

## **APPENDIX B: TECHNICAL GUIDELINES FOR RETROFIT AND NEW CONSTRUCTION PROJECTS**

The technical guidelines describe the eligibility and requirements an applicant and project developer must follow to demonstrate energy and cost savings for a PACE project. Pursuant to its authority under G.L. c. 25A, sec. 6(13)<sup>1</sup>, the Massachusetts Department of Energy Resources hereby publishes these technical guidelines for the implementation of the Commercial Property Assessed Clean Energy (PACE) program, as set forth in G.L. c. 23M.

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<sup>1</sup> G. L. c. 25A, § 6 (13) <https://malegislature.gov/Laws/GeneralLaws/PartI/TitleII/Chapter25A/Section6>

## I. Project Eligibility

### A. General Eligibility

Energy Improvements that qualify for PACE Massachusetts financing include retrofits or new construction of a commercial, industrial, or multifamily (five or more units) property, that are permanently fixed to the property.

### B. Projects eligible under PACE Massachusetts include:

- a. **Retrofits that reduce energy consumption** (*Energy Consumption Reduction Improvements*) (*Pathway 1.A*): energy efficiency and conservation measures including, but not limited to, lighting and lighting control upgrades, heating, ventilation, and air conditioning (HVAC) equipment upgrades, building envelope improvements and efficient electrification. Stand-alone energy storage systems as defined in this guideline are also eligible.
- b. **Installation of renewable energy systems** (*Renewable Energy Improvements*) (*Pathway 1.B*): installation of technologies that meet requirements for RPS Class I or technologies that meet requirements as renewable thermal generating units under the APS program, including but not limited to solar photovoltaic panels, wind systems, anaerobic digestion, solar thermal, ground-source heat pumps, air-source heat pumps, and biomass, as defined above. Energy storage systems paired with eligible Renewable Energy Improvements may qualify for PACE without meeting the consumption reduction standard for a stand-alone energy storage system, if the total project Savings to Investment ratio (SIR) is greater than one, as discussed below.
- c. **New Construction that falls under one of the following categories and complies with pathways 2.A., 2.B. or 2.C. in Table 1 of this guideline:**
  - New building construction;<sup>2</sup>
  - Large addition (greater than 20,000 sq ft or 100% or more of the existing building size) to an existing building;<sup>3</sup>
  - Alteration Level 3 (affecting greater than 50% of the area) to an existing building;<sup>4</sup>
  - Change of use to an existing building;<sup>5</sup>

Project developers for PACE financing must follow the qualifying criteria associated with one of the project pathways in Table 1. below. Please see Section F: Detailed Technical Requirements for more details on the requirements for each pathway.

The qualifying criteria for project types 2.A., 2.B. and 2.C. reference 225 CMR 23.00: Massachusetts Commercial Stretch Energy Code (Stretch Code) and Municipal Opt-in Specialized Energy Code (Specialized code). As the Massachusetts building energy codes undergo periodic updates, projects will be evaluated against the version that is current at the time of permit application.

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<sup>2</sup> Please see Section B. Timeline for application.

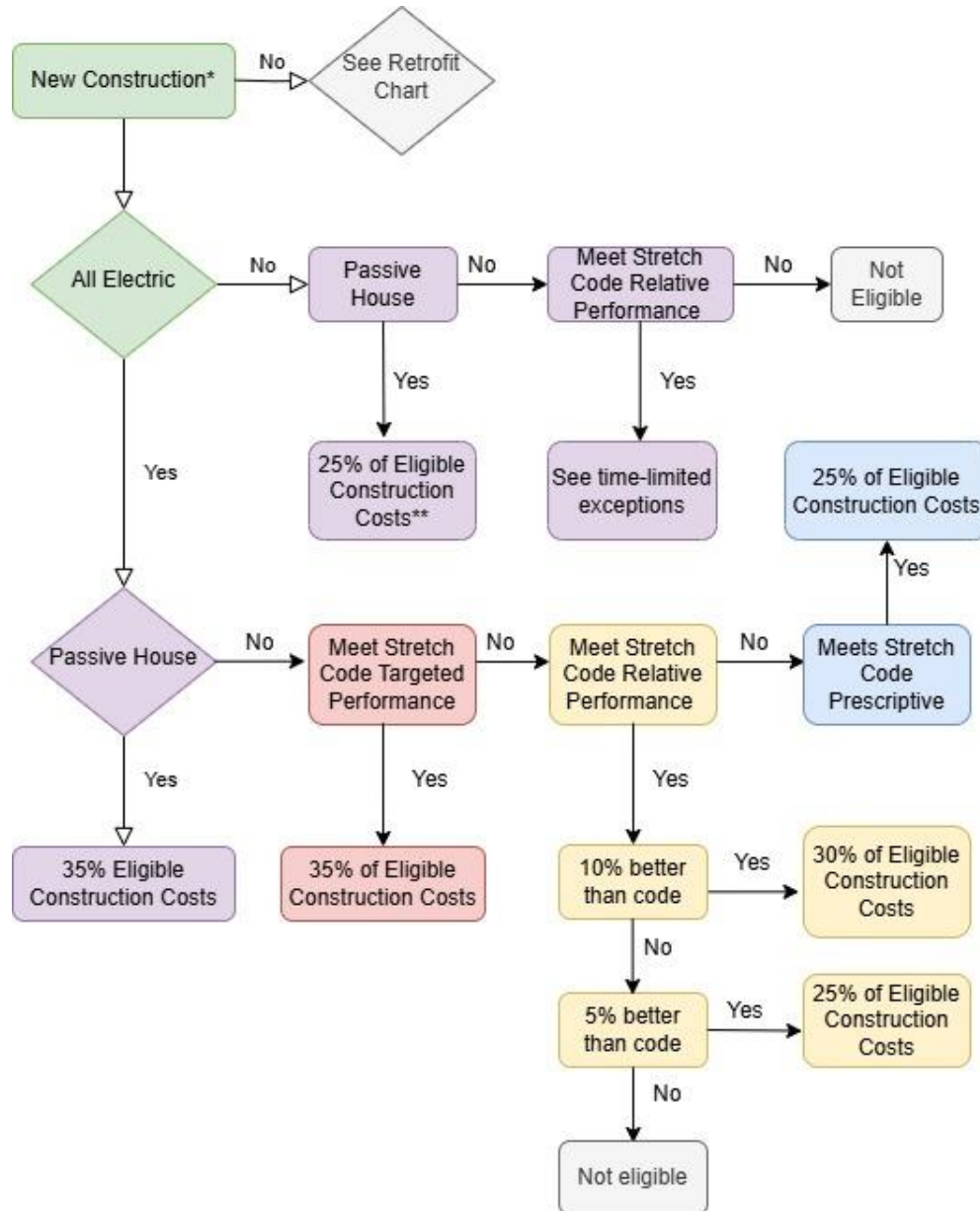
<sup>3</sup> As defined in the International Energy Conservation Code (IECC) 2021, Section 202.

<sup>4</sup> As defined at International Existing Building Code (IEBC) 2021, Section 604.

<sup>5</sup> As defined in International Energy Conservation Code (IECC) C501.1.

The following chart is a guide for identifying the applicable pathway and maximum financing amount for a project applying to PACE MA.

**Fig 1. Guide to identifying applicable PACE project pathway**



\*See Section I.B. for the definition of new construction projects in PACE MA.

\*\*See time- limited exceptions

**Table 1. Pathways and criteria for PACE Massachusetts financing**

PROJECT PATHWAY	QUALIFYING CRITERIA	MAXIMUM FINANCING AMOUNT ALLOWED	
1.A. Retrofits	Savings to Investment Ratio (SIR) Required: Energy cost savings must exceed cost of project	Entire Cost of project	
1.B. Renewable Energy Improvements	Savings to Investment Ratio (SIR) Required: Energy cost savings must exceed cost of project	Entire Cost of project	
NEW CONSTRUCTION			
2.A. Whole Building Pathway: Relative Performance <sup>6</sup>	Condition 1: Relative Performance Compliance*  Building must conform to 225 CMR 23.00, Section CC104 (All-electric pathway of the Municipal Opt-in Specialized Energy Code) and Section C401.2.1. Part 3 (Relative Performance compliance) and	BPF Factor in Table 4.2.1.1. reduced by 5%	25% of TECC
	Condition 2: Building Performance Factor (BPF) in 225 CMR 23.00, Section C407.2.2.1, ANSI/ASHRAE/IESNA Standard 90.1-2019 Table 4.2.1.1 <sup>7</sup> is further reduced by at least 5%. Amount allowed for PACE financing increased if BPF is reduced by at least 10% (see columns to the right)	BPF Factor in Table 4.2.1.1. reduced by 10%	30% of TECC

<sup>6</sup> Consistent with the 225 CMR 23.00, the Whole Building Pathway: Relative Performance option can only be used if the building is not a residential building, dormitory, fire station, library, office, school, police station, post office, or town hall and/or the building has average ventilation at full occupancy of greater than 0.5 cfm/sf.

<sup>7</sup> <https://www.mass.gov/doc/commercial-and-other-stretch-energy-code-and-specialized-opt-in-code-language/download>, Page 24.

**Table 1. continued: Pathways and criteria for PACE Massachusetts financing**

PROJECT PATHWAY (continued)	QUALIFYING CRITERIA (continued)	MAXIMUM FINANCING AMOUNT ALLOWED (continued)	
<b>2.B. Whole Building Pathway: Targeted Performance</b>	<b>Option 1: Targeted Performance Compliance</b>  Building must conform to 225 CMR 23.00, Section CC104 ( <b>All-electric pathway of the Municipal Opt-in Specialized Energy Code</b> ) and Section C401.2.1. Part 2. ( <b>Targeted Performance Compliance</b> )	All-electric	<b>35% of TECC</b>
	<b>Option 2: All-electric Passive House Compliance</b> Building must conform to 225 CMR 23.00, Section CC104 ( <b>All-electric pathway of the Municipal Opt-in Specialized Energy Code</b> ) and Section C401.2.2. Part 1 ( <b>Passive House compliance</b> )	All-electric	<b>35% of TECC</b>
	<b>Option 3: Mixed-fuel Passive House Compliance**</b>  Building must conform to 225 CMR 23.00, Section CC105 ( <b>mixed-fuel building pathway of the Specialized Municipal Opt-in code</b> ) and Section C401.2.2 Part 1 ( <b>Passive House compliance</b> )	Mixed fuel	<b>25% of TECC</b>
<b>2.C. Prescriptive Pathway<sup>8</sup></b>	<b>Condition 1.</b> Building must conform to 225 CMR 23.00, Section CC104 ( <b>all-electric pathway of the Municipal Opt-in Specialized Energy Code</b> ) and Section C401.2.1. Part 1 ( <b>Prescriptive compliance</b> ) <b>and</b> <b>Condition 2. SIR Required</b> Energy cost savings must exceed <i>incremental</i> cost of energy improvements.	<b>25% of TECC<sup>9</sup></b>	

<sup>8</sup> This pathway may only be used for any nonresidential building, or portions thereof up to 20,000-sf.

<sup>9</sup> Total Eligible Project Costs (TECC).

## **Time-Limited exceptions**

\* Mixed-fuel Relative Performance Pathway projects: High-ventilation buildings (buildings having average ventilation at full occupancy greater than 0.5 cfm/sf) will be eligible for PACE financing if they meet the following conditions

- Were permitted prior to 2024
- Meet the standards of the mixed-fuel pathway of the Specialized Code (CC101.3, Part 3 and CC101.4) as listed below
  - Hybrid electric heat pump/gas space heating (heat pumps sized to a min. 25% of peak heating load as the primary heat source) (C401.4.1),
  - Envelope backstop and thermal bridge derating (C402.1.5),
  - High ventilation recovery effectiveness (C403.7.4.1),
  - Low air-infiltration (C402.5),
  - Electric readiness (CC106.1), and
  - On-site solar PV (CC105.2)
- Remain high-ventilation buildings after receiving PACE financing

\*\* All Passive House (PH) projects permitted prior to May 2023, the date of release of PACE for new construction guidelines, will be eligible for retroactive PACE financing up to 35% of TECC provided they apply within the 36-month period from receiving a Certificate of Occupancy. Mixed-fuel PH projects permitted after this date will be subject to the 25% cap, while all-electric PH will be eligible for 35%.

## **C. Timeline for Application**

PACE Massachusetts applications for new construction are encouraged to be submitted prior to permit application. However, a project may apply for CPACE financing provided it has received its Certificate of Occupancy, or has been completed as a retrofit, within 36 months prior to the date of submission of a complete application to the PACE program. The project must meet the eligibility and qualifying criteria for the applicable project pathway. The maximum terms of the financing will remain the same.

## **D. Eligible Costs**

### **(Retrofits and New Construction, as applicable)**

The specific items in a commercial PACE project that are eligible for financing are:

- Design and procurement, including engineering and consulting services to prepare a PACE application, as well as legal fees<sup>10</sup> and other related project costs
- Construction, installation, and implementation of Energy Improvements, including barrier mitigation and Renewable Energy Improvements<sup>11</sup>
- Cost of non-eligible items directly related to the installation of eligible Energy

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<sup>10</sup> To support a request for legal fees, the documentation must clearly show the legal fees are attributable to eligible construction activities.

<sup>11</sup> Renewable Energy Improvements may be financed separately under Project Pathway 1.B. or combined with other energy improvements through the other project pathways.

Improvements. Examples of non-eligible items that may be necessary to facilitate a project and therefore may be included in the C-PACE financing amount include:

- Asbestos abatement associated with a boiler retrofit
- New pads to support new plant equipment, such as a new chiller
- Relocation of equipment associated with the installation of energy saving measures, such as relocating a packaged rooftop unit to better serve redistributed loads within a building
- Rerouting of a fire sprinkler system to accommodate a new HVAC system
- Electrical upgrades associated with the conversion of a gas-fired heating system to electric heat pumps or a new solar photovoltaic (PV) system
- Carports supporting a solar PV array
- Demolition of an existing parking lot and installation of a new parking lot to allow for installation of a bore field associated with a new ground source heat pump system
- Window shading devices.
- Project management
- Related energy audits
- Feasibility studies
- Permitting fees for eligible Energy Improvements
- Commissioning of the installed improvements
- Measurement and verification reports of the installation and effectiveness of Energy Improvements (including commissioning)
- Financing and application fees<sup>12</sup>

## **2. Total Eligible Construction Costs (TECC) for new construction**

Maximum PACE financing for new construction is dependent on the pathway followed in Table 1. and is a percentage of the TECC. The specific items eligible for inclusion in the TECC are hard and soft costs directly related to a project's design and construction. Costs of any items not permanently affixed to the building are not eligible, e.g., furniture, computers, and appliances. Energy Improvements must be permanently fixed to the property. Power purchase agreements and equipment lease agreements are not eligible for financing.

The TECC for each application is subject to review and approval by DOER and may include the following items:<sup>13 14</sup>

- 03 – Concrete
- 04 – Masonry
- 05 – Metals
- 06 – Woods, Plastic, Composites
- 07 – Thermal and Moisture Protection

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<sup>12</sup> See guidance from Mass Development for allowable costs under this item.

<sup>13</sup> Consistent with the goals of CPACE, the intention is to promote the construction of energy efficient and clean energy utilizing buildings. Therefore, some of the eligible items may be narrowly construed to support the CPACE purpose. Applicants should work with DOER and its technical consultant to determine the scope of eligible costs.

<sup>14</sup> Please refer to the MasterFormat® (CSI Codes) for a complete list of eligible items under this construction code division.  
<https://www.csiresources.org/standards/masterformat>

- 08 – Openings
- 09 – Finishes
- 14 – Conveying Equipment
- 15 – Plumbing + HVAC
- 16 – Electrical + Lighting (except for electrical upgrades and modifications required and owned by the utility)
- 20 – Mechanical Support
- 21 – Fire Suppression
- 22 – Plumbing
- 23 – HVAC (including geothermal drilling and installation costs)
- 25 – Integrated Automation
- 26 – Electrical
- 27 – Communications
- 28 – Electronic Safety and Security
- 48 – Electrical Power Generation (limited to: photovoltaic, wind turbine, and energy storage systems attached to the building)
- 01 – General Requirements associated with above divisions
- Engineering and consulting services related to design and delivery of above.
- Modeling and other soft costs related to energy use and PACE application.

TECC shall not include the following Divisions

- 02 – Existing Conditions
- 10 – Specialties
- 11 – Equipment
- 12 – Furnishings
- 13 – Special Construction
- 30 through 39 (Site and Infrastructure Subgroup) including
  - Foundations and ground improvement
  - Soil and ground water remediation
  - Soil characterization, management, and disposal
  - Demolition
  - Site development
  - Dewatering
- 40 through 47 (Process Equipment Subgroup)
- General conditions associated with excluded items

In addition, TECC shall not include the following

- Site acquisition and Enabling Costs
- Licensed Site Professional (LSP) Services
- Easements and permits
- Engineering, consulting, or other soft costs associated with excluded items



## II. Project Developer Eligibility

PACE Massachusetts requires a qualified energy Project Developer (PD) to prepare the technical application package, baseline, and savings calculations and to use this information to calculate the SIR for the project. A PD must have at least one of the following qualifications:

- Massachusetts registered architect or Massachusetts registered professional engineer<sup>15</sup>. For new construction projects, the PD must satisfy this requirement and engage a qualified team of consultant(s) to demonstrate energy code compliance with the applicable criteria in Table 1.
- Investor Confidence Project (ICP) PD Credential<sup>16</sup>
- Association of Energy Engineers Certified Energy Manager® Certification<sup>17</sup>
- The North American Board of Certified Energy Practitioners (NABCEP) Photovoltaic Design Specialist certification
- For Energy Consumption Reduction Improvements that use the standard or targeted ICP protocols only, at least five years (minimum) of demonstrated experience calculating energy savings in lieu of formal certification.

**Please note:** DOER will not recommend a PD or assist a building owner with PD selection.

## III. Application Requirements

### A. Overview of application

The components of a PACE Massachusetts project required for technical review are:

- PACE Massachusetts application
- Narrative describing the project, including:
  - Building characteristics, i.e., type, age, size
  - Description of type, size and efficiency of existing and proposed energy systems
  - New construction pathway and related TECC percentage or retrofit ICP protocol selected
  - An explanation of the extent to which project benefits will be passed down to tenants or the surrounding community (if applicable)
  - Other information to support DOER's project technical review.
- For projects requiring a Savings to Investment Ratio (SIR) (Pathways 1.A, 1.B and 2.C.)–
  - Building energy use baseline
  - Savings calculations documentation as outlined under the section for the respective project pathway set forth in this guideline
- Estimated project costs including PACE financing costs and fees provided by MassDevelopment
- Supporting documentation, where applicable, including:
  - Evidence of consideration of Energy Consumption Reduction and/or Renewable Energy Improvements
  - Evidence of engagement with energy efficiency programs offered by Mass Save® or Municipal Light Plants (MLPs)

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<sup>15</sup> <https://www.mass.gov/orgs/board-of-registration-of-professional-engineers-and-land-surveyors>

<sup>16</sup> <https://www.eepperformance.org/how-does-pd-credentialing-work.html>

<sup>17</sup> <https://www.aeecenter.org/certified-energy-manager/>

- Documentation and estimation of incentives including APS, RPS, or those available through the energy efficiency programs offered by Mass Save® or Municipal Light Plants (MLPs). For RPS or APS, Conditional Statement of Qualification approved by the DOER is required.
- Statement from PD certifying that the technical application information is accurate and complete based on the professional's opinion, affixed with the PD's licensing stamp.
- Application signed by the building owner attesting to the accuracy of the cost estimate information.
- For new construction projects
  - Itemized construction budget of items delineated in accordance with Construction Specifications Institute (CSI) divisions, included in the TECC of 'as-designed' building.
  - Itemized construction budget of items delineated in accordance with Construction Specifications Institute divisions<sup>18</sup>, included in the TECC of 'baseline' building where applicable.
  - A copy of the permit submittal and/or certificate of occupancy submittal documentation required to demonstrate compliance with the applicable energy code.

## **B. Savings to Investment Ratio**

To qualify for PACE Massachusetts, 1.A., 1.B. and 2.C. projects must demonstrate that they meet the savings to investment ratio (SIR) test threshold. This means that the energy cost savings from the project must exceed the costs of the project over the life of the energy improvements.

For new construction, project Pathways 2.A. and 2.B. do not need to submit a separate SIR calculation as these projects are deemed to be cost-effective under the Stretch Code Pricing Analysis.

For retrofits, the PD must use the SIR workbook tool provided on the PACE Massachusetts web site to provide a summary of all SIR inputs for technical review. The PD must also provide supporting documentation to substantiate the values used in the workbook tool.

If applicable, the following data points should be included:

- Savings calculation may include:
  - Avoided energy usage
  - Unit costs for energy used in the building (e.g. cost per kilowatt hour, cost per therm, cost for propane, demand charges, etc.) and cost-escalation assumption
  - Annual demand reduction
  - Annual electricity sales to grid, for Renewable Energy Improvements (if applicable)
  - Annual revenue from production incentives including, but not limited to, REC, AEC, and CPEC sales, tax credits, and Mass Save® rebates
  - Tax credits and/or MACRS depreciation
  - Any other energy market revenues (ISO-NE Forward Capacity Market, etc.)
  - If the useful life of a system is greater than the maximum financing term of 20 years, the savings in the years past the end of the financing term (up to 30 years) may be included in the savings calculation.
  - Avoided Energy Supply Costs (AESC) for New England<sup>19</sup>

<sup>18</sup> See for example: <https://crmservice.csinet.org/widgets/masterformat/numbersandtitles.aspx>

<sup>19</sup> <https://www.synapse-energy.com/avoided-energy-supply-costs-new-england-aesc>

- Energy Efficiency Program incentives (e.g. Mass Save® efficiency incentives)

If RECs, AECs, or other environmental attributes are retired to realize the environmental benefits, please state this in the application and account for retirement in the SIR calculations.

- Investment calculation data points
  - Cost for design, procurement, construction, installation, and implementation of Energy Improvements or new construction
  - Cost for related energy audits
  - Cost for feasibility studies
  - Cost for measurement and verification reports of the installation and effectiveness of Energy Improvements
  - PACE financing costs (including principal, interest, fees) and associated fees, including application fees (estimates can be provided by MassDevelopment)

### **C. Project Comprehensiveness and Post Construction Requirements**

1. Applicants are encouraged to consider both Energy Consumption Reduction (e.g. efficiency measures) and Renewable Energy Improvements (e.g., solar) when proposing PACE projects. Consideration does not require implementation but should include documentation of the evaluation of the specific energy consumption reduction improvements considered. If on-site renewable generation is not implemented, an explanation must be provided.
2. Applicants should provide evidence of engagement with incentive programs, e.g., MassSave®, to ensure that the Applicant utilizes all possible financial incentives and explores all economically feasible Energy Improvements. Examples of satisfactory documentation of engagement include, but are not limited to, a letter from the energy efficiency vendor, a copy of a rebate check, or a copy of a previous audit with documentation of steps taken in response. If an applicant has interacted with the programs but has chosen to forgo incentives or technical assistance, the reason should be stated in writing in the application.
3. Upon construction completion, the property owner shall provide the following:
  - All PACE projects that receive PACE Massachusetts financing shall report building energy use annually through ENERGY STAR Portfolio Manager<sup>20</sup> for as long as the PACE lien is active. This information shall be shared with the DOER ENERGY STAR Portfolio Manager account, and energy consumption data will be available publicly. Compliance with the Large Building Energy Reporting (225 CMR 27) satisfies this requirement.
  - one or more Certificates of Occupancy (CofO). A copy of each fully executed Certificate of Occupancy will subsequently be provided by the Capital Provider to MassDevelopment and DOER. In addition, the property owner/ financing agreement shall authorize the capital provider,

<sup>20</sup> <https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/use-portfolio-manager>

MassDevelopment and DOER to inspect the property and property owner records (as necessary) to assure completion of the energy improvements in accordance with the requirements of the PACE Massachusetts program.

- A statement that systems have been installed in accordance with the contract documents, and that the systems are performing as expected; Commissioning of all Energy Improvements is required under PACE Massachusetts, and costs thereof are eligible for financing.

#### **D. Unsatisfactory PACE Applications**

Applications that fail to follow the PACE Massachusetts technical guidelines may be rejected for reasons including, but not limited to, the following:

- Projects that do not meet the applicable eligibility criteria for the project pathway
- 1.A., 1.B. or 2.C. Project that does not have an SIR greater than one (1)
- Proposed Energy Improvements are not designed to conserve energy
- Failure to consider Energy Consumption Reduction for Renewable Energy Improvements
- Unsubstantiated or unreasonable cost or savings estimates
- Failure to adequately demonstrate compliance with the applicable building energy code
- Inaccurate energy-modelling input
- Stand-alone electric energy storage systems that do not meet the performance qualifications established in the Guideline definition.
- Energy Improvements are not permanently affixed to the property. Financing of power purchase agreements and equipment leases are not eligible.

If an application for PACE Massachusetts does not meet one or more of the technical requirements, DOER will take the following remedial steps:

- Notify applicant and MDFA via email
- Encourage continued communication between parties.
- Speak directly with the applicant and their project team to discuss any items that do not comply with the PACE Massachusetts program guidelines and/or email written confirmation of the information needed.
- Request the timely submission of the remedial information.
- Review remedial information submitted by the applicant.

If the application still has significant deficiencies after remedial steps have been taken, DOER may reject the application for not complying with the PACE Massachusetts technical program guidelines. After an application has been rejected, it may be updated and resubmitted for review. If an application for a project is resubmitted after a formal rejection has been issued, the PD will need to restart the application process.

#### **E. Project Developer Statement**

The Project Developer (PD) must include a written statement confirming that the project's technical details, including the Savings to Investment ratio calculation in the application if applicable, is accurate and complete based on the professional's opinion, affixed with the PD's licensing stamp. Please see the PACE

## IV. Detailed Technical Requirements

The following section contains details on the specific eligibility criteria and application requirements for each project pathway in Table 1.

### A. Retrofits (Pathway 1.A)

To receive technical approval from DOER, a Retrofit Project following Pathway 1.A must adhere to an Investor Confidence Project (ICP) baseline and savings calculation protocol<sup>21</sup>. The goal of using ICP protocols in PACE is to streamline the application process for building owners, project developers, project reviewers, and capital providers in meeting the energy reduction requirements under Pathway 1.A. In the case of a conflict between the ICP protocols and the PACE Massachusetts program guidelines, the PACE Massachusetts program guidelines take precedence. See 2 below for further guidance on the ICP protocol.

#### 1. Application

- a. The PACE application must include supporting studies or other documentation that show how savings calculations were determined. The SIR should be submitted with the following supporting documents, as applicable:
  - Full Engineering Drawings
  - Equipment and Installation Cost Schedule
  - Relevant Warranty Information
  - Equipment Useful Life Assumptions
  - Proof of Incentive
  - Measurement and Verification Plan<sup>22</sup>
  - Commissioning Plan<sup>23</sup>
  - Operation and Maintenance Plan<sup>24</sup>

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<sup>21</sup> <http://www.eepperformance.org/>

<sup>22</sup> All Energy Consumption Reduction Improvement projects are encouraged, but not required, to undertake the detailed measurement and verification requirements of ICP “Measurement and Verification”. Costs for detailed measurement and verification of Energy Improvements may be included as part of the PACE financing.

<sup>23</sup> Commissioning of all Energy Improvements is required under PACE Massachusetts, and costs thereof are eligible for financing.

<sup>24</sup> ICP Protocols for “Design, Construction and Verification” and “Operations, Maintenance, and Monitoring” are the preferred protocols for this documentation in Energy Consumption Reduction Improvements, but DOER may consider other protocols if written justification is provided by the PD.

- Dispatch Schedule
- Interconnection Agreement
- Tax Credit Schedule
- Estimated Savings Calculations
- Energy Generation Schedule
- SMART Payment Schedule
- RECs, AECs, & CPECs Sales Schedule

b. PACE applicants are encouraged to engage with energy efficiency programs offered by Mass Save® or MLPs. If the project has neither engaged nor participated in these incentive programs, the supporting documentation must state the reason.

c. The following types of building documentation may be used as part of a PACE application if it was completed no more than three years (36 months) prior to the date of application submission:

- American Society of Heating Refrigeration and Air Conditioning Engineers (ASHRAE) energy audit, minimum Level I, including estimated energy savings that will accrue from eligible energy improvements
- Building energy use baseline
- Technical assistance study prepared under a Mass Save® or MLP program
- Other Energy Improvement project documentation prepared for a Mass Save® or MLP program

Please submit the documentation as an attachment to the PACE application. DOER will review baseline and audit information on a case-by-case basis and evaluate in accordance with current PACE program guidelines.

d. PACE applications must include projected savings calculated using a methodology based on project type. The methodology should be determined using this guidance. For a methodology to calculate savings from Energy Consumption Reduction Project, use ICP “Savings Calculation” of the selected protocol.

## 2. **Determine ICP Protocol for Supporting the SIR Calculation**

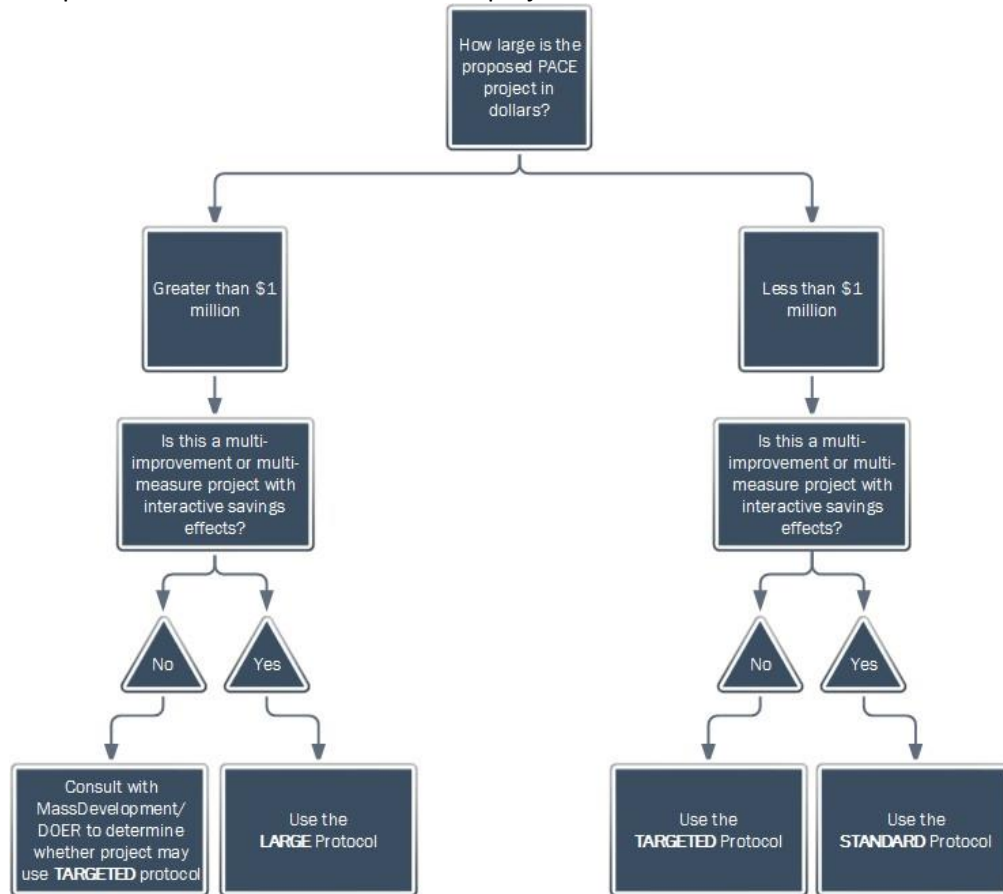
Commercial PACE Energy Consumption Reduction project applications shall be prepared using one of six ICP protocols. The specific protocol used will depend on project size, building type, savings calculation methodology applied and the nature of proposed Energy Improvements. Applicants should take the following steps to determine which ICP protocol to use.

### **Step 1: Commercial or Multifamily?**

1. For Commercial or Industrial projects, use the **Commercial** version of the selected protocol.

2. For multifamily residential with five or more dwelling units, use the **Multifamily** version of the selected protocol.

**Step 2:** Which protocol should be used for a PACE project?



**Decision Tree Notes:**

1. A PACE application with proposed Energy Improvements over \$1M must use the **large** protocol. However, any project can elect to use the **large** protocol if the PD determines that it is appropriate.
  - a. Exception: In cases where the proposed Energy Improvement(s) will not have interactive effects on other building systems but has a cost of over \$1,000,000, the project may use the **targeted** protocol, following consultation with and confirmation by DOER. For instance, a PACE project may consist solely of a geothermal heat pump which could make the targeted protocol appropriate. However, many Energy Improvements have interactive effects. For instance, window upgrades could result in lower heating needs which justify a smaller heating system.
2. PACE applications under \$1,000,000 will use either the **standard** or **targeted** ICP protocols.

- a. A project may use the **targeted** protocol if the proposed Energy Improvement consists of a single measure or a smaller set of related Energy Consumption Reduction improvements that have limited or no interactive effects with other building systems.
- b. If the project is too complex for the **targeted** protocol but not complex enough for the **large** protocol, the PD can use the **standard** protocol.

### 3. The Six ICP Protocols

Building Type	Project Type	Criteria	ICP Protocol
<b>Commercial</b> <sup>25</sup>	Large	>\$1,000,000 in project costs	Large Commercial v1.2a <sup>26</sup>
	Standard	<\$1,000,000 in project costs; interactive	Standard Commercial v1.1a <sup>27</sup>
	Targeted	<\$1,000,000 in project costs; limited or no interactive effects	Targeted Commercial v2.0 <sup>28</sup>
<b>Multifamily</b> <sup>29</sup> (residential structure with 5 or more units)	Large	>\$1,000,000 in project costs	Large Multifamily v1.0a <sup>30</sup>
	Standard	<\$1,000,000 in project costs; interactive	Standard Multifamily v1.1a <sup>31</sup>
	Targeted	<\$1,000,000 in project costs; limited or no interactive effects	Targeted Multifamily v2.0 <sup>32</sup>

A companion to the ICP protocol documents is the ICP Project Development Specification<sup>33</sup> which can clarify details of specific ICP protocols.

### 4. Useful Life

The useful life of Energy Consumption Reduction Improvements should conform to the useful measure lives listed in the current Massachusetts Electronic Technical Reference Manual for Estimating Savings from Energy Efficiency Measures (e-TRM)<sup>34</sup>. The PD must clearly state the reason why any measure lives

<sup>25</sup> <http://www.eepformance.org/commercial-protocols.html>

<sup>26</sup> <http://www.eepformance.org/large-commercial.html>

<sup>27</sup> <http://www.eepformance.org/standard-commercial.html>

<sup>28</sup> <http://www.eepformance.org/targeted-commercial.html>

<sup>29</sup> <http://www.eepformance.org/multifamily-protocols.html>

<sup>30</sup> <http://www.eepformance.org/large-multifamily.html>

<sup>31</sup> <http://www.eepformance.org/standard-multifamily.html>

<sup>32</sup> <http://www.eepformance.org/targeted-multifamily.html>

<sup>33</sup> <http://www.eepformance.org/project-development-specification.html>

<sup>34</sup> <https://www.masssavedata.com/Public/TechnicalReferenceLibrary>



deviate from e-TRM guidelines in the supporting documentation for the PACE application. Useful life calculation should also be substantiated by relevant warranty information. If the useful life is greater than the maximum financing term of 20 years, the savings in the years beyond the financing term, up to 30 years, may be included in the SIR calculation.

## **5. Building Energy Use Baseline**

All Energy Consumption Reduction retrofit projects shall include baseline calculations performed using ICP Part 2.0 “Baselining – Core Requirements” or Part 3.0 “Baselining – Rate Analysis, Demand, Load Profile, Interval Data” of the appropriate protocol.

If a building has not operated long enough to have consumption data in line with the ICP protocols or will be renovated substantially enough to trigger a change of use and/or the requirements to meet building code, the baseline should use current version of 780 CMR – Massachusetts State Building Code<sup>35</sup> Energy Efficiency Amendments. Baseline conditions shall utilize the same primary fuel as the proposed system. Alternatively, the project may use the Mass Save® New Construction baseline<sup>36</sup>.

## **6. Supporting Documentation**

- a. The PD must include supporting documentation that show how savings calculations were determined. See the SIR workbook for more detailed requirements.
- b. For projects that participate in Mass Save® programs that prepare technical assistance (TA) studies, the TA studies should be included as supporting documentation.

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<sup>35</sup> <https://www.mass.gov/massachusetts-state-building-code-780-cmr>

<sup>36</sup> <https://www.masssave.com/-/media/Files/PDFs/Business/MA-Baseline-Document.pdf>

## B. Project Pathway 1.B. Renewable Energy Improvement Projects

The following Energy Improvements are considered renewable in PACE Massachusetts:

- Massachusetts RPS Class I eligible technologies<sup>37</sup>
- Massachusetts APS<sup>21</sup> renewable thermal eligible technologies<sup>38</sup>
- Energy storage technologies eligible for the SMART Massachusetts program<sup>39</sup>

**Please note:** Renewable Energy Improvements must be affixed to the benefitted property.

Power purchase agreements and equipment leases are not eligible for PACE Massachusetts financing. Always refer to the latest APS and RPS Class I Regulations posted on the MA DOER web site<sup>40</sup>.

As of March 2023, the following fuels, energy resources and/or technologies are eligible for financing under PACE:

RPS Class I	APS Renewable Thermal	Other
Solar photovoltaic	Air Source Heat Pumps Ground	Energy Storage <sup>24</sup>
Solar thermal electric	Source Heat Pumps Solar Hot	
Wind energy	Water	
Small hydropower	Solar Hot Air	
Landfill methane and anaerobic digester gas	Eligible Biomass	
Marine or hydrokinetic energy		
Geothermal energy		

### 1. Application

**For Renewable Energy Improvements**, the PACE Massachusetts application must include:

- 1) A description of the proposed renewable electric, renewable thermal energy, or paired storage system
- 2) Identification and evaluation of site/building suitability, including a shading study and assessment of the building's capability to support a rooftop PV system load under all conditions, including snow and wind loads.
- 3) Identification of metering specifications (locations, # of meters, etc.)
- 4) Identification of the electricity and/or fuel rate structure
- 5) Assessment of the expected system performance and maintenance requirements
- 6) Comparison of the expected system performance against the baseline energy consumption of the commercial or industrial property/ Expected system performance as modeled
- 7) Identification of performance guarantees and calculation of useful life of Renewable Energy Improvements

<sup>37</sup> < <https://www.mass.gov/doc/rps-class-i-11-28-22/download> > Please note that new biomass systems no longer qualify for the RPS Class I eligible technologies

<sup>38</sup> <https://www.mass.gov/files/documents/2019/07/01/225%20CMR%2016%20APS%20Regulation%20CLEAN%20FINAL%20%28060619%29.pdf>

<sup>39</sup> For the purposes of Massachusetts PACE, energy storage is defined as a commercially available technology that can absorb energy, store it for a period, and thereafter dispatch the energy.

<sup>40</sup> <https://www.mass.gov/info-details/statutes-regulations-and-guidelines>

- 8) For storage projects, operational information including:
  - A description of the proposed dispatch strategy for storage systems, including how the storage will be dispatched during times of peak electric grid load.
  - An estimate of the annual number of full charge and discharge cycles for the energy storage system.
- 9) Assessment of total project capital expenditures
- 10) SIR calculation showing that the revenue generated or avoided cost from the system over its lifetime exceeds the cost of financing, including the cost of all associated feasibility studies and fees. For projects combining a renewable installation with energy consumption improvements, the SIR may include all costs and savings of the project as a whole.
- 11) Please provide the following supporting documents if applicable:
  - Operation and Maintenance Plan
  - Dispatch Schedule
  - Interconnection Agreement
  - Tax Credit Schedule
  - Energy Generation Schedule
  - SMART Payment Schedule
  - RECs, AECs, & CPECs Sales Schedule

## **2. Useful life**

The useful life of Renewable Energy Improvements is determined by the product manufacturer or PD. All relevant product documentation (e.g. warranties or cut sheets) for all components of the Renewable Energy Improvements must be submitted in the PACE Massachusetts application. If the useful life is greater than the maximum financing term of 20 years, the savings in the years past the end of the financing term (up to 30 years) may be included.

## **3. Note on Resiliency and Microgrids**

PACE Massachusetts will consider all equipment that is required for a project to be eligible for financing, provided the overall project meets the SIR test. For example, for a project that requires microgrid controls such as black start switch gears, main transfer switches and/or master controllers, the resiliency equipment may be included in the investment side of the SIR calculation and financed through PACE.

## **4. Dispatch Strategy**

When paired with a Renewable Energy Improvement, an energy storage system may follow a dispatch strategy that does not conform to the strict operational standard outlined in the section about calculating savings for Energy Consumption Reduction Improvement measures. An energy storage system can be considered a part of a renewable measure if the SIR of the whole system is greater than one.

## New Construction Projects

### C. Project Pathway 2.A. Whole Building Pathway: Relative Performance

#### 1. Requirements

For projects using this pathway, *both* of the following conditions must be met.

- Condition 1: Building must conform to 225 CMR 23.00, Section CC104 (**all-electric pathway of the Municipal Opt-in Specialized Energy Code**) and Section C401.2.1. Part 3 (**Relative Performance compliance**) and
- Condition 2: Building Performance Factor (BPF) must be at least 5% lower than relevant value in 225 CMR 23.00, Section C407.2.2.1, ANSI/ASHRAE/IESNA Standard 90.1 2019 Table 4.2.1.1 to qualify for this pathway. The maximum amount allowed for PACE financing for buildings with a **BPF factor lower by at least 5% is 25% of TECC**. Buildings with a **BPF factor lower by at least 10%** are eligible for PACE financing of **30% of TECC**.

#### 2. Ineligible Projects

Consistent with 225 CMR 23.00, this pathway can only be used if the building is not a residential building, dormitory, fire station, library, office, school, police station, post office, or town hall and/or the building has average ventilation at full occupancy of greater than 0.5 cfm/sf.

#### 3. Supporting documentation

- Narrative description of the project stating the pathway followed and any milestone dates that have passed such as permitting date, date of completion and certificate of occupancy
- A copy of the permit submittal and/or certificate of occupancy submittal documentation required to show compliance with the code pathways at the time the building was permitted or as stipulated in the Specialized Municipal Opt-in Code and code guidelines.
- Itemized construction budget for items included in the Total Eligible Construction Cost (TECC) delineated in accordance with Construction Specifications Institute (CSI) divisions<sup>41</sup>
- Statement from PD certifying that the technical application information is accurate and complete based on the professional's opinion, affixed with the PD's licensing stamp.

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<sup>41</sup> See for example: [MasterFormat Numbers and Titles](#)

## D. Project Pathway 2.B. Whole Building Pathway: Targeted Performance

### 1. Requirements

These project types must follow *any one* of the following options:

- Option 1: Targeted Performance Compliance, all-electric building - Building must conform to 225 CMR 23.00, Section CC104 (**all-electric pathway of the Municipal Opt-in Specialized Energy Code**) and Section C401.2.1. Part 2 (**Targeted Performance Compliance**). The maximum allowed amount of PACE financing for this pathway is **35% of TECC**.
- Option 2: Passive House Compliance, all-electric building - Building must conform to 225 CMR 23.00, Section CC104 (**All-electric pathway of the Municipal Opt-in Specialized Energy Code**) and Section C401.2.2 Part 1 (**Passive House Compliance**). The maximum allowed amount of PACE financing for this pathway is **35% of TECC**.
- Option 3: Passive House Compliance, mixed-fuel building - Building must conform to 225 CMR 23.00, Section CC105 (**mixed-fuel building pathway of the Specialized Municipal Opt-in code**) and Section C401.2.2 Part 1 (**Passive House Compliance**). The maximum allowed amount of PACE financing for this pathway is **25% of TECC**.

### 2. Supporting documentation

- Narrative description of the project stating the pathway followed and any milestone dates that have passed such as permitting date, date of completion and certificate of occupancy
- A copy of the permit submittal and/or certificate of occupancy submittal documentation required to show compliance with the code pathways at the time the building was permitted or as stipulated in the Specialized Municipal Opt-in Code and code guidelines.
- Itemized construction budget for items included in the Total Eligible Construction Cost (TECC) delineated in accordance with Construction Specifications Institute (CSI) divisions<sup>42</sup>
- Statement from PD certifying that the technical application information is accurate and complete based on the professional's opinion, affixed with the PD's licensing stamp.

## E. Project Pathway 2.C. Prescriptive Pathway

### 1. Requirements

- a. These project types must meet *both* of the following conditions:
  - Condition 1: Compliance with 225 CMR 23.00, Section CC104 (**all-electric pathway of the Municipal Opt-in Specialized Energy Code**) and Section C401.2.1. Part 1 (**Prescriptive compliance**) and

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<sup>42</sup> See for example: <https://crmservice.csinet.org/widgets/masterformat/numbersandtitles.aspx>

- Condition 2: An SIR showing that energy cost savings exceed incremental cost of energy improvements compared to a building meeting 780 CMR (Massachusetts State Building Code). Alternatively, the SIR could show savings compared to a building meeting 225 CMR 23.00 (Stretch Code).

The maximum allowed amount of PACE financing for this project type is **25% of TECC**. This pathway may only be used for any nonresidential building, or portions thereof up to 20,000-sf.

- b. As evidence of meeting the above conditions, the Project Developers must do the following:
  - Model the energy performance of the ‘as-designed’ building that is compliant with 225 CMR 23.00, Section CC104 (**all-electric pathway of the Municipal Opt-in Specialized Energy Code**) and Section C401.2.1 Part 1 (**Prescriptive compliance**).
  - Model the energy performance of the baseline building that meets either Massachusetts State Building Code or Stretch Code.
  - Find the difference in total operating costs between the ‘as-designed’ and baseline building including utility costs and demand charges over 25 years to get the energy cost savings.
  - Find the difference in construction cost between the ‘as-designed’ and baseline building. The difference must be less than the energy cost savings together with any additional revenue from AECs, RECs, electricity sales to grid etc.
- c. Savings calculations shall account for:
  - Unit costs for energy used in the building (e.g. cost per kilowatt hour, cost per Therm, cost for propane, demand charges, etc.) and cost-escalation assumption
  - Annual demand reduction
  - Annual electricity sales to grid, for Renewable Energy Systems (if applicable)
  - Annual revenue from production incentives including, but not limited to, REC, AEC, and CPEC sales, tax credits, and Mass Save® rebates
  - If the useful life of a system is greater than the maximum financing term of 20 years, the savings in the years past the financing term (up to 30 years) may be included in the savings calculation.
  - If RECs, AECs, or other environmental attributes are retired to realize the environmental benefits, please state this in the application and account for retirement in the SIR calculations.

Investment calculation shall show:

- Cost of hard and soft costs directly related to building construction.
- Cost for feasibility studies
- Cost for measurement and verification reports, if applicable
- PACE financing costs (including principal, interest, fees) and associated fees, including application fees (estimates can be provided by MassDevelopment)

## 2. Supporting Documentation

- Project Developers should submit a summary with the following details –
  - Narrative description of the project stating the pathway followed and any milestone dates

- that have passed such as permitting date, date of completion and certificate of occupancy
  - Design changes between baseline building and as-designed building.
  - Incremental cost of these combined design changes.
  - Energy savings from design changes between 'as-designed' and baseline building.
  - Energy cost savings with unit fuel cost assumptions.
  - Ratio of energy cost savings to incremental cost of design changes (must be greater than 1)
- A copy of the permit submittal and/or certificate of occupancy submittal documentation required to show compliance with the code pathways at the time the building was permitted or as stipulated in the Specialized Municipal Opt-in Code and code guidelines.
- Design drawings
- Equipment cutsheets and AHRI certificates
- All model inputs and outputs for the 'as-designed' and baseline building
- Itemized construction budget for items delineated in accordance with Construction Specifications Institute (CSI) divisions<sup>43</sup>, included in the Total Eligible Construction Cost (TECC) of the baseline building.
- Itemized construction budget for items delineated in accordance with Construction Specifications Institute (CSI) divisions<sup>44</sup>, included in the Total Eligible Construction Cost (TECC) of the as-designed building. This should be in .xls format and the differences in items from baseline building should be highlighted.
- Measurement and Verification Plan<sup>45</sup>
- Commissioning Plan<sup>46</sup>
- Operation and Maintenance Plan<sup>47</sup>
- Dispatch Schedule
- Interconnection Agreement
- Documentation for items included in the savings calculation including the following where applicable-
  - Tax Credit Schedule
  - Energy Generation Schedule
  - SMART Payment Schedule
  - RECs, AECs, & CPECs Sales Schedule

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<sup>43</sup> See for example: MasterFormat Numbers and Titles

<sup>44</sup> See for example: MasterFormat Numbers and Titles

<sup>45</sup> All Energy Consumption Reduction Improvement projects are encouraged, but not required, to undertake the detailed measurement and verification requirements of ICP "Measurement and Verification". Costs for detailed measurement and verification of Energy Improvements may be included as part of the PACE financing.

<sup>46</sup> Commissioning of all Energy Improvements is required under PACE Massachusetts, and costs thereof are eligible for financing.

<sup>47</sup> ICP Protocols for "Design, Construction and Verification" and "Operations, Maintenance, and Monitoring" are the preferred protocols for this documentation in Energy Consumption Reduction Improvements, but DOER may consider other protocols if written justification is provided by the PD.