



# **DEMONSTRATION PLAN GUIDANCE**

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**Installation Energy and Water Projects**

**March 2018**

## OVERVIEW

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All Environmental Security Technology Certification Program (ESTCP) project Principal Investigators must create a Demonstration Plan and submit the plan to the ESTCP Program Manager for approval. The Demonstration Plan includes a statement of what the demonstration will attempt to prove, a description of the performance objectives, an explanation of how the demonstration should unfold, and descriptions of measurements and analyses involved in the project. The Demonstration Plan creates the conditions to create valid findings that will provide insights for Department of Defense (DoD) policy and resource management decisions.

This document provides guidance for writing Demonstration Plans for projects that receive funding under the ESTCP Installation Energy and Water program area. *Principal Investigators should submit a draft demonstration plan at least two months prior to the initiation of demonstration data collection activities to allow time for review, comment, and revisions.* Demonstration teams may make *minor changes to the Demonstration Plan in the field during the demonstration and document the changes in the Final Report.* *In the event of substantial changes to the Demonstration Plan that occur after approval, Principal Investigators must notify the ESTCP Program Manager and Technical Assistant, briefly explain the circumstances and request concurrence with the proposed changes.*

### Format

Demonstration Plans are working documents and not intended for publication. However, they form the basis of and create the data for the Final Report, which ESTCP will publish on a public website. ESTCP recommends the following general formatting parameters to develop a professionally written and properly edited document.

<b>Cover</b>	Use the cover of this document as a template; include project name and number, date (month/year), document version number, and the researcher(s) name(s) and organization.
<b>Font</b>	Times New Roman
<b>Cover Main Title</b>	26 pt, bold, flush right
<b>Cover Title</b>	18 pt, bold, flush right
<b>Section Headings</b>	14 pt, bold, flush left
<b>Subsection Headings</b>	12 pt, bold, flush left
<b>Text</b>	12 pt
<b>Margins</b>	1" top, left, right, bottom
<b>Page Numbering</b>	Bottom center Cover page: none Front matter: i, ii, iii, iv... Body of document: 1, 2, 3, 4...
<b>File Type</b>	Submit draft documents in Microsoft Word. Submit revisions in Word and Adobe PDF
<b>Figures, Charts, Tables, Diagrams, Photographs, etc.</b>	Insert all figures on the same page or first page following the first reference to the figure.

## How to Submit a Draft Demonstration Plan

Please submit Demonstration Plans to the ESTCP Support Office using *one of the methods* indicated below:

- For files that are 100MB or less: Submit the report in SEMS 2.0 (<https://sems2.serdp-estcp.org>). Follow the instructions below for uploading your document:
  - From the project dashboard, click “Overview & Plan” in the left-hand panel, then click “Project Plan”.
  - Scroll down to the document milestone and click “Upload” in the milestone box.
  - Select the file you would like to upload and click the “Upload” button.
  - Click
  - “Submit” in the bottom right corner of the milestone box.
- For files larger than 100MB: Contact [serdp-estcp.documents@noblis.org](mailto:serdp-estcp.documents@noblis.org) to receive an email with the web link that will allow access to the system to upload your file(s). Please make sure you include the project number and the title(s) of the document(s) to allow identification of your files.

**Please do not submit reports directly to the ESTCP Program Manager.**

## **SECTION-BY-SECTION DEMONSTRATION PLAN GUIDANCE**

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### **Cover Page**

Using the cover page provided in the Word version of this guidance document and also available at <http://serdp-estcp.org/Investigator-Resources/ESTCP-Resources/Demonstration-Plans>, include the Demonstration title, ESTCP project number, date (month/year), document version number, and the researcher(s) name(s) and organization.

**Front Matter:** Provide a Table of Contents and lists of Tables, Figures, and Acronyms.

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## ACRONYMS AND ABBREVIATIONS

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[SAMPLE]

Btu	British thermal unit
CARB	California Air Resources Board
CFR	Code of Federal Regulations
CHP	combined recovered heat and electrical power
DoD	Department of Defense
EO	Executive Order
EPA	U.S. Environmental Protection Agency
ESTCP	Environmental Security Technology Certification Program
EW	Installation Energy and Water
gpm	gallons per minute
H <sub>2</sub>	hydrogen
ICS	Industrial Control Systems
ISO	International Organization for Standardization
ITC	investment tax credit
kW	kilowatt
lb/hr	pounds per hour
LHV	lower heating value
MW	megawatt
N	nitrogen
NDAA 2007	National Defense Authorization Act of 2007
NIST	National Institute of Standards & Technology
O&M	operation and maintenance
RCRA	Resource Conservation and Recovery Act
SCADA	Supervisory Control and Data Acquisition
SCFM	standard cubic feet per minute
SNL	Sandia National Laboratory
TCLP	Toxicity Characteristic Leaching Procedure
THC	total hydrocarbon
VOC	volatile organic compound

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## **1.0 INTRODUCTION [STYLE “HEADING 1”]**

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In this section provide the background for the project, why the demonstration should occur and how it will contribute to the needs of the Department of Defense (DoD).

### **1.1 BACKGROUND [STYLE “HEADING 2”]**

Describe the installation energy or water problem the project will address and the impact of the problem on Department of Defense (DoD) operations. Briefly describe the technology involved in the demonstration and the potential benefit of the new technology compared to current practices and other alternatives.

- Current Technology State of the Art: Describe the current commercially available technology that conducts the functions the project team will demonstrate with new technology or practices.
- Current State of Technology in DoD: How is DoD currently using the technology or an earlier generation of the technology? If DoD is not using the technology, what is DoD using or doing instead?
- Technology Opportunity: If adopted, briefly describe how the demonstrated technology may impact DoD’s mission accomplishment, energy costs, energy security or attainment of energy goals.

### **1.2 DRIVERS**

State existing or anticipated regulations, Executive Orders, DoD directives, industry standards or other drivers that the proposed technology addresses. Briefly describe the section or aspect of the driver relevant to the demonstration. Highlight how the project may contribute to achieving goals described in the driver. Link the driver to the technology or practice featured in the demonstration. Possible drivers may include:

- Executive Orders: EO 13423, EO 13514
- Legislative Mandates: Energy Policy Act of 2005, Energy Independence and Security Act of 2007
- Federal Policy: Federal Leadership in High Performance and Sustainable Buildings MOU 2006
- DoD Policy: Strategic Sustainability Performance Plan, Energy Security MOU with DOE
- Service Policy: Army, Navy, Air Force
- Regulations: Air Force Instructions
- Guides: Whole Building Design Guide (<http://www.wbdg.org/>)
- Specifications: ASHRAE, LEED, IEEE, ICC Codes (IMC, IPC, IECC, etc.)
- Metering: list goals by military Service
- Others

### 1.3 OBJECTIVE OF THE DEMONSTRATION

Provide a succinct statement of the specific, tangible objective of the project. Provide a sound bite about the technology involved in the demonstration. Briefly explain why a demonstration of the particular technology is necessary to help DoD achieve installation energy or water security.

- Validate: Briefly explain how the demonstration will validate the performance, costs and benefits of the technology. Validations usually involve analysis of the cost and performance of a new technology or approach compared to an existing technology baseline, a known condition or a theoretical basis.
- Findings and Guidelines: Briefly explain how insights from the demonstration may influence DoD policy, practices, guidelines, regulations and/or standards.
- Technology Transfer: Briefly explain how the demonstration will create the conditions to facilitate transfer of the technology to other DoD installations. List specific technology transfer actions and deliverables that will result from the demonstration, such as guidelines, presentations, training, software tools, equipment, services, etc. Use Section 8 to provide further details of technology transfer.
- Acceptance: Briefly explain how the demonstration may increase acceptance of the technology within the DoD.

## 2.0 TECHNOLOGY DESCRIPTION

In this section, provide an overview of the technology and/or practices featured in the demonstration.

### 2.1 TECHNOLOGY OVERVIEW

Provide additional information to enhance the technology description. Describe only the technology in Section 2 and use Section 5 to describe how the project team will install and use the technology at a military facility.

- Description: Name and describe the proposed technology in sufficient detail to provide an understanding of its theory, functionality, and operation. Describe the technology as a system and as components.
- Visual Depiction: Provide schematics, diagrams and/or photographs of the technology.
- Chronological Summary: Provide a brief summary of the development of the technology over time. Indicate its maturity for commercialization.
- Future Potential for DoD: Describe expected applications of the technology within DoD.

### 2.2 ADVANTAGES AND LIMITATIONS OF THE TECHNOLOGY

State the advantages and limitations of the proposed technology, and compare these with the advantages and limitations of the existing technologies. Briefly indicate why something is an advantage or disadvantage. Use tables or graphs to summarize information if feasible.

- Performance Advantages: Describe how the new technology may potentially increase efficiency, generate energy or enable improved organizational or system performance or security. Provide expectations of potential performance improvements using simple metrics such as: \$/watt, Coefficient of Performance or similar metrics commonly used within the industry associated with the technology.
- Cost Advantages: Identify the major cost considerations involved with current practices and technologies and any advantages the new technology may offer. Consider first cost, installation cost and operations & maintenance costs.
- Performance Limitations: Describe potential risks associated with the new technology such as shortened lifetime, high maintenance or system complexity.
- Cost Limitations: Identify potential cost disadvantages associated with first cost, installation cost and operations & maintenance costs. Describe cost and performance tradeoffs if relevant.
- Potential Barriers to Acceptance: Identify potential barriers to acceptance by operators, maintainers or management.

### **3.0 FACILITY/SITE DESCRIPTION**

This section should provide a concise summary of the selected facility or site and should include all facility or site information that is relevant to the demonstration. State the name of the installation(s) selected and any further descriptive information available, such as building number, address or general location of the demonstration site on the installation.

#### **3.1 GENERAL FACILITY/SITE SELECTION CRITERIA**

Describe the criteria used to select the demonstration site(s). Note that this section is intended to showcase what criteria were utilized to select a site for this demonstration, not for information regarding the specific installation chosen.

- Geographic Criteria: Describe the climate zone or other geographic criteria relevant to the demonstration.
- Facility Criteria: Describe the types of buildings, terrain characteristics, infrastructure or other relevant criteria related to the Department of Defense installation.
- Facility Representativeness: Describe how the selected installation(s) represent characteristics common to other military installations that may benefit from the demonstrated technology.
- Other Selection Criteria: Describe any other criteria used, such as proximity to manufacturing facilities, leveraging of other initiatives or ongoing relationships among demonstration stakeholders.

#### **3.2 DEMONSTRATION FACILITY/SITE LOCATION AND OPERATIONS**

Describe the location and relevant physical characteristics of the host installation for the demonstration and any relevant portion (range, training area, or cantonment area) or facility (particular building) on the installation that will serve as the demonstration site.

- Demonstration Site Description: Describe the location, physical characteristics and any relevant facility characteristics of the demonstration site.
- Key Operations: Describe military operations occurring in the vicinity of the demonstration site and how the demonstration and military operations may interact.
- Location/Site Map: Provide a map of the demonstration site location(s).
- Other Concerns: Describe any other concerns or issues, positive or negative, related to the selected demonstration site.

#### **3.3 SITE-RELATED PERMITS AND REGULATIONS**

Identify any permits or potential regulations that may apply to the demonstration. Provide an update of the status of permit applications or agreements initiated and possibly discussed with ESTCP during the project kick-off call.

- Regulations: Identify and briefly describe any potential regulations at the federal, state or local level related to the project.
- Environmental Permits: Provide information on the status of applications submitted and appropriate references for emissions or other environmental permits required for the demonstration to proceed. Describe the process or key points of contact involved in permitting and provide an approximate timeline involved.
- Agreements: Provide information on the status of applications submitted and appropriate references for electrical interconnection or other agreements required for the demonstration to proceed. Describe the process or key points of contact involved in agreements and provide an approximate timeline involved.
- Military Requirements: Identify any DoD-wide, service-specific, or site-specific requirements, approvals, or waivers that may impact the demonstration. Describe the requirements associated with information security and information assurance and how they relate to communications associated with the demonstration. For example: Risk Management Framework (RMF) for DoD IT approval, Navy Acquisition Information Assurance Strategy (AIAS) approvals, or other requirements for operating connected or disconnected computer systems, communications systems, and Supervisory Control and Data Acquisition (SCADA) or Industrial Control Systems (ICS) equipment on military installations. If applicable, address potential issues such as construction requirements, dig permits, asbestos remediation or historic preservation. Describe the process or key points of contact involved in the approval process and provide an approximate timeline involved.
  - DoD RMF Directive:  
[http://www.dtic.mil/whs/directives/corres/pdf/851001\\_2014.pdf](http://www.dtic.mil/whs/directives/corres/pdf/851001_2014.pdf)
  - Navy AIAS Strategy:  
<http://www.doncio.navy.mil/Download.aspx?AttachID=3612>

### 3.4 PROPERTY TRANSFER OR DECOMMISSIONING

Discuss property transfer or disposition plans and procedures relevant to the demonstration.

- Principal Investigator's Guide to Military Installations: Identify and briefly describe any activities referenced in the "PI Guide," such as DD Form 1354 preparation to transfer the demonstrated equipment to the military installation.
- Equipment Removal: Briefly discuss equipment removal considerations if applicable. Describe the process to remove the demonstration equipment and restore the site to near original conditions or better.

## 4.0 PERFORMANCE OBJECTIVES

Describe the technology and economic Performance Objectives (PO). Describe how they will enable measurement of the contribution of the technology to DoD Installation Energy and Water goals and how they will enable measurement of the impact of the demonstrated technology on military installations. Consider the following three criteria when selecting performance objectives:

- Installation Energy and Water Security: The performance objectives should help measure assured access to reliable supplies of sufficient energy and/or water to meet military installations' needs. Key measurements of the contribution of the new technology may include: reducing vulnerability to power grid disruptions, increasing the use of renewable energy generation or reducing energy intensity (MMBtu/ft<sup>2</sup> or kWh/ft<sup>2</sup>) or water consumption.
- Cost Avoidance: The performance objectives should measure cost avoidance or reduction, lead to improved metering and measurement of energy usage or reduce the adverse impact of price or supply volatility or disruption.
- Greenhouse Gas Reduction: The performance objectives should measure the reduction of GHG emissions for installations or non-tactical vehicles.

### 4.1 “TABLE 1” SUMMARY OF PERFORMANCE OBJECTIVES

Investigators will collect data before and during system operation to evaluate the technical objectives of the project. Provide a summary of proposed performance objectives in Table 1 in a manner similar to the example provided below. Sections 5.0 and 6.0 of the Demonstration Plan will include details of the methods for collecting and analyzing the data needed to assess the performance objectives.

Note: Submit the Table 1 Performance Objectives and Test Design to the project Technical Advisor and ESTCP prior to submitting the Demonstration Plan.

**[Table title is STYLE “Table.” Figure title is STYLE “Figure”]**

**Table 1. Performance Objectives**  
**[- Adjust as appropriate for specific technologies.]**

Performance Objective	Metric	Data Requirements	Success Criteria
<b>Quantitative Performance Objectives</b>			
Facility Energy Usage	Energy Intensity (MMBtu/ ft <sup>2</sup> or kWh/ft <sup>2</sup> )	Meter readings of energy used by installation; square footage of buildings using energy	% Reduction compared to baseline, or, targeted threshold value
Renewable Energy Usage	RE Used on Installation (kWh, MMBtu)	Meter readings of renewable energy usage	% Increase or targeted threshold value
Water Usage	Water (Gallons)	Meter readings of water used by installation	% Reduction compared to baseline, or, targeted threshold value

**Table 1. Performance Objectives (continued)**

<b>Performance Objective</b>	<b>Metric</b>	<b>Data Requirements</b>	<b>Success Criteria</b>
Direct Greenhouse Gas Emissions	Direct fossil fuel GHG emissions (metric tons)	Measured or estimated release of GHG based on source of energy	% Reduction compared to baseline, or, targeted threshold value
Facility Metering	Number	Number of metered buildings	% Increase
System Maintenance	Number or Level	Scheduled and unscheduled maintenance events; downtime; survey data	% Reduction or increase compared to industry standard or similar systems
System Economics*	%, \$, Years	Dollar costs, discount rate, usable life	% Reduction or increase
Other			
<b>Qualitative Performance Objectives</b>			
User Satisfaction	Degree of Satisfaction	Likert Scale Survey	% Increase in satisfaction over baseline
Other			

\*For “System Economics” - Refer to the NIST Building Life Cycle Cost program, available on the DOE website: <https://energy.gov/eere/femp/building-life-cycle-cost-programs>.

### Optional Quantitative Performance Objectives

- Availability: The amount of time the system is operational or ready to operate.
- Footprint: Area required by system for normal operation.
- Levelized Cost of Energy:  $LCOE = \text{Total Lifecycle Cost} / \text{Total Lifetime Energy Production}$
- Load reduction: The amount of base load or peak load reduction.
- Power Quality: Variations on voltage, frequency, flicker, harmonics, power factor and direct current injection into the grid.
- Reliability: The amount of time the system performs as designed.
- Safety: The number of accidents or injuries caused by normal operations or maintenance of the demonstrated system compared to similar statistics associated with currently used technology.
- Scalability across the Department of Defense: The number of installations that could benefit from the technology.
- Stability of design: The number of adjustments from the original design during or after the demonstration.
- Usability: The number of training hours required of system operators and maintainers.
- Waste Reduction: The amount of waste diverted from landfills.

## Optional Qualitative Performance Objectives

- Ease of Use: Survey and/or interview results describing the user's attitude and/or opinion toward the difficulty of using the technology as designed.
- Behavior Change: Survey and/or interview results describing small/large behavior changes, reinforcements of the new behavior, cues to action, new processes, strategies to avoid lapses or prevent relapses and perceived benefits.
- Transferability to Operational Energy: Expert opinion, survey or interview results describing the feasibility of deploying the technology in a military operational environment; such as at a Forward Operating Base.
- Security: Expert opinion, survey or interview results describing the vulnerability of the technology to theft, damage or destruction by manmade or natural causes.

## 4.2 PERFORMANCE OBJECTIVES DESCRIPTIONS

Describe each performance objective listed in Table 1. Refer to earlier descriptions of data or metrics for subsequent descriptions if they are similar. Use the format below for quantitative and any qualitative POs if appropriate.

- Name and Definition: Describe the PO.
- Purpose: Describe the use and relevance of the PO in the context of the demonstration - for comparison with the currently used system, to show direct contribution toward a DoD goal, to address situations unique to military installations, etc.
- Metric: Describe the metric (units) the investigator will use to measure performance. Provide brief background information about the range of values of the metric relevant to the technology demonstration. For example, for a demonstration of new solar PV technology provide the efficiency of other solar PV technologies as points of reference.
- Data: Describe the data required to calculate or evaluate the metric.
- Analytical Methodology: Briefly address the type of analytical methodology the investigator will use, such as type of statistical or graphical analysis outlined in Section 6.
- Success Criteria: Describe the metric threshold value, percent change from a baseline or other criteria used to determine success.

## 5.0 TEST DESIGN

This section provides the detailed description of the system design and testing procedure to address the performance objectives described in Section 4.0. Ideally, the information in this section, combined with the information from Section 2 should be adequate to enable a technician to conduct the demonstration.

Note: Principal Investigators must receive approval of the Table 1 Performance Objectives and Test Design by the project Technical Advisor prior to the submission of the Demonstration Plan. Highlight revisions of previous submissions when providing revised documents for review.

- **Fundamental Problem:** State the problem the demonstration will attempt to solve. For example, the demonstrated technology may create a new approach to energy usage that replaces an older, inefficient approach.
- **Demonstration Question:** State the question the demonstration will answer to solve the problem. For example, the question may address the economic, operational or environmental feasibility of implementing a new technology.

### 5.1 CONCEPTUAL TEST DESIGN

Provide an overview of the test design the investigator will use to evaluate the performance objectives.

- **Hypothesis:** State the hypothesis, the proposition the investigator will assert and test as true or false through the demonstration.
- **Independent variable:** Identify and briefly describe the value being manipulated or changed, such as the capacity of a system to generate renewable energy. Independent variables are what the investigator can change. For most demonstrations, this is a single item, such as the use of a piece of software, the inclusion of a device in an HVAC system or the use of technology where none existed before the demonstration.
- **Dependent variable(s):** Identify and briefly describe the value(s) the project team will measure, such as the amount of renewable energy consumed. Dependent variables are what the investigator observes.
- **Controlled variable(s):** Identify and briefly describe the values being held constant to avoid influencing the independent or dependent variables, such as the size of a building. Controlled variables are what the investigator keeps the same.
- **Test Design:** Describe the approach used to test the hypothesis. Emphasis should be on measuring cost and performance. Most demonstrations involve a comparison such as side-by-side, baseline/intervention or sequential testing.
- **Test Phases:** Describe the various phases involved in the test, such as pretest preparation, baseline measurements, equipment or sensor installation, calibration, commissioning, data collection, data analysis, etc.

## 5.2 BASELINE CHARACTERIZATION

Describe baseline characterization required to support the demonstration. Ensure the baseline represents typical operating conditions, adequate time to cover seasonal variations and mimics the actual demonstration period as much as possible.

- Reference Conditions: List the installation energy or water related data the investigator will collect and use as reference conditions to assess each performance objective. For example, building temperatures, humidity, energy consumption, etc.
- Baseline Collection Period: State the planned amount of time to collect baseline data.
- Existing Baseline Data: Describe any existing data that may augment or expand the data the investigator will collect.
- Baseline Estimation: Describe any anticipated estimation methodologies involved in the effort to establish baseline cost and performance.
- Data Collection Equipment: Identify and briefly describe any data collection sensors, meters or other measurement equipment needed for the demonstration.

## 5.3 DESIGN AND LAYOUT OF SYSTEM COMPONENTS

Describe the components and provide a depiction of the demonstrated system.

- System Design: Describe the design of the entire system the investigator will demonstrate. Highlight key relationships among components. Describe commercial products used in the system.
- Components of the System: Describe key or major components of the system the investigator will demonstrate. Provide component diagrams or photos as appropriate
- System Depiction: Provide schematics, diagrams or photos of the system. Highlight components as appropriate.
- System Integration: Describe how the demonstrated system will augment, replace or coexist with the original system. Highlight changes and/or components remaining unchanged. Discuss failure modes and effects analysis where possible to identify potential impacts of the new technology on the existing larger systems at the facility and to identify actions to mitigate any conflicts.
- System Controls: Provide a diagram or photos and a description of system controls, if applicable. If applicable, discuss bypass systems or emergency shutoffs and associated procedures.

## 5.4 OPERATIONAL TESTING

Provide a description of each significant operational phase of the technology the investigator will assess.

- Operational Testing of Cost and Performance: Describe the activities associated with data collection through various modes of operation, such as system start up, system commissioning or adjustment, controlled testing, steady state operations, extreme conditions, system shutdown and any other relevant modes of operation.
- Modeling and Simulation: Describe any modeling and simulation that may accompany the operational testing.
- Timeline: Describe the operational testing plan in terms of anticipated start dates and the duration of activities using a Gantt chart or table.

## 5.5 SAMPLING PROTOCOL

The sampling protocol should result in the collection of relevant and sufficient data to validate the technology cost and performance under real-world conditions. Consider using a tabular format to convey the data sampling protocol.

- Data Collector(s): Indicate who will actually collect the data.
- Data Recording: Describe how data recording will occur - manually or through automated systems and how often.
- Data Description: Describe the data samples the investigator will collect and the anticipated number of samples.
- Data Storage and Backup: Describe the process for storing and backing up data to avoid loss.
- Data Collection Diagram: If possible, provide a schematic, diagram or photo of the data sampling points.
- Non-standard Data: Describe any unusual data collection processes if applicable.
- Survey Questionnaires: Insert as an appendix copies of any surveys the investigator will use to collect data.

## 5.6 EQUIPMENT CALIBRATION AND DATA QUALITY ISSUES

Address the following topics to ensure data collection is valid.

- Equipment Calibration: Indicate which equipment requires calibration and who will ensure the calibration occurs.
- Quality Assurance Sampling: Describe the activities associated with data collection to ensure data quality, such as duplicate sampling or optimization of sampling frequency.
- Post-Processing Statistical Analysis: Describe any statistical data analysis to ensure reasonableness of collected data and to identify possible discrepancies, such as incorrect readings or faulty measurement equipment.

## 6.0 PERFORMANCE ASSESSMENT

Provide a summary of the data analysis the investigator will use to evaluate each performance objective or groups of performance objectives.

- Performance Objective Analysis Overview: Describe the rationale for the types of assessment procedures selected.
- Statistical Methodologies: Describe any planned use of statistical analysis such as t-tests, analysis of variance, regression analysis, etc.
- Graphical Methodologies: Describe any planned use of graphical techniques such as bar charts, time series charts, scatter plots, box plots, etc.
- Modeling and Simulation: Describe any planned use of models or simulation to assess performance.
- Sensitivity Analysis: Describe any planned analysis to address how the performance of the technology may vary with changes in conditions.
- Anecdotal Perspectives: Discuss any planned interviews with energy managers, facility personnel or maintenance workers who may provide anecdotal observations of the performance of the demonstrated technology.
- Industry Standards: Describe any industry standards of performance assessment the investigator may use.
- Internal Validity: Describe any planned actions to prevent findings that do not represent the true performance of the demonstrated technology caused by the demonstration process itself, such as variability in the equipment, inadequate data collection time, uncontrolled variables, etc.
- External Validity: Describe any planned actions to ensure the findings will be applicable to other military installations, such as accounting for climate zone, adjusting for electricity prices, choosing a representative military installation, etc.

## 7.0 COST ASSESSMENT

Develop and validate the expected life cycle operational costs for the demonstrated technology.

- **Building Life-Cycle Cost Program:** To address the System Economics Performance Objective, apply the BLCC model to evaluate the cost and benefits of installation energy and water conservation and renewable energy projects. Refer to the NIST Building Life Cycle Cost program available on the DOE website:  
<https://energy.gov/eere/femp/building-life-cycle-cost-programs>.
- **NIST Handbook 135:** Refer to the *Life-Cycle Costing Manual for the Federal Energy Management Program* as a guide to evaluate energy and water conservation projects. The handbook and its annual supplement are available online at:  
<https://energy.gov/eere/femp/building-life-cycle-cost-programs>.
- **Life-Cycle Cost Table:** Use Table 2 to highlight the data relevant to the technology the project team will track during the demonstration. The objective of this effort is to estimate life cycle costs at full scale operation.
- **Life-Cycle Cost Elements:** Briefly describe each cost element, the associated data collection process and relevant data interpretation to determine life-cycle costs for the demonstrated technology.
- **Life-Cycle Cost Timeframe:** Define the timeframe for the life-cycle cost estimate.

### SAMPLE

**Table 2. Cost Model for an Energy or Water Technology**

Cost Element	Data Tracked During the Demonstration
<b>Hardware capital costs</b>	Estimates made based on component costs for demonstration
<b>Installation costs</b>	Labor and material required to install
<b>Consumables</b>	Estimates based on rate of consumable use during the field demonstration
<b>Facility operational costs</b>	Reduction in energy required vs. baseline data
<b>Maintenance</b>	<ul style="list-style-type: none"> <li>• Frequency of required maintenance</li> <li>• Labor and material per maintenance action</li> </ul>
<b>Hardware lifetime</b>	Estimate based on components degradation during demonstration
<b>Operator training</b>	Estimate of training costs
<b>Salvage Value</b>	Estimate of end-of-life value less removal costs

## 8.0 TECHNOLOGY TRANSFER

Outline the planned activities to influence the DoD or other installation energy and water communities to expand usage of the demonstrated technology or methodologies. Discuss venues, timelines, audiences and other relevant context for:

- Presentations
- Publications
- Training
- Guidance documents
- Industry specifications
- Policy recommendations
- Modeling tools
- Etc.

Plan to work with the ESTCP Program Office to schedule and conduct an outbrief webinar with DoD Energy Managers after submission of the final deliverables.

## **9.0 SCHEDULE OF ACTIVITIES**

Provide a Gantt chart to show the date and anticipated duration of each task of the demonstration, from project initiation to project completion. This chart differs from the Gantt chart requested in Section 5.4 in that it should encompass the entire project, whereas the Gantt chart in Section 5.4 should address only the activities conducted as part of the field testing.

## **10.0 MANAGEMENT AND STAFFING**

Describe responsibilities of personnel during the demonstration. Provide a flow chart or wire diagram to show managerial hierarchy and the relationship between the principal investigator, Service representatives, and their contractors. Use Appendix B to provide contact information for appropriate representatives from the project team, subcontractors, technology vendor, the host site and any other key personnel.

## **11.0 REFERENCES**

Provide complete citations to references cited in the Demonstration Plan narrative to capture the various data sources used or literature consulted. When applicable, also include web-site addresses, if available. List any useful websites that provide additional information related to the technology.

## APPENDICES

### Appendix A: Health and Safety Plan (HASP)

Each Demonstration Plan should include or reference a Health and Safety Plan. **Demonstrators are responsible for ensuring that the HASP is reviewed and approved by appropriate offices. ESTCP will not formally review and approve these plans.** Demonstrators should anticipate the most likely scenarios and develop plans for handling emergencies that are as detailed as possible to ensure the safety of everyone involved.

Demonstrators who already have a HASP can adapt that plan to the demonstration.

Overall, demonstrators should consider the following issues:

- What are the applicable local, state, and federal health and safety laws and regulations?
- What is the potential for worker exposure to hazardous materials and/or other hazards?
- What physical requirements are expected of workers?
- How many people are required to operate the technology?
- What is the technology's history of breakdowns or accidents?
- Will there be any potential effects from the transporting of equipment, samples, wastes, or other materials associated with the technology?
- What impact will this technology have on the surrounding environment?
- Where is the closest medical facility with emergency services? (Provide a map and written directions.)

## Appendix B: Points of Contact

List all the important points of contact involved in the demonstration, such as co-investigators, sponsors, industry partners, regulators, etc. The list should include the following information: (1) full name, (2) organization, (3) telephone number and e-mail address, and (4) the role of the individual in the project.

Use the tabular format below:

Point of Contact	Organization	Phone & E-mail	Role in Project

## Additional Appendices

Provide additional appendices as needed.