Workshop on Computational Intelligence Techniques for Smart Grids

Abstract:

The operation environment of modern power systems is becoming increasingly rigorous due to the continually evolving functions of a power system from operation jurisdiction to control responsibly - coupled with the rising demand and expectation for reliability. More and more components operate at or near their limits and the systems are enduring much more frequent changes of operating conditions. In this emerging scenario, the large scale deployment of the Smart Grid paradigm could play a strategic role in supporting the evolution of conventional electrical grids toward active, flexible and self healing web energy networks composed of distributed and cooperative energy resources.

From a conceptual point of view, the Smarty Grid is the convergence of information and operational technologies applied to the electric grid, allowing sustainable options to customers and improved security. Smart Grids technologies include advanced sensing systems, two-way high-speed communications, monitoring and enterprise analysis software and related services to get location-specific, and real-time actionable data in order to provide enhanced services for both the system operators (i.e. Distribution automation, Asset Management, Advanced Metering Infrastructure) and the end-users (i.e. Demand Side Management, Demand Response).

From this perspective, a crucial issue is how to support the evolution of existing electrical grids from static hierarchal systems to self organising, high scalable and pervasive networks. In this field modern trends are oriented toward the employment of computational intelligence techniques for deploying advanced control, protection and monitoring architectures that move away from the older centralized paradigm to system distributed in the field with an increasing pervasion of intelligence devices. The large scale deployment of computational intelligence technologies in Smart Grids could lead to a more efficient tasks distribution amongst the distributed energy resources and, consequently, to a sensible improvement of the electrical grid flexibility.

The topics of interested include, but are not limited to:

- Computing paradigms and new technologies for fast contingency analysis
- Fuzzy based regulation and control (i.e. voltage regulation, power systems stabilizers)
- Meta heuristic techniques for optimal power flow solution
- Fuzzy arithmetic and range methods for power flow analysis in the presence of data uncertainty
- Bio inspired paradigms for data management
- Cooperative, self organising, wireless sensor networks
- Predictive tools for data analysis (i.e. load and wind forecasting)
- Advanced methodologies for demand side management
- Wide Area Monitoring Protection And Control systems (WAMPAC)

Tentavive list of presentations:

- “Self organizing sensor networks for Smart Grid State Estimation”
- “Power Flow Analysis in the presence of data Uncertainty by Fuzzy Arithmetic”
- “Distributed and Cooperative Fuzzy Controllers for Voltage Regulation in Smart Grids”
- “The role of Metaeuristic optimisation algorithm in Smart Grid”
- “Optimal load shedding and reactive power for Improving Voltage Security using artificial intelligence methodology”

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