**Smart Grid: Secure and Sustainable Energy for all forever**

Electricity costs are predicted to skyrocket in the coming years and it’s expected to double over the next 5 years due to challenges in resources development and climate change, and this is a worldwide issue.

Smart Grid achieves bidirectional energy and information flow between the energy user and the utility grid, allowing energy users to generate energy and share with the utility grid or with other energy consumers.

“Prosumer” is the energy user who consumes as well as generates energy and they form a “Prosumer Community Smart Grid”. The key objective of a prosumer community smart grid is to be self-sufficient and sustainable and to share the excess energy amongst the community first and then auction the rest to the utility grid.

There are a number of research issues and challenges that need to be addressed to implement and realize the community smart grid vision. These are

1. identifying and attracting more dynamic prosumers to the community
2. motivating new prosumers to join the community
3. keeping sustainable growth in prosumer base
4. understanding and optimizing energy generation, consumption and sharing patterns
5. understanding and managing negative or selfish behaviours in a community
6. securing the community grid from cyber-attacks
7. providing a trusted environment for the community to operate
8. innovative sensor technology design and development
9. risk assessment, management and mitigation
10. ensure network availability and integrity
11. load modelling and prediction under different weather conditions

This tutorial will discuss these issues and outline how these issues can be addressed. Specifically this tutorial will cover the following:

1. Introduction to the Prosumer Community Framework of Smart Grids for Community Formation, Community Growth and Community Management using crowd-sourcing and crowd-sensing approach to ensure long term and sustainable community participation in the energy generation process.
2. Introduction and interplay between Smart Grids, Wireless Sensor Networks and Cyber-P Systems infrastructure for efficiently capturing high quality sensor data for communication, network monitoring (i.e. load prediction, load balancing) and network visualization.
3. Introduction to smart grid communication protocols for load modelling and prediction, heterogeneous communication across different sensors, optimal service and resource discovery, price forecasting, incentive schemes for prosumer motivation and participation, trust and risk management
4. Introduction to cyber-security infrastructure within the smart grid community to protect the critical energy infrastructure against malicious network attacks and anomalies.
About Dr. Vidyasagar Potdar

Dr. Vidyasagar Potdar is a Senior Research Fellow at Curtin University, Australia. His key areas of research include Smart Grids, Cyber Physical Systems and Information Security.

He has published more than 125 scientific research publications in journals and conferences. His research has been widely cited, so far he has 1345 citations and his h-index is 19 and i10 index is 41. He has attracted more than one million dollars in research funding in the areas of smart grids and sustainable development.

He has supervised to completion 6 PhD students and is currently supervising 4 full time PhD students. He has been awarded best researcher award in 2011 and 2012 across all faculties in Curtin University.


He has organized more than 25 international workshops at IEEE and ACM conferences worldwide and was the General Chair for CEAS 2011, CUBE 2012 & CUBE 2013. He has more than 10 years of full time research experience and in this period he was involved in the management of a Multi-Disciplinary Research Institute at Curtin University, where he took the responsibility of research commercialization, research mentoring, business development and research student recruitment.
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