

Attachment F - Measurement and Verification Plan

The purpose of this Measurement and Verification (M&V) Plan (Plan) is to describe how energy savings will be quantified for the Business Energy Pro P4P Pilot and subsequently how performance-based payments will be calculated. Additionally, the Plan outlines the process for the reporting and detection of Non-Routine Events (NREs) and how associated Non-Routine Adjustments (NRAs) will be calculated.

The Plan is adapted from the Investor Confidence Project's M&V Plan Template: Option C - Measurement and Verification, IPMVP Option C, Whole Facility.

CalTRACK 2.0¹, which provides transparent and peer-reviewed protocols for Option C implementation, is also incorporated. The CalTRACK methods were developed in an open and transparent stakeholder process that used empirical testing to define replicable methods for calculating normalized metered energy consumption using either monthly or interval data from an existing condition baseline.

Baseline Period Energy and Conditions

The P4P Pilot adopts an existing condition baseline. The baseline period for each Project consists of the 12 months immediately before implementation of the initial Intervention (energy efficiency work).

Savings are the avoided energy use calculated during the Performance Period (the 3-year period during which Portfolio Managers will be compensated for calculated energy savings). An avoided energy use value will be calculated using the following equation:

Equation 1

Avoided Energy Use (or Savings) = (Counterfactual Baseline Energy – Performance Period² Energy)

Counterfactual Baseline Energy represents what energy consumption was anticipated to have been during the Performance Period if an energy efficiency Intervention had not occurred. This is calculated by modeling the relationship between baseline energy consumption and baseline weather conditions, then using Performance Period weather conditions to predict energy consumption.

¹ <http://www.caltrack.org/>

² For additional information, see: <http://docs.caltrack.org/en/latest/methods.html#>

Responsibilities

Table 1. M&V Roles and Responsibilities

Role	Responsibilities
Advanced M&V (AMV) Solution Provider	<ul style="list-style-type: none"> • Pull utility data transmissions, Portfolio Manager Project data, and weather data required for savings calculations into the AMV Platform. • Calculate and track energy savings and Basis-of-Payment for Portfolio Payment Recommendation. • Detect potential NREs and report flagged Projects to the Evaluation Contractor. • Apply approved NRAs.
Evaluation Contractor ³	<ul style="list-style-type: none"> • Review reported and detected NREs and approve NRAs. • If necessary, perform interviews and site visits as appropriate to confirm the presence of NREs. • Document NRA decision and explanation for Portfolio Manager(s)' reference. • Provide input to NYSERDA regarding M&V-related issues.
NYSERDA	<ul style="list-style-type: none"> • Oversee and approve adjustments and improvements to the AMV Platform, including the use of updates made to the CalTRACK methodology, and the Pilot's M&V processes. • Review and approve Payment Recommendation provided by AMV Solution Provider.
Utility Administrator	<ul style="list-style-type: none"> • Manage contracts with Portfolio Managers. • Provide utility data to AMV Solution Provider. • Review and approve Payment Recommendation approved by NYSERDA and execute recommended payment to Portfolio Manager.

Analysis Procedures

Separate regression models shall be constructed for electricity and natural gas consumption for each Project by the AMV Solution Provider. Consumption data from each account shall be modeled as base load, heating load, and cooling load. Heating load and cooling load are assumed to have a linear relationship with heating and cooling demand, as approximated by heating and cooling degrees⁴.

Data Quality Control

Data quality procedures will be administered by the AMV Solution Provider and conform to CalTRACK Compliance specifications, as they relate to daily estimation methods and as published at <http://docs.caltrack.org/en/latest/methods.html>

³ In addition to these responsibilities, an Evaluation Contractor will be responsible for conducting customer process surveys, project data verification site inspections, and in-depth interviews with pilot stakeholders.

⁴ The balance point temperatures selected for counting heating and cooling degrees will be determined for each fuel type, based on the average daily temperatures which yield the highest R-squared across a range of candidate balance points in a set of regression calculations.

Detection of Non-Routine Events (NREs)

Non-Routine Events (NREs) are changes in building energy use that are not attributable to changes in the independent variables used in the baseline model nor to the Intervention that occurred at the Project site. In the case of an NRE, the savings calculation, Equation 1 may have to be adjusted.⁵

Table 2. NRE Detection and Adjustment Process

Step	Role	Responsibility
1.	Utility Administrator	Screen Customers and provide contracted Portfolio Managers with a list of eligible Customers that may participate in the P4P Pilot. Accounts with detectable NREs during the prior 12-months will not be included on the eligible Customer list.
2.	Portfolio Manager	Flag known NREs in Portfolio Manager(s)' database or Customer Relationship Management (CRM) system and provide required documentation of NRE ⁶ .
3.	AMV Solution Provider	Flag Projects with operationally observable energy consumption patterns suggestive of possible NREs. Perform annual analysis to identify and flag additional Projects with energy consumption patterns suggestive of possible NREs.
4.	Evaluation Contractor	Review and investigate Projects identified as having possible NREs. Approve Projects for NRAs.
5.	AMV Solution Provider	Pull Projects approved for an NRA into a special sub-portfolio.
6.	AMV Solution Provider	Apply NRAs as outlined in the M&V Plan and calculate appropriate adjusted Basis-of-Payment.

Step One: Baseline Period NREs

The Utility Administrator will periodically screen its Customers and provide contracted Portfolio Manager(s) with a list of eligible Customers that may participate in the P4P Pilot. Customers who do not meet the below criteria will be removed from eligible Customer lists provided to contracted Portfolio Manager(s):

- Sufficient baseline energy consumption data for all meters serving the site/utility account⁷
- Baseline model meets goodness-of-fit criteria, defined as model CV(RMSE) of less than 1.0⁸

⁵ Granderson, Jessica, Paula Gruendling, Peter C. Jacobs, Christina Torok (2018). *Guidance for Pilot Level M&V Plans: Normalized Metered Energy Consumption Savings Estimation in Commercial Buildings, DRAFT*, Prepared for California Public Utilities Commission Energy Division by Lawrence Berkeley National Laboratory

⁶ Required documentation will be contractually defined between the Portfolio Manager and the Utility Administrator and documented in *Table 3. Reportable NREs and Acceptable Forms of Verification*.

⁷ Refer to requirements as specified in the [CalTRACK Methods](#).

⁸ While all sites with a baseline model CV(RMSE) of less than 1.0 will be eligible for participation, Portfolio Managers will be able to view the calculated CV(RMSE) of each eligible site and make informed targeting decisions based on the available data.

Step Two: Performance Period NRE Reporting

Portfolio Managers may flag that an NRE has occurred at a Project site by indicating, at minimum, the following in either their database or CRM:

- A Boolean flag indicating an NRE has occurred
- A timestamp representing when (exact or approximate) the NRE occurred
- An indicator of what type of NRE has occurred (as categorized in Table 3 below)
- A link to documentation of the NRE

The AMV Solution Provider will collect this information on a nightly basis along with all other Project data. The AMV Solution Provider will remove Projects with reported NREs from a Portfolio Manager’s main Portfolio. If an NRA for a project is approved, payment will be calculated for the Project separately from the main Portfolio. This payment will be processed annually during the Performance Quarter in which the Project’s Annual Adjusted Payment would have been processed. NRE documentation may be stored using any secure means agreed to by the Portfolio Manager and NYSERDA, provided it allows documentation to be linked to a project and is easily accessible to NYSERDA staff on an ongoing basis. Solutions may range from keeping the documentation in cloud storage to emailing documentation to NYSERDA on a monthly basis.

Table 3 below provides examples of NREs that Portfolio Managers may report and forms of verification. As part of the contracting process, each Portfolio Manager and Utility Administrator will formally agree to a list of claimable NREs and method of documentation. Acceptable forms of verification will be documented, defined, and updated on an as-needed basis throughout the course of the P4P Pilot through agreement of NYSERDA, the Utility Administrator, and the Portfolio Manager.

Table 3. Reportable NREs and Acceptable Forms of Verification⁹

NRE ID	NRE Description	Load Increase or Decrease	Forms of Verification
<i>NRE001 Example</i>	<i>Introduction of new equipment load</i>	<i>Increase</i>	<i>Invoice for equipment, building management logs, message from customer email account verifying installation</i>
<i>NRE002 Example</i>	<i>Removal of existing equipment load</i>	<i>Decrease</i>	<i>Invoice for equipment removal, survey response from customers</i>
<i>NRE003 Example</i>	<i>Change in Occupancy</i>	<i>Increase or Decrease</i>	<i>Sensor records, employment records, customer confirmation that layoffs occurred, customer visits/records of foot traffic</i>
<i>NRE004 Example</i>	<i>Change in Square Footage</i>	<i>Increase or Decrease</i>	<i>Building Permit, secondary data from third-party database</i>
<i>NRE005 Example</i>	<i>Installation of PV or other on-site electric generation</i>	<i>Decrease</i>	<i>Invoice for equipment, pictures of installation, documentation of net metering</i>
<i>NRE006 Example</i>	<i>Change in site operating hours</i>	<i>Increase or Decrease</i>	<i>Screenshot of customer website announcing change in hours</i>

⁹ Table 3 currently contains examples provided for clarification purposes only.

Step Three: Performance Period NRE Detection

During a Project's Performance Period, the AMV Solution Provider shall screen for NREs as follows:

- On an ongoing basis:
 - **Interruptions in utility consumption data.** If the AMV Solution Provider is no longer able to pull utility account data because of account closure or revocation of authorization to view and leverage account data, a Project will be flagged.
 - **Indications of net metering.** If utility account data indicates previously unnoted net metering, the Project will be flagged.
- On an annual basis:
 - **Savings relative to baseline consumption.** Recalculate savings as a percentage of baseline consumption for all Projects. Flag Projects with savings greater than plus or minus fifty percent ($\pm 50\%$) of the baseline consumption.
 - **Deterioration in normalization model goodness of fit.** Fit normalization model to the Year 1 post-retrofit consumption data and recalculate CV(RMSE) at the end of Year 1. If the Year 1 model has a CV(RMSE) of greater than 1.0, then the Project will be flagged for a potential NRE. If an NRE is not detected during Year 1, the model from Year 1 will then be fit using consumption data from Year 2 at the end of Year 2. If the Year 2 CV(RMSE) is greater than 1.0, then the Project will be flagged for a potential NRE. The Year 2 process will be followed for subsequent years as necessary.

NYSERDA may adjust thresholds for flagging possible NREs as needed. If such an adjustment were to be made, 30-day notice would be provided to all Portfolio Managers.

Step Four: NRA Approval

The AMV Solution Provider will supply the Evaluation Contractor with a list of all Projects that have reported or detected NREs. The Evaluation Contractor will then perform the following tasks on a monthly basis:

- Review NREs reported by Portfolio Managers to ensure proper documentation has been included as contractually required.
 - If the Project is not approved for an NRA, the Evaluation Contractor will notify the Portfolio Manager, and the Portfolio Manager will have the opportunity to resubmit the NRE with the appropriate documentation.
- Investigate possible detected NREs through follow-up phone interviews with Portfolio Managers and utility account holders, secondary data resource review, and/or site visits, as appropriate. Portfolio Managers shall act in good faith to assist the Evaluation Contractor in investigating possible NREs. The Utility Administrator may also be solicited for information regarding Customer account status and concurrent participation in other energy efficiency programs.

Projects with NREs may then receive NRAs per the protocols specified in Step 6. Suspicious patterns of NREs may trigger investigation by the Evaluation Contractor.

Step 5: Preparing Projects for Non-Routine Adjustments

Once the Evaluation Contractor approves the NRA to be applied, they will document and share approvals with the AMV Solution Provider. If a Project was approved, the AMV Solution Provider will place the Project in a special sub-portfolio specifically designed to hold Projects with approved NRAs. If the NRA for a Project is denied, the AMV Solution Provider will move the Project back into the Portfolio Manager's main Portfolio, where savings calculations and payments will continue as normal.

Step 6: Calculating Non-Routine Adjustments

NRA methodologies are defined below and are binding for contracted Portfolio Managers. NRAs will be calculated and tracked by the AMV Solution Provider in the AMV Platform.

The adjustment mechanism is one of the following:

1. For Projects with more than one year of Performance Period meter data prior to the NRE, calculate first-year normalized metered energy consumption savings and set it to be the projected annual savings value for the Year 2 and/or Year 3 Annual Adjusted Payments. This savings value will then be multiplied by the Payment/Energy Unit value to calculate the performance payment.
2. For Projects with less than one year of Performance Period meter data prior to the NRE, calculate the Portfolio realization rate and the Annual Adjusted Payment as follows:

$$B(d) = RR \times P_{1(p)} \times CC$$

Where:

- B(d) = Annual Adjusted Payment in USD
- RR = Portfolio realization rate = $\sum S_1 / \sum P_{1(p)}$
- S₁ = Actual annual Project savings in MMBtus as calculated by the AMV Platform
- P_{1(p)} = Predicted annual Project savings in MMBtus as reported by the Portfolio Manager during Project submission to the AMV Platform Provider
- CC = Payment/MMBtu

Each Project in the sub-portfolio designated for approved NRAs will be adjusted by the appropriate mechanism. NRAs will be calculated and applied to performance payments annually in the place of measured savings by the AMV Solution Provider.

Force Majeure

In rare instances, a Project site may be impacted by a catastrophic occurrence (i.e. fire, flooding, etc.). Provided the Portfolio Manager furnishes appropriate documentation demonstrating that such an instance has occurred, an NRA will be applied for the impacted Project site as detailed above.

M&V Protocols to Detect Malicious Intent

Portfolio Managers will be subject to the below protocols if they are found to be engaging in either of the following: (a) intentionally inflating the incidence of NREs in a manner that would be financially favorable to the Portfolio Manager; or (b) disguising the impact of NREs to resemble expected energy savings. Examples include, but are not limited to, Customer recruitment focusing on Customers that expect future reductions in baseload energy consumption; installation of secondary heating sources or power generation fueled by non-metered fuels; and fraudulent reporting.

The following requirements shall apply:

1. Portfolio Managers shall not systematically target, recruit, or enroll Customers who expect to experience a decline in energy consumption due to non-routine events within the coming twelve months.
2. Portfolio Managers shall not misrepresent the scope of energy efficiency improvements in such a way as to disguise non-routine changes to energy consumption baselines as true energy savings.

While it is anticipated that Portfolio Managers will participate in the pilot in good faith, these requirements will ensure the accurate evaluation of a framework designed to open new market opportunities for energy efficiency service providers and benefit NY utility customers.

Methodology for Detecting NRE Patterns Prohibition 1

If the frequency of consumption reducing NREs cannot be explained by random occurrence within a Portfolio (i.e. a pattern of NREs triggers concern), the Portfolio will be examined by the Evaluation Contractor to assess whether the NREs are statistically indicative.

Methodology for Detecting Fraudulent Reporting Prohibition 2

NYSERDA or a representative will randomly inspect Participating Customers' Projects to verify that installed measures reported by Portfolio Manager(s) have been installed. Project data verification site inspection failure(s) will trigger required corrective action(s) to the job. These corrections will be made by the Portfolio Manager at the expense of the Portfolio Manager. Additional penalties may include dropping Projects from the Portfolio and/or suspending the Portfolio Manager's participation in the pilot. More severe penalties may be enacted by the Utility Administrator, depending on the severity of the fraudulent activity.