

Technology and Market Development 2014-2018 Impact Evaluation Plan

Impact Evaluation

Final

September 17, 2019

Dana Nilsson

Project Manager, NYSERDA

Bradley Campbell

Project Manager, DNVGL

NYSERDA Contract #: DNV GL Agreement #104536A

TWO No. 7

TWO ID No. 143776

Program/Initiative Background

NYSERDA's Innovation Program employs a variety of approaches that aim to advance the development of innovative, reliable, efficient, and clean energy technologies, and increase their market acceptance and adoption. Research and Development (R&D) demonstration projects are largely conducted within the Innovation Program and are one of NYSERDA's best-established strategies for promoting these goals. These projects aim to demonstrate and obtain objective information on the technical performance, cost, and environmental impacts of emerging clean and energy-efficient technologies. Demonstration projects are designed to showcase the value and effectiveness of a new technology or process, or the application of an existing technology in a commercial setting.

Demonstration projects cover a wide variety of technology areas and project types, including advanced materials, air and waste remediation, building systems, electric power delivery, energy storage, industrial products, heating and cooling, transportation, waste management, wastewater treatment, and others. While demonstration projects often generate benefits in their own right, these projects are designed to achieve additional impacts through successful replications.

NYSERDA finalized the first two studies of its R&D demonstration projects in 2012 and 2014. The first study covered projects that were completed between 2004 and 2007. The second and third studies surveyed projects completed during 2008-2010 and 2011-2013, respectively. These studies assessed: demonstration impacts, NYSERDA's influence on the demonstrations, replications and sales, demonstration influence on the replications, replication impacts, and participant satisfaction.

The current study updates the R&D demonstration survey with projects that were completed between 2014 and 2018.

For the most up-to-date information on the initiative's progress, please refer to the SBCIV semi-annual and Technology and Market Development (T&MD) annual reports ^{1,2,3}

Roles of Project Team

DNVGL ["Contractor"] was selected as the top ranked impact evaluation firm and shall execute this evaluation plan in consultation with NYSERDA and in accordance with the tasks identified within this plan.

Dana Nilsson (NYSERDA) will serve as the main point of contact for this evaluation, serving in a project management role, and shall assist the selected contractor in developing and implementing this evaluation plan.

Anticipated Impacts

This evaluation will quantify outcomes listed in Table 1 as well as document Performance Metrics in the categories stipulated in Table 2-2 "Anticipated Cumulative T&MD Benefits through December 31, 2016" (See Appendix A).

Initiative Schedule and Budget

The annual budget allocation for this initiative is listed in the T&MD semi-annual reports^{1,2,3}

¹ <https://www.nyserda.ny.gov/-/media/Files/Publications/PPSER/NYSERDA/tmd-report-2016Dec.pdf>

² <https://www.nyserda.ny.gov/-/media/Files/Publications/PPSER/NYSERDA/TMD-report-2017jun.pdf>

³ <https://www.nyserda.ny.gov/-/media/Files/Publications/PPSER/NYSERDA/TMD-2018-june.pdf>

EM&V Approach

The evaluation objectives and main research topics are listed in the table below.

Table 1: Evaluation Objectives and Main Research Questions

Impact Quantification		
Objective	Evaluation Questions	Data Sources & Evaluation Methods
Evaluated gross energy impacts of demonstration and replication projects	What are the annualized first-year electric (kWh), natural gas savings (MMBtu) and other energy savings?	Salesforce, survey
Non-energy bill cost savings of demonstration and replication projects	What are the non-energy bill cost savings (\$) associated with the NYSERDA funded demonstration and subsequent replication projects?	Salesforce, survey
Revenue generated	What is the revenue generated (\$) from demonstration and replication projects?	Survey
Influence on demonstration projects and replications	To what degree do respondents identify NYSERDA as an important contributor in their decision to undertake and complete a demonstration project and in any replications that have occurred?	Survey
NYSERDA technology demonstration program Return on Investment (ROI)	What is the ratio of monetized benefits from all demonstration and replication projects divided by NYSERDA's direct investment in dollars?	Salesforce, survey
Impact Optimization		
Objective	Evaluation Questions	Data Sources & Evaluation Methods
Characterize replication projects	What are the number, scale, and type of replication projects either funded or attributable to NYSERDA?	Salesforce, survey
Factors leading to or hindering replication	What are the factors either leading to or hindering replication, and what is their relative strength?	Salesforce, survey

Evaluation Methodology

Surveys, either conducted as in-depth interviews, phone interviews, or web-based surveys, of key market actors will be used to establish baseline metrics for the identified indicators.

The Contractor shall keep NYSERDA informed throughout the data collection process and should provide an immediate notification if findings, interim or otherwise, are drastically different than originally anticipated.

The Contractor is qualified in:

- Engineering Reviews and Analysis
- Longitudinal Market Actor & Customer Surveys

Timeframe for Long-Term Data Collection

The approach outlined in this evaluation plan includes an interim report and follow-up measurements. After the interim report, NYSERDA will decide whether to move forward with the Contractor to conduct the follow-up assessment(s). No assumption shall be made by the Contractor on implementing follow-up measurements without prior written approval from NYSERDA.

Methodology for Primary Data Collection

Demonstrations are defined as the NYSERDA funded demonstration of a new technology or process, or application of an existing technology in a commercial setting. Demonstration projects are designed to showcase the value and effectiveness of the technology or process being demonstrated.

Replications projects involve an additional installation, scaling up of the technology or process demonstrated under the NYSERDA-funded project, or additional sales of the same technology or services that were used in the project.

Primary data collection will rely on social science methods including surveys, interviews, and sampling approaches to collect data on the current and evolving state of demonstration and associated replication projects. The Contractor shall review survey instruments currently fielded by program staff to determine where additional information is necessary, and update the instruments used in the prior study accordingly. It is anticipated that the survey instruments used for this study will also be updated to reflect the state-of-the art in distribution methods.

NYSERDA uses Qualtrics survey software and can provide the Contractor with the ability to use the software for this study, if needed.

NYSERDA will provide the Contractor with data from internal sources to assist in compiling a sample.

NYSERDA may provide contact information for a portion of the survey sample and may assist with introductions to improve the response rate.

Primary sampling unit: The project will be the primary sampling unit.

Upper level Stratification:

A census of demonstration and replication projects will be attempted. To expand the responding sample to the full population, post-stratification will be applied, as described below under Weighting.

Lower level Stratification:

Results for demonstration and replication projects may be reported by categories such as NYSERDA dollar investment (size), technology, or other factors deemed relevant during the course of the evaluation. The Contractor shall work with NYSERDA to establish the sub-groups for reporting.

Confidence and Precision Goals:

Demonstration projects: The goal for number of completed survey responses is a minimum target of 15% precision level at 85% confidence for each year, with an aggregate 10% precision at 90% confidence for the entire population of projects.

Replication projects: The population should have a 10% precision at 90% confidence.

If these goals are not achieved, the Contractor shall discuss the impact of a lower confidence and precision on study outcomes and possible reasons for lower response rate compared to past impact evaluations.

Table 2: Overview of Primary Data Collection Activities

Research Approach	Target Group/ Population	Estimated Population Size	Sampling Method	Confidence /Precision	Primary Sampling Unit	Stratification
Survey	Demonstration projects	<175	Census	85/15 per year, 90/10 aggregate	Project	Year
Survey	Replication projects	TBD	Census	90/10	Project	None

On-line data collection will be attempted for a census of participants, without regard to stratification. With 175 or fewer in the population, a preliminary assessment is that there will be 150 projects eligible for the study, and responses will be obtained for 2/3 of these, or 100 projects. Contacts will be recruited by email to complete the on-line surveys.

For each project, on-line data collection will be attempted for all three (3) parties that are applicable and for whom contact information can be found: the site owner, the integrator, and the vendor. For emails that bounce and for email non-respondents, phone data collection will be attempted. Phone follow-up will also be conducted for some projects with completed web surveys.

For reporting results, the resulting sample will be post-stratified at least by year, project type, and size, with NYSERDA investment used as the measure of size. Other variables may be used to report results by various segments either known in advance or determined from the survey responses.

NYSERDA expects that DNV GL plans to maximize the potential response rate of the participating site owners, integrators, and vendors through a mix of the following methods:

1. Sending advance letters and/or emails to participants to notify them of upcoming calls and web surveys.
2. Following up with all non-respondents after email reminders, by calling to get the correct contact and to encourage them to fill out the web survey, while also allowing them to walk through the web survey while on the phone.
3. Designing the data collection instruments to facilitate responses, for each of the three (3) types of respondents.
4. Offering multi-model response options: via web or phone.
5. Attempting contact with each contact up to six (6) times over the course of two (2) weeks and at varying times of day, and days of week.

The Contractor shall use a multi-model approach for surveying the project site owners, vendors and integrators. The Contractor shall use the Qualtrics online survey tool for data collection.

Within a week of delivery of advance letters and emails, the Contractor shall commence contacts via phone. This short call will attempt to identify the contacts most familiar with the project and encourage these contacts to fill out the web survey. This will be done either by directing them to the web survey link or by filling out the web survey on their behalf over the phone.

Despite the convenience of the web format many respondents will not complete the web survey. Therefore, a follow-up phone survey is planned for those who did not respond to the web survey (including those with email “bounce-back” messages or only partially-filled out the web survey). This phone call will not only improve the overall survey response rate but should also broaden the range of respondents. Past research has shown that certain respondent types are more likely to respond to a phone survey vs. a web survey.

The survey designs will work from the prior study's instruments, adapting these to the web mode and refining some question sequences as described elsewhere.

The survey topics will be consistent across the three (3) target contact types, with variations in wording appropriate to each of the site owner, vendor, and integrator. Multiple completed surveys will be targeted for each project, with the assumption that some benefits of the project are known only to site owners, while others are known only to other actors. Contacting more than one (1) type of contact where available for each project increases the chance of capturing all benefits of the project.

While the focus of the survey will be the identified metrics for the impact evaluation, there is likely considerable value to be gained by asking some process-related questions that capture best practices as well as the most significant outcomes (positive and negative) from each project.

This evaluation has the opportunity to capture key lessons and extract best practices that are generic across projects and also from specific situations that have implications for future technical market development work in current and future CEF programs. The Contractor anticipates that the projects completed through technical market development are each piloting something unique in some way. This makes it crucial to put results in context in order to draw full value from the aggregated results.

If NYSERDA opts to include process-related questions in the survey, these results can be provided. The current budget includes the option of adding a few process-related questions as described above.

The Contractor shall use best practices in data collection, including:

- Sending out an advance letter and/or advance email, preferably on the client's letterhead, which notifies participants of the upcoming survey, explains the research objectives, and emphasizes the importance of completing the survey.
- Sending out multiple email notifications to contacts reminding them of the survey and the incentive. After the initial notification, DNV GL plans to send a reminder notice on Day 3 after the survey launch, and then a follow-up notices on Day6.
- Fielding a small test survey before releasing the full survey campaign to find, and correct, any potential glitches.
- Timing the phone surveys during targeted days of the week and hours of the day to improve response rates.
- Keeping track of incomplete responses, click-throughs, drop outs, and terminations.
- Allowing extra time for web survey completion on the back-end to account for some respondents being on vacation.
- Attempting contact (including both phone and email notification) with each project, up to six (6) times over the course of two (2) weeks, and at varying times of day and days of week.
- Keeping contact satisfaction and survey fatigue considerations always in mind.
- Looking up non-respondents to confirm that they have not closed (reduces non-response bias potential).

Direct Impacts Calculation Methodology

Direct impacts are defined as those impacts expected from projects directly funded by NYSERDA, either immediate or lagged.

Direct impacts constitute the direct energy savings resulting from NYSERDA funded demonstration projects featured in this study.

Weighting

A census of all projects (subject to screening criteria) will be attempted, and any follow-up interviews will be determined based on response characteristics, not random selection. However, to estimate results for the program as a whole, it will be necessary to develop expansion weights. These weights expand the results for the

responding sample to the full program. For a project in the responding sample, the expansion weight is the number of projects in the population “represented” by that project. All ratios and weighted totals will be calculated using the expansion weights developed.

The analysis will create expansion weights as the ratio of the number of projects in the population to the number for which survey respondents are obtained, by expansion strata agreed with NYSERDA. These strata used for expansion will depend on the mix of projects in the full program, and in the responding sample. The primary variables to be considered for expansion strata are the project type and year.

Stratification by project size (funding level), technology, location, or other factors may also be considered. Expansion strata must be defined by variables known for the full population.

Responses from multiple parties for the same project will be integrated into a consolidated response set for the project. The weights will therefore be applied at the project level.

Given the high response rates achieved in the prior studies, there may be some expansion cells for which complete responses are obtained, and these groups of projects will be self-weighting. That is, their expansion weight will be 1. Other cells with few in the population may have 0, or very few responses. These cells projects will be collapsed with related cells to develop expansion weights.

Indirect Impacts Calculation Methodology

Indirect impacts are defined as market effects that are expected to accrue over the longer term from follow-on market activity that results from NYSERDA’s investments, including replication projects that were not funded by NYSERDA, but resulted from a prior NYSERDA funded demonstration project. Indirect impacts across NYSERDA initiatives may not be additive due to multiple initiatives operating within the same market sectors.

Gross Energy Impacts and Revenue Generated, for Demonstration and Replication Projects

Energy impacts and revenue generated for each project will be based on survey responses confirming impacts previously reported to NYSERDA, or providing values not previously reported. The Contractor shall work with NYSERDA to establish the treatment for projects where the respondent indicates impacts occurred but doesn’t provide quantitative values. Potential treatments include:

- Report the number and scale of projects with positive benefits, quantified or not, as a qualitative metric, as in prior studies.
- Incorporate survey questions to probe the rough magnitude of impacts and use these to impute quantified impacts.
- For the projects with quantified impacts, determine the ratio of impact to project cost, by project type, and apply that ratio to all projects with unquantified reported impacts.
- The prior survey asked respondents to indicate whether each type of reported benefit was direct, indirect, or uncertain, but did not explain these terms. Particularly for the web survey, it will be important to include the definitions and examples to ensure meaningful responses to these questions.

Non-Energy Cost Savings

The Contractor shall ask if the project had any impacts on a list of impact categories that will be aligned with previous studies and informed by Contractor experience in other states. For those categories impacted, the respondent will be asked if the impact was direct or indirect, positive or negative. At this point, the respondent will be asked a series of questions to concretely quantify the impact. By asking structured sequences of questions, rather than asking for a single dollar amount, we are able to help respondents break the complex question “what was the dollar impact of this benefit?” into questions that are more easily answerable. For example, in quantifying operations and maintenance impacts, respondents will be asked the approximate hours per year of work that the equipment impacted and the rough cost per hour of the employees, or contractors,

affected. These questions will allow respondents to choose their unit of time - since some will be comfortable thinking of the impact in terms of weekly, monthly or annual effects.

NYSERDA Influence

In the current study, free-ridership, spillover, etc., will not be evaluated. Influence questions will focus on response to NYSERDA activities.

The Contractor shall:

- Re-design the survey to reduce the number of importance/influence questions that ask similar things in different ways to avoid survey fatigue.
- Use some of the questions as “framing” to return the respondent to the context of when the investment decisions were made, and possible consistency check, rather than for explicit scoring. Framing helps respondents answer the right question.
- Probe to resolve inconsistencies either in the web survey or in follow-up phone calls. Rather than blending responses to multiple similar questions, attempt to get key scoring questions as accurately as possible.
- “Chain” together the key scored questions in a way that reflects the structure of influence dimensions: on adoption at all, on the scale of adoption, and on the timing of adoption.

The Contractor shall work with NYSERDA to specify a questionnaire and scoring approach that provides comparability to past work, while also offering improvements as indicated above.

Factors Supporting and Hindering Replication

The prior studies asked respondents who had replicated their projects, key factors that contributed in both open- and closed-end questions. The studies asked those who had not replicated their projects an open-ended question of reasons why not and grouped these into around a dozen response categories.

The current study will use similar questions for the closed-end success factors, and for the open-ended questions. Given the primary delivery of the survey via web, a closed-ended question on barriers is also recommended.

The results on barriers will be reported by categories, aligned with those of the prior studies, as well as by a smaller number of broader categories areas, such as: market demand, production costs or capabilities, demonstration/technology limitations, organizational issues, regulatory issues.

Outputs/Outcomes/Indicators

The table below lists the outputs, outcomes and indicators to be assessed through this evaluation, with all of the initiative’s outputs, outcomes and indicators, some of which will be derived from sources other than this evaluation.

The Contractor shall work with NYSERDA to ensure indicators and data collection processes align with initiative hypotheses testing. Deliverables shall include a hypothesis testing summary within the Contractor’s reporting of evaluation results.

Table 3: Outputs, Outcomes, and Indicators

The Performance Metrics listed in 3 are those that will be assessed in this study. Outputs/outcomes attributed to replications will be considered as indirect impacts.

Outputs/Outcomes	Indicators	Data Source	Annually Reported to DPS?	Used to Estimate Impacts?		Data Collector
				Direct	Indirect	
Evaluated gross energy impacts	KWh, MMBTu	Survey, Salesforce	Yes	X	X	Contractor, NYSERDA program staff
Revenue generated	\$	Survey	Yes	X	X	Contractor
Cost savings of projects	\$	Survey	Yes	X	X	Contractor
Characterize replication projects	Number, scale, and type	Survey	No		X	Contractor
Influence on demonstration projects	Number, scale, and type	Survey	No		X	Contractor
Factors leading to replication	TBD	Survey	No		X	Contractor
Return on Investment (ROI)	Percent (%)	Survey, Salesforce	Yes	X	X	Contractor, NYSERDA program staff
Participant satisfaction	Number of respondents	Survey	No		X	Contractor, NYSERDA program staff

Tasks, Budget, and Schedule

Timeliness and ability for quick turnaround on the indicators outlined in this plan, especially those for which NYSERDA has no baseline values (e.g., denoted as “TBD”), is crucial. For purposes of this evaluation plan, the tasks are defined as follows:

Task 1: Project Kick-Off and Evaluation Plan Finalization

Complete background review of initiative. Finalize evaluation plan and general/high-level sampling plan in consultation with NYSERDA. Participate in kick-off meeting with NYSERDA to discuss project details, priority issues, availability of contact lists and databases, and project schedule.

- Deliverables – Final evaluation plan and sampling plan, agenda and other material associated with kick-off meeting

Following successful completion of Task 1, the project manager will notify the contractor in writing that the evaluation plan has been finalized.

Task 2: Sample Strategy

Develop and implement strategies to select appropriate samples. Contractor should describe procedures to reach respondents including call back procedures which will address the number of attempts or callbacks to be made as part of a screening procedure and the schedule of making them, if a specific schedule is planned. Re-contact callbacks for follow-up interviews should be noted in terms of expected completion rate. Care shall be taken in determining the most appropriate manner to contact market actors such that research questions are assessed while ensuring an efficient interaction with the actor(s). Consult with NYSERDA staff on identifying appropriate populations.

- Deliverables – List of proposed survey respondents and documentation of how samples were selected and final sample strategy

Task 3: Develop Primary Data Collection Instruments

Design and develop surveys, questionnaires, interview guides and other forms of data collection as noted in the Methodology section. Drafts will be submitted to NYSERDA for review and feedback. The Contractor shall use the survey instrument developed previously, and adjust for distribution method, as appropriate.

- Deliverables – Draft and final instruments, advance letters to respondents

Task 4: Administer Data Collection Instruments

Conduct pretests of survey instruments to ensure maximum effectiveness. Conduct interviews according to the finalized sampling plan.

- Deliverables – Survey disposition, survey results, and methodology reports

Task 5: Data Analysis

Conduct analysis of primary data to assess and measure research objectives and associated indicators. Transform data into a usable format, assess quality and consistency through editing and cleaning.

During this task, an interim report (3-5 pages) summarizing data collection and analysis progress, project challenges, and remaining work required to meet DPS requirements in Table (Outputs/Outcomes) is required.

The interim report shall be produced no later than mid-way through the Task 4: Data Analysis execution, as defined by the Task 4 schedule, so that course corrections needed for project success can be made. It is anticipated that this interim report shall be confidential to NYSERDA and used solely for project guidance.

- Deliverables – Data and analysis files, tabulations and other statistical analysis outputs
- Interim report

The interim report will include a limited number of key metrics, primarily direct sums of reported benefits and impacts (results type 1 described below). Review of the numbers of sample cases reporting specific impacts and replications, and the numbers providing quantified impacts, will guide decisions for subsequent analysis and reporting.

Types of Results Calculated

Past studies for this program have reported results as totals and proportions of the responding projects, and also included data from projects that had reported results to NYSERDA but did not complete surveys. That approach provides conservative totals, implicitly assuming the non-responding/reporting projects have no impacts.

For this study, the analysis is intended to provide results at 85/15 confidence precision, or better. This requirement means that the results will be provided as population estimates, not simply totals for responding projects. To produce population estimates from the collected data, the analysis will apply the weights described under the Weighting section.

The total pool of projects for this study is indicated as fewer than 175. A preliminary assumption is that there will be approximately 150 projects eligible for study, and responses or prior report data will be obtained for 2/3 of these, or 100 projects. The previous two (2) studies had response rates around 75%. Conservatively, a somewhat lower rate is assumed for planning.

With 100 projects out of a population of 150, the relative precision for an estimated proportion in the neighborhood of 50%, would be 85/8 or 90/9 for a simple random sample. Depending on the distribution of project types and sizes and the variability of proportions across different categories of projects, the precision for the post-stratified weighted sample may be somewhat worse, but is still likely to achieve 85/15 or better for most metrics of interest. For metrics where values previously reported to NYSERDA can be combined with the survey responses, confidence/precision will be even better. These same high-level relative precision calculations apply also to a ratio estimator with an error ratio of 1 or smaller and apply to both demonstrations and replications.

Several types of results can be produced from the data collected:

1. Direct counts, impact totals, and proportions for the responding sample and additional reported projects, without weighting or expansion to the population. These results represent only the reported cases, and are the known values for these cases, without statistical uncertainty.
2. Estimated population impact totals and proportions, directly applying expansion weights to the responding/reporting projects. Confidence/precision can be reported for any such estimate.
3. Ratios such as impact per funding dollar, non-energy to energy quantitative benefits, project revenue per funding dollar, replication impacts to demonstration impacts, or overall return on investment. These ratios are calculated as stratified ratio estimators: the numerator and denominator are each calculated as weighted population totals estimated from the responding sample projects. Such ratios can be illuminating for understanding the program's leverage.

4. Ratio estimates of population totals. These estimates are obtained by applying ratios of results type 3 to known population totals. When there is a good correlation between the numerator and denominator variables, ratio estimation produces an estimated population total with tighter confidence/precision than the direct expansion (results type 2). For example, the total program impact may be estimated more precisely by applying the sample-based ratio of impact per funding dollar to total program funding dollars.

The Contractor shall work with NYSERDA to identify which results types will be produced for the various metrics of interest.

Task 6: Draft Report and Preliminary Findings Presentation

Contractors shall follow the format and guidance as set forth in NYSERDA's Evaluation Report Guidelines. Draft reports and presentations shall be submitted to NYSERDA in advance for review and input.

- Deliverables – Draft report and presentation with slide deck

The Contractor shall make a presentation with slide deck first to NYSERDA's PM, then to Program staff for review and input. Feedback received will be incorporated into the draft report for review. The draft report will be written and structured to allow non-technical audiences to interpret and understand the results.

Statistical results will be supplemented by detail gleaned from individual projects to provide examples of the innovative technologies, the factors that enabled their success, and best practices identified based on responses across multiple projects.

Task 7: Final Report

Incorporate feedback and prepare final report in accordance with the NYSERDA Evaluation Report Guidelines. The final report will be an internal or publicly available document.

- Deliverables – Final report and final version of presentation materials

Task 8: Data Transfer

Transfer data files and associated analysis files to NYSERDA via SharePoint. Includes tasks to prepare data for dissemination.

- Deliverables – all project-related data files

Task 9: Data Destruction

Upon conclusion of the project (or contract in the case of multi-year studies), and after transferring all data files to NYSERDA, any confidential utility customer data used as part of the project must be destroyed by the contractor and the contractor must countersign a letter to NYSERDA certifying this has occurred. All other data associated with the project must also be destroyed by the contractor and the contractor shall send NYSERDA an e-mail stating this has occurred.

- Deliverable – countersigned letter sent to NYSERDA upon destruction of utility data; e-mail sent to NYSERDA upon destruction of all other project data

Task 10: Project Management

Attendance at conference calls and meetings with NYSERDA, management, staff and NYSERDA-designated parties and presentations to such groups. Participation in bi-weekly calls with NYSERDA project managers, as well as development of memoranda stating any issues, project status and actions items discussed during the calls. These calls will be scheduled in consultation with NYSERDA. The Contractor shall also provide weekly progress reports demonstrating activity over the prior week. These reports shall be submitted to NYSERDA in advance of the weekly status calls. Monthly progress reports should be submitted with invoices.

- Deliverables – weekly and monthly progress reports

Budget Summary

The total budget for this study is \$185,000.

Anticipated Evaluation Challenges and Potential Threats to Data Reliability

The Proposer should add possible risks and mitigation strategies below.

Table 1: Data Reliability Risk & Mitigation Summary

Task #	Vulnerabilities/ Threats	Risk	Likelihood	Impact	Mitigation Strategy
4	Survey responses could be incomplete	Data could be insufficient to complete study	High	Moderate	Use skip functions and close-ended questions to keep survey as relevant and short as possible
6	Incomplete, or out of date, contact information	Low response rate, higher cost for recruitment	High – contact information is likely very good for integrators, but may be less so for site owners	Moderate	Plan to contact all participants via available information. Supplement with online sources and leads developed from initial contact listed. Budget assuming additional time to identify site contacts.
4	Organizing the data for analysis may be complex due to multi-contact data collection for projects	Analysis takes longer than planned	Moderate	Moderate	Work with NYSERDA PM and program staff to understand data. Set up clear organizing framework for analysis.
7	More Non-Energy Impacts (NEIs) reported than assumed	Budget is inadequate for amount of analysis required	Moderate	Low	Work with NYSERDA PM to assess risk during data collection. Assess cost per site with NEIs for analysis based on initial completed sites and compare to budget assumptions.
7	Low quality information provided by respondents	Self-reported energy impacts and NEIs may not be accurate	Moderate	High	Use a structured survey approach to capture and confirm key information. Ask respondent how they came up with their estimate to provide an ability to evaluate data quality.

6	Low response rate	Poor precision and potential bias	High	High	Use multi-model survey approach. Attempt contacts with all 3 roles involved, as applicable.
1-13	Program staff may not value evaluation as a priority throughout the project	Evaluation gets incomplete understanding of program and data; report does not serve program needs	Moderate	High	Work with NYSERDA PM to engage program staff early and as needed.
8+9	Multiple report reviewers	Multiple iterations affect program budget and schedule	Moderate	Moderate	Plan for multiple iterations on deliverables and present results to reviewers prior to writing report.

Ethics and Operational Standards

NYSERDA’s EM&V function is organizationally separate from program implementation. The group takes steps to eliminate opportunities for bias in conducting EM&V activities and contracts with independent third-party consultants who exhibit a high degree of evaluation ethics.

Appendix A – Program Benefits and Budget

Energy Efficiency

Benefit Description	2012-2016	Out Years	Total	Thru Selected Period
On-site Electricity Savings from Energy Efficiency Projects, Technologies, Replications, and Codes & Standards (Cumulative Annual GWh)	470.20	225.44	695.64	98.0
GWh Savings from Funded Project and Technology Installations	100.20	0.00	100.20	98.0
GWh Savings from Anticipated Replications not Directly Funded by Program		13.11	13.11	0.0
GWh Savings from Codes & Standards Activities supported by the Program	370.00	212.33	582.33	0.0
On-site Fossil Fuel Savings from Energy Efficiency Projects, Technologies, Replications, and Codes & Standards (Cumulative Annual MMBtu)	2,820,370	647,382	3,567,752	337,994
MMBtu Savings from Funded Project and Technology Installations	562,370	0	562,370	337,994
MMBtu Savings from Anticipated Replications not Directly Funded by Program		101,992	101,992	0
MMBtu Savings from Codes & Standards Activities supported by the Program	2,358,000	545,390	2,903,390	0
On-site Demand Reduction from Energy Efficiency Projects, Technologies, Replications, and Codes & Standards (Cumulative Annual MW)	132.01	114.28	246.30	132.1
Demand Reduction from Funded Project and Technology Installations	42.01	3.62	45.63	132.1
Demand Reduction from Anticipated Replications not Directly Funded by Program		25.43	25.43	0.0
Demand Reduction from Codes & Standards Activities supported by the Program	90.00	85.23	175.23	0.0

¹⁶ With the submittal of its Clean Energy Fund Investment Plan Budget Accounting and Benefits Chapter on February 22, 2016, NYSERDA adopted the NYS Public Service Commission's recommendation in its January 21, 2016 Order Establishing the Benefit Cost Analysis Framework that New York's GHG emissions factor methodology shift from an average grid emission profile to a marginal grid emission profile. Due to this shift, New York's factor to calculate GHG emissions reductions has changed from 625 pounds CO₂e/MWh to 1,160 pounds CO₂e/MWh. The emissions reductions calculated for this report reflect the new factor of 1,160 pounds CO₂e/MWh.

¹⁷ Due to lag required to collect and compile annual data after year end from research partners, contractors and others, 2016 progress is incomplete. NYSERDA will update 2016 progress, adding lagged data, in its next report.

Table 2-2 continued

CHP Projects

Benefit Description	2012-2016	Out Years	Total	Thru Selected Period
On-site Electricity Generated from CHP Projects, Technologies, and Replications (Cumulative Annual MW)	11.00	14.40	25.40	53.22
MW's Installed from Funded Project and Technology Installations	11.00	12.00	23.00	53.22
MW's Installed from Anticipated Replications not Directly Funded by the Program		2.40	2.40	0.00
On-site Electricity Generated from CHP Projects, Technologies, and Replications (Cumulative Annual GWh)	78.30	114.64	192.94	446.6
GWh's Generated from Funded CHP Project and Technology Installations	78.30	100.00	178.30	446.6
GWh's Generated from Anticipated Replications not Directly Program Funded by Program		14.64	14.64	0.0
Primary Energy Savings from CHP Installations (Cumulative Annual MMBtu)	101,790	149,032	250,822	580,517
MMBtu Consumed from Funded Project and Technology Installations	101,790	130,000	231,790	580,517
MMBtu Consumed from Anticipated Replications not Directly Funded by Program		19,032	19,032	0

Other T&MD Benefits

Benefit Description	2012-2016	Out Years	Total	Thru Selected Period
System-wide CO2 Emission Reductions, Energy Efficiency - On-site and Central Station (Annual Tons)	443,762	168,674	612,436	76,633
Advanced Technologies Reaching Commercial Availability	42	19	61	31
Improved Technologies Deployment Programs Adopted by the Market or Further Supported by Deployment Programs	8	2	10	1
Commercial Sales of New and Improved Supported Technologies (millions)	\$24.60	\$109.07	\$133.67	\$41.27
Funding Leveraged (co-funding and outside investment) by Investment (millions)	\$481.43	\$19.93	\$501.36	\$797.02
Clean Energy Businesses Graduating from Incubators	90	4	94	48
Clean Energy Companies Receiving Support	466	30	496	390
Retail and Supply Chain Businesses Partnering with NYSERDA to increase Market Share of Energy Efficient Products	1,033		1,033	1,327
Clean Energy Training for Practitioners (Trainees)	19,219	8	19,227	35,674
Supply Chain Training to Facilitate Adoption of Energy Efficient Products (Partner Employees)	900		900	2,376

2.1.3 Budget and Spending Status

Table 2-3 shows the T&MD program budget and financial status through December 31, 2016. Committed and spent funds are also shown as a percent of the total 2012–2016 budget.

Table 2-3. Budget and Financial Status for T&MD Programs through December 31, 2016

	2012-2016 Budget ^a	Spent Funds	Percent of 2012-2016 Budget Spent	Committed Funds ^{b,c}	Percent of Budget 2012-2016 Committed
Power Supply and Delivery					
Smart Grid/Electric Vehicle	\$33,890,565	\$16,283,019	48%	\$31,807,955	94%
Advanced Clean Power	\$31,396,343	\$19,280,416	61%	\$31,080,665	99%
Combined Heat and Power ^c	\$46,055,354	\$8,452,515	18%	\$40,467,239	88%
Total Power Supply & Delivery	\$111,342,262	\$44,015,950	40%	\$103,355,859	93%
Building Systems					
Advanced Buildings	\$48,393,575	\$16,054,077	33%	\$41,414,776	86%
Advanced Energy Codes & Standards	\$9,785,964	\$4,387,288	45%	\$9,235,964	94%
Total Building Systems	\$58,179,539	\$20,441,365	35%	\$50,650,740	87%
Clean Energy Infrastructure					
Market Development	\$44,255,742	\$37,775,873	85%	\$42,681,367	96%
Clean Energy Business Development	\$25,287,254	\$17,431,779	69%	\$25,175,662	100%
Environmental Monitoring, Evaluation and Protection (EMEP)	\$16,428,580	\$7,914,934	48%	\$16,419,997	100%
Workforce Development ^c	\$15,945,695	\$12,278,056	77%	\$15,460,747	97%
Total Clean Energy Infrastructure	\$101,917,271	\$75,400,642	74%	\$99,737,773	98%
Total of All Program Areas	\$271,439,072	\$139,857,957	52%	\$253,744,372	93%
Administration (8%)	\$39,765,533	\$36,079,170	91%	\$36,087,963	91%
NYS Cost Recovery Fee (1.7%)	\$7,175,495	\$3,762,629	52%	\$3,762,629	52%
Evaluation (5%)	\$22,363,458	\$5,632,857	25%	\$10,265,317	46%
Grand Total - Portfolio	\$340,743,558	\$185,332,613	54%	\$303,860,281	89%

* Totals may not sum exactly due to rounding

^a Pursuant to the January 21, 2016 CEF Order, the budget figures presented herein include reclasses to the CEF of \$182.7 million of uncommitted funds as of February 29, 2016

^b Committed funds include amounts spent plus remaining funding obligated under a contract, purchase order, or incentive award. In addition, committed funds include planned funding for contracts awarded and under negotiation and planned funding under active development through solicitations with specific due dates.

^c Committed funds may decrease from period to period as a result of the disencumbrance/cancellation of contracts, or due to the actual award amount(s) resulting from a due date solicitation being less than the planned award. The Commission's January 21, 2016 Order Authorizing the Clean Energy Fund Framework directed that any uncommitted program funds after February 29, 2016 would be retained for future ratepayer benefits. On March 31, 2017, NYSERDA filed a report of uncommitted balances in the T&MD portfolio (and SBC, EEPs, and RPS portfolios) as of December 31, 2016. Those amounts are included in this table and will be retained for future ratepayer benefits in accordance with the Order.