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Energy Efficiency and Demand Response

Peak Load Management Alliance (PLMA)
Fall Conference

Austin, Texas
October 28-29 , 2008

By: Daniel Violette, Ph.D.
Summit Blue Consulting
Boulder, Colorado 80302
e-mail: dviolette@summitblue.com

Trends and Issues

1. **Integrating the delivery of EE, DG, DR, Rate Structures and Smart Metering**
   - New term – Integrated DSM (IDSM).
   - Could reduce costs, increase customer benefits and satisfaction levels.
   - Overall result, may be more cost-effective DSM, lower energy costs for ratepayers, and increased reliability.
   - DG is also important – self-generation and solar installations.
2. **Changing views on Benefit-Cost tests**
   - Static standard practice tests are generally used to assess DR resources using a specified proxy resource (i.e., a gas CT).
   - Supply-side resources are assessed using dynamic benefit-cost assessments – i.e., differential revenue requirements approaches with new supply-side resources added based on need over the planning horizon.
   - Not considering DR in a dynamic framework may under-estimate value of DR.
   - NOW, the need is to consider appropriate benefit-cost assessments of IDSM.

Some Programmatic Examples

- Energy efficient lighting:
  - Almost always reduces peak demand, but does it get the full credit for helping manage peak, particularly on system peak days.
  - Incents new technology that can further reduce peak demand with increased value due to dispatchability (e.g., dimmable ballasts)
- New construction programs:
  - Adding in DR and dispatchable DR technologies can provide revenues to the customer to cover other investments.
- Re-Commissioning programs:
  - Often focus on operations and the energy management system (EMS), but may not be considered in many programs.
- Self-Generation Incentives:
  - Link to automatic controls or automated start-up.

Integration and Automation of DR

- Residential loads are already largely automated through DLC programs.
- C&I program information:
  - The fraction of load that is “automatically controlled” is increasing.
  - Approximately 50% of loads have been automated in recent years with 70% of new loads being automated.
  - C&I auto-DR rely on buildings that have EMS that can be used to control space conditioning, lighting, and other end-uses.
  - Often the load sheds are designed to not impact building or facility comfort or operations.
  - Need to be able to appropriately value short-response DR, i.e. 10-minute availability, versus longer notice DR.
- Implication – Synergies between DR and EE programs that address the EMS system such as C&I new construction, retro-commissioning, or major retrofit programs can produce load-shed capabilities.

EE and DR Integration Issues

- Some Regulators and Utilities are seeking demand-side solutions not a:
  - EE Solution; and a DR solution; and a Pricing Solution.
  - They are looking for integrated demand-side solutions that leverage synergies across these activities.
  - Information is at a premium NOW as utilities get serious.
  - Does an EE program that improves the efficiency of AC units (e.g., an AC tune-up program) by 10% reduce the contribution of an AC DLC program?
    - NO – they should work together to provide synergies though cost reductions, greater customer benefits and higher participation.
  - Does a pricing program that shifts loads away from peak periods reduce what can be expected from callable DR programs?
    - NO – they can be made to work together.
  - But, these are being viewed by some as reasons not to take an integrated approach to EE, DR and Pricing.

Aggregator and Outsourced DR

- What is the implication of DR outsourcing in a market that is looking for integration on the demand-side?
  - Outsourcing is still a near-term focus of utilities; but, it is changing.
  - The outsourcer may be asked to deploy demand-side solutions rather than DR solutions.
    - Instead of energy audits, demand-side audits that look at both energy efficiency and demand flexibility may become the norm.
    - All communications systems and equipment should accommodate both price response and load response.
    - EE, Pricing and load response can meet different objectives:
      - Can EE be viewed as the equivalent of base load plants.
      - Can pricing be viewed is the equivalent of mid-merit plants.
      - Can Callable/dispatchable DR be viewed as a peaker resource and a provider of operational services.

Issues for Aggregators

- Can you outsource DR, but still attain demand-side integration?
  - Contracts with specified linkages to other demand-side activities – EE and Pricing – may work, but could be more complex.
    - Incorporate integrate EE and DR contracts to provide DSM solutions
    - The 80/20 rule likely applies, i.e., a few key EE / DR synergies may provide most of the benefits.
    - Seeking complete EE / DR integration may slow down the delivery of synergies.
  - Becoming a demand-side solutions provider rather than a DR provider may increase the size of the market for aggregators.
  - Aggregators with narrowly tailored DR/peaker solutions may be at a disadvantage compared to a demand-side provider, i.e., one that offers partial integration across DR and EE.
  - Pricing -- Should be able to integrate a base pricing package with curtailable loads and show impacts on the payback on EE investments.

Issues with EE / DR

- Some stakeholders and regulators may be not be fully receptive to EE /DR integration:
  - Lack of familiarity with DR in some cases, where EE is well established.
  - Preconceived ideas about DR, customer behavior and what customers want.
  - A focus on “desk thinking” rather than on examining in-field results.
  - More responsive to better established stakeholder groups that focus on supporting energy reductions through conventional EE.
- AMI business cases are so large in scale that many DR programs seem lost in the discussion and complexity.
- DR programs more directly impact customers by asking them to be part of the solution (or to not be the problem).
- Don’t want to change the market due to past experience with re-structuring.
- There may be a focus on short-term benefits and costs rather than on the long term where increasing customers’ ability to respond to prices and resource scarcity will result in greater market efficiencies.

Ongoing California PUC Rulemaking on DR Cost-Effectiveness

- Rulemaking 07-01-041 stems from CPUC D.05-11-009.
  - "Develop a cost-effectiveness methodology for DR programs."
  - "An industry accepted method for evaluating the cost-effectiveness of demand response has not yet been established."
  - "Innovation on the procedures and processes are needed."
  - "Pricing provides the underlying platform for the portfolio of DR activities over longer-term planning horizons."
  - "The role of information and experience with DR activities gained over time might be important as the industry is working to determine how to best incorporate DR into forward-looking resource plans and assess equivalence to other resource options."
- New perspectives on IDSM may be needed – free riders in IDSM?
- Rulemaking may reveal issues, but as an interim approach it may not yield ultimate solutions.

Interim Conclusions

- The benefits of integrating DSM activities seem clear.
  - Most cost-effective approaches can be selected.
  - Might reduce lost DSM opportunities (could be a significant benefit).
  - Improves customer service, i.e., a single point of contact to determine best solutions for each customer.
- But, new problems are posed:
  - Organizational issues within utilities – must cross silos.
  - Organizational and expertise challenges for utilities and regulators.
  - Allocation of benefits to different initiatives – EE, DR, DG, or rates.
  - Appropriate cost-effectiveness analysis of IDSM activities:
    - Are EE and DR program level B/C assessments needed.
    - Is net-to-gross still an issue and does it change for IDSM activities – DR often assumed not to have free-riders in the same context as EE.
    - Still, determining the baseline is a relevant problem.

Integration of EE, DR, and DG – California Rulemakings and Filings

- Joint Assigned Commissioner's Ruling (ACR) – Rulemakings (R.) 06-04-041 and 07-01-041, April 11, 2008 called for utility integration plans.
- Commission goals for integration.
  - Identified priority IDSM actions for 2009 through 2011
    1. Coordinated marketing and outreach;
    2. Coordinated program delivery including integrated audits; and,
    3. Optimizing technology which includes equipment that enables multiple DSM options.
- Utility filings (September 19, 2008) support the CPUC's direction to integrate, coordinate, and innovate to provide more comprehensives solutions.
- Commission defined integration is broad – "full range of comprehensive consumer demand-side options, such as demand response, advanced meters, conservation, and self-generation.

Some Integration Concepts

(Drawn from PG&E's September 19, 2008 filing)

- Integrating Delivery Channels – utility, 3rd party, or partnerships with local governments and agencies.
- Integrated Marketing and Outreach – collateral materials and single point of contract.
- Integrated Sales Training – DSM providers, utility staff, 3rd party contractors.
- Integrated Program Design
  - IDSM Audit tools.
  - Jointly calculated incentives.
- Analytic Methods to Support Integration:
  - IDSM Cost-Effectiveness Methods.
  - Attribution Methods.
  - Free-ridership assessment.
- Roadmap for integrated emerging technologies

Integration Platform

- The integration platform proposed by PG&E uses the EE portfolio as the foundation for integration.
  - Greater size, breadth, and funding of the EE portfolio.
  - Range of programs, savings goals, and types of customers reached through EE is greater than other IDSM activities.
  - ISSUE: Does this require internal organizational changes?
- Use the DR technical assistance (TA) program as the foundation for large customer IDSM audits.
- Technical Incentives (TI) for large customers will combined with EE incentives in a single application.
- One stop solution for customers' EE, DR, and DG recommendations
  - Avoids over-marketing and multiple customer contacts by different contactors and 3rd parties implementing EE, DR, and DG programs.
- PG&E's filing proposed that all DR audits in 2009 would be part of the Integrated Audit Program (IEA).

Smart Metering and DSM

- Period following meter installation and activation can be used to communicate EE, DR and DG messages.
- Integration of EE, DR, DG and Conservation messaging on how customers' might shift their energy use or participate in EE programs.
- Web presentment for customer accounts would use an present be as integrated as possible.
- COMMENTS:
  - Interface between smart metering and DR, DG, and rates programs should be detailed.
  - Role of Smart Metering and IDSM not fully developed

DR and AMI / SMI Business Cases

(General comments from Smart Metering Conference – Smart Metering East)

- Smart meters measure consumption at intervals (1 hour → 5 minutes)
  - supports TOU, RTP; behavior shifts load off-peak
  - information gateway to homes?
- Demand response (to prices or other signals)
  - automated control of end use devices & systems
  - commercial/industrial: energy management/control systems are gateway
  - residential: home automation, smart appliances communicate with gateway
- Distributed generation
  - backup generators, microturbines, combined-heating-and power, fuel cells
  - Renewable energy: solar, wind
- Distributed storage: batteries, heat/ice thermal storage for electrical end use

Demand response is the "low-hanging fruit" for the smart grid

COMMENTS: Business Case for AMI / SMI:

- For some utilities , DR is an important part of the AMI business case.
- "Approaches" for assessing DR in an AMI business are not yet developed.

On-going PG&E Integration Activities

- 2008 transitional integration activities will provide PG&E with “test and learn” activities.
  - PG&E has already established an internal integration team that meets weekly to coordinate integration efforts across EE, DR, LIEE, DG, and ET (emerging technologies).
  - The team is responsible for integration protocols and processes to:
    - Develop strategies based on input from stakeholders.
    - Coordinate with selected customers to identify strategies that can be replicated with other customers and market sectors.
    - Develop and deliver sales and integration training.
- PG&E has offered integrated audits to large customers (over 500 kW) and will continue through 2008 to offer detailed integrated audits focusing on EE, DR, and DG options.
- Established an integration desk to analyze, evaluate and approve audits.

On-going PG&E Integration Activities

- PG&E is bundling existing offers and integrated packages to customers in 2008 to test and refine IDSM program offers.
- Activities combine elements from existing EE core programs, DR TA/TI, SmartAC, and existing DG.
- Near-term approaches are being developed for:
  - Reliability solution for City of San Francisco (4 substations)
  - Commercial office buildings (Pilot office lighting project with ET program office)
  - Agriculture and food processing (California League of Food Processors)
  - Retail (retail grocery chain)
  - Healthcare (health care provider)
  - Residential new construction (integration with SmartAC)
  - Local government (two early adopter communities and one less familiar).
- PG&E will track and identify approaches that work and fail to create more successful approaches going forward.

Support Analytics (from PG&E)

- IDSM Cost Effectiveness Methodology – 2 approaches:
  - Sequential approach evaluates elements on an individual basis where energy reduction is assigned to individual elements.
  - Cumulative approach evaluates the impact of the entire IDSM program effort at a customer site – costs and benefits for the site not by individual element.
- Interim PG&E proposal -- Use Loading Order for savings attribution in the sequential approach.
  1. EE elements evaluated before DR elements.
     - Lowest cost EE elements evaluated before higher cost EE elements.
     - Costs and benefits determined first for EE on a stand-along basis.
  2. Incremental costs and benefits for adding DR to a project after all EE has been added and allocated.
- IDSM Free-Ridership Assessment – Joint ACR requests to assess IDSM using EE free-ridership protocols.

Tools to Support IDSM

- IDSM clearinghouse:
  - A one-stop shop for customers to receive information about and participate in EE and DR programs from PG&E AND other providers.
- Marketing Decision Support System (MDSS) replacement:
  - The volume of users and transactions has increased with the magnitude of expenditures and complexity of programs that use the MDSS.
  - MDSS supports program management, rebate processing, account management, and CPUC/CEC mandated reporting requirements.
- Road Map for Integrating Emerging Technologies:
  - The utilities should promote development and support of new technologies that enable IDSM.
  - Coordinate efforts with partners in the Emerging Technologies Coordinating Council (ETCC)

Conclusions

- Integration across demand-side activities is being taken seriously by a number of utilities across North America.
- California is requiring utilities file an integration plan as a “stand-alone document” in both EE and DR portfolio applications.
- Integration is needed:
  - EE is ahead of other DSM activities and has the broadest portfolio, but rates, DR and DG could be just as broad with all working interactively.
  - Integration provides cost-effective DSM and avoids lost opportunities.
- There are issues:
  - Cost-effectiveness of IDSM.
  - The organizations and program focus may take time to turn.
  - Not all will be supporters as long as funding is limited.
- Additional work on the benefits of integration is needed to continually justify a continuing effort.

Conclusions (cont.)

- Full integration will take a considerable amount of time, but it is important not to wait – apply the 80 – 20 rule.
  - Integrated audits and recommendations may be the first activity to leverage.
  - Integration for large customers programs may have the most near-term potential:
    - Technology options are moving towards automated, EMS based approaches.
    - Much of the EE obtained and ongoing DR potential is in the Commercial sector.
  - Residential integration may be easier, i.e., it may be more limited due to limited numbers of DR options.
- Establish an internal coordination group with responsibility for advancing integration and avoiding silos in the organization.

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DISCUSSION