

## **METHODOLOGY OF ENERGY SAVINGS GUARANTEE**

As part of the optional guarantee provisions, Siemens will work with the Client to develop an appropriate Measurement and Verification (M&V) plan that will define Siemens' obligations to prove the project's performance. While the details of this plan will vary depending upon the scope of the project it will, at a minimum, include the following components:

- A measurement process specific to each Facility Improvement Measure (FIM)
- A schedule for submitting Energy Savings Reports
- Annual Guaranteed Energy Savings
- Baseline Energy Consumption
- Utility Rate Structures



Upon completion of the selected FIM's, Siemens will follow the agreed upon M&V plan and report energy savings at the desired frequency of the Client, at a minimum of once per year.

***Should the achieved savings be greater than the guaranteed savings, an excess shall be recorded in the report. This excess is entirely to the benefit of the Client.*** Should the achieved savings be less than the guaranteed savings, a shortfall shall be recorded in the report. This shortfall shall be paid by Siemens, unless an operational improvement can be made to correct it, at no present or future cost or inconvenience to the Client.

The M&V plan specific to each FIM will be developed utilizing ***International Performance Measurement and Verification Protocol (IPMVP)***. As part of this protocol, there are four savings measurement methods:

### ***Option A - Retrofit Isolation: Key Parameter Measurement:***

Savings are determined by field measurement of the key performance parameter(s), which define the energy use of the FIM's affected system(s) and/or the success of the project. Measurement frequency ranges from short-term to continuous, depending on the expected variations in the measured parameter, and the length of the reporting period. Parameters not selected for field measurement are estimated. Estimates can be based on historical data, manufacturer's specifications, or engineering judgment. Documentation of the source or justification of the estimated parameter is required.

### ***Option B – Retrofit Isolation:***

All Parameter Measurement. Savings are determined by field measurement of the energy use of the FIM-affected system. Measurement frequency ranges from short-term to continuous, depending on the expected variations in the savings and the length of the reporting period.

### ***Option C - Whole Facility:***

Savings are determined by measuring energy use at the whole facility or sub-facility level. Continuous measurements of the entire facility's energy use are taken throughout the reporting period.

### ***Option D - Calibrated Simulation:***

Savings are determined through simulation of the energy use of the whole facility, or of a sub-facility. Simulation routines are demonstrated to adequately model actual energy performance measured in the facility. This Option usually requires considerable skill in calibrated simulation.

- The Project Baseline is defined as the period of time (typically 12 months) that has occurred prior to project commencement. The energy use, operating practices, and equipment in place during this time period represents the basis against which all future energy and operating usage will be compared. Specific to energy use, 12 months of utility data shall be recorded and agreed upon as the baseline. Degree days may be used to choose an appropriate 12-month period or to adjust a chosen period to a 30-year normal. The 12-month project baseline period used to calculate the energy savings for each building in this proposal can be found in Table 1.1.
- The Project Baseline may be adjusted for several reasons, including weather and operational changes. For each annual period, the current contract year and baseline year will both be adjusted to represent energy use during a 30-year normal period. This is done using 30-year average heating and cooling degree data for weather stations located in the area. Adjustments may be made due to operational changes within the college. Because a majority of the college's equipment will be controlled by Siemens Energy Management System, Apogee, Siemens will be trending a variety of data points, such as run hours, temperature set points, equipment alarms, etc, that will make operational changes readily apparent to us. This information will then be communicated to the Client at which time a mutually agreed upon adjustment will be made to reflect the impact of the changes. As the college's strategic partner, Siemens will take a proactive approach in identifying opportunities and making recommendations that are in line with the overall intent of reducing energy and operational costs.
- As discussed above, our method for calculating energy savings is based upon accepted engineering practices and formulas. We apply these methods to all FIM's recommended as part of our overall solution. The results of these calculations are units of energy saved (i.e. kWh, CCF, MMBTU, etc.), which are converted to dollars saved by applying the Client's average 12-month energy rate, determined from actual utility bills.

Due to the volatility in today's energy markets and the effect it has on utility rates, the ability of an ESCO to predict a floor and ceiling utility cost is limited. However, Siemens is able to mitigate some risk due to volatility by accurately quantifying the Client's baseline energy use and implementing FIM's that directly drive energy savings.

The Project Baseline is not adjusted in response to changes in energy cost. Siemens will report a reduction in energy consumption, whose equivalent cost reduction, is based upon established baseline utility and escalation rates.

- Any fees associated with Siemens' performance and energy savings are reflected as part of an annual M&V agreement. As stated above, there will be no energy savings payments made to Siemens because this is NOT a shared savings program. Any savings realized in excess of the guarantee are to the sole benefit of the Client.

## **APPROACH TO PERFORMANCE ASSURANCE**

Performance Assurance services are some of the most important services that we provide to our customers. These services employ a process that is applied to all energy savings projects to ensure the improvements we provide function correctly and deliver the savings estimated for the program.

Our most experienced engineers (Performance Assurance Engineers) use computerized diagnostic tools to measure and track the savings of our projects. Tools that the engineer will use will automatically call and collect information from the building for analysis at our offices. The customer is contacted immediately if a problem is detected. Reports are generated and reviewed with our customers. If corrective actions are needed or significant changes have occurred, the Performance Assurance Engineer schedules a review meeting where a corrective action plan is put together to preserve the project savings and the occupant comfort.

## **GENERAL PROBLEM RESOLUTION**

Problems will come to the project's performance assurance engineer in various ways. Most problems are uncovered through proactive monitoring and investigation. Some problems are identified via staff complaints.

## **REMOTE DIAGNOSTICS**

Our engineer will access the digital control system remotely to inspect present operation and review past operation, via previously trended data. Remote diagnostic analysis is extremely valuable in early identification of energy, comfort and air quality problems, especially in buildings with critical temperature control.

## **OPERATOR DISCUSSION**

One key to our past success has been good communication between our engineer and the maintenance staff. If a question has emerged due to operator action, we contact the person who made the changes to understand why those changes were made. If changes were made to compensate for a malfunctioning system, we will help uncover the cause of the malfunction and assist in fixing it. If changes were made due to lack of operator knowledge, we will educate the operator on how to operate the system properly and explain the impact changes can have on system performance. Some problems cannot be solved through remote diagnostics or operator discussion. In these cases, we will resolve the problem during an on-site inspection.

## **MANAGEMENT DISCUSSION**

We record issues affecting building performance and include this documentation in annual reports. For more pressing issues, we will call the Client's management representative to keep them abreast of issues significantly affecting the program results.

## **ANNUAL REPORTS**

Energy savings results will be summarized into reports annually, and will be delivered to the College by our Performance Assurance Engineer. These reports will trend the operation of the facility and validate the savings realized.

Following is a detailed outline of the annual M&V Report format:

- **Executive Summary**

Each annual report will include an executive summary section. This section will highlight relevant findings and energy savings results over the annual guarantee period including:

- ◇ *Measurement & Verification Report - Written Summary*

This summary will highlight the guaranteed energy savings and actual measured energy savings for the annual period. Savings excess or shortfall will be included. The written summary will conclude with a brief description of any baseline adjustments caused by measurable events that impacted energy consumption.

- ◇ *Observations, Discussions, Suggestions*

The intent of this section is to summarize any relevant information discussed with the Client or found through the M&V process. This section will change each annual period and is intended to keep open communication between the Client and the Performance Assurance Engineer to continuously improve energy and equipment performance.

- ◇ *Graph & Table – Total Achieved Energy Consumption Savings vs. Guaranteed Energy Consumption Savings*

This graph and table shows total project energy consumption savings annually. It allows the Client to analyze results year by year. Savings excess or shortfall will also be shown.

- ◇ *Graph & Table – Total Achieved Cost Savings vs. Guaranteed Cost Savings*

This graph and table shows total project cost consumption savings annually. It allows the Client to analyze results year by year. Savings excess or shortfall will also be shown.

- ◇ *Environmental Impact – Greenhouse Gas Emissions Reduction*

Siemens will show the positive impact the energy project has had on the environment. These results will be based on the annual achieved (measured) electric and gas energy consumption reductions.

- **Guaranteed vs. Achieved Energy Savings – Building Level Analysis**

Each building affected by the Energy Savings Project will be detailed separately. Each section will include, but not limited to:

- ◇ *Graph & Table - Total Achieved Energy Consumption Savings vs. Guaranteed Energy Consumption Savings*

This graph and table shows total building energy consumption savings annually; which is equal to the summation of individual FIM energy data for a particular building.

- ◇ *Graph & Table – Total Achieved Cost Savings vs. Guaranteed Cost Savings*

This graph and table shows total building cost consumption savings annually.

- ◇ *Table – Energy Consumption and Cost Savings - Guaranteed, Achieved and Variance per Facility Improvement Measure.*

This table shows the energy consumption and cost data for each specific FIM completed in the building.

- **Guaranteed vs. Achieved Energy Savings – Per Facility Improvement Measure**

Each Facility Improvement Measure will be detailed in accordance with the agreed upon M&V methodology. Siemens utilizes the International Performance Measurement and Verification Protocol (IPMVP 2007) to determine the methodology for energy savings measurements; please view the 'Performance Assurance Service Limitations' section of this document for additional information. This section provides the customer with observations and data used to generate the achieved energy savings associated with each FIM. Information found in this section will include, but not be limited to:

- ✧ *Equipment Operating Parameters – Trended on EMS*

Equipment that is trended continuously will be monitored by Apogee, Siemens Energy Management System. This data will be used to provide graphs, tables and important operating conditions where applicable.

- ✧ *Pre – Post Energy Measurements*

For FIMs that are not trended, Siemens will measure the energy consumption of associated equipment both before and after the project. These results will be shown, along with the calculations used to generate energy savings.

- ✧ *Boiler Efficiency & Status – Pre-Post & Trending*

A boiler retrofit project will utilize both pre-post measurements and continuous trending. Boiler efficiency is measured before and after the project. Important operating parameters are monitored and trended using the EMS. Any conditions thought to be outside normal operating parameters will be reported to the Client immediately.

- **Utility Bill Consumption and Cost Comparison**

Siemens will collect monthly utility bills for all buildings associated with the energy guarantee. These bills will be entered into a Utility Bill Analysis Software tool called Metrix. This analysis will be updated every year of the guarantee period and will show monthly utility data.

This bill tracking summary is being provided as a service to the Client and is in no way tied to the energy guarantee. Please realize that this information is actual, real-time data that may vary from the actual Performance Assurance Report savings. An explanation of how this data is collected and reported can be found in the Metrix™ Brief Overview that follows.

- ✧ *Metrix™ Brief Overview*

Metrix™ is utility accounting software, which utilizes linear regression to test for correlations to weather, billing period lengths and other variables (such as the amount of emergency room visits in hospitals or number of students in a school). Through actual utility data, the facility is modeled mathematically to predict energy usage based on these variables.

Differences in these variables between the base year (period before work was performed) and the performance year (period after work was completed) are accounted for by adjustments to the base year. In essence, this is how the facility would have responded to the performance year variables. Metrix™ refers to these adjustments to the base year as the Baseline.

Weather data is provided in an industry standard format with Heating and Cooling Degree-Days specific to the geographical area. Metrix™ utilizes this information to calculate the baseline, thus adjusting for the weather difference between the base year and the performance year.

The software provides graphical comparison of actual usage and costs to baseline values.

Adjustments can be made to model the facility for one-time events, such as, the installation of a temporary portable chiller for an emergency room whose air conditioning fails. Permanent changes, such as, building additions or the installation of equipment can also be easily accommodated.

- ***Performance Assurance Acceptance Letter***

- ◇ The annual report concludes with a letter of acceptance. This letter verifies that the Client accepts the results of the report. Signature is normally obtained following the annual M&V report presentation by the Performance Assurance Engineer.

### ***PERFORMANCE ASSURANCE SERVICE LIMITATIONS***

We will include in our performance guarantee agreement the labor to insure all guarantees as described above except for maintenance of the equipment.