

## APPENDIX B: TECHNICAL STANDARDS FOR RETROFIT AND NEW CONSTRUCTION PROJECTS

With the Massachusetts Development Finance Agency, 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/TitleI/Chapter25A/Section6>



# 1. Project Eligibility

## A. General Eligibility

Energy Improvements that qualify for PACE Massachusetts financing include those related to (1) retrofits that reduce energy consumption or install renewable energy systems, or (2) new construction of a commercial, industrial, or multifamily (five or more units) property, in each case, that are permanently fixed to the property.

## B. Projects eligible under PACE Massachusetts include:

- ***Retrofits that reduce energy consumption: 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.***
- ***Retrofits related to installation of renewable energy systems (Renewable Energy Improvements): 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 in Section 4. Energy storage systems paired with eligible Renewable Energy Improvements may qualify for PACE.***
- ***New Construction, as described below, that meets one of the New Construction Pathways, as set forth in Table 1 of this guideline:***
  - New building construction;<sup>2</sup>
  - Large addition (greater than 20,000sq 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>

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<sup>2</sup> Please see Section C. 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.

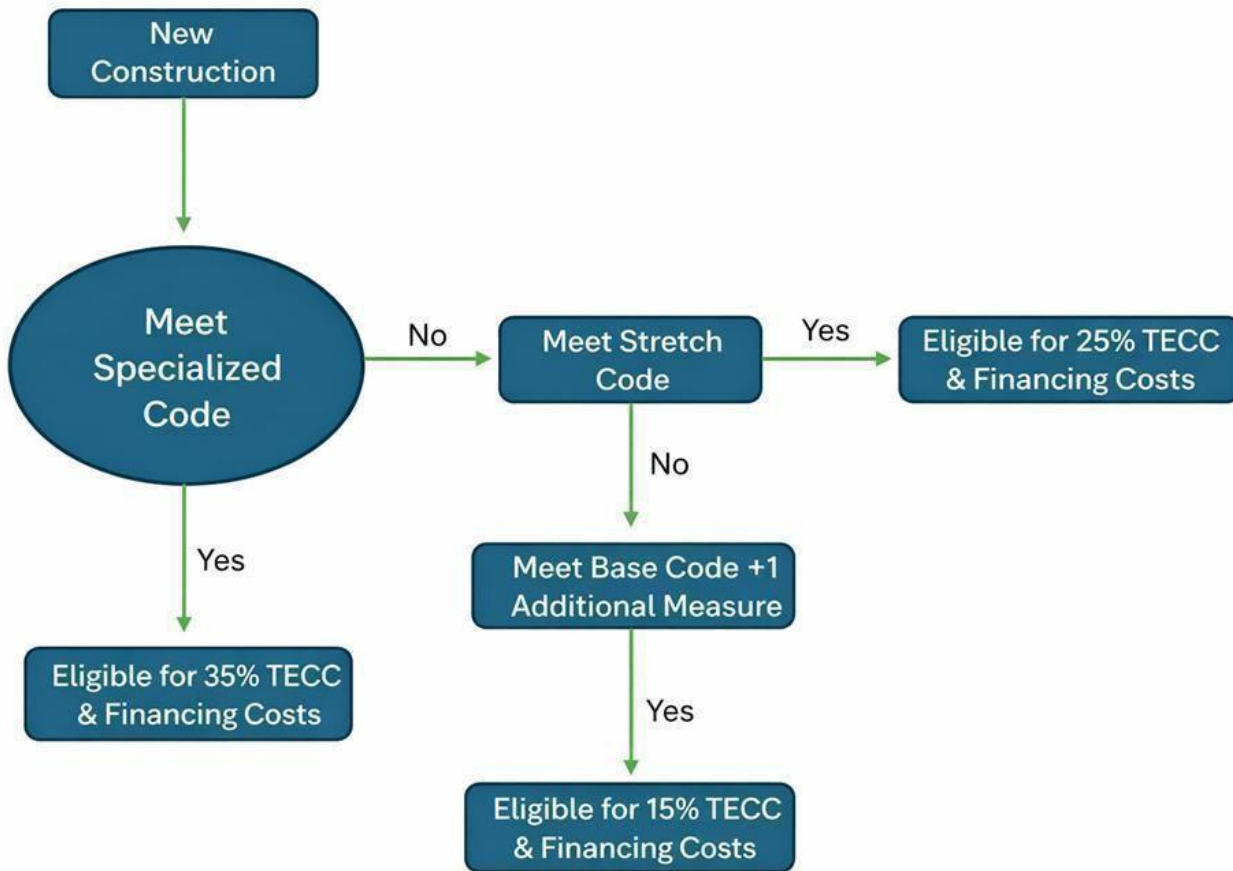
**Table 1. Criteria for PACE Massachusetts financing:**

RETROFITS OF EXISTING BUILDINGS	QUALIFYING CRITERIA	PACE FINANCING AMOUNT ALLOWED
<b>Energy efficiency retrofits</b>	See list of allowed improvements in Section 1.B. above.	Entire Cost of project and associated financing fees
<b>Renewable Energy Improvements</b>	See list of allowed improvements in Section 1.B. above	Entire Cost of project and associated financing fees
<b>NEW CONSTRUCTION PATHWAYS</b>		
<b>Buildings that meet the Specialized Code Pathway</b>	Building must conform to 225 CMR 23.00, Section CC104 (All-electric pathway) or CC105 (mixed-fuel building pathway)	35% of TECC, and associated financing fees and capitalized interest
<b>Buildings that meet the Stretch Code Pathway</b>	Building must conform to 225 CMR 23.00 (Stretch Energy code)	25% of TECC and associated financing fees and capitalized interest
<b>Buildings that meet the Base Code Pathway</b>	Buildings must conform to CMR 780 and meet one additional requirement above the base code, which may include: <ol style="list-style-type: none"> <li>1. All-electric space heating; or</li> <li>2. On-site solar installation</li> </ol>	15% of TECC and associated financing fees and capitalized interest

Massachusetts' building codes are set forth in 225 CMR 23.00. Municipalities select which level of code (base, stretch, or specialized) is in effect for all new buildings and deep retrofits in their communities. A municipality's effective building energy code therefore determines which commercial PACE new construction pathway is the minimum starting point, and projects will be evaluated against the version that is current at the time of permit application. Property owners in a base or stretch code community may also choose to build a project in compliance with a higher new construction pathway to achieve a higher percentage of allowable financing.

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

Fig 1. Guide to identifying applicable PACE financing



See Section 1.B. for the definition of new construction projects in PACE.

For projects in communities which change their effective code between the time a project is permitted and/or commences construction, PACE financing will be allowed at the level based on the project's compliance with the energy code which was effective at the time of permitting.

All Passive House (PH) projects permitted prior to May 2023 may seek retroactive PACE financing of up to 60% of TECC of the eligible portion of total building costs, provided that the total financing amount for a qualified project does not exceed 35% of TECC. DOER recognizes that mixed-use building projects will frequently contain a Passive House portion of the building envelope and one or more non-Passive House portion of the building envelope. This clarifies how projects should handle mixed-use building scenarios.

### **C. Timeline for Application**

PACE Massachusetts applications for new construction are encouraged to be submitted prior to permit application. However, an application for PACE Massachusetts project financing may be eligible if within 36 months from receipt of a Certificate of Occupancy, or completion as a retrofit. The project must meet the eligibility and qualifying criteria for the applicable project pathway. The terms of the financing will remain the same.

DOER will consider requests for conditional pre-approvals for new construction projects on submission of:

- A statement from the applicant stating the project is designed to meet the applicable technical requirements of that pathway
- Itemized estimates of costs to be included in the Total Eligible Construction Cost (TECC) categorized by Construction Specifications Institute (CSI) divisions or approved equivalent
- A statement from the Owner that all information in the request is accurate and complete to the best of their knowledge and intentions

Note: A conditional pre-approval is not a final DOER decision on an application. DOER will issue an approval based on review of project details as required in the program technical standards.

### **D. Eligible Costs<sup>6</sup>**

The specific items in a commercial PACE project that are eligible for financing (Retrofits and New Construction, as applicable) are:

- Design and procurement, including engineering and consulting services to prepare a PACE application, as well as legal fees<sup>7</sup> and other related project costs
- Construction, installation, and implementation of Energy Improvements, including barrier mitigation and Renewable Energy Improvements
- Cost of non-eligible items directly related to the installation of eligible Energy Improvements. Examples of non-eligible items that may be necessary to facilitate a project and therefore may be included in the PACE Massachusetts financing amount include:
  - Asbestos abatement associated with a boiler retrofit

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<sup>6</sup> All energy improvements financed through PACE Massachusetts must be permanently fixed to the property.

<sup>7</sup> To support a request for legal fees, the documentation must clearly show the legal fees are attributable to eligible construction activities.

- 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>8</sup>

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

The amount of PACE Massachusetts financing for new construction is dependent on the pathway followed in Table 1, and is expressed as 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:

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

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<sup>8</sup> Fully allowable, not subject to TECC calculations, See guidance from Mass Development for eligibility under this item.

- 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
- 13– Special Construction
- 30through 39(Site and Infrastructure Subgroup) including
  - Foundations and ground improvement
  - Soil and groundwater remediation
  - Soil characterization, management, and disposal
  - Demolition
  - Site development
  - Non-energy efficiency related scopes (i.e.. pools, fountains)
  - 40through 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

## 2. 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 new construction projects and retrofit projects requesting > \$2million in PACE financing. Retrofit projects requesting ≤\$ 2 million in PACE financing are not required to use a PD. A PD must have at least one of the following qualifications:

- Registered architect or Registered professional engineer<sup>9</sup>
- Investor Confidence Project (ICP) PD Credential<sup>10</sup>
- Association of Energy Engineers Certified Energy Manager® Certification<sup>11</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.
- MassSave® Program Administrator
- Energy Management Association Energy Management Professional (EMP) certification<sup>12</sup>

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

## 3. 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:
  - New construction: ground up or gut renovation/adaptive reuse
  - Building characteristics, i.e., type, age, size
  - Proposed changes to the building if it is an existing structure
  - 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 (Retrofit and renewable energy improvement pathways)
  - Documentation set forth in Section 4.A or 4.B, as applicable
  - Estimated project costs including PACE financing costs and fees provided by MassDevelopment

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<sup>9</sup> <https://www.mass.gov/orgs/board-of-registration-of-professional-engineers-and-land-surveyors>

<sup>10</sup> <https://www.eepformance.org/how-does-pd-credentialing-work.html>

<sup>11</sup> <https://www.aeecenter.org/certified-energy-manager/>

<sup>12</sup> <https://www.energygmt.org/energy-management-professional-certification/>

- Supporting documentation, where applicable, including:
- 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) in addition to all applicable components above, for new construction projects:
- Documentation set forth in Section 4.C

## **B. 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.
2. Applicants are encouraged to utilize all possible financial incentives and explore all economically feasible Energy improvements. If utilized, applicants should provide evidence of engagement with incentive programs, e.g., MassSave®. 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:
  - 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, 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; Costs for Commissioning of all Energy Improvements are eligible for PACE financing.

## **C. PACE Application review process**

DOER encourages applicants to engage with DOER as early as possible in the process of project development and application preparation. This will enable DOER and its technical review consultant to answer any questions and guide the preparation of an application that meets the standards of the PACE Massachusetts program.

Applications that cannot meet the PACE Massachusetts technical standards for reasons including, but not limited to, the following:

- Projects that do not meet the eligibility criteria as listed in this guideline
- Unsubstantiated or unreasonable cost estimates
- Failure to adequately demonstrate compliance with the applicable pathway

DOER will take the following steps:

- Notify applicant and MassDevelopment via email
- Send written confirmation of the reason(s). Speak directly with the applicant and their project team to discuss which items do not comply with the PACE Massachusetts program guidelines.
- 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 standards. DOER will notify the applicant and MassDevelopment via email. 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 applicant will need to restart the application process.

#### **D. Project Developer Statement (Appendix K)**

The Project Developer (PD) must include a written statement confirming that the project's technical details in the application are accurate and complete based on the professional's opinion. Please see the PACE Massachusetts Project Developer Statement Template ([Appendix K](#)).

For Project Developer completion by opt-up projects only I, the undersigned, attest the project outlined in this application meets the requirements of the (check one):

- Massachusetts Base Code, as outlined in 780 CMR, plus one of the following options
  - All-electric space heating as outlined in the technical standards (documentation provided)
  - Photovoltaic installation as outlined in the technical standards (documentation provided)
- Massachusetts Stretch Code, as outlined in 225 CMR 23.00.
- Massachusetts Specialized Code, as outlined in 225 CMR Chapter 23 and Appendix CC, and pursued the following pathway:
  - Mixed-Fuel Building Performance Standard (Sections CC105 and CC106)
  - All Electric Building Performance Standard (Section CC104)
  - Zero Energy Building Performance Standard (Section CC103)

## **4. Detailed Technical Requirements**

The following section contains details on the specific eligibility criteria and application requirements for retrofits and new construction, as detailed in Table 1.

### **A. Existing Buildings / Energy Retrofits**

To receive technical approval from DOER, a Retrofit Project for Energy Reduction must adhere to the requirements below.

#### **1) Application**

- (a) The PACE application for Energy Retrofits must include supporting studies

or other documentation. These should be submitted, as applicable:

- Design drawings or construction drawings
  - Equipment and Installation Cost Schedule
  - Relevant Warranty Information
  - Equipment Useful Life Assumptions
  - Proof of Incentive (if available)
  - Measurement and Verification Plan<sup>13</sup> (if available)
  - Commissioning Plan
  - Operation and Maintenance Plan
  - Dispatch Schedule
  - Interconnection Agreement (if available)
  - Tax Credit Schedule
  - Energy Generation Schedule
  - SMART Payment Schedule
  - RECs, AECs, & CPECs Sales Schedule
- (b) The following types of building documentation may be used as part of a PACE application for an Energy Retrofit if it was completed no more than two years (24 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 information on a case-by-case basis and evaluate in accordance with current PACE program guidelines.

## 1. Supporting Documentation

- a. The PD must include supporting documentation that show how savings calculations were determined. See the SIR workbook for more detailed requirements.

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<sup>13</sup> All Energy Retrofit projects are encouraged, but not required, to undertake the detailed measurement and verification requirements. Costs for detailed measurement and verification of Energy Improvements may be included as part of the PACE financing.

- b. For projects that participate in Mass Save® programs that prepare technical assistance (TA) studies, the TA studies should be included as supporting documentation

## B. Renewable Energy Improvement Projects

The following Renewable Energy Improvements are considered eligible for PACE Massachusetts:

- Massachusetts RPS Class I eligible technologies<sup>14</sup>
- Massachusetts APS renewable thermal eligible technologies<sup>15</sup>
- Energy storage technologies eligible for the SMART Massachusetts program<sup>16</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>17</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	Energy Storage
Solar thermal electric	Ground Source Heat Pumps	
Wind energy	Solar Hot 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. A helioscope with production numbers is an example of sufficient information.
- 3) Identification of metering specifications (locations, # of meters, etc.)
- 4) Identification of the electricity and/or fuel rate structure

<sup>14</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>15</sup> <https://www.mass.gov/files/documents/2019/07/01/225%20CMR%2016%20APS%20Regulation%20CLEAN%20FINAL%20%28060619%29.pdf>

<sup>16</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>17</sup> <https://www.mass.gov/info-details/statutes-regulations-and-guidelines>

- 5) Assessment of the expected system performance and maintenance requirements
- 6) Identification of performance warranties and warranty term (if applicable)
- 7) 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.
- 8) An estimate of the annual number of full charge and discharge cycles for the energy storage system Total cost for project
- 9) Please provide the following supporting documents:
  - Operation and Maintenance Plan (if available)
  - Dispatch Schedule (if available)
  - Interconnection Agreement (if available)
  - Estimate of Tax Credits (if applicable)
  - Energy Generation Schedule
  - SMART Payment Schedule
  - RECs, AECs, & CPECs Sales Schedule (if applicable)

## **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. 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 and financed through PACE.

## **4. Dispatch Strategy**

When paired with a Renewable Energy Improvement, an energy storage system can be considered a part of a renewable measure if the SIR of the whole system is greater than one.

## **C. New Construction Projects**

For **new construction projects**, the following conditions must be met.

### **1. Requirements**

PACE financing amounts are determined by the pathway a project follows as set forth in Table 1.

## 2. Supporting documentation

- Narrative description of the project stating the code compliance pathway followed and any milestone dates that have passed such as permitting date, date of completion and certificate of occupancy
- All documentation required to show compliance with the code pathways at the time building was permitted or as stipulated in the Specialized Code and code guidelines.
- Itemized construction budget for items included in the Total Eligible Construction Cost(TECC)
  - 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, included in the TECC of 'baseline' building where applicable and any milestone dates that have passed such as permitting date, date of completion and certificate of occupancy.
- Itemized construction budget for items included in the Total Eligible Construction Cost(TECC)
  - Itemized construction budget of items delineated in accordance with Construction Specifications Institute (CSI) divisions or similar, included in the TECC of the building.

All documentation required to show compliance with the applicable and appropriate new construction energy code pathways at the time the building was permitted, including:

- Design drawings
- Equipment cutsheets and AHRI certificates
- Energy Modeling Documentation (applicable for Stretch Code's Targeted Performance Pathway (C407.1) and Relative Performance Pathway (C407.2))
  - Energy model analysis report, stating all model inputs and outputs (results)
- Documentation applicable for Stretch Code's Certified Performance Pathway (C407.3-4):
  - Requirements to get a building permit(Phius): C407.3.2.1 or C407.3.2.2 C407.3.2.1 Phius Documentation.
    - 1. Prior to the issuance of a building permit, the following items must be provided to the Building Official:
      - a. A Passive House Verification report with results from the approved Passive House certification software which demonstrates project compliance with Phius CORE 2021 (or newer), or Phius ZERO 2021 (or newer) performance requirements.
      - b. A statement from the CPHC that the verification report results accurately reflect the plans submitted.
      - c. Evidence of project registration from Phius.
    - OR
      - a. A Design Certification Letter from
        - Itemized construction budget for items included in the Total Eligible Construction Cost (TECC) of the baseline building.
        - Itemized construction budget for items 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>18</sup> (if applicable)
- Commissioning Plan<sup>19</sup> (if available)
- Operation and Maintenance Plan (if applicable)
- Dispatch Schedule
- Interconnection Agreement (if available)

## **Technical Approval Letters**

DOER will issue an approval letter after a satisfactory technical review, which will contain the following information as applicable:

- Property owner and property/project address
- Outline of the Energy Improvements financed under PACE Massachusetts
- Which incentives, if any, were leveraged at the time of application

Approval letters are valid for 12 months from the date of issue. Up to two six-month extensions are available

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<sup>18</sup> All Energy Retrofit projects are encouraged, but not required, to undertake measurement and verification requirements.

<sup>19</sup> 21 Commissioning costs are eligible for financing.