Attachment A: Scope of Work

NOTE: It is tempting to develop a prescribed scope of work for the ESCO, detailing exactly what projects the ESCO should undertake in your facilities. This is not recommended, however, because it is very valuable to use the ESCO's technical expertise to help identify and assess the opportunities that are most cost-effective or most valuable for your facilities instead of pre-determining the scope.

The purpose of the Financial Grade Operational Audit is to develop a scope of work to be implemented by the ESCO, establish guaranteed savings, develop an agreed-upon plan to measure and verify the guaranteed savings, and ensure that the agreed-upon project meets statute requirements.

If any of the following services detailed below are not required for a given project, the ESCO and the Owner may agree to modify the Scope of Work.

1. Overview of Process and Decision Points

This will be an interactive approach in working with Owner, following these steps:

1.1 Assessment of Needs and Opportunities – Overview

Core Tasks (see detailed task list in next section)	**Submittals, Approvals, Decision Points**	**Uses**
• Collect General Facility Information (data and background information on buildings, equipment, energy use and costs, and facilities operation) • Inventory Existing Systems and Equipment (physical inspection and facility interviews to log information on major energy and water-using equipment) • Establish baseline and/or base year consumption and reconcile with end-use consumption estimates	• Meet with Owner to establish interests, plans, problems, etc. related to facilities and operation of facilities. • Meet with Owner to present preliminary findings and establish agreement on measures to analyze.	This information is the basis for contract shedules in the energy savings performance contract document (**Schedule B: Baseline)**

1.2 Preliminary Analysis of Measures - Overview

Core Tasks (see detailed task list in next section)	**Submittals, Approvals, Decision Points**	**Uses**
• Identify potential measures • Assess potential measures • Present Findings	• Submit the 30% level audit • Submit the Audit Workplan Approval Matrix • Meet with Owner to present preliminary findings • Establish agreement on measures to further analyze now and/or at 60% level audit.	• This is preliminary work for the **Financial Grade Operational Audit Report** (the deliverable under this contract). • This establishes the remaining work for the ESCO to develop the 60% then the 90% level Financial Grade Operational Audit

1.3 Further Analysis - Financial Grade Operational Audit - Overview

Core Tasks (see detailed task list in next section)	**Submittals, Approvals, Decision Points**	**Uses**
• Develop the Financial Grade Operational Audit Report (follow prescribed format) • Savings Analysis • Cost Estimates • Develop a preliminary Measurement and Verification Plan • Develop a preliminary Commissioning Plan • Develop a preliminary Operations and Maintenance Plan	• Submit the 90% level Financial Grade Operational Audit • Submit the Audit Workplan Matrix for approval • Meet with Owner to present results	• The Measurement and Verification Plan is the basis for **Schedule E** in the Energy Savings Performance Contract. • The Commissioning Plan is the basis for **Schedule T: Commissioning Plan** in the Energy Savings Performance Contract. • The Operations and Maintenance Plan is the basis for **Schedule C: Savings Measurement and Verification Plan** in the Energy Savings Performance Contract.

1.4 Energy Savings Performance Contract Proposal - Overview

Core Tasks (see detailed task list in next section)	**Submittals, Approvals, Decision Points**	**Uses**
• Develop an Energy Savings Performance Contract proposal • Review project proposal with Owner • Prepare final Financial Grade Operational Audit Report	• Meet with Owner to present results • Negotiate final terms • Deliver the final Financial Grade Operational Audit Report • Deliver the final Project Proposal	• The Financial Grade Operational Audit Report will be used as an exhibit, **Financial Grade Operational Audit Report**, in the Energy Savings Performance Contract. • The Project Proposal is the basis for the Proforma which will be used in **Schedule H: Final Project Cost and Project Cash Flow Analysis** of the Energy Savings Performance Contract.

2. Requirements

2.1 Pre-Approved Markup Costs

The markup costs are presented in **Cost and Pricing (Attachment D)**. These rates are within the maximum rates ESCO proposed in response to the RFP and will be used in the Financial Grade Operational Audit and subsequent Energy Savings Performance Contract.

2.2 Energy Savings Performance Contract Term

The Energy Savings Performance Contract shall have a term no greater than _____ years [20 years for Nevada State Governments – NRS 333A.100; 25 years for Nevada Local Governments– NRS 332.380(2)], measured beginning with the Guarantee Period Start Date, no greater than the useful lifetime of the equipment, and no greater than the amortized period; Owner and ESCO should agree on the Term within 30 days of the 30% review meeting.
[**NOTE**: It is recommended not to shorten the financing term as this reduces the project potential.]

2.3 Eligible Facilities

Nevada Local Governments: Allowable facilities include: Buildings, facilities and structures owned or operated by the local government, occupied and unoccupied, excluding construction of new facilities or additions. (NRS 332.310).

Nevada State Governments: Allowable facilities include buildings, facilities and structures owned or operated by the State, including other improvements that incur operating costs (NRS 333A.020).

2.4 Allowable Cost and Savings Factors

Allowable cost and savings factors approved for consideration:

Nevada Local Governments:

- Operating Cost-Savings (NRS 332.330, .320, .340, .360)
  - Expenses eliminated or avoided
  - Excludes savings resulting from a shift in the cost of personnel or other similar short-term cost savings.
  - Electrical energy and demand savings
  - Thermal energy savings
  - Water savings
  - Waste disposal
  - Contract labor cost savings
  - Other operating cost-savings reductions
  - Excluding shift in personnel costs or other short-term savings
- Operating Cost-Saving Measures ((NRS 332.330, .340, .360)
  - Energy-saving measures (lighting, HVAC, daylighting, windows or doors, automated controls systems, energy recovery systems, ground source heating and cooling, etc.)
  - Water-saving measures (devices in buildings and for lawn irrigation)
  - Waste-disposal savings measures (trash compaction, waste minimization, etc.)
  - Operating saving measures (operating saving measures (building operation programs to reduce operating costs, training programs)
  - Maintenance labor cost savings measures (reduction of required maintenance or operating tasks, routine maintenance – replacing filters and lighting products)
  - Other savings measures and building improvements (includes indoor air quality improvements)
  - Power generation (combined heat and power systems, renewables, alternative energy, etc.); other building improvements (indoor air quality).
  - Ground source systems for heating and cooling

- Educational programs related to operation and maintenance of equipment
- Any additional improvements to building infrastructures that produce energy and operating cost savings, significantly reduce energy consumption or increase the operating efficiency of the buildings for their appointed functions
- Excluding new construction or additions
- Must comply with building codes.

Nevada State Governments:

- Operating Cost-Savings (NRS 333A.030, .040, .075)
  - Long-term avoided expenses
  - Excludes savings resulting from a shift in the cost of personnel or other similar short-term cost savings.
  - Electrical energy and demand savings
  - Thermal energy savings
  - Water savings
  - Waste disposal
  - Contract labor cost savings
  - Other operating cost-savings reductions
- Operating Cost-Saving Measures ((NRS 333A.030, .040, .075)
  - Energy-saving measures (lighting, HVAC, daylighting, windows or doors, automated controls systems, energy recovery systems, steam trap improvements, ground source heating and cooling, etc.)
  - Water-saving measures (devices in buildings and for lawn irrigation)
  - Waste-disposal savings measures (trash compaction, waste minimization, etc.)
  - Steam trap programs to reduce operating costs.
  - Educational programs relating to occupational behavior designed to reduce energy or water and generation of waste.
  - Other operating saving measures (building operation programs, educational programs)
  - Procurement of low-cost energy supplies including electricity and natural gas
  - Procurement of cost savings as a result of outsourcing energy need for electrical power, heating, and cooling.
  - Combined heat and power systems, renewable or alternative energy systems
  - Maintenance labor cost savings measures (reduction of required maintenance or operating tasks, routine maintenance – replacing filters and lighting products)
  - Other savings measures and building improvements (includes indoor air quality improvements)
  - Power generation (combined heat and power systems, renewables, alternative energy, outsourcing electrical power, heating or cooling, etc.)
  - Other building improvements (indoor air quality).
  - Building operation programs that reduce operating costs (computerized programs, training, etc.)
  - Any additional improvements to building infrastructures that produce energy and operating cost savings, significantly reduce energy consumption or increase the operating efficiency of the buildings for their appointed functions
  - Must comply with building codes.
    - Steam trap programs to reduce operating costs.
    - Educational programs relating to occupational behavior designed to reduce energy or water and generation of waste.

2.5 Annual Guaranteed Energy and Cost Savings.

The annual guarantee is required for the entire financing term (Nevada State Governments – NRS 333A.090, .150; Nevada Local Governments – NRS 332.370, .440), with the option for Owner to terminate after a sufficient period

that demonstrates savings. (Nevada State Governments – NRS 333A.090; Nevada Local Governments – NRS 332.370)

The guarantee is based on consumption and cost savings attributable to all energy, water and operating savings measures, and must equal or exceed all project costs each year during the guarantee period. Annual project costs include debt service, ESCO fees, maintenance services, measurement and verification services, and other services. Measurement and verification services are required to be conducted by the ESCO each year of the guarantee period in order for the ESCO to guarantee savings.

2.6 Independent Third Party Review Paid from Savings

Independent Third-Party Review is required for review of operating cost-saving measures and may be required by Owner for review of annual M&V reports (Nevada State Governments – NRS 333A.086; Nevada Local Governments – NRS 332.430, .431). A percentage [_____] % of annually guaranteed savings shall be reserved for Owner to hire an independent third-party ESCO industry expert with M&V experience to review the ESCO's measurement and verification reports and advise Owner of compliance in measuring and verifying savings.

2.7 Excess Savings

Annual cost savings beyond the guaranteed minimum savings will be retained by Owner, and will not be allocated to shortfalls in other years.

2.8 Annual Savings

The annual savings for all measures must be given for each year during the contract period.

2.9 Prevailing Wage Requirement

The prevailing wage is required for skilled, semi-skilled, and unskilled workers as given in NRS 333A.020 to .090 inclusively (Nevada State Governments – NRS 333A.120; Nevada Local Governments NRS 332.390)

2.10 Escalation Rates

Escalation rates should be applied independently to each payment source: gas, water, operating savings, etc. These rates will be agreed upon at the start of the audit and used in cash flow projections for project development purposes.

[**NOTE**: Use federal Owner guidelines on utility escalation rates to ensure reasonableness, and/or consider using local utility projections.]

2.11 Interest Rates

Interest rates (typically municipal tax-exempt rates for public Owners) will be agreed-upon at the onset of the audit. A proxy interest rate will be used until a 30-day period before transaction closing.

2.12 Objectives

The Financial Grade Operational Audit shall demonstrate compliance with energy efficiency standards, objectives, goals or directives that apply to Owner's facilities.

2.13 Data Collection and Reporting by ESCO - Using eProject Builder (ePB)

ESCO shall collect and report project data, on behalf of Institution and with approval by Institution, as identified in **Energy Savings Performance Contract – Schedule D: Data Collection and Reporting – Using eProject Builder** and as amended on the LBNL website (http://eprojectbuilder.lbl.gov) and at the specified times.

eProject Builder ("ePB") is a web-based tool managed on behalf of the Department of Energy by The University of California/Lawrence Berkeley National Laboratory (LBNL). ePB enables ESCO and their contracting agencies or other entities to:

(1) Upload and track project-level information;

(2) Generate basic project reporting materials (e.g. task order schedules) that may be mandated by local, state, and/or federal agency requirements; and
(3) Benchmark proposed Energy Savings Performance Contract (ESPC) projects against historical project data.

Based on information provided by the ESCO, the parties agree that the data required to be delivered to LBNL under this clause has commercial value whose disclosure would cause competitive harm to the commercial value or use of the data. LBNL intends to withhold such data from disclosure under 10 C.F.R. 1004.3(e)(2). The use of this data is governed by the provisions of this contract. Unless compelled by a court of competent jurisdiction, there may be no release of this data to the public without the written consent of the Recipient and DOE. Aggregate data that does not identify project-specific metric information may be released as set forth in the contract. Other information required to be delivered under this contract, but not covered under this Commercially Valuable ESPC Project Data clause, shall be delivered in accordance with this contract.

3. Detailed Task List

The following scope will be conducted in intervals with review points at the 30%, 60% and 90% levels of completion. An Audit Workplan Approval Matrix (**Attachment A: Sample Audit Workplan Approval Matrix**) will be used in the presentations to facilities and management teams for decision-making and approval. This includes estimated cost, savings, simple payback and expected M&V Methodology for each individual measure, while emphasizing the performance of all measures as a whole.

3.1 Assessment of Needs and Opportunities – Detailed Task List

Collect General Facility Information

Owner agrees to work diligently to furnish ESCO, upon request, accurate and complete data and information, as available. Owner will allow ESCO reasonable access to facility staff to ensure understanding of existing systems and opportunities. Owner may conduct the task to collect utility information from utilities in order to reduce ESCO time and expense.

The ESCO shall collect data and background information from Owner concerning facility operation and energy and water use, including any changes to operation, energy and water use anticipated within the next 5 years. ESCO agrees to work diligently to assess validity of information provided and to confirm or correct the information as needed. Where information is not available from Owner, ESCO will make a diligent effort to collect such information through the facility inspection, staff interviews, and utility companies.

Collect the following information for the past 36-month period [24-month minimum]:

General Facility Information

- Building list with square footage and age (including age of major remodels or additions)
- Construction data of buildings and major additions including building envelope, window specifications/performance and roof/wall assembly.
- General use of facility

Utility Information

- Utility company invoices

Equipment and Facility Information

- Equipment Descriptions: Descriptions of all major energy and water consuming or energy and water saving equipment
- Facility Descriptions: Description of any structural or building use changes
- Past Changes: Record of any improvements or modifications related to energy, water or operational efficiencies that have been installed during the past three years
- Future Plans: Description of current or future plans regarding building or equipment modifications

- Drawings and Specifications: Drawings, as available (may include mechanical, plumbing, electrical, building automation and temperature controls, structural, architectural, modifications and remodels). Original construction submittals and factory data (specifications, pump curves, etc.), as available

Operations Information

- Occupancy schedules
- Usage information
- Description of current energy management procedures
- Description of current operational practices
- Operating engineer logs, maintenance work orders, etc., as available
- Records of maintenance expenditures on energy or water-using equipment, including service contracts

Energy Assessments

- Prior energy audits or studies, if any
- A completed Data Collection Form for DOE Energy Asset Score for each building
- ESCO shall request of Owner that its existing ENERGY STAR Portfolio Manager accounts for buildings within the scope be shared.

Inventory Existing Systems and Equipment

Compile an inventory based on a physical inspection of the major electrical and mechanical systems at the Facility, including:

- Cooling systems and related equipment
- Heating and heat distribution systems
- Automatic temperature control systems and equipment
- Air distribution systems and equipment
- Outdoor ventilation systems and equipment
- Kitchen and associated dining room equipment, if applicable
- Exhaust systems and equipment
- Hot water systems
- Electric motors 5 HP and above, transmission and drive systems
- Interior and exterior lighting
- Laundry equipment, if applicable
- Water consumption end uses, such as restroom fixtures, water fountains, irrigation, etc.
- Other major energy using systems, if applicable

Address the following considerations:

- The loads, proper sizing, efficiencies or hours of operation for each system; (Where measurement costs, facility operating or climatic conditions necessitate, engineering estimates may be used, but for large fluctuating loads with high potential savings, appropriate measurements are required unless waived by the Customer).
- Current operating condition for each system;
- Remaining useful life of each system;
- Feasible replacement systems
- Hazardous materials and other environmental concerns

Use data loggers and conduct interviews with facility operation and maintenance staff regarding systems operation, occupancy patterns and problems with comfort levels or equipment reliability.

Establish Baseline

Estimate Loads

- Estimate loads, usage and/or hours of operation for all major end uses of total facility consumption including: lighting, heating, cooling, motors (fans and pumps), plug loads, kitchen equipment, water, and other major energy and water using equipment.
- Where loading or usage are highly uncertain (including variable loads such as cooling), ESCO will use its best judgment, spot measurements or short-term monitoring. ESCO should not assume that equipment run hours equal the operating hours of the building(s) or facility staff estimates.

Estimate Baseline Usage

- Examine utility bills for the past 36 months for electricity, gas, steam, water, etc.
- Establish base year and/or baseline consumption
- Present base year and/or baseline consumption in terms of energy or water units (kWh, kW, ccf, Therms, gallons, or other units used in bills), in terms of dollars, and in terms of dollars per square foot.
- Describe the process used to determine the base year and/or baseline consumption and demand (averaging, selecting most representative contiguous 12 months, or sampling).
- Consult with facility personnel to account for any anomalous schedule or operating conditions on billings or equipment conditions that could skew the base year and/or baseline representation.
- ESCO will account for periods of time when equipment was broken or malfunctioning in calculating the base year or baseline definition period.

Reconcile Estimates

- Reconcile annual end-use estimated consumption and demand with the annual base year consumption. The purpose of this is to place reasonable limits on potential savings.
- Reconcile the annual end use estimated consumption with the annual Base Year consumption to within 5% for electricity (kWh), fossil fuels and water.
- Reconcile the contribution to electric peak demand for each end use within 5% of the annual Base Year peak.
- The "miscellaneous" category shall not be more than 5%.
- This reconciliation will place reasonable "real-world" limits on potential savings.

Baseline Adjustments

- Propose adjustments to the baseline for energy and water saving measures that will be implemented in the future.
- Baseline adjustments may be made only with advance approval by the Owner.

3.2 Preliminary Analysis of Measures – Detailed Task List

Identify Potential Measures

Interviews: Interview the facility manager and a sampling of maintenance staff, subcontractors and occupants of each building regarding:

- Facility operation, including energy management and operating procedures
- Equipment maintenance problems
- Comfort problems and requirements
- Equipment reliability
- Projected equipment needs
- Occupancy and use schedules for the facility and specific equipment.
- Facility improvements – past, planned and desired
- Other project sustainability goals, metrics or standards (i.e. LEED, ENERGY STAR, Living Building Challenge, Net Zero Energy, Passive House, EISA 2007, etc.)

Surveys: Survey major energy and water-using equipment, including:

- lighting (indoor and outdoor)
- heating and heat distribution systems
- cooling systems and related equipment
- automatic temperature control systems and equipment

- air distribution systems and equipment
- outdoor ventilation systems and equipment
- exhaust systems and equipment
- hot water systems
- electric motors
- transmission and drive systems
- special systems (kitchen/dining equipment, etc.)
- renewable energy systems
- Other energy using systems
- water consuming systems (restroom fixtures, water fountains, irrigation systems, etc.)
- plug loads
- server room equipment

Perform "late-night" surveys outside of normal business hours or on weekends to confirm building system and occupancy schedules, if deemed necessary.

Assess potential measures:

Consider the following for each system:

- Comfort and maintenance problems
- Energy use, loads, proper sizing, efficiencies and hours of operation
- How the measures work together (i.e. lighting upgrades can introduce less heat which requires less space cooling)
- Current operating condition
- Remaining useful life
- Feasibility of system replacement and replacement costs
- Hazardous materials and other environmental concerns
- Owner's future plans for equipment replacement or building renovations
- Facility operation and maintenance procedures that could be affected
- Capability to monitor equipment or system performance and verify savings

List Measures: Develop a preliminary list of potential energy and water saving measures.

- List all potential opportunities, whether cost-effective or not.
- Consider technologies in a comprehensive approach including, but not limited to: lighting systems, heating/ventilating/air conditioning equipment and distribution systems, controls systems, building envelope, motors, kitchen equipment, pools, renewable energy systems, other special equipment, irrigation systems, and water saving devices.
- Identify measures which appear likely to be cost effective and therefore warrant detailed analysis

Evaluate Measures:

- Estimate the cost, savings and life expectancy of each proposed measure.
- Conduct a preliminary analysis of potential measures using life cycle cost analysis and examining the value of non-energy benefits of specific measures

Assess Deep Retrofit Opportunities

- Survey performance and quality of passive energy elements such as envelope performance (window, wall, roof, floor, slab), points of infiltration, daylighting/blinds.
- Apply the process outlined in **Attachment J: Deep Energy Retrofit Planning** if applicable to determine if a building is 'ripe' for a deep retrofit.

Utilize ENERGY STAR Tools

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.

Present Findings

- Submit the list to Owner based on the agreed upon schedule.
- Meet with Owner to present preliminary findings prior to thorough analysis.
- Describe how the projected project economics meet the Owner's terms for completing the Financial Grade Operational Audit and Proposal Contract. Discuss assessment of energy use, savings potential, project opportunities, and potential for developing an Energy Savings Performance Contract. The Owner shall have the option to reject calculations of savings, potential savings allowed, or project recommendations.
- Develop a list of recommended measures for further analysis.

The result of this meeting is that ESCO and Owner are to come to agreement on the Audit Workplan (**Attachment E: Sample Audit Workplan Approval Matrix**) for the measures that merit further analysis.

A form will be used to document agreement from discussions, meetings and reviews (**Attachment F: Review Comments**).

3.3 Further Analysis for Financial Grade Operational Audit – Detailed Task List

Further estimate the cost, savings and life expectancy of each proposed measure.

Savings Analysis

- Follow the methodology of ASHRAE or other nationally-recognized authority following the engineering principle(s) identified for each retrofit option
- Utilize assumptions, projections and baselines which best represent the true value of future energy or operational savings. Include accurate marginal costs for each unit of savings at the time the audit is performed, documentation of material and labor cost savings, adjustments to the baseline to reflect current conditions at the facility, calculations which account for the interactive effects of the recommended measures.
- Use best judgment regarding the employment of instrumentation and recording durations so as to achieve an accurate and faithful characterization of energy use
- Provide analysis methodology, supporting calculations and assumptions used to estimate savings.
- Manual calculations should disclose essential data, assumptions, formulas, etc. so that a reviewer could replicate the calculations based on the data provided
- For savings estimates using computer simulations, Company shall provide access to the program and all inputs and assumptions used, if requested by the Customer.
- Provide detailed calculations for any rate savings proposals
- Provide detailed supporting calculations for any proposed maintenance savings
- Estimate any environmental costs or benefits of the proposed ECMs (e.g. disposal costs, avoided emissions, water conservation, etc.)
- Specify Facility operations and maintenance procedures which will be affected by the installation/implementation of the proposed ECMs;

Cost Estimates

Provide detailed estimates of costs associated with the installation, implementation and commissioning of each of the ECMs proposed in the Audit including breakouts for labor, materials, and equipment. Markups and fees must be consistent with those presented in **Attachment D: Cost and Pricing for Audit.**

Provide estimates of monthly costs associated with sustaining the project performance including breakouts for maintenance fees, monitoring fees, and training fees.

As relevant, include cost to provide services and complete application for Energy Star Label, LEED-EB certification for Existing Buildings, or other certification, and the cost for EPA's Tools for Schools or other such program related to improved air quality.

Measurement and Verification Plan

- Provide a preliminary savings measurement and verification plan for each proposed ECM
- Develop a measurement and verification plan for each measure
- Follow additional guidelines for analysis and report preparation given below

Commissioning Plan

- Provide a preliminary commissioning plan for the proposed ECMs

Operations and Maintenance Plan

- Develop a preliminary Operations and Maintenance Plan

3.4 Financial Grade Operational Audit Report and Project Proposal – Detailed Task List

The report provides an engineering and economic basis for negotiating a potential Energy Savings Performance Contract between the Owner and the ESCO. The report shall be completed within [____] calendar days of the date of execution of this Contract.

Financial Grade Operational Audit Report

Further analyze measures and account for measure interactions

The Financial Grade Operational Audit report includes:

Overview

- Contact information
- Executive Summary
- Description of the facility, measures evaluated, analysis methodology, results
- Summary table presenting the cost and savings estimates for each measure and for the project as a whole.
- Summary table of recommended energy and water saving measures, including total and itemization for each measure of total design and construction cost, annual maintenance costs, the first year cost avoidance (in dollars and energy units), simple payback and equipment service life
- Any cost savings due to changes to utility rates or commodity costs due to changes in metering, commodity procurement, etc.
- Summary of annual energy and water use and costs by fuel type and costs of existing or base year condition
- Calculation of energy and cost savings expected if all recommended measures are implemented, and total percentage savings of total facility energy cost.
- Description of the existing facility, mechanical and electrical systems

- Summary description of measures, including estimated costs and savings for each as detailed above
- Available rebates and incentives
- Summary of recommended owner related actions (i.e. internal occupant energy reduction programs or competitions, plug load reduction measures, procurement recommendations-laptops not desktops, etc.)
- Discussion of measures considered but not investigated in detail
- Summary of the value beyond energy cost savings (i.e. employee retention and recruiting benefits, employee productivity benefits, etc.). Qualitative at a minimum, quantitative would be best.
- Conclusions and recommendations

Baseline and/or base year energy use

- Description and itemization of current billing rates, including schedules and riders.
- Summary of all utility bills for all fuel types and water
- Identification and definition of base year consumption and description of how established
- Provide detail on baseline adjustments, if any, as approved by the Owner.
- Reconciliation of estimated end use consumption (i.e. lighting, cooling, heating, fans, plug loads, etc.) with base year (include discussion of any unusual findings)

Description of each operational, energy and water saving measure

Written description

- Existing conditions
- Description of equipment to be installed and how it will function
- Detailed descriptions for each measure including analysis method, supporting calculations (submitted in appendices), results, proposed equipment and implementation issues, including a discussion of facility operations and maintenance procedures that will be affected by installation/implementation.
- Plan for installing or implementing the recommendation.
- Discussion of the conclusions, observations and caveats regarding cost and savings calculations.

Savings calculations

- Base year energy use and cost
- Post-retrofit energy use and cost
- Savings calculations including analysis methodology, supporting calculations and assumptions used.
- Annual savings calculations. The cost savings for all energy saving measures must be estimated for each year during the contract period. Savings must be able to be achieved each year (cannot report average annual savings over the term of the contract).
- Savings calculations must be limited to savings allowed by the Owner as described above.
- Percent cost-avoidance projected
- Description and calculations for any proposed rate changes
- Explanation of how savings interactions between retrofit options is accounted for in calculations.
- Operation and maintenance savings, including detailed calculations and description. Ensure that maintenance savings are only applied in the applicable years and only during the lifetime of the particular equipment.
- If computer simulation is used, include a short description and state key input data and software used. If requested by Owner, access will be provided to the program and all assumptions and inputs used, and/or printouts shall be provided of all input files and important output files and included in the Financial Grade Operational Audit with documentation that explains how the final savings figures are derived from the simulation program output printouts

- If manual calculations are employed, formulas, assumptions and key data shall be stated.
- Conclusions, observations, caveats

Cost estimate

- A detailed narrative of the construction work needed, suitable for cost estimating. Level of detail to be provided should be consistent with Audit Workplan. Include all anticipated costs associated with installation and implementation. Provide specifications for major mechanical components as well as detailed lighting and water fixture counts.
- Engineering/design costs
- ESCO/vendor estimates for labor, materials, and equipment; include special provisions, overtime, etc., as needed to accomplish the work with minimum disruption to the operations of the facilities.
- Permit costs
- Construction management fees
- Environmental costs or benefits (disposal, avoided emissions, handling of hazardous materials, etc.)
- Note that all markups and fees stated in **Cost and Pricing for Audit (Attachment D)** shall be used in the cost estimates, unless otherwise documented and justified due to change in scope or size of project or other unforeseen circumstances.
- Conclusions, observations, caveats
- Other cost categories as defined above under "markups" in Section 3b above.

Other

- Estimate of average useful service life of equipment
- Preliminary commissioning plan (as outlined in **Energy Savings Performance Contract – Schedules**)
- Preliminary measurement and verification plan, following the current version of the International Performance Measurement and Verification Protocol (IPMVP), explaining how savings from each measure is to be measured and verified (description of Option A, B, C, or D will be implemented for the measure). The Preliminary M&V plan shall follow the format provided in **Attachment C: Guidelines for Preliminary Measurement and Verification Plan** and should be consistent with the methodology agreed to in the Audit Workplan (**Attachment E: Sample Audit Workplan Approval Matrix**).
- Discussion of impacts that facility would incur after contract ends. Consider operation and maintenance impacts, staffing impacts, budget impacts, etc., and identify who is responsible for maintenance.
- Compatibility with existing systems. NOTE: Include the name of the existing controls system, if new controls systems will have to be compatible with an existing brand of controls. Also note if a sole-source vendor is established for controls systems.
- Complete appendices that document the data used to prepare the analyses. Describe how data were collected.

3.5 Energy Savings Performance Contract Project Proposal

Project Proposal

Prepare an Energy Savings Performance Contract Proposal (Schedules and Exhibits to be attached to the Energy Savings Performance Contract).

In anticipation of ESCO and Owner entering into an Energy Savings Performance Contract to design, install, and monitor the energy and water saving measures proposed in the Financial Grade Operational Audit Report, prepare the Schedules and Exhibits to be incorporated in an Energy Savings Performance Contract, to include:

- Specific recommended measures from the preliminary compilation for installation and implementation at the Facility.
- Project Price - the total amount Owner will pay for the project and ESCO's services. The price must be consistent with cost estimates established in **Attachment D: Cost and Pricing for Financial Grade Operational Audit**. Costs may include but are not limited to: engineering, designing, packaging, procuring, installing (from Financial Grade Operational Audit Report results); performance/payment bond costs; construction management fees; commissioning costs; maintenance fees; monitoring fees; training fees; legal services; overhead and profit; other markups.
- Include a List of Services that will be provided as related to each cost.
- Expected term of the Energy Savings Performance Contract.
- Description of how the project will be financed including competitive bidding, available interest rates and financing terms, based on interest rates likely available to Owner at this time, and based on available lock options, and associated premiums, from prospective lending institutions.
- Measurement and verification methods must be consistent with the latest version of the *International Performance Monitoring and Verification Protocol* and **Attachment C: Guidelines for Preparing Measurement and Verification Plan**. Measurement and Verification shall be conducted on each measure unless otherwise specified.
- Explanation of how the savings will be calculated and adjusted. Adjustments made to the energy baseline shall only be made for any of the following changes in conditions affecting the facility:
    - utility rates;
    - number of days in the utility billing cycle;
    - floor area of the facility;
    - operational schedule of the facility;
    - facility temperature;
    - weather, if change is significant;
    - amount of equipment or lighting used in the facility, if change is significant;
    - space type(s) in the facility, if change is significant; and
    - material change(s) in or to the facility.

- Analysis of annual cash flow for Owner during the contract term. This includes the annual fee for the ESCO to conduct measurement and verification services. Such services shall be subject to negotiation each year. Use the tables presented in **Attachment D: Cost and Pricing**.

Review

Meet with Owner to:

- Review the recommendations, savings calculations and impact of the measures on the operations of the facility. Describe how the projected project economics meet the Owner's terms for completing the Financial Grade Operational Audit and Performance Contract Proposal. Discuss the willingness and capability of Owner to make capital contributions to the project to improve the economics of the overall project.
- Revise Audit as agreed by Owner and ESCO.

ATTACHMENT B. Notice of Acceptance of Investment Grade Audit Report

Notice of Acceptance

Date of Notice _____

Notice is hereby given that ***Institution*** accepts the Investment Grade Audit and Project Development Proposal by ESCO, as contemplated in **the Investment Grade Audit and Project Proposal Contract** dated _____.

Institution Name

By _____

Date _____

When completely executed, this form is to be sent by certified mail to the ESCO by Institution Name.

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.

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)
Total savings									
First Year Guaranteed Cost Savings: $									

Notes
*Annual electric demand savings (kW/yr) is the sum of the monthly demand savings.
MBtu=10^6 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=10^6 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 = 10^3 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	[a]Recommended time of submission	[a]Institution'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

[a]Times 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													

4.1.1 Notes

*Annual electric demand savings (kW/yr) is the sum of the monthly demand savings.

MBtu = 10^6 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.

ATTACHMENT D. Cost and Pricing for Audit Development

Where a prior RFP required cost and pricing information, the cost and pricing response is repeated below as a maximum, or else negotiated downward with respect to the agreed maximums.

Owners may choose to accept audit costs, markups, margins and fees proposed by ESCO for individual projects without further negotiation, provided they do not exceed the maximums established in the tables below, or directly negotiate with ESCO for reductions as dictated by individual facility or project requirements. ESCO may also propose lower audit costs, markups, margins and fees depending upon individual project considerations or their own internal business approach.

ATTACHMENT E. Sample Audit Workplan Approval Matrix

The table below summarizes the approach for the ESCO to develop the scope of work, guaranteed savings, and measurement and verification of the energy savings during the audit. Changes and modifications to may occur throughout the audit, however must be approved by all parties.

	ECM Description	Scope of Work Development	Savings Analysis	M&V Approach
1	Lighting Retrofit	Room-by-Room audit with planned retrofits	Pre and post wattage and hours of operation in the Room-by-Room audit	Retrofit isolation. Pre- and post-wattage measurements of a statistically valid sample of retrofits
2	Building Automation System	DDC points list with sequences of operation	BIN analysis utilizing local weather data and system design parameters.	Baseline operating conditions documented on xx/yy/2014 and approved by owner's facilities staff. The BAS trending capabilities will be used on a short–term basis to verify BAS operating as per ESCO design. Semi-annual visits from ESCOs Cx engineers to verify system to continues to operate within design parameters.
3	New Chiller Plant	General arrangement and single-line process drawings. Equipment submittal package.	BIN analysis utilizing local weather data and system design parameters.	Use existing BAS to trend baseline CHW plant operating parameters for 60 days during audit to determine Kw/ton at varying loads. Use BAS to trend CHW plant operating parameters to calculate post-retrofit kw/ton. Use verified data in baseline and post-retrofit BIN analysis.
4	Convert from Constant Volume to Variable Air Volume	Identify locations of boxes to be converted on the existing building HVAC plans. Equipment submittal packages for each type/size of box to be installed. DDC schematic for a sample VAV box with sequence of oeprations.	eQuest model to be calibrated to current baseline within x %.	eQuest model for the impacted building
5	Window Replacement	Room-by-Room audit with planned retrofits	eQuest model to be calibrated to current baseline within x %.	eQuest model for the impacted building
6	Wall/roof replacement or insulation enhancement	Room-by-Room audit with planned retrofits	eQuest model to be calibrated to current baseline within x %.	eQuest model for the impacted building
7	Infiltration sealing	Blower door test or smoke test on each aperture. Visual inspection?	eQuest model to be calibrated to current baseline within x %.	eQuest model for the impacted building
8.	New Boilers,burners,or boliler controls	Inspection of condition,evaluation of viability,combustion efficiency testing	Post retrofit combustion efficiency estimates	Post retrofit combustion efficiency tests and/or data collected from dedicated boiler controls

ATTACHMENT F. Review Comments

The following table will be used to document issues that arise during the audit review process, where the 3rd party reviewer may be a Program representative or the Owner's Representative.

Audit Review Comments

Project Title / Site: **Owner**	Date: **MM/DD/2014**
Type of Review: **___% Audit Submission - submitted by _____**	
Reviewers: **John Doe (JD), Mary Doe (MD)**	

CMT #	Section #	Reviewer	Comments	ESCO Response	Final Disposition of Comment	Closed (Y/N)
1						N
2						Y
3						
4						
5						
6						
7						
8						
9						

ATTACHMENT J. Deep Energy Retrofit Planning

What is a deep energy Retrofit?
A Deep Energy Retrofit is the integrative analysis and design process that enables projects to achieve over 50% annual operational cost savings with attractive financial returns. Key aspects to the deep energy retrofit process include:

- **Timing** the deep retrofit to coincide with planned capital improvements, breaks in occupancy and other key timing indicators;
- Applying **integrative design** principles to achieve more holistic retrofits at equal or lower capital costs;
- Using **advanced energy modeling**, auditing and life cycle cost analysis methods and tools; and,
- **Engage occupants to modify behavior,** one of the biggest factors impacting energy use.
- **Metering and continuous recommissioning** to verify savings and to provide feedback for optimizing building performance over time.

Lessons learned from deep energy retrofits can go beyond energy savings on individual buildings to impact a whole portfolio of similar buildings.

ESCO's in general currently get 15-30% savings-we think 40-60% could be profitable for ESCO and building owners who have aligned goals to minimize life cycle costs, and improved processes and tools.

Describe the value, risk and risk management on a Deep Retrofit?
The following tables summarize the potential value of a deep retrofit to an ESCO and an owner. They also summarize risks and ways to manage those risks.

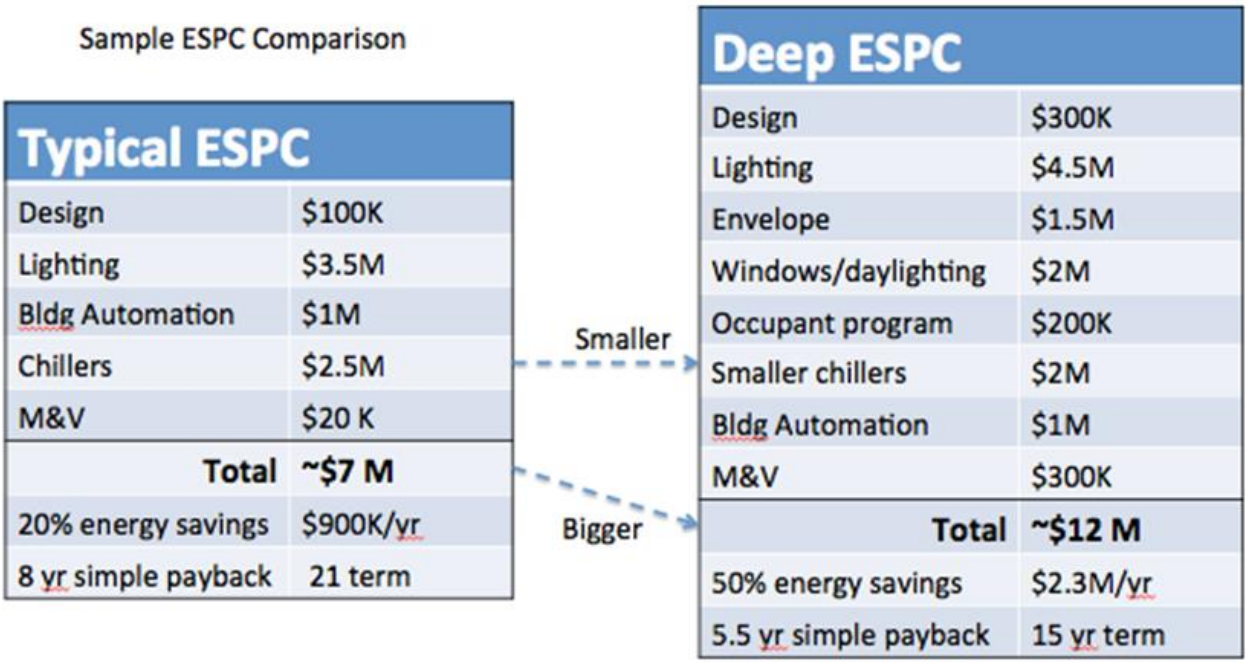
Value of a Deep Retrofit to an ESCO	
• Larger project size • Increase market size (new access) for the ESCO • Increase market share (differentiated offer) for the ESCO • Builds longer-term customer relationships	
ESCO's Risks on a deep retrofit	**Risk management**
Increased project development and construction time/complexity (more capital at risk)	More extensive analysis leads to a better understanding of the building, less risk of poor project performance . More comprehensive solutions = bigger overall project funded with more savings. Workshops with owners and technical experts help compress time, get a variety of design/construction perspectives. Multiple projects cause learning curves to reduce project time for future deep retrofits. Owners commit to pay for a greater percentage of the actual upfront analysis costs and are committed to the goal of a deep retrofit project.
Savings calculations inaccuracy/complexity	Use experienced modelers, train in-house experts
Lack of design integration competency/coordination of skills	Bring in experts other than traditional Mechanical and Electrical engineers.
Challenging determining good deep retrofit candidates	Make sure owner is on board, understand ripeness indicators, continue to refine with lessons learned
Real value beyond 'business as usual' - how to quantify non energy benefits, take credit and account for their economic value	Educate client regarding other benefits beyond energy cost savings. The value needs to be included in the economic business case decision.

Lack of owner interest/motivation	Owner education, mandates (federal), recognition, values beyond energy cost savings (branding, space efficiency, productivity, and asset value), industry awareness and competition, case studies. Federal and state government need to provide financial incentives for case studies.
Decrease excessive design safety margins (smaller mech equipment, more focus on load reduction and passive ECM's)	Leverage other building technologies for overall larger project, monetize additional services (O&M savings, space efficiency, health improvement)

Value of a Deep Retrofit to an Owner	
• Reduced/controlled energy costs • Advantageous long term financing terms/cost-benefit matching • High occupant value • Deferred maintenance • Space efficiency/flexibility	
Owners Risks on a deep retrofit	**Risk management**
Potential for longer project construction, occupant interruption	Understand process at onset, learning curve to overcome. Proper owner education on the full long term project value. Careful designs can minimize/eliminate occupant interruption.
Potential for budget overrun since longer list of ECM's	Proper analysis of ECM interactions justifies the selection of the ECMs included in the project. Due to complexity of design owner approves a larger contingency for project costs.
More extensive contract oversight	Better understanding of building stemming from rigorous ESCO analysis reviewed by a technically competent owner's representative familiar with ESCO deep retrofit design yields fewer uncertainties.
With additional complexity, challenge meeting performance guarantee	Owner invests in appropriate performance based maintenance and continuous commissioning services to optimize performance over time
Longer contract term	Approval by project finance decision makers to extend the term for financing and project performance.

Example:

- Integrative design can lead to smaller mechanical equipment (since loads have been reduced) but a broader bundle of ECM's.
- Makes total project bigger, even though smaller mech equipment
- This very optimistic example makes it clear that only rather large buildings with high energy costs could afford the extra design and M&V services and large envelope measures needed to justify a deep retrofit



Key learnings from successful deep retrofit projects:

- Collaborative, multidisciplinary team was challenging to maneuver but ultimately highly beneficial to ECM's. Would go smoother on future projects.
- A highly informed and motivated client is a must – too hard to drag an unreceptive client through the process. These are few unfortunately.
- Documenting the business as usual baseline is critical for demonstrating the business case. Also very challenging to get consensus on realistic, agreed-upon long term avoided costs that include non-energy benefits.
- The additional time for the technical potential workshop and investigating a large number of ECM's (i.e.72) is worth it. It changes the design objective-leaving nothing on the table. Time could be saved in the future with the same team.
- Including tenant related ECM's is key, although rarely included in ESPC due to the split incentive problem.

How do we tell if a building is 'ripe' for a deep energy retrofit?

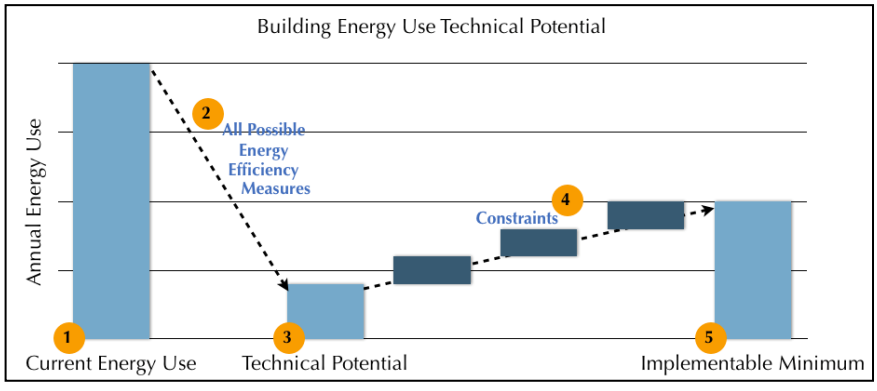
Not every building is ready for a deep retrofit. Deep retrofits should be carefully timed based on the long-term plan for a building. The following are situations in a building's life cycle that should trigger a deep energy retrofit design and analysis.

Deep Retrofit Trigger	Description
Adaptive reuse or market repositioning	Redeveloping an existing building will require significant capital expense to which the cost of a deep retrofit would be incremental and likely small in comparison.
End (or near end) of life roof, window or siding replacement	Planned roof, window and siding replacements provide opportunities for significant improvements in daylighting and efficiency at small incremental cost, providing the leverage for a deep retrofit that reduces loads and therefore the cost of replacing major equipment such as HVAC and lighting.
End (or near end) of life HVAC, lighting or other major equipment replacement	Major equipment replacements provide opportunities to also address the envelope and other building systems as part of a deep retrofit. After reducing thermal and electrical loads, the

	marginal cost of replacing the major equipment with much smaller equipment (or no equipment at all) can be negative. This logic only works if the owner has the capital to fund the major capital improvements.
Upgrades to meet code	Life safety upgrades may require substantial disruption and cost, enough that the incremental investment and effort to radically improve the building efficiency becomes not only feasible but also profitable.
New Acquisition or Refinancing	New acquisition or refinancing at historically low interest rates can put in place attractively financed building upgrades as part of the transaction, upgrades that may not have been possible at other times.
Fixing an "energy hog"	There are buildings, often unnoticed, with such high energy-use or high energy-prices (perhaps after a major rate increase) that deep retrofits have good economics without leveraging any of the factors above.
Major occupancy change	A company or tenant moving a significant number of people or product into a building or major turnover in square footage presents a prime opportunity for a deep retrofit, for two reasons. First, a deep retrofit can generate layouts that improve energy and space efficiency, and can create more leasable space through downsizing mechanical equipment. Second, ownership can leverage tenant investment in the fit-out.
Energy management planning	As part of an ongoing energy management plan for a group of buildings, the owner may desire a set of replicable efficiency measures. These measures can be developed from the deep retrofit of an archetypical building.

How is the process for a deep energy retrofit different?
When targeting aggressive building energy goals, understand what is technically feasible for lowering your building's energy use before bending to the constraints of schedule, timing, and budget. When we use constraints as our design guidelines, we often arrive at incremental energy reductions. Understanding what is technically possible *before* leaping to what is implementable can help design teams to arrive at more creative and cost-effective solutions.

The technical potential approach is a process used to first identify the lowest possible energy use of a building or system using integrated efficiency measures and available technology, and then, determine what is implementable by systematically reintroducing project constraints. As each constraint (e.g. budget, schedule) is reintroduced, the team can understand and quantify the true impacts of that constraint and determine a strategy (if any) to implement desired measures.



Step 1: Determine the current energy use and energy-use break down
Step 2: Brainstorm an extensive list of energy efficiency measures (ranging from envelope measures to day lighting to system efficiencies to system elimination). Model various bundles of measures.
Step 3: Identify the technical potential-the lowest possible technically feasible energy use
Step 4: Apply constraints (i.e. time, financial)
Step 5: Arrive at the implementable minimum
The technical potential changes the engineering conversation from 'we can't because…' to 'how can we do that despite…'

Resources:
Deep Retrofit case studies - http://newbuildings.org/existing-buildings

Deep energy retrofits at GSA –
http://www.rmi.org/Knowledge-Center/Library/2013-10_GSAReportCharette