

# Capabilities & Experience

**EPECentre is a world-class clean technology research incubator that fosters collaboration and innovation.**

We are a leading independent electric power and clean technologies research group, delivering specialist world-class research and innovation. Through our collaborations over the past two decades, we have a strong understanding of the NZ Electricity landscape and NZ industry in general, including the manufacturing and primary sectors.

# Capabilities

The following is an inexhaustive summary of the capabilities of the EPECentre researchers.

## Power System Engineering

Steady state, harmonic, dynamic and transient AC and DC power system modelling, design and analysis

High voltage and high current design

High voltage and high power testing

EMC, EMI, RFI testing and solution design

Protection design, co-ordination, implementation

Insulation co-ordination

System integration studies

## Modelling & Analysis

Software tools - MATLAB, SINICAL, COMSOL, Ansys, Open DSS, PSCAD/EMTDC, Python, R, SPICE, Altium, C, C++

Algorithm development

Statistical analysis

Thermal modelling

Fluid dynamics modelling

Mixed integer linear programming

Energy modelling and system optimisation

Finite Element and Finite Volume Modelling

Near-field optical analysis and electromagnetic simulations

Optimisation - linear, quadratic etc.

Electronics, electro-magnetic, power electronic and power system modelling and analysis

Hierarchical control design and implementation

System/process modelling

“Big data” and data processing

## Electro-magnetics

Motor, drive and actuator - design, construction and testing

High frequency power transformer, current transformer and inductor design, construction and testing (ferrite, amorphous metal and powder-iron cored)

## Electronics & Power Electronics

Signal processing, including precision analogue and digital circuit design

Electron beam lithography

Developing nano-tech fabrication processes and process integration

PCB design

Switching circuit topology design, analysis, synthesis and implementation

IOT systems

## Others

Scoping and requirement capture

Technical supervision

Techno-commercial analysis; financial, operational performance (losses, RAM)

Component and system testing

Chemical analysis and testing

Project planning and management

Risk identification, mitigation and management

Communication and art design

# Experience

Find below an extensive experience list for EPECentre researchers.

Project	Client(s), Funder(s) and/or Supplier(s)	Related Programme
<b>Power System Engineering</b>		
Network Waitaki - Probabilistic EV Hosting Study	Network Waitaki	
EV charger testing	EECA	
International HVDC Consulting services and special study project	Industry consulting	
Architecture of the Future Low Carbon, Resilient, Electrical Power System (FAN)	MBIE SSIF - AETP	<a href="#">FAN</a>
EV hosting study	Orion	
Investigation of low voltage distribution pedestals	Unison	
Repurposing EV batteries for stationary energy applications in NZ - Techno-commercial evaluation	DARC Technology	
High power testing (as a test engineer)	DNV-GL (formerly KEMA), STIMBR	<a href="#">Smart Electrode</a>
High voltage testing	STIMBR	<a href="#">Smart Electrode</a>
HVDC and FACTS system design, power system integration studies, protection and control design	Utilities world wide, GE	
<b>Renewable Energy /Energy Transition</b>		
NZ-German Platform for Green Hydrogen Integration (HINT)	Catalyst Funding	
Evaluation the opportunity to engineering transition to a low-carbon freight transport system in NZ	Swire Shipping	
Optimisation of a multiple tilt angle Solar system	DARC Technology	
Solar calculator	EECA	<a href="#">GREEN Grid</a>
DGHost	Electricity Utilities and MBIE	<a href="#">GREEN Grid</a>

<b>Project</b>	<b>Client(s), Funder(s) and/or Supplier(s)</b>	<b>Related Programme</b>
Distributed generation (PV) connection guidelines	EEA and MBIE	<a href="#">GREEN Grid</a>
Modelling NZ PV uptake	MBIE	<a href="#">GREEN Grid</a>
Optimising power system reserve for contingencies while considering response times	MBIE	<a href="#">GREEN Grid</a>
Fault location in distribution networks	Tait Electronics	
Modelling controlled hot water systems	EECA	
High resolution spatial and temporal solar, wind and wave power data series for New Zealand	MBIE	<a href="#">GREEN Grid</a>
Design and execution of the solution to integrate off-shore windpark into an onshore grid	Tennet, GE	
Design and control of half-bridge DC connected dynamic braking system	Solution development, GE	
<b>Instrumentation &amp; Sensors</b>		
Design and implementation of electric and magnetic field measurement array to measure spatial current distribution in and potential distribution across isotropic or anisotropic media with electrical excitation	STIMBR	<a href="#">Smart Electrode</a>
Design of wide range of signal conditioners and converters for thermo-couples and other sensors	Industrial Interface (UK)	
Novel cascaded CT-based current sensors, with bilateral depletion FET switches for measuring current distribution in and voltage distribution across novel (patented) segmented electrodes	STIMBR	<a href="#">Smart Electrode</a>
<b>Industrial Systems</b>		
Cabinet testing	Industry consulting	
Smart Electrodes for log grading	Research grant	<a href="#">Smart Electrode</a>
Reducing wood drying defects by increasing permeability through Joule heating	Research Grant	<a href="#">Smart Electrode</a>
Model-based predictive control of heating of anisotropic materials such as wood	STIMBR	<a href="#">Smart Electrode</a>

Project	Client(s), Funder(s) and/or Supplier(s)	Related Programme
Development of one dimensional model to predict the heating of anisotropic materials such as wood	STIMBR	<a href="#">Smart Electrode</a>
Three dimensional modelling of Joule heating in heterogeneous, anisotropic media, such as wood	STIMBR	<a href="#">Smart Electrode</a>
Process heat and energy modelling	IPL NZ, Boise-Cascade (USA)	
Process flow design, optimisation and instrumentation	Petrofac LLC	
Design of pneumatic scheme for log heating rig	STIMBR	<a href="#">Smart Electrode</a>
Optimisation of CAPEX and OPEX (including RAM) as a part of solution design	GE Tenders and contracts	
Electromagnetic Solutions		
Electrical motor prototype development	Heroux-Devtek	
A new electromagnetic imaging method for advanced food process optimization	MBIE	<a href="#">Food Imaging</a>
High magnetic field electric propulsion for space	MBIE	<a href="#">Electrification of Transport</a>
High efficiency, lightweight propulsion systems for electrification of transport	MBIE SSIF - AETP	<a href="#">Electrification of Transport</a>
Testing of FET Switching Thermal Performance	Industry consulting	
Ultra high temperature brushless motors for geothermal industry, deployed internationally	MB Century Ltd	
Novel single phase permanent magnet motor custom-designed for volume production	Wellington Drive Technologies Ltd, Grundfos Management A/S	
Motor design consultancy	UBCO Ltd, AuCom Ltd	
Actuator design consultancy	PulseData/Humanware Ltd	
Three-dimensional modelling of electromagnetic field distribution in heterogeneous, anisotropic media, such as wood	STIMBR	<a href="#">Smart Electrode</a>

Project	Client(s), Funder(s) and/or Supplier(s)	Related Programme
Patented magnetic components with optimally interleaved windings	Weir Electronics	
<b>Electronics &amp; Power Electronics Systems</b>		
FET education tool	Energy Education Trust NZ	
Near-field optical lithography using evanescent waves	IBM	
Photonic crystal devices including a slow light device	IBM	
World's smallest SRAM cell (circa 2004)	IBM	
Battery Go-Cart synchronous MOSFET chopper with regenerative braking driving PM 24V motor	University of Canterbury	
Novel fluorescent tube replacement system with 3 LED strings (White, Cyan-Blue, Red-Orange) driven by single modified dual-mode buck/flyback-converter	Solar Bright - LED lighting	
Development of trapezoidal current driver for large electromagnet - resulting in the invention of a novel BH-bridge	SfTI National Science Challenge	<a href="#">Inverting Electromagnetics</a>
Design and fabrication of a new generation of off-line switch-mode power supplies	Weir Electronics	<a href="#">Inverting Electromagnetics</a>
Design and implementation of SCADA system implemented using Zigbee, MODBUS Ethernet and LabVIEW	STIMBR	<a href="#">Smart Electrode</a>
Refrigerator fan motor drive COB update	Wellington Drives	
Performance evaluation of household technologies such as LED bulbs, heat-pumps and PV inverters	MBIE	<a href="#">Power Quality</a>
HVDC valve performance, rating and control	Utilities world wide, GE	
Design guideline package for LCC and VSC HVDC solutions	GE	