

An Indian-Australian research partnership

Project Title:

Modeling and Simulation of Smart Grid

Project Number

IMURA0458

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Research Academy Themes:**Highlight which of the Academy's Theme(s) this project will address?**

(Feel free to nominate more than one. For more information, see www.iitbmonash.org)

1. Advanced computational engineering, simulation and manufacture
2. Infrastructure Engineering
3. Clean Energy
4. Water
5. Nanotechnology
6. Biotechnology and Stem Cell Research

The research problem*Define the problem*

Traditional Power networks operate in a well-defined hierarchical way where in the energy and information flow happens from a centralized control centre throughout the value chain right from the energy generation to transmission and distribution to consumption. With the advent of new developments especially distributed energy generation and integration of these energy sources into central grid and also smart metering and communication technologies, both energy and information flow can happen in a bi-directional fashion paving the way for newer decentralized architectures for control and decision making. With these elements integrated the overall grid will be smart in the sense that in addition to central nodes other elements in the grid are also intelligent and hence can offer several benefits like better demand response, safety, reliability and energy efficiency, etc. However, to realize these benefits optimal deployment and management of smart grids addressing both logical and physical aspects of the problem is still challenging as it requires a systematic assessment of various architectures. This calls for a detailed

system level model for the smart grid infrastructure involving various sub-systems and components along with the underlying information model. Recently there have been several research efforts in integrating semantic modelling technologies for managing large amounts of data generated by smart grid and also enabling distributed decision making. As various standards have been defined, the objective of this research topic is to evaluate various modelling and simulation technologies and develop a framework that helps in architectural assessment of smart grid systems. IEC defined common information model (CIM) is good starting point for the study. From an application perspective in the literature the semantic model for information integration has been successfully demonstrated for dynamic demand response kind of applications. Interest is in utilizing this modelling framework to demonstrate the value in distribution grid asset management and event detection.

Project aims

Define the aims of the project

Study of various modelling and simulation technologies for smart grids
Technology assessment and selection for modelling of various physical (sub-systems and components, like transformers, etc.) and logical aspects (information flow) of smart grid.
Developing a modelling and simulation framework for smart grids

Expected outcomes

Highlight the expected outcomes of the project

Detailed technology assessment document for modelling of smart grids
A modelling and simulation framework for smart grids

How will the project address the Goals of the above Themes?

Describe how the project will address the goals of one or more of the 6 Themes listed above.

The proposed project is aligned with the themes of advanced computational engineering and clean energy themes. As the expected outcome from the project involves developing a modelling and simulation framework it is a key enabler for the goals of advanced computational engineering. Also, the developed framework could be of great value to assess various smart grid architectural alternatives which in turn may have an impact on improving overall energy efficiency and safety of the power grids and hence contributing to the goals of clean energy theme.

Capabilities and Degrees Required

List the ideal set of capabilities that a student should have for this project. Feel free to be as specific or as general as you like. These capabilities will be input into the online application form and students who opt for this project will be required to show that they can demonstrate these capabilities.

Candidate with Bachelor's/Master's degree in electrical engineering or computer science with good academic record.

For Industry Partners:: Potential Collaborators

Please visit the IITB website www.iitb.ac.in and Monash Website www.monash.edu to highlight some potential collaborators that would be best suited for the area of research you are intending to float.