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Clean Energy Fund Investment Plan: Workforce Development and Training Chapter

Portfolio: Market Development

Submitted by:

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16 Workforce Development and Training

The New York State Energy Research and Development Authority (NYSERDA) seeks to build on its long history of working in partnership with education and training systems to deliver the workforce skills employers need. With many of the state's most skilled employees approaching retirement age, an insufficient pipeline of skilled workers to fill the gap and technologies that are evolving rapidly, New York needs a readily available workforce that is skilled and adaptable. Many initiatives will target incumbent workers, but whenever possible, efforts will seek to identify future workforce needs and increase economic opportunity for unemployed and underemployed workers by developing and promoting middle-skill jobs.

In the first initiative described in this Chapter, NYSERDA is utilizing an Industry Partnership approach to workforce training (i.e., an ongoing dialogue among industry leaders on common workforce issues and opportunities). This approach is intended to: help identify worker skill needs; inform investments in skills and talent development; support career pathways; and develop the training infrastructure needed to better link supply and demand in the labor market. NYSERDA will initially focus this approach in the area of building operations and maintenance, however it is anticipated that this initiative will be modified to implement additional workforce training Industry Partnerships in other target sectors or technologies.

Potential additional initiatives under consideration would address discrete training and workforce development gaps and necessary interventions to support other Clean Energy Fund (CEF) priorities including, but not limited to, training on large scale renewables and distributed generation technologies for municipalities and code officials, practitioner training for geothermal systems, new storage technologies and zero energy homes, training to help support transitioning veterans and low-and moderate-income populations, training on advanced residential clean energy technologies, technical sales training for renewable energy technologies, etc.

Program investments and activities will be informed via engagement with stakeholders and subject matter experts.

16.1 Industry Partnerships

Present Situation	• Commercial net energy use, including most large multifamily buildings, accounts for 25 percent of the total energy demand in New York State. According to the U.S. Department of Energy, building owners can save five to 20 percent on their energy bills annually by implementing operations and maintenance best practices[1]. • Proper building operations and maintenance, quality training for operations and maintenance staff, and the creation of an energy efficiency culture for building owners and occupants are important components of operation and maintenance

[1] Patterns and Trends New York State Energy Profiles: 1999-2013 Final Report October 2015: http://www.nyserda.ny.gov/About/Publications/EA-Reports-and-Studies/Patterns-and-Trends

	programs[2] but are often overlooked or undervalued. Facility equipment performance is directly linked to the capabilities of the individuals responsible for building operations. Proper training for operators increases the likelihood that equipment will function effectively and efficiently over its expected lifespan. • There are more than 120,000 people employed in building operations and maintenance-related occupations across New York State. Approximately 20 percent of the building operations and maintenance workforce is slated to retire over the next five years. This would result in more than 24,000 vacancies, which could lead to a significant skills shortage[3]. With starting wages for entry level maintenance and operations workers averaging $17 per hour and boiler operators averaging $32 per hour, there is a great potential to prepare low- and middle-income workers for clean energy jobs. • In addition to losses through retirement attrition, the industry is also faced with ongoing technological advancements that can have significant impacts on the workforce. As new and emerging clean energy technologies, continue to gain prominence, there is a need to upgrade the skills of new and existing workers. Both employers and workers will benefit from the development of new clean energy skills. • NYSERDA has past experience developing training and career pathways initiatives, including its on-the-job training program, which resulted in more than 600 job placements and job advancements.
Intervention Strategy	• NYSERDA will leveraging existing training infrastructure and focus on job skills and training that lead to job placement and career advancement through an "Industry partnership" approach. This approach involves obtaining stakeholder input to help identify, implement, and replicate workforce development and training initiatives designed to match industry workforce needs with a supply of skilled workers. • The industry partnership approach will identify workforce development and training needs for building operations and maintenance occupations across multiple sectors. NYSERDA will also assess the potential for follow-on industry partnerships in additional areas where labor market needs and workforce training gaps have been identified, such as but not limited to renewable thermal technologies (e.g., geothermal and solar thermal), smart grid and smart networks, and large-scale renewables. • With guidance from industry, NYSERDA will implement a minimum of six demonstrations (three in building operations and maintenance and three related to renewables or smart grid technology applications) to demonstrate the business case for investing in training and for developing internal training mechanisms and career advancement for workers in a wide range of markets (commercial, industrial, and multi-family). • The results from the business case demonstrations will be disseminated to the markets to help support the development of more effective talent strategies for relevant occupations and to facilitate the adoption of an energy culture within facilities and across organizations. NYSERDA will reinforce this through competitive solicitations targeting large entities with multiple buildings and sites to support development of on-the-job workforce training initiatives. Employers will commit to replicating the results throughout their buildings.

[2] Energy Efficient Operations and Maintenance Practices in NYS Buildings, Columbia University School of International and Public Affairs, 2014

[3] Building Operations and Maintenance: Maintenance and Repair Workers (108,832 workers in 2015, SOC 49-9071), Property, Real Estate, and Community Association Managers (10,477 workers in 2015, SOC 11-9141), and Boiler Operators (1,768 workers in 2015, SOC 51-8021). Total of 121,077 workers.

	• Proposals could be submitted by an organization or by teams that include existing training entities, but it is anticipated that projects will be led by businesses. Examples of typical projects include: partnerships with training providers to update classroom training and the development of internal trainers to provide continuous, on-the-job training and sustainable, replicable models; development of internships, mentoring, or on-the-job training programs that can build skills, help new hires, and provide career advancement opportunities for supervisors/mentors; development of new curriculum or curriculum modules to support continuing education and pursuit of certifications; support for new certifications; or creation or updating of apprenticeships. • The strategy is designed to address common skills gaps and workforce training needs in an industry or sector, across industries or sectors, and related to a specific technology or occupation. While interventions are designed to be responsive to industry needs, existing workers will develop new skills that can result in new responsibilities and higher wages. • For a visual representation of this strategy, please reference the flow chart entitled "Logic Model: Workforce Development and Training: Industry Partnerships," which can be found in Appendix A.
Goals	• Demonstrate the value of training to employers of building workers. • Demonstrate the value of training to new and existing employees in terms of job placements, opportunities for low- and moderate-income workers, starting wages and wage increases, career paths and advancements, and attainment of certifications. • Train workers to meet the emerging technology demands of jobs in the clean energy sector. • Form industry partnerships to inform employer-driven workforce solutions, including: o improved skills enhancement for existing workers; o increased access to entry level jobs for disadvantaged (including workers from low- and moderate-income communities) New Yorkers; and o increased energy savings and net operating income for building owners.
State Energy Plan/Clean Energy Standard Link	This strategy contributes to the State Energy Plan goals for energy efficiency and emission reductions because well-trained workers will allow buildings to fully realize the energy savings potential of systems and equipment through proper maintenance and operation. The Energy Plan also directs the State to look for opportunities to leverage the Regional Economic Development Councils, to identify workforce needs and engage industry to help shape curriculum--particularly at the State University of New York (SUNY), City University of New York (CUNY), community colleges, and technical institutes--including short courses and incumbent worker retraining. This strategy encompasses jobs in energy efficiency, building retrofit, weatherization, site-based clean and renewable energy resources, power supply and demand, smart grid, codes and standards, manufacturing and operations, and professional services.

16.1.1 Target Market Characterization

Target Market Segment(s)	The initial target market is employers, managers, new hires and staff involved in building operations and maintenance across the commercial and multifamily building sectors. NYSERDA will seek to partner with large organizations and institutions with high potential for large scale energy savings as a result of training building operations and maintenance staff.
Market Participants	Market participants include: • Colleges and universities

	• Healthcare institutions
	• Large commercial real estate firms
	• Public agencies with significant building space
	• NYC Department of Citywide Administrative Services (DCAS)
	• SUNY, Office of Facilities Management
	• CUNY, Building Performance Lab
	• New York City Housing Authority
	• NYC Mayor's Office of Sustainability
	• NYC Small Business Services
	• NYS Department of Labor (DOL)
	• New York Power Authority (NYPA)
	• Training organizations, including, among others:
	  o International Union of Operating Engineers (IUOE) Local 94
	  o International Brotherhood of Electrical Workers (IBEW) Local 3
	  o Service Employees International Union (SEIU) 32 BJ
	  o Urban Green Council (NYC Chapter of the United States Green Building Council)
	  o Solar One
	  o Association for Energy Affordability
	  o Association for Energy Engineers
	• Regional Economic Development Councils (REDCs)
	• Workforce Investment Boards (WIBs)
	• Job seekers including disadvantaged workers[4]

Market Readiness	• NYSERDA has worked with over 70 training partners over the past 10 years to develop state-of-the-art training facilities and programs to ensure there is an adequate training infrastructure and a skilled labor supply to support the clean energy economy. The industry partnership approach will allow NYSERDA to leverage past work and identify a comprehensive portfolio of NYSERDA initiatives to enhance the skills of clean energy workers in order to enable growth in identified markets. • Industry is looking for more customized, site-specific and hands-on training to supplement classroom training. Such training can better prepare new workers and provide opportunities to advance the skills of existing workers. After extensive stakeholder interviews and surveys, building operations and maintenance was identified as an area for more concerted worker training beyond classroom training. • The level of retirements expected throughout the industry necessitates an influx of new entrants and increased skill levels for existing workers. • When combined with advanced technologies for energy and cost savings, these factors create an ideal opportunity to work with industry to address critical skills gaps and needs for building operators and maintenance staff. Initial feedback from industry partners, detailed in the Market Participants section, indicates that there is receptivity to the employer-driven approach to program planning. Feedback has been positive from employers as well as training providers.
Customer Value	• Properly managing and closely monitoring facilities can reduce energy use and associated utility costs, protect investments in equipment, improve building safety, and avert unnecessary service interruptions and the costs associated with equipment failures.

[4] Disadvantaged workers include, but are not limited to: those residing in low and moderate income communities, underrepresented populations including women and people of color, and disconnected youth.

	• If NYSERDA were to partner with 18 organizations to implement workforce development best practices across even a small percentage of the buildings in their portfolio, CO2e emission reductions could approach 80,000 metric tons annually after three years and more than 633,000 metric tons over the lifetime of the measures. This is comparable to reducing building energy usage by 18%. Annual energy cost savings could exceed $15 million after the first three years and more than $122 million over the lifetime of the measures.

16.1.2 Stakeholder/Market Engagement

Stakeholder/Market Engagement	• NYSERDA has conducted extensive outreach, including interviews, stakeholder meetings, and focus groups with more than 50 customers, as well as a survey that garnered an additional 48 responses. • Through its outreach, NYSERDA was able to engage with employers across a variety of market segments: solar electric; renewable thermal; existing trades (e.g., heating, ventilation and air conditioning, plumbing, carpentry, and weatherization) serving residential customers; equipment and component manufacturers; architects and engineers; investor-owned and private utilities; and building operations and maintenance staff serving multifamily and commercial buildings. • As a result of stakeholder input, building operations and maintenance quickly emerged as an initial focus area with the potential for a large impact in the near term: advancing skills for existing workers, better preparing new entrants to the workforce, and achieving energy efficiency and greenhouse gas reduction goals. • After several informal brainstorming sessions with stakeholders, an initial meeting of key industry partners took place in early June 2016. Additional sector partnership sessions and outreach will be conducted regularly. • NYSERDA will also coordinate with the workforce activities of other State agencies, such as NYPA, DOL, and Empire State Development (ESD).

16.1.3 Theory of Change

Market Barriers Addressed	• **Shortage of skilled workers due to attrition from retirements:** There is an opportunity for NYSERDA to assist industry partners to leverage existing training infrastructures, develop internal training systems to impact more buildings and workers, support entry-level workers, and advance the skills of existing workers. Career pathway development and career advancement for building operations and maintenance will be a priority. • **Changing technology demands requiring upgraded skills for new and existing workers:** The industry is faced with the integration of clean energy resources such as solar, geothermal, wind, storage technologies, micro-grids, smart meters and devices, network-connected systems, applications for managing equipment and building systems, and the availability of real-time data. These new technologies, devices, and systems will have significant impacts on building operations and maintenance and the workforce. There is a critical need to upgrade the skills of new and existing workers on a systematic and on-going basis. • **Lack of information and tools needed to address skills gaps from the demand side:** Most workforce interventions in New York State focus on the labor supply and are measured by the number of workers being trained or certified. New interventions demonstrated through this initiative will balance labor demand with

	supply. Recent industry-based efforts in the advanced manufacturing sector, have shown some of the most successful workforce interventions are those driven by regional employer demand[5].
Testable Hypotheses	• If industry partners implement operations and maintenance best practices, then energy savings could exceed five percent within the first two years of implementation. • If industry partners institutionalize a culture of continuing professional development among operations and maintenance staff, then they can expect to see improved worker retention and knowledge transfer as aging workers approach retirement. • If NYSERDA isolates the impacts of a trained and workforce to prove the business case for training through the demonstrations, then other decision makers (property owners, employers, institutional administrators, etc.) will adopt similar strategies.
Activities	1) Industry Partnerships to Identify Barriers and Skills - develop two to four regional industry partnerships of five to 10 employers to identify labor-related barriers and skills gaps based on labor market analysis a) Building operations and maintenance is the first industry partnership to be fully implemented. Convene industry partnership meetings and conduct voice of customer outreach to solicit input and find common skills and training gaps. b) With input from the industry partnership, identify the specific worker skills and talents needed by employers, which may be at any stage: hiring, technological modernization, or incumbent worker advancement. c) Explore opportunities to develop industry partnerships, where appropriate and through a modification to this plan or through an additional plan, in new areas: renewable thermal technologies (e.g., geothermal and solar thermal); smart grid and smart networks; and large-scale renewables. d) Facilitate the replication of successful training models and initiatives where applicable. 2) Business Case Demonstrations - conduct six business case demonstrations to prove the impact and value of technical classroom training. a) Evaluate technical training available in the market, utilizing an industry recognized evaluation model that goes beyond immediate reactions to training to measure the impacts of training. b) Present business case and evaluation findings in case studies and other tools for dissemination to others in the industry who may be considering an investment in workforce training and development. 3) Identify Training Intervention to Address Skills and Barriers - work with industry partners to identify specific building operations and maintenance training needs and best practices to address barriers identified by the Industry Partnership. Interventions will be targeted at developing sustainable in-house training infrastructure and practices and will include but will not be limited to, the following: a) Train-the-trainer initiatives to develop internal capacity for knowledge transfer b) Partnerships with manufacturers to ensure that training providers have equipment that meets or exceeds industry standards

[5] Groves Garrett and Woolsey, Lindsey. (2013) *Sector Strategies Coming of Age: Implications for State Workforce Policy Makers*. Ann Arbor, Michigan and Washington DC: Corporation for a Skilled Workforce, National Governors Association, and National Skills Coalition.

	c) Curriculum development d) On-the-job training, internships, and apprenticeship enhancement in support of career pathways 4) Competitive Solicitations - Issue one to three competitive solicitations (open to all eligible New York entities) in support of innovative approaches and interventions, as identified above, with entities with multiple buildings and sites). Projects will be solicited to develop workforce training initiatives that leverage existing resources while moving organizations toward a culture that promotes more routine training, including the advancement of skills for existing workers and the development of career pathways for new workers. a) Make contract awards – Award a total of approximately 18 contracts. Performance metrics may include, but are not limited to: number of workers training, incumbent workers advanced or promoted, new hires from LMI communities, and number of trainers trained. 5) Curriculum Development - Where gaps are identified, invest in curriculum development and asses the need for new industry standards to address technological changes. 6) Case Studies - Develop case studies to identify best practices and to illustrate career pathways in energy efficient building operations and maintenance. Templates- Work with industry partners to develop templates that identify interventions and combinations of interventions that can serve as a road map to advance skills and provide easy paths to entry-level jobs.
Key Milestones	<u>Milestone 1 (2016)</u> • Convene industry partners for building operation and maintenance. <u>Milestone 2 (2016)</u> • Identify employer champions, those who will help NYSERDA to lead the initiative, for building operations and maintenance. <u>Milestone 3 (2016)</u> • Identify common labor-related barriers and potential training interventions. <u>Milestone 4 (2016)</u> • Implement one to two business case demonstrations to show value of operations and maintenance training. <u>Milestone 5 (2016)</u> • Begin to collect data from demonstration sites. <u>Milestone 6 (2016)</u> • Identify additional demonstrations (for a total of six business case demonstrations identified and implemented) for implementation in 2017. <u>Milestone 7 (2016)</u> • Identify additional areas (by sectors, industry or technology) to initiate industry partnership strategy to address workforce development and training needs to advance goals of CEF. <u>Milestone 8 (2016)</u> • Issue a solicitation to support the development of building operations and maintenance training initiatives that address skills gaps and facilitate career paths.

	Milestone 9 (2017) • Issue contracts resulting from the solicitation(s). Milestone 10 (2017) • Revise and reissue solicitation, one to two additional times, if necessary based on results and findings from the solicitation issued in 2016. Milestone 11 (2107) • Data collected from demonstration sites to help demonstrate the business case for training. Milestone 12 (2017) • Case studies shared with industry. Milestone 13 (2017) • Templates available to illustrate models and training options. Milestone 14 (2018) • Data collection from all demonstrations completed. Milestone 15 (2018) • Execute any remaining contracts from 2017 solicitation, if applicable.
Goals Prior to Exit	• Achievement of site-specific performance targets at business case demonstration sites. These may include the following: o Energy savings/CO2 emissions reduced in buildings where on-site training is implemented o Employee retention and/or reduced time to fill vacancies improved o Training and skill enhancement institutionalized o Trained worker wage increased, commensurate with skill enhancement o New hires placed o Employee turnover for trained workers reduced o Career pathways better defined o Tenant satisfaction/health/comfort improved o Skills specific to technological barriers enhanced: ▪ Automated controls ▪ Network-connected systems • Dissemination of best practices proving the return on investment for training and skill enhancement for workers. • Improved coordination with Regional Economic Development Councils and Workforce Investment Board activities, including leveraging of funds where appropriate. • Replicate the industry partnership model across other areas of the clean energy economy where justified by market readiness. Other areas may include: large scale renewables, renewable thermal, and smart grid technologies.

16.1.4 Relationship to Utility/REV

Utility Role/Coordination Points	• NYSERDA is coordinating sector strategy work with NYPA's training activities to share best practices and lessons learned and intends to engage other utilities through the stakeholder engagement process. • Many training partners already work closely with the utilities. Commercial building partners often have close relationships with their utilities and participate in energy efficiency incentive programs administered by their

	utilities. NYSERDA will seek to engage utility key account managers to help identify potential end users. • NYSERDA will also take advantage of the Clean Energy Advisory Council (CEAC) Clean Energy Implementation and Coordination Working Group to coordinate planning and implementation with the New York State utilities.
Utility Interventions in Target Market	• The industry partnership model leverages investments such as Build Smart NY, under which NYPA and SUNY implemented large scale energy efficiency upgrades at several SUNY campuses. The industry partnership model seeks to bolster these investments by improving worker skills so that systems are operated optimally in eligible buildings.

16.1.5 Budgets & Expenditures

An annual commitment budget for all activities included in this chapter is shown in Table 1. The annual expenditure projection is included in Table 2. Budgets and expenditures do not include Administration, Evaluation, or Cost Recovery Fee; these elements are addressed in the Budget Accounting and Benefits chapter filing. The budget as presented in the Budget Accounting and Benefits Chapter will serve as the basis for any subsequent reallocation request. The additional level of detail presented within the table below is intended for informational purposes only.

Table 1: Annual Market Development Budget Allocation – Commitment Basis

Commitment Budget	2016	2017	2018	2019	Total
Direct Incentives and Services	$200,000	$4,000,000	$1,250,000	-	$5,450,000
Research and Technology Studies/Development/Demos	$100,000	$200,000	$100,000	$100,000	$500,000
Tools, Training, and Replication	$20,000	$200,000	$200,000	$150,000	$570,000
Implementation Support	$75,000	$100,000	$75,000	$75,000	$325,000
Total	$395,000	$4,500,000	$1,625,000	$325,000	$6,845,000

Table 2: Annual Expenditures Projection

Expenditures	2016	2017	2018	2019	2020	2021	2022	Total
Total	2%	13%	15%	22%	22%	15%	9%	100%

16.1.6 Progress and Performance Metrics

Table 3 provides program Activity/Output indicators representing measurable, quantifiable direct results of activities undertaken in the initiative. Outputs are a key way of regularly tracking progress, especially in the early stages of an initiative, before broader market changes are measurable. Outcome indicators can encompass near-term through longer-term changes in market conditions expected to result from the activities/outputs of an intervention. Outcome indicators will have a baseline value and progress will be measured periodically through Market Evaluation.

Table 3. Initiative Specific Metrics

Indicators[6]		Baseline (Before/Current)	2019 (Cumulative)	2022 (Cumulative)
Activity/Outputs	Increased wages for trainees	TBD	3-5%	5-10%
	Increase in number of workers trained	0	435	555
	Increase in the number of trainees obtaining national certifications	TBD	20%	30%
Outcomes	Improved employee retention	TBD	15%	25%
	Decreased time for employer to find and hire new talent with the appropriate skills	TBD	10%	15%
	Increased number of staff qualified to train others	0	90	120
	Increase in number of industry partnerships	1	3	5
	Increased number of curricula available	TBD	3	5
	Improved performance and efficiency of building systems	TBD	5%	10%
	Number of incumbent workers advanced/promoted	0	108	123
	Number of individuals placed into paid internships	0	130	170
	Number of disadvantaged (LMI) workers placed in building operations and maintenance jobs	0	70	90

Benefits shown in Table 4 and Table 5 are direct, near term benefits associated with this initiative's projects. These benefits will be quantified and reported on a quarterly basis and will be validated through later evaluation.

[6] TBD denotes that NYSERDA requires more data in order to quantify baseline/market metrics to the degree needed to measure against in the future. Baseline measurements of key market indicators are anticipated to occur soon following initiative approval and NYSERDA will update the information in this table as the information becomes available, which is anticipated within 9-12 months of initiative approval. A 0 (zero) denotes that the actual value is currently believed to be zero for baseline/market metrics.

Table 4. Direct Impacts[7]

Primary Metrics		2016	2017	2018	2019	TOTAL
Energy Efficiency	MWh Annual	-	9,210	25,800	55,300	90,270
	MWh Lifetime	-	73,700	206,000	442,000	722,200
	MMBtu Annual	-	61,000	171,000	366,000	597,700
	MMBtu Lifetime	-	488,000	1,370,000	2,930,000	4,781,000
	MW	-	-	-	-	-
Renewable Energy	MWh Annual	-	-	-	-	-
	MWh Lifetime	-	-	-	-	-
	MW	-	-	-	-	-
CO2e Emission Reduction (metric tons) Annual		-	8,080	22,600	48,500	79,200
CO2e Emission Reduction (metric tons) Lifetime		-	64,700	181,000	388,000	633,600
Customer Bill Savings Annual ($ million)		-	$1.56	$4.37	$9.37	$15.31
Customer Bill Savings Lifetime ($ million)		-	$12.5	$35.0	$75.0	$122.4
Private Investment ($ million)		$0.40	$2.25	$2.13	$2.08	$6.845

Table 5. Annual Projected Initiative Participation

	2016	2017	2018	Total
Participants (Contracts with employers)	6	13	5	24

Benefits shown in Table 6 represent the estimated indirect market effects expected to accrue over the longer term as a result of this investment and follow on market activity. The indirect benefits that accrue from this investment will be quantified and reported based on periodic Market Evaluation studies to validate these forecasted values. Market Evaluation may occur within one year (-/+) of the years noted in the table and projected future indirect benefits and/or budgets necessary to achieve them may be updated based on the results of market evaluation. Indirect impact across NYSERDA initiatives may not be additive due to multiple initiatives operating within market sectors. The values presented below are not discounted, however NYSERDA has applied a discount of 50% to the overall portfolio values in the Budget Accounting and Benefits chapter.

Table 6. Estimated Indirect Market Impact

Indirect Impact		2020	2025	2030
Energy Efficiency	MWh Cumulative Annual	212,000	779,000	1,420,000
	MMBtu Cumulative Annual	1,410,000	5,160,000	9,400,000
Renewable Energy	MWh Cumulative Annual	-	-	-
	MW	-	-	-
CO2e Emission Reduction (metric tons) Cumulative Annual		186,000	683,000	1,250,000

[7] Impacts are expressed on a commitment-year basis, and are incremental additions in each year. Assumes an 8-year measure life. Benefits are rounded to three significant figures. Totals may not sum due to rounding. Customer Bill Savings are calculated as direct energy bill savings realized by customers participating in NYSERDA's programs.

16.1.7 Fuel Neutrality

Fuel Neutrality	• NYSERDA intends to offer this initiative in a fuel neutral manner to encourage more efficient use of all fuel types. Offering the initiative on a fuel neutral basis will allow NYSERDA to achieve savings at a cost of $60 per ton of carbon, compared to a cost of $108 per ton of carbon in an electric only scenario.

16.1.8 Performance Monitoring and Evaluation Plans

Performance Monitoring & Evaluation Plan	NYSERDA's approach to monitoring and assessing the effectiveness of the initiative and overall market development is described below. **<u>Test-Measure-Adjust Strategy</u>** • Annual starting 2017: reporting on building and maintenance industry partnership approach to test if optimizing operation and maintenance strategies to keep building equipment and systems operating efficiently reduces the risk of early equipment failure, unscheduled down time, high utility costs, and tenant complaints and turnover. Assess and validate the sector partnership approach and adjust the program design or activity as needed. • Impacts of efficient building operation on a facility's net operating income and overall value will be captured via annual reporting. Additionally, impacts on energy efficiency and emission reductions due to well-trained workers better maintaining and operating energy efficient systems will be assessed. • Annually starting 2017: Test to see if business case demonstrations have proven the business case for investing in training and for developing internal training mechanisms and career advancement for workers in occupations in this sector in a wide range of markets. Adjust the program design or specific activity as needed. • 2019: Assess if business case demonstrations have supported the development of more effective talent strategies for building operations and maintenance occupations and facilitates the adoption of an energy culture within facilities and across organizations. **<u>Market Evaluation</u>** • Market Evaluation will draw on the logic model and will include baseline and longitudinal measurement of key indicators of programmatic and broader market success. • Baseline measurements of key market indicators will occur within one year following initiative approval and will provide additional insights that will allow NYSERDA to adjust the strategy. These include but are not limited to: increased wages for trainees, increase in number of workers trained, and employee retention. • Regular (e.g., annual or biennial) updates to key performance indicators and measurement of market change, including but not limited to: number

	of incumbent workers advanced/promoted, of industry partnerships established, and disadvantaged workers (LMI) entering building operations and maintenance careers. • Sources of data include intervention data, public and commercially available data, and primary data collection through surveys of key market actors. **<u>Impact Evaluation/Field Verification</u>** • Evaluation M&V will be conducted for a sample of participating spaces/buildings, according to the International Performance Measurement & Verification Protocol (IPMVP) method(s) most appropriate given the improvements made. Data from Field Verification/Impact Evaluation can be used to help lend confidence in the market, especially among other end users.

Appendix A – Logic Models