Demand Side Management and Demand Response

Energy & Telecommunications Interim Committee

5/2/2008

Bill Thomas
Manager Regulatory Support Services
Regulatory Support Services

- Deb Young – Consultant
  - 22 years utility experience
  - 19 yrs DSM experience

- Connie Moran – Administrative Specialist
  - 26 years utility experience
  - 15 yrs DSM experience

- John Campbell – Engineer
  - 7 years utility experience
  - 20 years DSM experience

- Dave Bausch – Engineer
  - 22 years utility experience
  - 14 years DSM experience

- Bill Thomas – Manager
  - 24 years utility experience
  - 13 years DSM experience
DSM Program Implementation Contractors

Montana Department of Health and Human Services

7 Human Resource Development Councils (multiple subcontractors)
DSM Strategy

• Acquire cost-effective DSM resources at or below avoided cost
  ▪ Energy can be saved for less than it can be purchased
  ▪ Levelized cost of DSM is approximately $20-25/MWH

• Annual Electric DSM Goal = 5.0 MW

• Resource intensive.
  ▪ DSM acquired in small increments from high volumes of customers
  ▪ Example: approaching 500,000 CFL mark since January 2005

• Multiple mechanisms used:
  ▪ On site inspections (audits)
  ▪ Rebates/incentives
  ▪ Marketing & promotion
  ▪ Trade Shows, Community Events, Association meetings
  ▪ Direct contact
  ▪ Certifications & preferred installation contractors

• Support development of trade ally infrastructure
• Mix of DSM and USB funded activities for all customer sectors.
DSM Strategy

• Broad mix of programs and technologies
  - From Single Compact Fluorescent Light bulb (CFL) with E+ Mail-in Energy Usage Survey ... to comprehensive design and measures at Bozeman Public Library with E+ Business Partners.
  - From USB-funded Commercial Lighting Rebates for Choice Customer ... to DSM-funded air-handling system renovation at the Mitchell Building in Helena.

• Primary sales tool is persuasion
• Primary measurement tool is estimation
**DSM Programs**

- **Electric DSM Programs**
  - Available to residential, commercial, industrial, irrigation customers
  - Broad program applicability, coverage and eligibility
  - 2008 budget = $5-6 Million (or higher depending on consumer interest)

- **Natural Gas DSM Programs**
  - Available to residential customers
  - 2008 budget = $1 Million
  - Future expansion to commercial natural gas customers is expected in 2009
**DSM Programs**

**USB Programs**
- E+ Energy Audit for Home
- E+ Energy Appraisal for Business
- E+ Irrigator Program
- E+ Free Weatherization
- E+ Renewable Energy

**Default Supply DSM Programs**
- E+ Home Lighting
- E+ Commercial Lighting
- E+ Residential New Construction
- E+ Electric Motors
- E+ Business Partners
- Northwest Energy Efficiency Alliance
  - Market transformation
  - Integrated design lab
  - Building operator training and certification
  - Sector initiatives
  - Regional marketing
  - Consultations & analysis
- Natural Gas Residential Savings
Missoula Green Blocks project

- Cooperative project with City of Missoula
  - Mayor’s Advisory Council on Climate and Sustainability
  - Mountain Water Company
  - Allied Waste
- Four 2-square block areas selected for weatherization
- Range of housing vintages
- Services provided at no direct charge to participants
- Home Energy Audit
- Full weatherization (insulation, infiltration reduction, programmable thermostats, tank/pipe insulation, CFLs, water conservation measures, waste management assistance)
- Follow-up evaluation
Future Developments

Advanced Metering Infrastructure ("Smart Metering")
Demand Response Programs
Smart Grid
Demand Response

What is it?

Demand Side strategy to implement programs that seek to lower peak demand during specific, limited periods by temporarily curtailing electric usage or shifting usage to other periods.

These programs typically use communication and control technologies to temporarily reduce demand in specific energy-using devices or systems.

Types of Demand Response Programs

- Time of Use Pricing
- Real-time pricing
- Critical peak pricing
- Direct Load Control
- Curtailment / interruptible load
Demand Response

Forces and trends

- 2005 Energy Policy Act
  - Amends PURPA standard
  - Requires Smart Metering and time-based pricing be offered
  - States have option to adopt/reject the amended standard
- Rising power costs, West cost power crisis and Northeast rolling blackouts created impetus
- Growing interest nationally in Advanced Metering Infrastructure (AMI) and the added services it enables
  - Some large utility systems are either implementing or experimenting
- Regulators’ interest in keeping up with national trends
  - Wants TOU Rates investigated
  - Wants AMI and associated capabilities tested
  - Wants to insure we are “...getting the most from the existing system...”
- Economics are highly variable
  - Sensitive to customer/load density and operations savings

Investigations to date:

- Direct Load Control - analysis & modeling
- Residential Time-of-Use Pilot Project – analysis & modeling
  - Pilot project will not yield sufficient information for decision-making
  - Full NWE system study is indicated ... Included in 2008 Electric Resource Plan
Advanced Metering Infrastructure ("Smart Metering")
Smart Metering

Smart Metering Capabilities (enabled by interval meter reading):

- **Price-Based Options**
  - Time-of-use (TOU)
  - Real-time pricing (RTP)
  - Critical Peak Pricing (CPP)

- **Incentive-Based Programs**
  - Direct load control
  - Interruptible/Curtailable Service
  - Demand Bidding/Buyback Programs
  - Emergency DR Programs
  - Capacity Market Programs
**Smart Grid**

**Smart Grid - Potential Capabilities & Benefits:**

1. Detect and address emerging problems before they impact service.
2. Make protective relaying be the last line of defense, not the only defense.
3. Respond to local and system-wide inputs and monitor and report on broader system problems.
4. Incorporate extensive measurements, rapid communications, centralized advanced diagnostics, and feedback control that quickly return the system to a stable state after interruptions or disturbances.
5. Automatically adapt protective systems to accommodate changing system conditions.
6. Re-route power flows, change load patterns, improve voltage profiles, and take other corrective steps within seconds of detecting a problem.
7. Enable loads and distributed resources to participate in operations.
8. Be inherently designed and operated with reliability and security as key factors.
9. Provide system operators with advanced visualization tools to enable them to provide the essential human oversight.
Smart Grid

Smart Grid - Potential Capabilities & Benefits:

- Remote connect/disconnect
- Reduced losses
- Better/faster outage detection and service restoration
- Cost savings due to automated operation, predictive maintenance, self-healing, and reduced outages
- Increased asset utilization.
**Costs**

- Communications system – Radio, PLC, telephone
- Meters with interval read capability
- I/T requirements – data management
- Billing system enhancements
- Customer premises equipment
  - Thermostats
  - Displays
  - Circuit breakers with radio interface (ZigBee, WiFi, etc.)
  - Disconnect devices
- Sensors & switches
- Operations & Maintenance
**Issues & Concerns**

- Service territory geography
  - Customer density
  - Load density
  - Line miles – transmission & distribution
- Energy supply economics
  - On-peak versus off-peak prices
- Amount of “shiftable” load ... (the “Demand Response” effect)
  - Air conditioning saturation
  - Amount of curtailable load
  - Willingness & ability of participants to change lifestyle
- Voluntary versus mandatory programs
- Operational savings achievable
- Previous AMR deployment
- Interoperability & “future proofing”
Smart Metering/Smart Grid

Request for Proposal – Scope of Work

Task 1: Project Plan
Task 2: Project Management
Task 3: Energy End Use Study – Electric and Natural Gas
Task 4: AMI Technology Evaluation and Selection
Task 5: Evaluation of Potential DR Activities/Programs
Task 6: AMI/DR Economic Analysis (Costs & Benefits)
Task 7: Undesirable Effects of AMI
Task 8: Special Analysis Scenario for Large Customers
Task 9: Smart Grid - Transmission and Distribution
Task 10: Project Final Report
Questions & Comments

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