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NYSERDA Technology and Market Development Program

Semiannual Report through December 31, 2016

Final Report

April 2017

NYSERDA's Promise to New Yorkers:

NYSERDA provides resources, expertise, and objective information so New Yorkers can make confident, informed energy decisions.

Mission Statement:

Advance innovative energy solutions in ways that improve New York's economy and environment.

Vision Statement:

Serve as a catalyst – advancing energy innovation, technology, and investment; transforming New York's economy; and empowering people to choose clean and efficient energy as part of their everyday lives.

NYSERDA Record of Revision

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NYSERDA Technology and Market Development Program

Semiannual Report through December 31, 2016

Final Report

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Albany, NY

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Table of Contents

List of Tables

1 Introduction

1.1 Public Policy Context

The System Benefits Charge (SBC) was established by Order of the New York State Public Service Commission (PSC) in 1998. The PSC established the ratepayer-supported SBC and designated the New York State Energy Research and Development Authority (NYSERDA) as the administrator of the program. The program was reauthorized in 2001 and 2006 for five-year terms. For the period 2006 through 2011, program funding was $154 million per year, of which approximately half focused on energy efficiency resource acquisition/deployment activities and half on technology and market development activities.

In its September 20, 2010 petition to the PSC to continue the SBC, NYSERDA proposed some modifications to the program, including consolidating and transferring the resource acquisition and deployment activities within the Energy Efficiency Portfolio Standard (EEPS) Program and requesting to extend the current SBC by six months to coincide with the December 31, 2011 conclusion of the current EEPS Program. The petition also summarized the history and accomplishments of the SBC and described a proposed Technology and Market Development (T&MD) portfolio to serve as the next iteration of the SBC.

The PSC issued a Notice of Proposed Rulemaking on October 6, 2010 (Case 10-M-0457) and asked for comments on NYSERDA's proposal to be submitted by November 22, 2010. NYSERDA and the Department of Public Service (DPS) also conducted a technical conference on November 4, 2010, to provide stakeholders and interested parties with more information on the potential uses of SBC funds for the T&MD Program. The PSC issued an Order on December 30, 2010, which "reaffirmed its high-level commitment to the continuation of SBC programs and to the important State policy goals they support."[1] The December 30, 2010 Order continued SBC through the end of 2011, but deferred a decision on the proposed T&MD Program, pending a more robust stakeholder input process and submission of an Operating Plan.

NYSERDA submitted the T&MD Operating Plan on May 16, 2011. On June 8, 2011, PSC issued a Notice of Proposed Rulemaking requesting public comment on the Operating Plan by July 25, 2011, with reply comments due August 15, 2011. The Operating Plan requested average annual program funding of $70 million for seven initiatives, plus $15 million for an incremental Combined Heat and Power (CHP) initiative.

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[1] PSC. Case 10-M-0457 and Case 05-M-0090. *Order Continuing System Benefits Charge Funded Programs*. Issued and effective December 30, 2010.

In a PSC Order issued on October 24, 2011, NYSERDA's T&MD Operating Plan was approved, including a CHP initiative for five years (January 1, 2012 through December 31, 2016). The average annual funding rate of $93.8 million represented $80 million in program costs and $13.8 million for administration, evaluation, and New York State Cost Recovery Fees.[2] This plan included $65 million in program costs ($76.2 million total) for NYSERDA's "base" T&MD initiatives and $15 million in program costs ($17.6 million total) for a CHP Initiative. Of the $15 million for CHP, $5 million in SBC funds was approved in the Order to be used for the CHP Aggregation and Acceleration Program, and, at NYSERDA's option, for feasibility studies. The remaining $10 million for the CHP Performance Program was to be derived from a source other than the SBC funds approved in the October 24, 2011 Order. NYSERDA was directed to submit a plan for funding the balance of the CHP Initiative by March 31, 2012. By March 31, 2012, NYSERDA was also directed by the Order to submit an accounting of SBC III funds that were uncommitted as of December 31, 2011 with the option to submit a proposal for use of those funds, as well as SBC III funds that may become uncommitted in the future.

A revised T&MD Operating Plan was filed with PSC on December 22, 2011, updating NYSERDA's May 16, 2011 submittal to comport with the October 24, 2011 Order.[3]

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2 PSC. Case 10-M-0457 – *In the Matter of the System Benefits Charge IV.* Issued and effective October 24, 2011.

3 NYSERDA, 2011. Technology and Market Development Program Operating Plan for 2012-2016, System Benefits Charge, December 22 and revised November 13, 2012 and February 15, 2013 nyserda.ny.gov/-/media/Files/About/System-Benefits-Charge/SBC-Five-Year-Operating-Plan.pdf

On March 9, 2012, NYSERDA submitted a full accounting of uncommitted SBC III funds as directed in the October 24, 2011 Order. On March 30, 2012, NYSERDA submitted a petition proposing ways to allocate those uncommitted SBC III funds among three primary activities:

- Develop and implement programs to reduce solar (also known as solar photovoltaic or PV) balance-of-system (BOS) costs and support priority solar electric technology development ($10 million).
- Provide cost-sharing support as part of a Brookhaven National Laboratory (BNL) proposal to the U.S. Department of Energy (DOE) solicitation for a New York State Energy Storage Innovation Hub ($10 million, with $2.5 million allocated to the New York Battery and Energy Storage Technology Consortium [NY-BEST]).
- Expand NYSERDA's Advanced Buildings Program ($5.76 million, including $3 million for an Advanced Buildings Consortium [ABC] and $3.76 million for a deep energy savings initiative in commercial buildings).

NYSERDA requested to apply $1.75 million in uncommitted SBC III funds to New York State Cost Recovery Fee assessments applicable to SBC III. In addition, NYSERDA requested approval to allocate uncommitted SBC III funds to projects committed as of December 31, 2011. A notice inviting comments was issued on May 11, 2012, and requested comments by August 3, 2012.

In addition, on March 30, 2012, NYSERDA submitted petitions to provide funding for the CHP Program and to provide continued funding and expansion of NYSERDA's workforce development initiatives as directed in the October 24, 2011 Order.[4] PSC issued a Notice of Proposed Rulemaking on May 9, 2012, and requested comments by August 3, 2012.

On September 13, 2012, the PSC issued an Order and approved, with modifications, NYSERDA's requests in its petition regarding uncommitted SBC III funds.[5] The PSC approved the reallocation of SBC III funds into the T&MD portfolio to support T&MD solar electric activities ($10 million) and Advanced Buildings activities ($5.76 million) as well as NYSERDA's support of the BNL proposal and NY-BEST

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4 Petitions related to adjusting the goals and funding for EEPS programs were also submitted on this date.

5 PSC. Case 10-M-0457 – *In the Matter of the System Benefits Charge IV*. Issued and effective September 13, 2012.

($10 million, with $2.5 million allocated to NY-BEST).[6] Also approved was NYSERDA's allocation of SBC III funds to New York State Cost Recovery fee assessments. The PSC did not approve NYSERDA's request to reallocate uncommitted SBC III funds to projects committed as of December 31, 2011 in advance, but directed NYSERDA to submit for review and approval any proposals separately. The Order directed NYSERDA to submit, within 60 days, a supplemental revision to its T&MD Operating Plan to account for the approved initiatives. A revised T&MD Operating Plan was filed with PSC on November 13, 2012 to comport with the September 13, 2012 Order. This plan included $75.15 million in average annual program funding plus $12.06 million in average annual funding for administration, evaluation, and cost recovery.

The PSC issued an Order on December 17, 2012 and approved, with modifications, the requests described in the balance of NYSERDA's March 30, 2012 petitions.[7] In this Order, the PSC approved NYSERDA to reallocate $35.9 million from the Benchmarking and Operations Efficiency and the Electric Reduction in Master-Metered Buildings (EEPS) programs and $22.7 million in uncommitted EEPS-1 funds to support the T&MD CHP Initiative. In addition, the Order approved NYSERDA reallocating $24 million in EEPS-1 funds ($12 million in electric funding and $12 million in natural gas funding) to support T&MD workforce development initiatives. PSC also directed NYSERDA to submit a supplemental revision to its T&MD Operating Plan by February 15, 2013 to comport with the December 17, 2012 Order.[8] On June 16, 2014, NYSERDA submitted a petition to the PSC to add $7.5 million to the CHP initiative. This petition was withdrawn on November 14, 2014[9] with the recommendation that the uncommitted funds be considered within the overall context of the Clean Energy Fund (CEF).

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6 Per the September 13, 2012 Order, if the BNL proposal was not selected by U.S. DOE, NYSERDA had seven days to notify the DPS Office of Energy Efficiency and the Environment (OEEE) of this decision and 60 days to submit a proposal on how those funds should be reallocated. On December 5, 2012, NYSERDA notified DPS OEEE of the proposal denial and designated February 5, 2013 as the date for NYSERDA to submit an alternative proposal to use the funds. The due date for this submission was subsequently extended three times and on September 5, 2013, NYSERDA submitted a petition to transfer $7.5 million in uncommitted SBC III funds to a Power Electronics Manufacturing Consortium proposal in response to a U.S. DOE solicitation. In an Order issued December 20, 2013, the PSC approved use of these funds with the same requirements regarding proposal acceptance and denial as described above.

7 PSC. Case 07-M-0548 - Proceeding on Motion of the Commission Regarding an Energy Efficiency Portfolio Standard and Case 10-M-0457 – In the Matter of the System Benefits Charge IV. Issued and effective December 17, 2012.

8 NYSERDA was also directed to submit a supplemental revision to its EEPS Operating Plan by February 15, 2013 and did so on that date.

9 Case 10-M-0457, *In the Matter of the System Benefits Charge IV*, Withdrawal of Petition for Allocation of Uncommitted T&MD Funds, November 14, 2014.

The CEF proceeding was initiated by the PSC in a May 8, 2014 Order Commencing Proceeding.[10] PSC noted in the Order that NYSERDA's CEF proposal "should refocus on market and technology transformative strategies designed to provide temporary intervention and support to overcome specific barriers and produce self-sustaining results." In response, NYSERDA filed its CEF Proposal on September 23, 2014 (Proposal).[11] In its Proposal, NYSERDA provided information regarding the four portfolios of activity that would constitute the CEF: market development; technology and business innovation (subsequently recast as innovation and research in the CEF Information Supplement); NY Green Bank; and the NY-Sun initiative. Also, in that filing, NYSERDA advanced both budget and benefit information regarding the proposed market development and business and technology innovation portfolios, among other issues. On June 25, 2015, NYSERDA filed a CEF Information Supplement to supplement and replace the original proposal to assist the stakeholder comment process and to provide more detailed information for PSC deliberation.

In these filings, NYSERDA proposed the CEF comprise both market development and innovation and research activities and was intended to supersede the final year (calendar 2016) of the current T&MD portfolio. A PSC Order approved the CEF in January 2016, subsuming the final year of T&MD.[12]

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10 Case 14-M-0094 – *Proceeding on Motion of the Commission to Consider a Clean Energy Fund*, Order Commencing Proceeding. Issued and effective May 8, 2014.

11 Case 14-M-0094 – *Proceeding on Motion of the Commission to Consider a Clean Energy Fund*, Clean Energy Fund Proposal, September 23, 2014.

12 Case 14-M-0094 – *Proceeding on Motion of the Commission to Consider a Clean Energy Fund*, Ordering Authorizing the Clean Energy Fund Framework. Issued and effective January 21, 2016.

1.2 T&MD Program Mission and Objectives

The mission of the T&MD Program is to test, develop, and introduce new technologies, strategies, and practices that build the statewide market infrastructure to reliably deliver clean energy to New Yorkers.

Specifically, objectives designed to support this mission include:

- Moving new/under-used technologies and services into the marketplace to serve as a feeder to help achieve EEPS and Renewable Portfolio Standard (RPS) goals.
- Validating emerging energy efficiency, renewable, and smart grid technologies/strategies and accelerate market readiness in New York State.
- Stimulating technology and business innovation to provide more clean energy options and lower cost solutions, while growing New York State's clean energy economy.
- Spurring actions and investments to achieve results distinct from incentive-based programs.

The nine initiatives that comprise the T&MD portfolio (detailed in Section 3) will be assessed based on their ability to support these objectives. Future evaluation reports will present these findings as programs are assessed.

Achievement of T&MD portfolio goals is dependent on long-term or multi-phase investments and for this reason, several of the T&MD initiatives build on the experience and success of programs funded by previous rounds of the SBC Program or other funding sources. Although this desired and necessary continuity of effort makes it difficult to attribute performance results and outcomes to a specific phase of funding, NYSERDA recognizes the importance of attempting to clearly delineate progress made in the T&MD portfolio from earlier or alternate funding sources. Toward this end, NYSERDA intends to count outputs and outcomes supported at least in part by T&MD funds toward T&MD performance milestones and results. Where prior SBC or other funded activities are foundational to the success of the T&MD program and illustrative of potential future expectations for the T&MD portfolio, they are highlighted to help convey a more complete picture of possible program benefits, but these achievements will not be tallied toward the T&MD goals unless they have received T&MD funds. Commercialization benefits from projects started in 2012 under T&MD will take at least few years to materialize and will be reflected as they do.

1.3 Organization of the Report

This semiannual report, filed pursuant to the October 24, 2011 PSC Order, describes how the T&MD Portfolio is progressing toward its mission and objectives. The report is divided into the following sections:

- Section 1: Introduction
- Section 2: Portfolio-Level Reporting
- Section 3: T&MD Initiatives
- Section 4: T&MD Program Evaluation Activities
- Appendix A: T&MD Program Advisory Committee Members
- Appendix B: T&MD Program Logic Models
- Appendix C: Evaluation Report Summaries
- Appendix D: T&MD Targets

As all the T&MD programs continue to fully mature, the content of these semiannual reports will expand and evolve to reflect the entirety of activities undertaken within each of the initiatives and how accomplishments to date relate to the T&MD portfolio's mission and the output and outcome metrics established in the Operating Plan.

2 Portfolio-Level Reporting

2.1 Portfolio Level Progress

To establish and implement the T&MD portfolio, NYSERDA has engaged in an intensive outreach process with stakeholders, developed and released competitive solicitations to implement the initiatives within the portfolio, and conducted other activities to put the T&MD initiatives into operation. These activities are outlined in the following sections.

2.1.1 Solicitations Released

Table 2-1 presents solicitations released, release date, and proposal due date or open enrollment end date. Note that solicitations released prior to December 31, 2015 were included in prior semiannual reports and are omitted from Table 2-1.

Table 2-1. Solicitations Released from July 1, 2016 through December 31, 2016

Solicitation Number	Solicitation Name	Solicitation Release Date	Solicitation Closing Date
	No new solicitations		

2.1.2 Implementation of T&MD Initiatives

Table 2-2 provides a summary of anticipated T&MD portfolio benefits for the five-year funding period (2012–2016) and out years (2017–2020), as well as achievements to date for applicable metrics. Performance milestone tables (included for each initiative in Section 3 of this report) show progress through December 31, 2016 against the Operating Plan's expected benefits.

An Output/Leading Indicator describes the anticipated immediate results associated with initiative activities. An Outcome/Impact describes expected achievements in the near, intermediate, and longer term. Consistent with the Operating Plan for Technology and Market Development Programs (2012–2016), where a target was originally a range, minimum value of the range was used.

With regard to on-site energy savings, the level of achieved savings to date should be viewed in the context of the expected ramp up of savings over time. Specifically, two contributors to the overall savings goals in NYSERDA's T&MD Operating Plan, the Advanced Codes and Standards and Advanced Buildings programs, anticipated most of their savings to be achieved in late 2014 through 2016 or later. The energy savings reported in Table 2-2 for all programs except Market Pathways Products Partners are program-reported; market impact evaluation activities have not yet been conducted on these other programs. Future reports will present findings from any evaluation studies that are conducted. The energy savings for the Market Pathways Products Partners Program are adjusted for the evaluation findings from a market/impact evaluation that was completed in 2014.[13]

Electricity, fossil fuel, and demand savings/generation targets and progress refer to the cumulative annual savings that have been achieved through a particular time period from all measures installed; e.g., T&MD savings for 2012–2016 are the energy savings achieved in 2016, as a result of energy efficiency measures installed from January 2012 through June 2016.

The progress for the 2012–2013 time period was previously restated[14] after the underlying data that is now in a centralized data warehouse went through a quality and reconciliation process resulting in corrections across the program. By restating the results for the previous reporting period, NYSERDA is following financial reporting practices and meeting the validation and verification criteria for all reporting.

In certain programs, the progress for the 2012–2013 and 2014–2015 time periods have been adjusted in this report to capture changes in that period due to lags in data collection or cancellation of projects.

To report certain underlying data on progress with an appropriate number of significant digits, targets are shown with more precision (significant digits) than actually exist in most of the target estimates. None of the targets changed by showing additional significant digits.

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13 http://www.nyserda.ny.gov/-/media/Files/Publications/PPSER/Program-Evaluation/2014ContractorReports/2014-New-York-Products-Program-Evaluation.pdf

14 http://www.nyserda.ny.gov/About/Publications/Program-Planning-Status-and-Evaluation-Reports/SBCIV-Documents

Primary energy savings for CHP systems (expressed in MMBtu) is based on the difference between the amount of energy displaced at grid-level generators and the energy used on-site by the CHP installations, accounting for both the avoided energy losses over the transmission and distribution system and the energy saved due to replacement of the on-site boiler with more efficient equipment. The energy displaced at grid-level generators is estimated based on the electricity system simulation model used in the development of the State Energy Plan process.

The CEF proposal recommended repurposing a substantial amount of 2016 T&MD funding for CEF work. Given the corresponding early end to the T&MD portfolio, the 2016 T&MD goals presented in this report are the goals that were established in the second revision of the Operating Plan (2012–2016) dated February 15, 2013, adjusted in proportion to the reduction of funds that occurred in 2016.[15] Other noteworthy program implementation and progress milestones are each described in greater detail in Section 3.

[15] Pursuant to the January 21, 2016 CEF Order, the CEF received a transfer of $182.7 million of uncommitted funds from T&MD as of February 29, 2016. The T&MD program also ended nearly a year early. Individual programs lost between 2% and 91% of their budgets as a result of this budget transfer and, given the early end to the T&MD portfolio, the T&MD goals for each program have been adjusted in this report proportional to the budget reductions each program received. Original goals from the February 15, 2013 Operating Plan are included in Appendix D for reference.

Table 2-2. Summary of Anticipated Cumulative T&MD Benefits through December 31, 2016 (at full implementation) for Energy Efficiency, CHP, and Other Benefits[16,17]

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)	2,920,370	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 CO_2e/MWh to 1,160 pounds CO_2e/MWh. The emissions reductions calculated for this report reflect the new factor of 1,160 pounds CO_2e/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
MWs Installed from Funded Project and Technology Installations	11.00	12.00	23.00	53.22
MWs 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
GWhs Generated from Funded CHP Project and Technology Installations	78.30	100.00	178.30	446.6
GWhs Generated from Anticipated Replications not Directly Program Funded by Program		14.64	14.64	0.0
Primary Energy Savings from CHP Installations (Cumulative Annual MMBtus)	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.

3 T&MD Initiatives

This section provides a status update on each of the nine T&MD initiatives, including budget status and highlights of achievements.

An Output/Leading Indicator describes the anticipated immediate results associated with initiative activities. An Outcome/Impact describes expected achievements in the near, intermediate, and longer term.

3.1 Power Supply and Delivery Initiatives

Table 3-1 shows committed and spent funds for this initiative as a percentage of the total 2012–2016 budgets. Later sections describe progress for each area of this initiative.

Table 3-1. Power, Supply, and Delivery Budget and Financial Status 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
Smart Grid/Electric Vehicle					
Smart Grid	$25,629,750	$12,823,479	50%	$25,376,662	99%
Electric Vehicle	$8,260,815	$3,459,540	42%	$6,431,293	78%
Total Smart Grid/Electric Vehicle	*$33,890,565*	*$16,283,019*	*48%*	*$31,807,955*	*94%*
Advanced Clean Power					
Technology Innovation	$24,228,401	$14,761,125	61%	$23,940,677	99%
Resource Development	$1,256,016	$515,939	41%	$1,256,016	100%
Solar Cost Reduction	$5,911,926	$4,003,352	68%	$5,883,972	100%
Total Advanced Clean Power	*$31,396,343*	*$19,280,416*	*61%*	*$31,080,665*	*99%*
Combined Heat & Power[c]					
CHP Aggregation & Acceleration	$5,974,523	$3,735,399	63%	$5,976,073	100%
CHP Performance	$40,080,831	$4,717,116	12%	$34,491,166	86%
Total Combined Heat & Power	*$46,055,354*	*$8,452,515*	*18%*	*$40,467,239*	*88%*
Grand Total - Power, Supply, & Delivery Initiatives	***$111,342,262***	***$44,015,950***	***40%***	***$103,355,859***	***93%***

* 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.

3.1.1 Smart Grid and Electric Vehicle Infrastructure

3.1.1.1 Smart Grid

The Smart Grid Program promotes product development and demonstrations targeted at ensuring high levels of security, quality, reliability, and availability of electric power; improving economic productivity; and minimizing environmental impacts while maximizing safety and sustainability. A smarter grid will be characterized by the widespread application of advanced sensing, communication and control devices, and other uniform diagnostic systems to support real-time visualization of electric grid operating conditions. This smarter grid is expected to reduce energy losses, extend equipment life, reduce operating costs, increase system resiliency to disruptions, support quicker restoration after disruptions, support the integration of distributed energy resources, and increase the throughput or transfer of electric energy between regions of the State. A smarter grid will also be essential to accelerating adoption of grid-powered electric vehicles (GPV) and associated infrastructure. Projects funded through program activity must demonstrate significant statewide public benefit and quantify all energy, environmental, and economic impacts. Technology demonstrations, product development, research studies, and engineering studies are all eligible for funding support through periodic program solicitations.

The following key program activities and accomplishments have occurred during this reporting period:

- Lockheed Martin (LM) successfully completed its multi-phased approach to develop its Automated Rapid Infrastructure Evaluation System (ARIES™) to address the need for improved electric utility post-storm damage assessment time. Following a successful demonstration of the Infrastructure Analytics algorithms developed in Phase 1, NYSERDA, LM, and AVANGRID® partnered to develop a Phase 2 system in which a complete prototype solution, consisting of a Graphical User Interface (GUI), database, system software, and reporting capabilities, is built around the algorithms. In addition to damage assessment, the system's automated analytics are also capable of detecting floodwaters using aerial LiDAR imagery. The integrated GUI supports a variety of user interactions for mission planning, status monitoring, and results analysis. Depending on the population and distribution of assets, data can be collected and assessed for an area of up to 500 square miles in size within 24 hours. This solution will ultimately reduce the duration that AVANGRID®'s customers are without power following a major storm event by providing a reliable and accurate tool for rapidly assessing damage and developing estimated time of restoration information.

- Micatu commenced activity on their GridView Voltage Sensor Development project. The GridView™ Advanced Monitoring System provides a real-time operating picture of the Medium Voltage Distribution System to help operators observe, analyze, and operate the system more precisely and reliably. The Micatu team, along with the NYS Pollution Prevention Institute, engaged with Clarkson University to conduct a series of independent tests to validate the accuracy of Micatu's GridView sensor platform against a reference standard and other typical industry sensors. Micatu completed both a field deployment of third generation GridView sensors with Orange and Rockland Utilities and design and architecture of the fourth generation GridView sensors.
- As part of their Integrated Grid Project, EPRI has completed an in-depth analysis of the NY Joint Utility Initial and Supplemental DSIP filings. EPRI created a detailed interview guide for conducting 1-day data gathering sessions with each of the State's investor owned utilities and PSEG-LI, to be completed in early 2017 and as of this date, EPRI with program staff have conducted all-day interviews with three investor owned utilities and interviews with each of the remaining utilites have been scheduled.

Table 3-2 shows performance milestones and results for the Smart Grid Program through December 31, 2016. Outputs/Leading Indicators measure immediate results; Outcomes/Impacts measure achievements. Blank cells indicate the lack of a target in a particular time period. Signed contracts and completed projects are for technology development, demonstration and pilot projects including several large flagship projects. Signed contracts and completed projects for research studies include studies on technologies, market barriers, and policies related to increased smart grid implementation in New York State.

Table 3-2. Smart Grid Performance Milestones and Results through December 31, 2016[18,19]

Outputs/Leading Indicators

		2012-13 with Adjustments	2014-15 with Adjustments	2016	2017-20	Total
Technology, development, demonstration or pilot projects	Projects Contracted - Target	7	9			16
	Projects Contracted - Progress	9	6	4		19
	Projects Completed - Target		5	9	2	16
	Projects Completed - Progress	0	4	1		5
Research Studies	Projects Contracted - Target	2	2			4
	Projects Contracted - Progress	12	15	4		31
	Projects Completed - Target		2	2		4
	Projects Completed - Progress	0	13	6		19
All Projects	Supported Companies - Target	8	10			18
	Supported Companies - Progress	21	15	6		42

Outcomes/Impacts

		2012-13 with Adjustments	2014-15 with Adjustments	2016	2017-20	Total
All Projects	Leveraged Funds Amount (millions) - Target	$18.00	$42.00	$0.50		$60.50
	Leveraged Funds Amount (millions) - Progress	$13.15	$63.97	$4.88		$82.00
	Products and Technologies Commercialized - Target			1	1	2
	Products and Technologies Commercialized - Progress	0	2	0		2
	Product Revenue Amount (millions) - Target				$3.24	$3.24
	Product Revenue Amount (millions) - Progress	$0.00	$1.25	$0.00		$1.25
	Market Adoption - Target			2	1	3
	Market Adoption - Progress	0	0	0		0

3.1.1.2 Electric Vehicle Infrastructure

The electric vehicle (EV) infrastructure efforts include engineering studies, product development, demonstration projects and pilot programs to validate technology that minimizes negative grid impacts from grid-powered vehicle (GPV) charging, develops GPV-to-grid communication technologies and control processes, and promotes new business models that enable the benefits of vehicle storage for the distribution system.

The following key program activities and accomplishments were performed during this reporting period:

- As of December 31, 2016, more than 720 EV charging stations had been installed through NYSERDA programs.
- NYSERDA's contractor, Energetics Inc., compiled updated reports on the use of NYSERDA-supported EV charging stations installed through the EV Charging Station Demonstration Program. The reports show quarterly use of the stations broken down by geographic region, type of location, and business model.

18 Adjustments made to data in previously reported periods is due to lagged data and/or QA/QC.

19 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.

- NYSERDA completed final reports on grid impacts of increased DC fast charger use, the feasibility of battery leasing to bring down upfront EV costs.
- NYSERDA launched a project to conduct a benefit-cost analysis of EV impacts for utilities and ratepayers in New York State, which should be completed in Q3 2017.
- NYSERDA met periodically with stakeholders, including auto manufacturers, environmental groups, EV infrastructure providers, site owners, and installers to solicit input for the design of new EV-related programs.
- eV2g is preparing to install equipment at Queens College as part of their demonstration providing vehicle-to-building power from EVs in emergency situations. The project will collect data and test systems to inform technology providers, resiliency planners, and fleet owners.
- Long Road Enterprises continues development of their innovative switched-reluctance motor. To develop early markets, they entered into an agreement with a major supplier of HVAC systems. Refining the technology on smaller motors for HVAC systems will help build toward delivering the motors for cars and trucks.
- Clean Communities of Central New York kicked off a project focused on increasing the adoption of EVs through the expansion of workplace charging programs. The project team has started identifying candidate workplaces and meeting with candidates to discuss the value of workplace charging.
- Energetics, Inc. has been developing resources for planning boards on how to incorporate EV charging stations into new site approvals. They have been working with planning organizations statewide to gather input and spread information to local planners.
- Autronic Plastics successfully demonstrated 20 preproduction LED overhead lighting fixtures in New York City Transit's Spring Street Subway Station, resulting in a "Letter of Functional Equivalency" from NYC Transit. Two additional units were sent out to UL verification Services for LM-79 testing, which successfully documented the in-spec performance of total luminous flux, electrical power, luminous intensity distribution, efficacy (lm/watt), and chromaticity.

Table 3-3 shows performance milestones and results for Electric Vehicle Infrastructure Program through December 31, 2016. Outputs/Leading Indicators measure immediate results; Outcomes/Impacts measure achievements. Blank cells indicate the lack of a target in a particular time period. Research studies focus on technologies, market barriers and policies related to increased grid powered vehicle implementation in New York State. Leveraged funds include cofunding and outside investments for EV infrastructure.

Table 3-3. Electric Vehicle Infrastructure Performance Milestones and Results through December 31, 2016 [20]

Outputs/Leading Indicators

		2012-13 with Adjustments	2014-15 with Adjustments	2016	2017-20	Total
Technology, development, demonstration or pilot projects	Projects Contracted - Target	4	9	2		15
	Projects Contracted - Progress	1	15	2		18
	Projects Completed - Target		3	6	6	15
	Projects Completed - Progress	0	3	5		8
Research Studies	Projects Contracted - Target	4	1			5
	Projects Contracted - Progress	1	12	2		15
	Projects Completed - Target		4	1		5
	Projects Completed - Progress	0	2	7		9
All Projects	Supported Companies - Target	5	10	3		18
	Supported Companies - Progress	3	21	6		30

Outcomes/Impacts

		2012-13 with Adjustments	2014-15 with Adjustments	2016	2017-20	Total
All Projects	Leveraged Funds Amount (millions) - Target	$4.00	$14.00	$6.80		$24.80
	Leveraged Funds Amount (millions) - Progress	$7.86	$21.64	$0.57		$30.08
	Products and Technologies Commercialized - Target		1	1		2
	Products and Technologies Commercialized - Progress	0	0	0		0
	Product Revenue Amount (millions) - Target				$5.31	$5.31
	Product Revenue Amount (millions) - Progress	$0.00	$0.00	$0.00		$0.00
	Market Adoption - Target			1	1	2
	Market Adoption - Progress	0	1	0		1

3.1.2 Advanced Clean Power

3.1.2.1 Clean Power Technology Innovation Program

The Clean Power Technology Innovation Program works to advance clean power technology, assist New York State innovators in product development, and overcome barriers and institutional impediments to the widespread use of renewable and clean power, and storage technologies. Technologies eligible under this program include innovative renewable-electric and other advanced clean power technologies for grid-connected applications, storage technologies for sub-utility-scale stationary applications, or technologies that improve grid power quality and reliability. Subsystems and components of these technologies, as well as improved innovative manufacturing methods for these technologies are included. Examples of technologies include fuel cells, batteries, solar electric power, wind power, hydropower, power conditioning equipment, waste heat to electricity, biomass to electricity and innovative control or monitoring technologies.

20 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 the next report.

The following key program activities and accomplishments were performed during this reporting period:

- Cadenza Innovation, a pioneering provider of energy storage solutions based on disruptive architectures for lithium-ion battery packs, announced more than $5 million in growth capital. The company will use the new funds to expand product development, secure additional certifications, extend initial deployments, make key new hires, and fuel revenue growth.
- Lionano Inc., an innovator in battery components has been awarded an Army SBIR Phase II with $1 million award, obtained an exclusive worldwide technology license from Cornell University for the commercialization of an advanced anode material, and has its own research and prototyping labs located in the McGovern Center incubator at Cornell University, to produce cathode material at a rate of over 30 tons/yr. Lionano is currently seeking $4M venture funding from private sector.
- Six proposals were contracted for Advanced Clean Power (PON 2942). The remaining one proposal is still to be contracted. The delay is due to contractors revisiting terms and conditions in the original contract.

Table 3-4 shows performance milestones and results for the Technology Innovation and Energy Storage programs through December 31, 2016. Commercialization metrics for projects that only received SBC III funding are not reported here; those metrics are reported in the SBC III annual report. Outputs/Leading Indicators measure immediate results; Outcomes/Impacts measure achievements. Blank cells indicate the lack of a target in a particular time period. Leveraged funds include cofunding and outside investments f or clean power technology projects.

Table 3-4. Clean Power Technology Innovation (top two sections) and Energy Storage Commercialization Center (bottom section) Performance Milestones and Results through December 31, 2016[21,22]

Outputs/Leading Indicators

		2012-13 with Adjustments	2014-15 with Adjustments	2016	2017-20	Total
All Projects	Projects Contracted - Target	15	26	3		44
	Projects Contracted - Progress	12	20	3		35
	Projects Completed - Target		10	15	19	44
	Projects Completed - Progress	1	7	9		17
	Supported Companies - Target	19	32	5		56
	Supported Companies - Progress	12	20	3		35

Outcomes/Impacts

		2012-13 with Adjustments	2014-15 with Adjustments	2016	2017-20	Total
All Projects	Leveraged Funds Amount (millions) - Target	$20.00	$32.00	$4.60		$56.60
	Leveraged Funds Amount (millions) - Progress	$19.53	$71.62	$1.79		$92.94
	Products and Technologies Commercialized - Target		1	2	4	7
	Products and Technologies Commercialized - Progress	3	2	0		5
	Product Revenue Amount (millions) - Target	$1.00	$1.00	$3.00	$42.85	$47.85
	Product Revenue Amount (millions) - Progress	$0.53	$24.72	$0.00		$25.25

Outcomes/Impacts

		2012-13 with Adjustments	2014-15 with Adjustments	2016	2017-20	Total
All Projects	Leveraged Funds Amount (millions) - Target	$2.00	$2.00	$1.00	$1.10	$6.10
	Leveraged Funds Amount (millions) - Progress	$0.50	$0.77	$0.30		$1.57
	Products and Technologies Commercialized - Target	1	4	4	13	22
	Products and Technologies Commercialized - Progress	0	0	0		0
	Revenue Amount (millions) - Target	$0.15	$2.20	$1.40	$4.99	$8.74
	Revenue Amount (millions) - Progress	$0.00	$1.03	$0.32		$1.35
	Product Development Tests - Target	2	8	6	20	36
	Product Development Tests - Progress	0	19	8		27

3.1.2.2 Resource Development Program

The Resource Development Program is focusing on activities to stimulate the development of new renewable energy supplies, technologies, and businesses in the renewable energy industry with the greatest potential to meet near-to-intermediate-term energy and environmental goals. Similar to previous efforts to address market barriers that helped develop land-based wind energy in Upstate New York, this program concentrates on the gap in understanding offshore wind energy. Marine resource and site assessment activities will increase knowledge of coastal marine energy assets and their suitability for power development and improve understanding of the capacity in New York State to manufacture, construct, and service new marine-based electrical generation projects and components.

21 Adjustments made to data in previously reported periods is due to lagged data and/or QA/QC.

22 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.

The following key program activities and accomplishments were performed during this reporting period:

- An Offshore Wind Cost Benefit Study was completed. It assessed the potential costs, ratepayer impacts, environmental benefits, economic benefits and impacts (job and other macroeconomic impacts) to New York State associated with plausible scenarios of future offshore wind energy deployment in the New York Bight through 2025.
    - The Offshore Wind Master Plan, that is funded through the Clean Energy Fund, will include cost studies that build on the work completed for the Offshore Wind Cost Benefit Study.
- Northeast Wind Resource Center – NYSERDA continued to be an active supporter of the National Renewable Energy Laboratory-funded Northeast Wind Resource Center (NWRC) led by the Clean Energy States Alliance. The NWRC's purpose is to provide credible information, targeted outreach, and direct engagement with stakeholders and decision makers about offshore wind energy. The NWRC plans to support the development of a viable offshore wind industry by:
    - Collecting and disseminating Web-based information by creating an NWRC-specific website and by maintaining websites for the U.S. Offshore Wind Hub, the Offshore Wind Accelerator Project, and the Maine Ocean and Wind Industry Initiative.
    - Developing strategies to increase opportunities for multistate collaboration.
    - Sponsoring regular webinars, workshops, and meetings.
    - Coordinating with other regions (e.g., Southeast Coastal Wind Coalition).

Table 3-5 shows performance milestones and results for the Resource Development Program through December 31, 2016. Outputs/Leading Indicators measure immediate results; Outcomes/Impacts measure achievements. Blank cells indicate the lack of a target in a particular time period. Signed contracts and completed projects include studies, surveys and plans. Stakeholder engagements include engagements with stakeholder organizations and consortia in support of developing a research/program agenda. Leveraged funds include cofunding and outside investment.

Table 3-5. Resource Development Performance Milestones and Results through December 31, 2016

Outputs/Leading Indicators

		2012-13 with Adjustments	2014-15 with Adjustments	2016	2017-20	Total
All Projects	Projects Contracted - Target	1				1
	Projects Contracted - Progress	3	0	0		3
	Projects Completed - Target	1				1
	Projects Completed - Progress	0	2	0		2
	Stakeholder Engagements - Target					
	Stakeholder Engagements - Progress	2	1	0		3

Outcomes/Impacts

		2012-13 with Adjustments	2014-15 with Adjustments	2016	2017-20	Total
All Projects	Leveraged Funds Amount (millions) - Target		$0.20			$0.20
	Leveraged Funds Amount (millions) - Progress	$0.00	$0.00	$0.00		$0.00
	Site Development Potential (MW) - Target				90.00	90.00
	Site Development Potential (MW) - Progress	0.00	0.00	0.00		0.00

3.1.2.3 Solar Cost Reduction[23]

This program will help achieve the goals of the NY-Sun initiative[24] through activities that reduce the balance-of-system (BOS) costs of solar electric installations and support priority solar electric technology development in New York State. BOS costs include non-module hardware, labor, design, permitting and interconnection, and can amount to approximately one-half of the installed cost of a solar electric system. A dialogue with representatives of the industry, permitting authorities, and various stakeholders will be conducted through workshops and other means to develop a thorough understanding of the solar electric project development process and the elements that constitute BOS cost components.

The following key program activities and accomplishments were performed during this reporting period:

- Under Solar One's PV group purchase program called Here Comes Solar (HCS), Solar One completed a business plan that they developed with input from external partners including the rocky Mountain Institute and Co-op Power. The business plan is rooted in the very specific position that Here Comes Solar occupies New York City's unique residential solar market, an intermediary that facilitates solar development in high-barrier, underserved property segments through the deployment of innovative demand-side interventions that materially reduce and offset common impediments that limit adoption. During the 18-months, the initiative has succeeded in facilitating approximately 1.1 MW of solar contracts across a mix of owner-occupied homes and multi-family residential properties in several New York City communities that had previously experienced very low rates of penetration. Looking forward, HCS aims to extend its mission and focus to additional multifamily property segments, filling a void left by private sector suppliers, and bridging gaps that commonly suppress demand. Specifically, HCS will develop new models and forms of deployment that open solar access for multi-family cooperatives. For mission and strategic reasons, the initiative will primarily focus its efforts in 2016–2017 on increasing penetration among a common form of low- equity cooperative known as a Housing Development Fund Corporation (HDFC) cooperative.
- Sunvestment Group (SVG) has developed a platform that brings together prospective investors in PV projects with proposed projects. Specifically, SVG focuses on community-based investments—making the attractive returns of solar projects available to members of the local community through establishing third-party investment entities that enter into a Community Power Purchase Agreement (CPPA) with the local site host. SVG's web platform now has the underlying architecture to support an online investment portal. SVG have been advised that it needs to address Securities and Exchange Commission Broker Dealer guidelines in order to offer securities, and is now working on refining its

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23 The September 13, 2012, Order in Case 10-M-0457, *Order Authorizing the Reallocation of Uncommitted System Benefits Charge III Fund,* included $10 million for a new initiative within the Advanced Clean Power Program focused on reducing the BOS costs for solar electric installations and the development of priority solar electric technology.

24 In his 2012 State of the State Address, Governor Cuomo announced the NY-Sun initiative, designed to install, in 2013, four times the customer-sited solar electric capacity installed in 2011, while protecting the ratepayer by keeping costs under control.

broker dealer strategy. SVG has also begun to reach out to Foundations and corporate organizations that provide philanthropic support to some of the underlying organizations that are seeking to go solar, and we are working with them on strate

- The PV Trainers Network (PVTN) continued to provide a wide breadth of trainings across the State including, but not limited to, the following courses: Solar Procurement for Local Governments; Land Use Planning for Solar Energy; Intro to Solar Policy; and Solar PV Permitting and Inspection Methods. The PV Trainers Network assembled a Municipal PV Procurement Toolkit, which was approved for release by NYSERDA in December 2015. The toolkit was developed in response to requests for assistance for government procurement of solar electric from communities across the State. The toolkit provides resources to localities to guide them through the process. The toolkit includes:
    - Step-by-step guidance to the procurement process
    - A model Request for Proposals (RFP)
    - A model Power Purchase Agreement (PPA)
    - An Excel-based Bid Evaluation Form
    - A database of PPA Prices and Terms
    - One-on-One Technical Assistance for municipalities interested in solar procurement

Table 3-6 shows performance milestones and results for the Solar Cost Reduction program through December 31, 2016. Outputs/Leading Indicators measure immediate results; Outcomes/Impacts measure achievements. Blank cells indicate the lack of a target in a particular time period. Signed contracts and completed projects for development tools, practices, studies, surveys, and engagements are projects that reduce solar electricity costs. Signed contracts and completed projects for technology, development, demonstration or pilot projects are for BOS projects. The meetings, workshops, and conferences are a result of BOS projects. The training sessions focus on aspects of solar electricity for authorities having jurisdiction, local officials, and trainers. Leveraged funds include cofunding and outside investment for BOS projects.

Table 3-6. Solar Cost Reduction Performance Milestones and Results through December 31, 2016[25,26]

Outputs/Leading Indicators

		2012-13 with Adjustments	2014-15 with Adjustments	2016	2017-20	Total
Technology, development, demonstration or pilot projects	Projects Contracted - Target	6				6
	Projects Contracted - Progress	0	4	0		4
	Projects Completed - Target		2	4		6
	Projects Completed - Progress	0	0	0		0
Develop tools, practices, studies, surveys, engagements	Projects Contracted - Target	6				6
	Projects Contracted - Progress	0	8	1		9
	Projects Completed - Target		5	1		6
	Projects Completed - Progress	0	1	2		3
All Projects	Supported Companies - Target	5				5
	Supported Companies - Progress	0	12	1		13
	Solar (PV) Trainees - Target	1,180				1,180
	Solar (PV) Trainees - Progress	0	4,521	4,666		9,187
	Training Sessions - Target	118				118
	Training Sessions - Progress	0	155	142		297
	Meetings, Workshops, Conferences - Target	1	4	1		6
	Meetings, Workshops, Conferences - Progress	0	27	14		41

Outcomes/Impacts

		2012-13 with Adjustments	2014-15 with Adjustments	2016	2017-20	Total
All Projects	Leveraged Funds Amount (millions) - Target	$5.50	$2.30			$7.80
	Leveraged Funds Amount (millions) - Progress	$2.00	$16.45	$1.12		$19.57
	Products and Technologies Commercialized - Target				1	1
	Products and Technologies Commercialized - Progress	0	1	0		1
	Product Revenue Amount (millions) - Target				$4.25	$4.25
	Product Revenue Amount (millions) - Progress	$0.00	$0.04	$0.00		$0.04
	Market Adoption - Target		3	1		4
	Market Adoption - Progress	0	0	0		0

3.1.3 Combined Heat and Power (CHP)

3.1.3.1 CHP Aggregation and Acceleration Program

The CHP Aggregation and Acceleration Program began with T&MD funds by developing and transforming the marketplace for CHP systems from 50 kW to 1.3 MW, the nameplate capacity range of a majority of NYSERDA's previous CHP projects, and serves as the foundation for transition to the CEF-funded program in 2016 which expanded to support CHP systems 3 MW and smaller with no minimum size. The program will accomplish this transformation by (1) compiling a vetted catalog of prequalified equipment, and (2) creating

25 Adjustments made to data in previously reported periods is due to lagged data and/or QA/QC.

26 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.

and validating rules-of-thumb for simplifying the analysis used to determine the capacity needs of a given site. This focus on prepackaged CHP modules that include all major components will reduce the need for (and thus reduce the costs of and opportunities for errors during) equipment-integration engineering and assembly; nevertheless, site-specific engineering regarding placement of equipment at the site and tie-ins to the site's infrastructure will still be necessary.

The following key program activities and accomplishments were performed during this reporting period:

- Marketing and outreach activities transitioned to the CHP Program funded by IPEC/CEF.
- Four projects were completed and are now operational.

Table 3-7 shows performance milestones and results for the CHP Aggregation and Acceleration Program through December 31, 2016. Energy savings reported in Table 3-7 are program-reported; evaluation activities have not been conducted on these programs yet. Future reports will present findings from those studies as they are finalized. Project count, peak load demand, electric generation, and primary energy savings targets are established for projects installed through a particular time period. Progress or project count, peak load demand, electric generation, and primary energy savings refers to the cumulative savings that are installed, contracted or accepted through a particular time period; e.g., T&MD savings for 2012-2013 are the energy and demand savings/generation achieved or expected as of December 31, 2013 as a result of activity from January 2012 through December 2013. Outputs/Leading Indicators measure immediate results; Outcomes/ Impacts measure achievements. Blank cells indicate the lack of a target in a particular time period.

Table 3-7. CHP Aggregation and Acceleration Performance Milestones and Results through December 31, 2016

Outputs/Leading Indicators

		2012-13	2012-15	2012-16	2012-20
All Projects	Projects - Target	3	9	9	9
	Applications Approved but not yet Contracted - Progress	0	2	0	
	Projects Contracted but not yet Completed - Progress	4	33	30	
	Projects Completed - Progress	0	16	28	
	Total Progress	4	51	58	
All Projects	Peak Load Electric Generation (MW) - Target	1.00	3.00	3.00	3.00
	Peak Load Electric Generation Applications Approved but not yet Contracted (MW) - Progress	0.00	0.13	0.00	
	Peak Load Electric Generation Projects Contracted but not yet Completed (MW) - Progress	0.02	0.60	0.76	
	Peak Load Electric Generation Projects Completed (MW) - Progress	0.00	1.26	1.43	
	Total Progress	0.02	1.99	2.19	
All Projects	Electric Generation (GWh) - Target	6.10	18.30	18.30	18.30
	Electric Generation Applications Approved but not yet Contracted (GWh) - Progress	0.00	0.81	0.00	
	Electric Generation Projects Contracted but not yet Completed (GWh) - Progress	0.09	3.65	4.62	
	Electric Generation Projects Completed (GWh) - Progress	0.00	7.69	8.71	
	Total Progress	0.09	12.15	13.33	
All Projects	Primary Energy Savings (MMBtu) - Target	7,930	23,790	23,790	23,790
	Primary Energy Savings Applications Approved but not yet Contracted (MMBtu) - Progress	0	1,051	0	
	Primary Energy Savings Projects Contracted but not yet Completed (MMBtu) - Progress	119	4,742	6,011	
	Primary Energy Savings Projects Completed (MMBtu) - Progress	0	9,996	11,324	
	Total Progress	119	15,789	17,335	

		2012-13 with Adjustments	2014-15 with Adjustments	2016	2017-20	Total
All Projects	Pre-Packaged Systems - Target	5				5
	Pre-Packaged Systems - Progress	64	111	90		265
	Knowledge/Technology Transfer Activities - Target	2				2
	Knowledge/Technology Transfer Activities - Progress	19	82	27		128

Outcomes/Impacts

		2012-13 with Adjustments	2014-15 with Adjustments	2016	2017-20	Total
All Projects	Leveraged Funds Amount (millions) - Target	$12.00				$12.00
	Leveraged Funds Amount (millions) - Progress	$3.43	$20.31	$9.96		$33.70
	Leveraged Funds Replicated (millions) - Target				$9.60	$9.60
	Leveraged Funds Replicated (millions) - Progress	$0.00	$0.00	$0.00		$0.00
	Peak Load Electric Generation Replicated (MW) - Target				2.40	2.40
	Peak Load Electric Generation Replicated (MW) - Progress	0.00	0.00	0.00		0.00
	Electric Generation Replicated (GWh) - Target				14.64	14.64
	Electric Generation Replicated (GWh) - Progress	0.00	0.00	0.00		0.00
	Primary Energy Savings Replicated (MMBtu) - Target				19,032	19,032
	Primary Energy Savings Replicated (MMBtu) - Progress	0	0	0		0

3.1.3.2 CHP Performance Program

The CHP Performance Program funds installations of CHP systems using energy, summer peak demand, efficiency, and environmental performance-based payments. The program funds clean, efficient, cost effective, gas-fired systems using site-specific designs. In accordance with the PSC Order, systems are required to meet a minimum fuel conversion efficiency of 60% and a maximum of 1.6 pounds/MWh of NO_x emissions.[27] To quantify the performance-based payments, the program applies rigorous, multi-year system performance measurements, which is a groundbreaking approach for energy efficiency program administrators.

Additional incentives are geared toward projects that:

- Offer greater potential value to the distribution system.
- Operate at higher overall efficiency levels.
- Are located at critical infrastructure, including facilities of refuge.

Additional incentives for projects that offer greater potential value to the distribution system will initially be limited to the Con Edison service territory.

The following key program activities and accomplishments were performed during this reporting period:

- Various projects have financial partnerships with the New York Green Bank, the Dormitory Authority of the State of New York, as well as the New York City Energy Efficiency Corporation. Such arrangements have bridged financing gaps for applicants who seek an opportunity in replacing existing infrastructure with cleaner, more efficient CHP systems thus generating substantial energy and greenhouse gas savings throughout the lifetime of their equipment.
- Four projects, representing over 16MW of installed nameplate capacity, have received interconnection approvals and are nearing completion of commissioning. As they prepare for their respective measurement and verification periods, the aggregated peak load reduction commitments exceed 6MW.

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[27] PSC. Case 07-M-0548 - Proceeding on Motion of the Commission Regarding an Energy Efficiency Portfolio Standard and Case 10-M-0457 – In the Matter of the System Benefits Charge IV. Issued and effective December 17, 2012.

Table 3-8 shows performance milestones and results for the CHP Performance Program through December 31, 2016. Outputs/Leading Indicators measure immediate results; Outcomes/Impacts measure achievements. Energy savings reported in Table 3-8 are program-reported; evaluation activities have not yet been conducted on these programs. Future reports will present findings from those studies as they are finalized. Project count, peak load demand, electric generation, and primary energy savings targets are established for projects installed through a particular time period. Progress for project count, peak load demand, electric generation, and primary energy savings refers to the cumulative savings that are installed, contracted, or accepted through a particular time period; e.g., T&MD savings for 2012–2013 are the energy and demand savings/generation achieved or expected as of December 31, 2013 as a result of activity from January 2012 through December 2013. Outputs/Leading Indicators measure immediate results; Outcomes/Impacts measure achievements. Blank cells indicate the lack of a target in a particular time period.

Table 3-8. CHP Performance Program Performance Milestones and Results through December 31, 2016

Outputs/Leading Indicators

		2012-13	2012-15	2012-16	2012-20
All Projects	Projects - Target		1	5	13
	Applications Approved but not yet Contracted - Progress	4	5	2	
	Projects Contracted but not yet Completed - Progress	0	8	10	
	Projects Completed - Progress	0	1	1	
	Total Progress	4	14	13	
All Projects	Peak Load Electric Generation (MW) - Target		2.00	8.00	20.00
	Peak Load Electric Generation Applications Approved but not yet Contracted (MW) - Progress	24.27	24.86	8.34	
	Peak Load Electric Generation Projects Contracted but not yet Completed (MW) - Progress	0.00	29.59	39.89	
	Peak Load Electric Generation Projects Completed (MW) - Progress	0.00	2.80	2.80	
	Total Progress	24.27	57.25	51.03	
All Projects	Electric Generation (GWh) - Target		10.00	60.00	160.00
	Electric Generation Applications Approved but not yet Contracted (GWh) - Progress	187.22	172.51	49.12	
	Electric Generation Projects Contracted but not yet Completed (GWh) - Progress	0.00	272.08	359.10	
	Electric Generation Projects Completed (GWh) - Progress	0.00	25.00	25.00	
	Total Progress	187.22	469.60	433.22	
All Projects	Primary Energy Savings (MMBtu) - Target		13,000	78,000	208,000
	Primary Energy Savings Applications Approved but not yet Contracted (MMBtu) - Progress	243,389	224,265	63,854	
	Primary Energy Savings Projects Contracted but not yet Completed (MMBtu) - Progress	0	353,709	466,828	
	Primary Energy Savings Projects Completed (MMBtu) - Progress	0	32,500	32,500	
	Total Progress	243,389	610,475	563,182	

Outcomes/Impacts

		2012-13 with Adjustments	2014-15 with Adjustments	2016	2017-20	Total
All Projects	Leveraged Funds Amount (millions) - Target	$30.00	$110.00	$60.00		$200.00
	Leveraged Funds Amount (millions) - Progress	$11.47	$119.95	$82.40		$213.82

3.2 Building Systems Initiative

Table 3-9 shows the Building Systems budget and financial status through December 31, 2016. Committed and spent funds are also shown as a percentage of the total 2012–2016 budget. The following sections describe progress for each area of this initiative.

Table 3-9. Building Systems Budget and Financial Status 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
Advanced Buildings					
Emerging Technology/Accelerated Commercialization	$14,366,925	$3,014,111	21%	$15,345,491	107%
Technology Development	$25,007,131	$8,715,286	35%	$17,049,766	68%
Demand Response	$9,019,519	$4,324,680	48%	$9,019,519	100%
Total 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%
Grand Total - Building Systems Initiatives	***$58,179,539***	***$20,441,365***	***35%***	***$50,650,740***	***87%***

* 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.

3.2.1 Advanced Building Technologies

3.2.1.1 Emerging Technology/Accelerated Commercialization (ETAC) – Buildings

The ETAC Buildings component is employs a deliberate approach to accelerating commercial introduction of emerging or underused building technologies and strategies. ETAC will serve both as a feeder effort to support New York State clean energy programs and to encourage market adoption without additional ratepayer support. This effort focuses on three market sectors: commercial/institutional, multifamily and residential.

ETAC-Commercial/Institutional

NYSERDA's ETAC-CI program is targeted to technology developers and owners of multiple buildings wishing to gain independent validation of performance for a product, technology, or approach that is commercially available, yet not in widespread use, and accelerate market acceptance. Projects receive a NYSERDA-funded performance measurement and verification (M&V) study tailored to each project. Performance validation considers factors such as energy savings and other benefits, and pathways to overcome market challenges. Project results and validated performance information is shared through targeted, deliberate outreach to the market, other New York Program Administrators, and Department of Public Service staff. Support is offered through both competitive and open enrollment solicitations. The ETAC-CI open enrollment program, launched in May 2013, consists of two program tracks: Energy Performance Validation and Focused Demonstrations. Projects in the Focused Demonstration track receive NYSERDA funding to support installation and project costs, but must fall within one of NYSERDA's identified priority categories of technologies or approaches and provide prior independently verified performance data.

The following key program activities and accomplishments were performed during this reporting period:

- Although NYSERDA's ETAC-C/I program offering closed effective December 31, 2015, several focused demonstration applications were received and are still under review.

ETAC-Multifamily

The goal of this program is to identify commercially available energy efficiency methodologies, technologies, or strategies that are commercially available, but under-used in the multifamily market and to address the market barriers preventing their broader adoption. This goal will be accomplished through selected projects that will demonstrate the technologies or strategies, identify barriers to their implementation, and develop strategies to address identified barriers. Project contractors will transfer technology via a combination of published papers and presentations.

The following key program activities and accomplishments were performed during this reporting period:

- All three contractors have submitted, and had approved, the M&V plan for their ETAC projects.
    - Two Contractors completed project installation.
        - The Centralized Domestic Hot Water Controls project is now reporting savings.
        - The Supply Side Steam Orifice Plates project will report savings at the end of the 2016-2017 heating season.
    - The LED Lighting and Controls project installation is anticipated to begin spring 2017.

ETAC-Residential

ETAC-Residential targets the low-rise residential market, typically buildings of three stories in height or fewer above-grade. ETAC-RES demonstration projects are intended to validate improved energy efficiency performance under real-world conditions, overcome current market barriers and accelerate market uptake of proven, but underutilized, energy-saving technologies. The three current projects are focused on LED lighting. The subsequent solicitation under ETAC-RES focused on high-efficiency HVAC equipment.

The following key program activities and accomplishments were performed during this reporting period:

- Lighting systems and monitoring equipment were installed at all of the 18 demonstration sites under Program Opportunity Notice (PON) 2752.
- Eight of the sites have completed the M&V phase and data acquisition equipment has been removed and final energy usage and savings data has been compiled for five of those sites.
- PON 3127 Emerging Technology Demonstration Projects—Residential HVAC was issued in January 2016. Eligible technologies under this solicitation include air-source and ground-source heat pumps, and low-capacity natural gas furnaces. Of the eight proposals that were received on April 21, 2016, five demonstration projects were approved for $1,806,860 in cost-share funding. Contracts for demonstrations and M&V are under development.

Table 3-10 shows performance milestones and results for the ETAC Program through December 31, 2016. Outputs/Leading Indicators measure immediate results; Outcomes/Impacts measure achievements. Energy savings reported in Table 3-10 are program-reported; evaluation activities have not yet been conducted on these programs. Future reports will present findings from those studies as they are finalized. Project count, peak load demand, electric generation, and primary energy savings targets are established for projects installed through a particular time period. Progress for project count, peak load demand, electric generation, and primary energy savings refers to the cumulative savings that are installed, contracted, or accepted through a particular time period; e.g., T&MD savings for 2012–2013 are the energy and demand savings/generation achieved or expected as of December 31, 2013 as a result of activity from January 2012 through December 2013. Blank cells indicate the lack of a target in a particular time period.

Table 3-10. Emerging Technology/Accelerated Commercialization Performance Milestones and Results through December 31, 2016

Outputs/Leading Indicators

		2012-13	2012-15	2012-16	2012-20
All Projects	Projects - Target	1	6	7	7
	Applications Approved but not yet Contracted - Progress	0	1	8	
	Projects Contracted but not yet Completed - Progress	0	13	17	
	Projects Completed - Progress	1	4	5	
	Total Progress	1	18	30	
All Projects	Peak Load Reduction (MW) - Target	0.55	1.01	1.01	1.01
	Peak Load Reduction Applications Approved but not yet Contracted (MW) - Progress	0.00	0.02	0.95	
	Peak Load Reduction Projects Contracted but not yet Completed (MW) - Progress	0.00	1.10	1.60	
	Peak Load Reduction Projects Completed (MW) - Progress	0.00	0.25	0.25	
	Total Progress	0.00	1.36	2.80	
All Projects	Energy Savings (GWh) - Target	2.00	4.62	4.62	4.62
	Electric Savings Applications Approved but not yet Contracted (GWh) - Progress	0.00	0.07	1.82	
	Electric Savings Projects Contracted but not yet Completed (GWh) - Progress	0.00	15.94	17.83	
	Electric Savings Projects Completed (GWh) - Progress	0.00	0.75	0.75	
	Total Progress	0.00	16.76	20.41	
All Projects	Primary Energy Savings (MMBtu) - Target	5,000	34,320	34,320	34,320
	Primary Energy Savings Applications Approved but not yet Contracted (MMBtu) - Progress	0	0	10,952	
	Primary Energy Savings Projects Contracted but not yet Completed (MMBtu) - Progress	0	75,684	73,479	
	Primary Energy Savings Projects Completed (MMBtu) - Progress	1,053	1,614	16,821	
	Total Progress	1,053	77,297	101,252	

		2012-13 with Adjustments	2014-15 with Adjustments	2016	2017-20	Total
All Projects	Stakeholder Engagements - Target	6				6
	Stakeholder Engagements - Progress	20	5	0		25
	Knowledge/Technology Transfer Activities - Target	8	9			17
	Knowledge/Technology Transfer Activities - Progress	0	7	0		7

Outcomes/Impacts

		2012-13 with Adjustments	2014-15 with Adjustments	2016	2017-20	Total
All Projects	Leveraged Funds Amount (millions) - Target	$1.00	$1.86			$2.86
	Leveraged Funds Amount (millions) - Progress	$0.08	$4.45	$2.88		$7.41
	Leveraged Funds Replicated (millions) - Target				$9.24	$9.24
	Leveraged Funds Replicated (millions) - Progress	$0.00	$0.00	$0.00		$0.00
	Peak Load Reduction Replicated (MW) - Target				3	3
	Peak Load Reduction Replicated (MW) - Progress	0	0	0		0
	Energy Savings Replicated (GWh) - Target				13	13
	Energy Savings Replicated (GWh) - Progress	0	0	0		0
	Primary Energy Savings Replicated (MMBtu) - Target				101,992	101,992
	Primary Energy Savings Replicated (MMBtu) - Progress	0	0	0		0
	Market Adoption - Target			3		3
	Market Adoption - Progress	0	0	0		0

3.2.1.2 Technology Development

Under the Technology Development area, NYSERDA will undertake targeted building technology development activities that address the technical and economic barriers and opportunities for new or emerging products. As a complement to Technology Development, NYSERDA plans to establish an Advanced Building Consortium to guide and conduct targeted high priority technology development and demonstration projects and to help accelerate the introduction of emerging technologies to New York State markets.

The following key program activities and accomplishments were performed during this reporting period:

- Ephesus Lighting received NYSERDA funding to develop LED lighting for sporting arenas that can save over 200,000 kWh annually compared conventional lighting approaches. This technology's success led to its installation at Super Bowl XLIX, and many other US sports arena. Ephesus success also resulted in it being acquired by Eaton Corp. Eaton's worldwide sales force and other resources are helping Ephesus go global. Ephesus first overseas customer for its LED lights was the Rod Laver Arena in Melbourne, Australia, the main venue for the Australian Open in tennis.
- Steven Winter Associates completed a study that found sealing elevator shafts in mid- and high-rise buildings can save an average of $3,000 annually. The NYC Mayor's Office of Sustainability has since identified this measure as one of several strategies for existing buildings it will support with new codes or local laws to achieve its 80 x 50 commitment. Urban Green has estimated that if this measure is implemented on 4,000 foot tall apartment buildings in NYC, it will cut greenhouse gas emissions by 30,000 metric tons and save over $11 million every year.

Market Insights Team (formerly Behavior Research Program)

NYSERDA's Market Insights Team works with Action Research, Inc. (Action Research), Behavioral Ideas Lab (ideas42), Research Into Action (RIA), and clean energy programs in New York State to design, implement, and evaluate clean energy pilots that integrate behavioral strategies to improve clean energy program outcomes. The behavior research pilots are documented and shared with the public in public presentations, case study reports, and published articles. Funding to demonstrate successful pilot interventions at larger demonstration scale was allocated to three demonstration projects through NYSERDA's Behavior Demonstration Program (PON 2646). These projects are under contract development.

The following key program activities and accomplishments were performed during this reporting period:

- Under RFP 3072 funding, ideas42 prioritized three of NYSERDA's10 strategies identified during the first half of the year, and began planing the design of the three pilots, with the aim of incorporating behavioral strategies into existing NYSERDA programs, or integrating such strategies in a way to increase impact in certain market sector, including the low and moderate income segent of the population. The three pilots are currently under development with launch dates ranging from Q2 to Q4 2017. Separate contracts under this RFP were completed with KEMA (now DNG VL) (for independent evaluation services) and Action Research (for behavior design services). KEMA is providing evaluation oversight services for the pilots being developed by ideas42.
- Under PON 2631 funding, 11 behavior research pilots were contracted, of which three behavior pilots were completed, five are being implemented; and three were terminated for lack of viable implementation partners.
    - Fraunhofer USA, Inc. successfully influenced metered apartment dwellers in the Capital District Region to use customized programmable thermostat set points to promote winter heat savings with greater than 36% compliance
    - Clarkson University used real-time end-us energy feedback separately and in conjunction with a motivational workshop to successfully influence student residents of campus dorm suites to use 20% less hot water and 21% less electricity, and to feel more intrinsically connected to the environment
    - Rensselaer Polytechnic Institute's Lighting Research Center tested dynamic (changing) electronic messaging to influence office workers to conserve electricity used for lighting, but this interventionwas unsuccessful in changing office workers' lighting-related behaviors
    - CUNY Institute for Urban Systems Building Performance Lab completed deployment of a behavior pilot using a building management software (LogCheck) to influence building managers to perform routine diagnostic boilder checks (the evaluation will be completed Q1 2017)
    - Texas A&M is using choice architecture to determine the optimal number and relative characteristics of renewable power options to influence residential customers to "green up" their electricity purchases (the evaluation will be completed Q4 2017)
    - Ithaca College is testing whether a home visit by an energy educator will build trust in the home energy assessment and lead to greater conversion rates (the evaluation will be completed Q4 2017)
    - Brockport Research Institute =is testing building energy report cards with normative feedback separately and in conjunction with a social event to influence co-op board members of Downstate co-op buildings to convert common area lighting to light-emitting diodes (LEDs) (the evaluation will be completed Q3 2017).

- A behavior pilot designed by Action Research successfully influenced non-metered apartment dwellers who do not pay utilities to reduce summer window air-conditioning (AC) usage by 5% in a Downstate multifamily building equipped with wireless energy monitors by providing apartment residents normative feedback on their summer electricity usage compared to their similar neighbors' electricity usage and easy tips to reduce AC usage.

Table 3-11 shows performance milestones and results for the Technology Development Program through December 31, 2016. Outputs/Leading Indicators measure immediate results; Outcomes/Impacts measure achievements. Anticipated achievements and results are estimates based on savings per program dollar invested in projects. Blank cells indicate the lack of a target in a particular time period. Signed contracts and completed projects are for clean power technology projects. Supported companies are clean energy companies. Products and technologies commercialized are clean power technologies that have reached commercial availability. Product revenue includes commercial sales of supported clean power technologies. Leveraged funds include both cofunding and outside investment for clean power technology projects.

Table 3-11. Advanced Buildings Technology Development Performance Milestones and Results through December 31, 2016[28,29]

Outputs/Leading Indicators

		2012-13 with Adjustments	2014-15 with Adjustments	2016	2017-20	Total
All Projects	Projects Contracted - Target	23	11			34
	Projects Contracted - Progress	25	48	8		81
	Projects Completed - Target		23	11		34
	Projects Completed - Progress	0	14	12		26
	Supported Companies - Target	12	5			17
	Supported Companies - Progress	19	42	8		69

Outcomes/Impacts

		2012-13 with Adjustments	2014-15 with Adjustments	2016	2017-20	Total
All Projects	Leveraged Funds Amount (millions) - Target	$7.00	$3.40			$10.40
	Leveraged Funds Amount (millions) - Progress	$36.24	$82.15	$4.89		$123.29
	Products and Technologies Commercialized - Target		1	3		4
	Products and Technologies Commercialized - Progress	2	4	0		6
	Product Revenue Amount (millions) - Target			$8.00	$53.42	$61.42
	Product Revenue Amount (millions) - Progress	$0.44	$14.28	$0.00		$14.72

28 Adjustments made to data in previously reported periods is due to lagged data and/or QA/QC.

29 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.

3.2.1.3 Enabling Demand Response and Load Management

Under the Enabling Demand Response (DR) Load Management Program, NYSERDA helped increase participation and reliability of performance in utility and New York State Independent System Operator (NYISO) programs. These outcomes suppress wholesale energy costs, reduce congestion costs, increase reliability, and provide other benefits. The development of enabling DR technologies and new demand management models through this program has increased the technical potential of DR in New York State.

The Existing Facilities Program (PON 1219) is no longer offering open-enrollment incentives for DR projects across New York State as of September 1, 2015.

SBC IV and Indian Point Energy Center Reliability Contingency Plan funding is no longer available for new DR projects, but existing projects are still in the process of implementation and benefits from these projects continue to accrue.

The following key program activities and accomplishments were performed during this reporting period:

- Six demand response enablement projects have been implemented that save 805 kW, representing approximately $1,000,000 in private investment.

Table 3-12 shows performance milestones and results for the Demand Response Program through December 31, 2016. Energy savings reported in Table 3-12 are program-reported; evaluation activities have not yet been conducted on these programs. Future reports will present findings from those studies as they are finalized. Outputs/Leading Indicators measure immediate results; Outcomes/Impacts measure achievements. Blank cells indicate the lack of a target in a particular time period.

Table 3-12. Demand Response Performance Milestones and Results through December 31, 2016

Outputs/Leading Indicators

		2012-13	2012-15	2012-16	2012-20
All Projects	MW Registered - Target	9.00	23.00	41.00	44.62
	MW Registered Applications Approved but not yet Contracted (MW) - Progress	2.05	1.44	0.01	
	MW Registered Projects Contracted but not yet Completed (MW) - Progress	5.44	7.84	3.16	
	MW Registered Projects Completed (MW) - Progress	40.22	115.59	126.17	
	Total Progress	47.71	124.87	129.34	

Outcomes/Impacts

		2012-13 with Adjustments	2014-15 with Adjustments	2016	2017-20	Total
All Projects	MW Registered Evaluated - Target				22.31	22.31
	MW Registered Evaluated - Progress	0.00	0.00	0.00		0.00

3.2.1.4 Advanced Energy Codes and Standards

The Advanced Codes and Standards Initiative consists of two components: a set of code activities targeted at the commercial and residential building sectors in New York State, and a set of standards activities directed at influencing State and national appliance and equipment standards and specification setting processes for various equipment types. Activities within these areas are described in the following sections.

3.2.1.5 Annual Statewide Compliance Assessments

Statewide compliance assessment studies provide a means to track compliance trends associated with changing codes and standards. These assessment studies help identify where program intervention may be needed. Compliance assessments will occur as a phased effort.

The following key program activities and accomplishments were performed during this reporting period:

- NYSERDA began in earnest the data collection phase of a Delphi Panel to establish a baseline Energy Code compliance level as of December 2014. Unlike traditional compliance assessment approaches which are comparatively costly and time consuming, and produce varying degrees of reliability, the Delphi Panel approach assembles a group of stakeholders and industry professionals representing building design, construction, and enforcement markets to draw from their experience with commercial and residential building construction to reach an agreed upon, qualitative compliance estimate. The Delphi Panel went through three rounds of interviews designed to elicit feedback on compliance in New York State. The results of the first Delphi Panel are available in the report titled *Advanced Energy Codes Impact Evaluation Interim Report: First Delphi Process Results*, and were summarized in Appendix C of the June 30, 2016 NYSERDA Technology and Market Development Program Semiammual Report. The Delphi Panel process will be repeated in 2017 or 2018 to determine how compliance levels changed.

3.2.1.6 Development and Delivery of Advanced Training and Tools

Training to support new and advanced codes and standards is critical, particularly at points of adoption. Training efforts will build on those developed using American Recovery and Reinvestment Act of 2009 (ARRA) funds, with new or enhanced approaches and topics that address areas of low compliance or code change.

The following key program activities and accomplishments were performed during this reporting period:

- Progress made to finalize the State's first above-minimum Energy Code, titled NYStretch-Energy. NYStretch-Energy is modeled on changes anticipated in the 2018 International Energy Conservation Code and, depending on type of construction and chosen compliance path, 8-14% more stringent than current state Energy Code. NYSERDA will conduct a 30-day public comment period to solicit feedback from the market on NYStretch in Quarter 1, 2017.

3.2.1.7 Technical Support, Studies, and Resources

Technical consulting and other research firms will be competitively selected to provide technical and administrative support Advanced Codes and Standards program efforts, including new strategies to improve compliance and enforcement.

3.2.1.8 Pilots and Expanded Implementation Assistance

Pilots testing strategies for improved code compliance and enforcement strategies, and stretch and green planning efforts were developed for competitive selection. NYSERDA also will support the construction and code enforcement communities by strategically providing implementation assistance to increase compliance with new and advanced codes and standards.

Table 3-13 shows performance milestones and results for the Advanced Energy Codes and Standards Program through December 31, 2016. Outputs/Leading Indicators measure immediate results; Outcomes/Impacts measure achievements. Energy savings reported in Table 3-13 are program-reported; evaluation activities have not yet been conducted on these programs. Although NYSERDA anticipates making progress toward increased energy savings through the activities completed to date, the results have not yet been studied and quantified. Future reports will present findings from those studies as they are finalized. Blank cells indicate the lack of a target in a particular time period. The training sessions are for new or expanded code training modules. The program support solicitations will competitively hire consulting and market research firms to provide program support. The support solicitations are for pilots and program implementation assistance.

Table 3-13. Advanced Energy Codes and Standards Performance Milestones and Results through December 31, 2016

Outputs/Leading Indicators

		2012-13 with Adjustments	2014-15 with Adjustments	2016	2017-20	Total
Code compliance efforts	Annual Code Compliance Assessments - Target	2	1			3
	Annual Code Compliance Assessments - Progress	1	1	1		3
	Training Sessions - Target	6	1			7
	Training Sessions - Progress	0	7	7		14
	Code Requirement Trainees - Target	7,000	1,850			8,850
	Code Requirement Trainees - Progress	0	2,411	3,863		6,274
Equipment and appliance standards efforts	State/Federal Standards Conformance Assessments - Target	1	1			2
	State/Federal Standards Conformance Assessments - Progress	0	0	0		0
All Projects	Program Support Solicitations - Target	1				1
	Program Support Solicitations - Progress	0	0	0		0
	Implementation Support Solicitations - Target	1				1
	Implementation Support Solicitations - Progress	1	2	0		3

Outcomes/Impacts

		2012-13 with Adjustments	2014-15 with Adjustments	2016	2017-20	Total
Code compliance efforts	Energy Savings Installed (GWh) - Target	84.00	140.00	90.00	58.29	372.29
	Energy Savings Installed (GWh) - Progress	0.00	0.00	0.00		0.00
	Energy Savings Installed (MMBtu) - Target	575,000	1,057,000	726,000	545,390	2,903,390
	Energy Savings Installed (MMBtu) - Progress	0	0	0		0
	Peak Load Reduction Installed (MW) - Target	18.00	28.00	19.00	11.11	76.11
	Peak Load Reduction Installed (MW) - Progress	0.00	0.00	0.00		0.00
Equipment and appliance standards efforts	Energy Savings Installed (GWh) - Target		5.00	51.00	154.04	210.04
	Energy Savings Installed (GWh) - Progress	0.00	0.00	0.00		0.00
	Peak Load Reduction Installed (MW) - Target		2.00	23.00	74.12	99.12
	Peak Load Reduction Installed (MW) - Progress	0.00	0.00	0.00		0.00

3.3 Clean Energy Infrastructure Initiatives

Table 3-14 shows the Clean Energy Infrastructure budget and financial status through December 31, 2016. Committed and spent funds are also shown as a percent of the total 2012–2016 budget. Progress for each area of this initiative is described in following sections.

Table 3-14. Clean Energy Infrastructure Budget and Financial Status through December 31, 2016

	2012-2016 Budget [a]	Spent Funds	Percent of 2012-2016 Budget Spent	Committed Funds [b,c]	Percent of 2012-2016 Budget Committed
Market Development					
Market Research	$4,435,370	$3,953,629	89%	$4,274,139	96%
Market Pathways	$32,694,001	$28,370,009	87%	$31,341,068	96%
Education/Behavior	$7,126,371	$5,452,235	77%	$7,066,160	99%
Total Market Development	*$44,255,742*	*$37,775,873*	*85%*	*$42,681,367*	*96%*
Clean Energy Business Development					
Innovation Entrepreneurial Capacity	$21,356,497	$14,355,019	67%	$21,273,220	100%
Market Intelligence	$988,978	$902,293	91%	$960,663	97%
Direct Support for Business	$2,350,975	$1,587,264	68%	$2,350,975	100%
Marketing	$590,804	$587,203	99%	$590,804	100%
Total Clean Energy Business Development	*$25,287,254*	*$17,431,779*	*69%*	*$25,175,662*	*100%*
EMEP	$16,428,580	$7,914,934	48%	$16,419,997	100%
Workforce Development					
Renewable Energy/Advanced Technologies	$5,843,483	$4,705,777	81%	$5,400,447	92%
Energy Efficiency	$10,102,212	$7,572,279	75%	$10,060,300	100%
Total Workforce Development	*$15,945,695*	*$12,278,056*	*77%*	*$15,460,747*	*97%*
Grand Total - Clean Energy Infrastructure	***$101,917,271***	***$75,400,642***	***74%***	***$99,737,773***	***98%***

* 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.

3.3.1 Market Development

The Market Development initiatives help to create the foundation for long-term changes in the market for the delivery of products and services that address energy efficiency and the adoption of renewable energy technologies. Strategies address the supply chain, consumer behavior, market barriers, and education. Market Development activities identify new market opportunities and keep the supply chain informed about technological innovations. They also provide the technical tools, resources, and training necessary to promote energy efficiency and renewable options to consumers.

3.3.1.1 Market Research

The Market Research component identifies market and institutional barriers to technology and product adoption, obtains critical early stage information and insights to guide investment decisions, and further advances the reach of T&MD and EEPS programs and other public policy goals. Its goal is to amass specific market intelligence and identify program opportunities to increase implementation efficiency and effectiveness. Since the start of the program in 2012, 20 projects have been completed, covering a variety of technologies and topics including lighting, data centers, solar, and NYSERDA-wide corporate strategy. These various studies have offered insights on how NYSERDA can best position its programs and overall organizational structure to advance key energy efficiency and renewable energy technologies.

The following key program activities and accomplishments were performed during this reporting period:

- NYSERDA completed additional studies to inform ongoing CEF and REV activities, including an inventory of clean energy organizations in New York State.

Table 3-15 shows performance milestones and results for the Market Research Program through December 31, 2016. Outputs/Leading Indicators measure immediate results; Outcomes/Impacts measure achievements. Blank cells indicate the lack of a target in a particular time period.

Table 3-15. Market Research Performance Milestones and Results through December 31, 2016

Outputs/Leading Indicators

		2012-13 with Adjustments	2014-15 with Adjustments	2016	2017-20	Total
All Projects	Projects Completed - Target	2	1	1		4
	Projects Completed - Progress	3	13	4		20

3.3.1.2 Market Pathways

The Market Pathways component works across the supply chain and sectors to promote the stocking, specification, sales, installation, maintenance, and use of energy-efficient products and strategies. NYSERDA provides tools, business strategies, and business and marketing materials to manufacturers, suppliers, distributors, retailers, service providers, designers, specifiers, contractors, and builders. The following sections describe progress in key areas.

Products Team

The Products Team conceptualizes, drives, and implements strategies and interventions that accelerate the adoption of emerging or underutilized energy-relevant products by working to develop supply chains and service networks. Interventions include: support for product availability in relevant channels, support for channel and customer awareness, and support for capacity development in key service networks (e.g., installation and maintenance).

During this reporting period, the products team continued to investigate and develop its strategies around three emerging and underutilized technologies: air source heat pumps (ASHPs), home energy management systems (HEMS) and advanced rooftop units (ARTUs). Strategies in the promotion of ASHPs and ARTUs made the greatest advancements. The Products team continued to research the opportunities in NYS as well as communicating extensively with stakeholders on the key stall points and barriers that prevented those stakeholders from moving these markets in NYS.

The team also continued to develop project components of NYSERDA's agreement with Vermont Energy Investment Corporation (VEIC). This project was awarded under NYSERDA's PON 3125 "Accelerating Availability of Targeted Residential Products" and allows for VEIC to implement a residential upstream ASHP pilot in the Con Edison (Con Ed) utility service territory. This pilot seeks to influence ASHP manufacturers and distributors with various approaches while complementing downstream ASHP rebates offered by Con Ed. The launch of the pilot is planned for the first quarter of 2017, with a final evaluation report anticipated for the first quarter of 2018.

Business Partners Programs

The Business Partners Programs were designed to accelerate the adoption of energy efficiency products and services within the commercial sector. Activities help service providers (contractors, vendors, installers, distributors, and designers) in the commercial midmarket supply chain develop business models to address the primary factors affecting their customers' operations and energy decisions. New market opportunities are identified and the supply chain is informed of technological innovations and provided the technical tools, resources, and training necessary to promote profitable energy efficiency options to their customers.

Technical and sales training is provided for the network of service providers (Business Partners) focusing on quality and efficient design practices, and maintenance, repair and replacement services for energy products in commercial and industrial buildings. Tools and resources are made available for Business Partners to design projects, demonstrate cost-benefit information, and help customers develop and implement energy efficiency plans. These tools and resources enable Business Partners to differentiate their business models within the marketplace, make it easier to demonstrate the value of clean energy solutions, increase customer confidence in project benefits, improve project performance, streamline the procurement of energy services, and help integrate energy efficiency information into the decision making processes for buyers and sellers. Incentives are provided to help Business Partners overcome risk, understand new technologies, and encourage the expansion of new clean energy solutions for their customers.

Business Partner programs focused on commercial lighting design, rooftop HVAC service and maintenance, and motor inventories. ICF Resources is the implementation contractor for the Commercial Lighting Business Partners Program. The core elements of the lighting program provide educational and technical support and resources to Lighting Business Partners (lighting contractors, distributors, manufacturer representatives, architects, engineers, and energy service companies [ESCOs]) that incorporate lighting quality elements into their interior energy-efficient lighting projects. DNV GL is the implementation contractor for the HVAC Business Partners Program that provides HVAC Business Partners (primarily commercial HVAC firms and refrigeration firms) with quality maintenance strategies and tools in accordance with ASHRAE/ACCA Quality Maintenance Standard 180. Partners learn to evaluate and upgrade commercial roof top units (RTU) beyond what is typically offered as standard practice. There are no updates for this program due to the Commercial Lighting and HVAC Program Business Partners programs closing effective December 31, 2015.

The Motors Program was intended to focus on providing educational and technical support to NYSERDA's Partners (motor suppliers, repair shops, electrical companies, manufacturers, and distributors). However, the program was discontinued prior to market launch.

Innovative Strategies

Innovative Strategies supported the identification and demonstration of sector-specific approaches, tools, and strategies for demonstrating and verifying energy savings and to broadcast the energy efficiency message to building owners, operators, and the financial sector. Efforts were standardized where appropriate, and credibility was provided to approaches that reduced barriers to financing energy efficiency projects not addressed by EEPS programs.

Table 3-16 shows performance milestones and results for the Market Pathways Program through December 31, 2016. Energy savings reported for the Business Partners program in Table 3-16 are program-reported; evaluation activities have not yet been conducted on these programs. The completed evaluation factors for the efficiency products with Energy $mart Partners have been applied to the energy savings reported for the Product Partners program. Outputs/Leading Indicators measure immediate results; Outcomes/Impacts measure achievements. Blank cells indicate the lack of a target in a particular time period.

Table 3-16. Market Pathways Performance Milestones and Results through December 31, 2016

Outputs/Leading Indicators

		2012-13 with Adjustments	2014-15 with Adjustments	2016	2017-20	Total
Market Pathways - RES	Energy Smart Product Partner Participants - Target	732.0				732.0
	Energy Smart Product Partner Participants - Progress	610.0	281.0	0.0		891.0
	Product Partner Trainees - Target	200.0	95.0			295.0
	Product Partner Trainees - Progress	130.0	353.0	0.0		483.0
Market Pathways - Midstream Support	Midstream Partner Participants - Target	301				301
	Midstream Partner Participants - Progress	95	341	0		436
	Midstream Partner Trainees - Target	375	230			605
	Midstream Partner Trainees - Progress	1,103	790	0		1,893
	Factsheets - Target	4	1			5
	Factsheets - Progress	0	0	0		0
	Seminars/Webinars - Target	4	1			5
	Seminars/Webinars - Progress	12	12	0		24
Market Pathways - C/I	Innovative Energy Efficiency Investment Strategy Participants - Target	18				18
	Innovative Energy Efficiency Investment Strategy Participants - Progress	12	12	0		24
	EAL Evaluations - Target	4	2			6
	EAL Evaluations - Progress	0	0	0		0
	EAL Seminars/Webinars - Target	4	2			6
	EAL Seminars/Webinars - Progress	48	0	0		48
	Factsheets - Target	3	1			4
	Factsheets - Progress	0	0	0		0
	Seminars/Webinars - Target	4	2			6
	Seminars/Webinars - Progress	0	0	0		0

Outcomes/Impacts

		2012-13 with Adjustments	2014-15 with Adjustments	2016	2017-20	Total
Market Pathways - RES	Energy Savings Installed (GWh) - Target	50.00	23.75			73.75
	Energy Savings Installed (GWh) - Progress	5.91	4.30	0.00		10.21
	Energy Savings Installed (MMBtu) - Target	254,000	274,050			528,050
	Energy Savings Installed (MMBtu) - Progress	142,610	94,132	0		236,742
Market Pathways - Midstream Support	Energy Savings Installed (GWh) - Target	15.00	6.83			21.83
	Energy Savings Installed (GWh) - Progress	4.64	62.74	0.00		67.38
	Market Adoption - Target	1	1			2
	Market Adoption - Progress	0	0	0		0
Market Pathways - C/I	Projects Completed - Target	5	7			12
	Projects Completed - Progress	0	7	1		8

3.3.1.3 Education to Change Behavior and Influence Choices Component

Economic Development Growth Extension Program

The Economic Development Growth Extension (EDGE) Program is facilitated by Regional Outreach Contractors (ROCs) who perform outreach, education, and promotion of NYSERDA program opportunities to residents, businesses, institutions, and local governments across the State. Formerly known as the Energy $mart Communities Program, EDGE educates New Yorkers about the role that energy efficiency and renewable power can play in reducing energy costs and providing clean, reliable energy for homes, schools, and workplaces. The EDGE Program was designed to include support for Governor Andrew M. Cuomo's Regional Economic Development Council initiative by aligning the program territories geographically and providing direct support to advance the strategic priorities and regionally significant projects identified in each region. Through this alignment with the Regional Councils, NYSERDA provides a greater level of education and adoption of energy efficiency practices at the community level. NYSERDA contracted with the New York State Economic Development Council and Solar One, a team that includes regionally based economic development organizations to provide on-the-ground outreach support.

The following key program activities and accomplishments were performed during this reporting period:

- EDGE's emphasis moved away from promoting these SBC-specific programs to promoting opportunities for various new NYSERDA initiatives and other statewide opportunities. That outreach and marketing conducted by the Regional Outreach Contractors (ROCs) includes, but is not limited to, the following activities:
    - EDGE Program ROCs established new partnerships that led to referrals from these new relationships.
    - ROCs participated in public outreach events including the Consolidated Funding Application Workshops held across the State to support the efforts of the Regional Economic Development Council initiative.
    - Instrumental in identifying municipal contacts for interviews conducted for the Governor's Community Energy Deployment Working Group, now known as the NYS Community Partnership (NYSCP). Conducted interviews and provided write-ups for the Working Group.
    - Assisted in staffing the first NYSCP workshop held in White Plains, NY.
    - Instrumental in providing contacts to invite to the NY-Prize Statewide Energy Tour workshops as well as marketing the NY-Prize RFP 3044 for Round 1. Held webinars to connect potential projects with consultants.
    - Provided contacts with banks and invited them to the NY Green Bank Road Show.
    - Established relationships with Constituency-Based Organizations to assist in establishing Community Solarize Programs for the NY-Sun initiative.
- Conducted outreach to public schools in the various regions to encourage them to enlist in the K-Solar program.

- Promoted the PV Trainers Network workshops to partners and contacts in the appropriate regions.
- New York City ROCs have been instrumental in planning workshops for and tours of CHP sites events, which lead to increased attendance in the programs' CHP Expos. These events have increased the demand for CHP in the Con Ed territory as well as Central New York, which had over 100 participants in the only event held Upstate and was promoted by the Central New York ROCs.

Behavioral Demonstrations

Projects selected under the Behavioral Demonstrations program will test the efficacy, persistence, and cost effectiveness of behavioral interventions designed to encourage consumers to use less energy and invest in energy efficiency services. Implementation contractors are partnered with utilities, and the utilities will specify metrics and cost effectiveness criteria that, if met, will compel them to invest in further expansion of these interventions without NYSERDA funding.

The following key program activities and accomplishments were performed during this reporting period:

- NYSERDA assessed the validity of the pilots upon which the proposed Behavioral Demonstrations projects were based and deemed that one of the pilots was invalid, which led to cancelling the related demonstration.
- NYSERDA contracted with organizations: Nexant, the Oversight & Evaluation Contractor for the demonstrations, and the Energy Improvement Corporation (EIC). The demonstration project is underway. Completed work plans include: a compilation of key indicators of success and how they will be measured, a data acquisition plan, an implementation plan, and an experimental design plan.
- NYSERDA has completed the contracting process with two other organizations (ThinkEco and Opower (now Oracle), both of which were also selected for funding by the Technical Evaluation Panel to implement behavioral demonstrations. The Opower demonstration is slated to launch in mid-May 2017, and the ThinkEco demonstration began began activities this past summer, with full implementation slated for summer 2017.

Low-Income Forum on Energy (LIFE)

The Low-Income Forum on Energy (LIFE) is the longest running statewide low-income energy dialogue in the United States. LIFE brings together a diverse range of parties committed to addressing the challenges and opportunities facing low-income New Yorkers as they seek safe, affordable, and reliable energy. Guided by a steering committee composed of State agencies, utilities, contractors, and community-based organizations, the forum undertakes several initiatives to increase awareness of low-income energy issues.

The following key program activities and accomplishments were performed during this reporting period:

- Began planning for the LIFE 2017 Regional Meetings, which will be held in seven locations around New York State in May 2017.

- Produced and distributed six electronic newsletters that include feature articles of interest to low-income energy stakeholders along with hyperlinked resources for readers to connect with further information. Each newsletter arrives in over 5,100 inboxes.
- Hosted six webinars on various topics including program updates, best practices, and consumer protections. On average, the webinars were attended by 45 individuals representing 32 organizations.
- Held three meetings of the LIFE Steering Committee (August 3, October 20, December 19) to plan for LIFE initiatives, share program information and discuss opportunities for collaboration.

Table 3-17 shows performance milestones and results for the Education/Behavior Program through December 31, 2016. Outputs/Leading Indicators measure immediate results; Outcomes/Impacts measure achievements. Blank cells indicate the lack of a target in a particular time period. Signed contracts represent the sponsorship of behavioral pilots. The meetings, workshops, and conferences are the sponsorship of annual LIFE conferences. The LIFE program anticipates sponsoring, planning, and supporting a total of seven LIFE conferences and regional meetings. Completed projects include completing and evaluating behavioral pilots.

Table 3-17. Education/Behavior Performance Milestones and Results through December 31, 2016

Outputs/Leading Indicators

		2012-13 with Adjustments	2014-15 with Adjustments	2016	2017-20	Total
All Projects	Projects Contracted - Target	5	1			6
	Projects Contracted - Progress	0	0	4		4
	Meetings, Workshops, Conferences - Target	2	2			4
	Meetings, Workshops, Conferences - Progress	1	1	1		3
	Community Partnership Participants - Target	250	158			408
	Community Partnership Participants - Progress	465	560	21		1,046

Outcomes/Impacts

		2012-13 with Adjustments	2014-15 with Adjustments	2016	2017-20	Total
All Projects	Projects Completed - Target		4	5		9
	Projects Completed - Progress	0	0	0		0

3.3.2 Clean Energy Business Development

3.3.2.1 Innovation/Entrepreneurial Capacity Building

There are three Proof-of-Concept Centers (POCC): New York University, in partnership with the City University of New York, and Columbia University, in partnership with Stony Brook University, Cornell NYC Tech, and Brookhaven National Laboratory, are co-branding the two programs as PowerBridgeNY. Another POCC is run through High Tech Rochester as NEXUS-NY. The mission of the POCCs is to accelerate the

translation of clean energy research into marketable products and services. This translation is primarily accomplished by fostering successful pre-startup companies. Generally, the next step for these companies is to participate in a business mentoring or incubation program. NYSERDA is investing approximately $5 million in seed money at each center over a five-year period. The centers are expected to operate independently after NYSERDA funding ends.

The objectives of the POCC initiative are to:

- Accelerate the commercialization of innovations out of research institutions and into the marketplace, particularly through startups.
- Early in the research and development phase, match emerging clean energy technologies with scalable commercialization potential, based on real market need, with the investment community.
- Establish sustainable regional innovation ecosystems of potential investors and entrepreneurs in clean energy technologies and solidify the POCC linkages to them.

The following key program activities and accomplishments were performed during this reporting period:

- Two NEXUS-NY teams were selected for awards as part of the 76West Clean Energy Business Plan competition.
- A team from the second NEXUS-NY cohort won a contract from the Bill and Melinda Gates Foundation.
- Two teams from the third NEXUS-NY cohort and one team from the second cohort interviewed and were encouraged to apply to the Shell Game Changer innovation program.
- As a spin-off from the PowerBridge-NY program, Columbia University is launching a Hacking f or Energy graduate course in January 2017. As of the application deadline at the end of 2016, industry hosts provided sevem problem statements that attracted 23 applications. Teams of four graduate students will work with an industry mentor in a Lean LaunchPad focused graduate course.
- As of the end of 2016, eight PowerBridge-NY teams received either private investment or non-NYSERDA grant funding to continue business and product development.

Emerging Clean Energy Business Development

The Clean Energy Business Incubator program was established in 2009 with funding from SBC III. The purpose of these incubators is to foster the viability and growth of the State's most promising cleantech startup companies. Most of these companies are still in the process of commercializing technologies and have yet to earn revenue from commercial operation and product sales. The six incubators are strategically located across the State from Buffalo to Long Island, and assist companies by providing ready access to investors, mentors, development partners, and commercialization resources.

The following key program activities and accomplishments were performed during this reporting period:

- Rochester Institute of Technology's Venture Creations incubator graduate ClearCove Systems, a Victor-based renewable energy company, received $400,000 from investors to commercialize its water treatment process that harvests organic matter from wastewater, providing energy and cost reductions in wastewater treatment processes.
- Stony Brook University's Clean Energy Business Incubator Program client ThermoLift, a Stony Brook-based clean energy company, raised an additional $3 million in private capital from investors to further develop its natural gas air-conditioner and heat pump technology that combines heating, air-conditioning, and water heating into a single appliance.
- New York Univeristy's ACRE incubator graduate Anellotech, a Pearl River-based clean energy company, secured its $1.5 million Series D investment from a new strategic investor to scale up production of its cost competitive renewable chemicals from nonfood biomass.

Table 3-18 shows performance milestones and results for the Innovation/Entrepreneurial Program through December 31, 2016. The metrics only reflect results from the incubators that received T&MD funding. Outputs/Leading Indicators measure immediate results; Outcomes/Impacts measure achievements. Blank cells indicate the lack of a target in a particular time period. Leverage funds include cofunding and outside investments to help clean energy businesses. Product revenue includes commercial sales of new and improved supported technologies. The following key program metrics and accomplishments have been tracked and achieved by companies working with the NYSERDA-sponsored incubators during this reporting period: Private capital raised, non-NYSERDA grants awarded, new commercial products developed, revenue generated, jobs created and retained, strategic partnerships formed, and mergers and acquisitions completed.

Table 3-18. Innovation/Entrepreneurial Milestones and Results through December 31, 2016[30,31]

Outputs/Leading Indicators

		2012-13 with Adjustments	2014-15 with Adjustments	2016	2017-20	Total
All Projects	Incubators or POCCS Participants - Target	65	90	50	30	235
	Incubators or POCCS Participants - Progress	29	76	13		118

Outcomes/Impacts

		2012-13 with Adjustments	2014-15 with Adjustments	2016	2017-20	Total
All Projects	Leveraged Funds Amount (millions) - Target	$40.00	$45.00	$2.00		$87.00
	Leveraged Funds Amount (millions) - Progress	$40.15	$83.35	$24.72		$148.22
	Products and Technologies Commercialized - Target	5	10	8		23
	Products and Technologies Commercialized - Progress	1	6	10		17
	Product Revenue Amount (millions) - Target	$2.50	$5.00	$4.10		$11.60
	Product Revenue Amount (millions) - Progress	$0.00	$0.00	$0.00		$0.00
	Businesses Graduated from Incubators - Target	36	36	18	4	94
	Businesses Graduated from Incubators - Progress	9	37	2		48
	FTEs Associated with Incubator Graduates - Target	108	108	54	12	282
	FTEs Associated with Incubator Graduates - Progress	185	124	14		323

3.3.2.2 Market Intelligence

New York State Clean Energy Technology Innovation Metrics

NYSERDA worked with SRI International to research and prepare a 2015 report update on clean energy technology metrics. To determine the metrics for the first report, focus groups involved nearly 100 individuals including entrepreneurs affiliated with clean tech startup companies, clean tech investors, executives, and other representatives of larger, more established technology companies, directors of clean tech incubators, representatives from clean tech industry consortia, universities conducting clean tech research, and other clean tech organizations. This second report tracks those same metrics three years later.

The second edition (2015) of the New York State Clean Energy Technologies Innovation Metrics report was posted on the NYSERDA website in April 2016. A survey was completed to understand user usage and additional reporting needs. The 2015 report added seven vignettes of New York State clean energy company success stories. See the report, infographic and factsheet at http://www.nyserda.ny.gov/Partners-and-Investors/Clean-Energy-Startups/NYS-a-National-Leader-in-Cleantech

30 Adjustments made to data in previously reported periods is due to lagged data and/or QA/QC.

31 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 3-19 shows performance milestones and results for the Market Intelligence Program through December 31, 2016. Outputs/Leading Indicators measure immediate results; Outcomes/Impacts measure achievements. Blank cells indicate the lack of a target in a particular time period. Signed contracts include creating annual benchmark reports on clean energy business and financial indicators for New York State. Website downloads support the dissemination of clean energy benchmark information.

Table 3-19. Market Intelligence Performance Milestones and Results through December 31, 2016

Outputs/Leading Indicators

		2012-13 with Adjustments	2014-15 with Adjustments	2016	2017-20	Total
All Projects	Projects Contracted - Target	2	1			3
	Projects Contracted - Progress	0	2	0		2
	Website Downloads - Target	100	195			295
	Website Downloads - Progress	0	109	67		176

3.3.2.3 Direct Support for Business Acceleration Program

NYSERDA's Entrepreneurs-in-Residence (EIR) program offers experienced entrepreneurial coaching to NYSERDA contractors and incubator clients. Some of the general outcomes and observations from the program show that companies struggle with customer delivery and engagement and the development of an overall business strategy. Most of these companies are founded by technical entrepreneurs who initially lack the business skills to bring a high-impact clean-energy product to market.

During 2016 the program continued placing experts with startup clean-energy companies who were moving into a new stage in their lifecycle, required a mentor to help them take advantage of unexpected opportunities such as a strategic partnership, or were confronting significant business challenges such as not enough funding. As this was happening the program was being reviewed and redesigned to provide critical services to more companies, change the types of engagements to expose more companies to the value of coaching and to provide shorter engagements for specific needs, and to reduce per engagement administrative time and cost. These changes are expected to be rolled out in 2017.

The New York Executive Clean Energy Leadership (NY EXCEL) program at Skidmore College and NY Clean Start at New York University's Advanced Diploma program target experienced business people with a concentrated course about the markets, financing models, permitting requirements, technology solutions, and other unique aspects of the cleantech industry necessary to start a successful clean energy business. The ultimate goals of NY EXCEL and NY Clean Start are to increase the number of clean energy entrepreneurs in the State, create well-paying jobs in New York communities, and provide solutions for addressing the long-term challenge of energy independence.

The following key program activities and accomplishments were performed during this reporting period:

- **NY EXCEL** (Skidmore College) completed its second cohort in with 16 students in January 2016. The course included visits to NYISO and a full-day visit to NYSERDA to learn about 14 energy segments and well as seminars by renewable experts, legal, and regulatory entities. The students also traveled around NYS for weekend classes and to visit companies and support centers in Syracuse, Saratoga, White Plains and New York City/Long Island, and Rochester.
- For the second cohort, a shift in branding of the **NY Clean Start** program to the New York University Advanced Diploma in Clean Energy was done to improve and simplify administration and improve program appeal to potential students.. The program is geared for professionals with five to 10 years of experience who have targeted a transition into the clean energy sector. The Clean Start curriculum combines business and technology to create a hybrid platform for professionals to team up with leaders of the State's clean energy economy—from startups to industry members and utilities. The 120-hour evening and weekend part-time curriculum is designed to attain a professional certificate from the New York University School of Professional Studies Center for Global Affairs. Classes at NYU wereheld from February 2016 through July 2016. The graduates received an Advanced Diploma in Clean Energy from NYU's School of Professional Studies https://www.sps.nyu.edu/professional-pathways/diplomas/advanced-diploma/clean-energy.html
- In 2016 the Commercialization Toolkit (www.startupGPS.org) was reviewed for search engine optimization by NYSERDA's Marketing and IT teams. This toolkit addresses a very common need of new startups: their struggle to understand the big picture of their company's development in the journey from product ideation to commercial deployment. The toolkit is designed to provide a framework for guiding company business development, an easy way to assess overall business readiness, and a curated suite of resources tailored to the specific needs of clean economy entrepreneurs as they pursue successful commercialization of their offerings. NYSERDA contracted with Northeast Clean Energy Council Institute (NECEC) to develop this online tool.

Table 3-20 shows performance milestones and results for the Direct Support for Business Acceleration Program through December 31, 2016. Outputs/Leading Indicators measure immediate results; Outcomes/Impacts measure achievements. Blank cells indicate the lack of a target in a particular time period. Companies supported includes companies with new and improved products serving New York State markets. Business executives transitioned includes the transition of business executives to the clean energy technology industry.

Table 3-20. Direct Support for Business Acceleration Performance Milestones and Results through December 31, 2016[32,33]

Outputs/Leading Indicators

		2012-13 with Adjustments	2014-15 with Adjustments	2016	2017-20	Total
All Projects	Companies Supported - Target	59	59	29		147
	Companies Supported - Progress	41	33	9		83

Outcomes/Impacts

		2012-13 with Adjustments	2014-15 with Adjustments	2016	2017-20	Total
All Projects	Business Executives Transitioned - Target		18	18	8	44
	Business Executives Transitioned - Progress	0	23	18		41

3.3.3 Workforce Development Initiative

New York State's ambitious energy and environmental goals require trained workers with applied skills in energy efficiency, renewable energy, and advanced technologies. The Workforce Development (WFD) Initiative is designed to address the ongoing need for workers with skills that will result in quality installations, services, and maintenance for clean energy technologies.

The following key program activities and accomplishments were performed during this reporting period:

- From July through December 2016, NYSERDA's training partners delivered courses to 4,674 New Yorkers in energy efficiency and renewable energy courses.
- 1,766 individuals participated in courses offered through the PV Trainers Network. Courses included solar electric training for code officials, first responders, municipal personnel, architects, and engineers.
- The remaining 2,908 trainees participated in courses including: passive house training for design professionals and tradespeople; energy efficiency training for plumbers, electricians, and building operators; science, technology, mathematics, and engineering (STEM) for high school students; and entry-level technical training coupled with paid internships for New Yorkers with barriers to employment.

Table 3-21 and Table 3-22 show performance milestones and results for the Workforce Development Program through December 31, 2016. Outputs/Leading Indicators measure immediate results; Outcomes/Impacts measure achievements. Blank cells indicate the lack of a target in a particular time period. Community colleges may offer renewable energy, advanced technology, and energy efficiency courses.

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32 During the December 31, 2016 reporting period, the EIR program commenced 18 new engagements with companies referred by NYSERDA project managers and NYSERDA affiliated incubators. Detail will be provided in future reports.

33 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 3-21. Workforce Development – Renewable Energy Performance Milestones and Results through December 31, 2016

Outputs/Leading Indicators

		2012-13 with Adjustments	2014-15 with Adjustments	2016	2017-20	Total
All Projects	Renewable Energy Technical Trainees - Target	500	280			780
	Renewable Energy Technical Trainees - Progress	0	2,738	1,220		3,958
	Entry Level Trainees - Target	90	97			187
	Entry Level Trainees - Progress	0	460	122		582
	OJT, Hands-On Training - Target	150	115			265
	OJT, Hands-On Training - Progress	39	90	2		131
	Training Organizations - Target	2				2
	Training Organizations - Progress	2	2	1		5
	Certifications Developed - Target		1			1
	Certifications Developed - Progress	0	0	0		0
	Course Development - Target	2	1			3
	Course Development - Progress	0	16	1		17

Outcomes/Impacts

		2012-13 with Adjustments	2014-15 with Adjustments	2016	2017-20	Total
All Projects	Leveraged Funds Amount (millions) - Target	$0.80	$0.90			$1.70
	Leveraged Funds Amount (millions) - Progress	$1.11	$1.55	$0.02		$2.67

Table 3-22. Workforce Development – Energy Efficiency Performance Milestones and Results through December 31, 2016

Outputs/Leading Indicators

		2012-13 with Adjustments	2014-15 with Adjustments	2016	2017-20	Total
All Projects	Energy Efficiency Technical Trainees - Target	3,448	2,345			5,793
	Energy Efficiency Technical Trainees - Progress	96	9,414	4,975		14,485
	Entry Level Trainees - Target	800	544			1,344
	Entry Level Trainees - Progress	0	721	152		873
	OJT, Hands-On Training - Target	467	317			784
	OJT, Hands-On Training - Progress	48	95	0		143
	Training Organizations - Target	2	1			3
	Training Organizations - Progress	4	2	0		6
	Certifications Developed - Target		1			1
	Certifications Developed - Progress	0	0	0		0

Outcomes/Impacts

		2012-13 with Adjustments	2014-15 with Adjustments	2016	2017-20	Total
All Projects	Leveraged Funds Amount (millions) - Target	$1.30	$1.70			$3.00
	Leveraged Funds Amount (millions) - Progress	$0.40	$6.24	$1.40		$8.04

3.3.4 Environmental Monitoring, Evaluation, and Protection (EMEP)

EMEP provides knowledge to reduce the adverse impacts associated with electricity generation that damages New York's ecosystems and the health of its residents, and it assists planning efforts for cleaner alternative options. Additionally, informing the clean energy technology industry about life cycle environmental impacts early in the development stage can minimize unanticipated negative effects and document the energy and

environmental attributes of products. EMEP also provides critical energy-related environmental research to help support the regulatory responsibilities of a range of other agencies in New York State including the Department of Environmental Conservation, Department of Health, Department of State, and the Office of the Attorney General.

The following key program activities and accomplishments were performed during this reporting period:

- A digital aerial baseline Survey of marine wildlife in support of New York State offshore wind energy development was initiated, and two seasonal surveys were completed. The project is the largest aerial digital survey of marine wildlife ever undertaken. The project will reduce costs and accelerate the environmentally responsible development of offshore wind energy.
- A draft Metocean Plan was developed to guide offshore wind energy developers in the accurate measurement of wind speeds using LiDAR buoys. The draft was released though a Request for Information seeking feedback from stakeholders and is currently being updated to incorporate the feedback provided.
- A stakeholder supported effort to document and summarize guidance for the siting of large, land based renewable energy projects (ground-mounted photovoltaics and wind turbines) was initiated to minimize land use conflicts.
- Outreach activities included leading a World Renewable Energy Network (WREN) sponsored webinar to inform stakeholders about NYSERDA's offshore digital aerial surveys of marine wildlife; sponsoring a workshop to inform policy makers of the results of a refined spatial deposition modeling project for atmospheric pollution; participation and support for the Catskills Environmental Research and Monitoring conference; presentation of the results of several climate-related projects, including those related to changes in extreme rainfall and flooding under future climate change at various conferences and meetings; hosting a Chinese delegation interested in energy and environmental policy; participation in the American Wind Energy Association meeting highlighting NYSERDA's work in offshore wind energy; participation in an Advancing Clean Energy New York (ACE NY) workshop to highlight NYSERDA's activities and improve communications with their members; participation and support in workshops for the Renewables on the Ground Roundtable sponsored by ACE NY and the Nature Conservancy; and organized and led NYSERDA's annual Environmental Stakeholders Workshop.

Table 3-23 shows performance milestones and results for the EMEP Program through December 31, 2016. Outputs/Leading Indicators measure immediate results; Outcomes/Impacts measure achievements. Blank cells indicate the lack of a target in a particular time period. Signed contracts include several large flagship projects. The meetings, workshops, and conferences are sponsored by NYSERDA. Briefings are on research projects convening with policymakers or other stakeholders. Leveraged funds include cofunding and outside investment to support projects and sponsored research.

Table 3-23. Environmental Monitoring Performance Milestones and Results through December 31, 2016[34,35]

Outputs/Leading Indicators

		2012-13 with Adjustments	2014-15 with Adjustments	2016	2017-20	Total
All Projects	Projects Contracted - Target	23	28	2		53
	Projects Contracted - Progress	21	36	3		60
	Projects Completed - Target	5	23	23	2	53
	Projects Completed - Progress	0	14	5		19
	Program Advisory Group Meetings - Target	2	2			4
	Program Advisory Group Meetings - Progress	3	0	0		3
	Science Advisory Committee Meetings - Target	2	2			4
	Science Advisory Committee Meetings - Progress	3	0	0		3
	Meetings, Workshops, Conferences - Target	5	6	1		12
	Meetings, Workshops, Conferences - Progress	7	13	5		25
	Briefings - Target	12	12	3		27
	Briefings - Progress	5	5	0		10

Outcomes/Impacts

		2012-13 with Adjustments	2014-15 with Adjustments	2016	2017-20	Total
All Projects	Leveraged Funds Amount (millions) - Target	$3.50	$4.50	$1.80		$9.80
	Leveraged Funds Amount (millions) - Progress	$2.53	$31.17	$0.00		$33.70
	EMEP Research Citations - Target			2,670		2,670
	EMEP Research Citations - Progress	0		0		0
	Peer-reviewed Scientific Journal Articles - Target	10	35	45	16	106
	Peer-reviewed Scientific Journal Articles - Progress	15	40	5		60

34 Adjustments made to data in previously reported periods is due to lagged data and/or QA/QC.

35 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.

4 T&MD Program Evaluation Activities

NYSERDA is actively working with third-party evaluation contractor, Industrial Economics (IEc), to evaluate the T&MD programs. During the first half of 2014, a comprehensive plan was developed for evaluation of the T&MD programs over the next three and six years. This plan will be used by NYSERDA and IEc to guide the evaluation efforts and will be updated as needed. This section summarizes evaluation work completed, underway, and planned for the T&MD programs. Some evaluations are program-specific, while others are done at a higher level to inform and optimize the portfolio level results.

4.1 Program Theory and Logic Models

Program Theory and Logic Model (PTLM) reports are typically developed early in the program time line, and updated as changes are made. PTLM reports inform evaluation work by documenting the relationships between program activities, outputs, and short/medium/long-term outcomes the program intends to induce.

Prior to June 2016, PTLM activities were completed and reports posted to NYSERDA's website for the following programs/areas:

- Smart Grid[36]
- Advanced Codes and Standards[37]
- EDGE[38]
- New York Products[39]
- Clean Energy Business Development[40]
- Workforce Development[41]
- CHP Aggregation and Acceleration[42]

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36 The Motors Program was intended to focus on providing educational and technical support to NYSERDA's Partners (motor suppliers, repair shops, electrical companies, manufacturers, and distributors). However, the program was discontinued prior to market launch.

37 http://www.nyserda.ny.gov/-/media/Files/Publications/PPSER/Program-Evaluation/2013ContractorReports/2013-PLM-Advanced-Codes-Standards.pdf

38 http://www.nyserda.ny.gov/-/media/Files/Publications/PPSER/Program-Evaluation/2013ContractorReports/2013-PLM-Advanced-Codes-Standards.pdf

39 http://www.nyserda.ny.gov/-/media/Files/Publications/PPSER/Program-Evaluation/2014ContractorReports/2014-New-York-Products-Program-Evaluation.pdf

40 http://www.nyserda.ny.gov/-/media/Files/Publications/PPSER/Program-Evaluation/2013ContractorReports/2013-PLM-Clean-Energy-Business-Development.pdf

41 http://www.nyserda.ny.gov/-/media/Files/Publications/PPSER/Program-Evaluation/2013ContractorReports/2013-PLM-Workforce-Development.pdf

42 http://www.nyserda.ny.gov/-/media/Files/Publications/PPSER/Program-Evaluation/2014ContractorReports/2014-PLM-CHP-Acceleration.pdf

- Advanced Buildings: ETAC[43]
- Advanced Buildings: Technology Development[44]
- Solar Cost Reduction[45]
- Clean Power Technology Innovation[46]
- Transportation[47]

During this reporting period, no PTLMs were completed.

Following the development of a PTLM, NYSERDA typically engages in an Evaluation Readiness Review[48] to help identify whether a program has various factors, or when such factors will be in place, to ensure an evaluation is justified, feasible, and likely to provide useful information. For example, programs must have appropriate data tracking to support evaluation. Evaluation Readiness Reviews have been completed for several programs to date and helped identify areas to strengthen or solidify in order to lay the groundwork for the most productive evaluations.

4.2 Process Evaluation

Process Evaluation reviews oversight and operations, gauges customer satisfaction, and recommends process and efficiency improvements. The goal of Process Evaluation is to inform real-time adjustments and maximize program efficiency and effectiveness through actionable recommendations. The T&MD Operating Plan identified that formative process evaluations would be conducted on most programs during the early stages of implementation and repeated periodically to examine program efficiency and effectiveness in light of

43 http://www.nyserda.ny.gov/-/media/Files/Publications/PPSER/Program-Evaluation/2014ContractorReports/2014-PLM-Advanced-Buildings.pdf

44 http://www.nyserda.ny.gov/-/media/Files/Publications/PPSER/Program-Evaluation/2014ContractorReports/2014-PLM-Advanced-Buildings.pdf

45 http://www.nyserda.ny.gov/-/media/Files/Publications/PPSER/Program-Evaluation/2014ContractorReports/2014-SCR-logic-model.pdf

46 http://www.nyserda.ny.gov/-/media/Files/Publications/PPSER/Program-Evaluation/2014ContractorReports/2014-CPTI-Logic-Model-Report.pdf

47 http://www.nyserda.ny.gov/-/media/Files/Publications/PPSER/Program-Evaluation/2015ContractorReports/2015-Transportation-LM-Report.pdf

48 Formerly known as Evaluability Assessment.

the program's stated outcomes and impacts. Process evaluations are typically conducted through in-depth interviews resulting in a qualitative assessment and will be supported by secondary research, such as review of program documents, as appropriate. Evaluations of NYSERDA's organizational processes (e.g., competitive solicitation) may also be conducted.

Prior to June 2016, focused process evaluations were completed for the following T&MD programs. Each of these process evaluation reports is available on the NYSERDA website:

- Smart Grid[49]
- Workforce Development[50]
- EMEP[51]
- Solar Cost Reduction[52]
- EDGE[53]

During this reporting period, one process evaluation was completed for the following program/area:

- Advanced Codes and Standards[54]

Process evaluations which are or will be underway in the near term cover the following programs, with estimated completion date indicated in parentheses:

- Technology Development (Q1 2017)
- Advanced Codes and Standards Behavioral Study (Q1 2017)

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49 http://www.nyserda.ny.gov/-/media/Files/Publications/PPSER/Program-Evaluation/2013ContractorReports/2013-PLM-EPTD-Smart-Grid-Program.pdf

50 http://www.nyserda.ny.gov/-/media/Files/Publications/PPSER/Program-Evaluation/2014ContractorReports/2014-EMEP-Workforce-Development.pdf

51 http://www.nyserda.ny.gov/-/media/Files/Publications/PPSER/Program-Evaluation/2014ContractorReports/2014-EMEP-Citation-Analysis.pdf

52 http://www.nyserda.ny.gov/-/media/Files/Publications/PPSER/Program-Evaluation/2015ContractorReports/Solar-Cost-Reduction-process-evaluation.pdf

53 http://www.nyserda.ny.gov/-/media/Files/Publications/PPSER/Program-Evaluation/2015ContractorReports/2015-economic-development-growth-extension-process-evaluation.pdf

54 http://www.nyserda.ny.gov/-/media/Files/Publications/PPSER/Program-Evaluation/2016ContractorReports/Codes-Process-Evaluation-Report.pdf

4.3 Market and Impact Evaluation

The IEc team will also assist NYSERDA in evaluating the T&MD portfolio's near- and long-term impacts through full-scale impact and market evaluations. Early evaluation activities will include collecting baseline information to identify the program effects on the number and knowledge base of market participants, and whether barriers to more widespread technology adoption are being effectively addressed. Later evaluation activities will examine longer-term impacts such as technology commercialization and replication. Some methods expected to be used in assessing program impacts include surveys and interviews with program participants and nonparticipants, Delphi panels, case studies, on-site measurement and verification of energy savings for certain technologies, technology commercialization tracking, technology transfer, bibliometric tracking, and citation analysis.

This evaluation includes the following three primary activities, which are briefly described as intended to apply to the T&MD programs:

- **Market characterization** will describe a specific market or market segments, including size of the market, key market actors, distribution channels, market actor awareness and knowledge, key market drivers and opportunities, and market barriers. The market characterization assesses the market before or early in the commencement of a specific intervention or program, for the purpose of guiding the intervention and/or facilitating future evaluation of effectiveness.
- **Market impact assessment** is used to analyze the extent to which a market has been transformed by specific program interventions or programs. Market impact assessment describes changes in market actor awareness and knowledge, key market drivers and opportunities, and market barriers, as well as the value of the program perceived by key market actors. Market assessment also collects and tracks information on key indicators the program is expecting to influence (i.e., the adoption of clean energy and energy-efficient products, services, or practices). Market impact assessments may require a previous market characterization study.
- **Energy impact evaluation** will address program-specific, directly induced quantitative changes (e.g., kWh, kW, and Btu) attributable to the T&MD programs. This evaluation is distinguished from market impact assessments, which assess other program outcomes distinct from energy and demand savings.

Prior to June 2016, focused market evaluations were completed for the following T&MD programs:

- NY Products Program[55]
- NYSERDA and National Customer Awareness of ENERGY STAR® for 2014 (Analysis of Consortium for Energy Efficiency Household Survey)[56]

Prior to June 2016, an impact evaluation was completed for the following program/area:

- Advanced Codes and Standards Impact Evaluation, Phase 1[57]

During this reporting period, one market evaluation was completed for the following program/area:

- Smart Grid Market Characterization[58]

During this reporting period, an impact evaluation was completed for the following program/area:

- Market Pathways: Business Partners

Market/Impact evaluations are planned or are underway for the following programs/areas with expected completion date in parentheses:

- ETAC/Technology Development Market Assessment, Phase 1 (Q1 2017)
- Advanced Codes and Standards Impact Evaluation, Phase 2 (Q4 2018)
- Transportation Market Characterization Assessment (Q1 2017)
- Transportation: Six Impact/Market Evaluation Case Studies (Q1 2017)
- Combined Heat and Power Market Assessment (Q1 2017)
- Clean Energy Business Development Market Assessment (Q1 2017)

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55 http://www.nyserda.ny.gov/-/media/Files/Publications/PPSER/Program-Evaluation/2014ContractorReports/2014-New-York-Products-Program-Evaluation.pdf

56 http://www.nyserda.ny.gov/-/media/Files/Publications/PPSER/Program-Evaluation/2015ContractorReports/NYSERDA%20-and-National-Awareness-of-ENERGY-STAR.pdf

57 http://www.nyserda.ny.gov/-/media/Files/Publications/PPSER/Program-Evaluation/2016ContractorReports/2016-advanced-energy-codes.pdf

58 http://www.nyserda.ny.gov/-/media/Files/Publications/PPSER/Program-Evaluation/2016ContractorReports/Smart-Grid-MCA-Report.pdf

4.4 Higher-Level Studies

In addition to evaluation activities, NYSERDA also plans to conduct studies organized around one or more high-level research questions that focus on data, impacts, and processes across programs. The studies reflect a range of evaluation activities, including evaluation readiness reviews, market characterizations, process evaluations, and market and energy impact assessments. The list of high-level studies is likely to evolve over time to meet NYSERDA's needs. This list includes but is not necessarily limited to the following activities:

- **Data and resources:** How can the NYSERDA R&D Metrics Database and the existing data from prior evaluations best support evaluation efforts for the T&MD portfolio?
- **Solicitation process and markets:** How well is NYSERDA's current solicitation process reaching intended markets and soliciting high-quality proposals?
    - During the first half of 2016, a Solicitation Process Benchmarking Assessment was completed. It provided best practices and lessons for NYSERDA based on the solicitation processes relied upon by other peer organizations.
- **NYSERDA's reputation:** What is the effect of NYSERDA's reputation on support for products and innovations, and how can NYSERDA best use its institutional credibility to support products and innovations?
    - During the first half of 2016, a NYSERDA Reputation Effect study was completed which provided information on how well recognized NYSERDA and its programs are among its stakeholders, how the brand is perceived, the effect of the reputation on projects, and other opportunities for NYSERDA's reputation to help the market.
- **Portfolio performance:** What are the effects of NYSERDA's shift from focus on technology development to its newer, broader focus on technology and business development?
- **R&D demonstration project impacts:** What are the direct and replication impacts of NYSERDA demonstration projects and how do these evolve and accumulate over time?
    - During the first half of 2014, the R&D demonstration project impact study was completed.[59] This study updated a prior similar evaluation and addressed R&D demonstration projects completed in 2008–2010. An update to this study is currently underway.
- **Informing decisions and policy:** How can NYSERDA and external organizations effectively incorporate learning from past NYSERDA projects into decisions about the design of programs and policies?
    - During the first half of 2016, the Learning From Experience project was completed, which provided information on NYSERDA's current approach to learning from experience, best practices in organizational learning implemented by peer organizations, and recommendations for improvement.

[59] http://www.nyserda.ny.gov/-/media/Files/Publications/PPSER/Program-Evaluation/2014ContractorReports/2014-RD-Demo-Survey-Report.pdf

Appendix A: T&MD Program Advisory Committee Members

The last meeting of the T&MD Advisory committee was in 2014. The Committee has been replaced by advisory structures under the Clean Energy Fund and/or program specific advisory groups.

Richard Adams
Manager
NREL Innovation and Entrepreneurship Center, Center for Renewable Energy Economic Development

Anthony Collins
President
Clarkson University

Mark Duvall
Director
Electric Transportation and Energy Storage
Electric Power Research Institute (EPRI)

Kate Fish
Executive Director
Adirondack North Country Association

Colleen Gerwitz
Director
Office of Clean Energy
NYS Department of Public Service

Maria Gotsch
President and CEO
NYC Investment Fund

Jeff Harris
Senior Policy & Tech Advisor
Alliance to Save Energy

Dave Hewitt
Consultant
ZNE and Market Transformation

Brook S. Jackson
Vice President
Policy Partnership for New York City

James Misewich, Ph.D.
Associate Laboratory Director
for Basic Energy Sciences
Brookhaven National Laboratory (BLN)
Energy Sciences and Technology Department

Steven Nadel
Executive Director
American Council for an Energy-Efficient Economy (ACEEE)

Christopher Raup
Director, Distrusted Resource Integration
Consolidated Edison Company of New York, Inc.

Robert Simpson
President and CEO
CenterState Corporation for Economic Opportunity

Susan Stratton
Executive Director
Northwest Energy Efficiency Alliance (NEEA)

David Terry
Executive Director
National Association of State Energy Officials/ASERTTI

Sue Tierney
Senior Advisor
Analysis Group, Inc.

Cheri Warren
Vice President, Asset Management
National Grid

Jane Weissman
Former Executive Director
Interstate Renewable Energy Council, Inc. (IREC)

Ed Wisniewski
Executive Director
Consortium for Energy Efficiency (CEE)

Appendix B: T&MD Program Logic Models

No logic models were completed during this period.

Appendix C: Evaluation Report Summaries

Smart Grid Program: Market Characterization and Evaluation Baseline

Industrial Economics, Incorporated (IEc), September 2016

Program Summary:

NYSERDA's Smart Grid program is only one of many influences in the market for smart grid technologies and strategies. NYSERDA plays a role similar to that of several other agencies and organizations providing policy and financial support or knowledge sharing. Therefore, it is critical that NYSERDA avoid crafting projects and activities that duplicate or hinder other market actors' efforts. Because the Smart Grid program supports both product development and demonstration projects, NYSERDA's target audience is also varied, and includes both technology developers and transmission and distribution utilities, the end-users for grid-level technologies. Similarly, because of the program's current focus on DER interconnection, DER providers may be a key part of the Smart Grid program's audience. Ratepayers are not typically a focus for program activities, though some projects may involve input from specific ratepayers (e.g., large industrial facilities participating in demand response). The program's current focus on reducing DER interconnection costs may result in increased focus on ratepayers as part of the program's target audience.

Evaluation Research Questions:

Trends in Smart Grid Development

1. How have smart grid technologies and tools developed over time?
2. How have policies and planning decisions, including those of utilities, incorporated smart grid research and development (R&D) in recent years?
3. What trends in New York State's grid performance can be identified?
4. How does smart grid development in New York State compare to other states?

NYSERDA's Role and Potential Future Contributions

1. What external (non-NYSERDA) initiatives, such as those carried out by utilities or the U.S. Department of Energy (DOE), contribute to advancing smart grid development?
2. What role does NYSERDA play compared to these other initiatives?
3. What are the gaps in market readiness for smart grid technologies in New York State, and how can NYSERDA help address them?

Measuring Trends in Smart Grid Development

1. What is a reasonable baseline scenario (e.g., expected future trajectory) for smart grid technology development?
2. What metrics can be used to track future improvements smart grid development in New York?

Methodology:

Industrial Economics, Inc. (IEc) relied on two primary methods of analysis to answer these questions: a panel of strategic expert advisors, and a benchmarking assessment. The panel was designed to provide qualitative insight into all research questions. The benchmarking assessment provided analysis in support of Questions 3, 4, and 9. In addition, IEc observed a workshop conducted by NYSERDA and Meister Consultants Group, Inc. as part of their effort to develop an inventory of "smart grid" companies in New York State.

Conclusions:

The expert panel, benchmarking assessment, inventory workshop, and multiple public-sector reports consulted for this evaluation converge on the following conclusions:

The smart grid market is still relatively young and evolving, both in New York State and nationally.

- Initial efforts on smart grid development began around 2005, with widespread implementation taking off after 2010 (e.g., PMUs, distributed storage).
- Grid-level impacts are still emerging, but several widely-tracked metrics are beginning to show changes in grid performance consistent with adoption of smart grid technologies and strategies.
- Much of the market potential for adoption of smart grid technologies and strategies is at the grid-level, and will require the involvement of many stakeholders, including utilities, regulators, and technology developers.

Several key challenges to market development remain, including:

- System testing and data collection to demonstrate the value of smart grid technologies and strategies and facilitate larger-scale adoption
- Utility engagement
- Utility workforce development
- Knowledge sharing to promote replication
- Communication of the value of smart grid technologies and strategies to potential customers (both utilities and ratepayers)

NYSERDA is well positioned to act as a catalyst for the emerging smart grid market by:

- Encouraging testing and validation of emerging technologies to help demonstrate benefits to regulators, investors, and customers
- Supporting development of training tools and curricula for the next-generation utility workforce, to establish smart grid leadership and expertise in New York
- Supporting R&D efforts that will reduce risk and validate the benefits of key smart grid technologies and strategies
- Facilitating increased coordination and knowledge sharing among market actors

As confirmed by the expert panel, NYSERDA's work to date has begun to establish smart grid expertise in New York State, but key gaps and barriers remain. In particular, the panel noted that one of the greatest remaining technical barriers to smart grid development is the interconnection between DER, the distribution system, and the transmission system. The Smart Grid program's initial focus on reducing DER interconnection costs is well-targeted to help address these issues. Overall, the Smart Grid program is likely to play an increasingly important role in the context of REV and New York's ambitious energy and environmental policy goals, since, as several experts concluded, "REV cannot be implemented without smart grid."

Advanced Energy Codes Program: Knowledge Survey Process Evaluation

Conducted by: Industrial Economics, Incorporated (IEc), September 2016

Program Summary

To increase compliance with the Energy Conservation Construction Code of New York State (the "Energy Code") and to reduce energy consumption, the New York State Energy Research and Development Authority (NYSERDA) provides training and support services through the Codes initiative of its Advanced Energy Codes and Standards program. NYSERDA has contracted with multiple training contractors, including Newport Ventures (Newport) and the Urban Green Council (UGC), to develop and conduct a portfolio of training courses on updates to the Energy Code that take effect on October 3, 2016. These trainings target three audiences—code officials, design professionals, and members of the construction trades—and cover both commercial and residential buildings.

Project Scope and Methods

The primary goal of this process evaluation is to evaluate reactions to training and learning among participants in the NYSERDA Energy Code trainings, focusing on the subset led by Newport and UGC between April 2015 and June 2016. A secondary goal is to gather trainee feedback on the value and quality of course offering to inform future course improvements. Evaluation objectives and methods are summarized in Table C-1

Table C-1 Summary of Objectives and Methods

Objective	Purpose	Method	
		Pre-/Post-Training Survey	Interviews with NYSERDA, Training Contractors
Evaluate trainees' reactions to the training program	Assess trainees' satisfaction with and the value of the training program	✓	
Measure the change in trainees' level of knowledge of the Energy Code following training	Assess training quality	✓	✓
Determine whether trainees plan to enact changes as a result of training	Assess the extent to which trainings may increase code compliance	✓	✓
Examine perceptions of training's effectiveness at increasing code compliance	Assess the extent to which trainings may increase code compliance, and inform improvements to NYSERDA's Energy Code initiative		✓
Solicit suggestions for other activities that trainees think would be effective at increasing code compliance	Inform improvements to NYSERDA's Energy Code initiative	✓	✓

Key Findings

Overall, the NYSERDA Energy Code trainings have been well-received and very successful in increasing participant knowledge, as shown in Figures C-1 and C-2. Trainees also indicated they intend to make changes to how they do their jobs as a result of the training (Figure C-3). Finally, NYSERDA program staff and training contractors indicated that the trainings are meeting their objectives.

Figure C-1. Trainee Understanding of the Energy Code

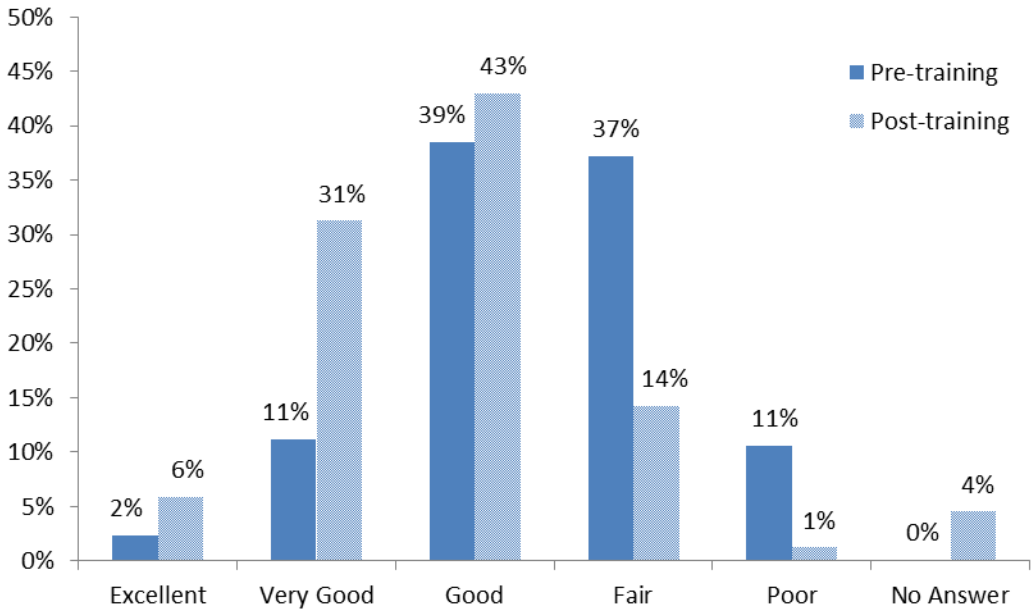


Figure C-2. Trainee Satisfaction

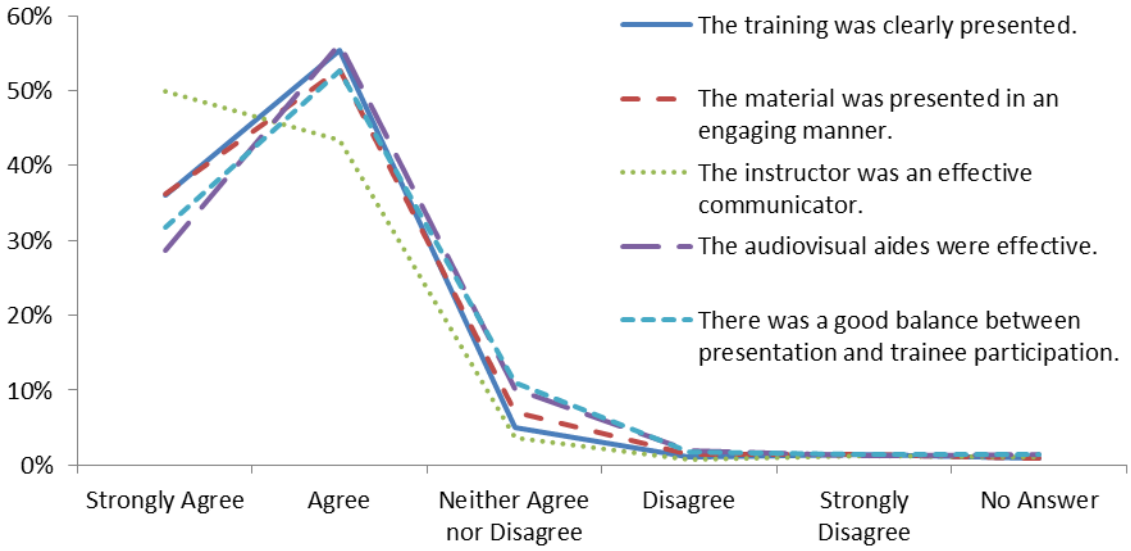
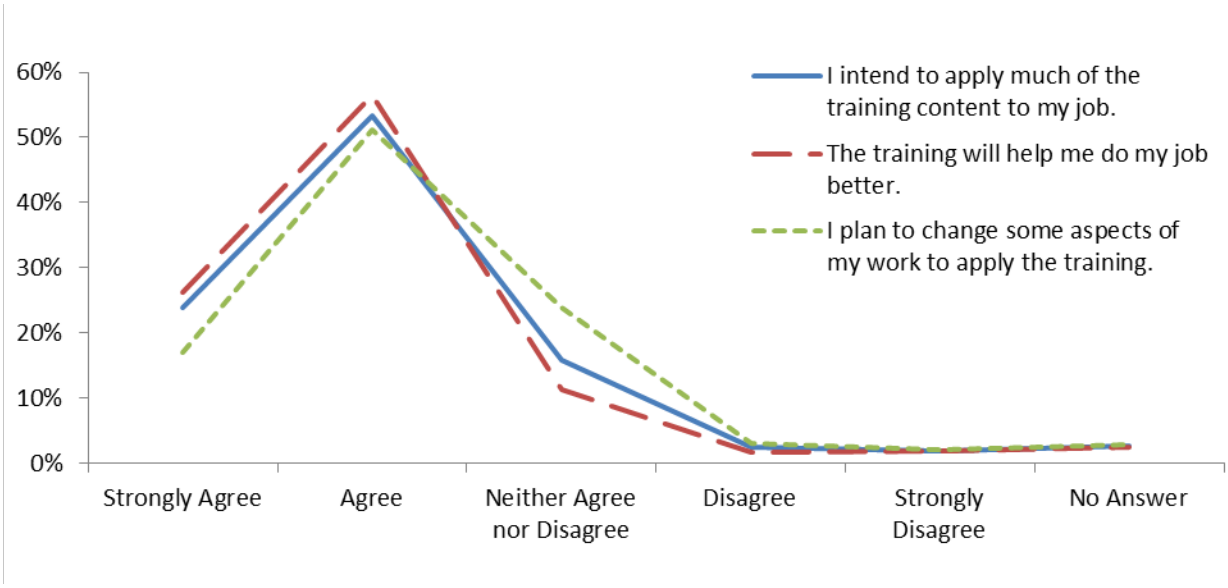


Figure C-3. Trainee Plans to Apply Training



Most trainees (73 percent) did not recommend covering additional topics as part of the training, either because they believed the training was complete as-is or there was no time to cover additional topics. Only 22 percent provided feedback on the course, and many of those responses were positive comments such as "thank you." The two most common categories of suggestions were changes to course materials (e.g., requests for more handouts and sample documents) and additional courses or content (e.g., requests for advanced training). Suggestions for other ways to increase code compliance included incorporating more case studies into trainings, extending training time, and offering trade-specific trainings.

Recommendations

While the trainings have largely been successful, IEc offers four recommendations for future trainings:

1. **Build on introductory trainings by incorporating additional topics or courses that go into greater depth regarding specific elements of the code and code compliance.** When asked about ways to improve the trainings or increase code compliance, some trainees requested more advanced training. This could be a natural follow-on to the current introductory trainings.
2. **Consider changes to training exercises, materials, and class format.** Many trainees suggested increasing the use of sample projects and case studies and experimenting with alternative class formats. Trainees also frequently requested copies of the presentation slides, the Energy Code, and other resources; training contractors should consider providing a web link for participants to download at least the training slides.

3. **Focus on increasing participation by the construction trades.** Engaging members of the construction trades remains a key challenge. According to NYSERDA, trade-specific trainings, which were requested by some trainees, can help attract members of the construction trades, and may be an effective strategy in the short term.
4. **Follow up with trainees to determine whether they have applied knowledge from the trainings to their jobs**. NYSERDA program staff and training contractors identified several provisions that trainees are likely to struggle with in practice. Follow-on surveys could help determine the extent to which participants are applying information from the trainings to their jobs, and would provide context for the results of any future code compliance studies.

Market Pathways Commercial Lighting Impact Evaluation Summary

Conducted by: Industrial Economics, Incorporated (IEc), September 2016

Program Summary

The Market Pathways Business Partners Commercial Lighting Program (CLP) provides training, assistance, and incentives to lighting practitioners (Business Partners), which include contractors, distributors, vendors and lighting designers. The program is both focused on energy savings and emphasizing appropriate lighting levels and fixture spacing during the design of retrofit and new construction lighting systems.

Evaluation Scope and Methods

The impact evaluation had three objectives:

1. Compare baseline assumptions used in Program projects with Technical Reference Manuals (TRMs).
2. Evaluate the energy savings from 20 sample projects completed in 2014–2015.
3. Make recommendations for baseline approach to be used in the planning and design of future, similar initiatives.

To meet these objectives, the evaluation team completed three overarching tasks: a desk review to verify that the correct Program baseline methodology was applied correctly, a review of secondary sources to compare the Program baseline methods to prevalent methods used in other jurisdictions, and a calculation of savings under alternative baseline methods. Although this evaluation was not designed or intended to calculate a program-level realization rate, the authors provide a realization rate to show the savings for the program with the accepted baseline assumptions. It should be noted that the realization rate shown for illustration and summary purposes in this report does not meet a 90/10 sampling precision level.

Key Findings

Based on post-stratification, the total verified savings are 45,119,575 kWh with a margin of error of +/- 8,843,437 kWh as shown below in Table C-2.[60]

Table C-2. Verified Savings

Strata	Database kWh	Verified kWh	Margin of Error
All Other	33,705,450	27,638,165	+/- 15,504,507
High	18,144,159	17,481,411	--
Total	51,849,609	45,119,575	+/- 8,843,437

The savings are based on the calculated realization rate. The total verified realization rate is 87% with a margin of error of +/-19.6% at 90% confidence. As shown below in Table C-3, the realization rate for the single project in the "High" strata is 96%; the realization rate for "All Other" projects is 82% with a margin of error of +/-46% at 90% confidence.

Table C-3. Realization Rates for Database Stratified by Savings

Strata	Coefficient of Variation	Standard Error	Mean Realization Rate	Error Ratio	Margin of Error (90% Confidence)
All Other	0.32	0.28	0.82	1.05	0.46
High		0.00	0.96	1.00	0.00

The margin of error is high because there is a great deal of variation in the verified realization rates for each underlying projects, ranging from 27% to 136%. Table C-4 shows the database savings and verified realization rates for each sample project.

[60] If we do not stratify, the resulting total verified savings are 49,288,683 kWh, reflecting a verified realization rate of 95.1% with a margin of error of +/− 138.2% at 90% confidence.

Table C--4. Sample Project Level Database Savings and Verified Realization Rates

Project	Database Savings (kWh)	Verified	Reason for Difference between Database and Verified Savings
J3019	33,228	27%	Baseline LPD should be 1.1 (exercise area); 2.1 was used. Also, lower fixture wattage on inspection than application. These adjustments are in opposite directions.
J3046	48,631	101%	--
J3052	4,680	59%	Application fixtures (24) do not match inspection fixtures (27). This results in higher wattage in the verified case.
J3068	18,144,159	96%	Baseline LPD should be 3.0 (Warehouse High Bay); 3.1 was used.
J3116	30,978	110%	Baseline LPD should be 0.2 (parking garage); 0.178 was used.
J3125	96,185	54%	Baseline standard 2010; Database had 1999. Also, lower fixture wattage on inspection than application. These adjustments are in opposite directions.
J3129	19,718	92%	After the project was completed, there was a change in space and number of fixtures.
J3136	55,900	104%	Lower fixture wattage on inspection than application
J3137	35,006	101%	--
J3143	436,738	46%	Database uses baseline LPD of 3.0 instead of 1.7. Also, total watts 21,384 in database and 21,060 in inspection. These adjustments are in opposite directions.
J3144	106,560	112%	Baseline LPD 2.9, not 3.0; PAR 38 LED 19W, not 150W.
J3145	42,576	136%	PAR 38 LED 19W, not 150W; Quantity differs - 30 not 31 PAR38 fixtures
J3148	8,407	117%	Total watts 6,540 in database and 5,995 in inspection.
J3153	81,114	100%	--
J3155	118,762	100%	--
J3165	394,243	99%	--
J3168	167,432	99%	--
J3193	18,431	100%	--
J3201	88,446	54%	Inspection report wattages differ from application wattages

Of the 19 projects, seven had no major differences between the database savings and verified project savings; these are indicated with a -- in the table above.

Recommendations

1. Consider using project specific (custom) calculations instead of deemed savings values. This is consistent with the previous Program theory, which focuses on encouraging designers to achieve the best lighting in a space.
    a. Continue to use space-by-space LPD rather than prescriptive fixture savings to be consistent with the State energy codes. This is the appropriate frame of reference for designers.
    b. The reference baseline code decision structure should ensure that the current code is the baseline when more than the trigger level of lighting is adjusted for retrofit and expansions. For the last two versions of the State code, this has been 10% of connected lighting load. Previously, it was 50% of the connected lighting load.
    c. We recommend customizing the calculations of occupancy controls. Occupancy sensors should be treated on a space-by-space basis. The Program practice of an additional 30% savings attributable to occupancy controls is common practice, but it likely overstates savings. When controls are present in the baseline or controls are required as part of the code, additional savings for including controls are not appropriate. Changing the kind of controls, from space to fixture level occupancy or to include daylighting will also require custom calculations.
2. Improve project quality assurance protocols. The majority of adjustments between database and verified savings were due to errors in documentation—either LPD or wattage.
    a. Continue to conduct verification visits to confirm actual wattages installed and space dimensions for a sample or where merited based on a risk analysis findings. This can be performed by the program implementer or a third party and act as a check on the installer.
    b. Conduct review of assumed baseline LPD values as a separate line item from document review. This could include a checklist that the correct baseline year was identified (based on tenant age, portion of connected load remodeled, and code in place) and that the correct LPD was used for the space.
    c. Enable the program administrator to quickly flag projects with extreme values. Substantially low values of installed LPD or high values of baseline LPD may indicate an error in calculation of space dimensions or entry of fixture wattage or count.

Appendix D: T&MD Targets

Pursuant to the January 21, 2016 CEF Order, the CEF received a transfer of $182.7 million of uncommitted funds from T&MD as of February 29, 2016. The T&MD program also ended nearly a year early. In the uncommitted funds transfer, individual programs lost between 2% and 91% of their budgets and, in light of the early sunset of this portfolio, the T&MD targets for each program have been adjusted in this report proportional to the budget reductions each program received. Original targets from the February 15, 2013 Operating Plan are included in this appendix for reference.

Table D-1 Original Targets from the February 15, 2013 Operating Plan

T&MD Initiative	Milestone / Result Type	Project Type	Metric	Original Target Total	Revised Target Total	Percent Budget Reduction*
Advanced Buildings Technology Development	Outputs/Leading Indicators	All Projects	Projects Completed	46	34	26%
Advanced Buildings Technology Development	Outputs/Leading Indicators	All Projects	Projects Contracted	46	34	26%
Advanced Buildings Technology Development	Outputs/Leading Indicators	All Projects	Supported Companies	23	17	26%
Advanced Buildings Technology Development	Outcomes/Impacts	All Projects	Leveraged Funds Amount (millions)	14	10	26%
Advanced Buildings Technology Development	Outcomes/Impacts	All Projects	Product Revenue Amount (millions)	83	61	26%
Advanced Buildings Technology Development	Outcomes/Impacts	All Projects	Products and Technologies Commercialized	6	4	26%
Advanced Energy Codes and Standards	Outputs/Leading Indicators	All Projects	Implementation Support Solicitations	2	1	41%
Advanced Energy Codes and Standards	Outputs/Leading Indicators	All Projects	Program Support Solicitations	2	1	41%
Advanced Energy Codes and Standards	Outputs/Leading Indicators	Code compliance efforts	Annual Code Compliance Assessments	5	3	41%
Advanced Energy Codes and Standards	Outputs/Leading Indicators	Code compliance efforts	Code Requirement Trainees	15,000	8,850	41%
Advanced Energy Codes and Standards	Outputs/Leading Indicators	Code compliance efforts	Training Sessions	12	7	41%
Advanced Energy Codes and Standards	Outputs/Leading Indicators	Equipment and appliance standards efforts	State/Federal Standards Conformance Assessments	3	2	41%

Table D-1 continued

T&MD Initiative	Milestone / Result Type	Project Type	Metric	Original Target Total	Revised Target Total	Percent Budget Reduction*
Advanced Energy Codes and Standards	Outcomes/Impacts	Code compliance efforts	Energy Savings Installed (GWh)	631	372	41%
Advanced Energy Codes and Standards	Outcomes/Impacts	Code compliance efforts	Energy Savings Installed (MMBtu)	4,921,000	2,903,390	41%
Advanced Energy Codes and Standards	Outcomes/Impacts	Code compliance efforts	Peak Load Reduction Installed (MW)	129	76	41%
Advanced Energy Codes and Standards	Outcomes/Impacts	Equipment and appliance standards efforts	Energy Savings Installed (GWh)	356	210	41%
Advanced Energy Codes and Standards	Outcomes/Impacts	Equipment and appliance standards efforts	Peak Load Reduction Installed (MW)	168	99	41%
CHP Aggregation and Acceleration	Outputs/Leading Indicators	All Projects	Knowledge/Technology Transfer Activities	10	2	76%
CHP Aggregation and Acceleration	Outputs/Leading Indicators	All Projects	Pre-Packaged Systems	20	5	76%
CHP Aggregation and Acceleration	Outcomes/Impacts	All Projects	Electric Generation Replicated (GWh)	61	15	76%
CHP Aggregation and Acceleration	Outcomes/Impacts	All Projects	Leveraged Funds Amount (millions)	50	12	76%
CHP Aggregation and Acceleration	Outcomes/Impacts	All Projects	Leveraged Funds Replicated (millions)	40	10	76%
CHP Aggregation and Acceleration	Outcomes/Impacts	All Projects	Peak Load Electric Generation Replicated (MW)	10	2	76%
CHP Aggregation and Acceleration	Outcomes/Impacts	All Projects	Primary Energy Savings Replicated (MMBtu)	79,300	19,032	76%
CHP Aggregation and Acceleration	Outputs/Leading Indicators	All Projects	Electric Generation (GWh)	76	18	76%
CHP Aggregation and Acceleration	Outputs/Leading Indicators	All Projects	Peak Load Electric Generation (MW)	13	3	76%

Table D-1 continued

T&MD Initiative	Milestone / Result Type	Project Type	Metric	Original Target Total	Revised Target Total	Percent Budget Reduction*
CHP Aggregation and Acceleration	Outputs/Leading Indicators	All Projects	Primary Energy Savings (MMBtu)	89,125	21,390	76%
CHP Aggregation and Acceleration	Outputs/Leading Indicators	All Projects	Projects	37	9	76%
CHP Performance	Outcomes/Impacts	All Projects	Leveraged Funds Amount (millions)	250	200	20%
CHP Performance	Outputs/Leading Indicators	All Projects	Electric Generation (GWh)	200	160	20%
CHP Performance	Outputs/Leading Indicators	All Projects	Peak Load Electric Generation (MW)	25	20	20%
CHP Performance	Outputs/Leading Indicators	All Projects	Primary Energy Savings (MMBtu)	260,000	208,000	20%
CHP Performance	Outputs/Leading Indicators	All Projects	Projects	16	13	20%
Clean Power Technology Innovation	Outputs/Leading Indicators	All Projects	Projects Completed	51	44	13%
Clean Power Technology Innovation	Outputs/Leading Indicators	All Projects	Projects Contracted	51	44	13%
Clean Power Technology Innovation	Outputs/Leading Indicators	All Projects	Supported Companies	64	56	13%
Clean Power Technology Innovation	Outcomes/Impacts	All Projects	Leveraged Funds Amount (millions)	65	57	13%
Clean Power Technology Innovation	Outcomes/Impacts	All Projects	Product Revenue Amount (millions)	55	48	13%
Clean Power Technology Innovation	Outcomes/Impacts	All Projects	Products and Technologies Commercialized	8	7	13%
Demand Response	Outcomes/Impacts	All Projects	MW Registered Evaluated	23	22	3%
Demand Response	Outputs/Leading Indicators	All Projects	MW Registered (MW)	46	45	3%
Direct Support for Business	Outputs/Leading Indicators	All Projects	Companies Supported	150	147	2%
Direct Support for Business	Outcomes/Impacts	All Projects	Business Executives Transitioned	45	44	2%
Education/Behavior	Outputs/Leading Indicators	All Projects	Community Partnership Participants	575	408	29%
Education/Behavior	Outputs/Leading Indicators	All Projects	Meetings, Workshops, Conferences	5	4	29%

Table D-1 continued

T&MD Initiative	Milestone / Result Type	Project Type	Metric	Original Target Total	Revised Target Total	Percent Budget Reduction*
Education/Behavior	Outputs/Leading Indicators	All Projects	Projects Contracted	8	6	29%
Education/Behavior	Outcomes/Impacts	All Projects	Projects Completed	12	9	29%
Electric Vehicle	Outputs/Leading Indicators	All Projects	Supported Companies	30	18	41%
Electric Vehicle	Outputs/Leading Indicators	Research Studies	Projects Completed	8	5	41%
Electric Vehicle	Outputs/Leading Indicators	Research Studies	Projects Contracted	8	5	41%
Electric Vehicle	Outputs/Leading Indicators	Technology, development, demonstration or pilot projects	Projects Completed	25	15	41%
Electric Vehicle	Outputs/Leading Indicators	Technology, development, demonstration or pilot projects	Projects Contracted	25	15	41%
Electric Vehicle	Outcomes/Impacts	All Projects	Leveraged Funds Amount (millions)	42	25	41%
Electric Vehicle	Outcomes/Impacts	All Projects	Market Adoption	3	2	41%
Electric Vehicle	Outcomes/Impacts	All Projects	Product Revenue Amount (millions)	9	5	41%
Electric Vehicle	Outcomes/Impacts	All Projects	Products and Technologies Commercialized	4	2	41%
Emerging Technology/Accelerated Commercialization	Outputs/Leading Indicators	All Projects	Knowledge/ Technology Transfer Activities	38	17	56%
Emerging Technology/Accelerated Commercialization	Outputs/Leading Indicators	All Projects	Stakeholder Engagements	13	6	56%
Emerging Technology/Accelerated Commercialization	Outcomes/Impacts	All Projects	Energy Savings Replicated (GWh)	30	13	56%
Emerging Technology/Accelerated Commercialization	Outcomes/Impacts	All Projects	Leveraged Funds Amount (millions)	7	3	56%
Emerging Technology/Accelerated Commercialization	Outcomes/Impacts	All Projects	Leveraged Funds Replicated (millions)	21	9	56%
Emerging Technology/Accelerated Commercialization	Outcomes/Impacts	All Projects	Market Adoption	7	3	56%

Table D-1 continued

T&MD Initiative	Milestone / Result Type	Project Type	Metric	Original Target Total	Revised Target Total	Percent Budget Reduction*
Emerging Technology/Accelerated Commercialization	Outcomes/Impacts	All Projects	Peak Load Reduction Replicated (MW)	7	3	56%
Emerging Technology/Accelerated Commercialization	Outcomes/Impacts	All Projects	Primary Energy Savings Replicated (MMBtu)	231,800	101,992	56%
Emerging Technology/Accelerated Commercialization	Outputs/Leading Indicators	All Projects	Primary Energy Savings (MMBtu)	78,000	34,320	56%
Emerging Technology/Accelerated Commercialization	Outputs/Leading Indicators	All Projects	Projects	17	7	56%
Emerging Technology/Accelerated Commercialization	Outputs/Leading Indicators	All Projects	Energy Savings (GWh)	11	5	56%
Emerging Technology/Accelerated Commercialization	Outputs/Leading Indicators	All Projects	Energy Savings (MW)	2	1	56%
Energy Efficiency	Outputs/Leading Indicators	All Projects	Certifications Developed	3	1	58%
Energy Efficiency	Outputs/Leading Indicators	All Projects	Energy Efficiency Technical Trainees	13,793	5,793	58%
Energy Efficiency	Outputs/Leading Indicators	All Projects	Entry Level Trainees	3,200	1,344	58%
Energy Efficiency	Outputs/Leading Indicators	All Projects	OJT, Hands-On Training	1,867	784	58%
Energy Efficiency	Outputs/Leading Indicators	All Projects	Training Organizations	6	3	58%
Energy Efficiency	Outcomes/Impacts	All Projects	Leveraged Funds Amount (millions)	7	3	58%
Energy Storage Commercialization Center	Outcomes/Impacts	All Projects	Leveraged Funds Amount (millions)	7	6	13%
Energy Storage Commercialization Center	Outcomes/Impacts	All Projects	Product Development Tests	41	36	13%
Energy Storage Commercialization Center	Outcomes/Impacts	All Projects	Products and Technologies Commercialized	25	22	13%
Energy Storage Commercialization Center	Outcomes/Impacts	All Projects	Revenue Amount (millions)	10	9	13%
Environmental Monitoring, Evaluation, Protection	Outputs/Leading Indicators	All Projects	Briefings	30	27	11%
Environmental Monitoring, Evaluation, Protection	Outputs/Leading Indicators	All Projects	Projects Completed	60	53	11%

Table D-1 continued

T&MD Initiative	Milestone / Result Type	Project Type	Metric	Original Target Total	Revised Target Total	Percent Budget Reduction*
Environmental Monitoring, Evaluation, Protection	Outputs/Leading Indicators	All Projects	Meetings, Workshops, Conferences	14	12	11%
Environmental Monitoring, Evaluation, Protection	Outputs/Leading Indicators	All Projects	Program Advisory Group Meetings	5	4	11%
Environmental Monitoring, Evaluation, Protection	Outputs/Leading Indicators	All Projects	Science Advisory Committee Meetings	5	4	11%
Environmental Monitoring, Evaluation, Protection	Outputs/Leading Indicators	All Projects	Projects Contracted	60	53	11%
Environmental Monitoring, Evaluation, Protection	Outcomes/Impacts	All Projects	EMEP Research Citations	3,000	2,670	11%
Environmental Monitoring, Evaluation, Protection	Outcomes/Impacts	All Projects	Leveraged Funds Amount (millions)	11	10	11%
Environmental Monitoring, Evaluation, Protection	Outcomes/Impacts	All Projects	Peer-Reviewed Scientific Journal Articles	119	106	11%
Innovation Entrepreneurial Capacity	Outputs/Leading Indicators	All Projects	Incubators or POCCS Participants	405	235	42%
Innovation Entrepreneurial Capacity	Outcomes/Impacts	All Projects	Businesses Graduated from Incubators	162	94	42%
Innovation Entrepreneurial Capacity	Outcomes/Impacts	All Projects	FTEs Associated with Incubator Graduates	486	282	42%
Innovation Entrepreneurial Capacity	Outcomes/Impacts	All Projects	Leveraged Funds Amount (millions)	150	87	42%
Innovation Entrepreneurial Capacity	Outcomes/Impacts	All Projects	Product Revenue Amount (millions)	20	12	42%
Innovation Entrepreneurial Capacity	Outcomes/Impacts	All Projects	Products and Technologies Commercialized	40	23	42%
Market Intelligence	Outputs/Leading Indicators	All Projects	Projects Contracted	5	3	41%
Market Intelligence	Outputs/Leading Indicators	All Projects	Website Downloads	500	295	41%
Market Pathways - C/I	Outputs/Leading Indicators	All Projects	EAL Evaluations	10	6	41%
Market Pathways - C/I	Outputs/Leading Indicators	All Projects	EAL Seminars/ Webinars	10	6	41%
Market Pathways - C/I	Outputs/Leading Indicators	All Projects	Factsheets	6	4	41%

Table D-1 continued

T&MD Initiative	Milestone / Result Type	Project Type	Metric	Original Target Total	Revised Target Total	Percent Budget Reduction*
Market Pathways - C/I	Outputs/Leading Indicators	All Projects	Innovative Energy Efficiency Investment Strategy Participants	30	18	41%
Market Pathways - C/I	Outputs/Leading Indicators	All Projects	Seminars/ Webinars	10	6	41%
Market Pathways - C/I	Outcomes/Impacts	All Projects	Projects Completed	20	12	41%
Market Pathways - Midstream Support	Outputs/Leading Indicators	All Projects	Factsheets	9	5	41%
Market Pathways - Midstream Support	Outputs/Leading Indicators	All Projects	Midstream Partner Participants	510	301	41%
Market Pathways - Midstream Support	Outputs/Leading Indicators	All Projects	Midstream Partner Trainees	1,025	605	41%
Market Pathways - Midstream Support	Outputs/Leading Indicators	All Projects	Seminars/ Webinars	9	5	41%
Market Pathways - Midstream Support	Outcomes/Impacts	All Projects	Energy Savings Installed (GWh)	37	22	41%
Market Pathways - Midstream Support	Outcomes/Impacts	All Projects	Market Adoption	3	2	41%
Market Pathways - RES	Outputs/Leading Indicators	All Projects	Energy Smart Product Partner Participants	1,240	732	41%
Market Pathways - RES	Outputs/Leading Indicators	All Projects	Product Partner Trainees	500	295	41%
Market Pathways - RES	Outcomes/Impacts	All Projects	Energy Savings Installed (GWh)	125	74	41%
Market Pathways - RES	Outcomes/Impacts	All Projects	Energy Savings Installed (MMBtu)	895,000	528,050	41%
Market Research	Outputs/Leading Indicators	All Projects	Projects Completed	4	4	4%
Renewable Energy and Advanced Technologies	Outputs/Leading Indicators	All Projects	Certifications Developed	3	1	61%
Renewable Energy and Advanced Technologies	Outputs/Leading Indicators	All Projects	Course Development	8	3	61%
Renewable Energy and Advanced Technologies	Outputs/Leading Indicators	All Projects	Entry Level Trainees	480	187	61%
Renewable Energy and Advanced Technologies	Outputs/Leading Indicators	All Projects	OJT, Hands-On Training	680	265	61%
Renewable Energy and Advanced Technologies	Outputs/Leading Indicators	All Projects	Renewable Energy Technical Trainees	2,000	780	61%
Renewable Energy and Advanced Technologies	Outputs/Leading Indicators	All Projects	Training Organizations	6	2	61%

Table D-1 continued

T&MD Initiative	Milestone / Result Type	Project Type	Metric	Original Target Total	Revised Target Total	Percent Budget Reduction*
Renewable Energy and Advanced Technologies	Outcomes/Impacts	All Projects	Leveraged Funds Amount (millions)	4	2	61%
Resource Development	Outputs/Leading Indicators	All Projects	Projects Completed	6	1	91%
Resource Development	Outputs/Leading Indicators	All Projects	Projects Contracted	6	1	91%
Resource Development	Outputs/Leading Indicators	All Projects	Stakeholder Engagements	3	-	91%
Resource Development	Outcomes/Impacts	All Projects	Leveraged Funds Amount (millions)	3	-	91%
Resource Development	Outcomes/Impacts	All Projects	Site Development Potential (MW)	1,000	90	91%
Smart Grid	Outputs/Leading Indicators	All Projects	Supported Companies	34	18	46%
Smart Grid	Outputs/Leading Indicators	Research Studies	Projects Completed	8	4	46%
Smart Grid	Outputs/Leading Indicators	Research Studies	Projects Contracted	8	4	46%
Smart Grid	Outputs/Leading Indicators	Technology, development, demonstration or pilot projects	Projects Completed	29	16	46%
Smart Grid	Outputs/Leading Indicators	Technology, development, demonstration or pilot projects	Projects Contracted	29	16	46%
Smart Grid	Outcomes/Impacts	All Projects	Leveraged Funds Amount (millions)	112	60	46%
Smart Grid	Outcomes/Impacts	All Projects	Market Adoption	6	3	46%
Smart Grid	Outcomes/Impacts	All Projects	Product Revenue Amount (millions)	6	3	46%
Smart Grid	Outcomes/Impacts	All Projects	Products and Technologies Commercialized	3	2	46%
Solar Cost Reduction	Outputs/Leading Indicators	All Projects	Meetings, Workshops, Conferences	10	6	41%
Solar Cost Reduction	Outputs/Leading Indicators	All Projects	Solar (PV) Trainees	2,000	1,180	41%
Solar Cost Reduction	Outputs/Leading Indicators	All Projects	Supported Companies	9	5	41%
Solar Cost Reduction	Outputs/Leading Indicators	All Projects	Training Sessions	200	118	41%

Table D-1 continued

T&MD Initiative	Milestone / Result Type	Project Type	Metric	Original Target Total	Revised Target Total	Percent Budget Reduction*
Solar Cost Reduction	Outputs/Leading Indicators	Develop tools, practices, studies, surveys, engagements	Projects Completed	10	6	41%
Solar Cost Reduction	Outputs/Leading Indicators	Develop tools, practices, studies, surveys, engagements	Projects Contracted	10	6	41%
Solar Cost Reduction	Outputs/Leading Indicators	Technology, development, demonstration or pilot projects	Projects Completed	10	6	41%
Solar Cost Reduction	Outputs/Leading Indicators	Technology, development, demonstration or pilot projects	Projects Contracted	10	6	41%
Solar Cost Reduction	Outcomes/Impacts	All Projects	Leveraged Funds Amount (millions)	13	8	41%
Solar Cost Reduction	Outcomes/Impacts	All Projects	Market Adoption	7	4	41%
Solar Cost Reduction	Outcomes/Impacts	All Projects	Product Revenue Amount (millions)	7	4	41%
Solar Cost Reduction	Outcomes/Impacts	All Projects	Products and Technologies Commercialized	1	1	41%

* The actual percent target reduction may vary from the percent budget reduction due to rounding.

NYSERDA, a public benefit corporation, offers objective information and analysis, innovative programs, technical expertise, and support to help New Yorkers increase energy efficiency, save money, use renewable energy, and reduce reliance on fossil fuels. NYSERDA professionals work to protect the environment and create clean-energy jobs. NYSERDA has been developing partnerships to advance innovative energy solutions in New York State since 1975.

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