



FINAL REPORT GUIDANCE

Energy and Water Projects

May 2018

OVERVIEW

A Final Report is a requirement of all Environmental Security Technology Certification Program (ESTCP) projects. This report must be reviewed and approved by the ESTCP Office. The Final Report is a comprehensive technical report documenting the project's activities, results, and conclusions.

This document provides general guidance for writing Final Reports for facilities or energy projects that receive funding under the ESTCP Energy and Water program area. The guidance provided in this document will help to ensure that project reporting of demonstration results is consistent with ESTCP standards.

The guidance provided here is general and all elements may not apply to all ESTCP Energy and Water projects. It will be the responsibility of each investigator, with concurrence of the ESTCP Office, to decide what is most appropriate, and to what degree, for his or her site and technology.

Security Review

Because all Final Reports will be made available to the public via the ESTCP web site (<http://www.serdp-estcp.org>), a security review is required. A Standard Form 298 Report Documentation Page ([SF 298](#)) must be included in each document submission.

- For government agencies, the author will be responsible for Security and Distribution Classification review through their own agency's authority. The SF 298 should reflect the allowable distribution (i.e., unlimited public release) as determined by the clearing organization.
- For private and academic institutions, the SF 298 should be filled out to the extent possible, and ESTCP will conduct a Security and Policy Review through the Department of Defense's (DoD) Directorate for Freedom of Information and Security Review (FOISR).

All Final Reports should have the statement, "**Approved for public release; distribution is unlimited**" on the SF 298. If any portion of the ESTCP-sponsored work requires limited distribution (i.e., proprietary, classified, or other distribution limitations), the principal investigator (PI) should contact the Energy and Water program manager for guidance.

The reports will be posted on Defense Technical Information Center (DTIC) (<http://www.dtic.mil>). Federal organizations are responsible for ensuring that their publications are forwarded to DTIC. The ESTCP office will submit all non-DoD organization reports to DTIC.

Format

Final Reports are intended for publication. As such, ESTCP expects them to be professionally written and properly edited. The following general formatting parameters are recommended:

Cover	Use the cover of this document as a template; include ESTCP project name and number, your organization's project number (if applicable), date (month/year), document version number, and the researcher(s) name(s) and organization.
Font	Times New Roman proportional font
Cover Main Title	26 pt, bold, flush right
Cover Title	18 pt, bold, flush right
Section headings	14 pt, bold, flush left
Subsection headings	12 pt, bold, flush left
Text	12 pt
Margins	1" top, left, right, bottom
Page numbering	Bottom center Cover page: none Front matter: i, ii, iii, iv... Body of document: 1, 2, 3, 4...
Word processing software	Use either Microsoft Word or provide a PDF document
Figures, tables, and photographs	Insert in the document on the same or first page following the first reference. Liberal use is highly recommended.

How to Submit a Draft Final Report

Final Reports must be submitted to the ESTCP Support Office. The report may be sent 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 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 FINAL REPORT GUIDANCE

Cover Page: Using the cover page provided in the Word version of this guidance document and also available at <https://www.serdp-estcp.org/Investigator-Resources/ESTCP-Resources/Technical-Reports>, include the Demonstration title, ESTCP project number, your organization's project number (if applicable), date (month/year), document version number, and the researcher(s) name(s) and organization.

Standard Form 298 Report Documentation Page: Include report date, type, title, author(s), contract number, project number, performing organization name and address, abstract, subject terms, number of pages, and name and phone number of responsible person.

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

Acknowledgments: State the individuals and/or organizations that contributed to the demonstration project and the generation of the final report.

Abstract: Provide a one page abstract with the following sections:

- Introduction and Objectives
- Technology Description
- Performance and Cost Assessment
- Implementation Issues
- Publications

The abstract will be used to update the project web page:

Executive Summary: Provide a 5 to 10 page extended Executive Summary. The Executive Summary will be posted as a stand-alone document on the SERDP & ESTCP web site. It should include key graphics and tables from the Final Report. Include the following sections:

- Introduction
- Objectives
- Technology Description
- Performance Assessment
- Cost Assessment
- Implementation Issues

1.0 INTRODUCTION

This section is intended to provide a general overview of the project. Specific subsections as described below should be included in this section.

1.1 BACKGROUND

Describe the environmental problem to be addressed and its impact on DoD operations. Briefly describe the technology that was demonstrated and its potential benefit compared to current practices and other alternatives.

1.2 OBJECTIVE OF THE DEMONSTRATION

Provide a succinct statement of (1) the project's objectives and (2) the overarching objective(s) of the field demonstration(s). Briefly describe the technology demonstrated and the issues validated.

1.3 REGULATORY DRIVERS

State existing or anticipated federal, state, or local regulations or DoD directives that have resulted in a need for a new technology.

2.0 TECHNOLOGY DESCRIPTION

2.1 TECHNOLOGY OVERVIEW

- Describe the technology in sufficient detail to provide an accurate and factual understanding of its theory, functionality, and operation.
- Provide an overall schematic or flow diagram for the technology.
- Provide a chronological summary of the development of the technology to date.
- Describe expected applications of the technology.

2.2 TECHNOLOGY DEVELOPMENT

Provide a detailed description of all development conducted prior to the field demonstration as part of the ESTCP project. If the development work has been published in a separate technical report, provide a brief summary and reference that report. If not, this section should be sufficiently detailed to fully describe the work. As appropriate, detailed data sets and design information should be provided in appendices. A summary of the results should be provided in this section. Liberal use of graphics is encouraged to aid the reader in understanding the results.

2.3 ADVANTAGES AND LIMITATIONS OF THE TECHNOLOGY

Identify and briefly describe any prominent alternative technologies that are currently in place (if any) to meet the need. State the advantages and limitations of the proposed technology and compare these with the advantages and limitations of the identified alternative technologies. Identify the major cost considerations involved with current practices and technologies.

This section should be updated from that provided in the Demonstration Plan to include any advantages or disadvantages as noted during the demonstration.

3.0 PERFORMANCE OBJECTIVES

Performance objectives are the primary criteria established by the investigator for evaluating the innovative technology. They provide the basis for evaluating the performance and costs of the technology. Meeting these performance objectives is essential for successful demonstration and validation of the technology. This section should provide an accurate summary of the performance objectives and whether they were met and, if not met, the principal reason for failure.

Performance objectives may be related to and presented in two ways, via *qualitative and quantitative parameters*, and along with related metric information should be summarized in Table 1 (sample provided). Performance objectives should include, but are not limited to, such things as end-point criteria, performance time, and analytical sensitivity.

Table 1. Performance Objectives
[SAMPLE ONLY–Performance objectives must be specific to the technology being demonstrated.]

Performance Objective	Metric	Data Requirements	Success Criteria	Results
Quantitative Performance Objectives				
Reduce carbon footprint	Life-cycle reduction in installation carbon footprint	Inventory of carbon emissions and sequestrations	> 50% reduction in installation carbon footprint compared with current profile	
Increase energy efficiency	Efficiency of energy production process	Data on conversion efficiency of energy produced versus energy content of the source	> 10% improvement in efficiency compared with current technology	
Reduce emissions	ppm of copper	Effluent discharge data for copper	Concentration reduced below the applicable regulatory limit	
Reduce amount of solid waste requiring disposal	Tons/day of solid, non-hazardous waste sent to landfill	Disposal data for solid waste	> 75% reduction in tons/day disposed compared to current amounts	
Improve water conservation	Amount of installation water usage per day	Metering data for installation water usage	> 50% reduction in water usage per day	
Qualitative Performance Objectives				
Ease of use	Ability of a technician-level individual to use the technology	Feedback from the technician on usability of the technology and time required to use	A single field technician able to effectively take measurements with minimal training	

The following information, presented in brief in Table 1, should be included in the detailed text description of each performance objective:

- Sufficient narrative to fully explain the objective and its relevance to the demonstration
- A full description of the metric that was used to assess whether the objective was met
- A full description of the data required to calculate or evaluate the metric
- Criteria that were used to determine success (i.e., for quantitative objectives, the metric threshold value) and to what extent the success criteria were met.

Please note that equivalent information should be provided for each performance objective. It is recognized that related performance objectives may have similar data acquisition needs, As a result, reference can be made to these earlier descriptions rather than repeating information. Qualitative performance objectives, though perhaps lacking a relationship to specific units of measure, may still require some level of data collection and analysis. This format also should be used for qualitative performance objectives as appropriate.

4.0 FACILITY/SITE DESCRIPTION

This section should provide a concise summary of the selected facility or site(s) and should include all facility or site information that was relevant to the demonstration(s). Specific subsections below are intended to capture relevant information; however, please include other site information that had immediate bearing on the demonstration(s).

4.1 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 served as the demonstration site. Describe any existing operations at the test site(s) that may have impacted the demonstration.

Provide a map showing the location of the site(s) where the demonstration took place.

4.2 FACILITY/SITE CONDITIONS

Provide information that was relevant for the demonstration. Describe the site conditions; for example, describe any relevant infrastructure, climatic, or other feature that may have impacted the demonstration.

5.0 TEST DESIGN

This section provides the detailed description of the system design and testing conducted during the demonstration. Descriptions here should be sufficiently detailed that a reader can fully understand the demonstration(s) and all data collected.

5.1 CONCEPTUAL TEST DESIGN

Provide a broad overview of the test design used to evaluate the performance objectives, including a discussion of controls, various operational phases, and/or other means to evaluate the technology performance. Specific details should be provided in the following sections.

5.2 BASELINE CHARACTERIZATION

Describe baseline characterization that was required to support the demonstration. As appropriate, provide chemical, physical, and/or energy utilization information that was used as reference conditions to assess performance of the technology. Include a subsection on each relevant characterization activity. If data were collected prior to the ESTCP project, briefly summarize results, and provide references.

5.3 DESIGN AND LAYOUT OF TECHNOLOGY COMPONENTS

This section should provide a thorough description of all technology components, as applicable. Provide a subsection for each significant technology component describing its design and location. Provide detailed maps or drawings showing the location(s) of all technology components. Schematic diagrams of equipment showing details should be provided when such equipment is an integral part of what was demonstrated. If details are available in other published documents, a brief description should be provided and reference made to those documents. This section also should provide a thorough description of any controls used.

5.4 OPERATIONAL TESTING

Provide a description of each significant operational phase of the technology assessed. Activities may include system start-up, system operation under different operating parameters (provide a subsection on each operating parameter condition), and system shutdown and demobilization. Alternatively, activities may include test initiation, monitoring of progress, and, when appropriate, equipment removal.

Descriptions here should be sufficiently detailed such that a reader can fully understand all test data. If needed, provide references or appendices to describe details of operations.

Provide actual dates and duration of the operational testing. This may be presented in the form of a Gantt chart or a table. If equipment is left in place, please provide written permission from the facility to do so in a separate memorandum.

5.5 SAMPLING PROTOCOL

Provide a description of the samples collected during each phase of the project and summarize the number and type of samples collected in a table. In addition, provide a brief description of each method required. Methods that are not standard must be described in detail in the text. Provide a detailed sampling schedule as applicable. When appropriate, provide a map or schematic showing the sampling points.

In addition the following information, as appropriate, should be provided as an appendix to the Final Report.

- *Calibration of equipment.* Provide a description of the calibration procedures for any equipment that was utilized as part of the project, except for equipment operated by a contract laboratory. If calibration procedures follow manufacturer guidelines, it is not necessary to repeat the procedure in this report; instead, a reference can be provided.
- *Quality assurance sampling.* Provide a description of the quality assurance (QA) samples that were collected, such as duplicates, spiked samples, and blanks.

5.6 SAMPLING RESULTS

Provide a detailed summary of all sampling results in terms of both temporal and spatial dependence as appropriate. Liberal use of graphics and tables is encouraged. The Final Report serves as the archived document for all data gathered during the demonstration. All results should be reported in this section or summarized and provided in detail in appendices.

6.0 PERFORMANCE ASSESSMENT

A summary of all data analysis conducted in support of the assessment of performance objectives should be provided in this section. At a minimum, provide a subsection for each performance objective. Substantive analyses of data obtained during the demonstration that supports the conclusions summarized in Section 3.0 should be provided. Describe the statistical procedures/tests applied for analyzing the data and determining statistical significance, especially when comparisons with data from current or alternative technologies are needed or comparisons to success criteria are sensitive to variances in the data and sample size. Discuss the bases for selecting these procedures. Also describe any power analyses that were conducted prior to the demonstration to ensure that sample sizes were appropriate and provided data sufficient to enable valid statistical analyses.

Please note that equivalent subsections should be provided for each performance objective. It is recognized that related performance objectives may have similar data analysis. As a result, reference can be made to earlier subsections rather than repeating all information.

7.0 COST ASSESSMENT

This section should provide sufficient cost information that an engineering professional could reasonably estimate costs for implementation at a given site. In addition, this section should provide a discussion of the cost benefit of the technology. The following subsections with detailed discussions and examples should be provided.

7.1 COST MODEL

A simple cost model for the technology should be presented so that an engineering professional may understand costing implications. The cost model should reflect all cost elements that would be required for implementing the technology at a real site. For each cost element, list the cost data that were tracked during the demonstration and the associated cost incurred during the demonstration. Please note that some cost elements may not have been tracked during the demonstration. These cost elements should also be included in the table, with cost estimates made from other sources of data. A sample of a cost model for an energy efficiency technology is provided in Table 2. Please modify this table to illustrate the cost elements that are relevant for the technology that was demonstrated.

SAMPLE

Table 2. Cost Model for an Energy Efficiency Technology

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

¹ Detailed list of materials and analytical costs provided in Final Report

For each cost element relevant to the technology, provide a subsection that includes the following information:

- A description to briefly explain the cost element and the need for it in the implementation of the technology
- A description and, if appropriate, supporting analysis as to what data supports the listed cost estimate or range
- A description as to how the costs should be interpreted and how issues of scale are addressed.

7.2 COST DRIVERS

Discuss anticipated cost drivers that should be considered when selecting the technology for future implementation. Highlight any site-specific characteristics or regional issues that will significantly impact cost. Provide examples of how these cost drivers will impact the implementation and operational costs of the technology.

7.3 COST ANALYSIS AND COMPARISON

This section should provide realistic estimates for the costs of the technology when implemented operationally. Provide a description of how each applicable cost element can be used to estimate the life-cycle costs for implementing and operating the demonstrated technology. Clearly define the time frame for the life-cycle cost estimate. Include the following information as appropriate:

- Basic site description assumed for the cost analysis
- A list of any assumptions made for the basis of the cost analysis
- A description of the approach for developing an estimated life-cycle cost for the technology. As appropriate, life-cycle costs should be estimated using the real discount rate as provided by the Office of Management and Budget (OMB) Circular A-94 or information from Handbook 135, the *Life-Cycle Costing Manual for the Federal Energy Management Program (FEMP)* and its annual supplement.
 - https://www.whitehouse.gov/omb/circulars_a094/a94_appx-c/
 - www.bfrl.nist.gov/oe/publications/handbooks/135.pdf
 - <https://energy.gov/eere/femp/building-life-cycle-cost-programs>

As appropriate, comparison should be made between the demonstrated technology and the current approach that it is intended to replace. If a cost comparison to an existing technology can be conducted, provide an additional table for the existing technology that lists the same cost elements with the same assumptions, so that a direct comparison can be made. As appropriate, include cost comparisons for different regions of the country where due to climatic conditions or energy costs, the cost effectiveness of the technology may significantly vary. In some cases, the technology does not replace an existing approach, but instead improves on existing technologies. In such instances, cost savings or cost avoidances that the technology provides should be discussed.

8.0 IMPLEMENTATION ISSUES

This section should provide information that will aid in the future implementation of the technology. A brief description and references for other documents such as guidance or protocols should be provided. Lessons learned during the demonstration and other pertinent issues such as those listed below should be provided, as appropriate.

- Identify potential regulations that may apply to the use of the technology. Provide a list of pertinent regulations and any necessary permits required to implement the technology.
- Highlight end-user concerns, reservations, and decision-making factors. Discuss how the demonstration addressed these concerns.
- Describe any relevant procurement issues (whether equipment required for implementation is standard commercial off-the-shelf [COTS], a custom-built prototype, or newly commercialized.)

9.0 REFERENCES

Use a standard format for literature citations such as:

Author name(s). Year. *Title*. Publication. Publication number. Page number.

APPENDICES

Appendix A: Points of Contact

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

Use the tabular format below:

POINT OF CONTACT Name	ORGANIZATION Name Address	Phone Fax E-mail	Role in Project

Additional Appendices

As needed, provide additional appendices to fully define methodologies identified in Section 5.0, Test Design, and to archive results summarized in the body of the report.