Demand Response Partnership Program

2013 Summary

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

Driving Market Adoption

Challenges to Adoption

→ Limited number of energy-focused facility managers

→ Lack of familiarity with utility DR programs

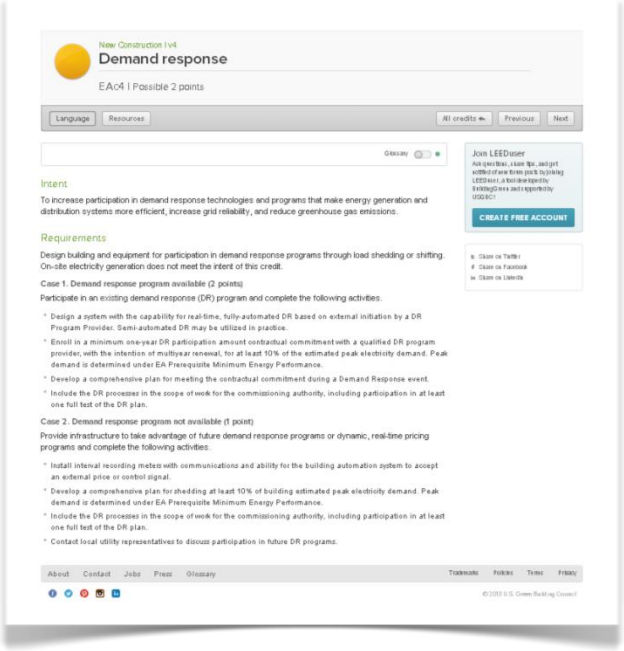
→ Lack of specific knowledge around costs and benefits

→ Perception that demand response is disruptive

→ Concern over loss of control

→ Concerns over ongoing operational changes

Market Adoption



New Construction | v4

Demand response

EAc4 | Possible 2 points

Language | Resources | All credits | Previous | Next

Glossary

Join LEEDuser

CREATE FREE ACCOUNT

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

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

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

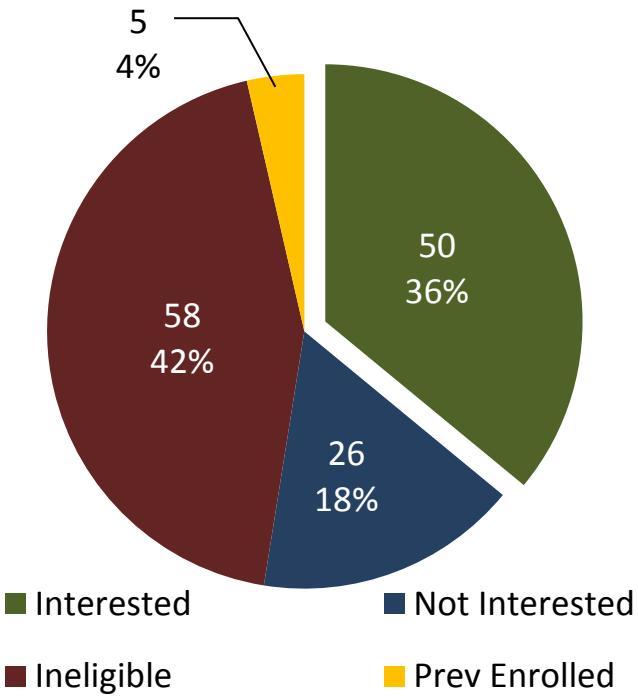
Outcomes

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

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

NV ENERGY DASHBOARD

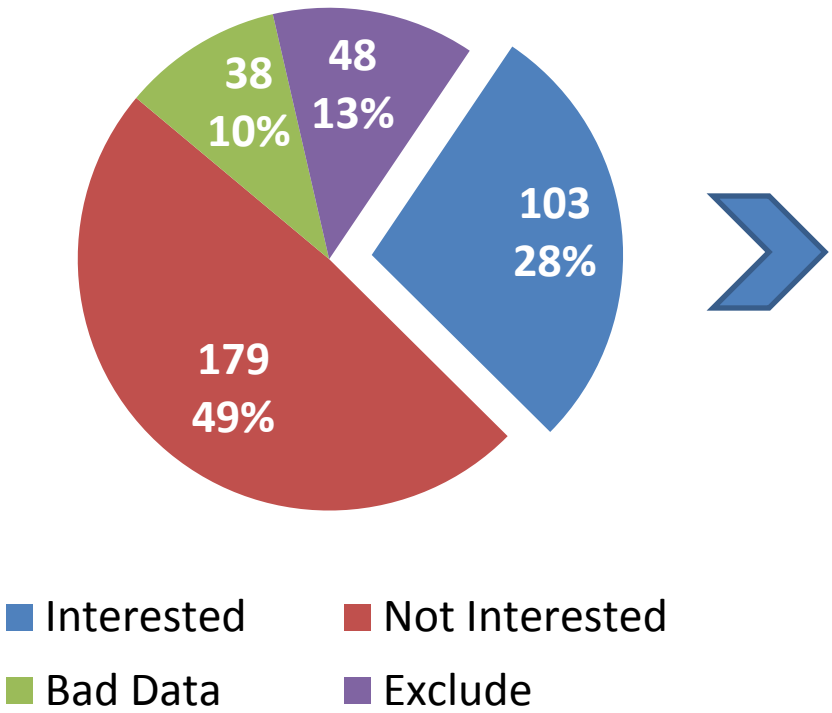
139 Building Targets



Prospect Status	Count
Pending Enrollment	9
NVE Site Assessment	1
Preliminary Discussions w/NVE	21
2nd Pass Outreach by NVE	19

SCE DASHBOARD

433 Building Targets



Win Type	Count
Research Track Participation	81
Building Auto DR Ready	98
Pursue Pilot Credit	1

Note: Building target can be counted across multiple win types

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

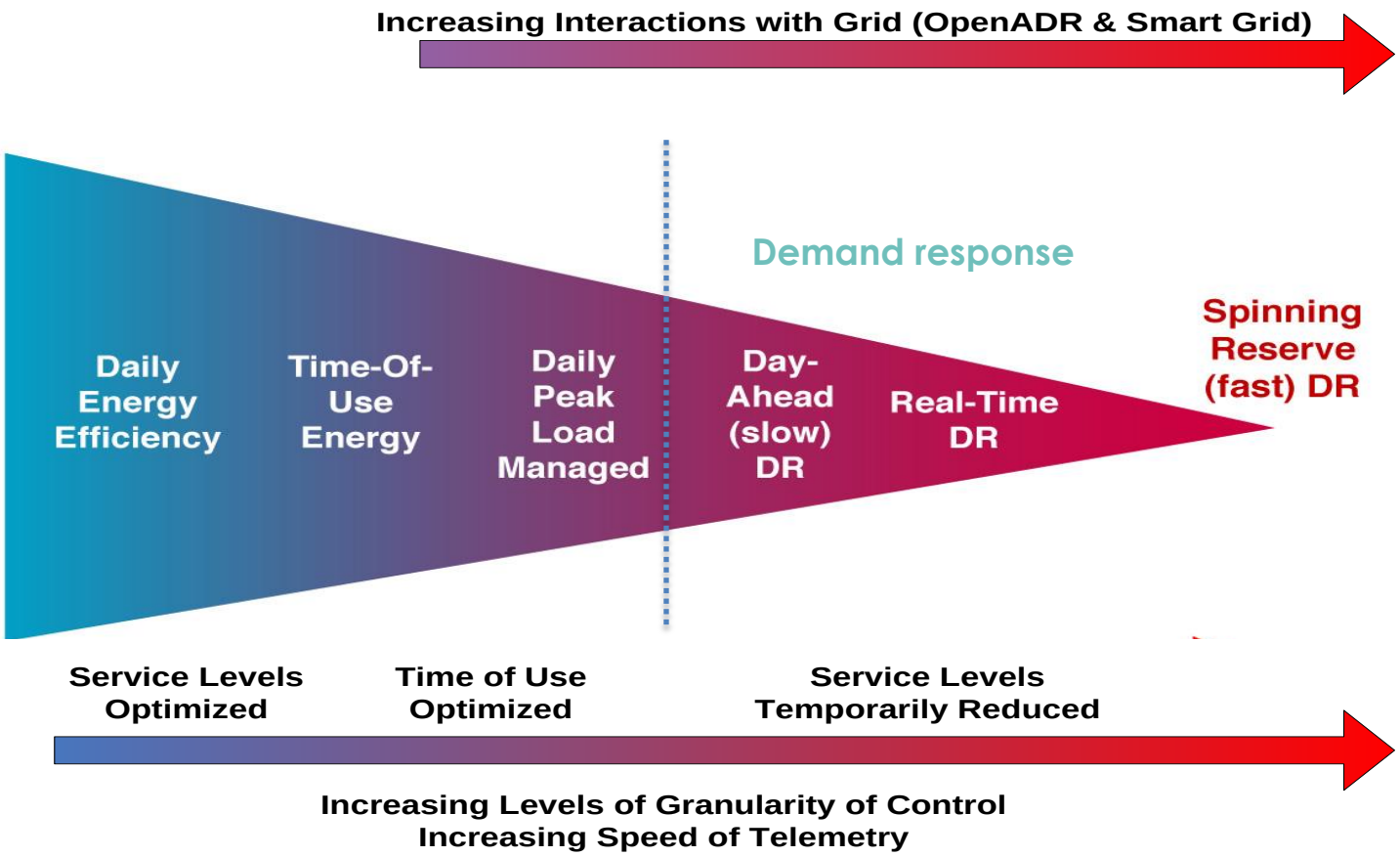
→ Performance assessment and estimation in commercial buildings

→ Establishing baselines and peak load benchmarking

→ Customer financial analysis and cost-effectiveness

→ System-wide impacts, including environmental and reliability impacts

How can we quantify potential benefits of DR?



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

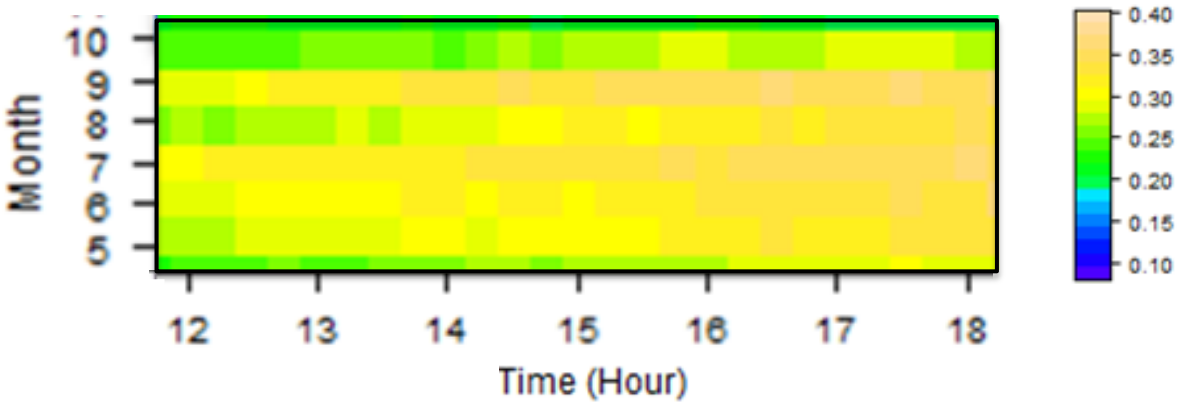
→ Load variability

→ Weather sensitivity

Key Building Characteristics

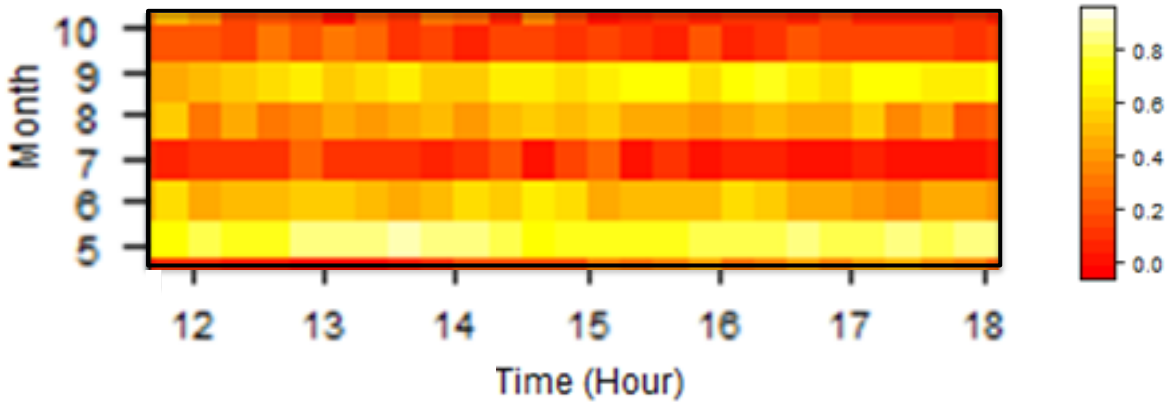
Load Variability

DR- capable Months and Hours



Weather Sensitivity

DR- capable Months and Hours



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

→ Capability of Energy Management System (EMS) to DR event requests

→ Reliable size of load sheds

→ Reduce load while maintaining comfort

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

Demand Response Database

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

→ Building categorization made according to

- → Building location
- → DR program
- → Building type
- → Building size
- → DR strategies

→ Choice of baseline development options

Demand Response Metrics

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

→ Peak load time and magnitude

Relevant Metrics

→ W/ sq. ft

→ Whole Facility Power % (WFP%)

→ DR Enablement Costs ($/kW)*

*to be added

Baseline Options

Adjusted* 10/10 Baseline

→ Averages from 10 most recent admissible days

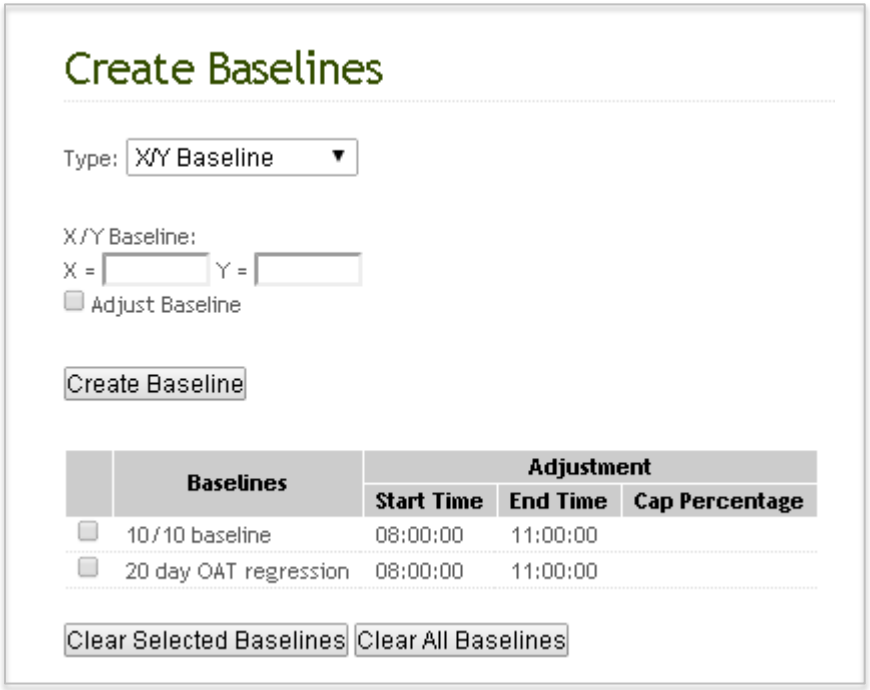
→ commonly used by utilities

→ assumes that recent past information is a good predictor of today's energy consumption

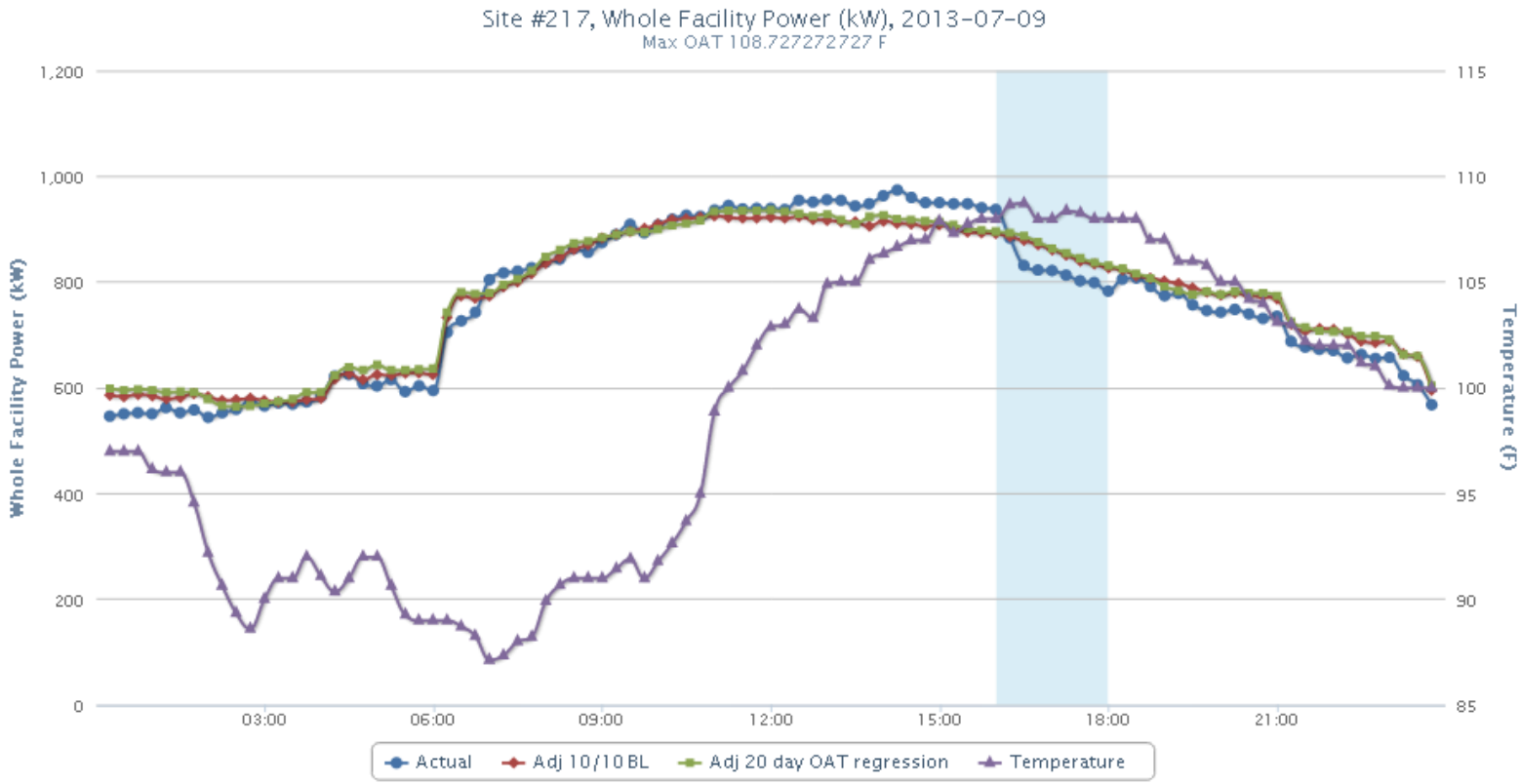
Adjusted* outdoor air temperature

→ assumes energy consumption is strongly influenced by weather

*Both baselines are morning adjusted from 8am to 11am.

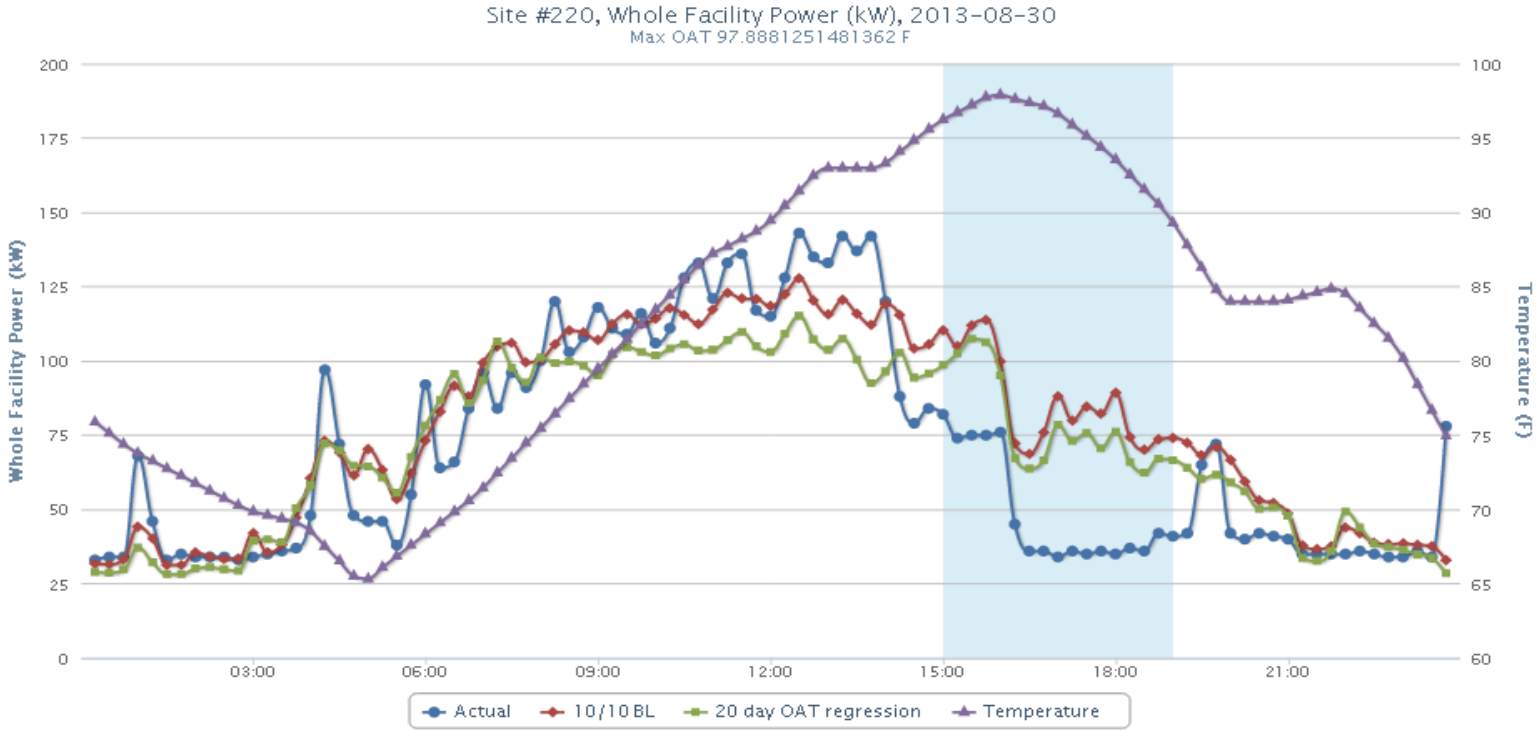


Preliminary Research Results



Date	Baseline	Period	kW			W/ft²			WFP%		
			Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
2013-07-09	Adj 10/10 baseline	16:00:00 - 17:00:00	2	48	34	0.02	0.48	0.34	0.2	5.5	3.9
		17:00:00 - 18:00:00	35	44	39	0.35	0.44	0.39	4.2	5.3	4.6
		16:00:00 - 18:00:00	2	48	36	0.02	0.48	0.36	0.2	5.5	4.3
	Adj 20 day OAT Reg	16:00:00 - 17:00:00	10	56	40	0.1	0.56	0.4	1.1	6.3	4.6
		17:00:00 - 18:00:00	38	48	43	0.38	0.48	0.43	4.5	5.8	5.1
		16:00:00 - 18:00:00	10	56	41	0.1	0.56	0.41	1.1	6.3	4.8

Preliminary Research Results



Baseline	Period	kW			W/ft²			WFP%		
		Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
10/10 baseline	15:00:00 - 16:00:00	24	39	33	0.43	0.69	0.58	23.8	34.1	30.1
	16:00:00 - 17:00:00	27	54	39	0.48	0.97	0.69	37.6	61.5	49.8
	17:00:00 - 18:00:00	44	54	49	0.79	0.97	0.87	55	60.8	57.7
	18:00:00 - 19:00:00	32	37	34	0.56	0.67	0.61	42.9	50.3	46.6
	15:00:00 - 19:00:00	24	54	38	0.43	0.97	0.69	23.8	61.5	46
20 day OAT Reg	15:00:00 - 16:00:00	19	32	28	0.34	0.58	0.5	20.2	30.2	26.9
	16:00:00 - 17:00:00	22	44	31	0.4	0.79	0.56	33.2	56.6	44.8
	17:00:00 - 18:00:00	35	41	38	0.62	0.74	0.69	49	54.1	51.9
	18:00:00 - 19:00:00	25	29	26	0.45	0.52	0.47	37.4	43.9	40.5
	15:00:00 - 19:00:00	19	44	31	0.34	0.79	0.56	20.2	56.6	41

Preliminary Findings

→ Commercial buildings with high Demand Response effectiveness lead to reliable size of load sheds during DR event hours.

→ Effective Demand Response strategies lead to sustained load sheds even after DR events.

→ Load increases before and after curtailments should be managed carefully.

Research

Why does EDF care about smart grid?

→ Least-cost best fit

→ Clean Air Act rules for existing power plants

→ Get past 33% renewables in generation mix

→ More clean intermittent energy resources

→ Electric vehicle charging and grid services

→ Time-of-Use residential rates

→ Consumer empowerment

→ Environmental outcomes

Research

DRPP Research Hypotheses - Environmental

→ DR is least-cost and best fit for:

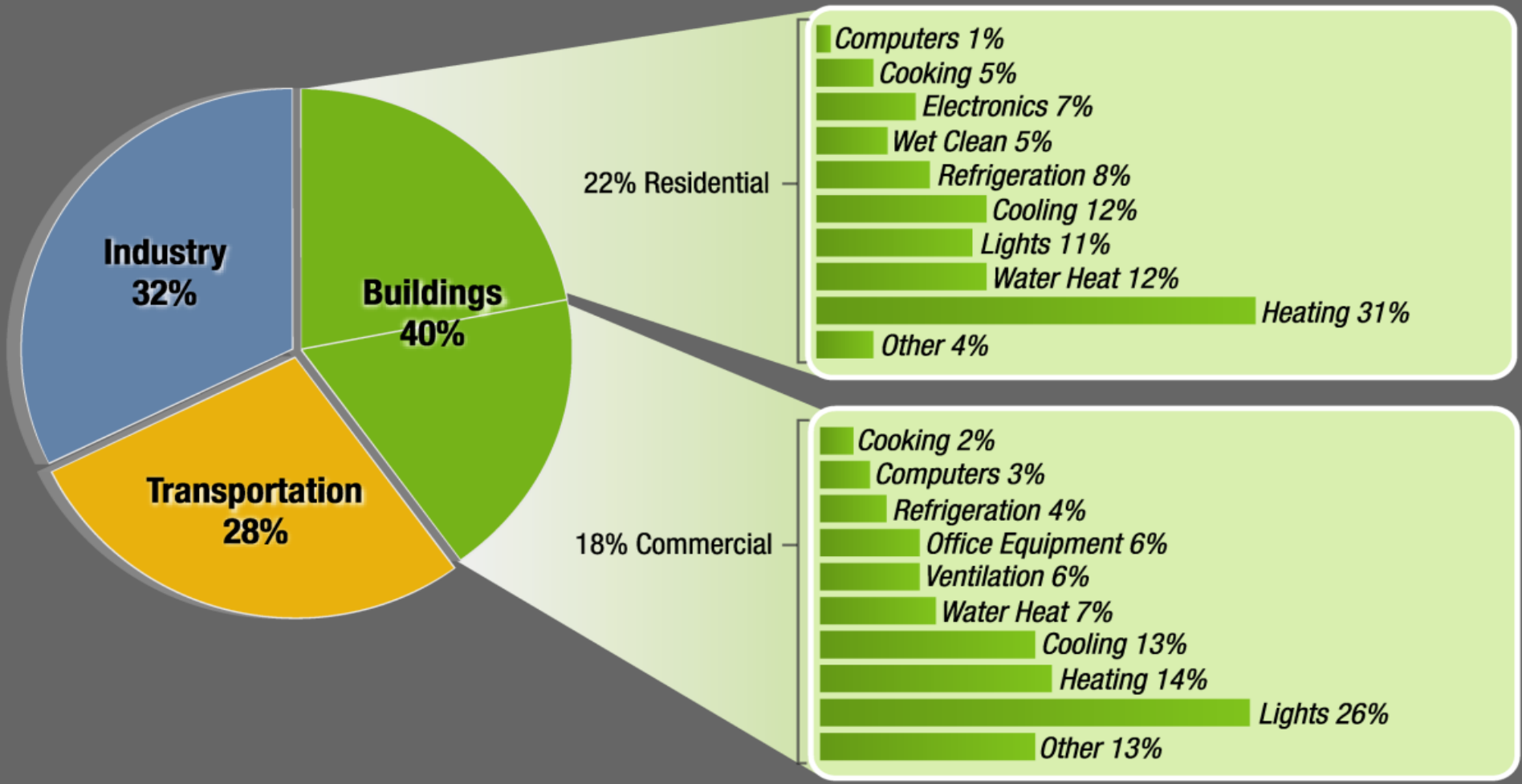
- → peak load management
- → intermittent renewable resources
- → electric vehicle charging

→ DR can provide significant environmental benefits

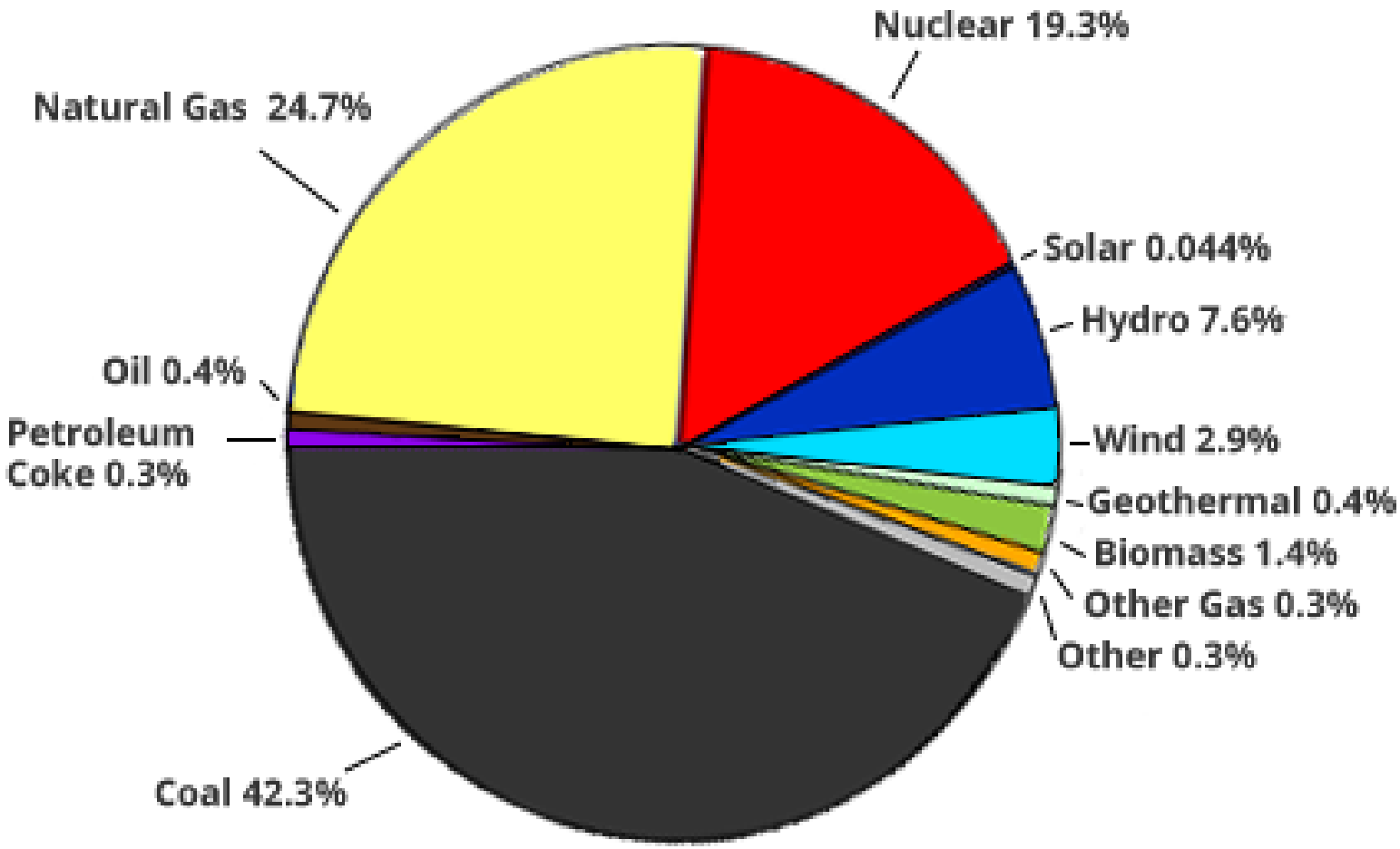
- → shifting demand away from peak
- → shifting demand to match clean generation

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

(Source: U.S. Energy Information Administration)

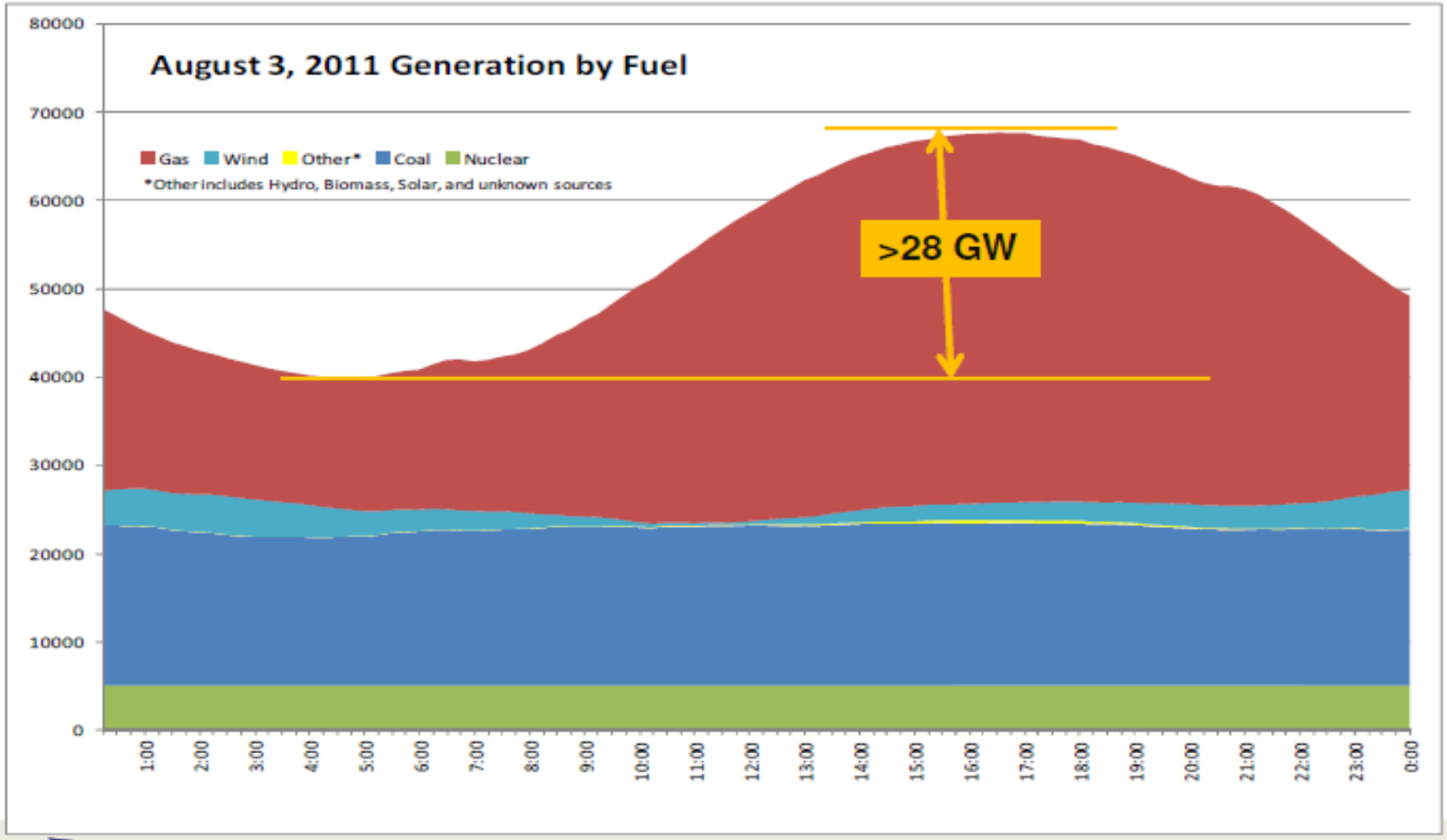


Fuel Mix for U.S. Electricity



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

Peak Load Fuel Mix



Sample Emissions Calculation

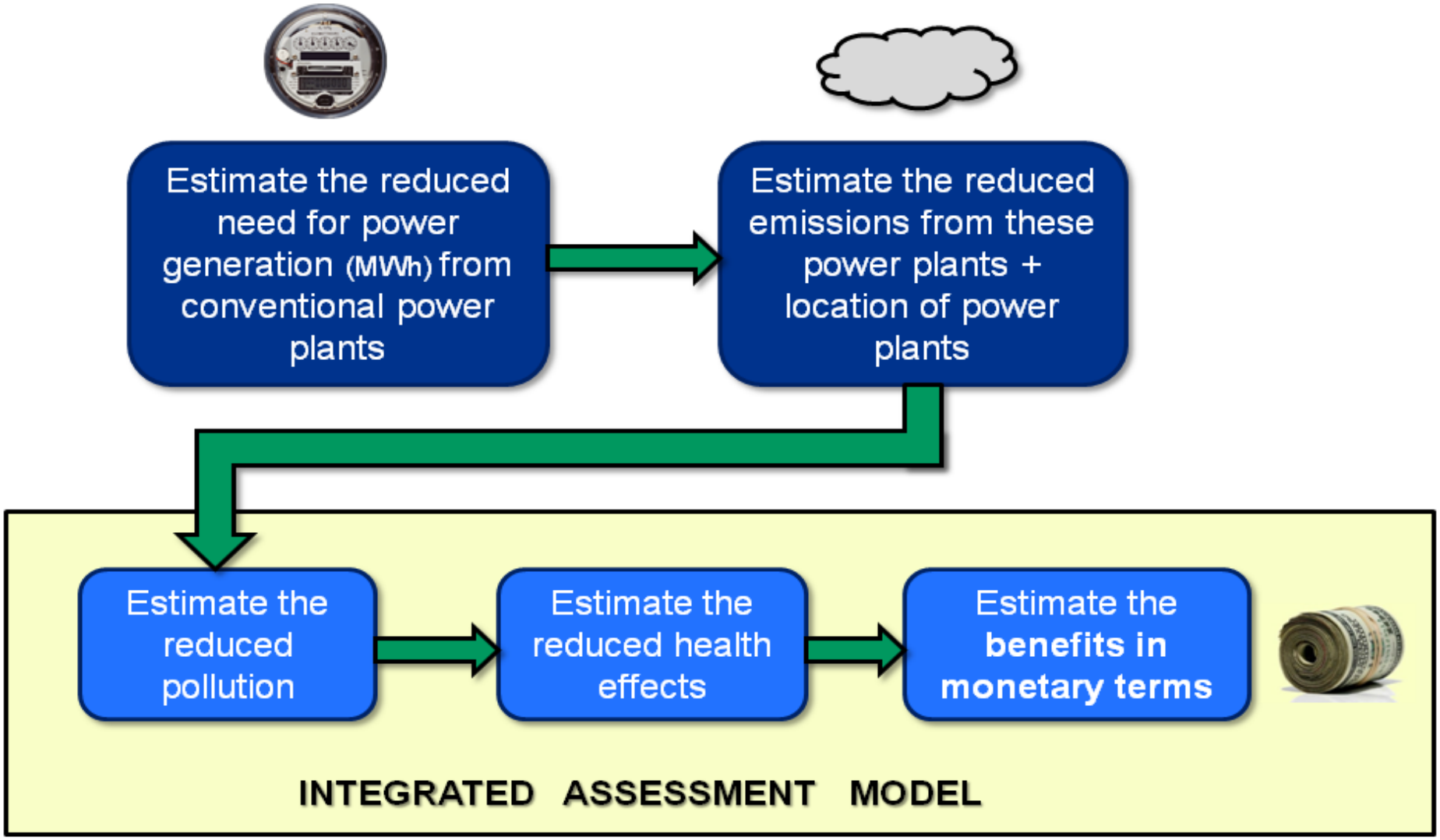
http://oaspub.epa.gov/powpro/ept_pack.router

1 YOUR ANNUAL EMISSIONS

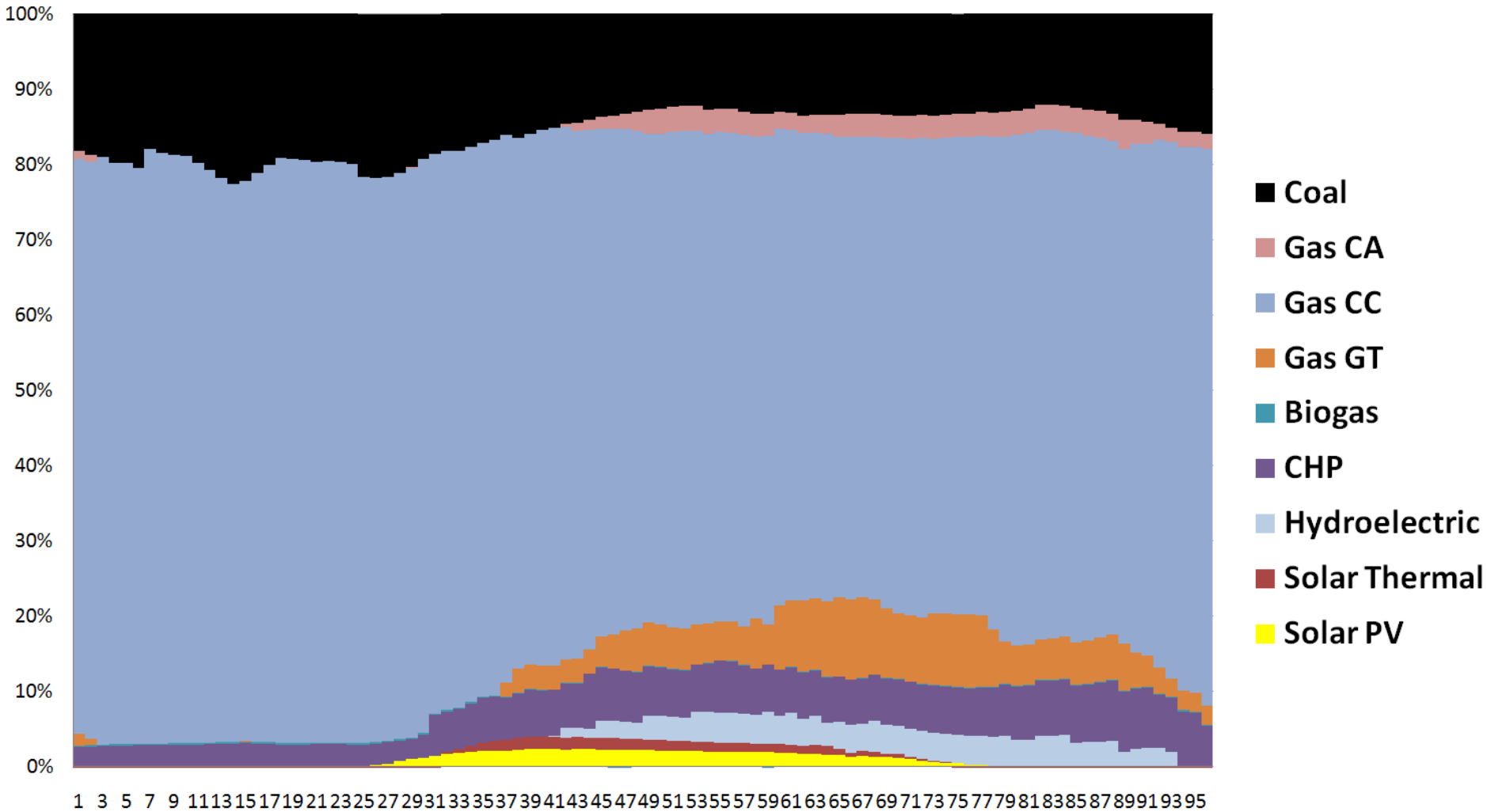
What Are My Annual Emissions?
This is an estimate of the pounds of air pollutants caused by the electricity you use in your home or business during one year.

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

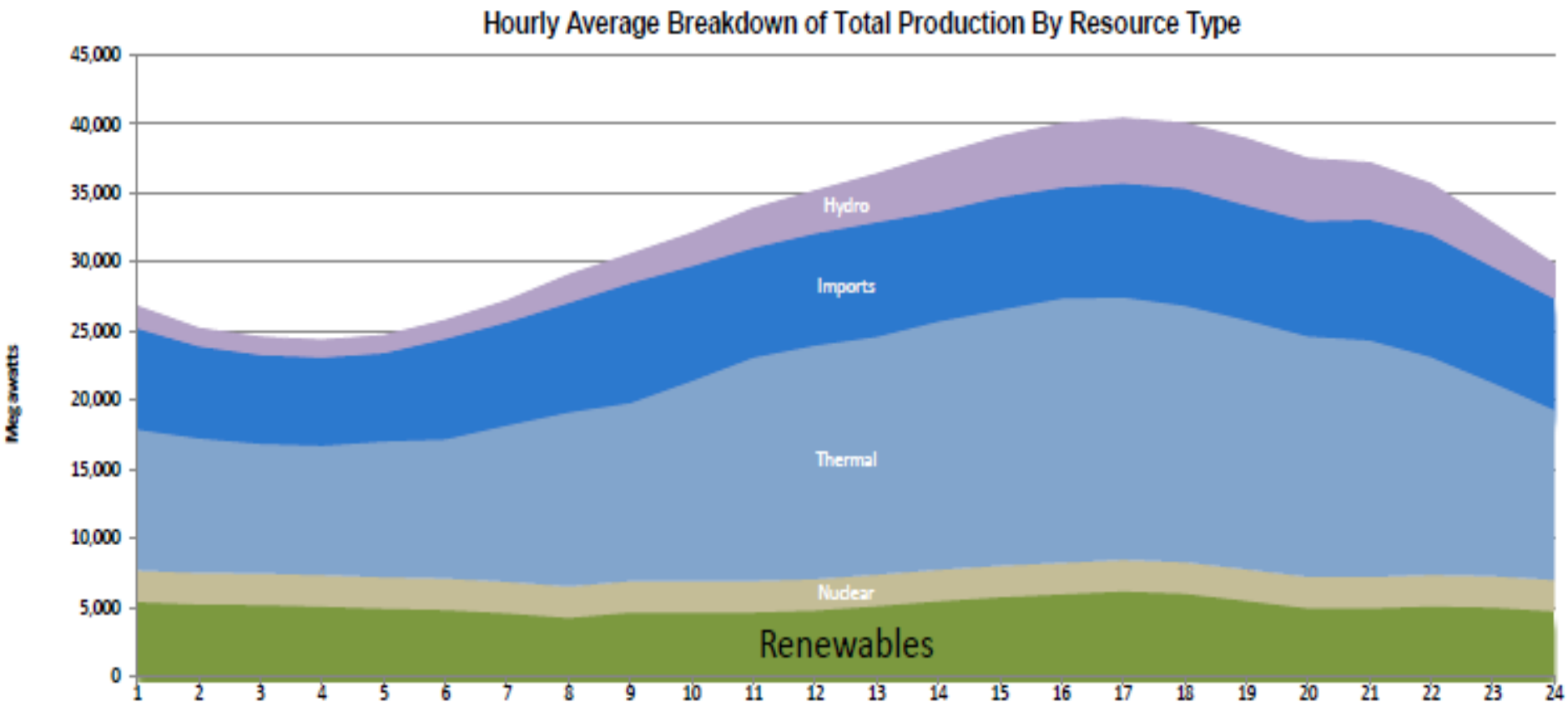
Measuring & Valuing Environmental Benefits of Demand Response



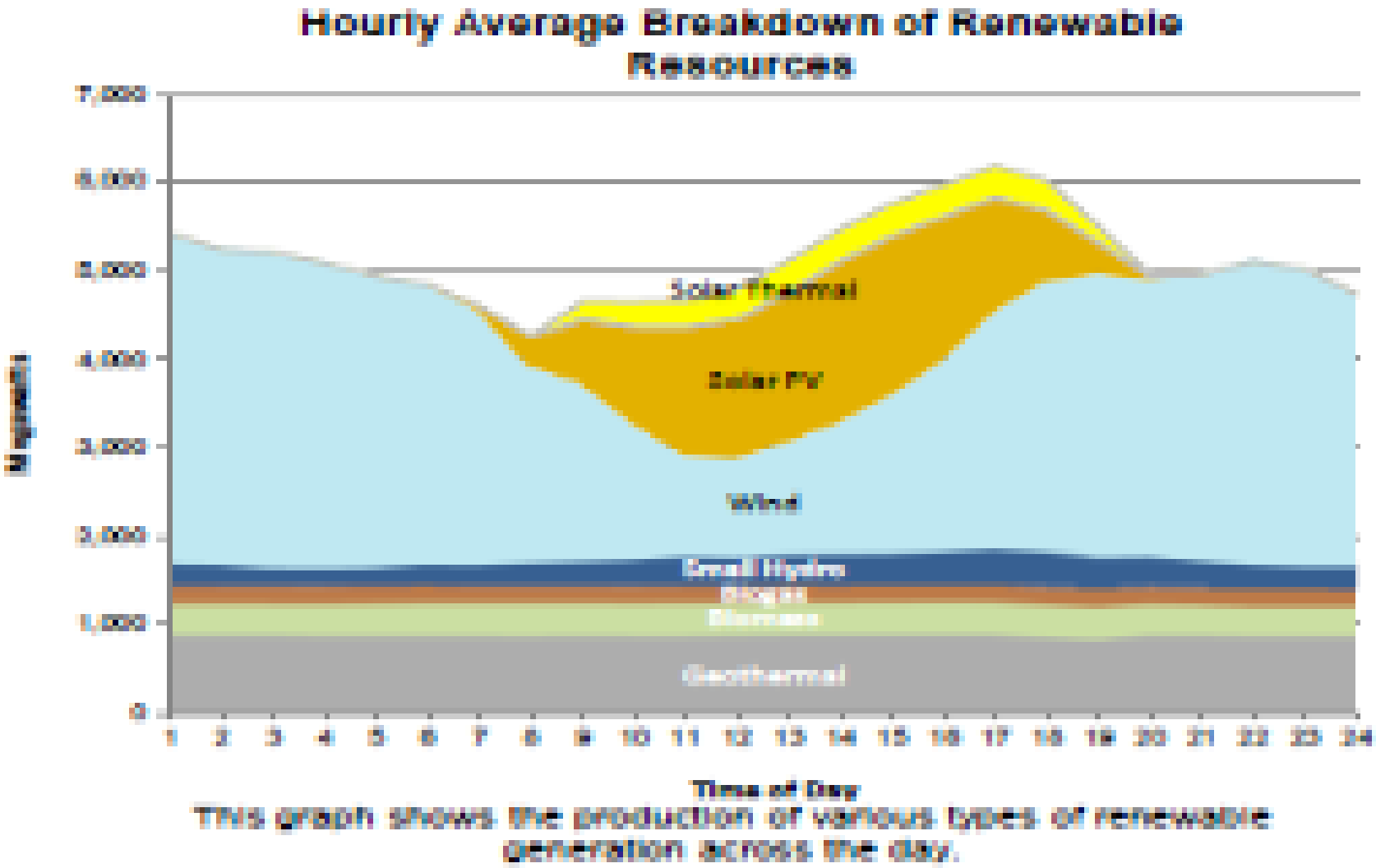
NV Energy Generation Mix
July 25, 2013 (15 minutes increments)



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



Daily Generation from Renewables in California – July 25, 2013



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