Demand Response Partnership Program

About DRPP

The Demand Response Partnership Program was created by USGBC and Environmental Defense Fund to:

→ Understand the relationship between commercial buildings and demand response

→ Drive adoption of Auto Demand Response (ADR) in commercial buildings

Who We Are

EDF ENVIRONMENTAL DEFENSE FUND®
Finding the ways that work

BERKELEY LAB
Lawrence Berkeley National Laboratory

SkippingStone™

NVEnergy™

SOUTHERN CALIFORNIA EDISON®
An EDISON INTERNATIONAL® Company

ENERLIANCE
Building Efficiency Solutions

MelRoK

Program Goals

→ Generate and maintain interest in ADR across utility territories, states and national levels

→ Reveal customer responsiveness and perceived barriers to adopting ADR

→ Quantify economic, environmental & grid benefits delivered by ADR

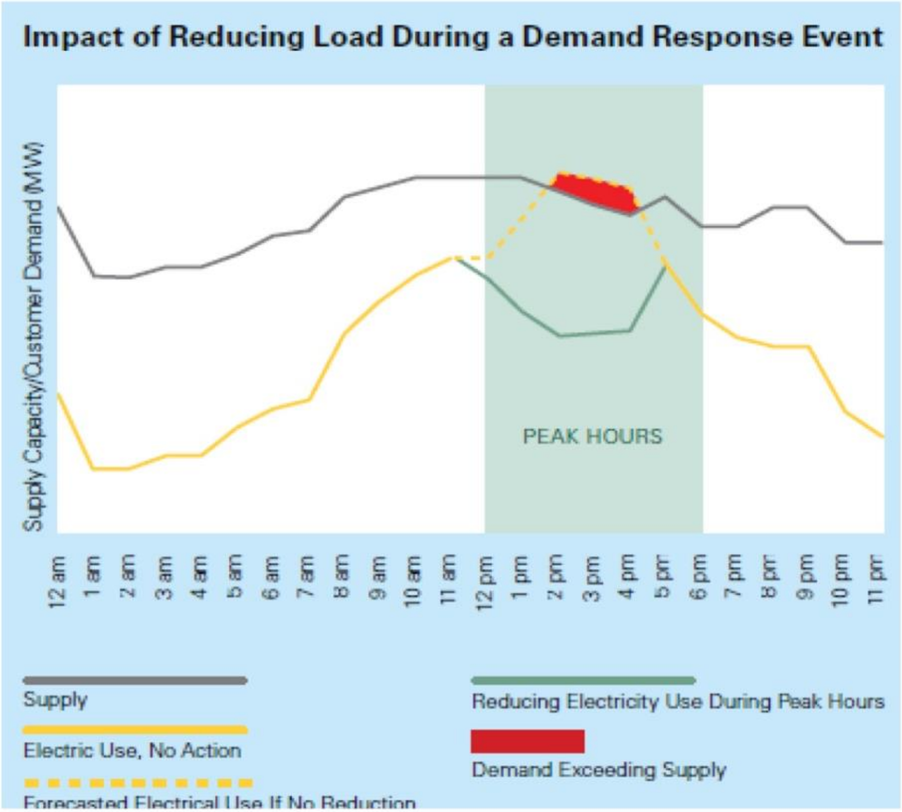
→ Serve as a foundation to bring together utilities, service providers and customers to continue the transformative journey of ADR at the company, state and national levels

What is Demand Response?

"Changes in electric usage by end-use customers from their normal consumption patterns […] when system reliability is jeopardized."

Federal Energy Regulatory Commission

Demand Response



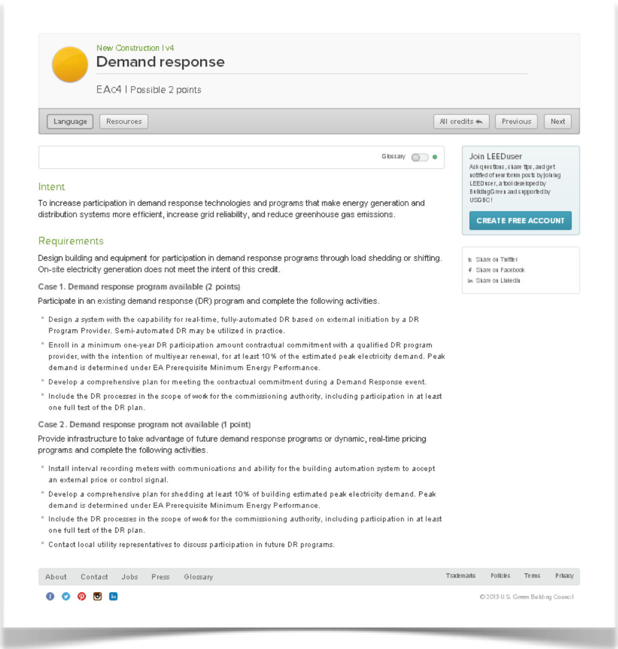
- → Customer agrees ahead of time to shed noncritical load during times of peak demand
- → Keeps the grid stable during hot summer months, prevents rotating outages

Challenges to Adoption

- → Limited number of energy-focused facility managers
- → Lack of familiarity with utility DR programs
- → Lack of specific knowledge around costs and benefits
- → Perception that demand response is disruptive
- → Concern over loss of control
- → Concerns over ongoing operational changes

Driving Market Adoption

Market Adoption


New Construction | v4

Demand response

EAc4 | Possible 2 points

Language Resources All credits Previous Next

Glossary

Intent

To increase participation in demand response technologies and programs that make energy generation and distribution systems more efficient, increase grid reliability, and reduce greenhouse gas emissions.

Requirements

Design building and equipment for participation in demand response programs through load shedding or shifting. On-site electricity generation does not meet the intent of this credit.

Case 1. Demand response program available (2 points)

Participate in an existing demand response (DR) program and complete the following activities.

- Design a system with the capability for real-time, fully-automated DR based on external initiation by a DR Program Provider. Semi-automated DR may be utilized in practice.
- Enroll in a minimum one-year DR participation amount contractual commitment with a qualified DR program provider, with the intention of multiyear renewal, for at least 10% of the estimated peak electricity demand. Peak demand is determined under EA Prerequisite Minimum Energy Performance.
- Develop a comprehensive plan for meeting the contractual commitment during a Demand Response event.
- Include the DR processes in the scope of work for the commissioning authority, including participation in at least one full test of the DR plan.

Case 2. Demand response program not available (1 point)

Provide infrastructure to take advantage of future demand response programs or dynamic, real-time pricing programs and complete the following activities.

- Install interval recording meters with communications and ability for the building automation system to accept an external price or control signal.
- Develop a comprehensive plan for shedding at least 10% of building estimated peak electricity demand. Peak demand is determined under EA Prerequisite Minimum Energy Performance.
- Include the DR processes in the scope of work for the commissioning authority, including participation in at least one full test of the DR plan.
- Contact local utility representatives to discuss participation in future DR programs.

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LEED v2009

→ Pilot Credit 8 for 1 point

LEED v4

→ EA Credit for up to 3 points

LEED Credits

Credit Requirements

→ Real-time, fully-automated demand response (ADR)

→ Minimum 1-year contractual commitment with intention of multi-year renewal

→ For the pilot credit: 10% or more of the estimated peak electricity demand (or a minimum of 20 kW, whichever is greater)

→ For the v4 credit: 10% or more of the estimated peak electricity demand

Performing Outreach

Outreach

Methodology

→ USGBC & Skipping Stone perform initial outreach

→ Target LEED registered and certified buildings

Multi-Pronged Approach

→ Emails, phone calls, in-person meetings

→ Webcasts, press releases

→ USGBC chapter resources

Outreach

Outcomes

→ 572 buildings representing 275 million sq ft selected for initial outreach

→ 133 buildings (51 million sq ft) enrolled, evaluating enrollment, or are DR ready

Performing Research

Research

Key Characteristics

→ Led by Environmental Defense Fund and Lawrence Berkeley National Lab

→ Work directly with utility sponsors to obtain data

→ Technical papers and case studies

Research

The Data

→ Building electric load

→ Weather

→ Emissions from generation resources

→ Customer survey responses

Over 3 million sq ft of Class A office space in the pipeline

Research

The Questions

- → Consumer energy use behavior and barriers to participation
- → Performance assessment and estimation in commercial buildings
- → Establishing baselines and peak load benchmarking
- → Customer financial analysis and cost-effectiveness
- → System-wide impacts, including environmental and reliability impacts

Research

Why does EDF care about smart grid?

→ Least-cost best fit

→ Clean Air Act rules for existing power plants

→ Getting to 33% RPS in California

→ Integrating distributed intermittent energy resources and electric vehicles

→ Time-of-Use residential rates

→ Consumer empowerment

→ Environmental outcomes

Research

DRPP Research Hypotheses - Environmental

→ DR is least-cost and best fit for:

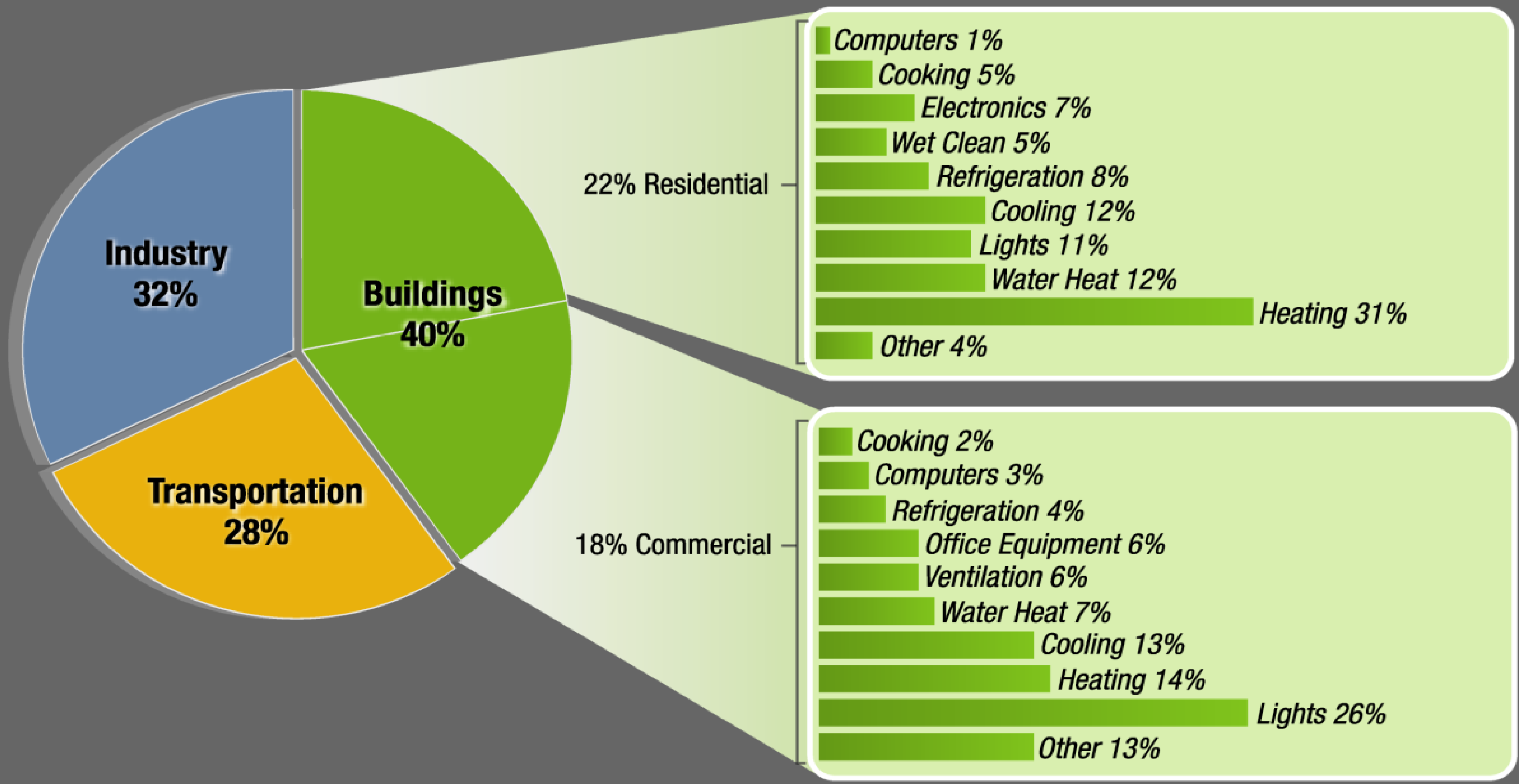
  → peak load management

  → Integrating intermittent renewable resources & electric vehicles

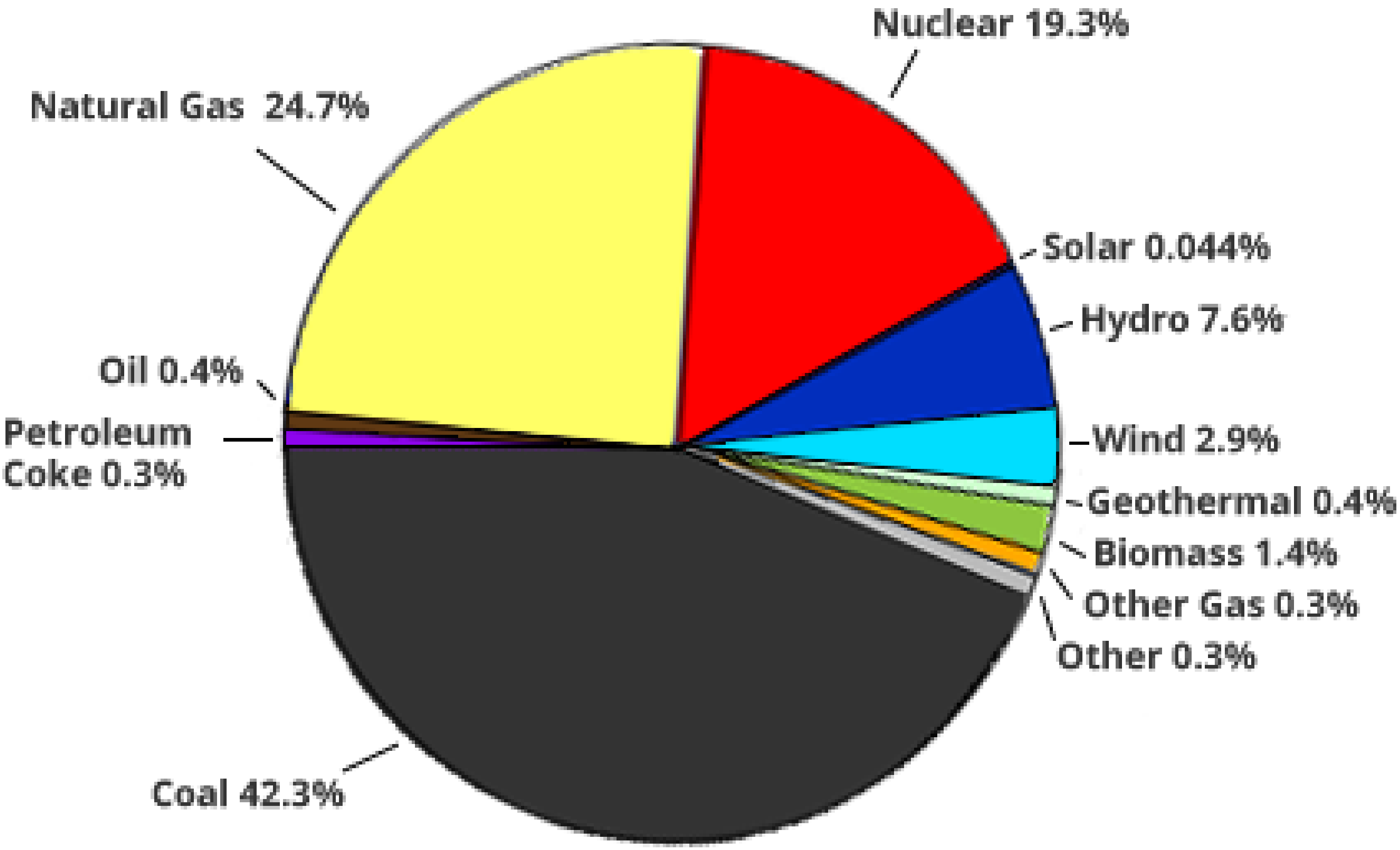
→ DR can provide significant environmental benefits – shifting demand to off-peak with cleaner generation mix

Approximately one third of the power grid load is attributable to the commercial building community.

(Source: U.S. Energy Information Administration)



Fuel Mix for U.S. Electricity



Source: http://www.epa.gov/cleanenergy/energy-and-you/index.html

Sample Emissions Calculation

http://oaspub.epa.gov/powpro/ept_pack.router

1 YOUR ANNUAL EMISSIONS

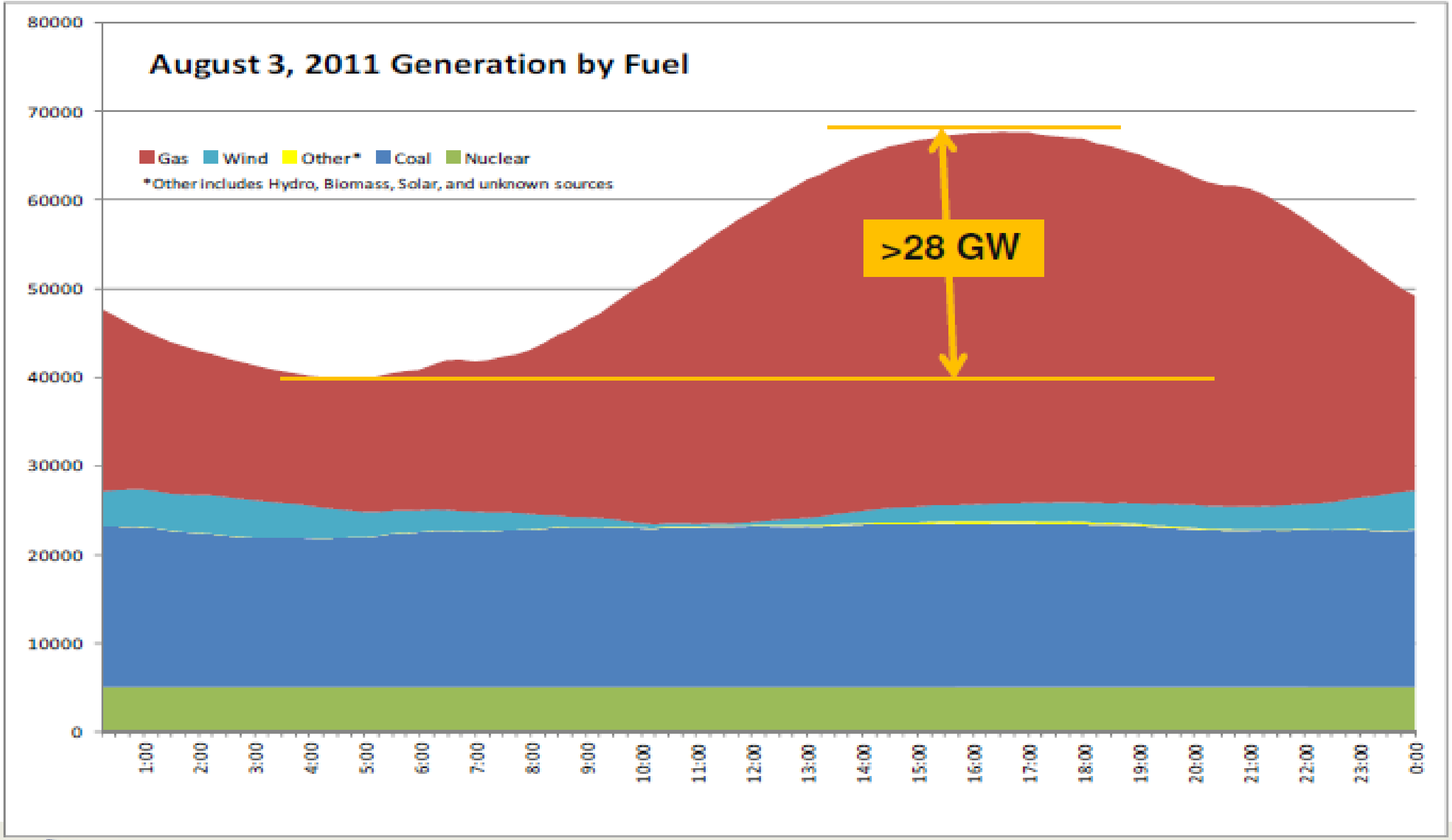
What Are My Annual Emissions?
This is an estimate of the pounds of air pollutants caused by the electricity you use in your home or business during one year.

17 pounds of nitrogen oxides

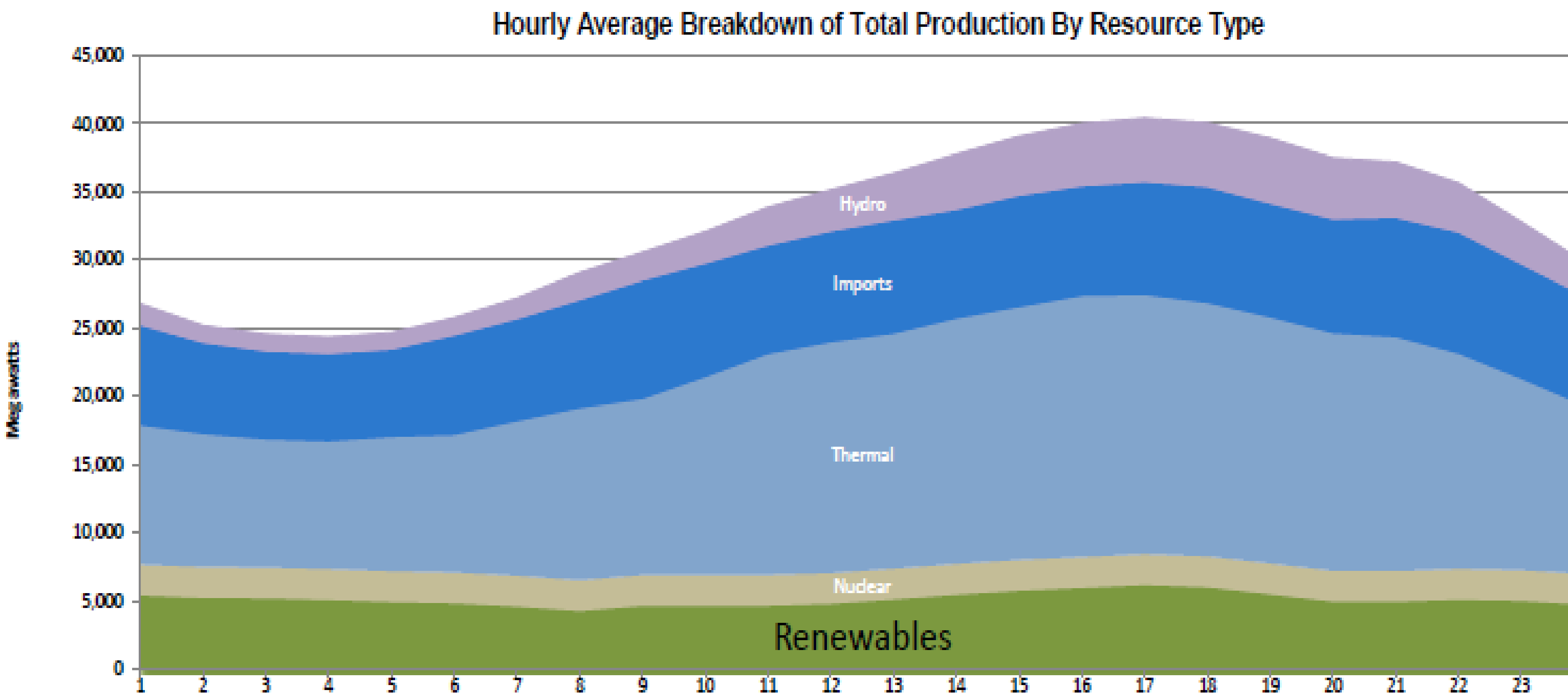
75 pounds of sulfur dioxide

19,314 pounds of carbon dioxide
Note: Your annual emissions include a grid region specific adjustment for line losses of 5.82 percent

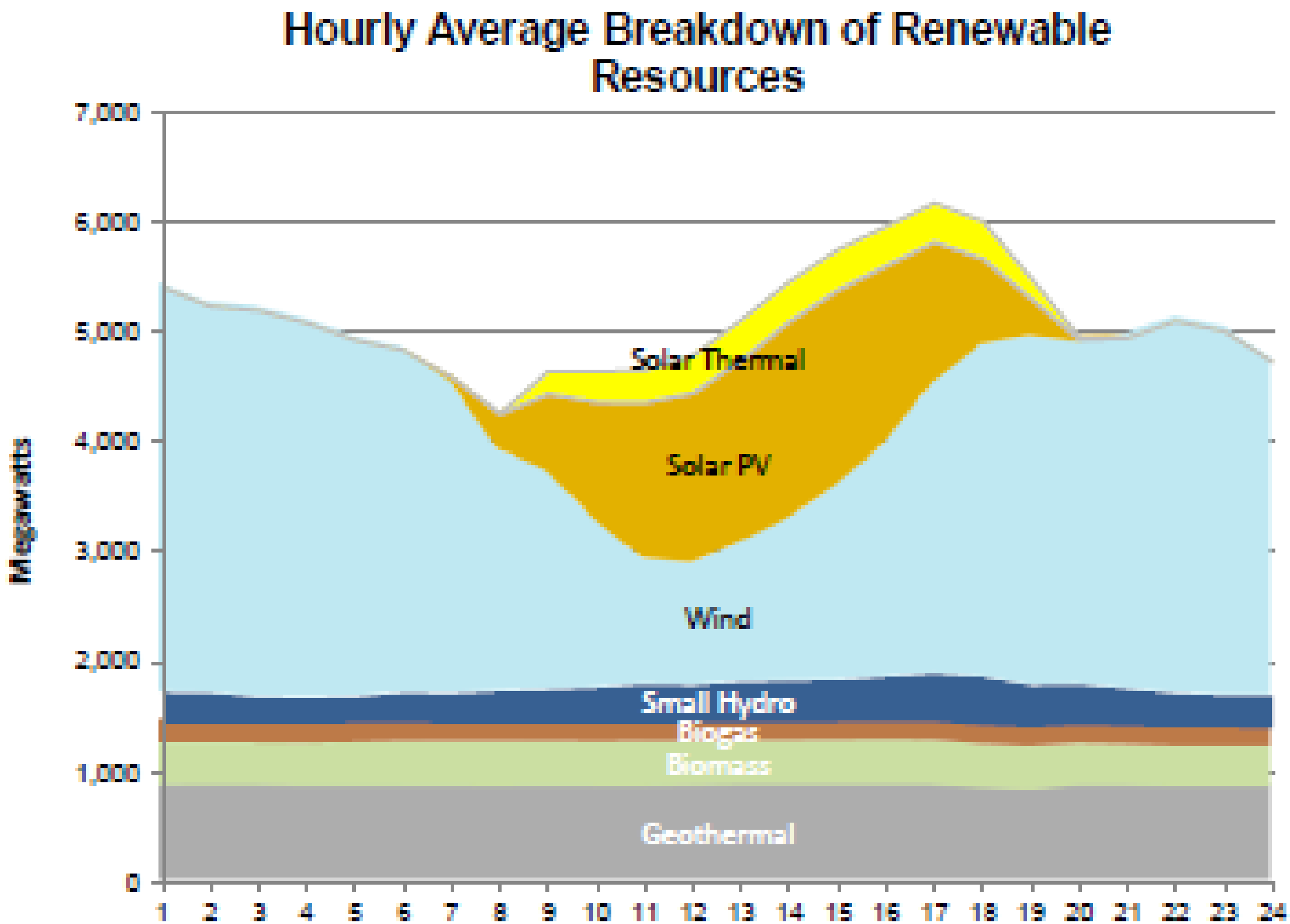
Peak Load Fuel Mix



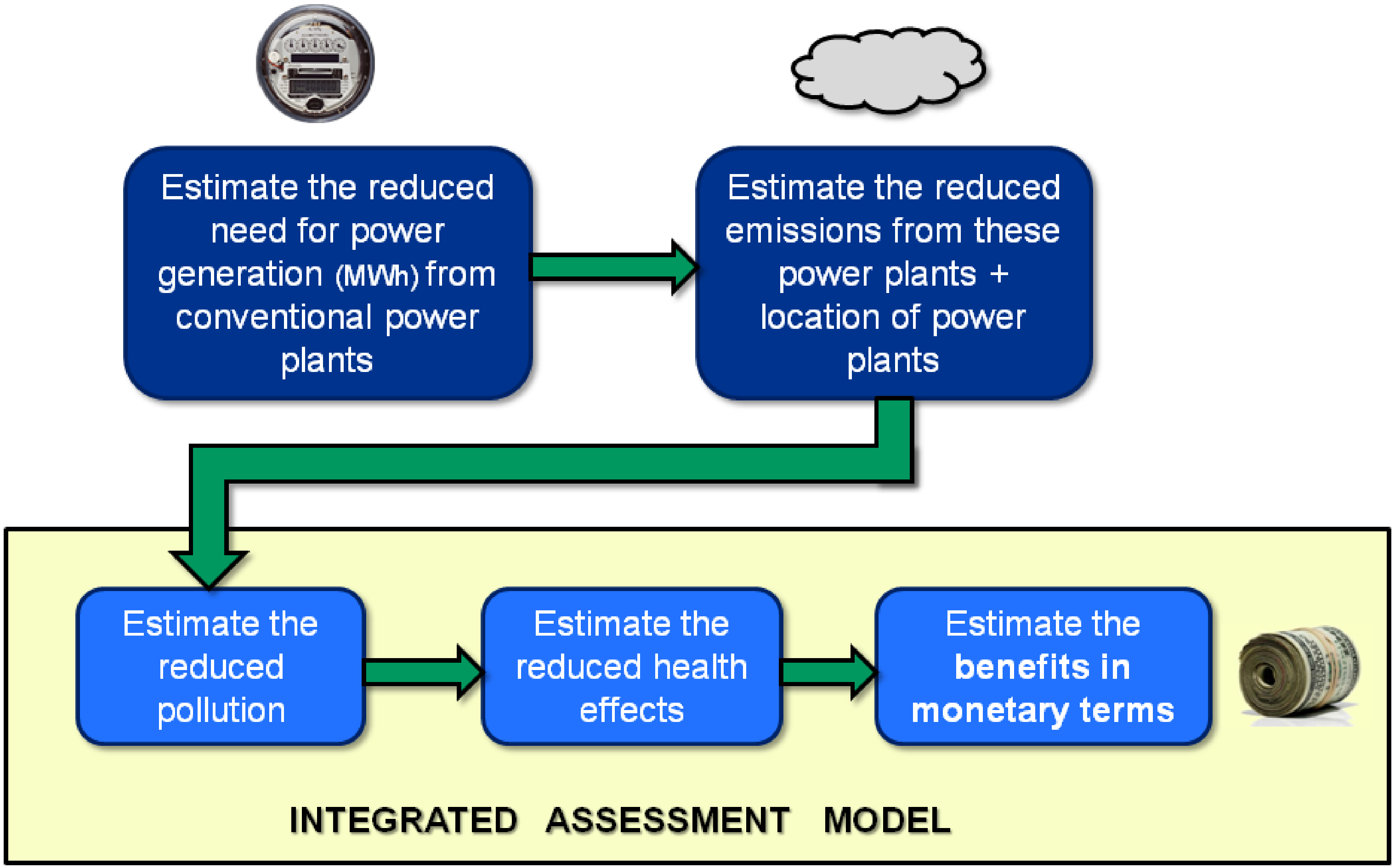
California ISO Generation Mix July 25, 2013 (1 hour increments)



California ISO Renewables Mix
July 25, 2013 (1 hour increments)



Measuring & Valuing Environmental Benefits of DRRP



Research

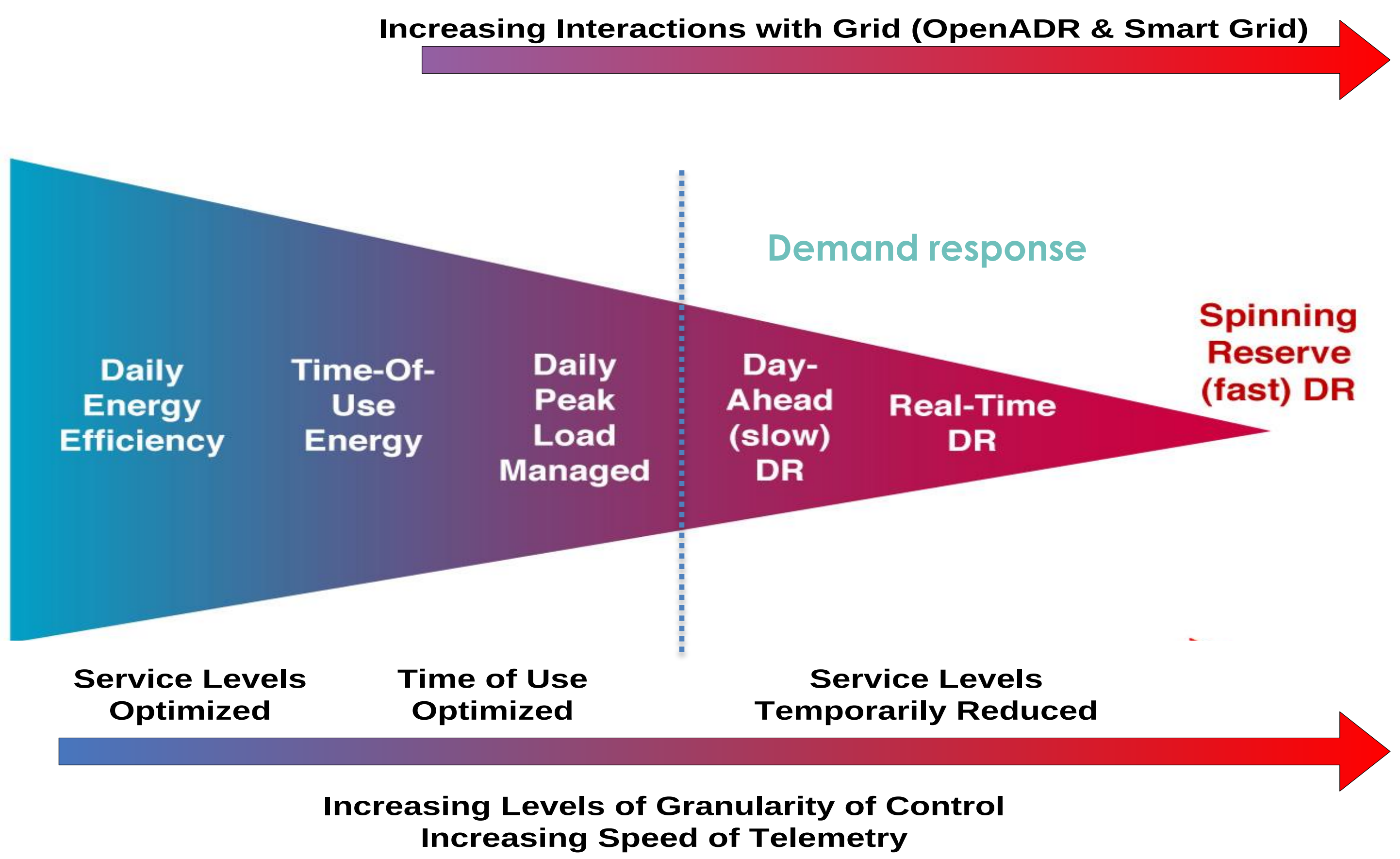
Next Steps

→ Calculate generation mix **emissions intensities**

→ Calculate benefits from load shifts and conservation

Research

How can we quantify potential benefits of DR?



Research

Key Building Characteristics

→ Building systems

→ Building size

→ Building type (e.g., office, retail, cold storage, etc.)

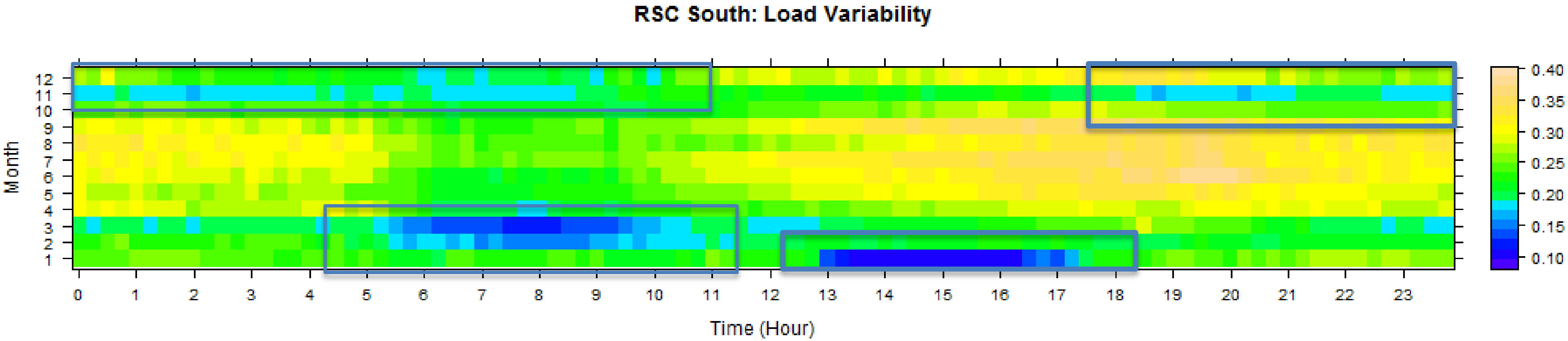
→ Occupancy schedule

→ Load characterization – peak load time and magnitude

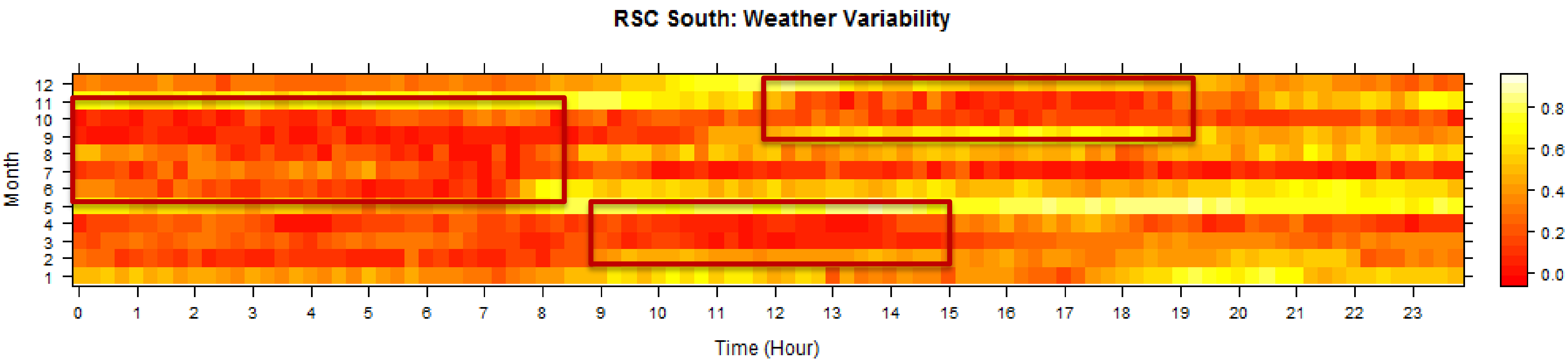
→ Load variability

→ Weather sensitivity

Research



RSC South: Load Variability
Month
12
11
10
9
8
7
6
5
4
3
2
1
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Time (Hour)
0.40
0.35
0.30
0.25
0.20
0.15
0.10



RSC South: Weather Variability
Month
12
11
10
9
8
7
6
5
4
3
2
1
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Time (Hour)
0.8
0.6
0.4
0.2
0.0

Research

What metrics are most useful to prioritize DR enablement of buildings?

→ Response time
→ Reliable load reductions
→ Reduce load while maintaining comfort

Each of these is influenced by properties of building systems and occupancy.

Research

Demand Response Database

→ Distinctions made according to
  → Building location
  → DR program
  → Building type
  → Building Size
  → DR strategies

→ Analysis tool to identify load variability between days, weather sensitivity of loads, load ranges and load shed in response to DR events over time

→ Choice of baseline development options

Research

Demand Response Metrics

→ Load shed (kW)- historically most reported figure of merit but lacks context

→ Peak load timing (compared with the timing of DR event)

Relevant Metrics

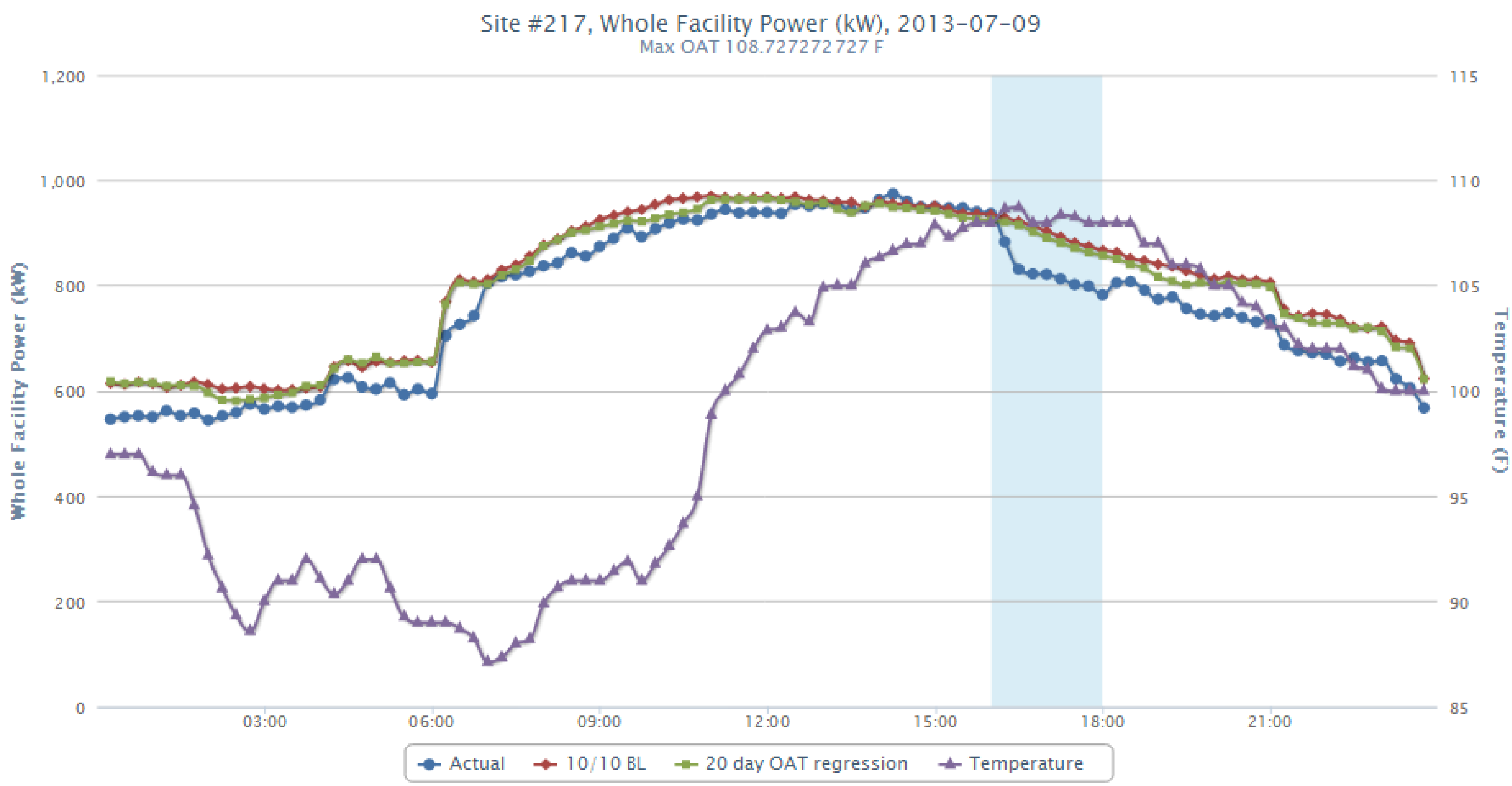
→ W/sq. ft .

→ Whole Facility Power % (WFP%)

→ Peak Load Benchmarking (magnitude & timing)

→ DR Enablement Costs ($/kW)

Research



Date	Baseline	Period	kW			W/ft²			WFP%		
			Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
2013-07-09	10/10 baseline	16:00:00 - 17:00:00	45	91	77	0.45	0.91	0.77	4.9	9.9	8.4
		17:00:00 - 18:00:00	76	84	80	0.76	0.84	0.8	8.7	9.7	9.1
		16:00:00 - 18:00:00	45	91	78	0.45	0.91	0.78	4.9	9.9	8.7
	20 day OAT Reg	16:00:00 - 17:00:00	38	84	68	0.38	0.84	0.68	4.1	9.1	7.5
		17:00:00 - 18:00:00	64	75	69	0.64	0.75	0.69	7.5	8.7	8
		16:00:00 - 18:00:00	38	84	69	0.38	0.84	0.69	4.1	9.1	7.7

Research

Preliminary Findings

→ Effective Demand Response strategies can lead to load sheds, from 5% to 18% (WFP%).

→ Load size does not make a stronger case for high demand response effectiveness.

→ Load shapes in response to outside air temperature can be a good predictor to determine potential load sheds in buildings.

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Who We Are