Smart Grid Operation for Renewable Energy Systems

Description:

Renewable energy such as wind, photovoltaic, and solar thermal generation require control of power systems that account for high short-term variability and uncertainty with these intermittent energy sources. Power system security needs to be ensured dynamically as the system operating condition continuously changes.

This technology features a dynamic stochastic optimal power flow (DSOPF) control system for performing multi-objective optimal control capability in complex electrical power systems. The DSOPF system and method replaces the traditional adaptive critic designs (ACDs) and secondary voltage control, and provides a coordinated AC power flow control solution to the smart grid operation in an environment with high short-term uncertainty and variability. The DSOPF system and method is used to provide nonlinear optimal control, where the control objective is explicitly formulated to incorporate power system economy, stability and security considerations. The system and method dynamically drives a power system to its optimal operating point by continuously adjusting the steady-state set points sent by a traditional optimal power flow algorithm.

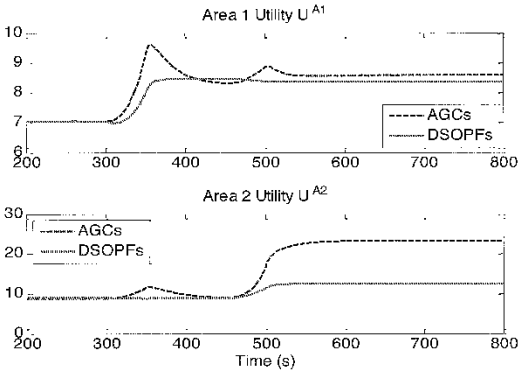

Fig. 9

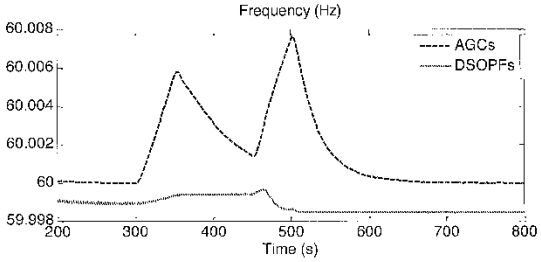

Fig. 10

Performance charts for two wind-powered generators indicating wind speed and power generation over time as controlled by AGC controllers and DSOPF controllers.

Applications:

- Renewable Energy Markets
  - Wind
  - Solar
  - Photovoltaic

Benefits:

- Real-time system management
- Increased system stability and control

Inventors: Kumar Venayagamoorthy, Jiaqi Liang, Ronald Gordon Harley
Protection Status: Patent issued; # 20,130,268,131
Licensing Status: Available for licensing
CURF Ref No: 2012-111

For more information: contactcurf@clemson.edu 864.656.4237 www.clemson.edu/curf