**Investment Grade Audit and**

Insert user logo

**Project Proposal**

**Attachment C**

# ATTACHMENT C

# SAVINGS MEASUREMENT AND VERIFICATION PLAN

Prepare the M&V Plan as outlined below.

**List of Processes and Tables:**

* **Risk, Responsibility and Performance Matrix.**
* **M&V Plan and Savings Calculation Methods**
* Proposed Annual Savings Overview
* Site Use and Savings Overview (Optional)
* M&V Plan Summary
* Schedule of Verification Reporting Activities
* Proposed Annual Savings For ECM
* Expected Year 1 Savings for ECM
* ENERGY STAR Ratings

# Risk, Responsibility and Performance Matrix.

The ESCO shall complete and include the matrix below to summarize the allocation of responsibility for key items related to M&V.

|  |  |
| --- | --- |
| **RISK, RESPONSIBILITY AND PERFORMANCE MATRIX** | |
| **RESPONSIBILITY/DESCRIPTION** | **CONTRACTOR PROPOSED APPROACH** | |
| **1. Financial** |  | |
| **a. Interest rates**: Neither the contractor nor the Institution has significant control over prevailing interest rates. Higher interest rates will increase project cost, financing/project term, or both. The timing of the TO signing may impact the available interest rate and project cost. |  | |
| **b. Construction costs:** The contractor is responsible for determining construction costs and defining a budget. In a fixed-price design/build contract, the Institution assumes little responsibility for cost overruns. However, if construction estimates are significantly greater than originally assumed, the contractor may find that the project or measure is no longer viable and drop it before TO award. In any design/build contract, the Institution loses some design control. **Clarify design standards and the design approval process (including changes) and how costs will be reviewed.** |  | |
| **c. M&V confidence:** The Institution assumes the responsibility to determine the confidence that it desires to have in the M&V program and energy savings determinations. The desired confidence will be reflected in the resources required for the M&V program, and the ESCO must consider the requirement prior to submittal of the final proposal. **Clarify how project savings are being verified (e.g., equipment performance, operational factors, energy use) and the impact on M&V costs.** |  | |
| **d. Energy Related Cost Savings:** The Institution and the contractor may agree that the project will include savings from *recurring* and/or *one-time* costs. This may include one-time savings from avoided expenditures for projects that were appropriated but will no longer be necessary. Including one-time cost savings before the money has been appropriated may involve some risk to the Institution. Recurring savings generally result from reduced O&M expenses or reduced water consumption. These O&M and water savings must be based on actual spending reductions. **Clarify sources of nonenergy cost savings and how they will be verified.** |  | |
| **e. Delays:** Both the contractor and the Institution can cause delays. Failure to implement a viable project in a timely manner costs the Institution in the form of lost savings, and can add cost to the project (e.g., construction interest, re-mobilization). **Clarify schedule and how delays will be handled.** |  | |
| **f. Major changes in facility:** The Institution controls major changes in facility use, including closure. **Clarify responsibilities in the event of a premature facility closure, loss of funding, or other major change.** |  | |
| **2. Operational** |  | |
| **a. Operating hours:** The Institution generally has control over operating hours. Increases and decreases in operating hours can show up as increases or decreases in “savings” depending on the M&V method (e.g., operating hours multiplied by improved efficiency of equipment vs. whole-building/utility bill analysis). **Clarify whether operating hours are to be measured or stipulated and what the impact will be if they change.** If the operating hours are stipulated, the baseline should be carefully documented and agreed to by both parties. |  | |
| **b. Load:** Equipment loads can change over time. The Institution generally has control over hours of operation, conditioned floor area, intensity of use (e.g., changes in occupancy or level of automation). Changes in load can show up as increases or decreases in “savings” depending on the M&V method. **Clarify whether equipment loads are to be measured or stipulated and what the impact will be if they change**. If the equipment loads are stipulated, the baseline should be carefully documented and agreed to by both parties. |  | |
| **c. Weather:** A number of energy efficiency measures are affected by weather. Neither the contractor nor the Institution has control over the weather. Should the Institution agree to accept risk for weather fluctuations, it shall be contingent upon aggregate payments not exceeding aggregate savings. **Clearly specify how weather corrections will be performed.** |  | |
| **d. User participation:**  Many energy conservation measures require user participation to generate savings (e.g., control settings). The savings can be variable and the contractor may be unwilling to invest in these measures. **Clarify what degree of user participation is needed and utilize monitoring and training to mitigate risk.** If performance is stipulated, document and review assumptions carefully and consider M&V to confirm the capacity to save (e.g., confirm that the controls are functioning properly). |  | |
| **3. Performance** |  | |
| **a. Equipment performance:** The contractor has control over the selection of equipment and is responsible for its proper installation, commissioning, and performance. The contractor has responsibility to demonstrate that the new improvements meet expected performance levels including specified equipment capacity, standards of service, and efficiency. **Clarify who is responsible for initial and long-term performance, how it will be verified, and what will be done if performance does not meet expectations.** |  | |
| **b. Operations:** Performance of the day-to-day operations activities is negotiable and can impact performance. However, the contractor bears the ultimate risk regardless of which party performs the activity. **Clarify which party will perform equipment operations, the implications of equipment control, how changes in operating procedures will be handled, and how proper operations will be assured.** |  | |
| **c. Preventive Maintenance:** Performance of day-to-day maintenance activities is negotiable and can impact performance. However, the contractor bears the ultimate risk regardless of which party performs the activity. **Clarify how long-term preventive maintenance will be assured, especially if the party responsible for long-term performance is not responsible for maintenance (e.g., contractor provides maintenance checklist and reporting frequency).**  **Clarify who is responsible for performing long-term preventive maintenance to maintain operational performance throughout the contract term.** **Clarify what will be done if inadequate preventive maintenance impacts performance.** |  | |
| **d. Equipment Repair and Replacement:** Performance of day-to-day repair and replacement of contractor-installed equipment is negotiable, however it is often tied to project performance. The contractor bears the ultimate risk regardless of which party performs the activity. **Clarify who is responsible for performing replacement of failed components or equipment replacement throughout the term of the contract.** Specifically address potential impacts on performance due to equipment failure. Specify expected equipment life and warranties for all installed equipment. Discuss replacement responsibility when equipment life is shorter than the term of the contract. |  | |

# M&V Plan and Savings Calculation Methods Outline

Fill in the following tables or provide equivalent information.

**Proposed Annual Savings Overview**

[Include all applicable fuels/commodities for project, e.g., electric energy, electric demand, natural gas, fuel oil, coal, water, etc.]

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **ECM** | **Total energy savings (MBtu/yr)** | **Electric energy savings (kWh/yr)** | **Electric demand savings (kW/yr)\*** | **Natural gas savings (MBtu/yr)\*\*** | **Water savings (gallons/yr)** | **Other energy savings (MBtu/yr)\*\*** | **Total energy and water cost savings, Year 1 ($/yr)** | **Other energy-related O&M cost savings, Year 1 ($/yr)** | **Total cost savings, Year 1 ($/yr)** |
|  |  |  |  |  |  |  |  |  |  |
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|  |  |  |  |  |  |  |  |  |  |
| Total savings |  |  |  |  |  |  |  |  |  |
| **First Year Guaranteed Cost Savings: $** | | | | | | | | | |
| Notes  \*Annual electric demand savings (kW/yr) is the sum of the monthly demand savings.  MBtu=106 Btu.  \*\*If energy is reported in units other than MBtu, provide a conversion factor to MBtu for link to cost schedules (e.g., 0.003413 MBtu/kWh). | | | | | | | | | |

**Site Use and Savings Overview**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Total energy savings (MBtu/yr)** | **Electric energy savings (kWh/yr)** | **Electric demand savings (kW/yr)\*** | | **Natural gas savings (MBtu/yr)\*\*** | | **Water savings (gallons/yr)** | **Other energy savings (MBtu/yr)\*\*** |
| Total proposed project savings |  |  |  | |  | |  |  |
| Usage for entire site\*\* |  |  |  | |  | |  |  |
| % Total site usage saved |  |  |  | |  | |  |  |
|  | | | | | | | | |
| Project square footage (KSF) |  |  | |  | |  | |  |
| Total site square footage (KSF) |  |  | |  | |  | |  |
| % Total site area affected |  |  | |  | |  | |  |
|  | | | | | | | | |
| Notes  MBtu=106 Btu  \*Annual electric demand savings (kW/yr) is the sum of the monthly demand savings.  \*\*If energy is reported in units other than MBtu, provide a conversion factor to MBtu for link to cost schedules (e.g., 0.003413 MBtu/kWh).  \*\*\*Define usage period.  KSF = 103 square feet. | | | | | | | | |

**M&V Plan Summary**

|  |  |  |  |
| --- | --- | --- | --- |
| **ECM No.** | **ECM Description** | **M&V Option Used\*** | **Summary of M&V Plan** |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

\*M&V options include A, B, C, and D of the International Performance Measurement and Verification Protocol (IPMVP).

**Schedule of Verification Reporting Activities**

|  |  |  |
| --- | --- | --- |
| **Item** | **aRecommendedtime of submission** | **aInstitution’s review and acceptance period** |
| Post-Installation Report | 30 to 60 days after acceptance | 30 days |
| Annual Report | 30 to 60 days after annual performance period | 30 days |

aTimes are recommended based on industry practice; modify as needed.

**Proposed Annual Savings for Each ECM**

[Include all applicable fuels/commodities for project, such as: electric energy, electric demand, natural gas, fuel oil, coal, water, etc.]

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Total energy use (MBtu/yr)** | **Electric energy use (kWh/yr)** | **Electric energy cost, Year 1 ($/yr)** | **Electric demand\* (kW/yr)** | **Electric demand cost, Year 1 ($/yr)** | **Natural gas use (MBtu/yr)\*\*** | **Natural gas cost, Year 1 ($/yr)** | **Water use (gallons/yr)** | **Water cost, Year 1 ($/yr)** | **Other energy use (MBtu/yr)\*\*** | **Other energy cost, Year 1 ($/yr)** | **Other energy-related O&M costs, Year 1 ($/yr)** | **Total costs, Year 1 ($/yr)** |
| Baseline use |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Post-installation use |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Savings |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1. **Notes**   \*Annual electric demand savings (kW/yr) is the sum of the monthly demand savings.  MBtu = 106 Btu.  \*\*If energy is reported in units other than MBtu, provide a conversion factor to MBtu for link to cost schedules (e.g., 0.003413 MBtu/kWh). | | | | | | | | | | | | | |

**ECM-Specific M&V Plan and Savings Calculation Methods**

**Develop section for each ECM.**

* Summarize the scope of work, location, and how cost savings are generated. Describe source of all savings including energy, water, O&M, and other (if applicable).
* Specify the M&V guideline and option used from the International Performance Measurement and Verification Protocol (IPMVP).
* Provide an overview of M&V Activities for ECM. Explain intent of M&V plan, including what is being verified.
* Provide an overview of savings calculations methods for ECM. Provide a general description of analysis methods used for savings calculations.

**Proposed Energy and Water Savings Calculations and Methodology**

* Provide detail description of analysis methodology used. Describe any data manipulation or analysis that was conducted prior to applying savings calculations.
* Detail all assumptions and sources of data, including all stipulated values used in calculations.
* Include equations and technical details of all calculations made. (Use appendix and electronic format as necessary.) Include description of data format (headings, units, etc.).
* Details of any savings or baseline adjustments that may be required.
* Detail energy and water rates used to calculate cost savings. Provide post-acceptance performance period energy and water rate adjustment factors.
* Detail proposed savings for this energy conservation measure for post-acceptance performance period. Include table - Proposed Annual Savings for Each ECM.

**Operations and Maintenance Cost Savings**

* Provide justification for O&M cost savings. Describe how savings are generated. Detail cost savings calculations.
* Provide post-acceptance performance period other cost savings adjustment factors.

**Details of other savings (if applicable)**

* Provide justification for cost savings. Describe how savings are generated. Detail cost savings calculations.
* Provide post-acceptance performance period other cost savings adjustment factors.

**Post-Installation M&V Activities** - Describe the intent of post-installation verification activities, including what will be verified.

* Describe variables affecting post-installation energy or water use. Include variables such as weather, operating hours, set point changes, etc. Describe how each variable will be quantified, i.e., measurements, monitoring, assumptions, manufacturer data, maintenance logs, engineering resources, etc.
* Define key system performance factors characterizing the post-installation conditions such as lighting intensities, temperature set points, etc.
* Define requirements for Institution witnessing of measurements if different than whole project data requirements.
* Provide details of post-installation data to be collected, including: Parameters to be monitored, Details of equipment to be monitored (location, type, model, quantity, etc.), Sampling plan, including details of usage groups and sample sizes, Duration, frequency, interval, and seasonal or other requirements of measurements, Monitoring equipment to be used, Installation requirements for monitoring equipment, Calibration requirements/procedures, Expected accuracy of measurements/monitoring equipment, Quality control procedures to be used, Form of data to be collected (.xls, .cvs, etc.), Sample data collection forms (optional)
* Detail data analysis to be performed.

**Post-Acceptance Performance Period Verification Activities**

* Describe variables affecting post-acceptance performance period energy or water use. Include variables such as weather, operating hours, set point changes, etc. Describe how each variable will be quantified, i.e., measurements, monitoring, assumptions, manufacturer data, maintenance logs, engineering resources, etc.
* Define key system performance factors characterizing the post-acceptance performance period conditions. Include factors such as comfort conditions, lighting intensities, temperature set points, etc.
* Describe the intent of post-acceptance performance period verification activities – what will be verified.
* Provide detailed schedule of post-acceptance performance period verification activities and inspections.
* Define requirements for Institution witnessing of measurements if different than whole project data requirements.
* Provide details of post-acceptance performance period data to be collected, including: Parameters to be monitored, Details of equipment to be monitored (location, type, model, quantity, etc.), Sampling plan, including details of usage groups and sample sizes, Duration, frequency, interval, and seasonal or other requirements of measurements, Monitoring equipment to be used, Installation requirements for monitoring equipment, Calibration requirements/procedures, Expected accuracy of measurements/monitoring equipment, Quality control procedures to be used, Form of data to be collected (.xls, .cvs, etc.), Sample data collection forms (optional)
* Detail data analysis to be performed.
* Define O&M and repair reporting requirements. Detail verification activities and reporting responsibilities of Institution and contractor on operations and maintenance items. Define reporting schedule.

**ENERGY STAR:** For each building included in the project, ESCO will provide a Portfolio Manager rating. Also, for applicable buildings, ESCO includes the cost to provide services and complete the annual application for a building ENERGY STAR label. ESCO shall provide a Portfolio Manager rating and energy performance target score estimate. For each eligible building, ESCO shall provide a pre-retrofit Energy Performance Rating using EPA ENERGY STAR’s Portfolio Manager, the weather normalized energy intensity in kBtu/SF, and an estimated post-retrofit Energy Performance Rating. If the building type is not eligible for rating in Portfolio Manager, then the normalized source EUI will suffice. ESCO shall provide a completed Cash Flow Opportunity Calculator (CFO Calculator) for the project, with variables inserted that represent the most likely options available to the customer. This will enable the ESCO and the customer to have an agreed-upon format for discussing project financing options and the potential costs of project delays. The CFO Calculator will be provided in both hard copy and electronic format, so that the agency can run its own analyses on financing options in the agreed format. ESCO will submit a completed Cash Flow Opportunity spreadsheet using the Cash Flow Opportunity Calculator (CFO Calculator) for the total project which shall include all facilities to be improved.