***<Note to Agency/company: It is tempting to develop a prescribed scope of work, 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.>***

PHASE 1

1. Scope of Work for Investment Grade Energy Audit (for non-chilled water plant systems)

The ESCO shall carry out the Investment Grade Energy Audit as outlined below:

1. **Collect data and background information from the Agency/company concerning facility operation and energy and water use for the most recent three years from the effective date of this Consultancy Agreement as follows**:
2. Building gross floor area and air-conditioned area.
3. Construction data of buildings and major additions.
4. Utility company invoices.
5. Occupancy and usage information.
6. Description of all energy-consuming or energy-saving equipment used on the premises, as available.
7. Description of energy management procedures utilized on the premises.
8. Description of any energy-related improvements made or currently being implemented.
9. Description of any changes in the structure of the facility or energy-using or water-using equipment.
10. Description of future plans regarding building modifications or equipment modifications and replacements.
11. Drawings, as available (may include mechanical, plumbing, electrical, building automation and temperature controls, structural, architectural, modifications and remodels).
12. Original construction submittals and factory data (specifications, pump curves, etc.), as available.
13. Operating engineer logs, maintenance work orders, etc., as available.
14. Records of maintenance expenditures on energy-using equipment, including service contracts.
15. Prior energy audits or studies, if any.

Where information is not available from the Agency/company, ESCO will make a diligent effort to collect such information through the facility inspection, staff interviews, and utility companies. The ESCO agrees to work diligently to assess validity of information provided and to confirm or correct the information as needed.

1. **Perform a facility inspection**

1. Interview the facility manager, maintenance staff or others regarding:
2. Facility operation, including energy management procedures
3. Equipment maintenance problems
4. Comfort problems and requirements
5. Equipment reliability,
6. Projected equipment needs,
7. Occupancy and use schedules for the facility and specific equipment.
8. Facility improvements, past and planned
9. Inspect major energy-using equipment, including but not limited to:
10. Cooling systems and related equipment
11. Automatic temperature control systems and equipment
12. Air distribution systems and equipment
13. Indoor and outdoor ventilation systems and equipment
14. Exhaust systems and equipment
15. Electric motors, transmission and drive systems
16. Lighting (indoor and outdoor)
17. Special systems (kitchen/dining equipment, swimming pools, laundry equipment, etc.)
18. Renewable energy systems
19. Other energy using systems
20. Water consuming systems (restroom fixtures, water fountains, irrigation systems, etc.)
21. Heating and heat distribution systems
22. Hot water systems
23. Perform surveys outside of normal business hours including late night or weekend surveys to confirm building system and occupancy schedules, if deemed necessary.

The Agency/company will allow the ESCO reasonable access to facility staff to ensure understanding of existing systems and opportunities.

The ESCO agrees to work diligently to assess validity of information provided and to confirm or correct the information as needed.

1. **Prepare a preliminary analysis of potential energy and water saving measures**
2. ESCO shall monitor and measure the physical parameters and energy consumption of major energy and water consuming equipment with a view to identifying energy and water saving measures that in the best judgement of the ESCO are cost-effective and warrant detailed evaluations.
3. ESCO shall consider technologies in a comprehensive manner for the various energy consuming systems.
4. For each energy and water saving measure, ESCO shall use its best judgement regarding the employment of instrumentation and recording duration so as to achieve an accurate and faithful characterization of energy use. Where loading or use are highly uncertain, ESCO will propose the instrumentation and recording documentation and take direction from the Agency/company to use spot measurements or short-term monitoring.
5. For each energy and water saving measure, ESCO shall prepare a preliminary estimate of energy cost savings including a description of analysis methodology, supporting calculations, and assumptions used to estimate savings.
6. Potential energy and water saving measures shall address the following:
7. Comfort and maintenance issues
8. Energy use, loads, proper sizing, efficiencies and hours of operation
9. Current operating condition
10. Remaining useful life of equipment to be replaced
11. Implications of system replacement
12. Hazardous materials and other environmental concerns associated with energy and water saving measures
13. Agency/company’s future plans for equipment replacement or facility renovations
14. Facility operation and maintenance procedures that could be affected
15. **Prepare a summary including the following:**
16. Information from Agency/company contacts
17. Summary table of recommended energy and water saving measures, with the estimated design and construction costs for each energy and water saving measure, annual maintenance costs, the first year cost avoidance (in dollars and energy units), and annual energy savings.
18. Summary of annual retrofit energy use and costs related to baseline energy and water use and costs
19. Calculation of annual savings expected if all recommended energy and water saving measures are implemented at current rates as specified in **Clause 8** of the document**: Consultancy Agreement**.
20. General description of the existing facility and its mechanical and electrical systems.
21. Complete appendices including identification of data used to prepare analyses and data collection methods
22. Proposed project schedule showing significant milestones
23. Conclusions and recommendations
24. **Provide a written description of each of the recommended energy and water saving measures including:**
25. General description
26. Existing conditions
27. Conceptual process design and physical layout of all major equipment, piping, ductwork and electrical distribution systems
28. Recommendations including discussion of facility operations and maintenance implications of energy and water saving measure installation/implementation
29. Preliminary savings calculations
30. Current estimated energy and water use and cost
31. Post-retrofit energy and water use and cost
32. Savings estimates including analysis methodology, supporting calculations, and assumptions used
33. Savings estimates must be limited to savings allowed by the Agency/company as described in **Clause 9** of the document**: Consultancy Agreement**.
34. Percent cost-avoidance projected
35. Explanation of how savings duplication or interaction between retrofit options is avoided
36. Operational savings, including calculations and descriptions. Maintenance savings should only be applied in the applicable years and only during the Term as defined in the Guaranteed Energy Savings Performance Contract. Calculations, formulas, assumptions and key data shall be stated.
37. **Meet with Agency/company to review the recommended energy and water saving measures proposed and assemble a package of options to establish facility improvement goals to be carried forward into the development of the Guaranteed Energy Savings Performance Contract phase.**
38. **Develop measure-specific Baseline Consumption and Measurement and Verification (M&V) Plan for each energy and water saving measure selected by Agency/company and present the draft Investment Grade Energy Audit Report.**
39. Energy Baseline Development

Describe in general terms how the baseline for each energy and water saving measure is defined.

1. Variables affecting baseline energy use
	* 1. State the variables such as operating hours, set point changes, etc.
		2. Describe how each variable will be quantified, i.e. measurements, monitoring, assumptions, manufacturer data, maintenance logs, engineering resources, etc.
		3. Discuss variables’ impact on savings uncertainty
2. Define key system performance factors characterizing the baseline conditions such as comfort conditions, lighting intensities, temperature set points, etc.
3. Specify requirements for Agency/company witnessing of measurements
4. Describe baseline data collected
	* 1. Parameters Monitored
		2. Details of equipment monitored, i.e. location, type, model, quantity, etc.
		3. Desired uncertainty level
		4. Sampling plan, including details of usage groups and sample sizes
		5. Duration, frequency, interval, and seasonal or other requirements of measurements
		6. Personnel, dates, and times of measurements
		7. Proof of Agency/company witnessing of measurements (if required)
		8. Monitoring equipment used
		9. Installation requirements for monitoring equipments (test plug for temperature sensors, straight pipe for flow measurement etc.)
		10. Certification of calibration / calibration procedures followed
		11. Expected accuracy of measurements/monitoring equipment
		12. Quality control procedures used
		13. Electronic file format of data (.xls, .cvs, etc.)
		14. Results of measurements (attach appendix if necessary)
		15. Completed data collection forms, if used
5. Explain data analysis performed
	* 1. Analysis using results of measurements
		2. Weather normalized regressions
		3. Weather data used and source of data
6. Baseline establishment through computer simulations will only be allowed when no other acceptable methods of ascertaining consumption exist. If computer simulation is used, include a short description and state key input data. If requested by the Agency/company, 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.
7. Energy Savings Calculations
8. Explain analysis methodology used
9. Detail all assumptions and sources of data
10. State equations used, savings calculation details and detail any adjustments that may be required
11. Establishment of energy savings through computer simulations will only be allowed when no other acceptable methods of ascertaining savings exist. If computer simulation is used, include a short description and state key input data. If requested by the Agency/company, 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 Investment Grade Energy Audit with documentation that explains how the final savings figures are derived from the simulation program output printouts.
12. Operational & Maintenance Cost Savings
	1. O&M Savings Justification
13. Describe how savings are generated
14. Detail cost savings calculations
15. Total costs and savings

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Electric Energy (kWh) | Electric Demand (kW) |  Fuel Oil (litres) | Water (m3) | O&M cost savings ($) | Total costs for one year ($) | Total costs over the Term ($) |
| Baseline Use |  |  |  |  |  |  |  |
| Post-Install Use |  |  |  |  |  |  |  |
| Savings |  |  |  |  |  |  |  |

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

1. Post-Installation M&V Activities

Describe the intent of post-installation verification activities, including what will be verified.

1. Variables Affecting Post-installation Energy Use
2. Variables such as operating hours, set point changes, etc.
3. Describe how each variable will be quantified, i.e. measurements, monitoring, assumptions, manufacturer data, maintenance logs, engineering resources, etc.
4. Discuss variables’ impact on savings uncertainty
5. Define key system performance factors characterizing the post-installation conditions such as lighting intensities, temperature set points, etc.
6. Specify requirements for Agency/company witnessing of measurements
7. Post-Installation Data To Be Collected
8. Parameters To Be Monitored
9. Details of equipment to be monitored (location, type, model, quantity, etc.)
10. Desired uncertainty level
11. Sampling plan, including details of usage groups and sample sizes
12. Duration, frequency, interval, and seasonal or other requirements of measurements
13. Monitoring equipment to be used
14. Installation requirements for monitoring equipment
15. Calibration requirements / procedures,
16. Expected accuracy of measurements/monitoring equipment
17. Quality control procedures to be used
18. Electronic file format of data to be collected (.xls, .cvs, etc.)
19. Sample data collection forms (optional)
20. Explain data analysis to be performed and minimum acceptance requirements
21. Annual M&V Activities
22. Variables Affecting Performance Period Energy Use
23. Variables such as operating hours, set point changes, etc.
24. Describe how each variable will be quantified, i.e. measurements, monitoring, assumptions, manufacturer data, maintenance logs, engineering resources, etc.
25. Discuss variables’ impact on savings uncertainty
26. Define key system performance factors characterizing the performance period conditions such as comfort conditions, lighting intensities, temperature set points, etc.
27. Intent of annual verification activities – what will be verified
28. Schedule of annual verification activities and inspections
29. Requirements for Agency/company witnessing of measurements
30. State data to be collected
31. Parameters To Be Monitored
32. Details of equipment to be monitored (location, type, model, quantity, etc.)
33. Desired uncertainty level
34. Sampling plan, including details of usage groups and sample sizes
35. Duration, frequency, interval, and seasonal or other requirements of measurements
36. Monitoring equipment to be used
37. Installation requirements for monitoring equipment
38. Calibration requirements / procedures,
39. Expected accuracy of measurements/monitoring equipment
40. Quality control procedures to be used
41. Electronic file format of data to be collected (.xls, .cvs, etc.)
42. Sample data collection forms (optional)
43. Explain data analysis to be performed and minimum acceptance requirements
44. Operations & Maintenance (O&M) and Repair Reporting Requirements
45. Detail verification activities and reporting responsibilities of Agency/company and ESCO on operations and maintenance items.
46. State whether Agency/company or ESCO is responsible for equipment operations. If appropriate, detail how responsibilities are shared or reference where this information is located.
47. State ESCO’s responsibility for performing maintenance and equipment repair.
48. Prepare a detailed project cost estimate and cash flow projection based on the Agency/company-selected energy and water saving measures.
49. **Record revisions to Investment Grade Energy Audit Report as requested and approved by Agency/company and submit final report for use in Phase 2.**

2. Scope of Work for Investment Grade Energy Audit (for chilled-water plant)

1. The chilled-water plant specific consumption shall be measured and the findings shall be presented in an energy appraisal report on chilled-water plant.
2. For measurements used in determining the chilled-water plant specific consumption, the ESCO shall ensure that the overall measurement system for the chilled-water plant shall be capable of calculating a resultant chilled-water plant specific consumption within 5% of the true value. The overall uncertainty of the measurement system is the arithmetic sum of the individual error of each measurement system, which includes the temperature measurement, flow measurement, power measurement and data acquisition system.
3. The ESCO shall prepare a more accurate estimate of the energy cost savings of the chilled-water plant retrofit. However, no establishment of baseline for the chilled-water plant retrofit is required. The ESCO has to ascertain, during its measurements and findings in the Investment Grade Energy Audit, that the Declared Chilled-water Plant Specific Consumption as set forth in the document: Form of Tender is attainable.
4. The ESCO shall take note of the requirements in Schedule A of Annex I1 for the equipment required in the chilled-water plant retrofit.
5. Prepare and submit a detailed report on the proposed measurement system to be installed for the purpose of measuring, monitoring and optimizing the operation of the central chilled-water plant, pursuant to Schedule P of Annex I1.
6. Annual M&V Activities
7. Variables Affecting Performance Period Energy Use
8. Variables such as operating hours, set point changes, etc.
9. Describe how each variable will be quantified, i.e. measurements, monitoring, assumptions, manufacturer data, maintenance logs, engineering resources, etc.
10. Discuss variables’ impact on savings uncertainty
11. Define key system performance factors characterizing the performance period conditions such as comfort conditions, temperature set points, etc.
12. Intent of annual verification activities – what will be verified
13. Schedule of annual verification activities and inspections
14. Requirements for Agency/company witnessing of measurements
15. State data to be collected
16. Parameters To Be Monitored
17. Details of equipment to be monitored (location, type, model, quantity, etc.)
18. Desired uncertainty level
19. Sampling plan, including details of usage groups and sample sizes
20. Duration, frequency, interval, and seasonal or other requirements of measurements
21. Monitoring equipment to be used
22. Installation requirements for monitoring equipment
23. Calibration requirements / procedures,
24. Expected accuracy of measurements/monitoring equipment
25. Quality control procedures to be used
26. Electronic file format of data to be collected (.xls, .cvs, etc.)
27. Sample data collection forms (optional)
28. Explain data analysis to be performed and minimum acceptance requirements
29. Operations & Maintenance (O&M) and Repair Reporting Requirements
30. Detail verification activities and reporting responsibilities of Agency/company and ESCO on operations and maintenance items.
31. State whether Agency/company or ESCO is responsible for equipment operations. If appropriate, detail how responsibilities are shared or reference where this information is located.
32. State ESCO’s responsibility for performing maintenance and equipment repair.

PHASE 2

3. Scope of Work for Development of Guaranteed Energy Savings Performance Contract (for both chilled-water plant and non-chilled water plant systems)

The ESCO shall carry out the Development of Guaranteed Energy Savings Performance Contract as outlined below:

1. Based on the energy and water saving measures approved by the Agency/company from the Investment Grade Energy Audit, the ESCO shall prepare a project development plan.

The project development plan shall consist of the design development documents (“the Design Development Documents”) including drawings and other documents to fix and describe the entire project, including modifications or additions to architectural, structural, mechanical and electrical systems, materials and such other elements as may be appropriate.

1. Design Development Documents shall include:
2. Floor plans of all spaces to receive new equipment.
3. Key plans showing the location in the building of relevant spaces.
4. Conceptual process design and physical layout of all major equipment, piping, ductwork and electrical distribution systems
5. Identification of all fixed equipment to be installed under the contract.
6. Legend showing all symbols used on the drawings.
7. Outline specification, and catalog cuts and/ or samples of specified items.
8. Reflected ceiling development including ceiling grid and all devices that penetrate ceiling (i.e., light fixtures, sprinkler heads, ceiling register or diffusers, etc.).
9. Analysis of applicable regulations including a code analysis as they pertain to the Project.

Design development documents shall include electronic data of the floor plans, key plans, legends and anything that is drawn that can be used for future as-builts.

All equipment proposed that is comparable to similar equipment at the facility, shall either:

* offer compatibility with existing systems, and be of the same manufacturer for standardization of equipment agency/company-wide, or
* retain necessary functionality of existing equipment and offer better performance, higher efficiency, and more user friendly features or provide more information.

All proposed systems shall maintain levels of building functionality consistent with existing systems, unless approved otherwise by the Agency/company.

***<Note to Agency/company: Include name of existing controls system, or a requirement for open systems or devices, if new controls systems will have to be compatible with an existing brand of controls. However, this may raise costs, make the project not viable and is usually unnecessary>***

1. Prepare the following documents, in anticipation of the Guaranteed Energy Savings Performance Contract.

Schedule A Equipment to be Installed by ESCO

Schedule B Energy and Water Savings Guarantee

Schedule C Contract Price

Schedule D Energy Use Baseline Consumption

Schedule E Savings Measurement & Calculation Formulae; Methodology to Adjust Baseline; Annual Reconciliation

Schedule F Construction and Installation Schedule

Schedule G Standards of Comfort and Quality Assurance

1. Prepare a draft of the following documents, in anticipation of the Guaranteed Energy Savings Performance Contract.

Schedule H Systems Start-Up and Commissioning; Operating Parameters of

 Installed Equipment

Schedule I ESCO’s Training Responsibilities

Schedule J Agency/company’s Operation Responsibilities

Schedule K Facility Maintenance Checklist

Schedule L Measurement and Verification Plan

Schedule M [Not used]

Schedule N Insurance

Schedule O Special Conditions

Schedule P Specifications for Measurement Systems of Central Chilled-water Plant

The Conditions of GESP Contract (Part I) and all the remaining Exhibits and Appendices to Part I.

1. Meet with Agency/company to:
2. Review the Design Development Documents for energy and water saving measures.
3. Review schedules A through P, the Appendices and the Exhibits.
4. Record revisions to the project development plan requested by Agency/company and prepare final documents in preparation for execution of the Guaranteed Energy Savings Performance Contract.