

# CIGRE NZ 2020 Technical Workshop

Advancing Energy Future with Focus  
on Protection, Automation and  
Control

## B5

Protection and  
automation

### Highlights

- Expert discussion on contemporary protection and automation issues and solutions
- Technical Presentations on subjects including Asset Management and IEC61850
- NZ.B5 Panel formation
- Lunch & Dinner included



University of Auckland Newmarket  
Campus, Auckland



9:30 – 19:00  
19<sup>th</sup> Nov 2020



[cigrenz2020@gmail.com](mailto:cigrenz2020@gmail.com)

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# **CIGRE & CIGRE NEW ZEALAND NATIONAL COMMITTEE [NZNC]**

## **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 Power System for the future, optimize existing equipment and power systems, respect the environment and facilitate access to information.

## **CIGRE New Zealand**

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 very active nationally and internationally through the following engagements:

- 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

# CIGRE NEW ZEALAND NATIONAL COMMITTEE

## 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	Convenor: Dr Dan Martin	A2: Power Transformers and Reactors
NZ.B1	Convenor: Andre Cuppen	B1: Insulated Cables
NZ.B5	Convenor: TBA	B5: Protection and Automation
NZ.IG3	Overhead Lines	B2: Overhead Lines D1: Materials and Emerging Technologies
NZ.IG4	Substations	A3: High Voltage Equipment B3: Substations 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 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	Vector
Duncan Maina	Secretary	AECOM
Dr Nirmal Nair	Events Manager / AORC Member	University of Auckland
Rebecca Marx	Membership Manager	Mitton ElectroNet
Nasser Farooqui	NGN Secretary	AECOM
Andre Cuppen	B1 Insulated Cables Convener	Unison Networks
Robert Deller	B3 Substations Convener	Individual
Brent Rees	Executive Member	ABB NZ
Trevor Lord	Executive Member	Individual
Stephen Jay	Executive Member	Individual
Waqar Qureshi	Executive Member	Horizon Networks

## CIGRE NZ 2020 B5 Panel Technical Workshop Organising Committee

Safa Al-Sachit	Workshop Chair	University of Auckland
Peter Bishop	CIGRE AU.B1 Panel Mentor	Transpower
Dr. Nirmal Nair	Event Manager Workshop Finance Committee / Mentor	University of Auckland
Doug Ray	CIGRE NZ Chair	Vector
Bernadette Robertson	Workshop Co-Chair	Transpower
Lakshita	Registration Coordinator	University of Auckland
Harsh S Suresh	Digital Delivery Coordinator	University of Auckland
Ebad Rehman	Digital Delivery Coordinator	University of Auckland
Rizki Dian Rahayani	e-handbook Coordinator	University of Auckland
Sainbold Saranchimeng	Venue Coordinator	University of Auckland
Xin Liu	Publicity	University of Auckland
Mohammed Aldarwesh	Volunteer	University of Auckland
Amanda Yang	Volunteer	University of Auckland
Bhabak Hadavandy	Volunteer	University of Auckland

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# CIGRE NZ PROTECTION & AUTOMATION TECHNICAL WORKSHOP

## NZ B5 PANEL - PROTECTION AND AUTOMATION

### Vision

To facilitate and promote the progress of engineering and the international ex-change of information and knowledge in the field of power system protection and automation.

To add value to this information and knowledge by means of synthesising state of the art practises and developing recommendations

### Introduction and context

Our CIGRE NZ 2020 Technical Workshop brings together experts and key players from within the power system industry across New Zealand and Internationally to discuss electricity power sector challenges, opportunities, and ways forward beyond 2020 from a protection, automation, and control perspective.

We will hear from protection, automation and control industry presenters and combine your own expertise as attendees with these professionals and practitioners. From this sharing of experiences, issues and solution finding we are looking to increase our collegiate network for your current and future benefit.

This workshop will also host critical discussion on the CIGRE NZ.B5 Panel formation and future plans.

The workshop will be delivered both face-to-face and online to provide maximum flexibility to everyone.

### Workshop Highlights

- Experts discussion on contemporary protection and automation issues and solutions
- International and NZ Technical Presentations on subjects including Asset Management and IEC61850
- CIGRE NZ.B5 Panel formation
- Venue and Online networking

## WELCOME FROM CIGRE NZNC CHAIR

Kia ora koutou katoa

On behalf of the CIGRE NZ Organising Committee, it is a privilege and great pleasure to extend a warm welcome to everyone to our 2020 Technical Workshop with its focus on Protection and Automation by our new Mirror Panel of the CIGRE International B5 Study Committee.



Our organising committee has established a cohesive program for a positive, informative, collegiate experience for all. Thank you also to Peter Bishop for your active involvement as CIGRE Australia B5 convenor and Dr Nirmal Nair in initiating our CIGRE NZ B5 Panel and this workshop.

We are bringing together proven power system expertise from across New Zealand and Internationally. We are indebted to our presenters, particularly the enduring involvement of CIGRE B5 Study Committee Chair Rannveig S J Loken, of Norway. Along with recognising our international colleagues Pablo Humeres Flores, of ELETROSUL Centrais Electricas S.A. Brazil, and Dr. Carl Benner, Dr. Don Russell and Dr. Jeffrey Wischkaemper, research professors of Texas A&M University and fellows of IEEE.

Plus, New Zealand utility industry locals, Stephen Chiu PowerCo, Peter McKenzie Horizon, Jin Phoon Transpower and Dr Nirmal Nair University of Auckland. All recognised power systems protection, automation and control leaders.

Our workshop approach will combine this experience and expertise along with your own as attendees, all of us aware of the challenges in this field including new energy flows from distributed and mobile energy inputs and outputs. Protection, automation and control are fundamental for our DERMS advances to best ensure continued end-to-end power system agility, resilience and reliability. In this we assure our profession's continued drive to achieve the best wellbeing of our customers via our electricity sector infrastructure performance and investment.

Thank you for joining us at our venue and live streaming event open to all, not only our CIGRE people. We look forward to your active participation and feedback.

Ngā mihi

A handwritten signature in blue ink, which appears to read "Doug Ray". The signature is stylized and fluid.

Doug Ray  
CIGRE New Zealand Chair

# WELCOME FROM TECHNICAL WORKSHOP CHAIR

Kia Ora everyone,

On behalf of the CIGRE NZ 2020 Technical Workshop Organizing Committee, it is my privilege and great pleasure to extend a warm Auckland welcome to all the online and venue delegates, invited speakers/guests and our sponsors. Our attendees come from all around New Zealand as well as abroad and have different life-long experiences from the power sector we are seeking to share and develop.



This CIGRE NZ Technical Workshop is blended as both online and in person. It was a challenge for our Next Generation Network and Women in Engineer (NGN/WiE) to spearhead this first ever workshop and deliver the required quality for our online attendees as well as our venue-based attendees.

I am very pleased with the performance of our organising team and the exceptional effort which the entire team has displayed to bring this workshop together from the birth of this event idea only several weeks ago in October 2020.

We saw the workshop as a way to bring together protection, automation and control professionals, practitioners and educator attendees abroad as well as within the country, along with international presenters to jointly share our immense experience within power system protection and automation.

Welcome to our CIGRE NZ 2020 inaugural Technical Workshop

Safa Al-sachit  
CIGRE NZ 2020 Workshop Chair

## TECHNICAL WORKSHOP COMMITTEE



**Safa Al-Sachit**  
Workshop 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



**Bernadette Robertson**  
Workshop Co-Chair  
Transpower



**Lakshita Lakshita**  
Registration Coordinator  
University of Auckland



**Harsh S Suresh**  
Digital Delivery Coordinator  
University of Auckland



**Ebad Rehman**  
Digital Delivery Coordinator  
University of Auckland



**Rizki Dian Rahayani**  
E-Handbook Coordinator  
University of Auckland



**Sainbold Saranchimeg**  
Venue Coordinator  
University of Auckland



**Xin Liu**  
Publicity  
University of Auckland



**Mohammed Al Darwish**  
Volunteer  
University of Auckland



**Amanda Yang**  
Volunteer  
University of Auckland



**Babak Hadavandy**  
Volunteer  
University of Auckland

# PROGRAMME

9:30-9:40	Opening Remarks by Workshop Chair & Co-Chair		Safa Al-Sachit Bernadette Robertson	University of Auckland, NZ Transpower, NZ
9:40-9:50	Address by CIGRE New Zealand Chair		Doug Ray	Vector Ltd., NZ
9:50-10:00	Address by CIGRE Australia.B5 Panel Convener		Peter Bishop	Transpower, NZ
10:00-10:25	Technical Presentations	News from CIGRE Study Committee B5 / IEC61850	Rannveig S. J. Løken <sup>1</sup>	Statnett SF, Norway
10:25-10:45		Protection of Down Conductor Faults	Stephen Chiu	Powerco, NZ
10:45-11:10		61850 Goose - Positive experiences and project roll-out	Peter McKenzie <sup>1</sup>	Horizon Networks, NZ
11:10-11:40		Coffee Break		
11:40-12:00		Transmission Network with the presence of Embedded Generation	Jin Phoon	Transpower, NZ
12:00-12:30		New Zealand Distribution Network Protection Practices- 2011 Survey Refresh	Nirmal Nair	University of Auckland, NZ
12:30-13:30	Working Lunch - CIGRE NZ.B5 Panel formation discussion (Draft Terms of Reference to be Released)			
13:30-14:00	Technical Presentations	IEC61850 experience of Brazilian utilities	Pablo Humeres Flores <sup>1</sup>	Electrobras, Brazil
14:00-14:30		Anticipating and detecting wildfire ignition mechanisms from failing line devices	Carl L. Benner <sup>1</sup> Prof. B. Don Russel <sup>1</sup>	Texas A&M University, USA
14:30-15:30	NZ Distribution &Generation Utilities Burning PAC* Issues <sup>2</sup>		Moderator - Nirmal Nair	
15:30-15:45	Coffee Break			
15:45-16:15	NZ Distribution &Generation Utilities Burning PAC* Issues <sup>3</sup>		Moderator - Nirmal Nair	
16:15-17:00	Discussion on Terms of Reference - CIGRE NZ.B5			
17:00-18:00	Physical Networking & Appetisers (Gold Sponsor Address and Open Mic Session for workshop attendees to talk about their ongoing P&A projects)			
18:00 onwards	Dinner			

<sup>1</sup>Online Speaker

<sup>2</sup>Opportunity for Venue attendees to share their points

<sup>3</sup>Opportunity for Online attendees to share their points

\*Protection, Automation and Control aspects of B5

a. System protection;

b. Substation control and automation; and

c. Remote control systems and equipment - metering systems and equipment.

## SPEAKERS



**Safa Al-Sachit**  
University of Auckland

Safa Al-Sachit received her BSc with first class honour in Electrical Engineering from Babylon University, Iraq in 2008, and her Master's in Electrical Energy Systems from Cardiff University, UK, in 2016. She is recipient of the NPower Energy challenge award for the best Masters project. She is currently a Doctoral researcher in the Electrical, Computer and Software Engineering Department at the University of Auckland. Safa worked as a power system engineer with Babylon investment Commission, Iraq. She also worked at Al-Qasim Green University in Iraq as a lecturer.

**Bernadette Robertson**  
Transpower



Talofa lava and Greetings, my name is Bernadette Robertson and I am a Protection & Automation Engineer at Transpower working in the HVDC and Operational Engineering team based in Wellington. I am a Graduate of The University of Auckland, with a Bachelor in Electrical and Electronic Engineering, Class of 2015. My career began as a Graduate Electrical Engineer for two years and have now been with Transpower for over four years. I also have experience as an Operations Planning Engineer in the System security team, working for the System Operator at Transpower. My great passion is working in the operational engineering space, analysing faults and getting power and security stored to the transmission system as quickly and safely as possible. The great challenge is being under pressure, it's always motivating coming to work not knowing what to expect on any day. I am very proud to be one of the few female Samoan Engineers in the industry, born and raised in South Auckland, and having the opportunity to inspire other young aspiring Maori and Pasifika youth, whilst working hard to provide for my family.



**Peter Bishop**  
**Transpower**

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.

**Rannveig S J Loken**  
**Statnett SF, Norwegia**

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 - she is currently a member of WG B5.69. Rannveig is in the Advisory board of PAC world, Committee member of DPSP, and Member of the International Advisory Committee APAP



**Stephen Chiu**  
**Manager Protection and Control**  
**Powerco**

Stephen Chiu is currently the Protection and Control Manager of Powerco in New Zealand. He leads a team of engineers specialised in planning and designing protection and automation systems for electricity distribution networks.

Stephen holds a Master of Engineering degree in electrical and electronic engineering from the University of Canterbury, and an MBA from Massey

University. He has presented several papers on faults analysis and protection of high impedance faults in EEA, IEEE and IET conferences.

**Peter McKenzie**  
Horizon Networks



Peter is an experienced project manager with experience in leading and delivering projects in the Petrochemical, Pulp and Paper, and electrical distribution industries. He has been instrumental in driving substation, communications, and protection upgrade initiatives for Horizon Energy Distribution Limited over the last 12 years, plus enjoys getting deeply involved in the hands-on site commissioning activities for the projects he has managed.



**Jin Phoon**  
Senior Protection and Automation Engineer  
Transpower

Jin is a 2002 graduate from Auckland University. On completion of university studies in 2001, he joined the Transmission and Distribution group in Maunsell (now AECOM). Jin has had extensive experience in secondary electrical detailed design work including protection, relay settings, SCADA and auxiliary systems.

Jin joined Transpower in November 2007 as a Planning and Development Engineer where he provided power system analysis to support new investments and grid augmentations.

In January 2013, Jin changed to his present role within Transpower to a Senior Secondary Systems Engineer in the Asset Planning Team. Jin is currently involved with the asset management of secondary assets including protection assets, revenue metering Assets, and 125V batteries & DC systems. He also provides input into the strategy for replacement of secondary assets and the annual Transpower Asset Management Plan.



**Nirmal Nair**  
**University of Auckland**



Nirmal Nair has held several professional and research positions in India, USA and New Zealand [NZ]. He is passionate about developing life-long learning opportunities for engineers, energy policy and media engagements around zero-carbon energy transition/adaptation.

For CIGRE B5 he has been NZ Observer Member [2010-18] and currently serves as Technical Advisor for New Network Requirements [2019-] and Tutorial Advisory Group Member [2017-]. He has actively contributed towards the development of CIGRE-B5 [2019-28] strategic plan. He has been involved with 4 B5 working groups [2 completed with one as Convenor and two as Regular Member ongoing]; 2 Task Forces [1 completed and one on-going for B5 Green book]; 5 CIGRE Paris papers and 4 CIGRE regional event papers; and, 2018 Special Reporter to B5 Preferential subject.

He serves as Executive of CIGRE New Zealand [NC] National Committee since 2008, elected Secretary [2014-17] and currently Treasurer and Event Manager [2018-] helping plan and deliver both venue and on-line events for life-long learning needs of the power engineering community. He received recognition as CIGRE Distinguished Member in 2018.



**Pablo Humeres Flores**  
**Head of Digital Supervision and Automation at**  
**ELETROSUL Centrais Electricas, S.A**

Electrical Engineer graduated from the Federal University of Santa Catarina - UFSC, where he also graduated in Master of Power Systems. MBA with specialization in Electric Energy Market, at the University of Vale do Itajai - UNIVALI.

Engineer at CGT Eletrosul since 1987 in Florianópolis, Brazil acting in project, maintenance, operation and development of automation systems. Author of several papers in the area published in national and international seminars and magazines. Active participant in CIGRE working groups, events and publications. And the Head of Management, Maintenance and Commissioning of supervision and control systems and automation infrastructure of HV transmission substations, power plants and Control Centers at Eletrosul.

**Carl L. Benner**  
Texas A&M University

Carl Benner holds B.S. and M.S. degrees in Electrical Engineering from Texas A&M University in 1986 and 1988. He serves as Research Professor in the Department of Electrical and Computer Engineering at Texas A&M University. His work centres on the application of advanced technologies to the solution of challenging power system problems, with an emphasis on waveform analytics. Mr. Benner is a registered Professional Engineer in the state of Texas. He is a Fellow of IEEE and a member of the IEEE Power and Energy Society, the IEEE Industry Applications Society, and CIGRE.



**Dr. B Don Russell**  
Professor  
Texas A&M University

Dr. B Don Russell is a Regents Professor and Distinguished Professor at Texas A&M University where he is director of the Power System Automation Laboratory. His research work spans 40 years, focused on using advanced digital signal processing and waveform analytics in real-time diagnostic and protection applications to electric distribution systems. Dr. Russell is a member of the United States National Academy of Engineering and a fellow of six technical societies. He is past president of the IEEE Power & Energy Society and currently serves as vice president for administration and secretary of the US national committee of CIGRE. He is a fellow of five professional societies and a member of the National Academy of Engineering.

**Dr. Jeffrey A. Wischkaemper**  
Asst. Research Professor  
Texas A&M University

Jeff Wischkaemper received his B.S. and Ph.D. degrees from Texas A&M University in Electrical Engineering in 2003 and 2011 respectively. Dr. Wischkaemper is a Research Assistant Professor in the Power System Automation Laboratory and has worked on a variety of research projects including investigating arcing on low-voltage networks, characterizing transient response behaviour for alternative distribution sensor technologies, and electrically characterizing vegetation contacts with conductors.



# NEW ZEALAND DISTRIBUTION NETWORK PROTECTION PRACTISE

12:00-12:30

New Zealand Distribution Network  
Protection Practise 2011 Survey Refresh

Nirmal Nair  
University of Auckland

	Utilities	%
1 attempt	5	45%
2 attempt	4	36%
3 attempt	6	54%
4 attempt	2	18%
5 attempt	-	0%

While one utility respondent has indicated that they apply 1 attempt in urban overhead lines, and 3 attempts in rural overhead lines, and 4 attempts has been clarified as legacy setting, the other respondent claims that 4 and 5 attempts are illegal. 2 and 4 attempts are the practices for trips in L/O rural sites and rural downstream devices in another utility and in one utility it varies from 1 to 3.

**First Reclosing Attempt** - Most responding utilities reported a first reclosing time of less than 5 seconds (90%). The answers are as following. One respondent has chosen both "1 to 2 seconds" and "2 to 5 seconds" options.

	Utilities	%
Less than 1 second		
1 to 2 seconds		
2 to 5 seconds		
5 to 15 seconds		
> 15 Seconds		

The utility respondent that has chosen the "> 15 second and it is for discharging the capacitors.

**Second reclose attempt** - Among the users emp a time delay less than 15 seconds.

#### SECOND RECLOSING TIME

Less Than 5 seconds	4 responses	45%
5+ to 15 seconds	5 responses	55%

**Reset Time Setting** - When asked what the reset about evenly between different options:

	Utilities	%
Less than 5 seconds		
5 to 30 seconds		
30 to 60 seconds		
More than 60 seconds		

One respondent indicated that it varies with the reclos 180 second and one of the respondent utilities using reclosers.

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Places	Utilities	%
All distribution feeders	1	9%
Selected breakers, due to criticality	1	9%
All new distribution breaker installations	1	9%
All metalclad switchgear breakers	2	18%

One of the two respondents that chose the "All metalclad switchgear breakers" option explained that they lost TC due to plug/socket connection open. One utility responded that they have experienced one breaker failure. Another utility have experienced some failures. One respondent commented that options are too broad and not appropriate to select - no CBs have failed to operate on fault; occasional feeder has failed to operate due to a secondary systems issue such as wiring, trip batteries, etc.

Among respondents using distribution breaker failure schemes, 3 utilities (50%) have experienced proper trips, 2 utilities (33%) have experiences false trips, and one utility (17%) have experienced fail to trip situations. For one respondent the question was unclear and another utility respondent reported that it happened during the commissioning.

**Conductor Burndowns** - 9 out of 11 utility respondents have experienced conductor burndowns, rarely (8), or occasionally (1). One respondent reports that they have had conductor fail due to weak joint or previous damage. The utility that reported occasionally indicates that mainly connections burn in faults, aged parallel grove is worst, and then the line taps. One of those 2 utilities that haven't experienced conductor burndowns explains that they may be unaware of occurrences due to the poor reporting.

**Clearing Times** - 8 out of the 11 respondents have defined protective device clearing time criteria for distribution line protection. The specific responses were as follows:

	Utilities	%
Less than or equal to 50 cycles	7	63%
Between 50+ and 75 cycles	1	9%

Two respondents indicated that it depends on fault type and fault current, and one reports that the maximum clearing time for earth fault is usually 1.5 seconds and 1 second for Phase faults. Another utility explains that it depends on equipment capability. In one utility the earth faults are given 0.5 second delay to allow transient faults onto the overhead lines, otherwise there will be fast trip or discrimination with downstream devices.

When asked what are the tripping criteria used for distribution line protection the answers were as following. Note that respondents may have checked more than one of the criteria.

	Utilities	%
Percent of line end fault current	6	54%
Multiple minimum trip current	4	36%
Size of trip current to load ratio	5	45%


While one respondent states that it depends on the control rating the other utility reports that the general criterion is 50% of line end fault current. "Detect all faults allowing for load" is the explanation given by one respondent that has chosen options 1 and 3. The question was unclear for one respondent.

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# NEW ZEALAND DISTRIBUTION & GENERATION FORUM

14:30-15:30	NZ Distribution & Generation Utilities Burning PAC Issues
15:45-16:15	NZ Distribution & Generation Utilities Burning PAC Issues
16:15-17:00	Discussion on Term of Reference – CIGRE NZ.B5

There are two workshop sessions, one for the venue attendees and the other for the online attendees that will be moderated by Dr Nirmal Nair. Workshop attendees can share their thoughts and burning issues in their network on protection, automation and control aspects.



**Terms of reference for CIGRE Protection and Automation panel NZ. B5**

**1. Vision**

To facilitate and promote the progress of engineering and the international ex-change of information and knowledge in the field of power system protection and automation. To add value to this information and knowledge by means of synthesising state of the art practices and developing recommendations.

**2. Introduction and context**

CIGRE Study Committee B5 - Protection and Automation, or SC B5 for short, focuses on Protection, Control, Monitoring and Metering, and aims to cover the whole Power system, end to end related to this topic, from transmission, to distribution systems, including generation and HVDC systems.

We intend to develop CIGRE NZ. B5 mirror panel acts as an expertise group for protection related matters across New Zealand, collaborating with AU. B5 to maintain the strong link across our Australasian region with deep focus around the Pacific rim of countries. All protection, automation and control challenges and experiences in distribution, generation and transmission network utilities and their service providers will be considered.

Much work has been done both locally and internationally on the state and art of protection, and control devices and mechanisms as can be seen from CIGRE SC B5. In New Zealand as with other advanced economies many technologies to maintain reliability and assure best value to the community are applied. These new technologies come up with a lot of challenges and issues to be solved to ensure a reliable power system.

A key disruption taking place in the energy industry is the movement towards the low carbon economy and decentralised generation. Transpower believes that with the incoming electric transport, electricity requirements will have doubled by 2050. The role of protection and automation during this increased scale of electrification and renewable energy penetration is expected to become more important.

The value intended for the members includes being able to discuss best engineering practice, understand potential protection & secondary system issues, have access to CIGRE publications, and help take considered action.

**3. Implementation plan**

**Goal 1:** Hold the planning and setup meeting. Potential panel members will be invited to the inaugural technical workshop to confirm the terms of reference and structure of NZ.B5.

Based on the full day of this workshop presentations and discussion, we will end the workshop discussing about finalizing the Terms of Reference (ToR) for CIGRE NZ B5 community going forwards that aligns with the CIGRE B5 Charter <https://b5.cigre.org/>

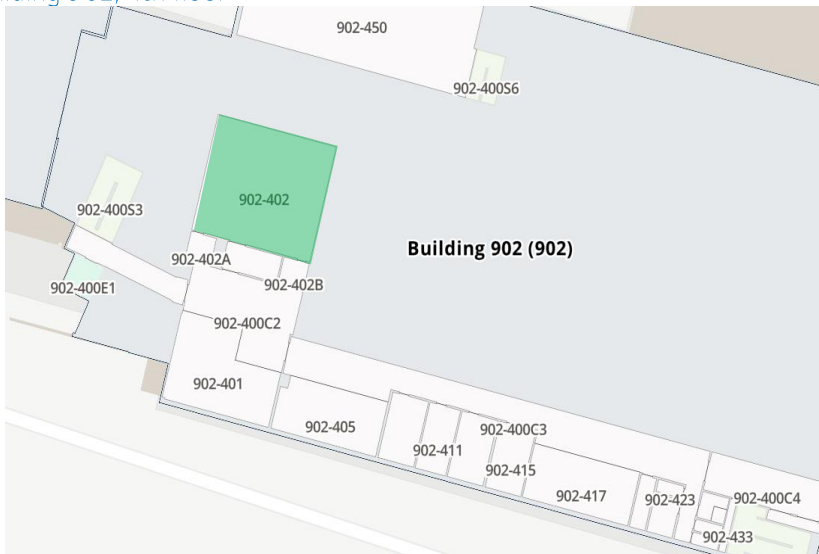
## VENUE LOCATION

Newmarket Campus, University of Auckland









314-390 Khyber Pass Road, Newmarket, Auckland 1023



Building 902, 4th floor



## LOCAL INFORMATION

Local Information		Useful Information	
	<b>Time Zone</b> UTC/GMT + 13		<b>Registration desk</b> Registration and information support are at: <u>UoA Newmarket Campus</u> Khyber Pass Rd Thursday, 19 November From 8:00 am onwards
	<b>Telephone Code</b> New Zealand is +64		
	<b>Climate</b> In <b>November</b> the average temperature ranges between min 12°C [53.6°F] and max 19.5°C [67.1°F]. Some rain may occur		<b>Workshop WiFi</b> Network: <b>UoA-Guest-WiFi</b> Username: <b>cigre_guest@uoawifi.com</b> Password: <b>AtZ7YMBI</b>
	<b>Emergency Line</b> Emergency [Ambulance, Fire and Police] Dial 111		<b>Parking</b> The UoA does not provide free car parking. Paid car parks are widely available around the Newmarket Campus. <ul style="list-style-type: none"> <li>• Secure Parking - Old Brewery Car Park</li> <li>• Khyber Pass Parking</li> <li>• Wilson Khyber Pass Parking</li> </ul>
	<b>Public Transportation</b> Auckland Transportation Planner <a href="https://at.govt.nz/">https://at.govt.nz/</a>		<b>Question &amp; Answer</b> Go to <a href="https://www.slido.com">slido.com</a> and enter the event code <b>#88655</b> to submit the questions.

# CIGRE PREVIOUS EVENTS



INTERNATIONAL COUNCIL  
ON LARGE ELECTRIC SYSTEMS  
NEW ZEALAND NATIONAL COMMITTEE INC.

**CIGRE AUCKLAND 2017**  
**11-15 September**



**Conference Includes:**

- CIGRE Women in Engineering Forum
- CIGRE Next Generation Forum
- Technical Tours
- Paper Sessions
- Trade Exhibits
- Tutorials

HV  
Equipment  
and  
Substations

Distribution  
Systems  
Dispersed  
Generation

Information  
Systems  
and  
Communications

Materials  
and  
Emerging Test  
Techniques

Protection  
Automation  
and  
Control

**Your Invitation to a Major International CIGRE Event in Auckland, New Zealand**

With Thanks to Our Sponsor 


Visit [www.cigreackland2017.org.nz](http://www.cigreackland2017.org.nz) for more information

Sponsorship and Trade Exhibit opportunities are available and welcome

## CIGRE AUCKLAND 2017


University of Auckland, New Zealand  
10<sup>th</sup> – 15<sup>th</sup> September 2017

### Secure and Efficient Delivery of Energy: Enabled by World Forum for Power Systems



### CIGRE Programme

- Study Committee B5 Colloquium and Annual Meeting
- Asia-Oceania Regional Council Technical Meeting
- Administrative Council Meeting



INTERNATIONAL COUNCIL  
ON LARGE ELECTRIC SYSTEMS  
NEW ZEALAND NATIONAL COMMITTEE INC.

Plenary & Paper Sessions

Tutorial & Poster Sessions

Administrative & Working Group Meetings

Women in Engineering & Next Generation Network Forums

Trade Exhibits, Tours & Networking





## CIGRE NEW ZEALAND 2018

Tuesday 19 June 2018

**Cigré New Zealand 2018 – One day event**  
Venue: SkyCity Convention Centre, Auckland

### “Secure and efficient delivery of energy”

CIGRE New Zealand 2018 brings together experts and key players from the power system industry across New Zealand. The key events are:

- Keynote Speech by Rob Stephen, President of CIGRE
- Discussion on planned participation by NZ delegates for BIENNIAL CIGRE 2018 PARIS SESSION.
- Workshop / tutorial on emerging technology
- Meeting of CIGRE NZ's six interest groups (encompassing all the 16 CIGRE study committees)
- Women In Engineering (WIE) and Next Generation Network (NGN) meeting

This one day event is wholly sponsored by CIGRE NZ. This event is free subject to registration. A certificate of attendance will be given to participants to use as a Continuing Professional Development (CPD) benefit.





For registration and more info



## CIGRE ANZ 2018

Presented by  
Platinum Sponsor  
of AUPEC 2018

  
www.cigre.org.nz

29 November 2018  
07:00 - 17:30  
Science Centre, 23 Symonds St  
University of Auckland

### Transitioning New Zealand to a Low-Carbon Energy Future






Meet industry and academia professionals, practitioners, colleagues

Hear from and work with:

- Industry Executives
- Industry Operatives
- Innovation Leaders
- CIGRE Practitioners

Develop your expertise from their progressive experiences in moving towards a low carbon future

In association with AUPEC 2018 (Australasian Universities Power Engineering Conference)







**CIGRE**  
2019 FORUM


**Asset Resilience  
within Electricity  
Networks**


Hear from and network with

- ♦ Industry Executives
- ♦ Industry Operatives
- ♦ Innovation Leaders
- ♦ CIGRE Practitioners

Meet industry and academia professionals, practitioners, colleagues

Develop your expertise from their progressive experiences in moving towards a more integrated asset resilient future

 SkyCity Convention Centre  
Auckland

 24 June 2019  
9:00 – 17:00

 [CIGREANZ2018\\_exemplar](mailto:CIGREANZ2018_exemplar@chairman@cigre.org.nz)  
[chairman@cigre.org.nz](mailto:chairman@cigre.org.nz)

**CIGRE NZ Webinar Series 2019, 2020**

**2019**

1. Remote indicating overhead line sensors for fault indication, Kate Murphy
2. The Electricity Distribution Sector for Tomorrow, Tahirah Jalal

**2020**

1. Cable Diagnostics to support Asset Management, Andre Cuppen
2. Enhancing your transformer asset safety and resilience, Dan Martin
3. Transmission Protection With Increased Penetration of Renewables and Distributed Generation, Sheila Matthews

**CIGRE NZ 2020 SPECIAL EDITION – PANEL & PODCAST**

COVID-19 Power Systems Resilience Response  
CIGRE NZ Conversations - April 2020



# **CIGRE NZ 2020 Conference**

**CIGRE centennial 2021**

**Shaping the power sector  
beyond 2020**

5th-6th August 2020

Auckland, New Zealand, and online

CIGRE NZ B1 Symposium

CIGRE NZ A2 Symposium

CIGRE NZ Study Committee updates

CIGRE International selected Study Committee  
updates

Presentations on Industry experiences

CIGRE NZ New Generation Network /  
Women in Engineering program

Tutorial and Panel Session  
on selective topics

Tours and  
networking



## ACTIVITIES IN AUCKLAND

### Shopping

Auckland offers a diverse, world-class shopping experience. Queen Street tops the list of shopaholics. Every shop, café and restaurant is different, but there's a strong sense of community in Karangahape Road [K' Road]. Ponsonby Road Auckland's retail heaven have plenty of stores offering exclusive New Zealand-made gifts, jewellery and crafts – always a great buy. Takapuna a north Auckland suburb, only 15 minutes from the city, has an enviable beach lifestyle and shopping to match. It's a great place to shop for Kiwi designs and New Zealand-made handicrafts. Sylvia Park is arguably the biggest and best Auckland has to offer in the way of all-in-one malls. Ticking all the boxes, Sylvia Park has a cinema, a variety of dining, cafe and fool hall options available, as well as a wide range of stores suitable for most budgets and ages, some of which are exclusive outlets found only in Sylvia Park. Dressmart [Arthur Street, Onehunga], Smith and Caughey's [Queen St, CBD], Lynn Mall and Albany Westfield are some of the other popular shopping centres.



### Dining

Whether it is fine dining or casual, Auckland has a plethora of options that can be found all over the city. Choose from a great selection of cafés and restaurants at popular waterside precincts Wynyard Quarter and Viaduct Harbour. Discover eclectic eateries and bars at the stylish Britomart precinct, enjoy a casual bite and award-winning cuisine on Federal Street or visit City Works Depot for food and craft beers with a kiwi twist. The inner suburbs also have much to offer. Don't miss the hip Ponsonby Central area, with its laneway of stylish bars and street vendor-style eateries and an organic produce market. If you're keen to pick up fresh gourmet treats, head to Parnell's French Style Farmers' Markets every Saturday and Sunday morning. For the serious foodies, there's no better way to uncover the city's superb cuisine than with a behind-the-scenes guided food tour – you'll visit the best foodie spots, meet local producers and enjoy tastings as you go. For more

information visit <http://www.newzealand.com/int/plan/business/the-auckland-tastebud-tour/>

### Adventure in the City

Leave Auckland with no regrets and having pushed all your limits. Try a Sky Jump from the iconic Sky Tower, or walk it's edge - 192 metres above ground level! And if that's not enough, head to the Auckland Harbour Bridge for New Zealand's only Bridge Climb or bungee into the Waitemata Harbour. Epic!

### Rangitoto Island

It is a dormant volcanic cone that sits just off the coast from the central city. Take a short ferry from the city to walk or do a guided tour to the summit for spectacular views, or glide across the harbour via paddle power on a sunset kayak tour.

### Waiheke Island

Waiheke Island is the ultimate island retreat, just a 35-minute ferry ride from downtown Auckland. Known as the 'island of wine' for its many wineries and vineyards, a wine tasting tour is a must. Enjoy a day trip and explore the beaches, restaurants and other activities on the island.

### Great Barrier Island

A boating paradise, Great Barrier Island shelters Auckland's harbour from the relentless swells of the Pacific Ocean. Covered in lush native forest, hike the Aotea Track, visit the rare wildlife of Glenfern Sanctuary or relax on Medlands Beach. Either Go Great Barrier Island Tours or Sundancer Tours offer great ways to see the island.

### West Coast Beaches and Waterfalls

Less than an hour from Auckland City lie the wild west coast beaches, where the Tasman Sea meets long, vast stretches of black sand and rainforests featuring waterfalls just beyond. Visit Muriwai Beach to see the impressive clifftops and gannet colonies or head to Piha, a popular surf beach, and Karekare, made famous as the backdrop for the film *The Piano*.

## NOTES

[illegible]

## NOTES

[illegible]

## NOTES

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