PERFORMANCE VERIFICATION PLAN
VERSION 3.0

TARGETED DEMAND MANAGEMENT
PERFORMANCE VERIFICATION FOR
NON-WIRES SOLUTIONS PROGRAM
DISTRIBUTED GENERATION AND ENERGY STORAGE RESOURCES

October 2024

INTRODUCTION

This Performance Verification Plan describes the approach to calculate and verify performance for energy storage (ES) and distributed generation (DG) projects as part of Non-Wires Solutions programs, including but not limited to combined heat and power (CHP), fuel cell, and battery energy storage system (BESS) technologies. This performance verification plan is applicable to eligible NWS projects installed in year 2024 and beyond.

This plan contains:

- Measurement and Verification Requirements – outlines measurement, data, and verification for participating projects
- Performance Assessment – outlines how performance will be assessed for:
    - Distributed Generation (Summer Performance Period)
    - Distributed Generation (NWS Event)
    - Distributed Generation (Underperformance of NWS Event)
    - Energy Storage (NWS Event)
    - Energy Storage (Performance Payment Calculation)
- Liquidated Damages resulting from Performance Assessment
    - Energy Storage (Underperformance of NWS Event)
    - Energy Storage (Charging on NWS Event Days)
    - Energy Storage (Liquidated Damages Calculation)

A monitoring system shall be installed to measure and collect the data necessary to quantify the electric power produced by the DG equipment or the charging and discharging patterns of the BESS equipment. The data will serve as the basis for performance assessments and payments. Depending on the specific nature of individual projects and technologies, revisions may be required to accurately quantify demand reduction impacts.

MEASUREMENT AND VERIFICATION REQUIREMENTS

The following subsections outline the measurement and data needs to assess DG and BESS project performance.

Measurement Requirements

Following an internal desk review of the project, Con Edison or its Measurement & Verification (M&V) vendor(s) will develop a project-specific M&V Plan. The M&V Plan will specify the measurement and any metering requirements for the NWS project. In the event the M&V Plan requires additional metering beyond the Applicant's proposal, Con Edison or its M&V vendors may request and install additional meters. The Applicant shall provide access to equipment and electrical panels to the M&V vendor as necessary for the deployment of measurement instruments.

Data Requirements

The Applicant shall provide Con Edison or its M&V vendor(s) direct access to real-time data over a web interface. The metering and data collection shall be granted to Con Edison or its M&V vendor(s) from the commercial operation date until the end of the contract term specified in the NWS Energy Storage Program Agreement, NWS Program Agreement, or other applicable Con Edison contract.

Required trend points shall include, but not be limited to:

- Real power (kW) production
- Voltage
- Amperage

- Power factor
- Natural gas or any other fuel consumed (if applicable)
- Heat recovered (if applicable)
- Parasitic loads
- Net power import/export from the system and grid

To confirm the accuracy of the trended electricity production, Con Edison or its M&V vendor may also deploy supplemental power meters. Field engineers may deploy real power meter(s) (current transformers), of varying size and quantity based on the DG or BESS system specifications, at the power disconnect of the targeted component(s). Real power will be metered for a representative period in order to retrieve sufficient data to verify system performance. The M&V vendor will require customer approval to access the site to verify conditions, observe functional testing, and install metering equipment as deemed appropriate and as defined by the project-specific M&V plan.

The M&V vendor will also investigate any parasitic loads (e.g., fuel booster pumps, auxiliary loads, site heating or cooling loads) related to the DG or BESS component(s) of the system that may impact facility/service electric consumption. Oftentimes, comprehensive data tracking systems already account for parasitic loads associated with the system and truly reflect the electricity displaced from the grid. If not, the M&V vendor may need to collect additional data or perform supplemental monitoring to accurately determine parasitic loads.

For DG and BESS projects, construction-grade design drawings or "As-Built" drawings shall be provided to the M&V vendor, as they become available.

Verification Requirements

The M&V vendor might perform on-site inspections and data collection at the time of project commissioning to confirm that the DG or BESS system is operating as planned. Additional verification activities may include, review of documentation for existing and As-Built conditions, as well as observation of functional testing and operational sequence activities required to demonstrate the ability to provide the anticipated demand reduction. These additional activities may or may not be conducted simultaneously to any commissioning activities being performed by others. This initial data collection will inform future incentive payment(s) by Con Edison.

PERFORMANCE ASSESSMENT

The M&V vendor's main objective is to assess the hourly grid electricity offset of the proposed DG or BESS system during the Summer Performance Period (May 1st through September 30th).

The M&V vendor will aim to confirm 1) a reduction in the grid-supplied electricity to the facility and 2) that this reduction is due to the newly installed DG or BESS system. Electric consumption, billing, and/or interval meter data from the summer before participation may be needed to identify shifts in the facility's electric load profile.

Con Edison reserves the right to request data throughout the entire program period, including shoulder or winter seasons, as needed, to determine the full impact of the project on the grid. Periods outside of the performance assessment period will not be used to determine incentives unless otherwise stated.

The following subsections detail the calculations used to derive Performance Factors (PF).

Distributed Generation (Summer Performance Period)

The Summer Capability Period is defined as:

- Weekdays, May 1st through September 30th of the performance year, defined as the peak summer electric load months in Con Edison's service territory.
- The Network Overload Period hours identified in the NWS Program Agreement. These hours within this Period are considered the peak summer electric load hours for the respective NWS project.

Using this data set, Con Edison and the M&V vendor will analyze the performance of DG system components. The DG Performance Calculation section is not applicable for BESS technologies.

The Average Load Reduction Performance (ALRP) is calculated based on the following formula:

$$ALRP = \frac{\sum_{i=0}^{n} kWh_i}{n}$$

Where,

kWh_i	Electricity generated per hour interval i
i	Each hourly interval during Summer Capability Period
n	Total number of qualified hours in the Network Overload Period

The hourly measurements are a result of aggregated 15-minute interval readings. The bottom 5% of kWh_i collected during Summer Performance Period will be excluded from this calculation. If Con Edison is unable to provide electric service to the Customer at any time during the Performance Period, those hours will be excluded from this calculation and made note of in the evaluation report.

For the Summer Capability Period, any missing data points will be replaced with assumed kWh_i of 0. Any remaining data points which captured maintenance or unexpected downtimes will be included in the performance extrapolation of the DG system.

The Performance Factor (PF_{Summer}) for the Summer Performance Period is calculated as follows:

$$PF_{Summer} = \frac{ALRP}{Pledge}$$

Where,

Pledge	Demand Reduction guaranteed in NWS Program Agreement

The program Participants are bound by the rules in the NWS Program Agreement. The PF_{summer} will be used to calculate performance-based incentives, as outlined in the Agreement**.** On NWS Event Days, these DG Participants are expected to perform at 100% during the Network Overload Period hours specified in the NWS Program Agreement.

Distributed Generation (NWS Event)

The NWS Event will occur on dates when a Commercial System Relief Program (CSRP) or Distribution Load Relief Program (DLRP) event[1] is called for the network during the defined Summer Capability Period:

- May 1st through September 30th of the performance year
- May occur during weekends and holidays

[1] See the Commercial Demand Response (Rider T) Program Guidelines for more information on Commercial System Relief Program (CSRP) and Distribution Load Relief Program (DLRP) events.

- For DG technologies, the call window is the Network Overload Period hours identified in the NWS Program Agreement.

To determine the Performance Factor, Con Edison or its M&V vendor will average hourly performance for each event and divide the result by the Pledge (i.e. NWS Program Agreement Load Reduction Guaranty). Underperformance penalties will be exercised as described in the NWS Program Agreement, Underperformance sub-section. The NWS Event – Performance Factor calculation below is applicable to DG technologies, not including BESS.

The Average Event Load Reduction (AELR) per event is calculated based on the following formula:

$$AELR = \frac{\sum_{i=0}^{n} kWh_i}{n}$$

Where,

kWh_i	Electricity generated per hour interval i
i	Each hourly interval during NWS Event
n	Total hours in the Network Overload Period

The Performance Factor (PF_{Event}) is determined for each NWS Event during the Summer Capability Period and is calculated as follows:

$$PF_{Event} = \frac{AELR}{Pledge}$$

Where,

AELR	Average Event Load Reduction for the NWS Event
Pledge	Demand Reduction guaranteed in NWS Program Agreement

Distributed Generation (Underperformance of NWS Event)

For distributed generation**,** underperformance will be determined for each NWS Event as the difference between the Pledge and the AELR for an NWS Event Performance Factor (PF_{Event}) less than 90%.

The Underperformance (U_{Event}) is determined for each NWS Event during the Summer Capability Period and is calculated as follows:

For any $PF_{Event} < 90\%$:

$$U_{Event} = Pledge - AELR$$

Where,

AELR	Average Event Load Reduction for the NWS Event
Pledge	Demand Reduction guaranteed in NWS Program Agreement.

Liquidated Damages are applied against Underperformance (U_{Event}) during an NWS Event as described in the Underperformance sub-section in the NWS Program Agreement.

Please refer to the appropriate NWS Program Agreement for information on payment calculations, including application of Liquidated Damages and any non-payment as a result of the DG resources failure to meet minimum performance requirements.

Energy Storage (NWS Event)

For energy storage technologies that are participating in the NWS program, NWS Events (or Events) may be called during the defined Summer Capability Period, at Con Edison's request.

- Summer Capability Period: May 1st through September 30th of the performance year
- Events will be called with no less than 21 hours advance notice
- Event notifications will, at minimum, specify the discharge time, discharge duration[2] and expected load reduction for the system[3]

Please refer to the Liquidated Damages Resulting from Performance Assessment section of this plan for treatment of underperformance during an NWS Event, and charging during the Network Overload Period on NWS Event days.

The first step in calculating the Performance Factor (PF) is to calculate for each event, the Average Event Load Reduction (AELR). To determine the AELR on an NWS Event day, the BESS system discharge in kWh is measured across the applicable NWS Event hours, then divided by the number of hours within the event call window to determine average hourly system discharge.

The Average Event Load Reduction for each NWS Event ($AELR_X$) is calculated based on the following formula:

$$AELR_X = \left(\frac{\sum_{i=E_{start}}^{i=E_{end}} kWh_i}{P} \right)$$

Where,

X	Individual events in each capability period (1, 2, 3 etc.)
kWh_i	Electricity discharged per hour interval i
i	Each hourly interval during the Summer Performance Period
E_{start}	Event start time (hour starting)
E_{end}	Event end time (hour ending)
P	Number of hours within the call window on an NWS Event day

To determine the Performance Factor for each event, Con Edison or its M&V vendor will divide the average hourly performance for each NWS Event ($AELR_X$) by the Dispatch Requested.

The Performance Factor for each event ($PF_{Event\ X}$) is determined for each NWS Event during the Summer Capability Period and is calculated as follows:

[2] Default discharge durations will be a four consecutive hour period, based on system needs, with event start and end time specified at the beginning of each Summer Capability Period and/or in the NWS Event Notification. Changes to length of call window will be communicated by the Company, where the Project may be expected to deliver the equivalent kWh over an adjusted duration and adjusted capacity, not to exceed Projects total Dispatchable Energy Capacity as identified in the NWS Program Agreement, subject to inverter limitations.

[3] Default value for expected load reduction will be the Demand Reduction guaranteed in the NWS Program Agreement. Changes to requested dispatch value (i.e., hourly kW) will be communicated by the Company, where the project may be expected to deliver the equivalent kWh over an adjusted duration and adjusted capacity, not to exceed the Projects total Dispatchable Energy Capacity as identified in the NWS Program Agreement, subject to inverter limitations.

$$PF_{Event\ X} = \frac{AELR_X}{Dispatch\ Requested}$$

Where,

X	Individual events in each capability period (1, 2, 3 etc.)
$AELR_X$	Average Event Load Reduction for each NWS Event
Dispatch Requested	Demand Reduction (kW) requested for dispatch as per the NWS Event Notification

If $PF_{Event\ X}$ calculated value is less than 50%, $PF_{Event\ X}$ for that event will assume the value of 0. If $PF_{Event\ X}$ calculated value is greater than 100%, $PF_{Event\ X}$ for that event will assume the value of 1.0.

Energy Storage (Performance Payment Calculation)

The Performance Payment for each Summer Capability Period will be based on 5% of the overall project incentive over the 10-year duration of the contract. The preceding performance calculation will be applied to the performance periods incentive, resulting in the eligible Performance Payment.

The Performance Payment for each Summer Performance Period will be calculated as follows:

$$Performance\ Payment = \frac{\sum_{X=1}^{X=M}(PF_{Event\ X})}{M} * Guaranty * Incentive * 5\%$$

Where ,

X	Individual events in each capability period (1, 2, 3 etc.)
$PF_{Event\ X}$	Performance Factor determined for each NWS Event during each Summer Capability Period
M	Total number of events in the Summer Capability Period
Guaranty	Total Demand Reduction (kW) specified in the NWS Program Agreement
Incentive	Total contracted incentive amount per kW ($/kW)

If the Performance Payment calculation results in a negative value (i.e., the NWS Participant owes the Company payment), the offset will be applied against future incentive payments per the NWS Energy Storage Program Agreement “Calculations of Performance Payments” section.

LIQUIDATED DAMAGES RESULTING FROM PERFORMANCE ASSESSMENT

The M&V vendor’s secondary objective is to determine if the behavior of the proposed DG or BESS system on NWS Event Days during the Summer Capability Period (May 1st through September 30th) has resulted in damages.

Please refer to the NWS Program Agreement for information on the application of Liquidated Damages and any non-payment as a result of the DG or BESS resources failure to meet minimum performance requirements.

The following subsections detail the calculations used to derive the Liquidated Damages for BESS, by considering both underperformance during an NWS Event ($U_{Event\ X}$) and charging during the network overload period on a

given NWS Event day (EC_X). Additional triggers for Liquidated Damages, resulting from conditions other than the BESS or DG performance, may also be outlined in the NWS Program Agreement.

Energy Storage (Underperformance of NWS Event)

Underperformance will be assessed for each NWS Event with a Performance Factor ($PF_{Event\ X}$) less than 90%. The Underperformance ($U_{Event\ X}$) is determined for each NWS Event during the Summer Capability Period and is calculated as follows:

For $PF_{Event\ X} < 90\%$:

$$U_{Event\ X} = Dispatch\ Requested - AELR_X$$

Where,

X	Individual events in each capability period (1, 2, 3 etc.)
Dispatch Requested	Demand Reduction (kW) requested for dispatch as per the NWS Event Notification
$AELR_X$	Average Event Load Reduction for each NWS Event

Energy Storage (Charging on NWS Event Days)

For BESS that are participating in NWS, the technology may not charge within the Network Overload Period on NWS Event Days from May 1st to September 30th, inclusive. If on NWS Event Days, charging occurs outside of event hours and within the overload period, an adjustment will be calculated per the Energy Charged on Event Days (EC_X) formula below.

The Energy Charged during Event Days (EC_X) in kW on an NWS Event Day during non-event hours within the restricted charging window is calculated based on the following formula:

$$EC_X = \frac{\sum_{t=E_{start}}^{t=R_{start}} kWh_t + \sum_{t=R_{end}}^{t=E_{end}} kWh_t}{(R_{end} - R_{start}) - (E_{end} - E_{start})}$$

Where,

X	Individual events in each capability period (1, 2, 3 etc.)
kWh_t	Energy charged at energy storage meter per hour interval t (charging will result in negative kWh values, discharging will result in kWh set to zero)
t	Each non-event hourly interval within the network overload period on NWS Event Days
E_{start}	Event start time (hour starting)
E_{end}	Event end time (hour ending)
R_{start}	Network overload period start time (hour starting)
R_{end}	Network overload period end time (hour ending)

If EC_X calculated value is positive, EC_X will assume the value of 0. Any missing or incomplete data points will be replaced with assumed kWh_t of 0. Any data points which captured maintenance or unexpected downtimes will be included in the EC_X calculation.

Energy Storage (Liquidated Damages Calculation)

Liquidated Damages balance will be calculated using the Underperformance ($U_{Event\ X}$) during NWS Events in the Summer Capability Period, and the Energy Charged (EC_X) during all events in the Summer Capability Period at the rate identified in the NWS Energy Storage Program Agreement, "Underperformance; Breach of Load Reduction Guaranty" sub-section.

Liquidated Damages will be calculated as follows:

$$Liquidated\ Damages = \sum_{X=1}^{X=M} (U_{Event\ X} + EC_X) * S$$

Where,

X	Individual events in each capability period (1, 2, 3 etc.)
M	Total number of events in the Summer Capability Period
$U_{Event\ X}$	Underperformance for each NWS Event, if applicable, during each Summer Capability Period
EC_x	Energy Charged during Event Days
S	Liquidated Damage Rate ($ per kW) as identified in the NWS Program Agreement