

CPET 581 Smart Grid & Energy Management
2013/9/19
4:30-5:45PM Thursday
Lecture 6

Keywords

- Energy Management
- Smart Grid
- ZigBee
- Home Area Networks (HAN)
- Demand Response
- Home automation

Topics of Discussion

- Energy Management Issues
- An Overview of Smart Grid

Energy Management

- Energy Cost: Production, Consumption
- Supply –Side: Energy Generation Management
- Demand-Side: Energy Usage Management
 - Onsite energy generation
 - Storage capacity
 - Active information management
- Cost
- Home Energy Management
- Efficiency
 - Industrial Energy Efficiency
- Sustainability
- Standards
- Energy Management Tools
- Current Issues in Energy Management
 - Peak Demand Challenges
 - Aging Infrastructure
 - Rising Prices
 - Rising Demands
 - Legislative Impact
 - Increase Use of Renewable Energy
 - The Plug-In Vehicles

Energy Efficiency & Renewable Energy - Federal Energy Management Program (FEMP),
<http://www1.eere.energy.gov/femp/>

- Develop a Strategic Energy Management Program
- SmartGrid Energy Management System
- Smart Grid Building Energy Management System
- Home Energy Management Smart Grid

Smart Grid

- NIST Framework and Roadmap for Smart Grid Interoperability Standards Release 2.0, 227 pages, http://www.nist.gov/smartgrid/upload/NIST_Framework_Release_2-0_corr.pdf
- IEEE Smart Grid, <http://smartgrid.ieee.org/ieee-smart-grid/smart-grid-conceptual-model>

Two Ways Communications

Electric Power Energy Information

Load Control

Demand Response

- A method of exercising greater control over entire electrical grid systems by using individual facilities' ability to reduce usage when the grid is overly stressed
- Methods
 - Permanent consumption reduction
 - Peak demand reduction
 - Load shifting

Demand Response Programs/Players [4]

- Utilities companies
- Independent Systems Operators (ISOs) that operate a regional transmission grid or power pool over one or more states. Their customers participate in demand response programs through members called Aggregators or Curtailment Service Providers (CSPs), who act as agents for the customers.
- Third-party aggregators or CSPs that contract with utilities or ISOs. The world's largest providers of commercial, institutional and industrial demand response are third-party aggregators. They work with many utility companies or ISOs, helping customers design demand response and energy efficiency programs.

Buildings with Smart Grid Technologies

- Two-way communications with utilities
- Proactive energy usage management
- Onsite energy generation
- Storage capacity
- Active information management

Homework Assignment #4

Papers, Slides, & Guides

- "Setting the Standard for Industrial Energy Efficiency," by A. McKane, R. Williams, W. Perry, and Li, T, <http://industrial-energy.lbl.gov/files/industrial-energy/active/0/Energy%20Management%20Paper.pdf>
- Ensuring a Sustainable Future: An Energy Management Guidebook for Wastewater and Water Utilities, 113 pages, 2008,

http://www.deq.virginia.gov/Portals/0/DEQ/PollutionPrevention/EPA_WWTP_guidebook_si_energy_management.pdf

- “Key Issues in Energy Management,” Prof. Alain Bouscayrol, Graz University of Technology (Austria) April 2012, <http://www.emrwebsite.org/uploads/Fichiers/EMR-TUG/1-KeyIssues-TUG-2012.pdf>
- Buildings with Smart Consumption Technologies are Equipped to Optimize Energy Flow, <http://w3.usa.siemens.com/buildingtechnologies/us/en/energy-efficiency/demand-response/documents/9-leave-behind-white-paper-smart-consumption.pdf>
- NIST Framework and Roadmap for Smart Grid Interoperability Standards Release 2.0, 227 pages, http://www.nist.gov/smartgrid/upload/NIST_Framework_Release_2-0_corr.pdf
- IEEE Smart Grid, <http://smartgrid.ieee.org/ieee-smart-grid/smart-grid-conceptual-model>

Other References

- Smart Grid Case Studies, http://www.smartgrid.gov/recovery_act/program_impacts/case_studies
 - Case Studies are short summaries of selected Smart Grid Investment Grant (SGIG) projects.
 - Smart Grid Saving and Grid Integration of Renewables in Idaho, http://www.smartgrid.gov/case_study/news/smart_grid_savings_and_grid_integration_renewables_idaho

IEEE Smart Grid

IEEE Smart Grid Conceptual Model Diagrams, <http://smartgrid.ieee.org/ieee-smart-grid/smart-grid-conceptual-model>

- Conceptual framework, Bulk Generation Diagram, Distribution diagram, Customer diagram, Operations Diagram, Markets Diagram, Service Provider Diagram
- Constructive Engagement Toolkit, <http://smartgrid.ieee.org/constructive-engagement-toolkit>
 - Video: Promote the Idea
 - Video: Build Internal Support
 - Video: Build Interest Among Community Partners
 - Video: Co-create the Future
 - Video: Promote Local Innovation
- Video: Inspire Action
- Public Policy – IEEE Actions on Smart Grid Policy Issues, <http://smartgrid.ieee.org/resources/public-policy>
- IEEE Smart Grid brand guidelines, <http://smartgrid.ieee.org/resources/brand-identity-toolkit>
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