



## Analyze This: Using Data to Improve Strategic Energy Plans

May 11, 2016



# Using Data to Improve Strategic Plans

Greg Dierkers, U.S. DOE, Office of Weatherization  
and Intergovernmental Programs (WIP)

# WIP – Who we are and what we do

**Mission:** Accelerate deployment of energy efficiency and renewable energy technologies over a wide range of stakeholders in partnership with states and local governments.

**Strategic objective:** “Deploy the clean energy technologies we have” through near-term activities that result in greater energy efficiency, expanded renewable energy capacity, and economic development.

## Pathways:

- **Financial assistance:** Formula and competitive awards > \$200 M per year to weatherize low-income homes, and assist states to deploy EE and RE projects and programs
- **Voluntary programs:** Better Buildings Challenge (BBC) & Accelerators
- **Technical assistance:** Resources to assist the public sector with planning, financing, designing and implementing EE and RE programs and accessing and using energy data

# Weatherization & Intergovernmental Programs (WIP) Office

WIP activities are focused in three primary areas:

- **State Energy Program (SEP):** State-led energy projects serve as an important foundation for reducing energy use and costs, developing environmentally conscious state economies, and increasing renewable energy generation.
- **Weatherization Assistance Program (WAP):** State/local agencies carry out residential energy retrofits in low-income residences that reduce energy consumption while concurrently reducing energy costs for these families.
- **Policy & Technical Assistance (P&TA) Team:** Assists in developing tools and solutions to barriers facing state and local government expansion of energy efficiency policies and programs and replicating successful efforts demonstrated by public sector leaders.



# State and Local Solutions Center

- Four Action Areas
  - Develop a Clean Energy Plan
  - Design and Implement Clean Energy Programs
  - Pay for Clean Energy
  - Access and Use Energy Data
- Take a Closer Look
  - Energy Savings Performance Contracting
  - Benchmarking and Transparency Policies and Programs
  - Outdoor Lighting
  - Energy Efficiency Savings Opportunities and Benefits





# Selected DOE and other Resources – Energy Data Management

Resource Description	Description	Resource Link
Asset Scoring Tool	Tool that manages, evaluates, and generates scores based off of data collected from building systems; will also identify cost-effective upgrade opportunities	<a href="http://energy.gov/eere/buildings/commercial-building-energy-asset-scoring-tool">http://energy.gov/eere/buildings/commercial-building-energy-asset-scoring-tool</a>
<b>C-LEAP</b> (Cities leading through Energy Analysis and Planning)	Tool to help guide decision-making in early phase city planning and implementation for data-driven energy goals, strategies, analytics, and best practices	<a href="https://www.nrel.gov/tech_deployment/state_local_governments/blog/cities-leading-through-energy-analysis-and-planning-helps-support-local-clean-energy-innovation">https://www.nrel.gov/tech_deployment/state_local_governments/blog/cities-leading-through-energy-analysis-and-planning-helps-support-local-clean-energy-innovation</a>
<b>SEEAction</b> (State and Local Energy Efficiency Action Network)	Composition of eight working groups that advance recommendations for design of state and local energy efficiency policies and programs	<a href="https://www4.eere.energy.gov/seeaction/topic-category/energy-use-data-access">https://www4.eere.energy.gov/seeaction/topic-category/energy-use-data-access</a>
<b>SLED</b> (State and Local Energy Data)	Application that generates basic energy market summary reports to help state and local governments plan and implement clean energy projects	<a href="http://apps1.eere.energy.gov/sled/#/">http://apps1.eere.energy.gov/sled/#/</a>

# Selected DOE and other Resources – Energy Data Management cont.

Resource Description	Description	Resource Link
EPA eGrid—	Comprehensive source of environmental characteristics data of almost all electric power generated in the United States	<a href="http://epa.gov/eGRID">http://epa.gov/eGRID</a>
EPA Greenhouse Gas Reporting by Facility	Comprehensive greenhouse gas data reported directly to EPA from across the country that are accessible to the public	<a href="http://epa.gov/ghgreporting">http://epa.gov/ghgreporting</a>
Portfolio Manager	Online tool used to track building-level energy and water consumption, as well as greenhouse gas emissions; can also be used to inform investment decisions across an entire building portfolio	<a href="http://energystar.gov/buildings/facility-owners-and-managers/existingbuildings/use-portfolio-manager">http://energystar.gov/buildings/facility-owners-and-managers/existingbuildings/use-portfolio-manager</a>
SEED Collaborative (Standard Energy Efficiency Data)	Partnership with local, state, and energy efficiency administrators that pursue data-driven program design and implementation in the energy efficiency sector	<a href="http://energy.gov/eere/buildings/seed-platform-collaborative">http://energy.gov/eere/buildings/seed-platform-collaborative</a>

**Thank you. Questions?**

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**202-287-1921**





**Better  
Buildings**<sup>®</sup>  
U.S. DEPARTMENT OF ENERGY

# Measuring the Co-Benefits of Clean Energy

Christopher Russell

Visiting Fellow, ACEEE

# ABOUT ACEEE

- 501(c)(3) non-profit
- Catalyst for policies, technologies, investments, and behaviors that advance EE
- Advising policy makers and program managers
- Conferences, workshops, media, education
- \$7.6 MM, (2013) ~50 staff

# THE INDUSTRIAL ENERGY HARVEST

Managing Energy From the Top Down



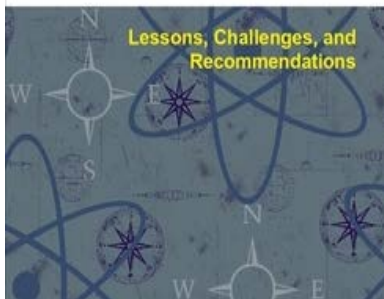
Christopher Russell, C.E.M.

Feb 2008



North American ENERGY AUDIT PROGRAM Best Practices

Christopher Russell



Lessons, Challenges, and Recommendations

June 2010

# Christopher Russell

Monetizing Energy Solutions  
Christopher Russell, C.E.M., C.R.M.  
Principal  
Energy Pathfinder Management Consulting LLC

## ABSTRACT

Potential energy efficiency solutions are routinely identified by commercial and industrial energy programs across North America. While these recommendations can be impressive for their technical content, they often have disappointing implementation rates. One reason may be a failure to accurately demonstrate the business performance of these improvements. Such a discussion would require thinking of energy efficiency improvements not as "projects," but as investments.

Investment analysis seeks capital recovery as its goal. In simple terms, "capital recovery" is the result of wealth creating wealth: it describes how well assets work at creating new income. The fundamental metric for capital recovery measurement is the rate of return on capital. But that's not all. Rates of return can also describe the destruction of wealth. This is exactly what happens when a proposed investment in energy efficiency is rejected, allowing energy waste to accrue. The result is capital recovery in reverse.

Rates of return are used to measure the investment performance of most assets, including stocks, bonds, and mutual funds, as well as the cost of borrowing money. However, critics claim that energy efficiency proposals are evaluated by simple payback, even for recommendations that involve thousands or even millions of dollars. When companies consider their capital investment options, proposals that rely on simple payback measures may be at a disadvantage because their performance is not measured by the same yardstick used for other investment opportunities. Think of it this way: Who wins a mutual fund's performance by its simple payback?

This discussion uses a realistic energy improvement proposal to seek clarity on a few points: What's wrong with simple payback? And if rates of return are a better tool, can that be proven? How can the economic and financial performance of energy efficiency investments be demonstrated? By the way, what's the difference between economic and financial justification? What exactly are the financial consequences of ignoring energy improvements? This paper will pursue all of these questions. The findings should have serious implications to demonstrate the investment value of energy improvements, therefore convincing more business leaders to accept energy solutions of all descriptions.

## WHY IS SIMPLE PAYBACK NOT SUFFICIENT?

Today, it is still customary to describe the benefits of energy efficiency in terms of "simple payback," that is, the number of years that it takes for an investment to "pay for itself" through the normal benefits that it generates. This metric is almost universally recognized and understood, but that doesn't mean that it is truly informative. Simple payback almost completely fails to answer the questions that an astute business investor would ask.

- What's the magnitude of benefits offered by the investment? Simple payback offers no mechanism for evaluating benefits that accrue after the investment has paid for itself. Therefore, some portion of the total benefits is ignored.
- How quickly do those benefits accrue? Payback is a measure of time. It fails to measure the magnitude of new wealth created from invested capital. Favoring the payback of a certain project tells you nothing about the cost of obtaining investment capital. It does not compare the project's returns to the profitability of the overall business. Nor does it compare the project returns to those provided by alternative investment opportunities such as stocks, bonds, or mutual funds.

## Monetizing Energy Solutions

(2012) [www.energypathfinder.com](http://www.energypathfinder.com)

## Understanding Industrial Investment Decision Making

(2012) [ACEEE.ORG](http://ACEEE.ORG)

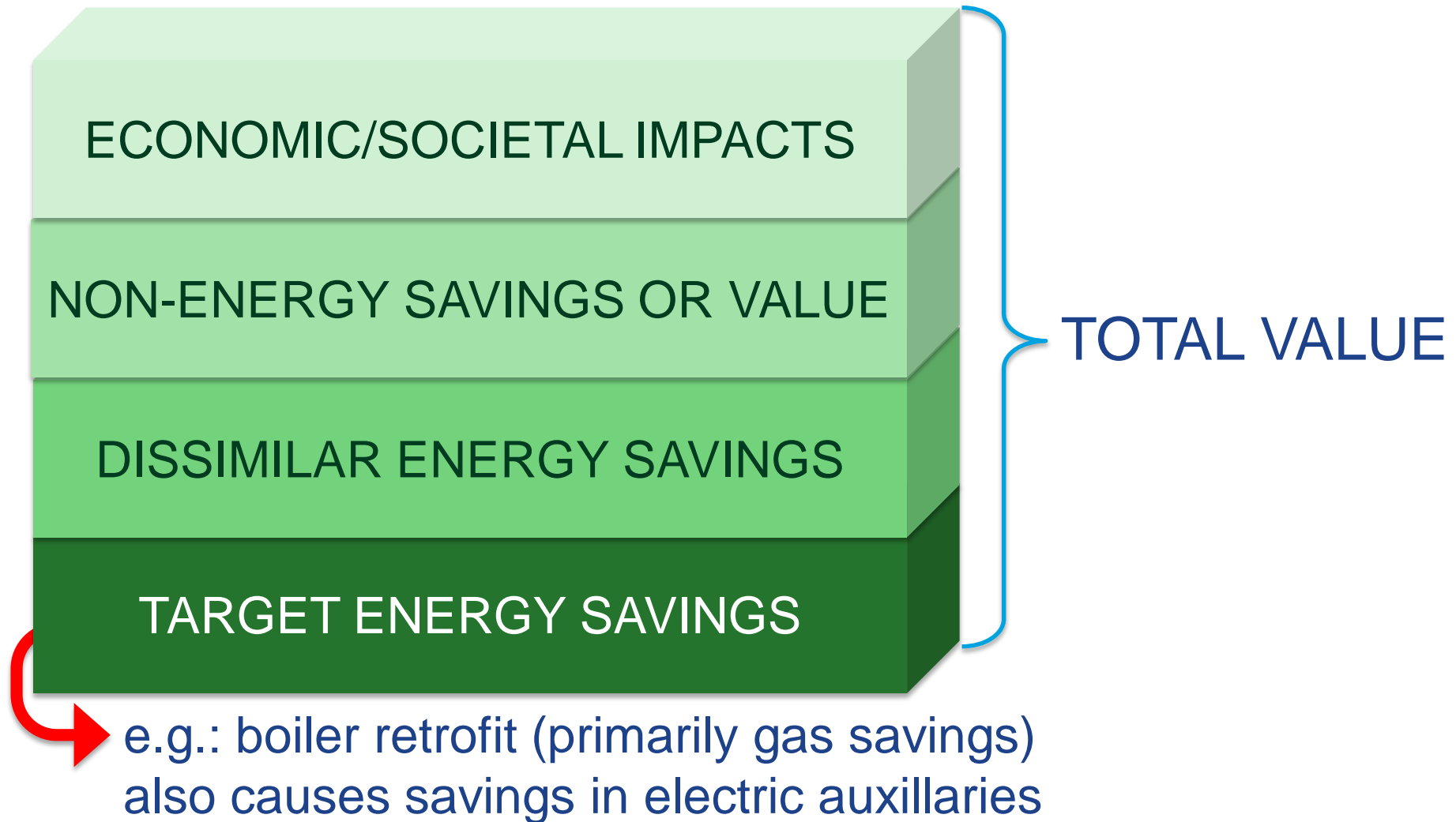
## Recognizing the Value of Energy Efficiency's Multiple Benefits

(2015) [ACEEE.ORG](http://ACEEE.ORG)

## Outsourcing Energy Performance

(2014) [ACEEE.ORG](http://ACEEE.ORG)

# WHAT ARE *MULTIPLE BENEFITS*?



# MULTIPLE BENEFITS\* ACCRUE TO:

## END-USERS

- Expense reduction
- Productivity gains
- Quality improvements
- Rebates/incentives
- New revenues
- Employee engagement
- Enhanced debt coverage

## ENERGY DISTRIBUTION SYSTEMS

- Reduced T&D stress
- Acceleration of DSM
- DSM program flexibility

## SOCIETY

- Environment
- Health
- Employment
- Diversified finance

\*Business context

# EVIDENCE OF VALUE: Sparse and Scattered

INTERVAL  
DATA

<b>44%</b>	Ancillary value relative to coincident energy savings 81 U.S. industrials, 1999-2004
<b>122%</b>	Value of productivity gains relative to energy savings 52 U.S. industrial case studies in aggregate
<b>43%</b>	Gain in worker productivity caused by energy improvements Sample of office HVAC upgrades and reconfiguration
<b>7%</b>	Percent of respondents that self-detected non-elec savings 1,071 BC industrial kWh efficiency projects

NOMINAL  
DATA

Sample Study: Percent of 63 businesses that self-detected:	
<b>92%</b>	Reduced maintenance cost
<b>71%</b>	Reduced labor costs
<b>63%</b>	Reduced procurement costs
<b>44%</b>	Enhanced corporate image
<b>33%</b>	Permanent capital expenditure avoidance



# CHALLENGES

- Variance of definition
- Variance of measurement standards
- Reliance on end user self-accounting
- Tendency to recognize year-one value only
- Utilities: meaningful for base load reduction, not peak\*

*\*Realization of multiple benefits may not vary directly with change in rate of energy consumption*

# ACEEE Study: Ranking Multiple Benefits

- Assume certain kinds of benefits are easier than others to define, detect, measure, document
- Panel of nine experts
- Generate & rank a list of 30 distinct benefits coincident with energy savings
- Rank each for ease of measurement (5=easy, 1=difficult).
- Parse the 30 listed benefits into categories (groups) reflecting affinity and ease of measurement

# Results:

## Seven Classes of Multiple Benefits

1. Concurrent facility expense reduction (easiest)
2. Business efficiency
3. Quality improvements
4. Capital value enhancement
5. Risk abatement
6. Revenue enhancement
7. Ancillary benefits (least easy)

# MBs PRICE BY PROXY

- \$30,000 office lighting upgrade
- \$10,000 annual savings
- 3 year payback, fails 2-year investment criterion
- Multiple benefit: increased productivity
  - \$800,000 payroll
  - 5% absenteeism reduced to 3% = \$16,000 productivity gain



## VALUE PROPOSITION:

An “extra” investment of **\$10,000** (i.e., \$30,000-\$20,000)  
buys a productivity gain = **\$16,000/year**

# MULTIPLE BENEFITS IN THE PORTFOLIO OF ENERGY RESOURCE INCENTIVES

## **In parallel with prescriptive, custom, etc.**

- Obtained with no/low investment or effort...
- Conceptual opposite of “tax”
- Versatile incentive for: EE, RE, DER, smart grid
- Easy to ramp up/down as a program incentive
- Functional linkage to new products/services
- Fosters new types of trade allies
- Anticipates alternative market segmentation

# RETHINKING SEGMENTATION

- **TRADITIONAL:** segment by industry, recognizing the typical mechanical profile of each
- **ALTERNATIVE:** Segment by coincident impacts and benefits:
  - Capital access and cost recovery formats
  - Management vision & culture
  - Economic (product market) conditions
  - Coordination with other energy solution initiatives
  - Coordination with allied industry initiatives

**Coincident (multiple) benefits temper the appetite for energy solutions**

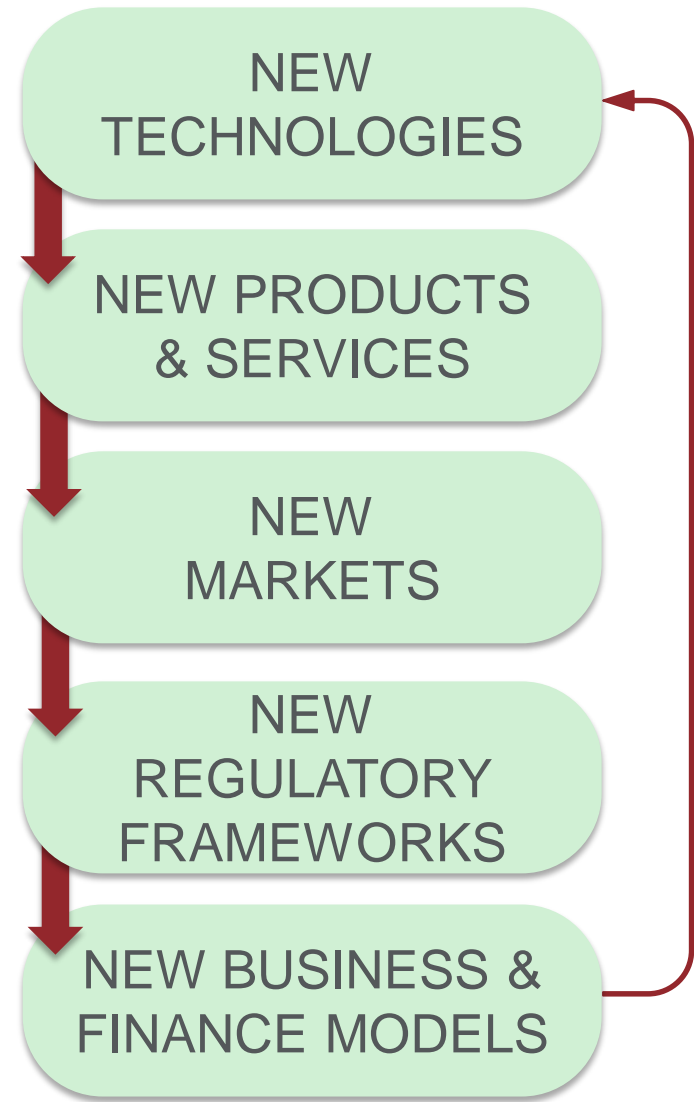


# CHANGE VS. INERTIA: MBs = CATALYST?

RENEWABLES  
ENERGY STORAGE  
ADV. METERING INFRASTRUCTURE  
INTELLIGENT EFFICIENCY  
AFV INFRASTRUCTURE

DISTRIBUTED ENERGY RESOURCES  
MICROGRIDS  
ENERGY MANAGEMENT SERVICES  
DEMAND RESPONSE

**“PROSUMERS”**  
RENEWABLE PORTFOLIO STANDARDS  
POWER PURCHASE AGREEMENTS  
PACE, ON-BILL FINANCING  
REORIENTATION OF CAPITAL  
NEW TRADE ALLIES FOR UTILITIES  
AFFINITY WITH ECON DEVELOPERS



THANK YOU!

## Christopher Russell



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# The Future of Energy Efficiency

Matt Golden

Senior Energy Consultant, EDF

CEO, Open Energy Efficiency

# OPEN ENERGY EFFICIENCY

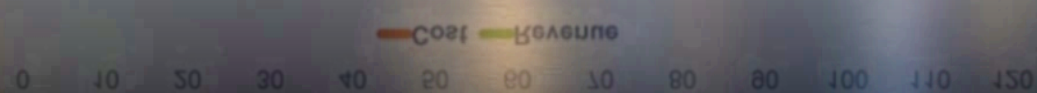
Enabling Markets for Efficiency as Capacity



Better Buildings Summit 2016



**Project Finance:** The long-term financing of projects based upon projected cash flows rather than the balance sheets of its sponsors.





# UTILITY REBATE PROGRAM

UP TO 70% INSTANT SAVINGS



# STORM RELIEF

New York State Appliance and Equipment

# REBATES

NYSApplianceRebates.com

## Taking Full Advantage

2013 Rebates & Incentives

mass save partner



NEVER A FEE NEVER EXPIRES

WE WILL NOT BE UNDERSOLD. GUARANTEED!

The Bridal Gift Registry

# 20% OFF

Take 20% off any single item.\* Present this certificate. Valid for in-store use only.

BED BATH & BEYOND

FRIGHT EXTRA CHARGE APPLIES TO ALL OUT-OF-STATE PURCHASES.



## CLOTHES WASHER REBATES

Qualified washers must be purchased and installed between January 1 and December 31, 2014.

Your local water agency and PG&E are offering

Your local water agency is offering

# \$200 -OR- \$50

CASH BACK ON AN ENERGY STAR MOST EFFICIENT 2014 MODEL

CASH BACK ON MODEL THAT MEETS CEE TIER 3

## Gas + Utility Company Rebates



## Get Rebates of up to \$6,500\* for Home Upgrade

Find a Home Upgrade Professional to make your home more energy efficient.

Search Now



Home Upgrade Energy Upgrade California

## WINTER IS COMING!

UP TO \$750 IN REBATES FROM DUKE, REMC & VECTREN



# Energy Efficiency Programs

## Efficiency Programs

Models, deemed savings,  
and consultant studies



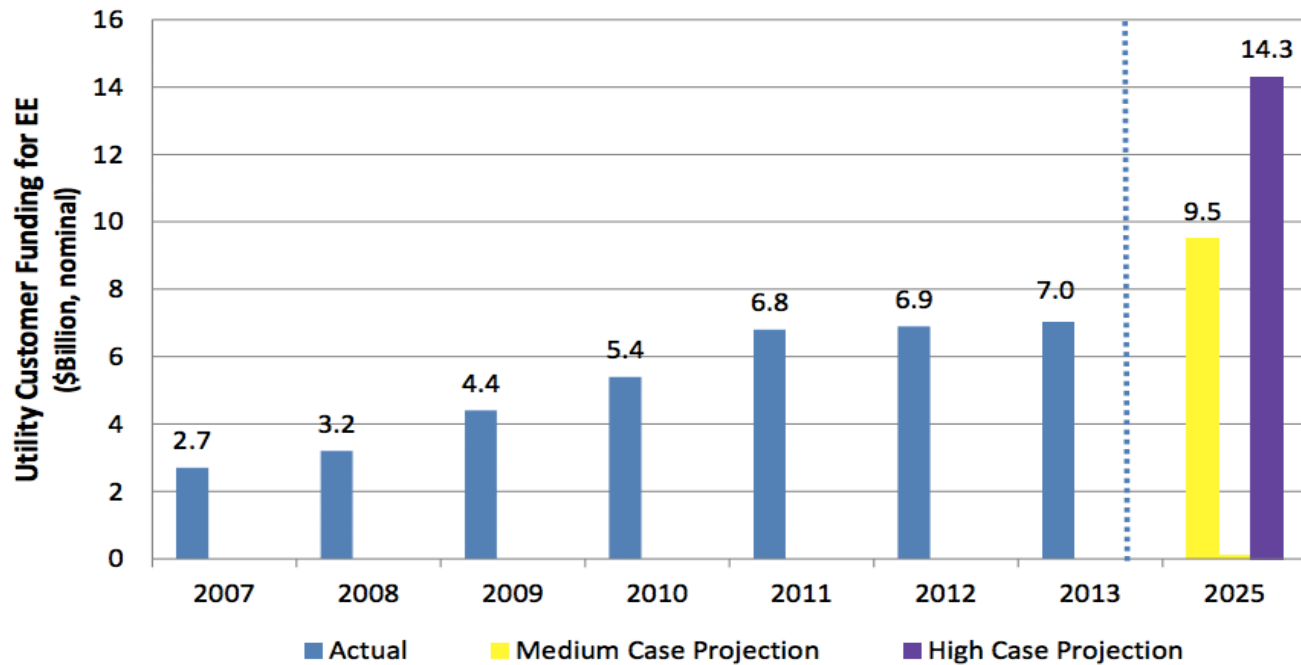
Paid on prediction  
in advance



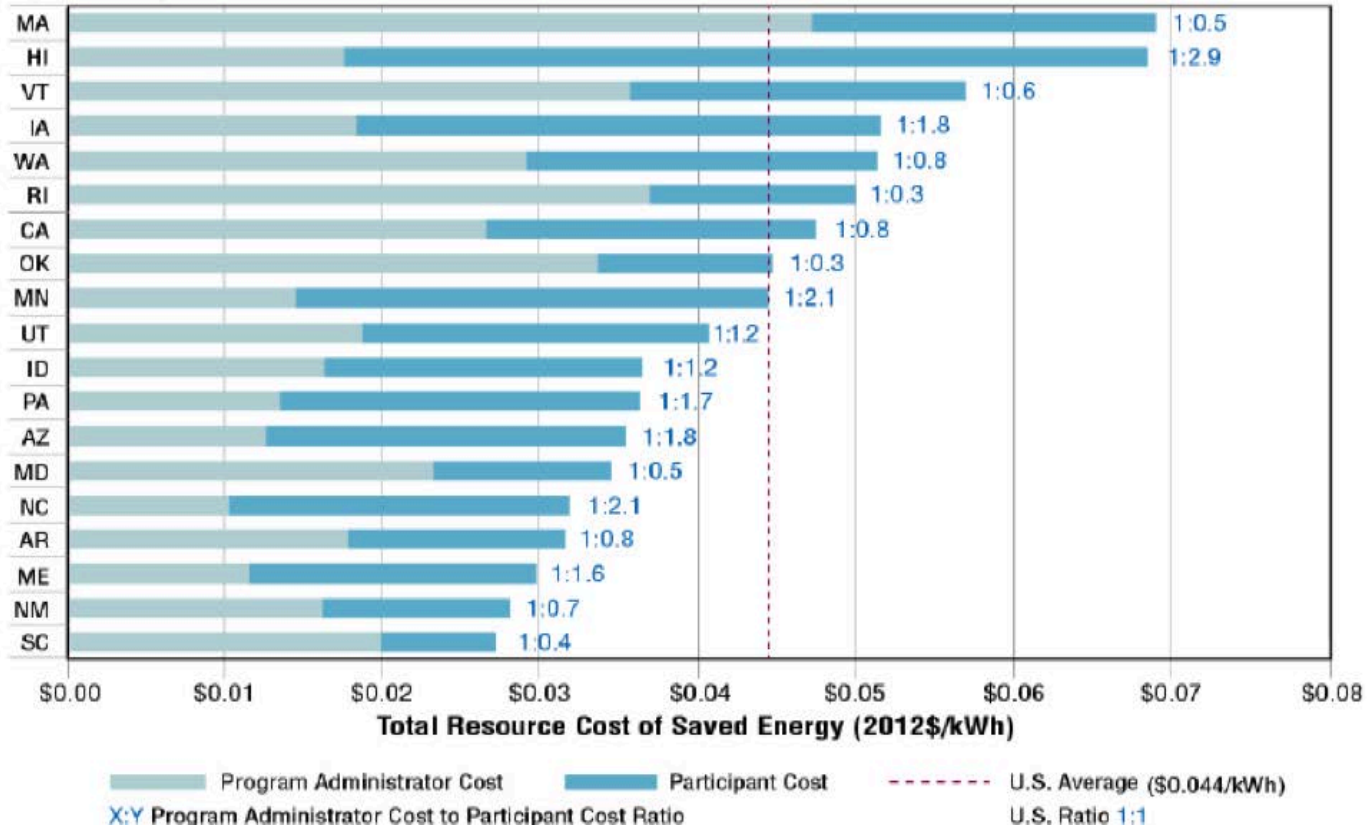
Regulation and program rules

# Efficiency Programs are Growing

## Electric Efficiency Budgets: 2007-2013 and 2025 Forecast



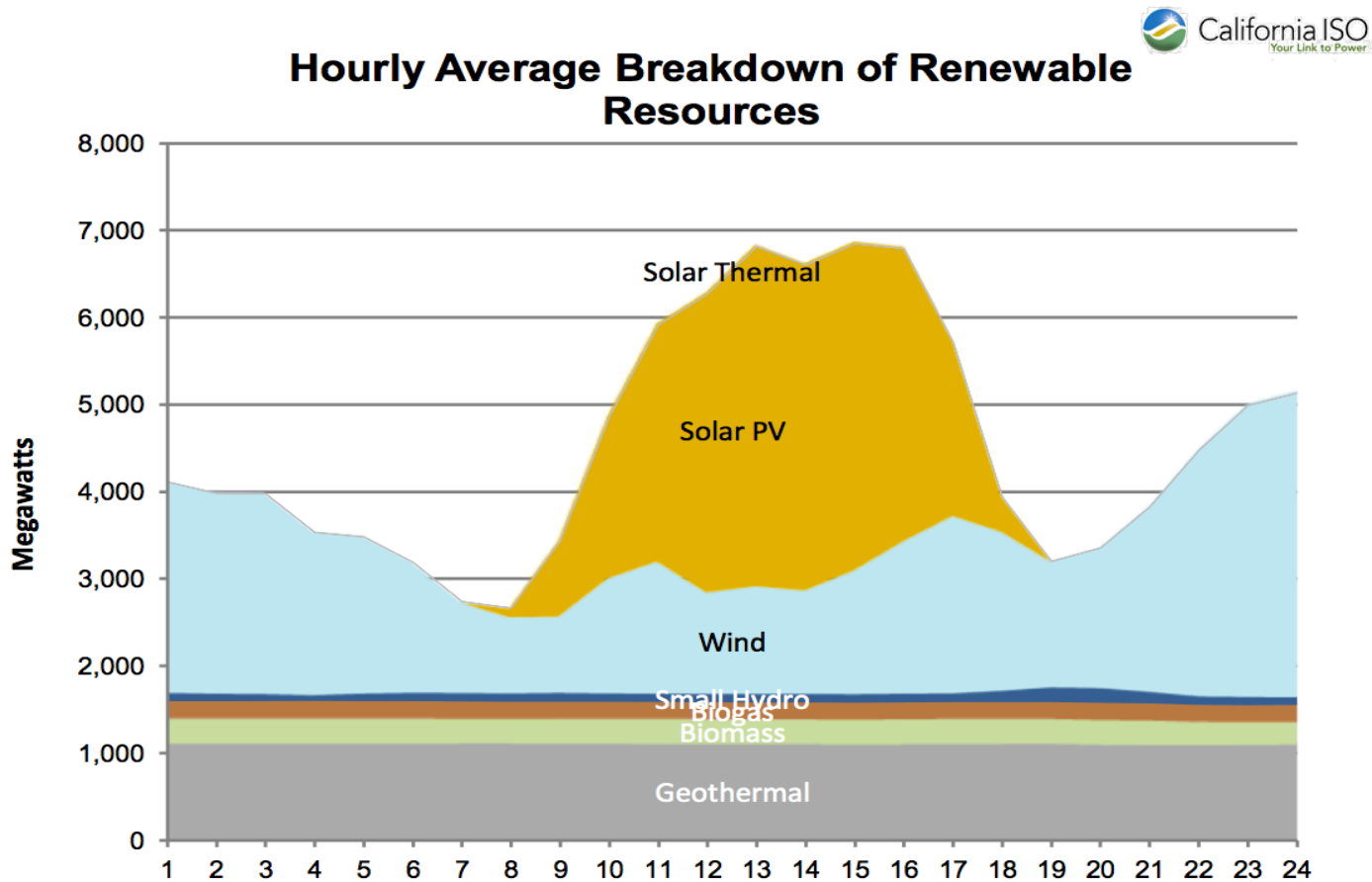
# Ripe for Disruption



# Efficiency Must Adapt to The Rules of Grid 2.0



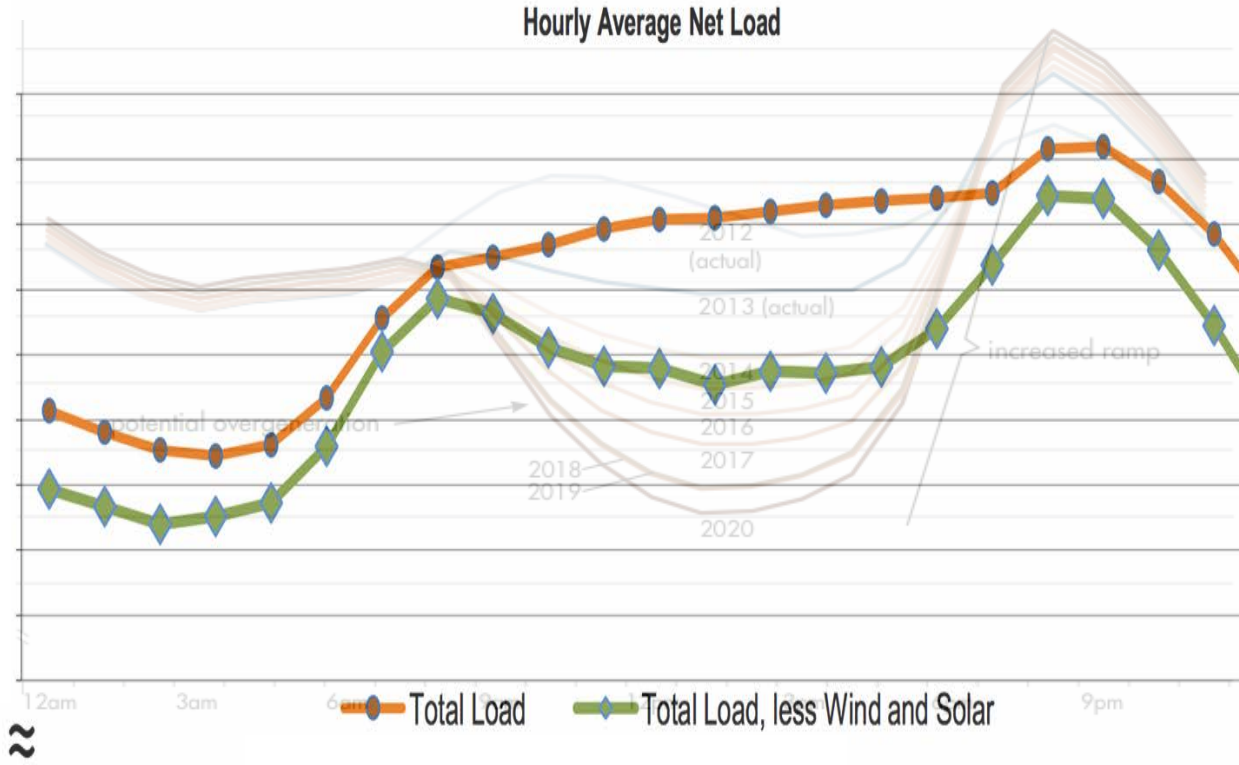
# The Grid is Changing



California ISO

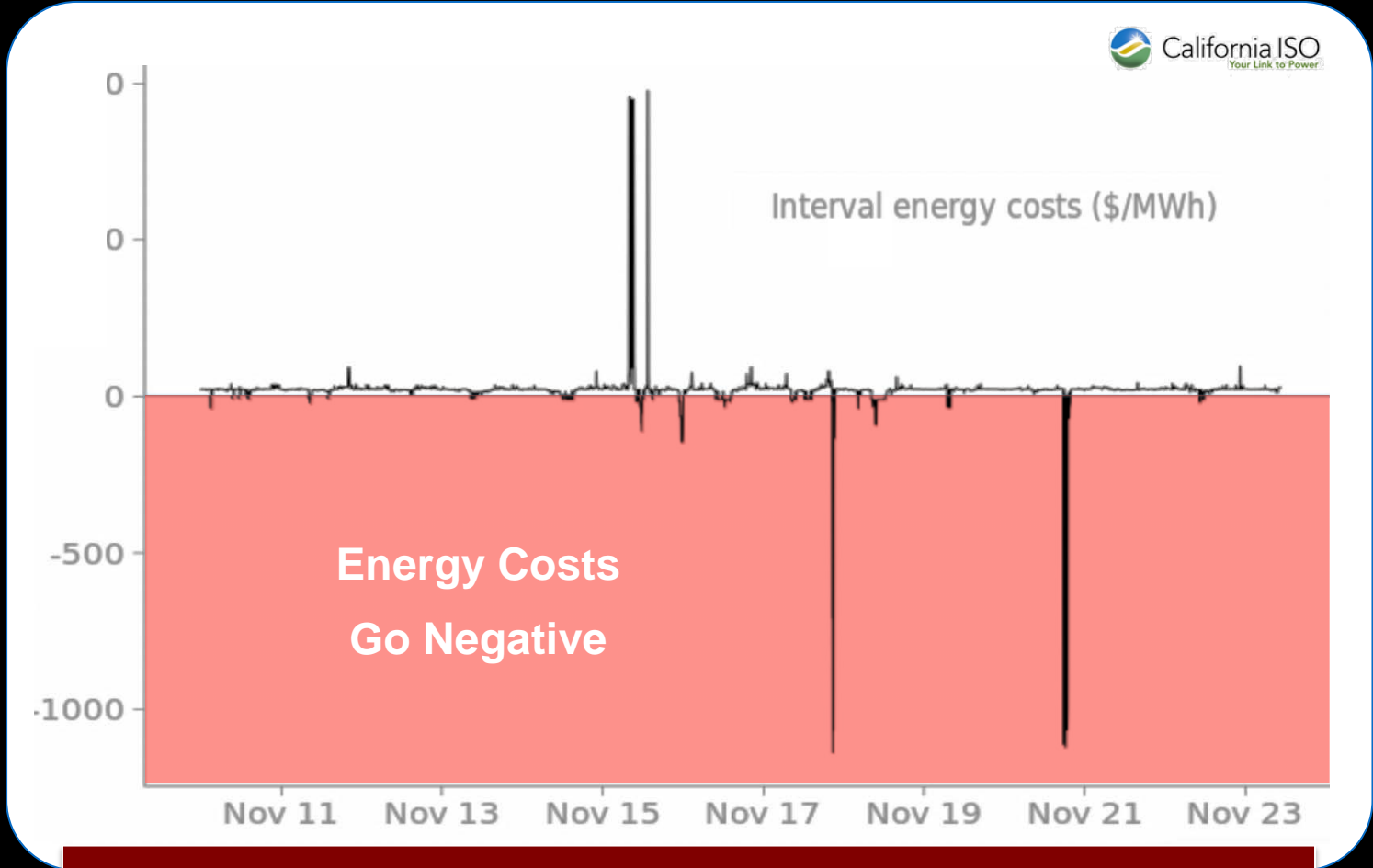
October 28, 2015

# Grid 2.0 Is Real and Right Now





# Not All Energy is Created Equal

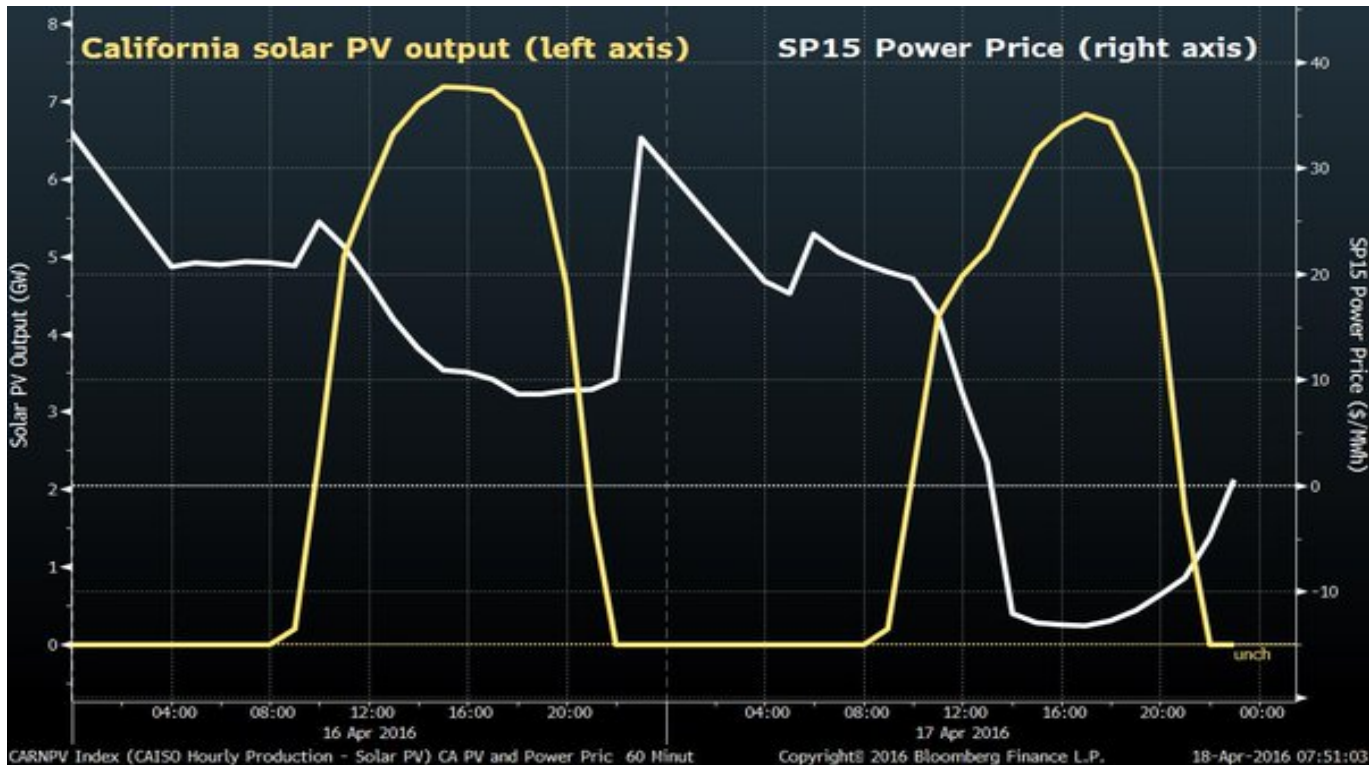


California ISO

Energy Costs Nov. 2015



# Not All Energy is Created Equal



**Solar Production vs. CAISO Price - April 17<sup>th</sup> 2016**

# **Demand Capacity as a Distributed Energy Resource**

# Energy Efficiency is a Massive Market



**HVAC**  
**\$18 B**



**Roofs**  
**\$12.5 B**



**Windows & Doors**  
**\$9 B**



**Insulation / Shell**  
**\$3+ B**

## Residential PACE Finance

51,148

Number of Homes

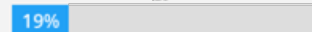
\$1,045

million

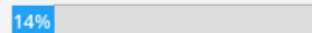
Energy efficiency



Renewable Energy



Mixed

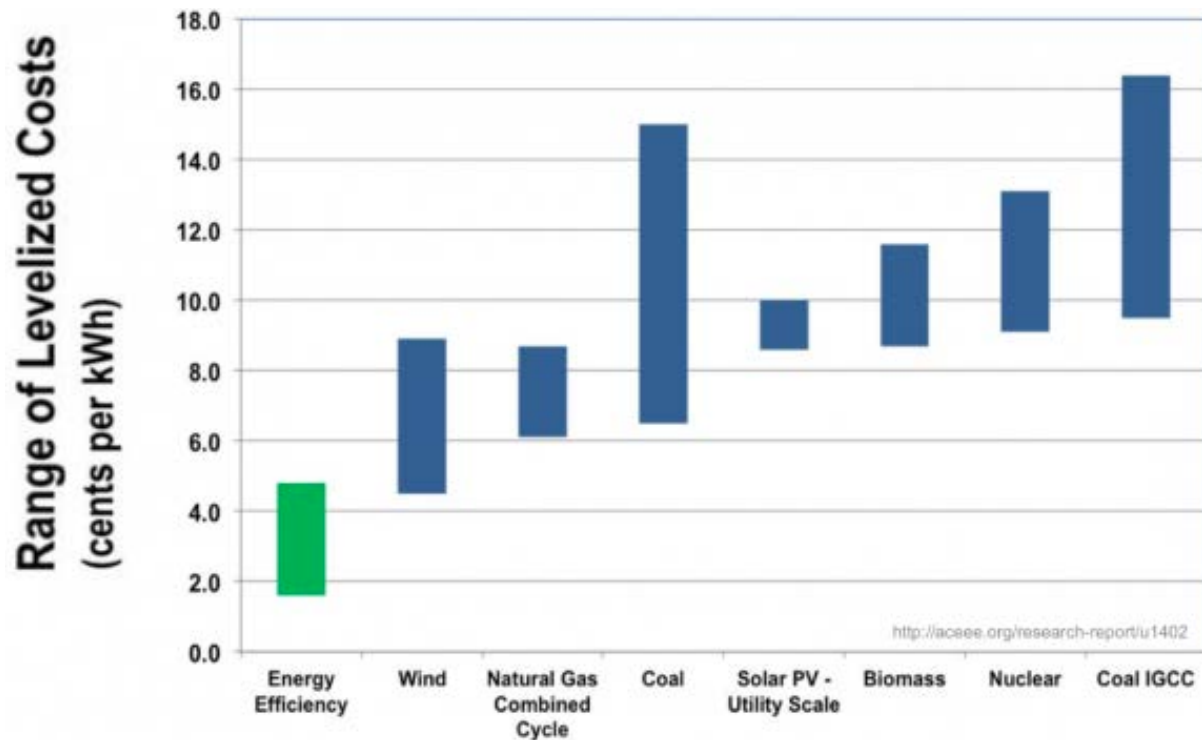


9,390

Jobs Created

**\$500m**  
California  
Residential  
Efficiency  
Projects in  
2015

# Efficiency is a Competitive Resource

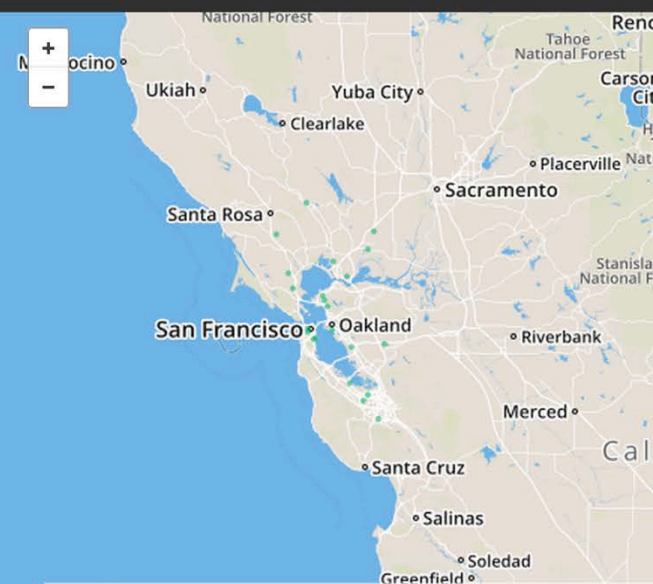


ELECTRICITY GROSS SAVINGS

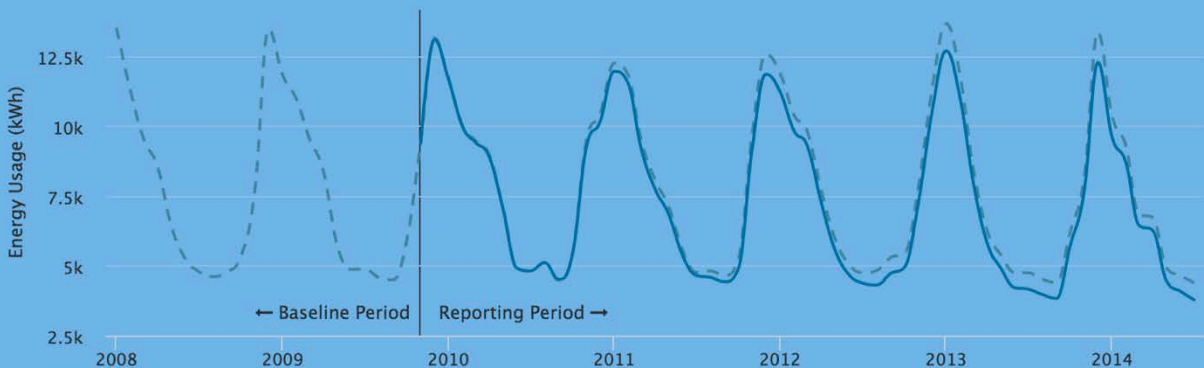
**21,219** kWh

GAS GROSS SAVINGS

**29,198** therm



Total Energy Usage Over Time



Leaflet | Map data © OpenStreetMap contributors, CC-BY-SA Imagery © Mapbox

Electricity Savings - Block

REALIZATION RATE

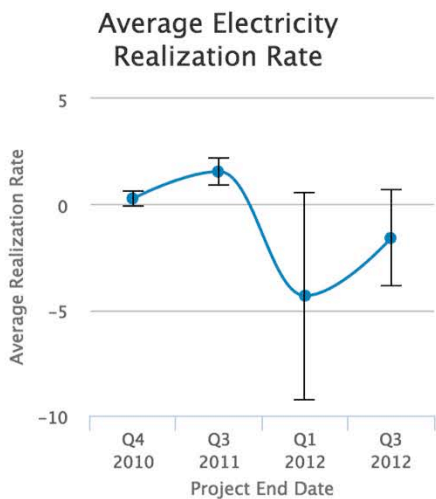
**85 %**

ACTUAL SAVINGS

21,219 kWh

PREDICTED SAVINGS

29,527 kWh



Gas Savings - Block

REALIZATION RATE

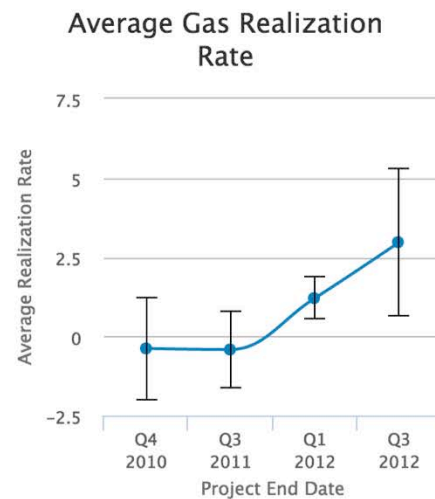
**62 %**

ACTUAL SAVINGS

29,198 therms

PREDICTED SAVINGS

44,411 therms

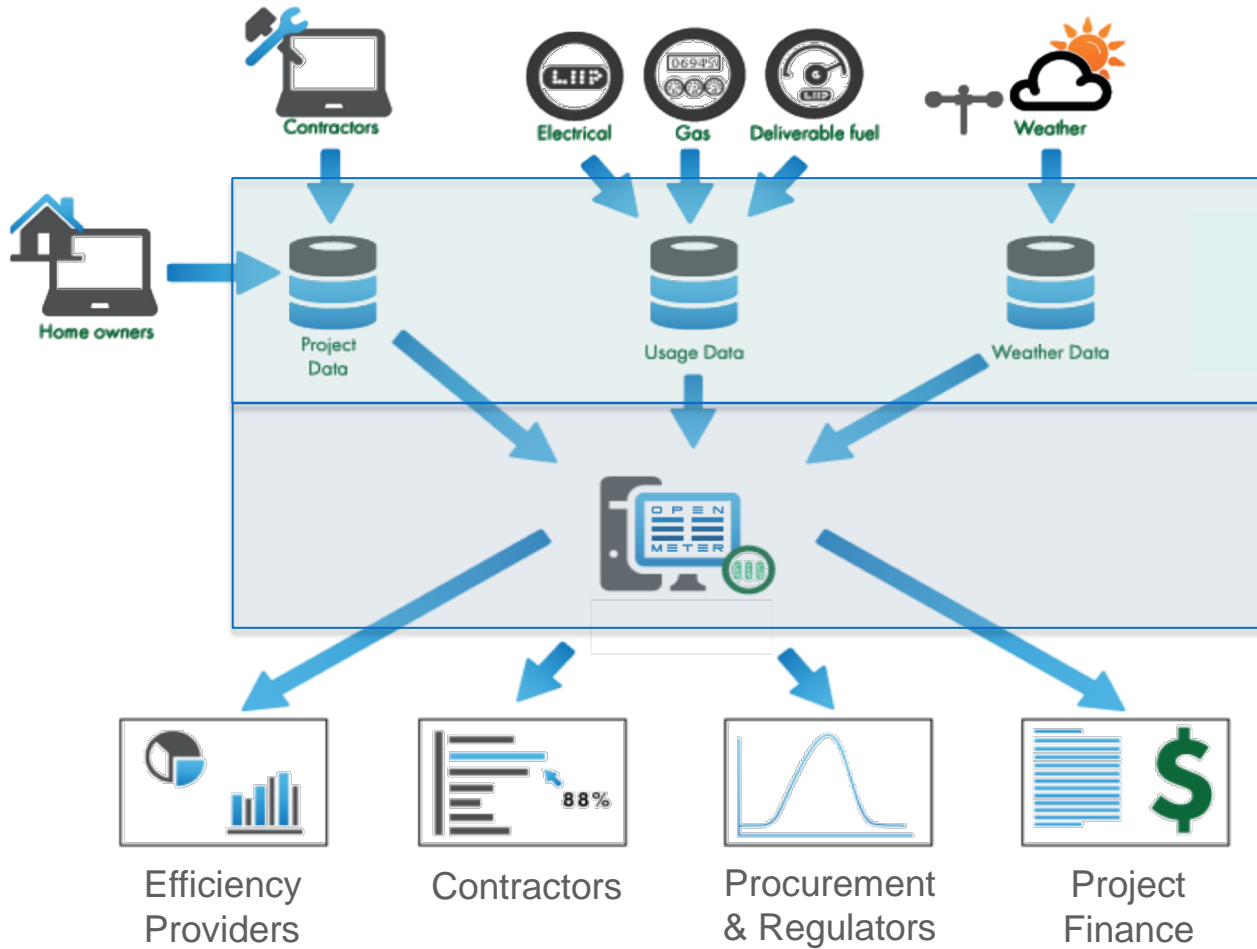


# Open EE Meter

OPEN STANDARD

OPEN SOURCE

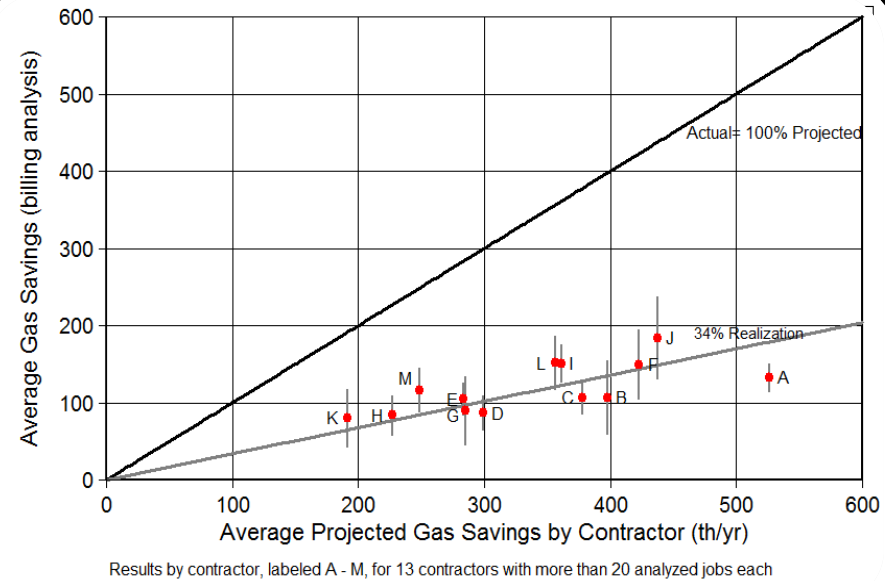
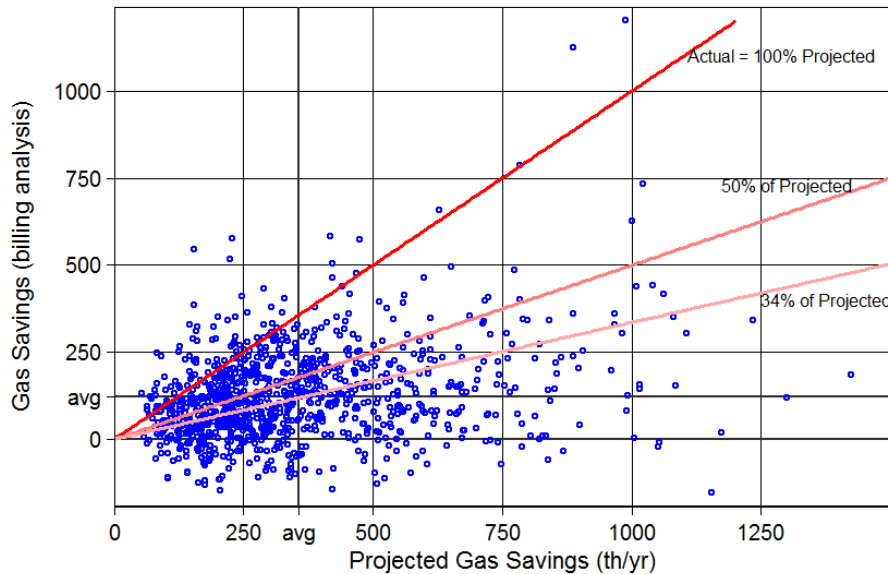
OPEN DATA



# Benefits of Pay-for-Performance

## Efficiency is a reliable and procurable resource

- Reliable returns at a portfolio level
- Turn efficiency into demand capacity (savings + time + location)

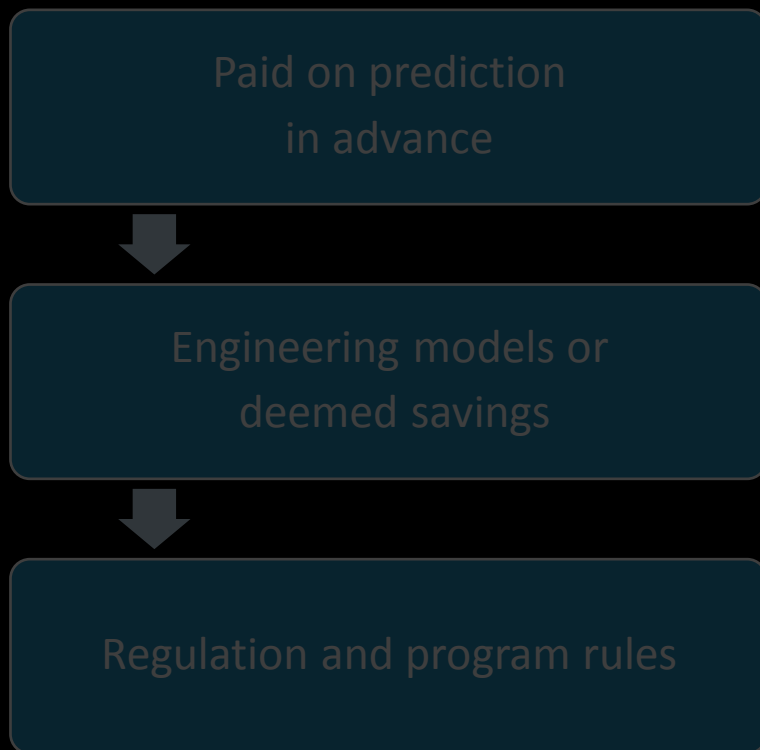


Uncertainty

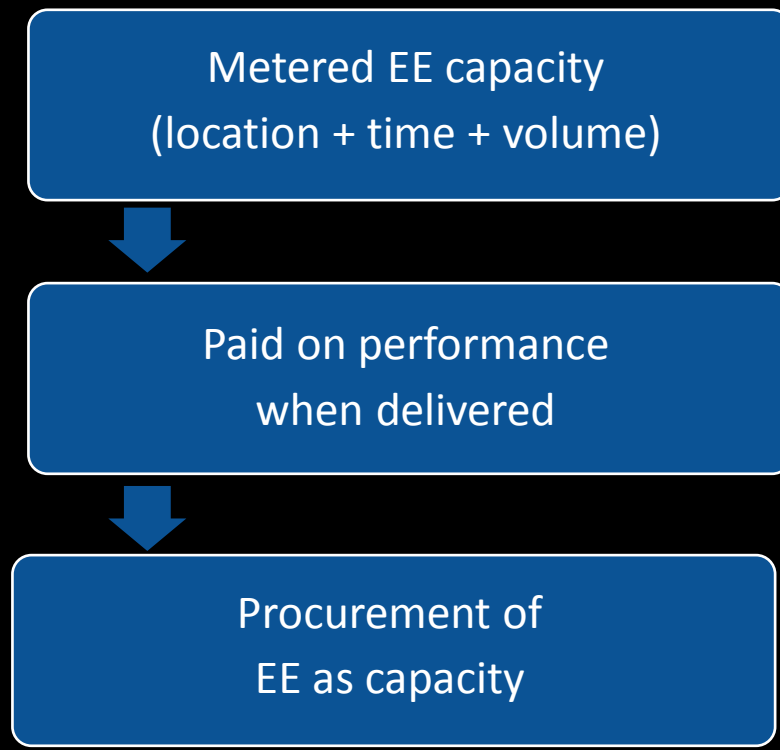
Risk

# Solution: Efficiency Procurement

## Efficiency Programs



## Pay-for-Performance





# Commercial Pay-for-Performance

## Seattle City Light's P4P Program

Three Buildings

Three Years

Three Providers



111 Third Ave

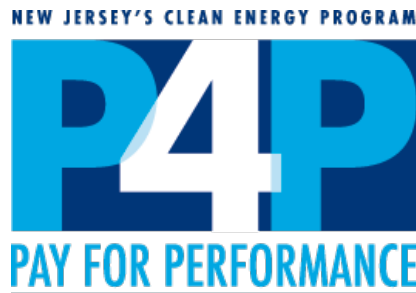


Lake Union  
Building



One Union Square

# Commercial Pay-for-Performance



**Incentive #1 - Submittal of complete energy plan**

**Incentive #2 - Installation of recommended measures**

**Incentive #3 - Based on Post-Construction M&V**

# Metered Pay for Performance is CA Law

- SB-350 / AB-802 Pass Oct 2015
- Increasing California EE goals by 50%
- High Opportunity Pilots – Sept '16



## Major Changes for Energy Efficiency

- EE = Normalized Metered Savings
- Count all savings including up to code and behavior
- Deploy Pay-4-Performance Pilots

# PG&E Residential Pay-for-Performance

## ≡ **AB-802 HOPPs Pilot**

- Normalized Metered Savings using CalTRACK
- Pay for Performance over time

## ≡ **Pay-for-Performance**

- Aggregators paid for 2 years on metered savings
- Savings Purchase Agreement paid by utility quarterly

## ≡ **Value for Efficiency**

- SPA based on discount from current costs
- Future will include time and location

# PG&E Residential Pay-for-Performance

## Goals

Take Res EE to scale  
by enticing more  
private capital

Achieve Data Driven  
M&V by measuring  
“at the meter”\*

Pay for measured  
savings performance

Develop a program  
that can successfully  
transition to grid-  
tied procurement



\* Weather-normalized



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