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# Expose Yourself: Demand Response and Dynamic Pricing for Federal Facilities

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# Outline

- Demand response defined
- Overview of DR program types (inc. dynamic pricing)
- Key DR trends in U.S.
- Federal participation has traditionally been low – why?
- Good news (and suggestions) re feds and DR
- Case Study: GSA's Moorhead F.O.B.

# Demand Response

- Def.: A short-term decrease in electrical consumption by end-use customers due to either increased electricity prices or incentive payments
  - Incentive payments could be triggered by high wholesale market prices or compromised grid reliability
- DR participation can be either through load curtailment (short-term conservation) or self-generation

# Overview of DR Program Types

- Reliability-based: “emergency” and “capacity” programs
  - Most common: “interruptible/curtailable” rates
    - Oldest variety: also called “active load management”
  - Also includes direct load control
  - Program calls usu. require mandatory response
- Price-based: “economic” programs
  - Participation usually voluntary
  - Day-of and day-ahead options common
  - Demand bidding programs
  - Also “dynamic pricing”: real-time, day-ahead, “block and swing,” and “critical peak” pricing

# Key DR Trends in U.S.

- DR resource participation in capacity auctions
  - Large DR participation in New England ISO and PJM
  - Attractive prices, usu. > \$50,000/MW
- Dynamic pricing has increased
  - RTP is large customer default in about 12 states
  - And partial RTP is popular in others (e.g., AL and GA Power)
  - “Critical peak pricing” is default for > 200 kW CA accounts
- Automated DR (“Auto-DR”) is on the rise
  - load drop or self-generation routine triggered automatically by external signal (e.g., XML)
  - Signal can indicate market price threshold (e.g., 25¢/kWh) or that utility is instigating DR program event

# Bottom Line

- DR is growing in the U.S. and will continue to because it's getting:
  - a) easier
  - b) more lucrative
- Also, building power plants is getting more and more difficult and expensive

# Federal participation has traditionally been poor – why?

- Classic “split incentive” problem
  - Who benefits when federal facility saves \$ w/ DR?
  - And can fed. facility even take proceeds?
- Lack of push in legislation or EOs
  - EE & RE goals are strong, but DR/LM not addressed
- Ignorance – partly due to two issues above
  - “Our loads are flat so it doesn’t make sense”
  - “It’s too risky”
- Variable returns, esp. w/ economic programs
  - This hinders DR in guaranteed savings ESPCs, UESCs
- Lack of proper retail tariffs or programs
  - Price responsiveness not rewarded under fixed, flat retail prices
  - In some cases retail DR programs may be limited or unavailable

# However, things are looking up ...

- DLA-Energy's "Master Agreements"
  - Simplifies contracting with independent (non-utility) "curtailment service providers" (CSPs)
  - > 50 sites have signed up in less than two years
- Legislative help
  - 2010 NDAA gave explicit okay to DoD facilities to contract with independent CSPs
- Other good signs
  - GSA pursuing DR more actively
  - FEMP's listing of DR programs: [www1.eere.energy.gov/femp/financing/energyincentiveprograms](http://www1.eere.energy.gov/femp/financing/energyincentiveprograms)
  - This panel – unprecedented at GovEnergy?

# How could federal participation be increased further?

- Assure savings retention
  - Make 100% savings retention law (EPACT-'05) a reality
- Encourage in EOs and legislation
  - Currently there's no mention of DR
- Strong push against fixed, flat pricing
  - Fed. facilities should not be paying for these insurance policies if they have any ability to respond to prices – U.S. gov't. is “self-insured”

# Case Study: GSA's Moorhead FOB

- 785,000 sq. ft., Pittsburgh, PA
- Cooling: two 600-ton centrifugal chillers
- Load response capability: 39 ice storage tanks with ~ 7,000 ton-hours of thermal energy storage (TES) capability
  - Maximum discharge rate: ~ 740 tons (~ 19 tons per tank)



# Moorhead Before (till 2008)

- 3<sup>rd</sup>-party supply contract for fixed, flat-priced electricity
- Ice storage operated as back-up if chiller went down and as supplement to cooling plant on summer days
  - Note: cooling with ice storage requires 25% more energy, on average, than standard chiller operation
- Local utility had rate rider for ice storage but it offered little value and Moorhead wasn't on it
  - only allowed higher nighttime peaks (b/c of TES operation) to be overridden by facilities' daytime peaks
- TES's value: was likely reducing PJM's peak capacity charges some, but that benefit probably canceled out by higher overall cost to operate

# Moorhead After (since 2008)

- 3<sup>rd</sup>-party supply contract for electricity indexed to day-ahead PJM market
- Goal is to avoid PJM capacity charges (set by demand during five “peak load contribution” hours) and generally avoid high prices in PJM market
- Ice storage operated in one of three modes, depending on demand level in PJM territory (indicated by daily e-mail):
  - Green – melt runs throughout business day
  - Silver – melt runs 12-5, complemented by operation of one chiller, if needed
  - Gold – melt runs 1:30-5:00 at max discharge rate (~ 740 tons/hr.); chiller use minimized (one or none)

# Moorhead Results

- Savings: ~ \$235K over two years (~ 14%) in savings relative to fixed, flat price option
- Energy Penalty?
  - Likely some, b/c air conditioning with ice is 25% more energy-intensive
  - Unadjusted comparisons showed about 5-10% year-over-year increases in electricity from 2007 to 2008 (for summer months only)
  - Confounding variable is additional space that came on-line over this period

# Next Steps for Moorhead

- Increased metering and data acquisition system
  - Should assist operators in fine-tuning strategy and also help energy buyers more accurately match purchases to loads
- Add tanks?
  - Moorhead has room for 4-6 more tanks
  - This would raise maximum ice discharge rate to roughly 850 tons – might permit shut-down of both chillers on hottest afternoons

# Take-Aways

- Numerous types of DR opportunities are available to federal customers
  - Ranging from voluntary to mandatory programs and including dynamic pricing options
- If you have *any* ability to respond, you should be taking advantage
  - And contracting for fixed, flat pricing is bad idea since gov't. has a diversified portfolio of facilities
- There are numerous tools to help you
  - DLA (Larry), GSA, FEMP (website), etc.