International Conference on Sustainability in Energy and Buildings

Invited Sessions

Title of Session: Advanced Microgrid Controller and Energy Management System

Name of Chair: Prof. Junwei Lu

Description:

This session will be focusing on the latest topics: Advanced Microgrid Controller and Energy Management System for residential, remote community and commercial buildings.

Advanced Microgrids meet resiliency and reliability needs by effectively providing an uninterruptable power supply to critical loads. They can also improve environmental performance by facilitating renewable resource integration, such as photovoltaics and energy storage and back up diesel generators. Advanced Microgrids afford opportunities for economically delivering energy, capacity, and ancillary services. As a result of all of these and other factors, policy makers are actively promoting Microgrid development. Advanced microgrids will serve to mitigate the economic and social impacts of power disruption, and will contain all the essential elements of a large-scale grid, such as the ability to (a) balance electrical demand with sources, (b) schedule the dispatch of resources, and (c) preserve grid reliability (both adequacy and security). In addition to these basic features, an advanced Microgrid will also be able to interact with, connect to, and disconnect from another grid. Advanced Microgrids will benefit both the utility grid and electricity customers as Advanced Microgrids will enhance power system reliability, resilience, economics, security, and sustainability.

Microgrids are a new paradigm for energy distribution systems in which generation (from a local energy source or storage device) is coordinated to supply local energy needs while behaving as a sole system. Benefit maximization in a Microgrid is directly related to demand reactiveness and optimal allocation of local energy resources. Because these characteristics can be implemented through an Energy Management System (EMS), knowing the elements that configure it and how they interact is crucial for the development of Advanced Microgrids. The M-EMS enables the interplay of different controllers and components needed to operate the EMS through cohesive and platform-independent interfaces. This approach will allow for component flexibility and customisation as well as for control algorithms to be deployed without sacrificing plug-and-play or limiting potential functionality. With solar PV and battery storage users can generate their own solar power during the day and store it to use at night, or to use if back-up power is needed during extreme weather events. Microgrid users are able to sell clean solar energy back into the grid exactly when it is needed, helping to reduce power costs for everyone. Renewable energy, however, is the most unstable energy form and always has some negative impact on the grid. A Microgrid integrated with a distributed energy resource, energy storage and load will improve performance will solve power recovery problems during extreme weather events, but conventional Microgrids integrated with energy resources, energy storage and loads can only provide two very basic functions: grid-connected or island-mode. Clearly the solution to this problem is the use advanced Microgrid technology.

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