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Technical Workshop
Demand Side Management

February 10, 2006

Agenda

- 2004 IRP DSM modeling Review
- Modeling Plan for 2006 IRP
  - Planning Drivers and Objectives
  - Modeling Approach Overview
  - Program Assumptions for 2006 IRP
- 2005 DSM RFP Summary and Challenges
- Summation and Next Steps

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2004 IRP DSM Modeling Methodology Review

Dan Swan

DSM Resource Classes

DSM programs are divided into four general classes:

Class 1 DSM – Fully dispatchable or scheduled firm. Customers agree to reduce load under the control of the utility. Most programs result in reduced peak loads at the expense of increased non-peak loads.

Class 2 DSM – Energy efficiency. Energy and capacity savings achieved through technological or design improvements in appliances, equipment, controls, structures, processes, etc. Savings typically continue over the lives of the improved devices.

Class 3 DSM – Price responsive programs. Energy and capacity savings that are achieved through customers voluntarily reducing load, based on financial incentive offers (e.g., Energy Exchange).

Class 4 DSM – Energy conservation education and awareness building leading to voluntary behavioral changes, sometimes driven by market messages (e.g., Power Forward).

2004 IRP Modeling Methodologies

	DSM Class 1	DSM Class 2
Program Definition	Irrigation Control proxy based on Idaho programs prior 2 years. Another 4 Proxies were taken from 2003 RFP bid responses for DSM Class 1	Program costs determined by "Decrement Approach" ▪ Marketsym model run with & without DSM program to compute decrement value
Valuation Methodology	Benefit derived from deferring supply-side resources	System production cost benefits accruing from reducing load
Modeling Results	CEM model selected 4 out of 8 Programs in 2011 (Irrigation) & 2015 (Cooling), during 2009 to 2015 timeframe	Decrement 100 MW DSM at peak applying 8 planning load shapes, covering East & West
Cost Effectiveness Test	CEM-selected programs reduce PVRR	DSM program cost is less than Decrement Value determined by the dispatch model
Program Details	Irrigation Programs - 24 Hours Week, Monday to Thursday, June 1 to September 15, 2-8 PM; return over remaining 18 hours Cooling Programs - 100 Hours Year, Monday to Friday, June to August, 2-8 PM	Residential Cooling - 7 to 12% L.F. Commercial Cooling - 24% L.F. Commercial Lighting - 51% L.F. System Load - 65 to 67% L.F.
Resulting Action Plan	178 MW in 2004 IRP action plan, ▪ 88 MW Irrigation Control FY2009 ▪ 89 MW Cooling Programs FY2014 In 2004 IRP Update - Irrigation load control added Summer 2008 ▪ 50 MW Utah ▪ 50 MW OR/ WA/CA	250 aMW Base, additional 200 MW if cost effective programs can be found in RFP

DSM Class 3 & 4 were not evaluated in the 2004 IRP analysis

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Modeling Plan for 2006 IRP

Pete Warnken
Ken Dragoon
Jeff Bumgarner

Planning Drivers and Objectives

Oregon Acknowledgement Order requirements

- **New Action Item #4.** *For the next IRP or Action Plan, develop supply curves for various types of Class 1 DSM resources, model them as portfolio options that compete with supply-side options, and analyze cost and risk reduction benefits. Evaluate this approach for Class 2 DSM resources and recommend whether this approach is preferable to the current decrement approach.*
- **New Requirement #1.** *Conduct an economic analysis of achievable Class 1 and Class 2 DSM measures in PacifiCorp's service area over the IRP study period, and assess how the Company's base and planned programs compare with the cost-effective amounts determined in the study.*
- **New Requirement #2.** *Determine the expected load reductions from Class 3 DSM programs such as new interruptible contracts and the Energy Exchange at various prices, and model these programs as portfolio options that compete with supply side options.*
- **New Requirement #3 (Excerpt).** *Evaluate loss of load probability, expected unserved energy and worst-case unserved energy, as well as Class 3 DSM alternatives for meeting unserved energy.*

Planning Drivers and Objectives, Continued

DSM Analytical Objective for 2006 IRP: *Evaluate DSM programs as competitors to supply-side alternatives, where practical, using the Capacity Expansion Model (CEM)*

- Research and benchmarking effort
  - Conduct testing to determine CEM behavior and sensitivities with respect to DSM resources
  - Gather/analyze supply curve information and optimization techniques from other organizations
- Synthesize Class 1 & Class 3 supply curves from RFP data, available program information, and outside data
  - Goal is to formulate DSM resources that can be evaluated on a comparable basis with respect to supply-side resources (cost and risk attributes)
  - Seeking recommendations from workshop participants on how to address resource comparability issues

Modeling Approach Overview

- Develop Class 1 & Class 3 proxy supply curve of programs consisting of program characterization, capacity, and program costs ($/kW/yr, $/MWh).
- Adjust costs (downward) by amounts not accounted for in models where appropriate for Class 1 & 3 DSM, e.g.:
  - Transmission and Distribution losses (CEM/PaR)
  - Lower operating reserve requirements (CEM)
  - Lower planning reserve margin requirements (possibly PaR)
  - Capital deferral of plant and/or transmission (PaR)
- Add programs with adjusted program costs to CEM along with other resources for selection in least cost portfolios
- Develop candidate portfolios for detailed study informed by selection of DSM programs determined by CEM in scenario runs
- Initial plan is to use decrement approach for Class 2 modeling, investigate value of supply curve vs decrement going forward

Program Assumptions for 2006 IRP

DSM program assumptions for 2006 IRP:

- **Class 1 & 3 DSM** – will be based on proxy supply curves to arrive at program sizes and costs
- **Class 2 DSM** – will use currently established decrement process
- **Class 4 DSM** – will not be modeled as a resource within the IRP process
- PacifiCorp is planning an in-depth market study of DSM potential
  - Results will not be available for this IRP cycle

Program Assumptions - Class 1

- Program Descriptions

  Cat 1: Fully dispatchable programs, 10 minute or less response, up to 87 hours annually (e.g. air conditioning, water heating, pool pumps, etc.)

  Cat 2: Fully dispatchable programs, over 10 minute response, up to 87 hours annually

  Cat 3: Scheduled firm up to 170 hours annually (e.g. agricultural loads)

  Cat 4:Scheduled firm at 360 or more hours annually (e.g. commercial energy storage)

- Basis for Cost and Quantity Assumptions
  - Costs are based on current programs, benchmarking and DSM RFP information. Quantity blocks to be modeled are believed achievable in some of the load centers however are subject to further refinement through potential study.
- Sample program costs and quantity to be modeled*:

  Cat 1: $60/kw/yr 40MW → $75/kw/yr 40MW → $95/kw/yr 40MW

  Cat 2: $45/kw/yr 40 MW → $60/kw/yr 40MW → $75/kw/yr 40MW

  Cat 3: $30/kw/yr 40MW → $45/kw/yr 40MW → $60/kw/yr 40MW

  Cat 4: $95/kw/yr 40MW → $110/kw/yr 40MW

  *Will be refined after further analysis of available program data and development of proxy supply curves. No assumptions made at this point as to whether, at these or similar prices, the CEM would select Class 1 resources over other available supply-side resource options.
- Program scenarios will be run within various locations

Program Assumptions - Class 2

- Program Descriptions

  Cat 1: Residential Cooling - 7 to 12% load shape (East vs. West)

  Cat 2: Commercial Cooling - 24% load shape

  Cat 3: Commercial Lighting - 51% load shape

  Cat 4: System Load Shape/Industrial - 65 to 67% load shape (East vs. West)
- Basis for Cost and Quantity Assumptions
  - Decrement process for cost-effectiveness limit, proxy for quantity (Same approach used for 2004 IRP)
- Current estimates of program costs and quantity:
  - Cost-effectiveness limits to be determined through modeling
  - Select reasonable MW block sizes
  - Blocks represent proxies for likely available loads at various load shapes
- Run program scenarios for various locations

Program Assumptions - Class 3

- Program Descriptions
  - Cat 1: Web based commercial and industrial energy bid program (hour ahead, day ahead, week ahead – near term). Examples include market price protection programs such as Energy Exchange
  - Cat 2: Residential and commercial challenge programs (seasonal offers with longer lead times and fixed pricing – greater price risk). Programs such as Customer Energy Challenge
  - Cat 3: New interruptible contract – need to further define
  - Cat 4: Others?
- Basis for Cost and Quantity Assumptions
  - Cat 1: Energy Exchange program performance data
  - Cat 2: Program performance data
  - Cat 3: TBD
- Current estimates of program costs and quantity:
  - Work in progress
- Program scenarios will be run within various locations

Summary of 2006 Program Assumptions

	DSM Class 1	DSM Class 2	DSM Class 3
Program Definition	1) Dispatch <= 87 hrs < 10 min: 2) Dispatch <=87 hrs > 10 min: 3) Scheduled firm <=170 hrs: 4) Scheduled firm =>360 hrs:	1) Res Cool 7-12% LS 2) Com Cool 24% LS 3) Com Lgt 51% LS 4) Ind/Sys 65-67% LS	1) Bid program 2) Challenge 3) Interruptible 4) Others?
Quantities and Prices	40MW blocks at the following prices *(sample values shown)* 1) $60/kW/yr - $75/kW/yr - $95/kW/yr: 2) $45/kW/yr - $60/kW/yr - $75/kW/yr 3) $30/kW/yr - $45/kW/yr - $60/kW/yr 4) $95/kW/yr - $110/kW/yr	Reasonable block sizes Prices determined by modeling.	TBD
Basis for Price/Quantity Assumptions	Costs will be based on current experience, benchmarking and current 2005 DSM RFP prices. Quantities are proxy figures until better data is available.	Use decrement methodology to solve for cost-effectiveness limit, proxies for quantities representing likely available loads at various load shapes.	Prior program performance, benchmarking, etc.
Modeling Methodology	Program costs, adjusted by non-modeled attributes (eg, T&D costs, reserves, etc.), and entered into CEM on same basis as supply-side resources. Each program scenario will be modeled at various locations.	Using the Preferred Portfolio, determine value of programs by decrementing the load forecast in the PaR model with zero program costs at various load shapes and quantities to determine the reduction delta for PVRR. Each program scenario will be modeled at various locations.	Same as Class 1, adjusted for diversity factor e.g. probable % of available load (non-firm loads).

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2005 DSM RFP Summary and Challenges

Jeff Bumgarner

2005 DSM RFP Summary and Challenges

- Like the 2003 DSM RFP we think we've found a few jewels
- New programs should help round out existing portfolio coverage
- Specificity of resource options was helpful in making this happen
  - Has led to more competing/competitive program proposals
  - Has provided a couple key program concepts needed in achieving targets
- Challenges
  - Vendor market assessments are varied and overall appear optimistic
  - Class 1 resource prices vary widely as do thoughts on operational flexibility
  - Pricing appears higher than that received through 2003 DSM RFP
  - Less low hanging fruit, may be partially driving costs

Next Steps

- April 5, 2006 – Technical Workshops on the CO_2 Cost Adder and IGCC (Includes Wyoming Teleconference)
- April 6, 2006 – Technical Workshop on Transmission (Includes Wyoming Teleconference)
- April 20, 2006 – General Public Meeting