RAP | Energy solutions for a changing world

Bridging Clean Air and Peak Demand

NARUC Webinar

Presented by Chris James

October 21, 2011

The Regulatory Assistance Project

50 State Street, Suite 3
Montpelier, VT 05602

Phone: 802-223-8199
web: www.raponline.org

Overview

- Problem definition
- Consequences of 1st solution to problem
- History
  - What's happened
  - Who's involved
- 2nd and subsequent approaches
- Good examples

Conclusions

- Pick up the phone or walk down the hall to talk with your PUC or air colleague. Experience shows it's worth it.
- Supply side resources used to relieve congestion may increase air pollution and electricity costs
- Comprehensive demand response programs that include supply and demand side resources can maintain reliability, reduce hourly electricity costs and improve air quality

Reliability

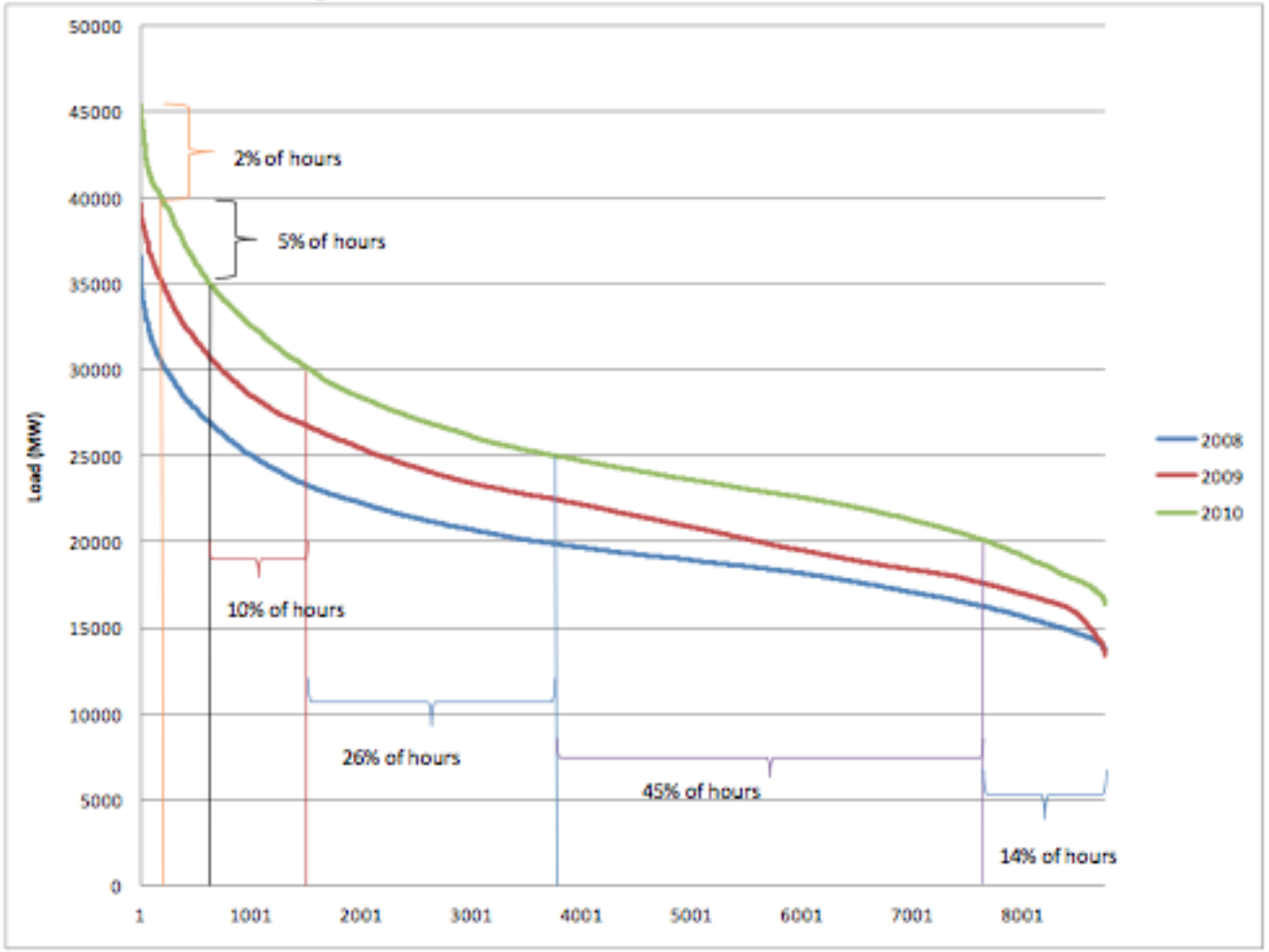
- Maintaining it is critically important to PUC
- Concern about what happens if system becomes unreliable
- Must maintain it
    - 1 day outage in 10 years: typical planning criterion

Peak Load Grows Faster than Base

- Residential and commercial sector generally grow faster than industrial
- Peak load is urban areas can lead to, or create concern for, congestion
  - How to keep the lights on in NYC, DC, Chicago?
  - If the lights go off, productivity losses can be seven figures per customer or more
    - Hospitals, banks, pharmaceutical co's can lose millions in just a few seconds. Loss of tissue samples is nearly priceless

Southwest Power Pool: Load Duration Curve

Figure I.8 Electric Load Duration Curve 2008 -2010



Crisis=Fear of Emergency

- Must avoid and prevent conditions that could lead to lights out or nearly lights out
- Enter back up generators
  - Easy solution
  - Off the shelf
  - Many manufacturers, many companies to install and service equipment
- Solved: piece of mind obtained

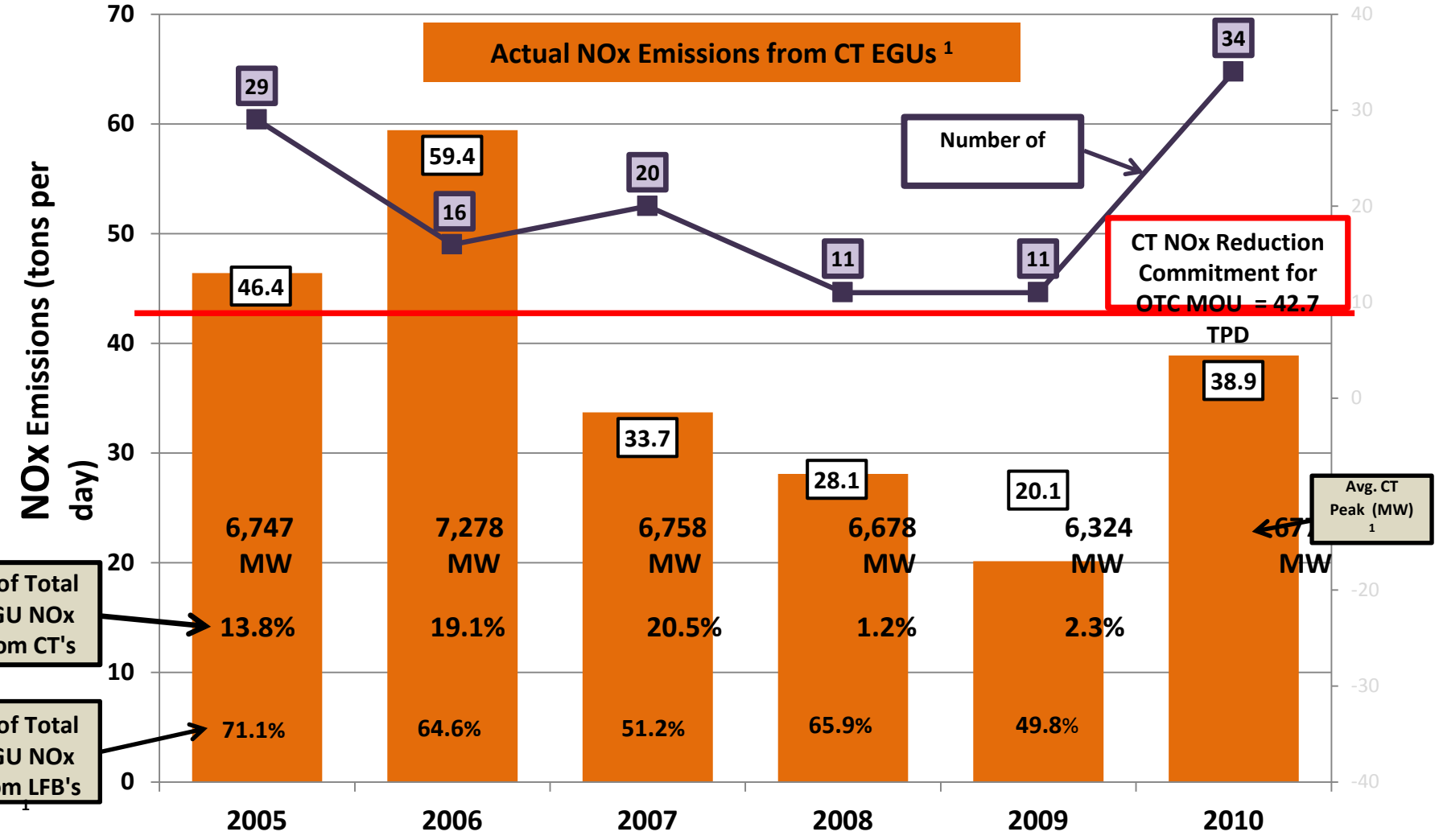
Consequences of "Simple" Solutions

- Thousands, tens of thousands of "BUGs" in each large urban area
  - We don't really know how many. Number is estimated via demographic surveys
  - Likely installed at most large commercial and industrial customers, many residences too
- High emissions per MWh
- Operation coincident with periods of unhealthy air

Air Quality Consequences of "Simple" Solution

- NO_X emissions:
  - Uncontrolled engine: up to 25 lbs/MWh
  - Compare to CCGT: @0.1 lbs/MWh
- Hours of operation
  - Low *when measured over an entire year*
  - High impact when run: peak periods of electricity demand are coincident with high concentrations of ozone and fine particles in many areas of the US: NE, Mid-Atlantic, CA, Chicago, TX

Connecticut's High Electric Demand Day (HEDD)



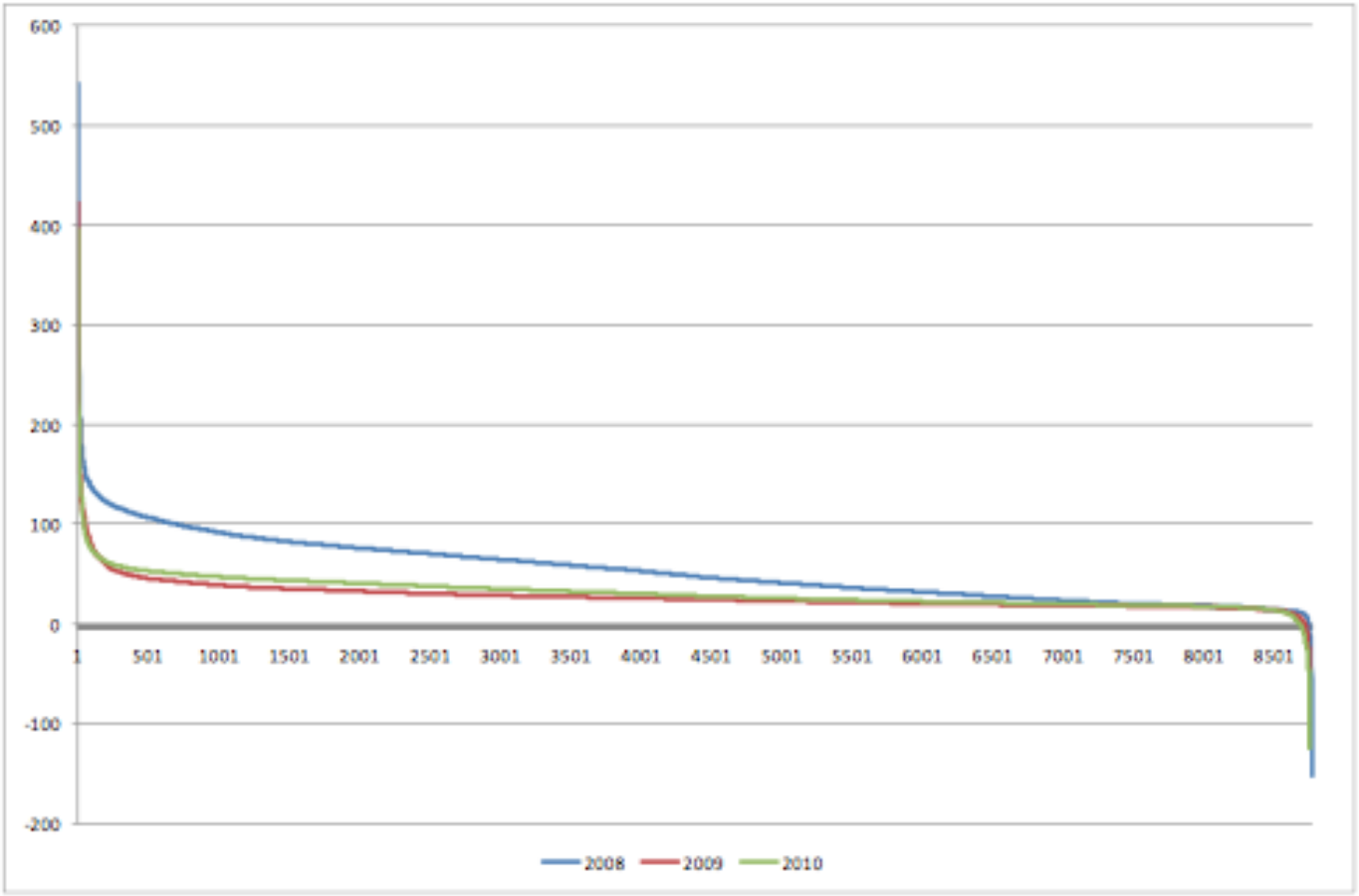
[1] Values for 2005 - 2010 are an average of the four highest Demand days in CT for that calendar year.

Units Dispatched to Meet the Highest Loads Can Also be Very Expensive

- Next slide is from SPP, but similar curve shape would be seen in other power pools, though the prices may differ.

As with Load, High Prices Also Occur During Peak 2-5% of the Hours Each Year

Figure II.8 Price Duration Curve for 2008 through 2010

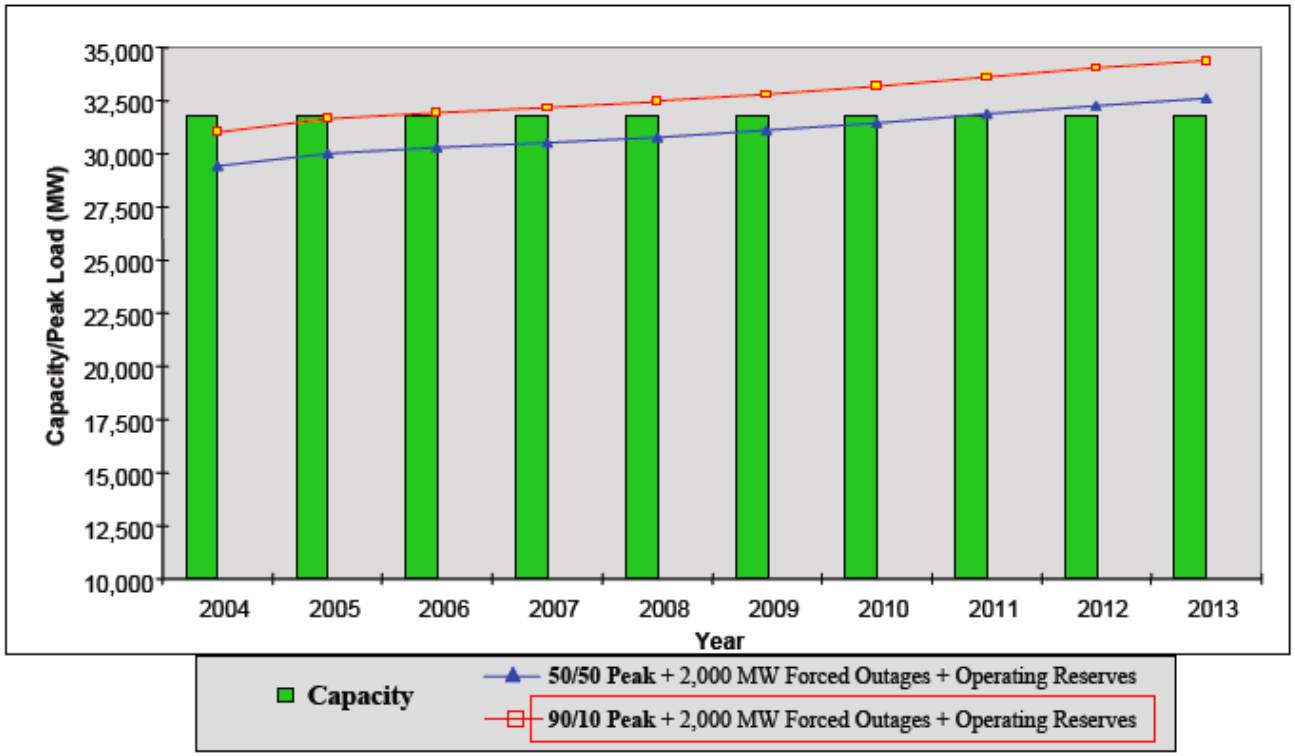


Initial Solution to Reliability Conflicted with Protecting Public Health

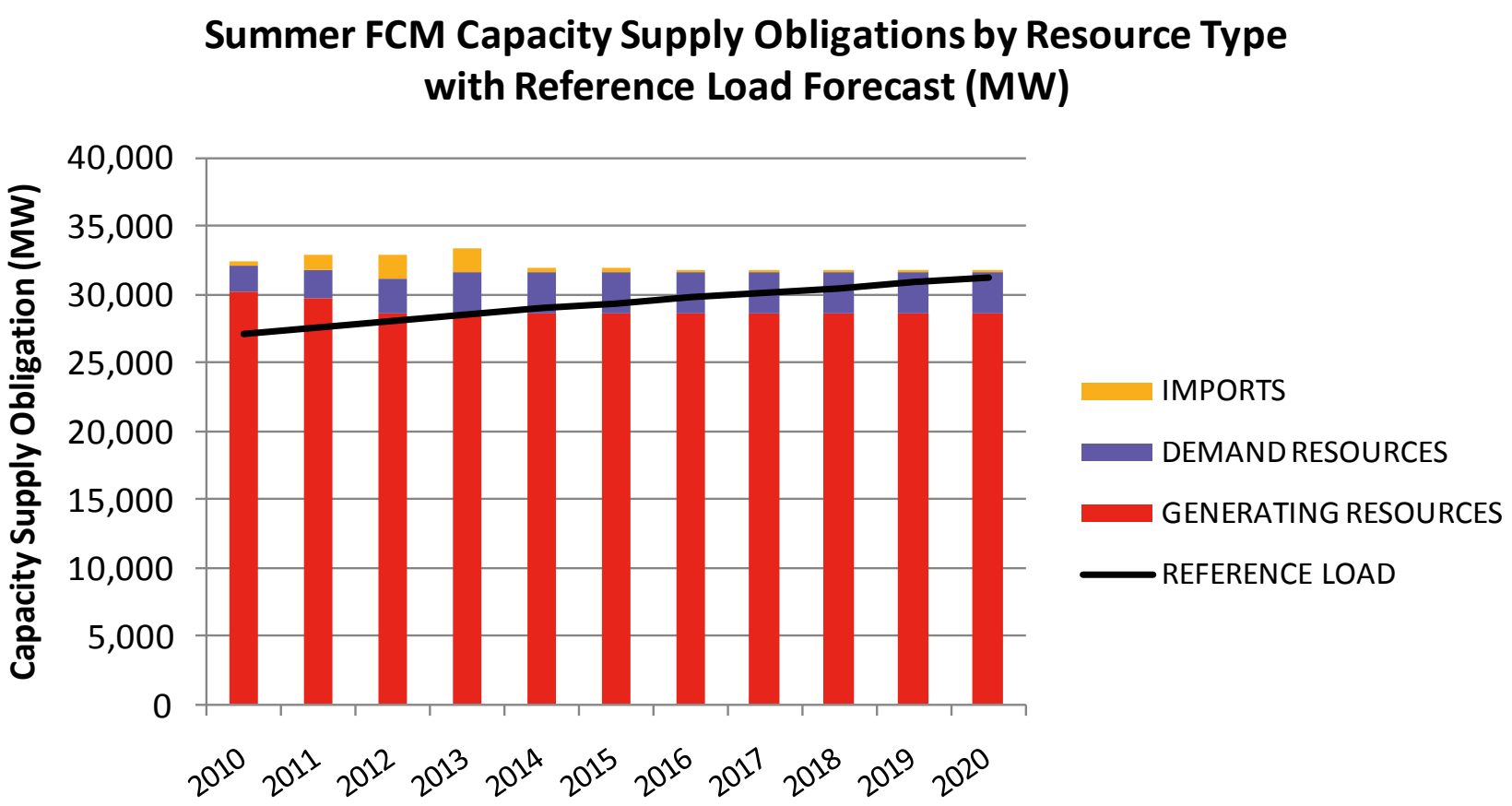
- …and during periods of high pollution episodes, sensitive populations are told to stay indoors and to run their air conditioners
- Can we do better?
- Fortunately, the answer is yes, and we're still learning
- The next two slides illustrate how the need for resources at peak periods has been characterized over time for one power pool

In 2004, Gaps Were Forecast and Future Reliability Was Questioned

New England Capacity Outlook: Overall Supply Surplus is Short-Lived



In 2011, Adequate Resources Are Forecast Through 2020



The Change Between 2004 and 2011 Occurred Because of Hard Work and Cooperation Among Regulators

- State DEPs, PUCs, RTO engaged, collaborated on information gathering
  - How many BUGs, when do they operate, how much do they emit
- Demand response program developed
  - Initially generator focused
  - ISO-NE worked with air regulators
    - DR participants notification
    - FERC filings: dates and hours run

Providing Certainty

- NEDRI, MADRI: DR collaboratives
- Permits by rule and output-based emissions standards for distributed resources
- After processes were complete, state regulations revised to limit unlicensed sources to operating only in lights out or almost lights out (<15 or 30 min) conditions

Long-Term Relations Between DEP, PUC and RTO Achieve Results

- Air regulators, environmental NGO convinced PUC, RTO that reliability solutions which feature only supply-side DR create constraints
  - Unhealthy air means “zero sum” game for air regulators. Any emissions increases must be offset or reduced. Additional emissions from small generators could lead requiring more emissions controls on larger generators, adding costs.

Demand Response Program Evolves in 2006 and Beyond

- Air regulators, PUC, RTO, environmental NGO, generator owners work to create NE forward capacity market
  - All resources comparably treated and subject to same protocols
  - DR resources include active (small generators) and passive (energy efficiency)
  - Qualified DR resources eligible for capacity payments for up to five years
  - 2011: DR (active and passive) accounts for ~10% of peak capacity in New England

NE's DR Program Has Helped to Reduce Frequency and Duration of High Hourly Electricity Prices

- 2005

- Hourly prices exceed $100/MW nearly every day May-August, and in several load zones. Many days approach $200/MW

- 2011

- Frequency of high prices reduced. Highest in CT load zone: 6/8, 7/12, 21-23 and 28. Two days with prices above $200/MW
- But, several days in Jan and Feb with prices >$100/MW, suggesting opportunities for winter DR

Lessons Learned

- Solutions are rarely “silver bullets”. “Silver buckshot” is more accurate
- It takes time to solve complex problems, especially those involving two or more regulatory agencies
- Respect each other’s authorities and constraints.

Demand Response Steps States Can Take to Improve Reliability and Clean the Air (1)

- Air agencies and PUCs work to define scope
  - How many small generators, where are they, when do they run, what are their emissions characteristics, ?
  - Role of existing EE? Can resources be targeted in areas of high load growth or congestion?
  - Many large commercial firms have DR and load management programs (e.g.,Wal-Mart)

Demand Response Steps States Can Take to Improve Reliability and Clean the Air (2)

- Determine potential for EE
  - Existing quantity?
  - Data from recent studies
- Determine potential for demand response
  - 5% of peak is a goal in some regions
- Consider the costs of traditional solutions
  - Someone pays to install and operate emissions controls
  - What other measures might be available to clean the air and keep the lights on?
    - CHP, EE, load management are all ways to reduce peak, maintain reliability
    - Each state or region is different

About RAP

The Regulatory Assistance Project (RAP) is a global, non-profit team of experts that focuses on the long-term economic and environmental sustainability of the power and natural gas sectors. RAP has deep expertise in regulatory and market policies that:

- Promote economic efficiency
- Protect the environment
- Ensure system reliability
- Allocate system benefits fairly among all consumers

Learn more about RAP at www.raponline.org

Chris James, Senior Associate
cjames@raponline.org
617-861-7684

Global
US
China
EU

The Regulatory Assistance Project
50 State Street, Suite 3
Montpelier, Vermont 05602
phone: 802-223-8199
fax: 802-223-8172
www.raponline.org