U.S. DEPARTMENT OF
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Understanding Your ESPC Savings Guarantee

This guide summarizes some of the important aspects of savings guarantees in energy savings performance contracts (ESPCs) and includes links to reference documents for readers who want more detail. Many ESPC customers look at the savings guarantee, and the methods used to verify whether the project is meeting it, as a simple calculation. In fact, the measurement and verification (M&V) of an ESPC savings guarantee is similar to a good financial audit: it verifies whether the project is producing the guaranteed savings, identifies specific areas of concern that may require attention, and may highlight opportunities for additional savings.

Definition of Savings

Savings in a performance contract, in their simplest form, may be defined as: *Pre-project energy and water usage and related operations and maintenance (O&M) minus post-project usage and O&M.*

While the savings guarantee in most ESPCs is, on its face, in financial (dollar) terms, it is important to understand that these dollar savings are contingent on unit energy prices (e.g., per kWh of electricity or therm of natural gas). The unit energy prices are stipulated in the contracts, usually in the form of an initial rate that is then escalated over time to account for estimated energy price increases. These starting prices, and particularly the escalation rates applied to them, need to be agreed upon by the customer and energy service company (ESCO)[1].

The pre-project utility usage, O&M, and sometimes other relevant expenses (e.g., planned capital costs) are captured in a calculation called the baseline, which factors in historical utility usage and O&M expenses for the equipment that the project will replace or retrofit. A baseline may be established for the facility's entire usage of a given utility (such as electricity or natural gas) or it may be focused solely on the consumption of one system or piece of equipment the ESCO plans to upgrade (in which case there can be many individual baselines). Baseline calculations rely on a set of variables, such as weather and occupancy, which influence utility usage (these are described in detail on page 2). Customers and ESCOs should be sure that they have a clear, mutual understanding of the project's baselines and the factors that go into them.

Measurement of Project Savings

Once the customer and the ESCO have agreed on the project baselines, they then decide how to measure and verify the savings. To that end, the ESCO will propose an M&V plan, which specifies how the savings from each of the project's energy conservation measures (ECMs) will be assessed and the format and frequency of the ESCO's M&V reports to the customer. When deciding how to measure and verify the project's savings, the customer and ESCO evaluate any legal or regulatory requirements, the risk of savings shortfalls for each ECM, the potential for additional savings from each, and the work and cost involved in each measure's M&V approach. The following examples illustrate some of the considerations.

Simpler Retrofits: In a basic lighting project, the risk of not achieving savings and the potential for discovering additional savings opportunities are relatively low. Consequently, the ESCO and customer could agree to a pre- and post-retrofit measurement of key variables (e.g., the number and wattage of the fixtures) to be performed by the ESCO and witnessed by the customer. If the lighting retrofit involves the extensive use of sensors or a building automation system (BAS) that automatically turns fixtures on and off or adjusts brightness, the M&V might require continuous monitoring through meters, as well as more ongoing analysis of metered data and other factors.

Comprehensive Projects or Substantial Renovations: If the lighting retrofit is part of a comprehensive project with multiple measures, the M&V approach may involve building a model of the facility's energy use that enables the ESCO and the customer to account for a greater range of interactive effects. This approach requires pre- and post-retrofit utility metering data and detailed information about changes that affect facility energy use (the section below addresses some of these). This "whole building" M&V approach can be complex, requiring considerable tracking of changes in the facility and its operations; it is often advisable to rely on it only for the first two or three years of an ESPC, after which a simpler approach might be considered.

[1] For more information on the substantial, cost-effective benefits of incorporating well-documented M&V in ESPCs, see the companion document, The Business Case for Conducting Measurement and Verification In State and Local Government Energy Savings Performance Contract Projects.

In cases where there is insufficient historical data for a building baseline model, the M&V sometimes involves an expert modeler who develops a building simulation model that defines the baseline and is used to quantify expected savings from various "what if" scenarios (particularly combinations of prospective ECMs).[2]

Factors that May Affect Your Bills During the Guarantee Period

Following project installation, the performance guarantee will be measured according to the M&V plan. However, actual customer utility bills may appear to be higher or lower than expected. It is important to understand that this may not be the result of the project at all, but may be caused by other impacting variables. Here are some common areas to examine before doing more elaborate analyses.

- **Weather:** Weather is a significant driver of energy usage and is often one of the reasons for a "baseline adjustment" to expected energy usage after projects are installed.
- **Utility Rates:** The guarantee is for units of energy and water, not dollars, so if utility rates increase more or less than the rates stipulated in the contract, the apparent "savings" in the bills will likely reflect this.
- **Hours of Operation:** The guarantee is based on mutually agreed upon hours of operation (usually based on pre-retrofit measurements), so if hours deviate significantly, the bills often will too.
- **Changes or Overrides in the BAS:** The guarantee is usually based on maintaining specified comfort conditions (e.g., interior temperatures and lighting levels) controlled by the BAS (or simpler controls, in some cases). If building operators use the controls to modify these conditions outside of the contractually agreed-upon range and forget to reset them, bills may increase.
- **Changes to the Customer Facility:** The guarantee is based on the pre-retrofit facility size and usage, so if the owner has added to, reduced, or significantly changed the usage of part of the facility (e.g., converting warehouse space to offices, or vice versa) bills will usually be affected.
- **Equipment Maintenance:** As part of the contract, the customer and ESCO agree on who will take responsibility for the O&M of all installed equipment. If the customer takes responsibility for maintaining project equipment and does not perform the maintenance according to the manufacturer's specifications or the contract's requirements, the equipment may lose efficiency and increase bills.

If none of these factors (or a combination of them) adequately explains deviations from expected savings, then the ESCO should make good on the savings guarantee or conduct a more detailed analysis to identify the source of the problem. Note that in the case that these factors appear to inflate savings (e.g., mild weather results in lower bills), this does not necessarily mean the project is exceeding its guaranteed performance. ■

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Additional Resources

The International Performance Measurement and Verification Protocol (IPMVP) is a product of the Efficiency Valuation Organization. See: https://evo-world.org/en/products-services-mainmenu-en/protocols/ipmvp).

The Federal Energy Management Program (FEMP) produces an M&V application guide primarily for use with federal government facilities, but many state programs and ESCOs refer to this document to inform their own guidance documents and M&V practices. See: https://www.energy.gov/eere/femp/downloads/mv-guidelines-measurement-and-verification-performance-based-contracts-version.

FEMP has also developed guidance for how to calculate and verify operations and maintenance savings. See: https://www.energy.gov/eere/femp/downloads/operations-and-maintenance-best-practices-guide.

The Business Case for Conducting Measurement & Verification in State and Local Government Energy Savings Performance Contract Projects is a U.S. Department of Energy resource that highlights the substantial, cost-effective benefits of incorporating well-documented M&V in ESPCs—M&V that includes ongoing data collection and regular reporting of M&V results (link forthcoming).

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For more information, visit:
energy.gov/eere/slsc

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2 The M&V approaches described in this section are representations of the four formal M&V "options" that are presented in the widely accepted International Performance Measurement and Verification Protocol (IPMVP) published by the Efficiency Valuation Organization. These range from the two "retrofit isolation" approaches, option A ("Retrofit isolation – key parameter measurement") and option B ("Retrofit isolation – all parameter measurement") to approaches that are more commonly used for whole buildings: option C ("Whole facility") and option D ("Calibrated simulation").