



UNIVERSITY
OF WOLLONGONG
AUSTRALIA

Centre for
Power Engineering
Excellence



Membership
Prospectus
2018





What is the Centre for Power Engineering Excellence?

The electricity supply industry is experiencing a once in a generation paradigm shift. As electricity prices continue to rise and renewable and distributed energy systems become more affordable, electricity supply is transitioning from the traditional centralised supply model to a model containing many more distributed sources. Further, as energy storage prices continue to fall, some customers are considering leaving the grid altogether or establishing micro-grids to better utilise available renewable energy resources. With these changes operation and management of the power system is becoming more challenging and new approaches are required together with regulatory changes.

The Centre for Power Engineering Excellence (CPEE) has been developed with a view to assisting the electricity supply industry during the transition from the traditional electricity supply model to a model that will consist of much more renewable and distributed energy supply and containing customers who are much more proactive with respect to management of their energy needs and much more discerning with respect to their expectations of electricity suppliers.

The objective of the CPEE is to foster and enhance electrical power engineering activities at the University of Wollongong for the benefit of the entire industry. The CPEE builds on over two decades of highly successful industry engagement which has resulted in UOW being recognised as a world leader in the power quality field. The CPEE will expand on this expertise and will offer partners access to world class opportunities, expertise and test and measurement facilities in the fields of electricity network power quality and reliability, power systems modelling and analysis, renewable energy integration studies and energy storage applications for power systems and professional development programs.

The CPEE also has the capability to leverage additional UOW expertise in fields including energy storage (via Institute for Superconducting & Electronic Materials - ISEM), sustainability (via the Sustainable Buildings Research Centre - SBRC) and infrastructure economics (via the Simulation, Modelling and Research Training (SMART) Infrastructure Facility). The CPEE has specific objectives in the areas of research, education, training and industry collaboration.



A message from the Director of the Centre for Power Engineering Excellence



It is with great pleasure that I invite you to become part of the strong, vibrant and well established electrical power engineering group at the University of Wollongong (UOW).

For close to two decades we have worked very closely with the electrical power industry in Australia to deliver outcomes with tangible benefits to the wider community. These include research and development projects, consulting activities and continuing professional development alongside undergraduate and postgraduate education. Through these activities, we have established a strong track record and an outstanding national and international reputation.

The modern electricity grid is now integrated with many novel types of devices, loads and generating sources. There are challenges ahead to ensure that the electricity grid continues to operate in a reliable and efficient manner while ensuring the lowest cost to the entire community. The work being undertaken at UOW in relation to the integration of renewable sources, quality of supply, network protection, and the techno-economic aspects of future electricity networks is helping to make this so. We are excited about these activities and our contribution to the industry and the community as a whole.

Our aim is to sustain our current strengths and activities while, at the same time, expand our collaboration with a broader cross-section of industry partners. With this in mind, we are now embarking on the establishment of the Centre for Power Engineering Excellence (CPEE), which aims to enhance the power engineering research and teaching activities at UOW by attracting industry partners from across the country.

I hope that you will take the time to read our prospectus and will consider partnering with us in this new centre.

Professor Sarath Perera

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The Centre for Power Engineering Excellence (CPEE) at the University of Wollongong will deliver excellence in power engineering research, education and industry professional development, along with value added services to industry supported through long term sustainable partnerships.”

Objectives



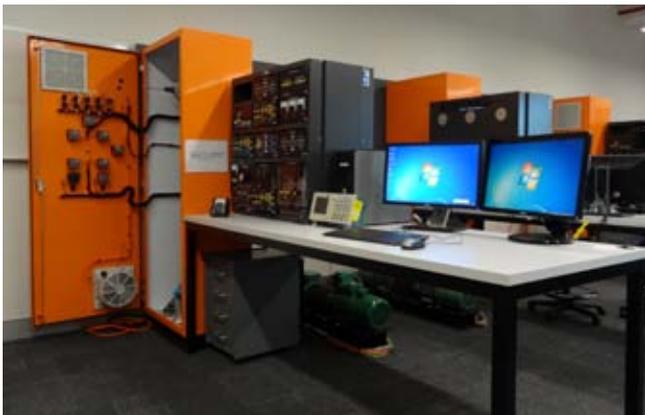
Research

- To engage in world-leading, highly industry-relevant collaborative research and innovation.
- To be recognised nationally and internationally as a leading Australian institution for electrical power engineering research.



Education

- To enhance the quality of power engineering education at UOW, and to play a key role in the fostering of power engineering education on a state and national level.
- To provide opportunities in postgraduate education allowing students to acquire the specialised skills required by industry and to develop the next generation of electrical power engineering professionals.



Training

- To provide ongoing training and continuous professional development courses to industry and the community in fields ranging from general awareness to specialised technical topics.
- To produce technical documentation useful to the industry and the broader community.



Industry collaboration

- To work closely with industry to ensure that the research and development work undertaken remains relevant and addresses the real world problems faced by the industry and to produce innovations that make Australian industries world leaders in electrical power engineering practice.
- To provide informed and credible input to the development of national and international standards and guidelines, via Standards Australia, the International Electrotechnical Commission (IEC) and Council for Large Electric Systems (CIGRÉ).

Electrical Power Engineering at UOW

UOW was initially founded on strengths in engineering disciplines which continue to this day. These strengths are reflected in the results of the Excellence in Research for Australia 2015 Initiative (ERA) which awarded UOW a 5 star rating (well above world standard) for electrical and electronic engineering.

The following are UOW research centres that are active in research related to electrical power engineering:

- The Australian Power Quality and Reliability Centre (APQRC). Founded in 1996, the APQRC is one of the premier electrical power engineering centres in the country. It has a distinguished record of collaboration with industry, producing high quality engineering graduates, delivering applied research and contributing to industry best practices.
- The Sustainable Buildings Research Centre (SBRC) which is a multi-disciplinary facility that brings together a wide range of research engineers active in renewable. SBRC staff members are active in renewable energy, distributed generation, energy efficiency and micro-grid research.
- The Simulation, Modelling and Analysis for Research and Teaching (SMART) Infrastructure Facility. SMART draws on UOW's proven research track record and academic strength in the areas of engineering, commerce, informatics, law, and science to holistically assess infrastructure solutions.
- The Institute for Superconducting and Electronic Materials (ISEM) is a world class research group with a record of research breakthroughs in new applications for innovative materials in the fields of energy generation and transmission, energy storage and energy conversion. ISEM also has internationally recognised specialist expertise in battery storage and management.

Education

UNDERGRADUATE EDUCATION

The UOW Bachelor of Engineering (Electrical) course (with specialist final year subjects available in power engineering) is a comprehensive engineering program that provides graduates with the core skills required for successful careers in professional practice. Electrical Engineering graduates from UOW are highly sought after by industry and hold many leadership roles.

POSTGRADUATE EDUCATION

A large number of postgraduate research students are engaged in electrical power engineering research at UOW. Their work is essential to the operation of the evolving electrical power system and hence brings benefits to the wider community.

The key research being conducted by UOW students includes:

- Power quality
- Power system reliability
- Renewable energy
- Distributed generation
- Electric vehicles
- Fault current limiters
- Energy storage
- Energy efficiency

In 2011 UOW launched a modular Master and a Graduate Certificate coursework program in electrical power engineering directly targeted towards addressing the industry needs for specialised knowledge. To date, this course has been extremely well supported by industry and attended by industry professionals.

Training

In addition to formal degree offerings, UOW has a long history in providing practical training to industry personnel ranging from engineers to managers to technicians across a range of subject areas. In addition to provision of training courses, the APQRC periodically publishes a number of documents which explain a range of electrical engineering topics in simple terms. These 'technical notes' are freely available to all.

Research

Power engineering research at UOW is internationally recognised. Researchers involved with the CPEE have published over 800 refereed journal papers. Significant power engineering research activities at UOW include:

- Australian Research Council (ARC) industry linkage and discovery research projects with funding in excess of \$5 million.
- A \$10.6 million ARENA grant for development of a smart sodium storage system for renewable energy storage.
- Successful completion of six Australian Strategic Technology Program (ASTP) projects.
- Power Quality Compliance Audit – An ongoing project which analyses, reports and benchmarks power quality data supplied by electricity distribution utilities across Australia.
- Standards Australia Handbook HB 264-2003 (now ENA Doc 33-2014 and Doc 34-2014), a practical guide to the Australian standards for allocation of harmonics and flicker written for Standards Australia.
- Membership of and significant contributions to a number of CIGRÉ working groups.
- Host of the 2008 International Conference on Harmonics and Quality of Power (ICHQP 2008).

Collaboration with Industry & Peak Bodies

UOW staff have a long history of industry collaboration, with many being active members of industry peak bodies and committees. These include:

- Standards Australia
- CIGRÉ (Council for Large Electric Systems)
- ENA (Energy Networks Association)
- IEC (International Electrotechnical Commission)
- EESA (Electric Energy Society of Australia)
- Australian PV Institute

UOW has provided consultancy services to some of Australia's largest power transmission and distribution companies and manufacturers to solve practical problems. Over the past five years 42 consulting projects have been undertaken for 22 individual industry clients.

Laboratory Facilities

UOW operates a number of world class teaching and research laboratories.

UNDERGRADUATE TEACHING LABORATORIES

UOW undergraduate teaching laboratories are equipped with modern LabVolt teaching equipment providing world-class educational experiences in the areas of power systems and renewable energy. This equipment is complemented by custom designed industrial grade equipment for motor and drive experiments.

POWER QUALITY & RENEWABLE ENERGY RESEARCH LABORATORY

The Power Quality & Renewable Energy Research Laboratory contains a range of sophisticated equipment useful for a broad range of research and testing. Hardware is complemented by advanced software packages allowing simulation and analysis.

THE SUSTAINABLE BUILDINGS RESEARCH CENTRE (SBRC) POWER QUALITY TEST LAB & MICROGRID TEST FACILITY

The SBRC power quality test laboratory is a fully equipped test and measurement laboratory for assessment of equipment power quality and energy efficiency performance. The laboratory contains extensive test and measurement equipment combined with flexible supply arrangements.

The SBRC microgrid test facility is designed for performance assessment of loads and generators up to a nominal rating of 30 kW and is housed in a 900 square metre industrial highbay. The microgrid is connected to the SBRC building distribution system and includes functionality for connection/isolation of building loads to provide real-world testing scenarios.

ISEM LABORATORIES

The Institute for Superconducting and Electronic Materials (ISEM) is housed within UOW's \$80m state-of-the-art Australian Institute for Innovative Materials (AIIM) on the Innovation Campus. The ISEM has almost 40 specialist laboratories, and is on the forefront of energy materials and energy storage research and development.

THE SIMULATION, MODELLING & ANALYSIS FOR RESEARCH AND TEACHING (SMART) INFRASTRUCTURE FACILITY LABORATORIES

The SMART Infrastructure Facility consists of 30 state-of-the-art research laboratories. Many of SMART's laboratories and research facilities are also open to outside researchers from industry, academia and other national laboratories.

CPEE Organisation and Governance Structure

CPEE partnerships are offered at Platinum, Gold, Silver and Bronze levels. The higher the level of membership, the greater the benefits including greater access to additional UOW resources and technical expertise.

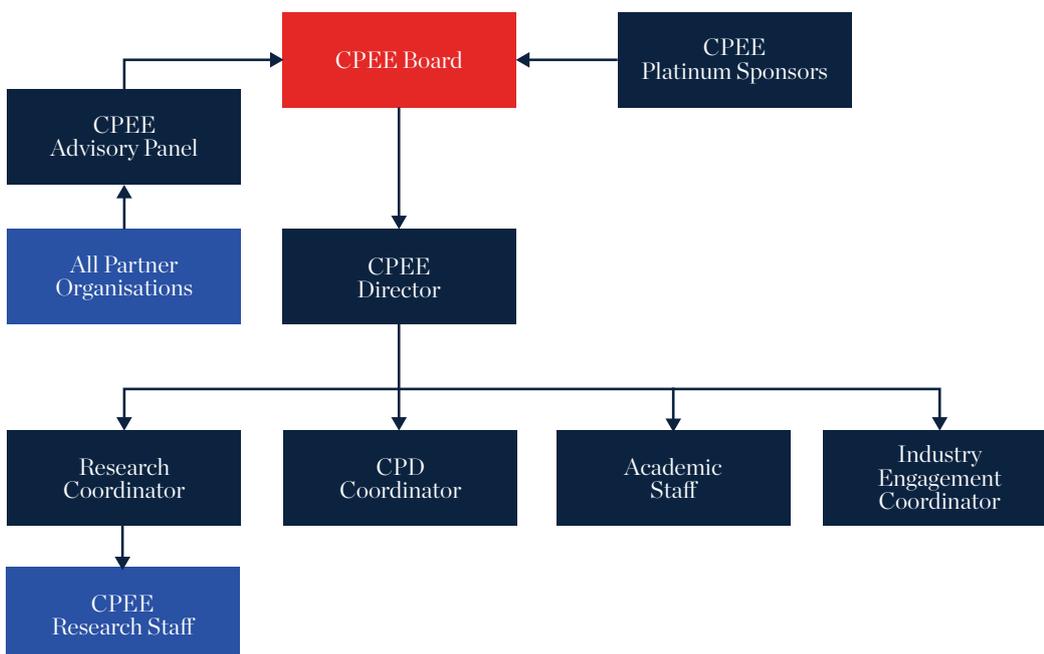
In addition to supporting the long term future of excellence in power engineering education and research in Australia, CPEE partners can expect to receive the following benefits:

- The ability to nominate undergraduate thesis and/or postgraduate research projects to enhance collaborative research.
- Acknowledgement on all CPEE websites and documentation
- Priority expert consulting and/or laboratory testing time.
- The ability to provide company-named scholarships to facilitate the recognition of company name, vision and values.
- Exposure to students through guest lectures and seminars and other CPEE activities.
- Complimentary attendance at all CPEE-managed continuing education courses (at least 2 per year).

- CPEE partner-only technical expertise and developed literature.
- Direct promotion of employment opportunities to potential undergraduate and postgraduate students.

The CPEE will be overseen by a small advisory board consisting of directors from partner organisations as well as a number of independent directors. Each platinum partner will have the opportunity to nominate one director to the board. A CPEE members panel will be formed to provide guidance to the board and each partner organisation regardless of partnership level will have an opportunity to nominate one representative to the panel. The director of the CPEE will have the overall responsibility for its day to day operation. The CPEE board will meet on advisory board will meet on a half yearly basis while the CPEE members panel will meet quarterly. A CPEE report including financial statements will be made available to all CPEE members on an annual basis.

CPEE Governance Structure



World-class results



We've worked hard to become one of the world's most respected young universities.

Number 1

Rated university in NSW.

Most star ratings in the Good Universities Guide 2017 and highest percentage across the key 12 categories in the Quality Indicators for Learning and Teaching (QILT) 2016.

Top 2%

Overall rating among the world's universities.

218th QS World University Rankings 2016/2017.
Top 0.5% in Engineering.

5 Stars

Ranking for Electrical and Electronics Engineering – well above world standard.

Excellence in Research for Australia 2015 Initiative (ERA).

Top 1%

Rating graduates from a global employer survey.

QS World University Rankings Graduate Employers Survey 2016/2017.

Top 20

12th best modern university in the world.

QS Top 50 Under 50 Rankings 2016.

5 Stars

Overall quality, student retention, learning resources, skills development, student support and teaching quality.

The Good Universities Guide 2017.

The University of Wollongong's Faculty of Engineering and Information Sciences at the University of Wollongong has many leading engineering, mathematics, physics and ICT research centres, based on our long standing collaboration with local and multinational industries and research institutions in Australia and overseas. We have over 600 students enrolled in PhDs and over 300 academic staff supported by more than 60 technical staff enabling us to be one of the most research intensive Faculties of its type in Australia. Our faculty members are driving relevant and cutting-edge research in a wide range of areas focused on providing innovative solutions to global issues.

A successful UOW undergraduate profile



FELICITY GALLUZZO

MANAGER URBAN PROGRAM, CITIPOWER & POWERCOR - WINNER OF THE ENGINEERS AUSTRALIA GRADUATE ELECTRICAL POWER ENGINEER OF THE YEAR AWARD, 2008

I completed my Bachelor of Electrical Engineering degree on a part-time basis as a Cadet Electrical Engineer at BlueScope Steel. Keen to pursue a future in Power Engineering I moved to Melbourne after graduating in 2003 to take up a position with CitiPower & Powercor as a Protection & Control Engineer. In October 2008 I joined Beca. I developed from the Secondary Team Leader to the Power Section Manager to the Senior Associate leading our power project delivery in the Australian market. In September 2016 I returned to CitiPower & Powercor as Manager Urban Program and am a member of the Senior Management Group. My portfolio includes project delivery leadership of customer projects in the Melbourne area and all overhead, underground and distribution substation design functions for the urban network. The business has undergone significant transformation and significant effort is being invested in improving our customer experience and building a network for the future. It is a challenging but exciting time to be part of the electricity distribution industry. I have often run into my former lecturers at industry events and conferences, and have always been impressed with how closely engaged the UOW Power Engineering staff is with industry. My undergraduate experience provided a robust foundation upon which I have developed my career, and I am proud to be associated with a university so committed to preparing its graduates for the vast world which awaits them.

A successful UOW postgraduate profile



DR TIM BROWNE

PRINCIPAL POWER SYSTEMS ENGINEER, PSC AUSTRALIA

The University of Wollongong offered a formidable reputation for power engineering expertise, and did not disappoint. Being able to learn from and work with noted experts in the field, who are particularly focussed on real-world problems experienced in industry, was an attractive selling point for UOW. Material from my postgraduate thesis has been, and continues to be, directly relevant to a number of consulting engagements. Power industry clients, both within Australia and internationally, have experienced and recognised the value in the broad and deep knowledge of power quality built up and passed on by UOW's experts.

Centre Funding Utilisation

The funding associated with the CPEE will be used to promote power engineering activities and excellence at UOW. Examples of the mainstream areas in which the funding will be utilised will include:

- Staff Recruitment and Retention – Funding will contribute to the recruitment and retention of leading researchers and educators in the field of electrical power engineering. These researchers and educators will be dedicated to undertaking applied industry based research as well as training the next generation of the electrical power industry workforce.
- Postgraduate Scholarships – Funding will be used to expand a scholarship program to attract high quality electrical power engineering postgraduate students who will work on industry-based projects and who will be committed to obtaining solutions to practical industry problems.
- Undergraduate Scholarships – Scholarships will be offered on a yearly basis to attract high quality students who will form the future industry workforce and leaders.
- Research Infrastructure Support – Funding will be utilised to procure and maintain laboratory equipment and facilities required to conduct applied research and undertake consulting work of relevance to the industry.
- Support national and international working groups and standards committees in the development of fair and practical regulations and standards governing Industry.

Benefits Available to Centre Partners

In addition to supporting the long term future of excellence in power engineering education and research in Australia, Centre partners can expect to receive the following benefits:

- The ability to nominate undergraduate thesis and/or postgraduate research projects to enhance collaborative research.
- Acknowledgement on all Centre websites and documentation
- Priority expert consulting and/or laboratory testing time.
- The ability to provide company-named scholarships to facilitate the recognition of company name, vision and values.
- Exposure to students through guest lectures and seminars and other Centre activities.
- Complimentary attendance at all Centre-managed continuing education courses (typically 2 per year).
- Access to Centre partner-only technical expertise and developed literature.
- Direct promotion of employment opportunities to potential undergraduate and postgraduate students.

■ ■ ■ Centre Partnership Levels

■ Centre partnerships are offered at Platinum, Gold and Silver levels. The higher the level of membership, the greater the benefits including greater access to additional UOW resources and technical expertise.

Key Staff Profiles



EMERITUS PROFESSOR VIC GOSBELL

Vic obtained his Ph.D. in 1971 from the University of Sydney for work on the asynchronous operation of turbogenerators. In 1972 he commenced lecturing at the University of Sydney where his research interests included model power systems, power system stability, HVDC transmission, power electronics and variable speed motor drives. In 1990 he moved to the University of Wollongong where he became foundation Professor of Power Engineering. His current research interest is power quality with an emphasis on harmonics, PQ survey measurements, and standards.

He is a member of the Standards Australia 'Power Quality' Committee, a Fellow of the Institution of Engineers, Australia and past Chairperson of the Australasian Committee for Power Engineering. He was the recipient of the M.A. Sargent Medal in 2008.



PROFESSOR SARATH PERERA

Sarath graduated from the University of Moratuwa, Sri Lanka with a BSc (Eng) specialising in Electrical Power. He obtained his MEngSc from the University of New South Wales and PhD from the University of Wollongong. He has been on the academic staff at the University of Wollongong since 1988. He has been active in electromagnetic modelling, machine design and analysis, in particular permanent magnet machines.

His current research interests are in the general area of power quality and in particular voltage fluctuations, flicker and voltage unbalance. He is a member of the Standards Australia Committee on Power Quality and is/has been closely involved with CIGRÉ C4 (System Technical Performance) working groups at international level. He is currently the Technical Director of the Australian Power Quality and Reliability Centre.



PROFESSOR CHRIS COOK

Chris graduated from The University of Adelaide with a BSc in 1971 and a BE in 1972. He received his PhD from The University of New South Wales in 1976. He then went to the U.K. to work for Marconi Avionics. After three years he returned to Australia to work for GEC as Technical Manager of their automation and control division.

In 1983 he joined UOW. In 1989 he became Professor of Electrical Engineering with research interests in industrial automation and power engineering. In 1990 he was involved in establishing, with Pacific Power, the Energy Efficient Research Centre Ltd., a nonprofit company which designs and installs variable speed drive and other power engineering systems. In 1996 he continued to develop joint Industry-University initiatives by assisting with the setting up and running of the 'Power Quality Centre' at UOW.

In 2002 he was appointed Dean of Engineering, and in 2013 he was appointed as Executive Dean, Faculty of Engineering & Information Sciences.



PROFESSOR DANNY SUTANTO

Danny received his B.Eng. and Ph.D. from the University of Western Australia in 1978 and 1981 respectively. Following his graduation he joined GEC Projects, Australia as a Power System Analyst. In 1982 he joined the School of Electrical Engineering at UNSW. In 1996 he joined the Hong Kong Polytechnic University as a Professor in Electrical Engineering.

In 2006, he joined UOW as Professor of Power Engineering. His main areas of research are power system analysis, power system economics, voltage stability, harmonics, power electronics and computer aided education. He was awarded the N. Svennson's Award for Teaching Excellence in the Faculty of Engineering in 1994. In 2000, he was awarded the HK Polytechnic University President's Award for Outstanding Performance in Teaching. He is also a member of the International Editorial Advisory panel of the International Journal 'Electric Power Systems Research'.



PROFESSOR PAUL COOPER

Paul is the Director of the UOW Sustainable Buildings Research Centre (SBRC). Paul has been involved in research on a wide variety of topics in sustainable buildings, energy systems, energy efficiency and fluid mechanics over the past thirty years. He holds a bachelor in Electrical Engineering, a masters in Science and Technology Studies and a PhD in Heat Transfer, all from Imperial College London. He joined UOW as a lecturer in the Department of Mechanical Engineering at UOW in 1988 and has collaborated with colleagues in the Electrical Power group since that time.

Paul was the Head of the School of Mechanical, Materials and Mechatronic Engineering at the University of Wollongong prior to taking up his present appointment. Paul was also the Faculty Advisor and the lead academic on the Team UOW Solar Decathlon China 2013 campaign. This project culminated in Team UOW winning the competition with the highest number of points scored by any team in the history of all competitions around the world.



PROFESSOR PASCAL PEREZ

Pascal received his PhD in Environmental Studies from Montpellier University, France in 1994. Pascal is a specialist of integrative infrastructure modelling, using various computer simulation technologies to explore complex interactions between social and technological components of infrastructure systems.

He has a 30-year experience in complex system modelling, first in France, then at the Australian National University and CSIRO. Pascal joined UOW in 2011. He currently is the Research Director of the SMART Infrastructure Facility. He is a member of the Technical Committee of the Australian Urban Research Infrastructure Network (AURIN). He is also a member of the Modelling and Decision Support Division of Simulation Australia and of the Modelling and Simulation Society of Australia and New Zealand (MSSANZ). Professor Perez has published 100 refereed papers and book chapters. In 2006, he co-edited with his colleague David Batten the book 'Complex Science for a Complex World' (ANU E Press).



Honorary Professorial Fellows



MR ALEX BAITCH

Alex holds BE, MEngSc and MBA degrees from Sydney University, University of NSW and Deakin University respectively. He is an honorary Fellow of Engineers Australia and a fellow of Australian Institute of Energy, a Senior Member of IEEE and an Associate Member of the Australian

Institute of Arbitrators and Mediators. In 2014 Alex took up the role of National President of Engineers Australia. Alex has over 40 years industry experience in the electricity industry including electricity utilities, manufacturing, importing and consulting. Alex is principal of BES (Aust) Pty Ltd specialising in electrical distribution and utilisation. Alex is one of Australia's leading authorities on electric safety.



DR ROBERT BARR AM

Robert commenced his career in the electricity supply industry in 1973 as a cadet engineer with Prospect Electricity. He was appointed as a professional engineer with Prospect Electricity in 1976 and gained experience in electricity distribution including load forecasting and system planning. Robert joined

Illawarra Electricity as System Control Engineer in 1982 and was later appointed Area Manager Nowra. Robert has managed and worked for his company 'Electric Power Consulting Pty Ltd' since 1990 and has dealt with a wide range of power quality and general electricity industry problems. He was recognised by the Electrical College of Engineers Australia as the 2012 Professional Electrical Engineer of the Year and was announced as being appointed as a Member of the Order of Australia (AM) in the Queen's Birthday 2013 Honours List for significant service to engineering, particularly electrical energy supply and distribution.



DR PEETER MUTTIK

Peeter holds Ph.D, B.E. (Hons) and B.Sc degrees from the University of Adelaide. Peter has many years of experience in a wide variety of electric power projects, power systems analysis and design including substations and high power electronics.



DR DAVID SWEETING

David holds Ph.D, B.Sc and B.E. (Hons) degrees from Sydney University. He is an Honorary Fellow of Engineers Australia, a Senior Member of IEEE, and a member of the Electric Energy Society of Australia, Consult Australia and CIGRÉ. After finishing his PhD David worked for Brown Boveri in

Switzerland for 4 years on circuit breaker development, testing and switching transients. On returning to Australia he joined the Sydney County Council, now Ausgrid, where he held positions in substations, overhead transmissions, the Testing Branch and ran the Lane Cove High Power Testing Station. In 1980 he joined the consulting firm Bassett and Partners where he became an Associate Director. In 1989 he began Sweeting Consulting Pty Ltd specialising in High Voltage Electrical Engineering. David has over 40 years experience in HV electrical distribution, power quality reviews and being an expert witness. He has been and still is involved on many National and International Standards Committees covering short circuit currents, standard voltages, power quality and arcing hazards.



MR TY CHRISTOPHER

Ty Christopher started in the Electricity Supply Industry in New South Wales in 1986 as a cadet engineer. Over the last 29 years, his career within the industry has included responsibility for substation and mains design, project management, system operations, network planning, asset strategy and most recently

program delivery. In his current role Ty is accountable to the Chief Operating Officer for overall program management and delivery of network capital and maintenance programs. This includes the management of a Portfolio Management Office to provide end to end management of projects, including those undertaken by contract resources and delivery of efficient and effective network asset management services. The portfolio delivered is in the order of \$500 million per annum. Ty has led his current team through a period of transformational change required to successfully deliver the largest network investment program ever undertaken by Endeavour Energy or its predecessor organisations, with substantial results delivered by contract service providers.

LEARN MORE

For more information about the Centre for
Power Engineering Excellence (CPEE):
Professor Sarath Perera
School of Electrical, Computer and
Telecommunications Engineering
University of Wollongong
Call +61 2 4221 3405
Email sarath@uow.edu.au
powerengcentre.com.au

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