committee (NZNC) was accepted as a full CIGRE National Committee by the CIGRE Administrative Council at its meeting held during the 2006 Paris Session. Since then we have been active nationally and internationally through engagements of:

- Disseminate CIGRE information and maintain communication with local NZ members regularly
- Provide a platform for presenting NZ expertise and experience to the New Zealand and International power systems community



- Active point of contact for CIGRE Paris, the ANC and other National Committees
- Take our place on the world stage at CIGRE Paris with the other CIGRE National Committees
- Invitations and hosts to CIGRE Study Committees to hold meetings in NZ
- Participate as a member of the Asia Oceania Regional Council (AORC) of CIGRE
- Participating in, and providing internationally recognised keynote speakers for EEA2018, EEA2019, and EEA2020 annual conferences
- Arranged and hosted Regional/Global Conferences and Symposia such as CIGRE Auckland Symposium 2013, B5 Colloquium 2017, AORC 2017, Administrative Council Meeting 2017, and CIGRE ANZ 2018 in conjunction with AUPEC 2018
- Presenting A2 Power Transformers and Reactors technical webinars (2020)
- Presenting B1 Insulated Cables technical webinars (2019, 2020)
- Hosting AU and NZ online B1 Power Cables web tutorials (2020)
- Presenting CIGRE NZ annual Conferences in alignment with EEA NZ, inaugurally in 2020 featuring venue and online international and local power systems experts inclusive of CIGRE President, Study Committee convenors, CEO EEA NZ

 Provide formal links to other national and international bodies such as IEEE to benefit NZ industry

ORGANISATIONAL STRUCTURE

The 16 international CIGRE Study Committees are mirrored as three Panels and four Interest Groups within CIGRE NZ.

CIGRE NZ Mirror Panel / Group		Associated Study Committee
NZ.A2	Transformers Convener: Dr Dan Martin	A2: Power Transformers and Reactors
NZ.B1	Insulated Cable Convener: André Cuppen	B1: Insulated Cables
NZ.B5	Protection & Automation Convener: Stephen Chiu	B5: Protection and Automation
NZ.IG3	Overhead Lines	B2: Overhead Lines D1: Materials and Emerging Technologies
NZ.IG4	Substations and Electrical Installations	 A3: High Voltage Equipment B3: Substations and Electrical Installations B4: HVDC and Power Electronics D1: Materials and Emerging Technologies D2: Information Systems and Telecommunication
NZ.IG5	System Performance	 C1: System Development and Economics C2: System operation and Control C3: System Environmental Performance C4: System Technical Performance C5: Electricity Markets and Regulation
NZ.IG6	Generation and Distribution	A1: Rotating Electrical Machines C6: Distribution Systems and Dispersed Generation D1: Materials and Emerging Technologies

From 2019 Study Committee Mirror Panels are being formed from our Interest Groups to best develop and reflect our CIGRE aims and objectives.

CIGRE NZ NATIONAL COMMITTEE COMPOSITION

Member	Position	Collective Organisation
Doug Ray	Chair / AORC Member	Vector
Nick Lee	Secretary	Transpower
Dr Nirmal Nair	Events Manager / AORC Member	University of Auckland
Rebecca Marx	Membership Manager	Mitton ElectroNet
Nasser Farooqui	NGN Convenor	Amplitude Consulting
André Cuppen	B1 Insulated Cables Convener	Unison Networks
Andrew Renton	Executive Member	Transpower
Brent Rees	Executive Member	Hitachi Energy
Trevor Lord	Executive Member	Individual
Waqar Qureshi	Executive Member	Horizon Networks

WELCOME FROM CIGRE NEW ZEALAND



Doug Ray

CIGRE New Zealand Chair

Kia ora koutou katoa

On behalf of our CIGRE NZ Organising Committee, our CIGRE NZ Executive and members, it is a privilege and pleasure to welcome you to our second annual CIGRE NZ 2021 Conference and its focus on *"building partnerships for end-to-end*

renewable power systems"

Our organising conference committee has established a cohesive program to give us an informative, collegiate experience for all.

We are bringing together proven power systems and industry expertise from across New Zealand and internationally. We are indebted to our keynote speakers, forum panellists, technical paper presenters and sponsors: thank you for making a difference to our knowledge sharing.

As we build our new energy future, we believe the importance of building successful partnerships within the energy sector, commerce and customers is paramount. Our customers drive our business direction.

We've invited cross sector people to share their views on how partnering benefits operationally and commercially sustainable and efficient outcomes towards addressing current climate and business change. And we're seeking equitable energy access and resilience of supply toward a net zero carbon end game. Insights and action needed now to make a difference for our people, communities, and industry.

Our Technical Sessions will show how we are resolving issues and adding technology value to solving for increasingly reliable, resilient, diversified energy connection and supply. From this knowledge sharing we will assure continued success for the wellbeing of our electricity sector infrastructure and our customers.

Enjoy the conference.

Nga mihi, and thank you for being with us.



Leonie Bule

CIGRE NZ 2021 Conference Chair

Kia ora everyone,

On behalf of the CIGRE NZ 2021 Conference Organising Committee, it is my great pleasure to extend a warm welcome

to all our online delegates, invited keynotes and guests, presenters, and our conference sponsors Hitachi Energy, AECOM, Powerco and session sponsor SGS ECL.

Our attendees come from throughout New Zealand with diverse lifelong experiences within the end-to-end power sector as well as our online attendees from abroad. A special welcome to all our invited plenaries.

Our Panel Conveners, Next Generation Network, Women in Engineering (NGN/WiE) have spearheaded the delivery of a diverse and topical mix of strategic and technical sessions throughout the CIGRE NZ 2021 programme for you. To all our conference speakers and those presenting at our technical sessions, we sincerely thank you for bringing the conference to life by sharing your knowledge and expertise with us all.

Thank you to the exceptional performance of our organising team to successfully bring the conference together, pivoting from a venue and online event to fully streaming in protecting our wellbeing within the current virus-induced lockdown.

Our conference brings us together to again share our knowledge and immense experience to continue our journey of achieving sustainable, resilient, and equitable end-to-end renewable power systems for the wellbeing of our people, communities, and economy.

We look forward to seeing you online to participate in shared learnings, believing you will gain valuable insights and knowledge from being with us.

Welcome to conference CIGRE NZ 2021



conference committee



Leonie Bule Conference Chair University of Auckland



Dr. Nirmal Nair Event Manager/ Workshop Finance Committee & Mentor University of Auckland



Doug Ray CIGRE NZ Chair/ Workshop Finance Chair & Mentor Vector



Xin Liu Digital Delivery Coordinator University of Auckland



Bernadette Robertson Pacific Forum Chair Transpower



Ebad Rehman Digital Delivery University of Auckland

Rizki Dian Rahayani

E-book Coordinator

University of Auckland



Evelyn Hunsberger Publicity RUTE Foundation Systems



André Cuppen CIGRE B1 convenor Unison



Stephen Chiu CIGRE B5 convenor Powerco



Reshma Jose CEO Forum Chair AECOM



Gary Caitlin B1 Programme Coordinator HV DiagnostiX



CIGRE A2 convenor ETEL

Dan Martin



Abhinav Chopra Cyber Security Chair Chief Architect



Neeraj Kant CEO Forum Co-chair ETEL



Nasser Usman Faarooqui Technical & Award Chair Amplitude Consultants



PROGRAMME



Conference schedule

Day 1 24 th Nov	ember 2021	
13:15 – 14:15 14:15 – 15:15 15:15 – 15:30 15:30 – 16:45	Opening Addresses and Keynote CEO Forum Break Pacific Forum	Platinum Sponsor
Day 2 25 th Nov	ember 2021	
8:45 – 10:15	A2 Panel Symposium: Power Transfo	ormers and Reactors

0.10 10.10		
10:15 - 10:30	Break	
10:30 - 12:00	A2 Panel Symposium continued	
12:00 - 12:30	Lunch	
*12:30 - 13:30	C6: Active Distribution Systems and Distribut D2: Information Systems and Telecommunic	ted Energy Resources ation inc. Cybersecurity
13:30 - 14:30	Cybersecurity Forum SGS ECL	
14:30 - 15:15	General Technical Session	Gold Sponsor
15:15 – 15:30	Break	AECOM
15:30 - 16:45	Technical Session continued	ALCOM

Day 3 26th Nov ember 2021

8:45 - 10:15	B5 Panel Symposium: Protection and Automation
10:15 - 10:30	Break
10:30 - 12:00	B5 Panel Symposium continued
12:00 - 12:30	Lunch
*12:30 - 13:30	B3: Substations and Electrical Installations
13:30 - 15:15	B1 Panel Symposium: Insulated Cables Silver Sponsor
15:15 – 15:30	Break OPOWERCO
15:30 - 16:45	B1 Panel Symposium continued
Join us by re	gistering at www.cigre.org.nz *separate free entry zoom

OUTLINE OF EVENTS

CIGRE NZ 2021 Conference event outline:

Conference Opening Address

Doug Ray, CIGRE NZ chair and Leonie Bule, CIGRE NZ 2021 Conference chair will welcome delegates and speakers, share a brief conference overview, and CIGRE's commitment to progressive power systems excellence in a changing world

Opening Keynote

An international and local view from the United Nations Development Programme on Sustainable Development Goals for change and achievements

CEO Forum

New Zealand CEO's and C-Suite executives will present key strategies for partnering to address resilient net zero sustainability

Pacific Forum

Delegates from Pacific will share their local expertise, experience, and expectations within their environment of climate and economic change and its power systems impact

CIGRE NZ A2 Panel Symposium

Panel members will provide ten-minute technical paper presentations on power and distribution transformer systems, with five minutes audience Q&A

CIGRE Panels inauguration (free entry)

- C6 Distributed Energy
- D2 Information / Communications technology

Parallel lunchtime sessions defining Panel benefits / objectives, setting direction with attendee input, seeking members

Technical Session Presentations

Industry technical experts present ten-minute technical papers on end to end power systems, with five minutes audience Q&A per paper in the usual CIGRE format

Cybersecurity Forum

A panel of industry sector expertise defining concerns and exploring solutions for operational technology to thwart cyberterrorist threats

CIGRE NZ B5 Panel Symposium

Panel members provide ten-minute technical paper presentations on protection and automation systems, with five minutes audience Q&A

CIGRE Panel inauguration (free entry)

B3 Substations and Electrical Installations inc. BESS

Lunchtime session defining Panel benefits and objectives, setting direction with attendee input, seeking members

CIGRE NZ B1 Panel Symposium

Panel members provide ten-minute technical paper presentations on insulated cable systems, with five minutes audience Q&A

Wrap up of the Conference & Symposium Closing acknowledgements

CIGRE NZ 2021 CONFERENCE DAY 1

Building Partnerships for end-to-end Renewable Power Systems

Wednesday 24 November

CONFERENCE OPENING



Doug Ray, CIGRE NZ Chair

Leonie Bule, Conference Convenor



CIGRE PARIS ADDRESS



Michel Augonnet

President CIGRE (International Conference on Large Networks)



Michel Augonnet is President of MVAconnect, an energy consulting and engineering company since 2016. Prior to this role he was Senior Vice President for Alstom Grid Commercial Solutions (now GE) in charge of the Regional Sales and Project organization

He is an industry recognised thought leader as the President of CIGRE, president of SuperGrid Institute (a research and testing laboratory in Lyon France), member of the board of AEG Power Solutions, Mastergrid SA in Grenoble, and alternate board director for ACTOM, South Africa. His work is distinguished by key investment decisions in technologies for power plant control and instrumentation, network management systems, and HVDC power electronics

Michel was 7 years Chairman of the CIGRE National Committee, member of CIGRE's Steering Committee, and elected Vice-President Finance of CIGRE in 2016

Graduate Engineer from SUPELEC in Power Electronics in 1973 Michel held various positions in the Power Generation Industry (Nuclear, Hydro, Thermal) and Grid Transmission from Project Manager to Senior Executive in companies such as Cegelec, ABBAlstom Power, Areva T&D, Alstom Grid

OPENING KEYNOTE



Kate Sutton

Head of the Innovation Centre United Nations Development Programme

Taking on the world's biggest challenges, working towards the UNDP Sustainable Development Goals (SDG's). Developing and scaling innovation and digital, Kate leads the Regional Innovation Centre at the UNDP based in Bangkok, Thailand

Headquartered in New York City, the UNDP is the largest UN development aid agency, with offices in 170 countries. The UNDP emphasizes developing local capacity towards long-term self-sufficiency and prosperity.

CEO FORUM

Conference 2021 November 24-26



CEO forum

We are inviting the end-to end power sector and customers to share their views on how partnering benefits more operationally and commercially sustainable and efficient outcomes towards addressing current climate and business change. We also see benefits for improved equitable energy access and resilience of supply. And our end game of targeting net zero carbon. Day 1 2:15 to 3:15

Vince Hawksworth Mercury



Mark Ryall Transpower Peter Ryan Vector



Vince Hawksworth

Chief Executive, Mercury

Vince joined Mercury in March 2020. Vince has considerable experience in the energy sector in both New Zealand and Australia. Most recently he was Chief Executive at generator/retailer Trustpower and prior to that, Chief Executive of Hydro Tasmania.

Vince qualified as a mining engineer, working for UK coal mines and has an MBA from the University of Waikato. Vince commenced his career in the New Zealand energy sector at the Huntly power station and led both the generation and retail divisions at Genesis Energy. He led the demerger of Tilt Renewables from Trustpower and is now a director of Tilt Renewables.



Peter Ryan

Chief Operating Officer, Electricity, Gas and Fibre, Vector

Peter Ryan is responsible for the strategic operations of the Vector electricity, gas, and fibre network businesses.

He has 20 years' international experience within the telecommunications industry, leading engineering, field and operational teams in the deployment, operations, and maintenance of mobile and fixed networks.

Most recently, Peter was the Chief Network Engineering Officer, Network & Service Operations at NBNCo Australia, where he oversaw the highly successful implementation of the broadband network. He brings a wealth of experience in operations management, performance transformation as well as a proven ability working across technical, operational, and commercial strategy to optimise business objectives.



Mark Ryall

General Manager, Grid Delivery, Transpower

Mark has been with Transpower since 2006, working in a variety of senior roles, including Regional Service Delivery Manager for the Upper North Island, before moving into General Management.

Previously, Mark worked in project management and consultant roles in New Zealand and the United Kingdom. Further to his degree from Lincoln University, Mark completed the University of Virginia Darden School of Business Executive Programme.

Responsibilities: Maintaining the operation, performance, and enhancement of our grid assets, such as substations and transmission lines, and property management related to our assets. Accountable for the delivery of national transmission grid services to New Zealand, providing effective real-time operations management.



Brent Rees

Country Managing Director, New Zealand, Hitachi Energy CIGRE NZ Executive member

Thank you to our CEO Forum from our Conference Platinum Sponsor

PACIFIC FORUM

The Pacific Forum develops further the presentations by our Keynote and CEO Forum speakers and the questions raised in those sessions.

Conveners explore and challenge a Panel of CIGRE members for ways for us to move forward with the concepts and ideas from these leaders who drive strategy, technology and innovation, to see how we are able to use their organisation's challenges and insights to the way we work. And are able to engage across the infrastructure landscape to continually make a difference to our diverse and sustainable energy future in the Pacific by our own contribution within and outside New Zealand.

Our unique times at present have opened the opportunity for different and diverse sectors to come together to involve and build new and strengthen existing relationships while highlighting the importance of building collaborative partnerships within the energy sector as well as others.

How will we take the inputs from our speakers today to ensure we as CIGRE NZ make an active difference for the Pacific, how is that possible and what might we achieve via our CIGRE connections, expertise, and experience.

Please join us to flesh ideas into actions we can take away from the conference.

Bernadette Robertson

Pacific Forum Chair CIGRE NZ 2021 Conference

CIGRE NZ 2021 CONFERENCE DAY 2

Building Partnerships for end-to-end Renewable Power Systems

Thursday 25 November



A2 panel symposium

Hosted by panel convenor Dan Martin, ETEL

Power Transformers and Reactors Day 2 25th November 2021

8:45		Opening of session and introduction	Dan Martin (ETEL) & Jon Brown (Transpower)
8:45 — 9:15	1	A review of distribution transformer energy efficiency metric: In the Australian and New Zealand context	Bhaba Das (Hitachi)
9:15-9:45	2	Investigating the impacts of customer PV, EV and batteries on the distribution network and transformers: a collaborative project between University of Canterbury, Northpower and ETEL transformers	Thomas Wang (University of Canterbury)
9:45 — 10:15	3	Servicing transformers: studies into optimising the stand time after oil filling using partial discharge tests	Neeraj Kant (ETEL)
0:15-10:30		Break	
10:30 — 11:00	4	Electric vehicle charging impacts on transformers and management approaches	Craig Baguley and Jeremy King (AUT)
11:00 — 11:30	5	Transformer oil: coming up to standards!	Philippe Reboul (Molekulis)
11:30 — 12:00	6	Impact of renewable generation in power transformer utilisation and specification in Queensland	Lagath Ganepola (Powerlink Queensland)
		A	

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New Zealand www.cigre.org.nz

meet the symposium conveners



Power Transformers and Reactors

CIGRE NZ A2 Panel specialises in all sizes and types of distribution, power and specialty transformers and reactors. For this symposium the topics of interest include how renewables and electric transport will impact the management of transformers, and how the industry is responding.

Dan Martin ETEL

Dr Dan Martin is a chartered professional engineer with 20 years of experience in

electrical engineering. In his role at ETEL he is responsible for leading, managing and completing innovation projects related to transformers. He has a PhD in electrical engineering from the University of Manchester. He is a senior member of IEEE and a chartered member of Engineering New Zealand.

Dan's interest is in understanding how utilities and industry need to adapt the management of their transformers as customers turn to EVs, solar and batteries, while ensuring reliability and sustainability. Dan has published over 100 articles on transformer topics in technical journals and is reviewing the forthcoming CIGRE Transformers Green Book. His published research is also used in the new IEC 60076/7 transformer loading guide.

Join us at our online CIGRE NZ 2021 Conference by registering <here> Our A2 Panel Symposium led by convenor Dan Martin is Thursday 26th Nov 8:45 am to 12:00 pm



A Review of Distribution Transformer Energy Efficiency Metric: in the Australian and New Zealand Context Dr. Bhaba Das Hitachi-Energy

Abstract - Distribution transformers play an important role in achieving the ambitious energy efficiency targets set by many countries in the world. Distribution transformers are of high value in terms of energy efficiency because of the number of installed

units in each country. In this context, energy efficiency metrics has been introduced such as efficiency at 50% load, maximum no-load and load losses, maximum combined losses etc. Typically, the selection of energy efficient distribution transformer is a two-step process: a) transformers must comply with the minimum power efficiency levels (typically at 50% load), b) selection of that transformer whose losses are economically optimal over the lifetime of the transformer. In this presentation, a review of the present energy performance metrics, especially the efficiency at 50% load is reviewed, paying particular attention to the Australian and New Zealand market which uses the AS 2374.1.2 standard. The need to update the AS 2374.1.2 standard will be illustrated as:

- A comparison between AS 2374.1.2 with the IEC 60076-20 metrics.
- Comparison of AS 2374.1.2 against the 5 global tiers
- Importance of Total cost of Ownership and Load factor in loss capitalization.
- Alternative metrics such as no-load and load loss values and peak efficiency index.



Investigating the impact of customer PV, EV and batteries on the distribution network and transformers: a collaborative project between University of Canterbury, Northpower and ETEL transformers

Speaker: Thomas Wang¹ Co-authors: Prof. Neville Watson¹, Dr. Ryan Van Herel¹, Russell Watson² and Dr Dan Martin³

¹University of Canterbury, ²Northpower and ³ETEL

Abstract - How are distribution networks being impacted by new customer technologies? A case study was performed to understand how a utility's network and transformer technical policies may need to change to accommodate the range of rooftop PV, EVs and batteries entering the community. In order to investigate possible impact on distribution transformers, Northpower teamed up with University of Canterbury and ETEL. Find out by attending this talk.



Servicing transformers: studies into optimising the stand time after oil filling using partial discharge tests

Speaker: Neeraj Kant. Co-authors: Scott Dickie and Dr Dan Martin

ETEL

Abstract - ETEL continuously investigates ways to improve the production process. For this project, we looked at oil

impregnation times for a large industrial transformer. The aim was to study the relationships between impregnation time, temperature and vacuuming pressure. Partial discharge measurements were utilized to detect unimpregnated pressboard. An overview of this study will be given in this presentation, along with the partial discharge detection system used by ETEL.



Electric vehicle charging impact on transformers and management approaches

Dr Craig Baguley Jeremy King Auckland University of Technology



Abstract - AUT is currently investigating how to manage transformers in distribution networks which will be used to supply EV chargers. Ideally, unnecessary transformer capacity upgrades should be avoided by better management of loads and controlling technology, preventing unneeded costs being incurred by the utilities and community. This presentation will cover some of the technologies being investigated along with findings.



Transformer oil: coming up to standards!

Philippe Reboul Molekulis

Abstract - The latest version of the IEC 60296 standard for "Fluids for electrotechnical applications – Mineral insulating oils for electrical" was released last year.

What does it mean to transformer OEMs, utilities, and other

asset owners? How much has changed and how can organizations update their internal specifications to ensure they are supplied with safe and high-performance transformer

oil complying with the latest standards applicable? And not forgetting about AS60296:2017... **Find out by attending this presentation.**



Impact of renewable generation in power transformer utilisation and specification in Queensland Lagath Ganepola Powerlink Queensland

Abstract - The Queensland electricity system was historically developed around coal fired generation. Over the last few years, driven by government energy policies and economics, there has been a steady increase in large-scale renewables such as solar

and wind. Find out how Powerlink Queensland has been managing the power transformers on its transmission system during this generation transition.



C6 Panel invitation Active distribution systems and distributed energy resources

New Zealand's medium and low voltage networks are undergoing rapid transformation as distributed and mobile generation brings us closer to achieve a carbon net zero outcome. The increasing impact of distributed energy resources [DER] needs to be addressed, witnessed by higher penetration of inverter-based generation reducing system inertia of networks.

This free CIGRE NZ C6 session will bring together *distribution utilities, DER developers, service providers, manufacturers and consultants* to share knowledge in shaping the implementation of interactive distribution networks

Join us online **12:30 to 1:30 pm Thursday 25 November 2021** and be involved in shaping the direction of the C6 Panel and its topical principal areas of interest, facilitated by Nasser Faarooqui alongside André Cuppen:

- Industry knowledge and practice for New Zealand connection frameworks
- Impact assessment of DER
 - Voltage issues
 - Power quality harmonics and flicker
 - Unintentional islanding
- Network protection with increased DER
- Development of Microgrids
- New technologies, tools and services for DER
 - ADMS, DERMS, Smart transformers and other assets
 - Services for EDB peak shaving
 - · Ancillary services for national grid
 - Switching technologies and automation for improving SAIDI, SAIFI

Looking forward to your participation with us in this rapidly evolving space

Join us by free registration by emailing cigrenz2021@gmail.com



D2 Panel invitation Information systems and telecommunication inc. Cybersecurity

New Zealand's end-to-end power systems and their active distribution connections are reliant on information systems and tele communications for their successful operation and electricity connection with our customers. These business Operational Technology systems must be resilient to cyber security threats: exploring these challenges and our strategies are the remit of the CIGRE NZ D2 Panel.

This free session will bring together generation, transmission, distribution and retail utilities, IT and IOT developers, service providers, manufacturers and consultants to share knowledge in shaping our strategies to these IT challenges to our network operation and its security of supply for customers

Join us online 12:30 to 1:30 pm Thursday 25 November 2021 and be involved in shaping the direction of the D2 Panel and its topical principal areas of interest, facilitated by industry specialist Abhinav Chopra alongside Stephen Chiu:

- Industry knowledge and practice within New Zealand and internationally
- Impact assessment of cybersecurity needs inc. CIGRE references:
 - TD 1: Telecom network technologies and management
 - TD 2: Implementation of the networks of the future
 - TD 3: New digital trends used by EPU and new business services
 - TD 4: Cybersecurity

https://d2.cigre.org/userfiles/Strategic%20Plan%20SC%20D2_2018-2028%20[0 lga%20V_%20Sinenko]%20ind2.pdf

Abhinav heads (CTO/CISO) the Future and Advanced Technology Security and Architecture portfolio working with Cyber Security, Big Data, Al, Blockchain, Distributed Systems, Cloud, ISA99 and IoT.

Join us by free registration by emailing cigrenz2021@gmail.com

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New Zealand

Conference Forum 25 November 1:30 – 2:30 pm

Cyber Security

Operational Technology cyber threats, challenges and strategies

There is a growing industry concern with the introduction of Information 4.0 and Society 5.0 innovations that cybersecurity threats will increase in Operational Technology environments. With COVID-19 cybersecurity threats likelihood increased, and its impact materialised. We are bringing cybersecurity expertise from our critical infrastructure and operational technology environments to work through how they have been conquering these hazards, their strategy moving forward and practices they propose, and the benefits are realizing.

Join us by registering at cigre.org.nz Email themes or questions you need us to explore in the forum

Abhinav Chopra Cybersecurity forum chair

Abhinav heads (CTO/CISO) the Future and Advanced Technology Security and Architecture portfolio working with Cyber Security, Big Data, AI, Blockchain, Distributed Systems, Cloud, ISA99, IoT

He has helped set standards and provides consulting services to critical infrastructure sectors – ports, telecommunication, transport, energy, water, health. He has also worked for council, insurance, healthcare, life sciences, critical infra, public policy, CERTNZ, NCSC and the higher education domain within Europe, the United States, Australia and New Zealand to uplift their security posture.

Abhinav is CISSP, TOGAF, Prince 2, ITIL, Six Sigma certified. He holds advanced degree qualifications in Software, Power Systems, Electronics and Telecommunications Engineering and Business Management.

He is the Cyber Security Advisor to the Rt. Hon. Helen Clark, and is an active member of AEA, IEEE, ISO, ITPNZ, Engineering New Zealand, and Institution of Engineers India.

Session Sponsor

<u>SGS</u>





- Exemplars of unreal issues and their resolution
- Strategies moving forward by design, software, firmware, operational risk controls
- · Improved practices to adopt

The Forum explores the impact of cybersecurity needs : **CIGRE TD 4: Cybersecurity** <u>https://d2.cigre.org/userfiles/files/Strategic%20Plan%20SC%20D2 2018-</u> 2028%20(Olga%20V %20Sinenko)%20ind2.pdf



Technical Session

Hosted by our sponsors Hitachi Energy | AECOM | Powerco

Day 2 25th November 2021

14:30 - 15:00	Welcome	Nasser Usman Faarooqui (Amplitude)
	Active Distribution Test System for typical NZ MV and LV networks	Samad Shirzadi (Unison) Dr Nirmal Nair (University of Auckland)
15:00 - 15:15	A case study of protection and control challenges of a microgrid	Suhao (Sam) Zhang and Cecilia Fang (Powerco)
15:15 – 15:30	Renewable energy challenges in Santo	Jason Bule (VUI)
15:30 - 15:45	Break	
15:45 – 16:00	Overview of WEL Networks 33kV network protection infrastructure and challenges	Daniel Han and Weihao Zhou (WEL)
16:00 - 16:15	Developing strategies to reduce LV pillar fires after failures of fuses, cables	David Bredda (Unison)
16:15 - 16:30	Summary and thank you	Andrew Renton

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A Case Study of Protection and Control Challenges of a Microgrid

Sam Zhang Powerco Cecilia Fang Powerco



Abstract - Our presentation describes a real-life example of microgrid, which supplies the thriving Central Business District (CBD) of Whangamata. Grid supply of the area relies on a single 33kV line from Waihi Substation that runs through some rugged terrain. Historically the 33kV line has experienced damages from severe weather, tree felling and assets failures. To improve the reliability of supply to the area, a cutting-edge backup power system has been installed to provide rapid transition between grid-tied and island operations. The backup power system consists of a Portacom Building housing a new 11kV switchboard, a battery container housing the 560 battery cells making up the 2MWh of battery capacity; a container housing dual inverters and associated control systems; a step-up transformer to convert the 480V AC inverter output to 11kV; and a diesel generator. The new switchboard is fed from an old 11kV feeder (WGM11) of the Whangamata substation, which has been diverted into the new switchboard.

Under normal conditions, WGM11 and the interface circuit breaker (CB1112) are closed, and the new CBD feeder (CB1122) is fed from the new 11kV switchboard. In the event of a line outage, the battery supply cuts in automatically within 100 milliseconds to pick up the load of CB1122. The batteries have enough capacity to supply the CBD during peak business hours for approximately two hours. If the 33kV line is not returned to service by then and/or if the battery becomes depleted, the diesel generator will cut in automatically to charge the battery and keep the CBD supplied. It has enough fuel capacity to run continuously at full load for about 20 hours. To operate this microgrid successfully, we have implemented adaptive protection to overcome many challenges such as large number of required protection settings, seamless transition from grid-tied mode to islanded mode, fault ride-through and coordination with downstream protection devices. An event of upstream network fault that caused the microgrid to transition seamlessly from grid-tied mode to islanded mode is included in the presentation.

The Whangamata microgrid has been successfully commissioned since November 2019. To date whenever Whangamata loses its sole incoming 33kV supply, the system will rapidly restore and maintain electricity supply to the township while the field staff locate and repair the damage to the network. During islanded operation, the BESS is capade of operating as a voltage source to maintain voltage regulation and frequency control. Under system normal conditions, the BESS will operate as current source in grid-tied model with the diesel generations switched off. It will inject or absorb current

to meet set active or reactive power reference to assist the system in regulating feeder voltage profile. The BESS or the diesel generator also has local area back-start capability to restore supply to the CBD area from a completely de-energized state.



Brief Overview of WEL Networks 33 kV Network Protection Infrastructure and Challenges

Daniel Han Wellington Electricity

Abstract - WEL's 33 kV networks are complex interconnected networks with significant embedded generations. At the Te

kowhai 33 kV GXP, all eight GXP feeders are interconnected via layers of zone substation 33 kV switchboards. A fault on the TWH 33 kV network most often result in fault current contributions from all eight GXP feeders. There are significant difficulties coordinating backup protection on the heavily meshed 33 kV network. NER earthing at the Hamilton and Te Kowhai 33 kV GXPs result in very low earth fault levels. There are sensitivity difficulties when these low earth fault current's split between many parallel paths in an interconnected network. Likely consequences are slow sequential clearance of line or bus faults, inadequate sensitivity on backup protection. Long 33 kV cables combined with NER earthing can present large capacitive earth fault current to healthy circuit relays for external faults. Two stage definite time earth fault protection are set to reduce the risk of sympathetic tripping. Very low circuit impedances, making it difficult to set time/impedance coordinated distance schemes to be secure and dependable even in the presence of fault resistance. For overhead circuits, there is a need to maintain stability for mutually coupled earth fault current into the interconnected network. WEL's traditional 33 kV line protection scheme consists of one communication-based protection and one backup protection for each circuit. Some of the circuits share a common protection communication equipment. Backup protection coordination is critical to prevent widespread loss of supply during communication outage. Due to the complexities mentioned above, WEL has been continuously improving the 33 kV protection and communications infrastructure over recent years, which opens the opportunity towards adopting a simpler setting approach for the 33 kV network. New 33 kV lines will have duplicate main protection. Omicron equipment has been purchased to measure line impedances for accurate modelling and relay setting configuration.

CIGRE NZ 2021 CONFERENCE DAY 3

Building Partnerships for end-to-end Renewable Power Systems

Friday 26 November



B5 panel symposium

Hosted by panel convenor Stephen Chiu, Powerco

Protection and Automation Day 3 26th November 2021

8:45 - 8:50		Welcome	Stephen Chiu
8:50 - 9:15	1	News from CIGRE SC B5 including updates from Paris session 2021	Rannveig Løken
9:15 - 10:15	2	B5 tutorial "Protection, automation, and control of the evolving grid"	Nirmal Nair and Alex Apostolov
10:15 – 10:30		Break	
10:30 - 10:50	3	Implementing DC system for protection and control systems	Doug Ray
10:50 - 11:10	5	Hydro synchroniser upgrade project at Mercury	John Wong
11:10 – 11:30	6	Protection reliability – What an asset manager thinks	Kiran Nanu
11:30 – 11:50	7	CIGRE AU B5 special report on human aspects in protection, experience and challenges of communication networks	Peter Bishop
11:50 – 12:00		Conclusion	Stephen Chiu
12:00 – 12:30		Lunch break	
	-		

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Conference 2021 November 24-26



meet the symposium conveners



Protection and Automation

CIGRE NZ B5 Panel has been active since late 2020. Its aim is to promote the learning and sharing of best industry practice and developments within protection and automation. Each year the Panel arranges panel meetings, webinars, symposiums and workshops on topics such as protection asset management, protection of large scale DER, detection of high impedance faults, and more. The panel forms working groups with other CIGRE B5 international panels to study topics of common interest, and gain from the global community local improvements for all our CIGRE members

Stephen Chiu Powerco

Stephen Chiu is the Principal Engineer Protection of Powerco, the largest electricity distributor in New Zealand. He is also a Chartered Professional Engineer (CPEng) and has over 15 years' experience in planning, design and operation of protection and control systems.

Stephen is interested at studying power system modelling, fault analysis and detection of high impedance faults. He has presented his work on analysing and detection of electricity distribution faults at IET APSCOM, EEA(NZ) and IEEE APAP conferences. Stephen holds a ME in electrical and electronic engineering from the University of Canterbury, and a MBA from Massey University. He is currently the inaugural CIGRE NZ B5 panel convenor

Join us at CIGRE NZ 2021 Conference by registering <here>

Our B5 Panel Symposium led by Stephen Chui is on Friday 26th November 8:45 am to 12:00 pm



News from CIGRE SC B5 including updates from Paris Session 2021

Rannveig LOKEN CIGRE Study Committee B5 Chair Protection and Automation Project Manager, Statnett, Norway

Rannveig received her Master of Science in Electric Power engineering from the Norwegian University of Science and Technology (NTNU) in 1992. She works in Statnett, the TSO of Norway, currently the project manager in Statnett R&D project related to Digital substation.

In August 2012, she became the secretary of CIGRE SC B5. She has been the Chair of SC B5 from September 2018. Her special field of interest is protection and control for the transmission system.

In addition, working in CIGRE Working groups is of great interest - Rannveig is currently a member of WG B5.69. Rannveig is on the Advisory board of PAC world, Committee member of DPSP, and Member of the International Advisory Committee APAP.



Protection, Automation and Control of the Evolving Grid

Dr. Nirmal NairDr. A. ApostolovUniversity of AucklandOMICRON

Abstract Electric power grids around the world are evolving from centralized

synchronous generation-based systems towards distributed renewable generation and storage-based systems. This is often associated with the use of grid-connected inverters presenting significant challenges to the traditional protection, automation, and control (PAC) practices and solutions. In addition, renewable generation like in large wind parks or hydro power plants may profit from bulk power transport over HVDC transmission lines or future grids. The first part analyses the characteristics of the evolving grid and the issues related to traditional PAC solutions. These characteristics include low levels of short circuit current, low inertia of the system during disturbances, varying output of the energy resources, and the increased meshing of the grid also at distribution level same as at transmission level. The second part analyses the challenges of the evolving grid. The digitization of functions and communication in substations and everywhere in power system allow a variety of PAC system architectures – distributed, centralized or hybrid – tailored best for any emerging requirements in the evolving grid. Traveling

waves-based protection and different communication-based schemes at the transmission and distribution level are examples discussed.



Implementing DC Systems for protection and control systems

Doug Ray Vector

Abstract Electrical substations require an uninterrupted dc supply for the correct and safe functioning of primary and secondary equipment. Substation asset protection, supervisory

control, operation, data acquisition, health monitoring and fault analysis are all outcomes that improve reliable electricity supply for customers. This session probes these concerns from procurement to replacement using principles of FMEA, risk analysis and applied knowledge to provide end-to-end functionality for dc systems.



Hydro synchroniser upgrade project at Mercury

John Wong Mercury

Profile John Wong CMEngNZ is an Electrical Engineer with 26 years' experience in electrical design and implementation in utility and infrastructure industries in New Zealand, Australia,

and Malaysia. John joined Mercury as Senior Electrical Engineer in 2012 and had been Lead Electrical Engineer in a few excitation upgrade projects, Arc Flash Protection installation at all Mercury power stations and recently successfully design and implemented Auto-sync Replacement at Waipapa Unit 3 and Maraetai-2 Unit 9.



Protection Reliability - What an Asset Manager thinks

Kiran Nanu Contact Energy

Abstract The functionality and complexity of electrical protection systems has progressively increased due to technology improvement. Asset management practices have not always kept pace with these changes which has meant that the

technology benefits are not optimised. Asset managers are often not protection experts, but they are responsible for the safety, reliability, and costs for most of the lifecycle of protection assets. This presentation covers some of the protection system risks asset managers need to consider to ensure their assets operate reliably.



CIGRE Australia B5 Panel 2021 Special Report Question Contributions on the Topics of 'Human Aspects in Protection' and 'Experience and Challenges of Communication Networks'

Peter Bishop Transpower

Profile Peter Bishop holds an Electrical and Electronic Engineering Degree from the University of Canterbury (NZ), and is a Chartered Professional Engineer. From 1989, he has gained transmission utility and manufacturer protection engineering experience in New Zealand and England. He presently works for Transpower New Zealand Ltd as a Principal Protection & Automation Engineer. 20 years protection engineering work at Transpower has included project technical support, operational technical support and management experience. Peter is the existing CIGRE Australia B5 (Protection & Automation) panel convenor.

Abstract During its 2021 annual meeting in July, the CIGRE Australia B5 panel discussed and developed Australian/New Zealand Special Report question contributions relating to the 2021 Preferential Subjects of 'Human aspects in Protection, Automation and Control (PACS)' and 'Communication Networks in Protection, Automation and Control (PACS): Experience and Challenges'. These technical contributions were then presented at the CIGRE Paris 2021 Virtual Centennial Session. This CIGRE NZ conference B5 presentation will briefly explain the concept of preferential subjects and a special report before summarising the specific Australian and New Zealand contributions that were developed. These contributions covered a range of practice and thinking by different Australian and New Zealand utilities. CIGRE Australia B5 Panel 2021 Special Report Question Contributions on the Topics of Human Aspects in Protection and Experience and Challenges of Communication Networks. CIGRE Australia B5 Panel 2021 Special Report Question Contributions on the Topics of Human Aspects in Protection and Experience and Challenges of Communication Networks.



B3 Panel invitation Substations and electrical installations

New Zealand's substations and electrical installations form the primary control of electricity network power flows. CIGRE Panel B3 covers all aspects of equipment performance, specification, testing and the application of testing techniques within scope, with a specific focus on the impact of changing interactions and demands due to evolution of the power system.

This CIGRE NZ B3 session will bring together generation, transmission and distribution utilities, service providers, manufacturers and consultants to share knowledge in shaping the implementation and performance of these systems for resilient security of bilateral electricity supply for our customers

Join us online 12:30 to 1:30 pm Friday 26 November 2021 and be involved in shaping the direction of the B3 Panel and its topical principal areas of interest, facilitated by Doug Ray alongside Dan Martin and Andrew Renton:

- Industry knowledge and practice within New Zealand and internationally
- Impact assessment of new technologies within electrical installations
 - Electricity substations and network connections
 - BESS
 - Photovoltaic solar farms
 - Wind farms
 - Microgrids

and their primary equipment, ancillary systems and facilities Asset management lifecycle assessment, risk management techniques, education and training are also important aspects.

Looking forward to your participation with us in this rapidly evolving space

Join us by free registration by emailing cigrenz2021@gmail.com

2021 Conference November 24-26



www.cigre.org.nz

B1 panel symposium

Hosted by panel convenor André Cuppen, Unison

Insulated Cables

Day 3 26th November 2021

13:30 - 13:50	1	Damped AC testing of cables	Michael Glass
13:50 - 14:10	2	Motivating for an addition to the cable testing standards/guides in New Zealand	Gary Catlin
14:10 - 14:30	3	Cable failure modes and failure investigations to support lifecycle activity decisions (contribution to NZWG on cable failures)	André Cuppen & Ryan Mitchell
14:30 - 14:50	4	Transient inductive interference analysis from HVDC and MVDC underground cables using the CDESGS SESTransient software package	Tony Auditore & Willie Otto
14:50 - 15:00	5	Windfarm cable design – Big turbines, big cables, route length and poor ground thermal resistivity	Craig Brown
15:00 - 15:10	6	Cable termination competency	Sujay Orpe
15:10 - 15:30		break	
15:30 - 15:40	7	High criticality cable – some learnings around some recent fauilts	Kewen Kueh
15:40 - 15:50	8	NZWG feedback: Cable asset management	Mohanad Al-Hasani
15:50 - 16:00	9	Insulation coordination for low-voltage underground reticulation	Goran Stojadinovic
16:00 - 16:20	10	Classification of fire rating and flame retardancy in power cables	Saddat Shamsuddin
16:10 - 16:30	11	твс	Russel Cathcart
16:20 - 16:30	12	Experiences with cable condition assessment measurements by Unison Contracting	Alan Carlisle
	- 29 - 5		

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Insulated Cables

CIGRE NZ B1 Panel is the expert industry group on insulated cable technology in New Zealand. Its aim is to promote the learning and sharing of best industry practice and developments within the topic of insulated cables. Each year the Panel arranges panel meetings, webinars, symposiums and workshops including cable design, construction, installation, commissioning, failure, maintenance, testing and condition assessment. Established in 2020 the Panel's industry contribution is continually increasing.

Andrė Cuppen Unison Network

André Cuppen possesses thorough knowledge of cable asset management, with

15+ years of experience in managing primary assets in electricity distribution and transmission networks in Australia, New Zealand and the Netherlands. Through 5 years of asset management consultancy working for the world leader in power asset consultancy and testing, DNV KEMA (now DNV Energy and previously KEMA), André developed an innovative mindset and a keen interest in extending the life of primary power assets, particularly cables. He takes a whole-network view with experience in modelling electricitly networks, managing and testing various items of primary equipment, such as transformers, switch-gear, surge arrestors, power cables and accessories.

Join us at CIGRE NZ 2021 Conference by registering at www.cigre.org.nz

Our B1 Panel Symposium led by convener André Cuppen is Friday 26th November 1:30 to 4:45 pm

Damped AC Testing on Wellington Electricity Cables



Michael Glass Wellington Electricity

Abstract - Like many other EDBs, Wellington Electricity has an ageing distribution cable fleet which is starting to experience an increasing failure rate. Cable replacements are very expensive projects, so we need a means of prioritising cable replacements

to be able to manage this problem. Wellington Electricity has been looking into different types of cable testing to identify cables that are higher priority for replacement. Early in 2021 we carried out Damped AC Partial Discharge testing of a selection of cables around our network. These cables were selected because of having had recent failures repaired and evidence of previous repairs. Damped AC (DAC) Testing involves injecting a high voltage into the cable which oscillates as it decays because of the capacitance of the cable and inductance within the test set, and any partial discharge within the cable is measured through a coupling capacitor. This testing identified that some of these older cables may not be in suitable condition for repairs that are effective and long lasting to be carried out. This information will assist with prioritisation of future repairs and replacements.



Motivating for an addition to the cable testing standards/guides in New Zealand

Gary Catlin HV DiagnostiX

Profile - Gary Catlin began his career at Eskom in 1991 after graduating from The University of Natal and then performing his

national service. Gary has worked as an engineer in electronic design companies and has owned and operated a number of small businesses as well as lecturing at the University of Natal for seven years. In 2008 he found himself back in the power industry and has specialised in electrical test equipment specifically insulation testing and diagnostics. Gary has his own company HV DiagnostiX which provides specialist high voltage testing products and complements the equipment with test services, training, consulting and support in insulation testing and diagnostics. His markets extend from New Zealand and Australia to SE Asia and the Middle East. Gary travels extensively every year and is fortunate to be exposed to the operations of utilities in many parts of the world.

Abstract - The current cable testing standards in New Zealand are AS/NZS 4805.1:2007, 1026:2004, 1429.1:2006, 1747:2003, 60840:2020. There is some indication that 4805 is

under review. There are some significant shortcomings regarding the current AS/NZ standards : (1) The standards were mainly written for cable manufacturing with very little information on after-laying (field) testing, (2) There is little support or use of these standards in New Zealand – there is a large number of utilities all with different test methods and different adaptations, and (3) The standards have limited application to New Zealand installed assets. There are a number of new technologies that have been developed this century and there is a proliferation of commercially biased, vendor-generated information used to promote the use of these technologies.

There have been some significant recent international publications that have addressed many of these shortcomings. Current standards and guides and have also started to address new technologies that have been developed, such as CDFI and their many publications, IEEE 400, and Cigre TB 841, 825, 493. The paper will unpack and discuss these motivations for a new field-testing guide for cables and will identify some of the main topics for discussion that could be included in the guide.



Cable failure modes and investigations to support lifecycle activity decisions (contribution to NZ WG on cable failures)

André Cuppen Unison Ryan Mitchell Unison

Abstract - Electricity customers connected to underground LV reticulation in New Zealand are typically connected to the

network with a fuse inside an LV enclosure on the boundary of the road and the property. A small percentage of this asset type may catch on fire after an internal component fails every year, currently estimated at less than 0.1%. The root cause of these failures is unconfirmed; however, several potential causes have been identified. This paper describes the efforts and progress to date to a establish risk-based maintenance strategy to reduce the instance of fires at plastic pillar sites resulting from internal faults, also known as "pillar fires". The goal is to understand the failure mode(s) needed to choose those inspection and maintenance actions that reduce the number of fires to a minimum, balancing cost, risk, and performance of the maintenance strategy are introduced as a framework to justify maintenance tasks balancing cost, risk, and performance.

This is followed by a discussion of investigations into failure modes of internal components such as the LV cable, fuse carriers, fuses, etc. that may lead to a fire. A functional failure analysis produced a list of potential triggers, causes, deterioration processes and root causes.

The relationships identified by the functional failure analysis and their effects on the components with potential consequences are explored. Potential test, inspection, and maintenance tasks are described, with developments of some tasks in progress. Case studies are provided as real-world examples. Laboratory testing of materials was included which confirm the flammability and burn rate of various materials used to construct the enclosures. Development of condition monitoring technologies such as fault detection on LV cable circuits and IoT sensors are reported. Finally, current and future work to further develop asset management processes are summarised with an interim conclusion listed from the analysis of the investigation and inspection performed to date.



Transient Inductive Interference Analysis from HVDC and MVDC Underground Cables Using the CDEGS SESTransient Software Package

Tony Auditoré Voltoni Limited

Willie Otto Amplitude Consultants



Abstract - Evolving since the mid-1970's, the EMTDC and EMTP-type programs with their current graphical user interface (GUI) are globally applied for electromagnetic transient simulation. The former programs include EMTPWorks, ATP and PSCAD. Such programs solutions are circuit based. In addition to circuit-based methods, a more complex solution method can be pursued by applying a Frequency Dependant Approach. CDEGS SESTransient applies a Frequency Domain Approach. It automates the analysis of transient events carried out with CDEGS' HIFREQ and FFTSES computation modules. HIFREQ solves a full three-dimensional network at frequencies that range from 0 to several gigahertz. It allows efficient electromagnetic modelling of combined metallic wire and metallic surface geometries, in which the Method of Moments (MoM) is employed to establish the Electric Field Integral Equations (EFIE) for the solution of the coupled set of currents on planar surfaces and wire conductors. Numerical results presented for the analysis of various EMI/EMC models demonstrate the high accuracy and efficiency of the full-wave method for analysing complex surface-wire configurations. To obtain a time-domain solution, SESTransient determines the spectrum of the time domain transient via Forward Fast Fourier Transforms (FFFT).

Nyquist Shannon Sampling Theorem is initially applied to determine the minimum frequency range required for a specific transient, and to avoid aliasing or frequency folding. Irregularities of maximum absolute values in the results can be addressed by introducing a practical method using causality error in assessing the adequacy of the frequency samples. This proposed paper provides a case study where CDEGS

SESTransient is applied to assess the Transient Inductive Interference generated from HVDC and MVDC underground cables (UGC). The recipients (or victims) of EMI considered are neighbouring 110 kV and 11 kV underground cables, and a buried fuel pipeline. Fault transients for a provided single phase to ground fault is investigated. This paper describes an appropriate assessment method that can serve as a useful guide for transient inductive interference studies on cables and pipelines using a Frequency Domain Approach. The former can accurately account for the frequency dependence of transmission line and pipeline parameters.



Windfarm cable design – big turbines, big cables, route length and poor ground thermal resistivity

Craig Brown Meridian Energy

Profile - Craig Brown has 20+ years in the Electricity industry including extensive involvement with investigation, development, and operation of wind farms in NZ, Australia, and

Antarctica. This includes management and lead of electrical, grid connection and transmission line design phases, and delivery of the first Wind turbine re-powering project in NZ at Brooklyn. Currently Electrical Engineering Team Leader – Wind at Meridian Energy and electrical lead on the Harapaki wind farm.

Abstract - This presentation offers a brief look into some of the present wind farm cable reticulation design challenges being faced, the measures being adopted in response and a view on what may be instore on this topic for the near future.



NZWG Feedback : Cable termination competency

Sujay Orpe Transpower

High criticality cable-learnings around recent faults



Kewen Kueh Powerco



NZWG feedback : Cable asset management

Mohanad Al-Hasani Vector Kiran Nanu Contact Energy



Abstract - The NZ B1 underground cables

panel has established a number of New Zealand working groups (WG's) to look at specific areas of interest within our industry. The presentation provides an update from one of these working groups, the 'Asset management of power cables". The group has representatives from five different Electricity Distribution Businesses (EDB's). Early stages of the working group have focused on defining a scope and a number of goals to work towards. The aims and outcomes are shared here.



Insulation coordination for low-voltage underground reticulation

Goran Stojadinovic TransNet

Classification of fire rating and flame retardancy in power cables

Saddat Shamsuddin La Lumiere Limited



-To be confirmed -

Russel Cathcard Tesla Consultant Limited

Experiences with cable condition assessment measurement by Unison Contracting

Alan Carlisle Unison

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- o Administrative Council Meeting



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2. The Electricity Distribution Sector for Tomorrow, **Thahirah** Jalal

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1. Cable Diagnostics to support Asset Management, Andre Cuppen

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