DR as Ancillary Services and Load Research.
A potential love story…

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Western Load Research Association
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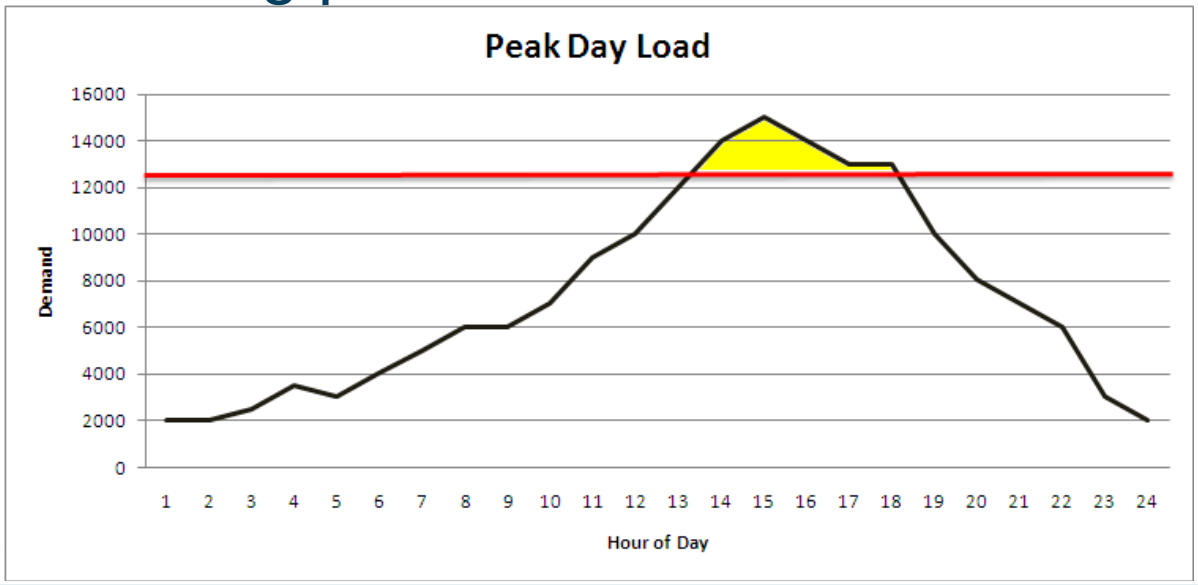
Outline

- What is AC Demand Response?
- What are Ancillary Services?
- Why DR as Ancillary Services
- Challenges
- Current KEMA Research
- Load Research and DR? The courtship

Air Conditioning Demand Response

- What is Demand Response?
- Using switches on air conditioners to temporarily shut them off
- Millions of ACs, shut down a percentage to curtail load during peaks



“Ancillary Services”

- Operational reserve “services” provided by generator units
  - Non-spinning reserves
    - Typically filled by gas turbines ramped up when needed
    - <10 minute response time
    - Kept idle & available until needed
  - Spinning Reserves
    - Gas turbines, *spinning,* but not generating
    - <10 *seconds* response time
    - Required available for 90 minutes, usually replaced by non-spin units within 10-20

Why ACs Might Make Good Reserves

- They're "spinning"
- They're dispatchable
  - Millions already equipped with switches
  - Millions more that could be (AMI-controlled?)
- Customers would be happier with daily/weekly 10-20 minute interruptions instead of rare 4-6 hour interruptions
  - 0.5 degree increase instead of 6-8 degrees increase
- The value of spinning reserves are <u>availablility</u> rather than <u>deployment</u>
- ACs have low costs for DR program when not deployed

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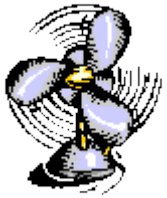
Challenges to Overcome

- Non-spin
  - ☑ 10 Minute dispatch (they run!)
  - ☑ Ability to calculate settlement (ex post)
    - Need sufficient # of participating AC units on system
  - ☐ Ability to forecast in real-time or near real-time

- Spin



  - ☑ Spinning
  - ☑ 10-second dispatch [see CERTS study]
  - ☑ Settlement (same as non-spin)
  - ☐ Forecast* - With a 10-minute window, we can adjust with other non-spin reserves. With a 10-second window, it's all on the line.

Studies – LBNL CERTS

- LBNL CERTS 2005
  - 50 units on one feeder
  - Demonstrated feasibility of 10-second response
- LBNL CERTS 2006, 2007
  - Continued feasibility demonstration on one feeder with 400 participating units
  - Preliminary development of SCADA data methodologies
- LBNL CERT 2008
  - Expanded to 4 feeders, 1400 units
  - Refined short-duration interruption SCADA methodologies
  - Begin exploring real-time unit-level data options and methods

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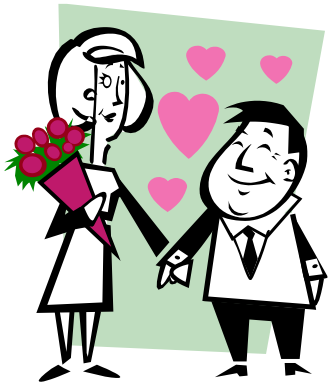
Studies – SCE PLP

- 2000+ units on a single base on two feeders
- Multiple levels of data
  - SCADA Feeder level 8-second
  - Real-time unit-level data from 500 units
  - Hourly temperature data
- Refining Ex-post settlement techniques on SCADA data
- Developing real-time monitoring/forecasting techniques using LR sample design approaches

How far are we?



- We see the potential…
- Proof of concept complete (CERTS study)
- Continuing to refine algorithms for
  - Short duration ex-post settlement
  - Long duration ex-post settlement
  - Sampling and projection strategies for real-time unit level metering
- Weekly bid of 2000 ACs into the CaISO non-spin reserve market

How far to go?

- More testing of real-time data collection options
  - AMI based vs Non-AMI based (3rd party network)
- More development of real-time forecast algorithms
  - Incorporating streams of data from multiple levels
    - SCADA
    - AMI hourly
    - AMI high frequency sample
    - Unit level

Where do “we” fit in?

- Exploring whether settlements/forecasts can be improved using site level AMI data
  - Can we leverage hourly population data to improve the projections of sampled unit level or high frequency site level data???
- Exploring high frequency AMI sample strategies
  - Use load research samples?
  - Physical limitations of the system?

Implications

Ancillary
Services
+
AC DR

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