

CPET 581 Smart Grid & Energy Management
Friday 6:00-8:45PM
2013/10/25

Lecture 12

Topics of Discussion

- Demand-Side Management (Energy Demand Management)
- Demand-Side Management Cost and Implementation Overview
- Smart Grid Technologies and Demand Response
- Advanced Metering and Advanced Metering Infrastructure
- Smart Grid, Demand Response, Related IT Tools
- Smart Grid Data Management, and Analytics

Energy Demand Management or Peak Demand Management

EIA (Energy Information Agency), U.S. DOE, definition of Demand-Side Management (DSM) Program (2001): “Demand-side management (DSM) programs consist of the planning, implementing, and monitoring activities of electric utilities which are designed to encourage consumers to modify their level and pattern of electricity usage, including the timing and level of Electricity demand.”.

Demand-Side Management and Cost, <http://www.eia.gov/tools/glossary/index.cfm?id=D#dsm>

A utility action that reduces or curtails end-use equipment or processes. DSM is often used in order to reduce customer load during peak demand and/or in times of supply constraint. DSM includes programs that are focused, deep, and immediate such as the brief curtailment of energy-intensive processes used by a utility's most demanding industrial customers, and programs that are broad, shallow, and less immediate such as the promotion of energy-efficient equipment in residential and commercial sectors.

The Smart Grid and the Promise of Demand-Side Management [1]

Demand-Side Management

- Load Shifting (Load Management or Demand Response)
 - Critical peak shift
 - Daily peak shift
- Energy Efficiency & Conservation (Load Reduction)
 - Energy conservation
 - Energy Efficiency

Implementation of DSM involves

- Rates
- Incentives
- Access to Information
- Utility Control
- Education and marketing
- Customer insight and verification

Source [5]

Demand Response:

- “Changes in electric usage by demand-side resources from their normal consumption patterns in response to changes in the price of electricity over time, or to incentive payments designed to induce lower electricity use at times of high wholesale market prices or when system reliability is jeopardized.”

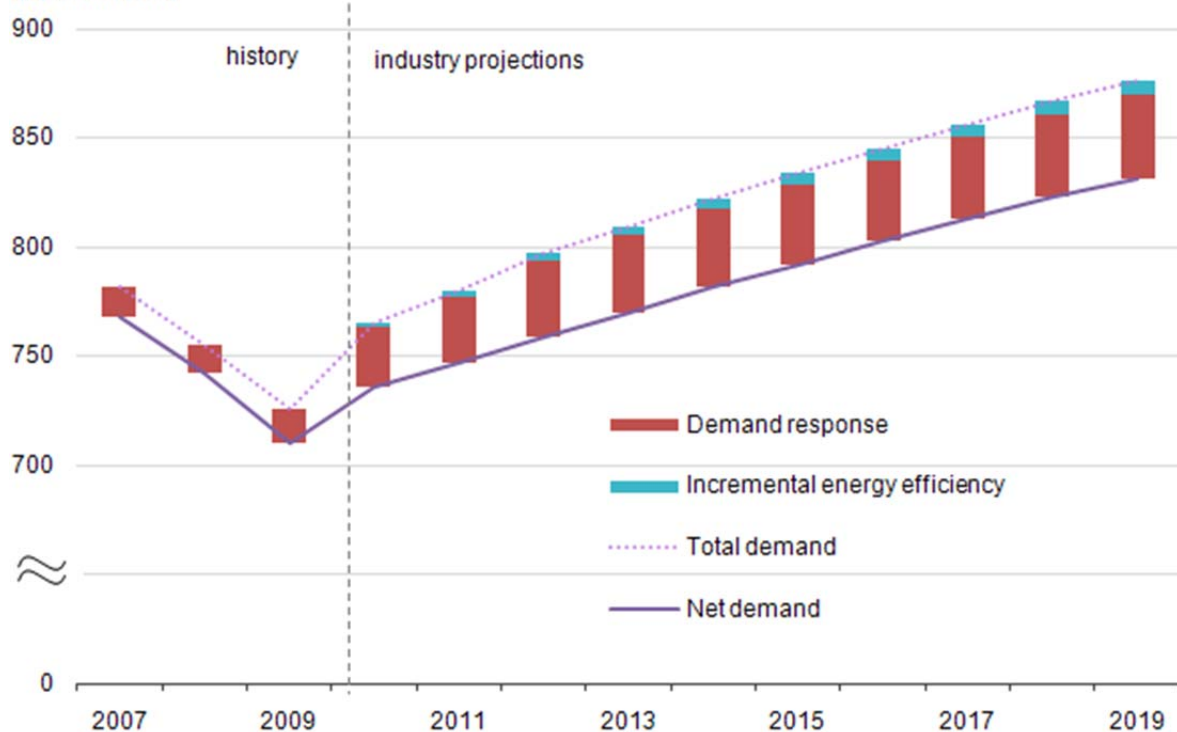
Advanced Metering

- “Advanced metering is a metering system that records customer consumption (and possibly other parameters) hourly or more frequently and that provides for daily or more frequent transmittal of measurements over a communication network to a central collection point.”

Source [7]

Grid planners report increases in expected peak demand response, energy efficiency

gigawatts (GW)



Smart Grid – Demand Response Technologies [9],

http://www.smartgridnews.com/artman/publish/Technologies_Demand_Response/

“Demand Response (DR) technologies allow utilities to talk to devices inside the customer premise. They include such things as load control devices, smart thermostats and home energy consoles. They are essential to allow customers to reduce or shift their power use during peak demand periods. Demand response solutions play a key role in several areas: pricing, emergency response, grid reliability, infrastructure planning and design, operations, and deferral.”

California ISO, Demand Response Initiative, <http://www.caiso.com/1893/1893e350393b0.html>

Indiana Utility Regulatory Commission, Demand Side Management Programs, July 28, 2004,
<http://www.in.gov/iurc/2571.htm>

California Public Utilities Commission, Integrated Demand Side Management Program (2013-2014),
March 2013, <http://www.cpuc.ca.gov/NR/rdonlyres/1A990EF9-1D4F-4BE4-9B3E-0B8DE4700726/0/201314IDSMPProgramFactSheet.pdf>

- “The Strategic Plan recognizes the integration of demand-side management (DSM) options including energy saving (EE), demand response (DR), and distributed generation (DG) as fundamental to achieving California’s strategic energy goal. ...”
- Related activities
 - Cost Effectiveness and EM&V (Energy Efficiency Program Evaluation) Approach
 - Integrating Emerging Technologies
 - Integrated Audits
 - Integrated Pilots, Programs and Activities
 - ...
- Energy Efficiency Program Evaluation,
<http://www.cpuc.ca.gov/PUC/energy/Energy+Efficiency/EM+and+V/>

ENERNOC, <http://www.enernoc.com/our-resources/term-pages/what-is-demand-side-management>

- DSM includes
 - Energy efficiency (reduce energy consumption)
 - Demand Response
- Demand Response Case Studies, <http://www.enernoc.com/our-resources/case-studies>

ConEdison, New York, Targeted Demand Side Management,
<http://www.coned.com/energyefficiency/targetedDSM.asp>

- Efficiency upgrades

PACIFI Corp, Demand Side Management:

Demand-side management involves reducing electricity use through activities or programs that **promote electric energy efficiency or conservation**, or **more efficient management of electric energy loads**. These efforts may:

- Promote high efficiency building practices
- Promote the purchase of energy-efficient ENERGY STAR® products
- Encourage the transition from incandescent lighting to more efficient compact fluorescent lighting
- Encourage customers to shift non-critical usage of electricity from high-use periods to after 7 p.m. or before 11 a.m.
- Consist of programs providing limited utility control of customer equipment such as air conditioners
- Promote energy awareness and education

Potential Study

- Integrated Resource Plan (IRP), <http://www.pacificorp.com/es/irp.html>
 - Public Input Process, Presentation, <http://www.pacificorp.com/es/irp/pip.html>
 - Wind Integration, http://www.pacificorp.com/es/irp/wind_integration.html

- Transmission SBT (System Operation and Reliability Benefits Tool), <http://www.pacificcorp.com/es/irp/SBT.html>

PACIFIC POWER: DSM Program – Efficient & Environment (Oregon, Washington and California) , <http://www.pacificpower.net/env/epi.html>

- Our Environmental Commitment
- Reduce Your Carbon Footprint
- Wattsmat, <http://www.pacificpower.net/env/ws.html>
- Efficiency Programs & Incentives
- Energy Efficiency Resources
- Blue Sky Renewable Energy
- Customer Generation, <http://www.pacificpower.net/env/nmcg.html>
 - Net Metering
 - Oregon Solar Programs
 - California Solar Incentive Program
 - Washington Renewable Energy Program
 - Customer Generation & Qualifying Facilities
 - Company qualified facilities
 - Grid interconnection requests
 - Company request for proposal for new generation
 - Market-based incentives
- Electric Vehicles, <http://www.pacificpower.net/env/ev.html>
 - Electricity & Charging Requirements, <http://www.pacificpower.net/env/ev/ecr.html>
 - AC Level 1 (120V/15A)
 - AC Level 2 (240/30-70A)
 - DC Fast Charging (480V)
 - Oregon Smart Guide for EV Charging at Home, http://www.pacificpower.net/content/dam/pacific_power/doc/Efficiency_Environment/Electric_Vehicles/OR_DCBS_EVguide_2011.pdf

Rocky Mountain Power, <http://www.rockymountainpower.net/env/ws/awvc/2013awvcw.html>

- 2013 Act Wattsmart Video Context Winners, Video

FERC (Federal Energy Regulatory Commission), Definitions of **Qualifying Facilities**, <http://www.ferc.gov/industries/electric/gen-info/qual-fac.asp>

Demand Response Research Center, Berkeley Lab, <http://drcc.lbl.gov/>

- Energy System Integration & Communications
- Buildings
- Industrial, Agriculture & Water
- Open Automated Demand Response
- Tools & Guides
 - OpenADR
 - CLIR (Client and Logic with Integrated Relay)
 - Audit Tools, <http://drcc.lbl.gov/tools>
- News & Events
 - Home Area Network (HAN) Security Consideration – May, 23, 2013

- OpenADR (Open Alliance for Demand Response) Release 2.0a Profile Specification and Compliance Test Suite, Aug. 8, 2012, <http://drrc.lbl.gov/news/openadr-alliance-releases-20a-profile-specification-and-compliance-test-suite>
- Open SMART Energy Gateway (OpenSEG), Sept. 4, 2012, <http://drrc.lbl.gov/news/open-smart-energy-gateway-openseg>
 - HAN, near real-time energy information from SmartMeter to consumer
- OpenADR Alliance, <http://www.openadr.org/>

References

- [1] EIA Electric Utility Demand Side Management – Archive 1994-2001, <http://www.eia.gov/electricity/data/eia861/dsm/index.html>
- [2] IEA Demand Side Management Programme, <http://www.ieadsm.org/>
- [3] PACIFICCorp Demand Side Management, <http://www.pacificcorp.com/env/dsm.html>
- [4] The Smart Grid and the Promise of Demand-side Management, by B. Davitio, H. Tai, and R. Uhlaner, http://calmac.com/documents/MoSG_DSM_VF.pdf
- [5] FERC (Federal Energy Regulatory Commission), Assessment Reports of Demand Response & Advanced Metering, 2006-Oct 2013, <http://www.ferc.gov/industries/electric/indus-act/demand-response/dem-res-adv-metering.asp>
- [6] EIA Demand Response, <http://www.eia.gov/todayinenergy/index.cfm?tg=%20demand%20response>
- [7] Electric Grid Planners: Demand Response and Energy Efficiency to Increase, <http://www.eia.gov/todayinenergy/detail.cfm?id=650>
- [8] PPT Report on “Energy Efficiency/Demand Response/Smart Grid/Distribution System Reliability and Consumption of Electricity Changes – Clearance 2014, <http://eia.gov/survey/meetings/elec-prelim0612/> , by Carolyn Moses, June 2012
- [9] SmartGrid News: Technologies – Demand Response, http://www.smartgridnews.com/artman/publish/Technologies_Demand_Response/
- [10] California ISO, Demand Response Initiative, <http://www.caiso.com/1893/1893e350393b0.html>
- [11] Demand Response Research Center, Berkeley Lab, <http://drrc.lbl.gov/>
- [12] Survey form EIA-861 – Annual Electric Power Industry Report, Form EIA-861 Data File, <http://www.eia.gov/electricity/data/eia861/>
- [13] Demand-Side Management Data Collection Activities: The Role of a National Government, by Diane Pirkey and Joseph H. Eto, <http://emp.lbl.gov/sites/all/files/Demand-side%20management%20data%20collection%20activities%20The%20role%20of%20a%20national%20government.pdf>