MEASURING ENERGY EFFICIENCY SAVINGS IN REAL-TIME ENHANCES PROGRAM PERFORMANCE

MODERATOR:
COMMISSIONER KIMBERLY O'GUINN, ARKANSAS

PANELISTS:
CARMEN BEST, DIRECTOR OF POLICY & EMERGING MARKETS, RECURVE
BEN BROWN, EXPERT PROGRAM MANAGER, PACIFIC GAS & ELECTRIC
MARK WYMAN, SENIOR PROGRAM MANAGER, ENERGY TRUST OF OREGON
The National Association of Regulatory Utility Commissioners (NARUC) is a non-profit organization founded in 1889.

Our Members are the state regulatory Commissioners in all 50 states & the territories. FERC & FCC Commissioners are also members. NARUC has Associate Members in over 20 other countries.

NARUC member agencies regulate electricity, natural gas, telecommunications, and water utilities.
WHAT IS NARUC’S CENTER FOR PARTNERSHIPS AND INNOVATION?

• Grant-funded team dedicated to providing technical assistance to members.

• CPI identified emerging challenges and connects state commissions with expertise and strategies.

• CPI builds relationships, develops resources, and delivers trainings.
WEBINAR LOGISTICS

• We’re recording the webinar. It will be posted on the CPI webpage.

• Because of the large number of participants, everyone is in *listen* mode only.

• **Please use the questions box to send us your questions** and comments any time during the webinar. You may want to direct your question to a specific panelist.

• The panelists will respond to questions typed in the chat box during moderated Q&A, following each presentation and at the end.
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Moderator & Panelists

Commissioner Kimberly O’Guinn, Arkansas

Carmen Best, Director of Policy & Emerging Markets, Recurve

Mark Wyman, Senior Program Manager, Energy Trust of Oregon

Ben Brown, Expert Program Manager PG&E
Meter-Based Efficiency

Building a Grid-Integrated Future

Carmen Best,
Director of Policy & Emerging Markets

NARUC Webinar
June 18, 2020
The Grid is Transforming from Centralized Power Plants to Distributed Grid Edge Resources
Recurve Platform: Architected for the Distributed Grid Edge
STANDARD
WEIGHTS & MEASURES

The Foundation of Market-Based Solutions
• Standard M&V Calculation Methods
• Monthly, Daily, and Hourly
• Public Stakeholders Empirical Process
• www.CalTRACK.org

• Python CalTRACK Engine
• Open Source Apache 2.0
• How It Works: https://www.lfenergy.org/projects/openneemeter/
• Code Repo: https://goo.gl/qFdW4P
Recurve Platform:

Execution of meter-based calculations at scale

- **Scaleable**: Parallelized architecture utilizing on demand disposable cloud resources
- **Automated**: Automatically run complex ETL and metering calculations in real time
- **Verifiable**: CalTRACK compliant using openEEmeter
- **Secure**: Isolated platform nodes with permissioned user access
- **Transparent**: Auditable record down to the meter

Computing savings once for 1,000,000 meters...

- **Using a local computer**: \( \approx 3,472 \text{ Days} \)
- **Using Recurve Flex Platform parallel cloud architecture**: \( \approx 1/2 \text{ Hour} \)
SCALE FOR THE FUTURE

Getting Started on Meter-based Solutions
A Path to Scaling Efficiency

- Competitive Procurement
- Implement Pay-for-Performance
- Track meter-based impacts
- Review past performance
23% of Projects

2.5X Greater Savings

70% Fewer Negatives
2015 *Legislation* sparked change

California Public Utilities Commission's key *regulations* support:

- Early pilot pathways
- Consistency and Transparency
- Flexibility for implementation
- Integration with third-party transition
- Performance and accountability

*Ruling on High Opportunity Programs and Projects - CPUC 2015*
Population-Level NMEC

**Program Fit**

Programs must meet the Population-level NMEC regulatory and filing requirements described in this document;

**Meter-Based**

Energy savings determinations are made using an NMEC approach based on pre and post-intervention energy usage data observed at the meter

**Pre-Defined & Consistent**

Measurement methods and calculation software are set before the program starts (and not subsequently changed) and apply to all sites in a uniform fashion

[CPUC Releases Version 2.0 of the Meter-Based NMEC Rulebook](#)
Create Performance Accountability

- Regulatory
  - Planning/ Evaluation
- Utility
  - Load Serving Entity
- State Energy Office or RTO
  - Load Forecast
- Measurement
- Aggregators
  - Efficiency Businesses
- Insurance
  - Performance Risk
- Project Finance
  - Private Capital
- Channels
  - Contractors
- Buildings
Project Finance: The long-term financing of projects based upon projected cash flows rather than the balance sheets of its sponsors.
Key policy changes today . . .

. . . enable a future of grid integration.
References & Resources
2019 Energy Efficiency Plan - Doubling Efficiency

- “develop ability to incorporate aggregations of energy efficiency and demand response programs into long term planning”

- “incorporate meter-based analysis into potential studies to identify cost effective savings potential.”

“With current savings projections, the state is missing the 2030 goal in terms of avoided GHG emissions.” p4
Decarbonization of electricity requires market-based demand flexibility

Matt Golden, Adam Scheer, Carmen Best

Clean Energy Portfolios Win on Price

THE ECONOMICS OF CLEAN ENERGY PORTFOLIOS

HOW RENEWABLE AND DISTRIBUTED ENERGY RESOURCES ARE OUTCOMPETING AND CAN STRAND INVESTMENT IN NATURAL GAS-FIRED GENERATION

BY MATIK DYSON, ALEXANDER ENCEL, AND JAMIL FARJIES

https://rmi.org/insight/the-economics-of-clean-energy-portfolios
Open Source: Opening New Doors for Performance-Based Regulation

Published on July 22, 2019
Carmen Best
Director of Policy & Emerging Markets at Recurve

The best way to create value for flexibility is to enhance price signals in the energy markets themselves, to ensure they are rewarding flexible resources.

https://www.2035report.com/
**Normalized Metered Energy Consumption**

**SB-350 Clean Energy and Pollution Reduction Act of 2015.**
(2015-2016)

“The energy efficiency savings and demand reduction . . . achieving the targets established pursuant to paragraph (doubling of EE by 2030) **shall** be measured taking into consideration the **overall reduction in normalized metered electricity and natural gas consumption** where these measurement techniques are feasible and cost effective.”

**Link:** [https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB350](https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB350)
Normalized Metered Energy Consumption

AB-802 Energy efficiency. (2015-2016)

"... increase the energy efficiency of existing buildings based on all estimated energy savings and energy usage reductions, taking into consideration the overall reduction in normalized metered energy consumption as a measure of energy savings. Those programs shall include energy usage reductions resulting from the adoption of a measure or installation of equipment required for modifications to existing buildings to bring them into conformity with, or exceed, the requirements of Title 24 of the California Code of Regulations ..."

Link: https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160AB802
Normalized Metered Energy Consumption

**CPUC Guidelines: Programs and Projects Using Normalized Metered Energy Consumption (NMEC)**
https://www.cpuc.ca.gov/General.aspx?id=6442456320

**History of NMEC (An Unauthorized Biography):**
*Policy References for Normalized Metered Energy Consumption in California - 2018 Update,* Published on February 4, 2019

_As California continues the discussions on Normalized Metered Energy Consumption...,* Published on February 14, 2018
https://www.linkedin.com/pulse/california-continues-discussions-normalized-metered-energy-best/
"Proprietary Methods & Software: Savings measurement methods and calculation software that is public, and especially those that are open-source, benefit from a stakeholder vetting process that allows experts and practitioners to share their knowledge and use updated information to inform savings estimates. The Commission has supported the development of public, open-source processes to develop NMEC methods (e.g. CALTRACK) and encourages stakeholders to engage in these open-source initiatives." p. 18
M&V Protocols and standards . . .

IPMVP Option (C)

Professional Guidance

Reproducible Execution

Time of Week & Temperature Model

The California Evaluation

California EM&V Framework Refresh Needs Assessment

. . . enable settlement.
Standard Weights & Measures

- Standard M&V Calculation Methods
- Monthly, Daily, and Hourly
- Public Stakeholders Empirical Process
- www.CalTRACK.org

- Python CalTRACK Engine
- Open Source Apache 2.0
- How It Works: https://goo.gl/mhny2s
- Code Repo: https://goo.gl/qFdW4P
- Overview: https://www.lfenergy.org/projects/open_eemeter/
CalTRACK Monthly Model

Technology Agnostic Change In Consumption

CalTRACK Hourly
Time of Week Temperature (TOWT) Model
Policy Pathways to Meter-Based Pay-for-Performance

Carmen Best, Recurve, Berkeley, CA
Megan Fisher, NYSE RDA, New York, NY
Mark Wyman, Energy Trust of Oregon, Portland, OR


## Three Generic Categories of Adoption

<table>
<thead>
<tr>
<th>Market Focus</th>
<th>Scaled Pilots &amp; 3P</th>
<th>Contractor Focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large scale pilot with focus on market development</td>
<td>Large scale pilots and third-party procurements</td>
<td>Step-wise testing with contractors delivering existing programs</td>
</tr>
<tr>
<td><strong>New York</strong>: Business Energy Pro, a Pay-for-Performance initiative</td>
<td><strong>California</strong>: Pacific Gas &amp; Electric Residential Pay-for-Performance, and Third-party Solicitations</td>
<td><strong>Oregon</strong>: Energy Trust Pay-for-Performance Pilot</td>
</tr>
<tr>
<td>Executive direction for grid level improvements, coupled with State Authority leadership</td>
<td>Legislation, regulatory authorization, and utility administrator leadership</td>
<td>Third-party administrator initiative coupled with Governors executive order</td>
</tr>
</tbody>
</table>

*Source: Policy Pathways to Meter-based Pay for Performance*
Pacific Gas and Electric Company
Pay for Performance Programs &
Grid Resource Program
Procurement

Ben Brown
NARUC Webinar on Meter-Based Efficiency
June 18th, 2020
History

- Began in the 1970s
- Building and appliance Code drove savings
- Decoupling introduced – utility profits not tied to revenue
- Shareholder incentive introduced

Currently

- $1 Billion/year in ratepayer funded EE
- Cost effective savings are mandated
- Huge variety of programs, channels and offerings
Figure 2: The duck curve shows steep ramping needs and overgeneration risk.

Hourly Value of Energy (Electric)

Source (C213 Shown):
Recent Impactful Legislation/Policy

California (CA) Senate Bill 350
• Doubles energy efficiency goals in existing buildings by 2030
• Calls out behavioral savings opportunities

CA Assembly Bill (AB) 802
• Allows “existing conditions” baselines
• Prioritizes weather normalized, “meter-based” savings

CA AB 793
• Requires that real time energy usage data is made available to customers
• Requires utilities to incentivize energy management technologies

CA Public Utilities Commission Decision 16-08-019
• Requires utilities to procure third party designed and implemented energy efficiency programs
Pay for Performance Program Model

Implementer/Aggregator
PG&E’s Residential Pay for Performance (Res. P4P) Programs

Unparalleled flexibility to pursue a range of improvements and activities over time to achieve residents’ savings goals

Retrofit
- Whole House
- HVAC
- Lighting
- Outdoor/Pool Deck

Operational
- Smart Thermostats
- Home Energy Management Systems
- Smart Appliances

Behavioral
- Homeowner Incentives
- Demand Response
- Other specially designed programs
Res. P4P Experience (so far)

Successful Solicitations

• We competitively procured four program contracts with three different implementers
• All contracts are entirely performance based using CalTRACK methods
• Two contracts contain variable pricing allowing us to value program energy savings in close alignment with real energy costs

Innovative Implementation

• Programs largely include behavioral and operational interventions to drive savings
• Customers are provided a strategic energy partner
• Implementers use data driven feedback to inform future program interventions

Challenges

• Incorporate behind the meter solar PV, battery storage, electric vehicle charging
• Implementer cash flow challenges
• Ensuring program participant and data integrity
• Develop benefit and cost reporting structure able to accommodate new program model
Next Steps

- Application in other program models and sectors (commercial retrofits and financing programs)
- Develop track record to allow for accuracy in forecasting
- Incorporate wider range of distributed energy resources (DERs)
- Incorporate more dynamic pricing into future contracts

Program Goals

- Demonstrate program is a sustainable model for EE program portfolios
- Create a supportive data ecosystem
- Allow EE to emerge as a reliable grid resource
EE as a Grid Resource

- PG&E invited Bidders to submit program designs that could demonstrate the capability of EE as a Distributed Energy Resource (DER).
- DERs must meet the same technical and operating standards as the rest of the distribution system such that when DERs are interconnected, they do not impact the safety and reliability of the grid.
- For EE, this requires a program that can deliver verifiable energy savings at:
  - Specific locations
  - Predictable times
  - Predictable levels (magnitude)
  - Acceptable levels of availability and assurance
- Grid Resource program proposals must target the right customers with the right measures at the right time and at the right locations such that the energy savings generated by the program naturally align to the specific locational and temporal needs of the grid.
EE as a Grid Resource

- PG&E's objective for Grid Resource programs in this RFP is to identify innovative EE program designs that demonstrate EE can provide energy savings with the level of precision and confidence equivalent to other DER technologies.

- There are two requirements for a program to be considered as a Grid Resource program in the RFP:
  - Grid Resource programs require a **meter-based approach and support near real-time Embedded M&V** to deliver verified energy savings and/or capacity reductions that can be substantiated, commercially transacted and settled to terms on par with other DER technologies.
  - Grid Resource Programs must be informed by both **customer data and grid data** to create a program design that can target customers in a region with the right measures, so the energy savings produced coincides when they are most needed by the grid which varies by the time of day, the time of year, and geographic location.

- At this stage, such program structures will not need to defer distribution capital investments or relieve grid constraints, avoiding the risk to system reliability and the associated punitive commercial terms that follow.

- It is PG&E’s expectation that some or all of these Grid Resource programs will, at some point in the future, serve these grid resource roles.
EE as a Grid Resource

- The dynamic interplay between weather patterns (coast, valley, mountain), development (urban, suburban, rural), and other regional factors (commercial / industrial activity and customer adoption of rooftop solar) coalesce and create distinct variations in grid needs across the various Distribution Planning Regions.

- This analysis is depicted as a simple delivery window for each DRP and can be seen in Figure 5.6 – PG&E DPR Savings Delivery Windows.

- For each DP Region, energy savings delivered during the time frames indicated in green are designated as preferred. Energy savings delivered outside of these timeframes are also accepted.
Thank You

Ben Brown

Ben.Brown@pge.com
About us

- Independent nonprofit
- Serving 1.6 million customers of Portland General Electric, Pacific Power, NW Natural, Cascade Natural Gas and Avista
- Providing access to affordable energy
- Generating homegrown, renewable power
- Building a stronger Oregon and SW Washington
Oregon Residential Pay For Performance (P4P) Design Principles

SAVINGS CALCULATED OFF 12 MONTHS WEATHER NORMALIZED BASELINE AND 12 MONTHS POST-TREATMENT USAGE DATA

USE CALTRACK AS THE FOUNDATION FOR SAVINGS METHODOLOGY, IMPLEMENTED THROUGH OPEN EE PLATFORM

SAVINGS ARE MEASURE-AGNOSTIC
Pilot overview

- **2 year limited deployment**: Three aggregators
  - Portfolios based on dominant treatment type
  - Layered onto deemed savings

- **Layered onto deemed savings**: performance above deemed assumptions
  - Lifetime value established by deemed weighted average

- **1 year performance period**: Two enrollment periods per year
  - Comparison group analysis nets exogenous change

- **Contractor-facing market test**: Three contractors act as aggregators of projects
  - Contractors have access to performance dashboards
Sample Portfolio Life Cycle

Example: deemed savings 15 therms per treatment, savings above deemed priced at $10/therm

Year 1: Deemed Savings 15 therms per site

Year 2: Metered Savings

Comparison

Pre/post weather normalize

Site | Savings
--- | ---
A | 10
B | 30
C | 15
D | 25

Portfolio Payment: \((80 - 60) \times \$10 = \$200\)
Pay for Performance Portfolio Types

Priority Measures

**weatherization**
- insulation
- windows

**HVAC**
- heating systems
- HVAC controls
- water heaters

**whole home**
- HVAC + weatherization
Aggregator Engagement

- All Staff Engagement
- Document + Apply Learnings
- Review Portfolio Progress
- Portfolio Payment
Research Questions

1) Do P4P designs enable better targeting of interventions with variable outcomes?

2) Do P4P designs improve measure cost effectiveness?

3) Do P4P designs create new participation opportunities for lagging markets?

4) Is the market ready for a “pure” P4P approach with no guaranteed (deemed) incentives?

5) How persistent are the energy savings from P4P?
Limits and Exclusions

- Sites with solar
- Missing meter data
- Fuel switching
- “Synthetic baselining” or non-routine adjustments
Risks, Unknowns and Considerations

- Monthly billing data quality
- Account changeovers
- Non-routine events
- Measures with market baselines
- Forecasting yield
Pilot Milestones

- **April 2019 launch**
- **October 2019 Portfolio #1 closes, Portfolio 2 opens**
- **October 2020 First Portfolio Payment**
- **Q1 2020 Evaluation Report**
Mark Wyman
Senior Program Manager
Mark.wyman@energytrust.org
QUESTIONS?

1. Use the Question box

2. Direct your question to Panelist by name
NARUC Innovation Webinar series

Hosted one Thursday each month from 3:00 p.m. to 4:00 p.m. ET

• PUC Participation in EarthEx 2020: An Energy Security Exercise
  
  June 25, 2020 | 3:00 – 4:00 PM Eastern

• Renewable Technologies You May Not Have Heard Of
  
  August 20, 2020 | 3:00 - 4:00 pm Eastern

Register at: https://www.naruc.org/cpi-1/emerging-issues/innovation-webinars/

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