CAPABILITIES STATEMENT

The Smart Energy Unit provides extensive expertise to the electricity supply industries to assess and roll-out smart grid programmes in all the major power markets in Australia. The Unit also develops strategies for grid design and operation, and addresses interconnection and intra-facing frameworks, which are networks within each individual substation of the grid such as generation, transmission and distribution.
SMART ENERGY UNIT

Bringing the aging electric grids into the 21st century requires incorporating power engineering with the latest digital communications system and information technology areas including sensors, electronics, controls and wireless devices. The era of smart grids is set to deliver real improvements.

A range of technological innovations are expected to make the grid more efficient, facilitate automation to reduce cost and improve quality, enable the integrated and optimal use of distributed and renewable generation, and promote interaction between supply and demand technologies and between the consumer and the utility that will provide benefits for both. Devices such as “smart meters” will be needed that can communicate back and forth with the central power station. Making the electricity grid “smart” has become a priority throughout the world and benefits are many.

The Smart Energy Research Unit aims at helping the modern power engineers work with end-user applications and devices such as “smart meters”.

RESEARCH FOCUS

- Power and Energy System
- Control Theory
- Power Engineering Education

EXPERTISE

Our expertise covers a broad-range of fields such as:

- Renewable Energy and Fuel cells
- Distributed Generation
- Trigeneration/Cogeneration
- Power System Analysis, Control, Quality, Protection and Communication
- Intelligent System and Control
- Energy storage
- Fault detection techniques
- Control Applications
- Operational Research
- Vocational, work-based, Problem Based Learning

TRACK RECORD AND INTERNATIONAL REPUTATION

Victoria University has a proud track record in the energy research area. Approximately 35 doctoral and master’s research students have graduated as well as a large number of scholarly papers published and a multitude of commissioned research and consultancies have been undertaken for a variety of industry and government partners.

Victoria University has built a strong reputation internationally with respect to Energy research as is evidenced by the unit member’s participation in a number of leading commercial and academic organisations.

STATE-OF-THE ART EXPERIMENTAL AND TESTING FACILITIES

The research group’s activities are supported by a number of specialist laboratories across the University. These include:

- Renewable Energy Research Laboratory
  This facility houses a range of experimental facilities and capabilities for simulation and testing such as energy consumption, energy usage, optimal energy utilisation, future smart grid application using hybrid models. The facility has 4 kW of wind and solar micro-generation system, 1.2 kW of PEM fuel cell, hydrogen generators, control interfaces and associated software.

- Power System Laboratory
  Equipped with state-of-the-art equipment and capabilities for electrical power system research including: power system protection, transmission line parameters, electrical machine modelling, power electronic devices, power quality measurement. The facility has universal electrical machines; 300 km artificial transmission lines, electromechanical, numerical and digital relays and access to simulation tools like: ATP-EMTP; SKM Power Tools for Windows; PSS/E; ETAP; EDSA; PSCAD; ERACS; DiGSIILENT Power Factory; MATLAB — Power Toolbox; EMPOD; Simploter.

- VU High Voltage Laboratory at Scienceworks
  Houses modern equipment such as 500 and 400 kV impulse generators, Tesla coil capable of generating 2 million volts producing 4 metre lightning bolts, insulators, overhead lines and associated high voltage gears.

- IEC61850 Training Test Unit
  A portable IEC61850 testing unit has been developed and manufactured at VU with the sole purpose to serve as a platform for the development, research and training of future power engineers in the recent IEC61850 protocols. The unit consists of: SEL-311L Line Current Differential Protection and Automation Relay; SEL-487E Transformer Differential Relay; REF1615 Feeder Protection and Control Relay; P145 Feeder Management Relay; SEL2407 Satellite-Synchronised Clock; SEL2725 Unmanaged Ethernet Switch; Ruggedcom RS62200 Nine-Port Managed Gigabit Backbone Switch; OMICRON CMU356 test set which is used to inject current and voltage signals, along with capturing GOOSE messages.

INDUSTRY ENGAGEMENT

The Smart Energy Research Unit has long standing relationship with the Australian electricity supply industries and this Unit at VU aims to engage with industry organizations by undertaking:

- Collaborative research projects (supported both by industry and government grants).
- These normally involve the recruitment of higher degree research students and hosting international academic staff visiting VU.
- Commissioned research projects through which industry clients gain access to technical expertise and state-of-the-art experimental research facilities.
- Consultancy services.
- Testing services across the entire capabilities range.
- Design and delivery of short courses and training across our specialist areas.

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