



PECO POWERSAVER

Measurement and Verification Protocol

How the energy-saving effect of a PECO Powersaver installation is measured, recorded and reported.

We do not publish a fixed saving percentage. This document sets out the method by which savings are measured instead.

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1. Purpose and Scope

This protocol defines how the effect of a PECO Powersaver installation on a facility's electrical energy consumption is measured, recorded and reported.

It is written to be read and checked by the customer's own engineers, and by third parties acting on the customer's behalf.

1.1 Scope

This protocol applies to all PECO Powersaver installations, at any rating, in any market. It covers:

- The quantity to be measured and the point at which it is measured
- The two measurement methods available, and how one is selected
- Instrumentation and logging requirements
- The conditions under which two periods may be compared
- The treatment of anomalous data
- The content of the verification report
- An optional harmonic record for rectifier-heavy sites

1.2 Out of scope

- Financial appraisal, tariff analysis and payback calculation
- Emissions accounting and reporting
- Preparation or submission of incentive scheme applications
- Measurement of quantities other than electrical energy

1.3 Relationship to IPMVP

The approach follows the whole-facility measurement principle described as Option C in the International Performance Measurement and Verification Protocol (IPMVP): energy use is measured at the facility metering point rather than modelled from equipment-level assumptions.

This protocol is not a substitute for IPMVP and does not claim certification under it. Where a customer requires formal IPMVP compliance, an accredited measurement and verification professional should be appointed; this protocol is designed to be compatible with that appointment.

2. Our Position on Savings Claims

Energy savings depend on load composition, operating hours, phase balance, harmonic content and the condition of the existing distribution system. These differ at every site.

A supplier publishing one guaranteed figure for all installations is not describing a measurable engineering result. ATECELECTRIC therefore does not publish a saving percentage, in marketing material or elsewhere.

What is committed to is the method: the quantity measured, the conditions under which periods are compared, the treatment of anomalous data, and the content of the report.

Three principles follow from this position and are applied to every project.

Measurement precedes claim

No saving figure is stated for a facility until it has been measured at that facility. Figures obtained at other sites are not transferable and are not presented as expectations.

Conditions are agreed before measurement

Comparison periods, logging intervals, recorded conditions and the rule for excluding anomalous data are all agreed with the customer before measurement begins — not after results are seen.

The complete record is reported

Where data is excluded from a comparison, both the complete data set and the filtered data set are reported, together with the rule applied. A result that depends on which data was selected is not a result.

3. What Is Measured

3.1 Quantity

Accumulated active electrical energy, in kilowatt-hours (kWh).

Instantaneous power (kW), average power over selected intervals, and power factor are recorded as supporting data but are not used as the basis of the comparison. The customer is invoiced in kWh; verification is therefore performed in kWh.

3.2 Measurement point

The metering point that determines the electricity invoice for the affected part of the facility — normally the utility revenue meter or the main incoming meter of the low-voltage distribution system.

Where the PECO unit serves only part of a facility, the measurement point is the meter covering that part, and the measurement boundary is stated explicitly in the report.

3.3 Measurement boundary

All loads downstream of the PECO installation and upstream of the measurement point are inside the boundary. The boundary is recorded in the measurement plan, with reference to the single-line diagram, before measurement begins.

Loads added, removed or significantly altered during the measurement period are recorded. Where such a change is material, the affected period is excluded under the rule in Section 7 or the measurement is repeated.

3.4 Supporting data

The following are recorded alongside energy consumption because they affect the validity of the comparison:

Quantity	Purpose
Input and output voltage	Confirms operation within the permitted supply voltage range
Line current, each phase	Indicates load level and phase balance
Outdoor air temperature	Weather-sensitive load is the most common source of drift between periods
Occupancy or production volume	Primary driver of load in hotels, retail and industry
Operating exceptions	Shutdowns, plant failures, events, construction work

4. Measurement Methods

Two methods are available. The applicable method is selected during technical review, before the unit is ordered, and is recorded in the measurement plan.

4.1 Method A — Continuous monitoring, before and after installation

Consumption is logged continuously at the measurement point, beginning before the PECO unit is installed and continuing afterwards.

Application

Method A is the recommended method for most installations. It requires only one change to the system — the installation itself — and produces an uninterrupted record.

Requirements

- Baseline period of at least four continuous weeks before installation. Twelve months is preferred where the facility has seasonal variation.
- Reporting period of at least four continuous weeks after installation, covering comparable operating conditions.
- Where baseline and reporting periods fall in different seasons, comparison is made between corresponding periods of different years, or normalised against recorded outdoor temperature.
- Utility invoices for both periods are obtained where available, as an independent check on logged data.

Limitation

Method A compares two periods separated in time. Any change in the facility between them — occupancy, plant, tariff structure, production volume — affects the comparison. Section 6 sets out the conditions that control for this.

4.2 Method B — Saving and By-pass comparison at the same site

PECO Powersaver includes an automatic transfer switch. The facility is operated for one period through the Saving path and for another through the By-pass path, and the two periods are compared.

Application

Method B is offered where the customer wishes to verify the effect directly on their own installation, and where the facility can accommodate scheduled transfer windows. It is a verification option rather than the standard method.

Advantage

Comparison is made on the same installation, at the same meter, with the same connected equipment, in the same season. No reference facility, modelled baseline or external benchmark is required.

Transfer conditions

Deliberate transfer between the Saving and By-pass paths is performed at no load, during a window scheduled with the facility's maintenance team. Loads are disconnected, the transfer switch is operated, and loads are restored last.

Automatic transfer to By-pass on an overload condition detected by the EOCR is a separate protective function and

operates under load. It is not part of this procedure.

Requirements

- Minimum one full continuous week in each mode, covering complete 24-hour cycles and all days of the week.
- Periods as close together as the facility's transfer windows allow, to limit seasonal drift.
- Transfer windows agreed with the facility in advance and recorded in the measurement plan.
- Where three or more transfer windows are available, an alternating sequence (Saving — By-pass — By-pass — Saving) is used so that any drift in ambient conditions affects both modes equally.
- Where only one transfer window is available, the sequence is a single A-to-B comparison. Outdoor temperature and occupancy or production volume must then be recorded for both periods, because they are the only means of controlling for drift.

Limitation

Each transfer requires a scheduled no-load window. In continuously operating facilities this limits the number of transfers, and therefore the strength of the sequence design. Where no transfer window can be scheduled, Method A applies.

4.3 Optional — harmonic spectrum on rectifier-heavy sites

Where a facility's load is dominated by six-pulse rectifier front ends — variable-speed drives, large inverter-driven motors, induction heating, forging plant — a harmonic spectrum may be recorded alongside the energy measurement.

This is an optional record, not a performance claim. PECO is not a harmonic filter and no harmonic reduction figure is published. The measurement is included where the customer's engineering team wants the record.

Requirements

Item	Requirement
Quantity	Individual harmonic orders and total harmonic distortion of current (THD-I), recorded per phase
Measurement point	The same point used for the energy measurement, identified by phase
Instrument	Power quality analyser. Make, model, serial number and accuracy class recorded
Load condition	Plant output or drive loading recorded for both measurements, and matched as closely as the facility allows
Timing	Before installation and after, under comparable operating conditions
Duration	A single recording session in each case, of sufficient length to capture normal operating variation

Limitation

The harmonic spectrum of a rectifier load varies with drive loading. Where the plant was not operating at a comparable output in both sessions, the comparison is not reported. This is stated rather than adjusted for.

Unlike the energy measurement, which requires weeks of accumulated data, a harmonic spectrum is recorded in a single session and the result is available the same day. It does not, however, substitute for the energy measurement: consumption is established in kWh, not inferred from distortion.

5. Instrumentation Requirements

The same instrument, at the same measurement point, with the same configuration, is used throughout both periods of a comparison. Changing instrument or configuration between periods invalidates the comparison.

Requirement	Specification
Quantity logged	Accumulated active energy (kWh), with instantaneous values recorded as supporting data
Logging interval	15 or 30 minutes
Coverage	Complete 24-hour cycles, all days of the week, without gaps
Accuracy class	Class 1 or better for revenue-grade comparison
Time reference	Clock synchronised at the start of each period and verified at the end
Instrument identity	Make, model, serial number and CT ratio recorded in the measurement plan
Calibration	Where the instrument is not the utility revenue meter, calibration status is recorded
Data integrity	Raw logged data retained unaltered; all processing performed on copies

5.1 Where remote monitoring is installed

Where the customer or the local partner operates remote metering equipment, logging is automatic and continuous. The requirements above apply unchanged. The reporting schedule is agreed with the customer at the start of the baseline period.

5.2 The unit's own digital meter

The digital meter fitted to PECO Powersaver displays operating voltage, current and power for verification during commissioning and routine inspection. It is not the measurement instrument for this protocol and its readings are not used as the basis of a comparison.

6. Comparison Conditions

A facility is not a laboratory. Load changes with occupancy, production and weather. The following conditions are agreed and recorded before measurement begins, and are applied identically to both periods.

Condition	Requirement
Period matching	Same days of the week compared with each other. Weekday and weekend data are not averaged together where the facility operates differently on those days.
Time-block matching	Comparison made interval by interval across the 24-hour cycle, not between daily totals only.
Duration	Minimum one full continuous week per period. Longer where load varies with occupancy, production or season.
Operating conditions	Occupancy rate, production volume or an equivalent activity measure recorded for both periods.
Ambient conditions	Outdoor air temperature recorded for both periods. Where the difference in mean temperature between periods is material, the comparison is normalised or repeated.
Facility changes	Plant added, removed or altered during either period is recorded. Material changes invalidate the comparison.
Tariff and supply	Any change of supply arrangement, tariff structure or metering configuration between periods is recorded.
Sequence (Method B)	Alternating where three or more transfer windows are available. Where only one is available, ambient and occupancy normalisation is mandatory.

6.1 Minimum acceptable comparison

A comparison is not reported unless all of the following hold:

1. Both periods cover at least one full continuous week of complete 24-hour cycles.
2. Both periods are matched by day of week and time block.
3. Occupancy or activity data is available for both periods, or the facility is documented as operating at constant load.
4. Outdoor temperature is available for both periods.
5. No material change to the facility occurred between or during the periods.

Where these conditions cannot be met, the limitation is stated in the report rather than the comparison being presented as though it were unaffected.

7. Handling of Anomalous Data

Any measurement taken on a working facility contains anomalies: metering dropouts, unplanned shutdowns, plant failures, exceptional operating days.

Deciding what to exclude is the point at which energy-saving measurements are most often distorted — usually without any intention to deceive. The rules below exist to remove that discretion.

7.1 Rule one — criteria are defined before measurement

The exclusion criteria are written into the measurement plan and agreed with the customer before logging begins. They are not established after results are seen. The criteria are quantitative, not descriptive.

The standard criteria are:

- Metering dropout — a logged value of zero, or an absent interval, where the facility was operating
- Recorded plant shutdown or supply interruption
- An interval deviating from the mean of the same interval across the period by more than a threshold agreed in advance and stated in the plan
- Days on which a recorded exceptional event occurred — construction work, plant failure, an event materially altering occupancy

7.2 Rule two — criteria are applied identically to both periods

An interval excluded from one period is excluded from the matching interval in the other. Exclusion is symmetric by construction, so that filtering cannot favour either mode.

7.3 Rule three — both data sets are reported

The report presents the result twice: calculated from the complete data set, and calculated from the filtered data set, with the exclusion rule and the number of intervals excluded stated in both cases.

If a result depends on which data was selected, it is not a result. Reporting both is how we demonstrate that it does not.

7.4 Divergent results

Where the complete and filtered data sets give materially different results, this is stated in the report and the cause is investigated. It is not resolved by presenting the more favourable figure.

8. Calculation

8.1 Basis

Accumulated energy for each period is the sum of logged interval energy across the period, in kWh. Where the instrument logs average power, interval energy is the average power multiplied by the interval duration in hours.

Comparison

Energy difference (kWh) = E(baseline or By-pass) – E(reporting or Saving)

Difference (%) = (Energy difference ÷ E(baseline or By-pass)) × 100

8.2 Normalisation to period length

Where the two periods are of unequal length, or where intervals have been excluded, comparison is made on a per-interval basis using matched intervals only, not on raw period totals.

8.3 Normalisation to conditions

Where mean outdoor temperature or activity level differs materially between periods, the comparison is normalised against the recorded variable and the method of normalisation is stated in the report. Where normalisation is not possible, the difference is stated as a limitation.

8.4 Annualised figures

Where an annual figure is required, it is derived by extrapolating the measured result across the facility's recorded annual operating profile — not by multiplying a measured week by fifty-two. The extrapolation method and its assumptions are stated.

8.5 Precision

Results are reported to one decimal place. Reporting a percentage to two or more decimal places implies a precision that facility measurement does not support.

9. Reporting

Each project produces a written verification report containing the following.

Section	Content
Installation	Facility identification, PECO model and rating, installation date, measurement boundary with reference to the single-line diagram
Instrumentation	Measurement point, instrument make and model, serial number, CT ratio, logging interval, calibration status
Method	Method A or B, and the reason for selection
Periods	Start and end of each period, mode of operation, days and intervals covered
Conditions	Occupancy or production data, outdoor temperature, recorded operating exceptions for each period
Complete data	The full logged data set for both periods
Exclusions	The exclusion rule as agreed before measurement, intervals excluded from each period, and the reason in each case
Filtered data	The data set after exclusions
Result	Accumulated kWh for each period, and the difference expressed in kWh and as a percentage — calculated from both the complete and the filtered data sets
Normalisation	Where applied, the variable used and the method
Harmonic record	Where the optional measurement of Section 4.3 was included: spectrum before and after, with instrument and load conditions
Limitations	A statement of what the measurement does and does not establish

9.1 Retention

Raw logged data is retained unaltered and is available to the customer on request. All processing is performed on copies, so that any calculation in the report can be reproduced from the original record.

9.2 Audience

The report is written to be read by the customer's own engineers, and to be checked by them. It is not written as a summary for presentation.

10. Limitations

This protocol produces a measurement of a specific installation over a specific period. The following limitations apply and are stated in every report.

The result applies to the facility measured

A result obtained at one facility does not predict the result at another, and is not presented as an expectation for any other installation.

The result applies to the period measured

Load composition, occupancy and operating patterns change over time. A measurement establishes what occurred during the measurement period.

Facility measurement is not laboratory measurement

Residual variation between periods cannot be eliminated on a working facility. The conditions in Section 6 reduce it; they do not remove it.

Method A compares periods separated in time

Where the baseline and reporting periods are separated by weeks or months, changes in the facility during that interval affect the comparison. Recorded conditions allow this to be assessed but not eliminated.

Method B is limited by transfer windows

The number of available no-load transfer windows determines how strong the sequence design can be. A single A-to-B comparison is weaker than an alternating sequence and is reported as such.

Savings are measured, not guaranteed

ATECELECTRIC does not guarantee a saving percentage. Where a contractual performance commitment is required, it is agreed separately and in writing, and this protocol defines only the measurement on which such a commitment would be assessed.

11. Confidentiality

Facility names, site locations, consumption data and verification reports belong to the customer, not to ATECELECTRIC.

They are not published on our website, in our brochures, or in our presentations. Reference information is provided to other prospective customers only under a non-disclosure agreement, at the customer's discretion.

Many PECO installations are in hotels operated by international groups, where energy and occupancy data is treated as commercially sensitive. We work on that basis by default, whether or not a confidentiality agreement is in place.

11.1 Use of reports by the customer

The verification report is the customer's document. The customer may use it for internal reporting, energy management review, owner reporting or applications to energy-efficiency incentive schemes, without reference to ATECELECTRIC.

Where a customer applies to a national incentive scheme, eligibility, procedures, calculation rules and approval are determined solely by the relevant national authority. ATECELECTRIC provides the measurement data and report; it does not administer applications and does not guarantee outcomes.

Appendix A — Measurement Plan Template

Completed and agreed with the customer before logging begins. Both parties retain a copy.

Facility

Measurement boundary

Single-line diagram reference

PECO model and rating

Installation date

Instrumentation

Measurement point

Instrument make and model

Serial number

CT ratio

Logging interval ☐ 15 min ☐ 30 min

Calibration status

Method

Method selected ☐ A — continuous monitoring ☐ B — Saving / By-pass

Reason for selection

Transfer windows available (Method B)

Sequence (Method B) ☐ Alternating ☐ Single A-to-B

Periods

Period 1	Period 2
Mode	
Start date	
End date	
Days covered	

Conditions to be recorded

Occupancy or activity measure
Source of occupancy data
Source of temperature data
Known planned events in either period

Exclusion criteria — agreed before measurement

Metering dropout	☐ Excluded
Recorded shutdown or supply interruption	☐ Excluded
Deviation threshold	_____ % from the mean of the same interval across the period
Exceptional event days	☐ Excluded
Additional criteria	

Customer	ATECELECTRIC / Partner
Name	
Position	
Date	
Signature	

Appendix B — Pre-Measurement Checklist

Before the baseline period

- Measurement plan completed and signed by both parties
- Measurement boundary marked on the single-line diagram
- Instrument installed, configured and clock synchronised
- Logging interval confirmed and a test download verified
- Source of occupancy or production data confirmed
- Source of outdoor temperature data confirmed
- Exclusion criteria agreed in writing
- Known planned events during the period identified and recorded

During each period

- Data downloaded at agreed intervals and checked for gaps
- Operating exceptions logged as they occur, with date and time
- Any change to plant or facility recorded
- Instrument clock verified

Method B — before each transfer

- Transfer window agreed with the facility maintenance team
- Loads disconnected before the transfer switch is operated
- Transfer performed at no load
- Mode indication confirmed after transfer
- Loads restored last
- Date, time and duration of the transfer recorded

At the end of measurement

- Complete raw data set downloaded and retained unaltered
- Instrument clock drift checked against the start reference
- Utility invoices for both periods obtained where available
- Occupancy or production data obtained for both periods
- Temperature data obtained for both periods
- Exclusion criteria applied symmetrically and the count recorded
- Both complete and filtered results calculated

Appendix C — Definitions

Baseline period	The period of measurement before the PECO unit is placed in service (Method A), or the period during which the facility operates through the By-pass path (Method B).
Reporting period	The period during which the facility operates through the Saving path.
Measurement boundary	The set of loads whose consumption is included in the measurement, defined by reference to the single-line diagram.
Measurement point	The physical location of the instrument whose readings form the basis of the comparison.
Interval	The logging period, 15 or 30 minutes, over which energy is accumulated.
Matched intervals	Intervals in the two periods corresponding to the same day of week and time of day.
Complete data set	All logged intervals in both periods, without exclusion.
Filtered data set	The data set remaining after the agreed exclusion criteria have been applied symmetrically to both periods.
Saving path	The circuit configuration in which supply passes through the Harmonic Energy Recycling Transformer.
By-pass path	The circuit configuration in which supply passes directly to the load, bypassing the transformer.
Normalisation	Adjustment of a comparison to account for a recorded difference in conditions between the two periods.

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