The velocity structure of complex overburden on the NW Shelf of Australia

Curtin supervisor: Professor Chris Elders
Aberdeen supervisor: Dr Vittorio Maselli
Theme: Energy
Area of research: Geoscience (seismic and petrophysics)

Description

Predicting the nature of sediment is important for designing efficient drilling programs, particularly in the North West Shelf of Australia, which is a major hydrocarbon province.

Overburden sediments are often overlooked as they are not direct exploration targets and costly delays can occur when drilling through them.

The aim of this project is to use imaging of overburden sediments on ubiquitous 3D seismic data sets from Australia's North West Shelf to:

- characterise different sediment bodies
- produce a predictive model that combines sedimentary processes with velocity structure.

Being aware of velocity structure aids correctly predicting the depth at which different formations will be encountered by a well.

Multiple agent based hierarchical control of smart grid using IEC 61850 protocol

Curtin supervisor: Professor Syed Islam
Aberdeen supervisor: Professor Murilo Da Silva Baptista
Theme: Energy
Area of research: Smart grid

Description

Electric power industries are undergoing significant changes to move towards distributed generation systems from renewable energy resources, and to support a more efficient and sustainable environment.

This research project looks at mapping new IEC 61850 standards that allow communication and integration of different intelligent electronic devices (IEDs) and the power grid. Seamless integration between IEDs and the grid is key to establishing a smart grid.

The project includes:

- setting up an AC-DC hybrid smart grid system using Curtin GEEP facilities such as wind turbines, PV system, fuel cell, controllable load, and battery banks
- implementing islanding and grid reconnection of a hybrid smart grid system with direct frequency and reactive power control
- introducing GOOSE protocol to replace the conventional hardware for intra-relay interlocking and tripping
- adding different layers of the control to ensure secured voltage, stability and real and reactive power control
- a simulation study using PSCAD/EMTDC and MATLAB/SIMULINK.

Development of reversible fuel cells for effective energy storage and electricity generation

Curtin supervisors: Professor San Ping Jiang, Professor Zongping Shao
Aberdeen supervisor: Dr Abbie McLaughlin
Theme:
Area of research:

Description

Renewable solar and wind power are generating a high demand for clean, secure and sustainable electrochemical energy storage and conversion technologies, yet power intermittency issues remain a problem.

The objective of this research project is to fully integrate processes in both electrode and electrolytes to address efficiency and cost problems, and by doing so, increasing the reliability of solar and wind power.

The project will involve:

- merging the concepts of fuel cell and electrolysis cell to form a reversible fuel cell
- developing highly efficient and low-cost fuel and oxygen electrodes with durable interfaces, which utilise highly ionic conducting ceramic membranes for low-temperature operation.

Given the nature of the research, a master degree in materials science, materials chemistry or applied electrochemistry is preferred.

Analysis of micro level property data

Curtin supervisor: Associate Professor Greg Costello

Aberdeen supervisor: Dr Rainer Schulz

Theme: Business

Area of research: Housing economics

Description

In recent decades government jurisdictions have developed detailed micro level property databases to which Curtin University and The University of Aberdeen both have access. This provides significant potential for a joint PhD project based on analysing the data.

Micro level data involves managing property records and activity at individual property parcel level, reporting transactions, physical characteristics and geographical location. The data is meaningful in empirical applications of hedonic pricing theory in housing markets and real-option pricing theory in financial markets.

Integrating micro level transaction data with Geographical Information Systems (GIS) also enables significant advances in spatial econometric methodology.

Reprogramming pancreatic cells towards an insulin secretory phenotype

Curtin Supervisor: Professor Philip Newsholme
Aberdeen Supervisor: Professor Kevin Docherty
Theme:
Area of research:

Description

Cell reprogramming has recently emerged as a useful mechanism for generating insulin-producing cells with therapeutic potential, yet little is known about the role of metabolic reprogramming in the pancreatic trans differentiation process.

The focus of this project is to explore this role, building on Professor Docherty's research that identified four key transcription factors required to reprogram exocrine tissue into islet cells, and Professor Newsholme's work on the role of carbohydrate, amino acid and lipid metabolism, and metabolic programming in the regulation of cell function.

The project will use the following platform technologies:

- cell culture
- gene expression facilities
- protein expression facilities
- metabolic analysis (mass spectrometry, bioenergetic determinations via Seahorse flux analysis)
- cell viability (flow cytometery)
- insulin secretion (ELISA).