



New York State Partners Advanced M&V Workshop June 24, 2020



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OPPORTUNITY.

NYSERDA

Please note

- This webinar is being recorded
- Interaction is encouraged, and..
 - Please mute yourselves unless speaking
 - Please identify yourself when commenting/questioning
 - Please use chat function as needed during presentations
 - There is also time for Q&A half way through and at end

Purposes of this Workshop

- An introduction to Advanced M&V concepts, resources, relevant pilot experience (high level)
- A forum for open discussion about Advanced M&V and its potential roles supporting current or future energy policy goals in New York

Agenda



- Welcome from NYSERDA
- High Level Summary of Advanced M&V Project
 - Overview
 - Commercial Pilot
 - Residential Pilot
- New York Stakeholder Information Exchange
 - Presentations
 - Round Robin
- Facilitated Discussion



Connecticut Department of Energy and Environmental Protection



Connecticut Department of
**ENERGY &
ENVIRONMENTAL
PROTECTION**

Standardized, Sustainable and
Transparent EM&V – Integrating New
Approaches in Connecticut

Michele Melley
CT Dept. of Energy/Environmental Protection
Advanced M&V-NYSERDA State Partner
Michele.L.Melley@CT.gov
860-827-2621
Workshop
June 24, 2020



Connecticut Department of Energy and Environmental Protection

Standardized, Sustainable and Transparent EM&V- Integrating New Approaches in Connecticut

Funding

DOE Funding: Office of Energy Efficiency
Renewable Energy.

Cost Match: Project Partners

Project Goals:

This project will test the use of advanced data analytics and collection tools (M&V 2.0) through a statewide pilot and compare these findings with traditional M&V practices.

The project team will transfer those results and experiences to other states along with additional EM&V 2.0 research and experiences from across the country.



Impact:

- Develop M&V 2.0 software tool standards and protocols
- Broad scale adoption and use of M&V 2.0 tools in CT based on pilot results
- State and regional education on automated versus traditional approaches to EM&V

Partners:

- NH, NY, RI, VT, NEEP, LBNL
- Eversource Connecticut (utility)
- United Illuminating (utility)

Stakeholders:

- State energy offices, regulators, utilities, program administrators, evaluators, system planners, facility managers

CT TEAM

Contacts and Roles

CT DEEP

Michele Melley, Project Manager (Michele.L.Melley@CT.gov)

- Grant recipient, overall project management, participate in pilot work, DOE reporting;

NEEP

Elizabeth Titus

- Outreach, disseminate information, lead/convene regional workshops;

LBNL

Jessica Granderson PhD, Eliot Crowe, Sam Fernandes

- Implement pilot/conduct advanced data analytics via LBNL M&V tool. Technical Advisor

CT Utilities- Eversource/UI

Miles Ingram, Dick Oswald

- Implement pilot, manage continuous M&V on buildings, comparative M&V analysis.



CT Advanced M&V Pilots: To Explore

Potential Benefits

- Lower cost-Utilities can reduce expenses
- Quicker feedback-identify low/high performing buildings
- Improved accuracy and precision- advanced M&V can capture more granular actual impacts



CT Advanced M&V Pilot: Resources

Resources/Deliverables-

- Utilities Traditional Savings Memo
- LBNL'S Implementation Resource Guide
- Commercial Pilot Results and [Fact Sheet](#) – LBNL Website
- Residential Pilot Results –Coming Soon
- State Partner Workshops – **Vermont, NH, RI, NY**
- Outreach Plan
- [Research Brief](#) and Other Briefs (NEEP Website)
- [Protocols Webinar](#) and Other Public Events (NEEP Website)
- CT Dept of Energy and Environmental Website
 - Advanced M&V Resources/Information –Coming Soon
 - August 2020: Public Workshop



CT Advanced M&V Pilot: Overview

Commercial Pilot-

- Targeted 2-3 Dozen Commercial Buildings
- AMI Data
- RCx, Energy Opportunities, SBEA
- Compared Advanced M&V to “ex ante” –savings estimates, time and cost.



CT M&V Residential Pilot: Overview

Residential Pilot-

Targeting ~ 2,000-3,000 CT “HES” homes

- Monthly Consumption Data- (not AMI)
- Compare the advanced M&V to “Traditional” approaches—billing analysis.



Lessons Learned from Connecticut Commercial Advanced M&V Pilot

Eliot Crowe

Lawrence Berkeley National Laboratory



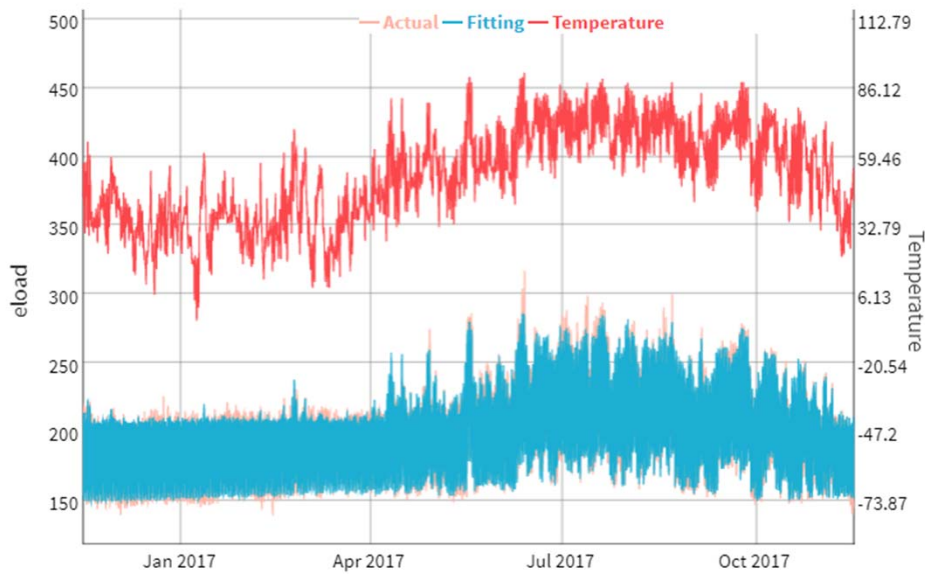
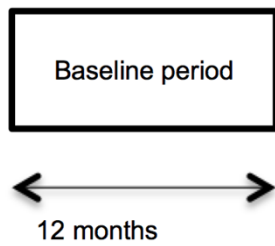
Background

Pilot Overview

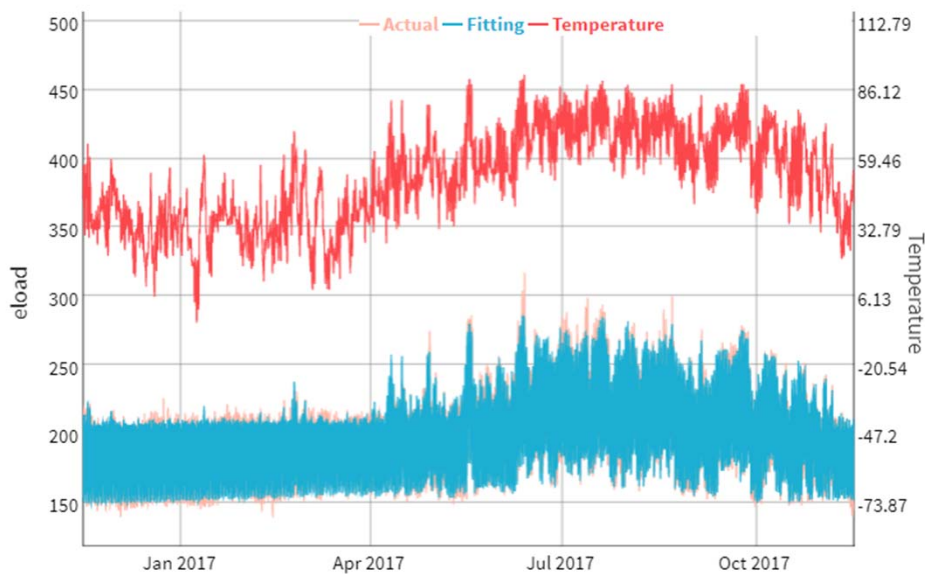
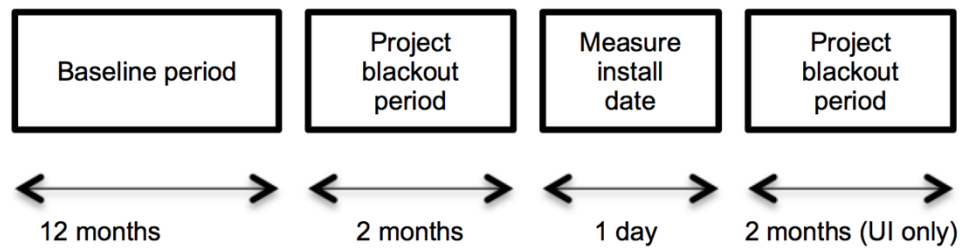
- Initiated 2017
- 28 Commercial pilot sites
- Objectives
 - How soon can we get an indication of savings?
 - How do advanced M&V savings compare to traditional estimation methods?
 - How does effort compare?



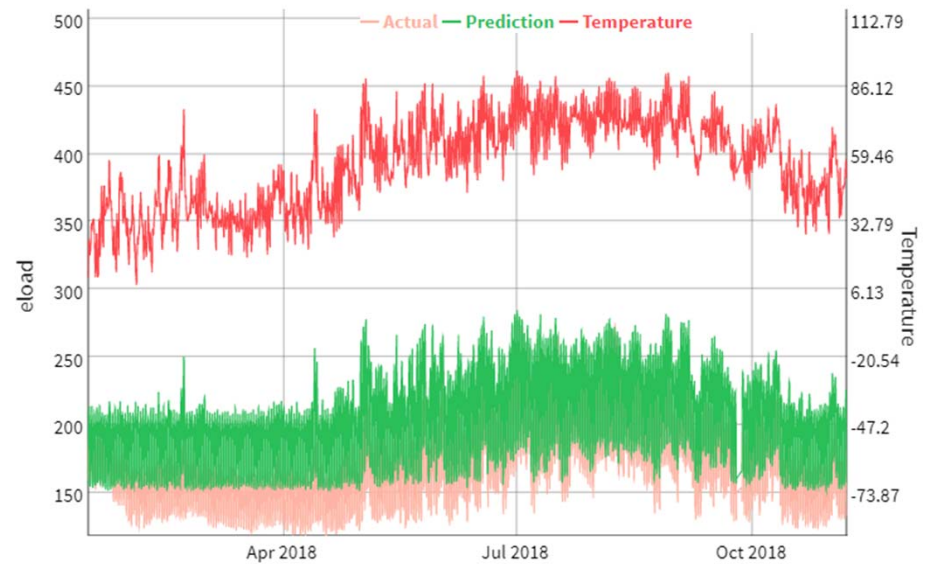
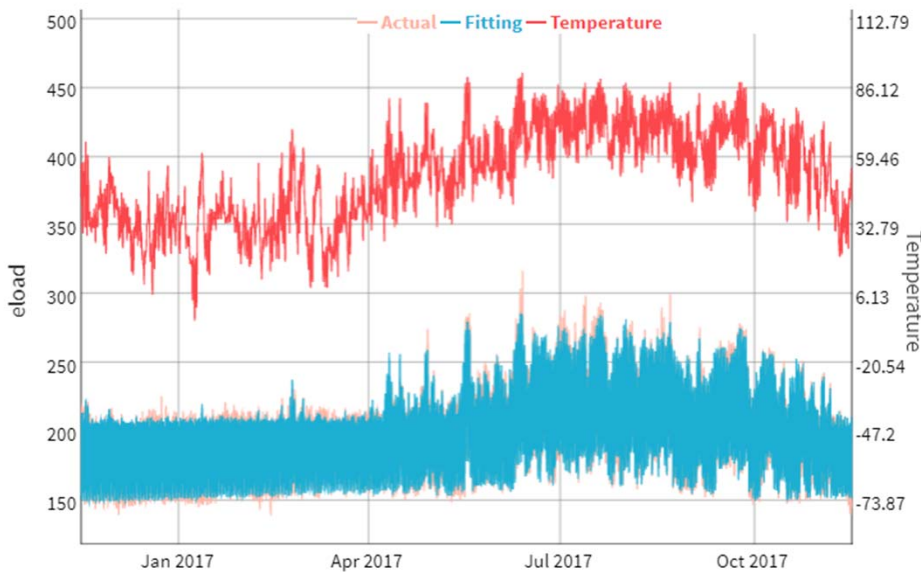
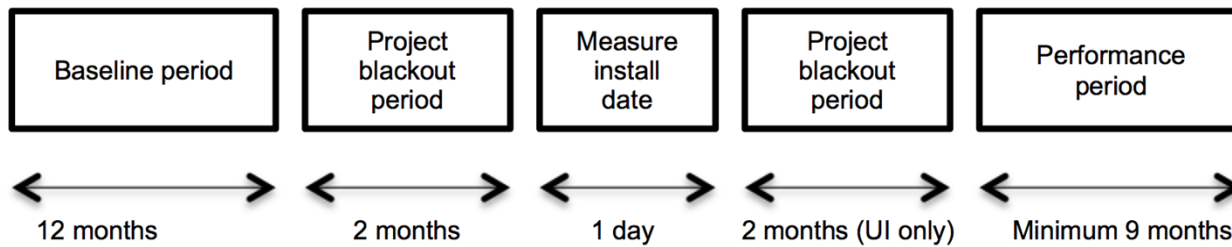
Pilot approach



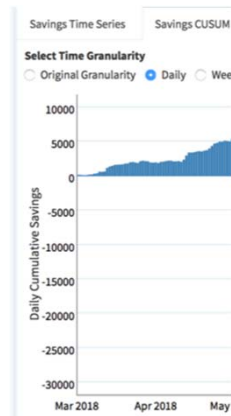
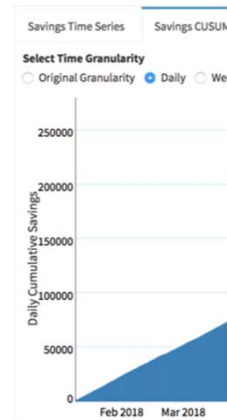
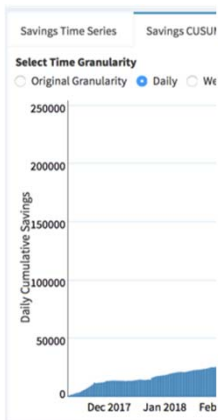
Pilot approach



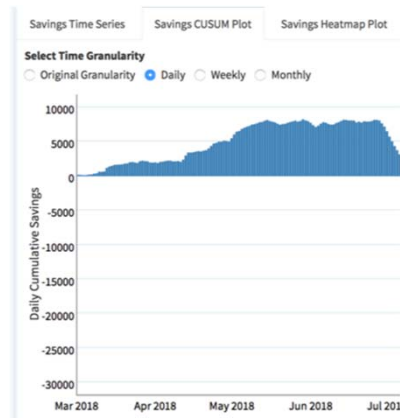
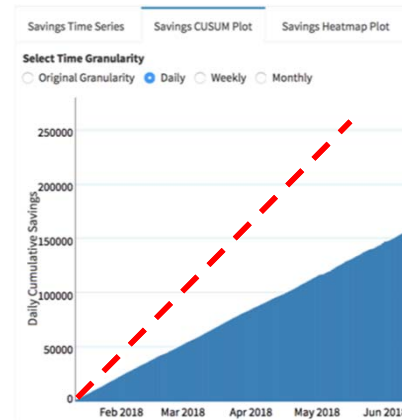
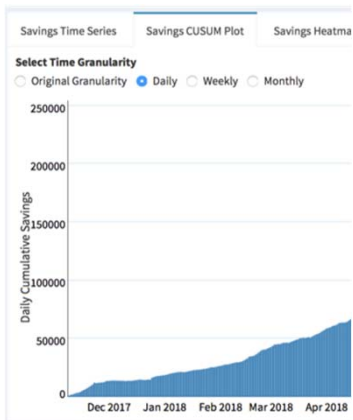
Pilot approach



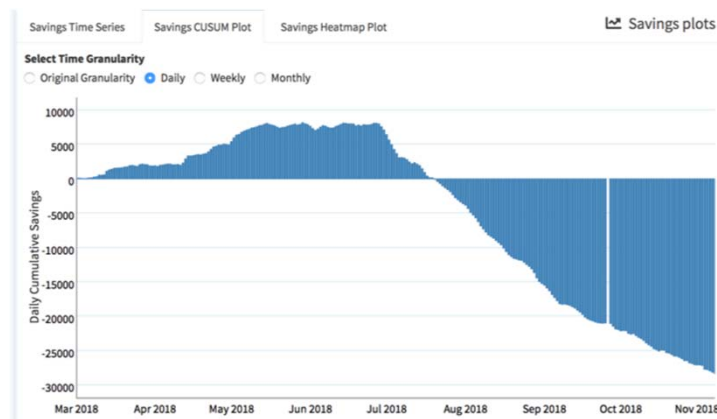
Lesson 1: Rapid feedback is possible



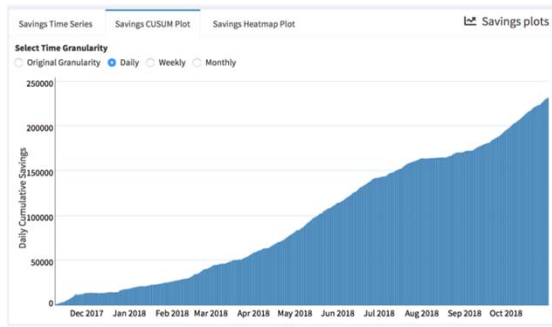
Lesson 1: Rapid feedback is possible



Lesson 1: Rapid feedback is possible



Lesson 2: Project classification can help manage risk



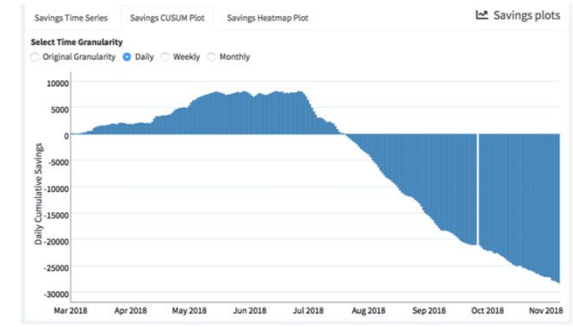
The Good

- $\pm 20\%$ vs. ex-ante
- 6 projects
- 84% realization rate



The Bad

- $>35\%$ below ex-ante
- 5 projects
- 55% realization rate



The Ugly

- +253% to -184%
- 9 projects
- 5% realization rate

Lesson 3: Advanced M&V effort level is low

Advanced M&V Activity	Average Time per Project (hours)	Percent of Total Time (%)
Data Processing	4.2	70%
Modeling	0.1	2%
Collating Results	1.7	28%
Total	6	100%

Expected Reductions in Effort When Scaled

- MDMS configured to provide consistent data, formatted and time-stamped as needed
- Streamlined process to allocate meters to buildings/projects and for logging key dates

- Implementers gain experience, reducing time to review savings estimates and make decisions.
- In some scenarios aggregation may reduce time spent reviewing individual project results.
- Automated tools to assist in identifying NREs, and make data-driven adjustments

Overarching Findings

- Tools and methods are ready to go
- Rapid feedback is feasible
- Project classification helps manage risk
- Advanced M&V is relatively low effort
- Data management is key (interval data and project dates)
- Time & experience needed to make judgment calls

Continuing Development

- Continue conversation on use cases for advanced M&V
- Continue R&D on non-routine events
 - Define thresholds for action
 - Build catalog of buildings' data with documented NREs
 - Test data-driven adjustment methods on simulated & real data
- Develop methods to address uncertainty
- Assess applications for time-sensitive valuation

THANK YOU!

Berkeley Lab Team



Jessica Granderson



Eliot Crowe



Sam Fernandes



Samir Touzani

Partners

- Michele Melley (CT DEEP)
- Miles Ingram (Eversource)
- Dick Oswald (UI)
- Elizabeth Titus (NEEP)

Sponsor

- U.S. Dept of Energy

Connecticut Residential Pilot



Connecticut Residential Pilot

CT Advanced M&V Residential Pilot: Overview

- Compared advanced M&V capabilities to “traditional” approaches—i.e., formal third-party evaluation conducted under established framework
- Analyzed monthly electric billing data for ~ 10,000 participants in CT Home Energy Solutions (HES) 2015-16 single-family weatherization program
- Scoped to align with the HES impact evaluation conducted on behalf of the CT Energy Efficiency Board (EEB),¹ to allow more meaningful comparisons
 - Same data sets for both the pilot and the formal EEB impact evaluation (except the pilot analyzed electric only, due to pilot objectives and available budget)

¹West Hill Energy and Computing. R1603, Impact Evaluation of CT Home Energy Solutions Programs, Final Report, October 22, 2019. Available at https://www.energizect.com/sites/default/files/R1603_HES%20Impact%20Evaluation_Final%20Report_10.22.19.pdf

CT Advanced M&V Residential Pilot: Current Status

- Advanced M&V vendor—Recurve
 - Completed analysis of HES data using advanced M&V tool
 - Documented pilot design and process
- CT Utilities, LBNL, DEEP
 - Completing Residential Pilot Findings memo, which will detail methods, savings results, key lessons learned
- Next steps: pilot → program.
 - CT Utilities working with Recurve to analyze more recent years' (2017-2019) programs (electric and gas) and optimize program implementation

Post-Pilot Phase: Advanced M&V for Program Improvement

Savings drivers: learnings from analyses of 2017-2018 program years

- Customers in the top 50% of pre-project gas & electric consumption drove *nearly all* program savings
 - **Target marketing/outreach and pre-screening of non-participants with high usage—*must still ensure equitable participation (e.g., avoid over-representation of high-use mansions)***
- Customers with electric space heating exhibited significantly higher average electricity savings.
 - **Target customers with electric space heating**
- A wide range of contractor performance was observed
 - **Monitor contractor performance and provide contractor-specific feedback**

Impact evaluation results: update 2015-16 results with results from more current program years



Savings Drivers and Program Optimization: Customer Targeting

Last Year's High Savers = Next Year's Targeted Customers

Electric savings for Eversource 2017-18 HES participants (*all heating types*)

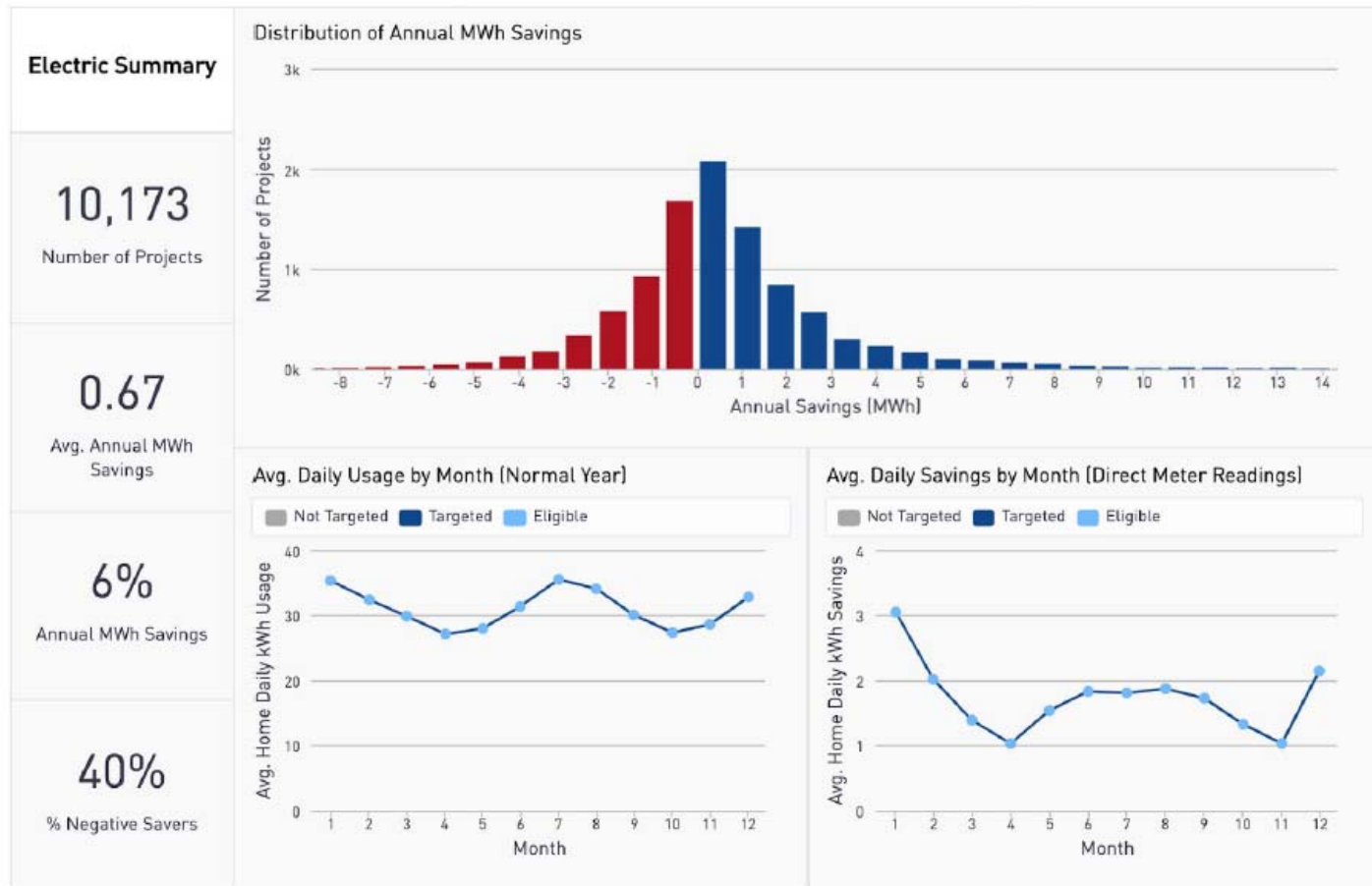


Figure 2: Summary of electric backcast results for the HES program - Non-solar PV customers

Savings Drivers and Program Optimization: Customer Targeting

Last Year's High Savers = Next Year's Targeted Customers

Electric savings for Eversource 2017-18 HES participants (*electric heating only*)

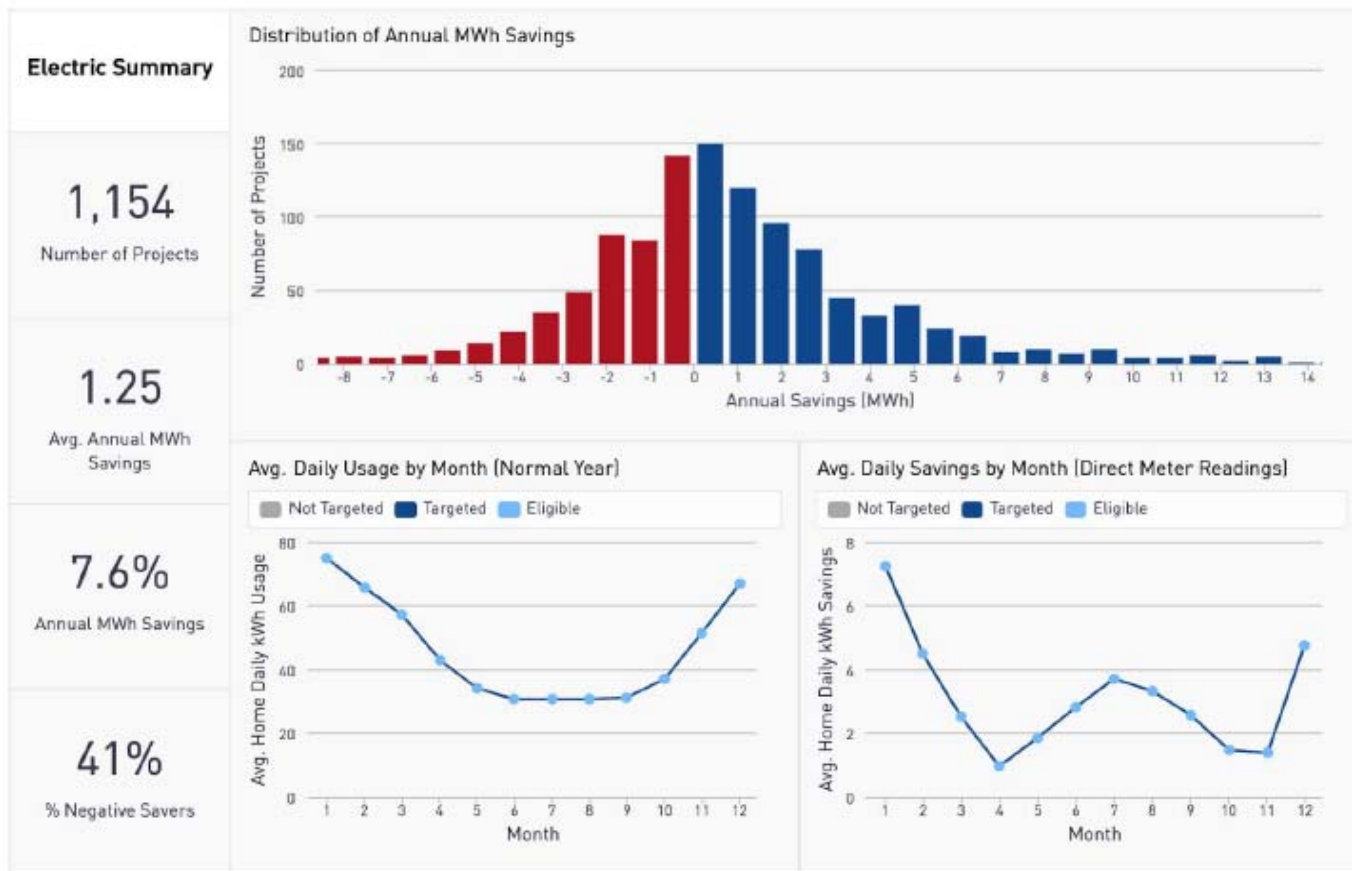


Figure 5: Summary of electric backcast results for the HES program - Non-solar PV customers with electric space heating

Savings Drivers and Program Optimization: Customer Targeting

Last Year's High Savers = Next Year's Targeted Customers

Electric savings for Eversource 2017-18 HES participants (*top 50% of pre-program usage*)

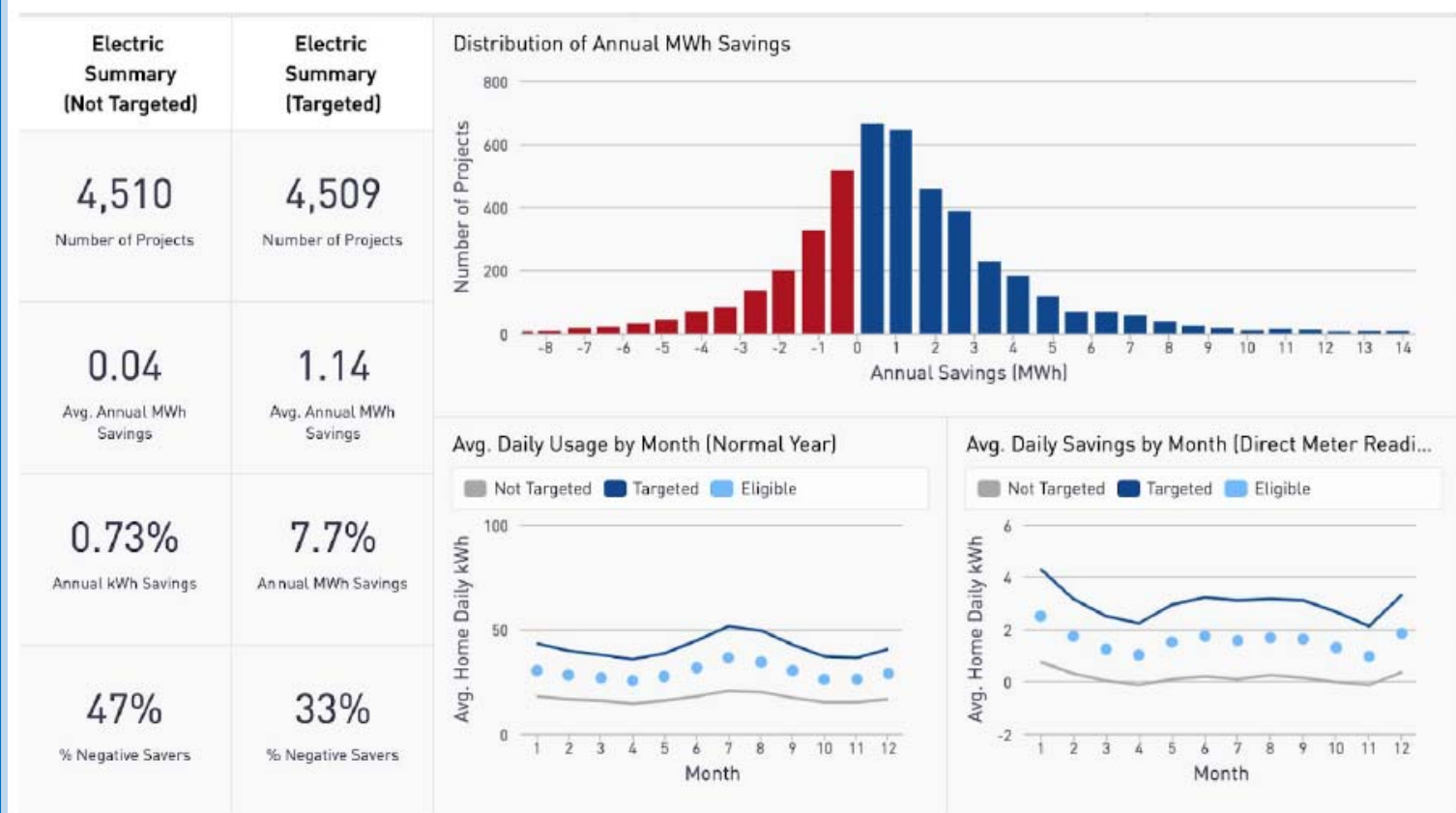
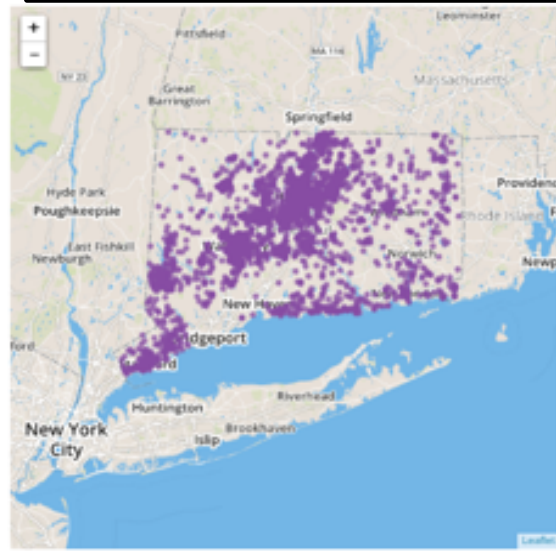
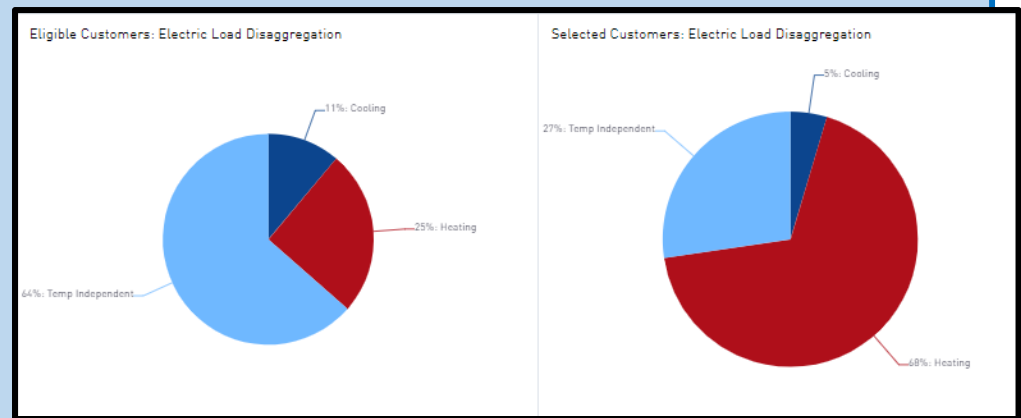
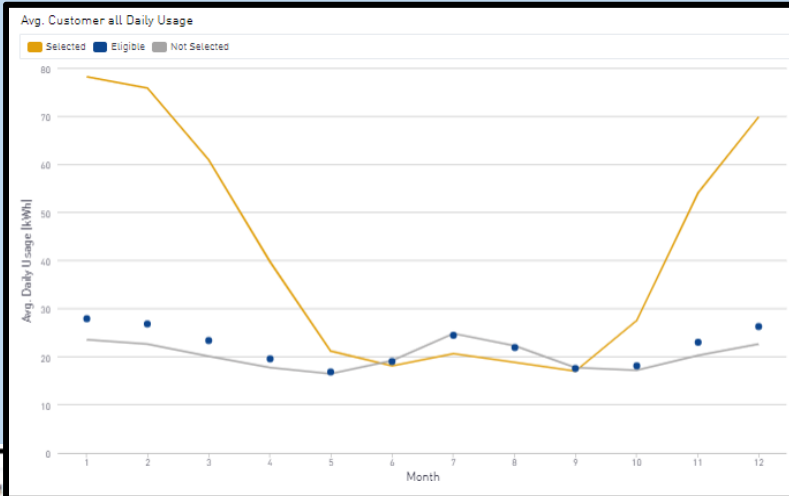


Figure 6: Summary of electric backcast results for the HES program - Non-solar PV customers with electric space heating. Selecting customers in the top half of pre-program annual kWh usage.

Savings Drivers and Program Optimization: Customer Targeting

Last Year's High Savers = Next Year's Targeted Customers

Non-participants with high electric heating loads (top 10% of customers by % heating-correlated load)



annual_kwh Targeting Feature 1	6,689.1 Threshold Annual_kWh	44.4k Max Annual_kWh	657 Count Targeted Meters
winter_kwh Targeting Feature 2	2,735.4 Threshold Winter_kWh	24.4k Max Winter_kWh	5.6% Percent Eligible Meters
pct_heating Targeting Feature 3	0.539 Threshold Pct_Heating	1 Max Pct_Heating	

Targeting Results Full List (Limited to 20,000)

METER ID	HES ID	RAW ADDRESS	BILL ACCT ID	CVMSE	ANNUAL KWH	SUMMER KWH
1	S1268292078-S1268292078-S1268292078_electricity	false		0.311782026489642066	21182.72477	1547.7622
2	S1499973206-S1499973206-S1499973206_electricity	false		0.054190247794855584	8700.0	970.262
3	S1589418232-S1589418232-S1589418232_electricity	false		0.124983262017982	17987.81421	1226.9742
4	S1477622011-S1477622011-S1477622011_electricity	false		0.10179326601071829	21014.0	1733.9262
5	S1192812274-S1192812274-S1192812274_electricity	true		0.198328727822799	6825.7829	1766.2872
6	S183087262-S183087262-S183087262_electricity	false		0.3510021029876312	9085.47914	1604.3794

Savings Drivers and Program Optimization: Vendor Management

Last Year's High Performers = Next Year's Preferred Vendors

Top Five Performing HES Vendors (based on electric savings)

CONTRACTOR	PROJECT COUNT ELEC	AVG MWH SAVINGS ↕	PROJECT COUNT GAS	AVG THERMS SAVINGS
[REDACTED]	338	1.34	61	53.39
[REDACTED]	431	1.23	262	64.97
[REDACTED]	134	1.08	26	90.55
[REDACTED]	582	0.87	117	52.91
[REDACTED]	166	0.81	26	67.86

Bottom Five Performing HES Vendors (based on electric savings)

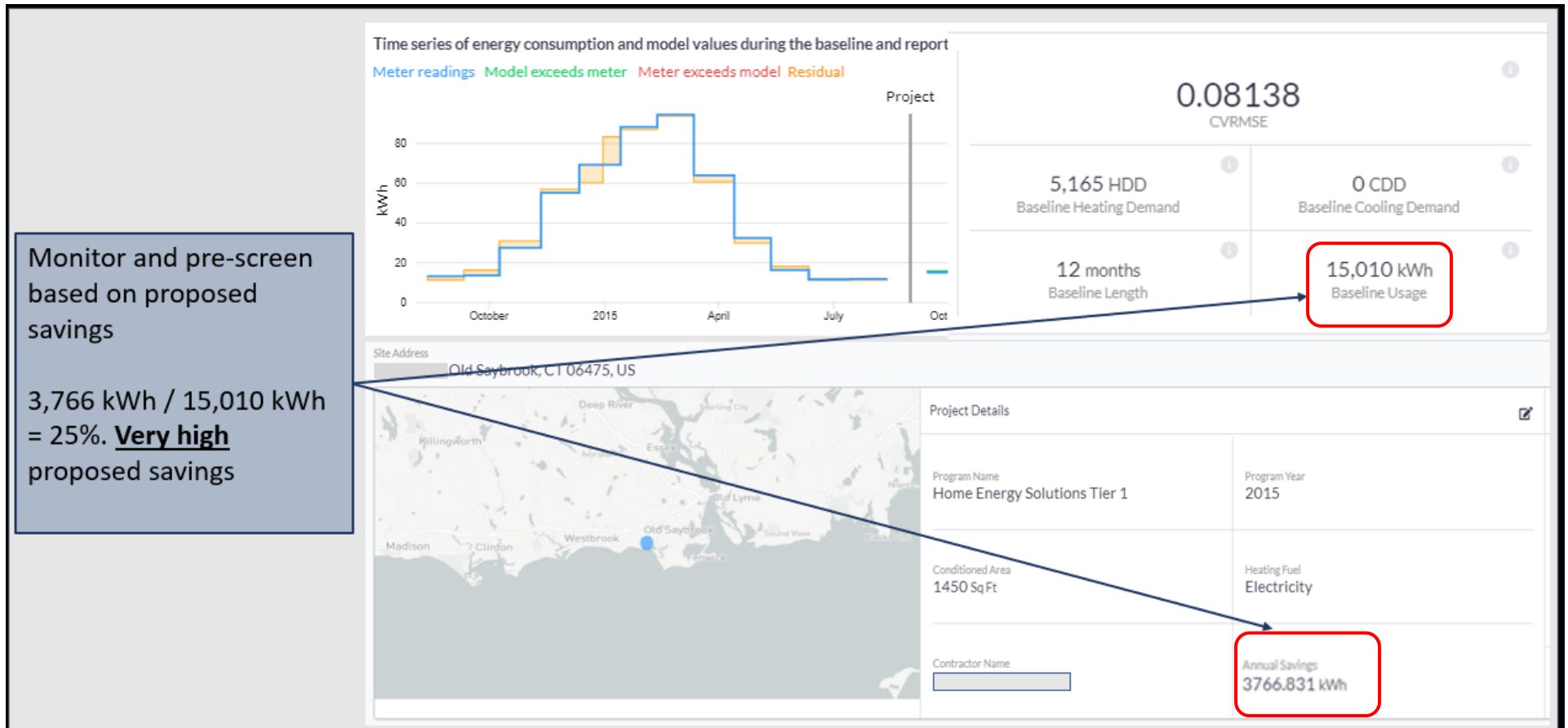
CONTRACTOR	PROJECT COUNT ELEC	AVG MWH SAVINGS ↕	PROJECT COUNT GAS	AVG THERMS SAVINGS
[REDACTED]	243	0.23	40	67.08
[REDACTED]	85	0.16		
[REDACTED]	74	0.14	11	5.06
[REDACTED]	118	-0.0	20	25.72
[REDACTED]	120	-0.09	19	39.03

Note: Non-solar, non-electric heating customers only. Outliers, corresponding to +/- 75% savings have been removed.



Savings Drivers and Program Optimization: Vendor Management

Last Year's Low Performers = Next Year's Watch List

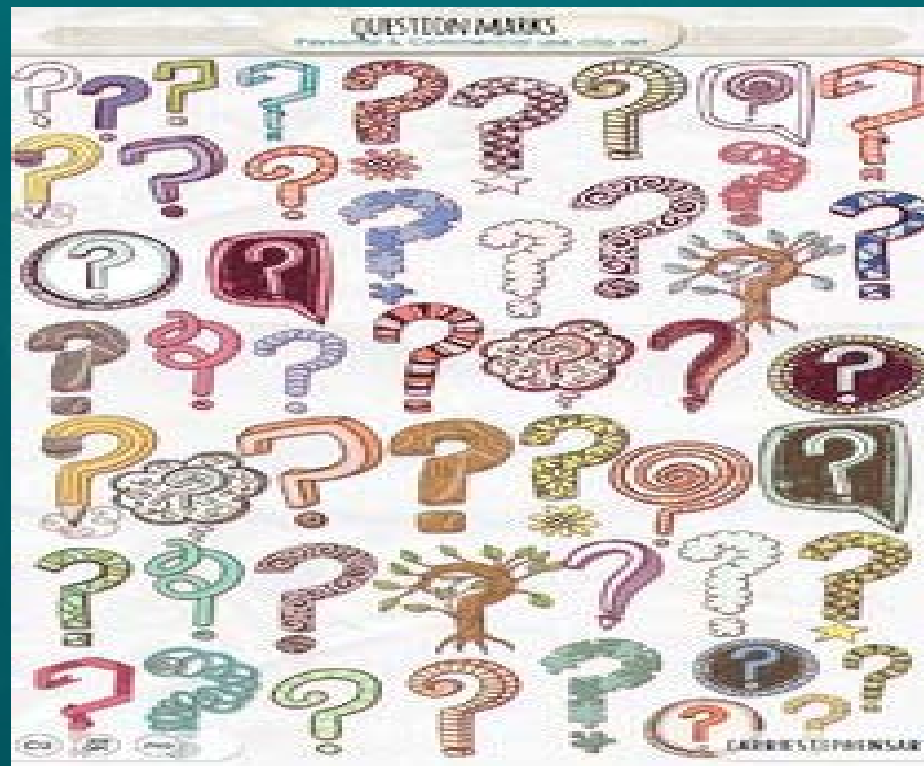


EVERSOURCE



Q&A

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New York Presentations & Round Robin



NYSERDA AM&V Activities

Dana Nilsson
Kartik Pilar

NYSERDA initiatives that use interval data capture and analysis include:

- Pay for Performance
- Energy Management Technology
 - > Real Time Energy Management
 - > Remote Energy Management
- Energy Management Practices
 - > Onsite Energy Management
 - > Strategic Energy Management
- NY-SUN (Solar PV)
- Energy Storage (standalone or in combination with Solar PV)



NYSERDA

NYSERDA AM&V Activities

Topics of investigation include:

- Is savings uncertainty addressed in a consistent manner?
- How are Non-Routine Events incorporated/adjusted into evaluation practice?
- How do we evaluate and integrate interval consumption analysis with generation data (e.g., energy storage and solar PV projects)?
- How do we assess effectiveness of adopted measures across sectors, locations and climate?
- Can NYSERDA data be used to verify aggregated methods?

New York Presentations & Round Robin



Discussion: The Road Ahead

- What EM&V is currently needed to meet policy and program goals in NY?
- What current or future energy program and policy directions in NY may benefit from advanced M&V tools?



THANK YOU

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For follow up , please contact:

Victoria Engel-Fowles, NYSERDA, victoria.engel-fowles@nyserdera.ny.gov

Elizabeth Titus, NEEP, etitus@neep.org

