



Commercial & Industrial
Large Energy Users Program
Program Guide

Fiscal Year 2018
(7/1/2017 through 6/30/2018)

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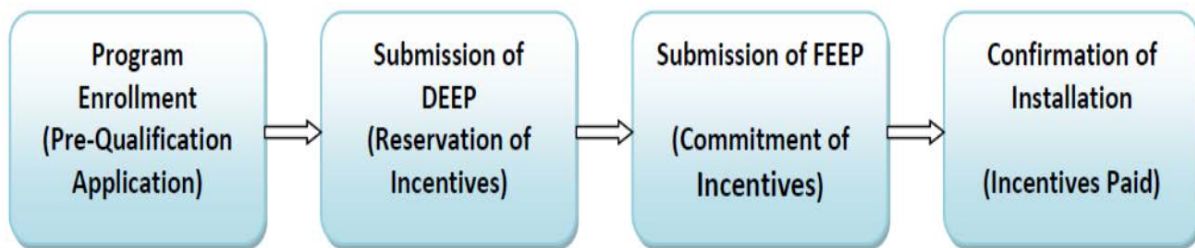
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Overall Program Description

The Large Energy Users Program (LEUP)'s aim is to foster large commercial and industrial (C&I) utility customers that have facilities in New Jersey to self-invest in energy efficiency, and combined heat and power projects. The program incentivizes owners or users of buildings to upgrade or install energy conserving measures in existing buildings and to help offset these capital costs provided they meet the program's eligibility and program requirements. These efficiency upgrades are customized to meet the requirements of the customers' existing facilities, while advancing the State's energy efficiency, conservation, and greenhouse gas reduction goals.

The figure below summarizes the steps for participation.



Entities or applicants must have contributed a minimum of \$200,000 into New Jersey's Clean Energy Fund in fiscal year 2017 via the Societal Benefits Charge (SBC), based on the prior 12 months of bills. The contribution can be calculated via a formula provided in Section 2 including an optional opportunity to "bank" up to two years of consecutive contribution. If an applicant owns multiple properties/facilities within New Jersey, the aggregate contribution into the SBC can be included when calculating total Therm and kWh usage.

The program requires qualified applicants to submit an energy plan which will be reviewed and approved by either NJ Board of Public Utilities Staff or the Program Manager based upon the final potential incentive amount. Applicants may begin with a Draft Energy Efficiency Plan (DEEP) or submit a Final Energy Efficiency Plan (FEEP). The intent of the DEEP submission process is to provide the program with a high level overview of the proposed energy conservation measures. From the customer perspective, approval of the DEEP may serve to assist implementers to gain internal corporate approval prior to fully developing a project. Upon approval of the DEEP, the incentive funds are "reserved" for the project based on estimated project costs and energy savings. Upon approval of the FEEP, when the scope of work is finalized and project costs/energy savings are more precise, the funds are formally committed.

Specific design features of this program include:

- Ability to submit multiple projects/buildings under one application submission;
- Flexible application submission process providing the customer the opportunity to submit up to three scopes of work in each program fiscal year;

- Appealing incentive structure allowing customers to obtain up to 90% of their respective NJ Clean Energy Program contribution for qualifying projects;
- Ability to participate in other programs while engaged in LEUP.

Program Eligibility

The Large Energy Users Program is available on a first come, first served basis so long as funding is available to existing, large commercial and industrial buildings that meet the following qualifications:

- Eligible entities must have contributed a minimum of \$200,000 (on a pre-sales tax basis) into New Jersey's Clean Energy Program fund in fiscal year 2017 defined as from July 1, 2016 to June 30, 2017 (aggregate of all buildings/sites). Eligible Entities shall be defined as (1) Public: having distinct and separate budgetary authority; (2) Public Schools: having distinct and separate budgetary authority; (3) Private: Non-residential companies including all related subsidiaries and affiliates regardless of separate EIN numbers or locations within New Jersey. Consistent with DOCKET NO. EOO7030203).

Note: The total fiscal year 2017 contribution is calculated as \$0.025905/therm times total therms plus \$0.003437/kWh times total kWh or by updated conversion factors provided and approved by BPU staff.

- Incentive Banking Option:
Entities have the option of applying to bank two consecutive years of their total fiscal year NJ Clean Energy Program contributions in order to increase one of the ways their maximum incentive per entity is calculated, i.e., the one calculated as 90% of NJCEP fund contributions. In order to apply to exercise that option, entities (i) cannot have been awarded their maximum incentive commitment in the fiscal year 2017 LEU program and (ii) must submit fiscal year 2016 monthly utility summaries (July 2015 through June 2016) in addition to the fiscal year 2017 summaries described above at "Submission Instructions and Requirements". If these conditions are met, the above-described maximum incentive can be calculated by combining the fiscal year 2017 maximum with the un-awarded portion of the fiscal year 2016 maximum. For the avoidance of doubt, banking of contributions to meet the minimum contribution threshold of \$200,000 (Item 6 above at "Submission Instructions and Requirements") is not permitted.
- In order to be considered for incentives, the average billed peak demand of all facilities submitted in the Draft Energy Efficiency Plan (DEEP)/Final Energy Efficiency Plan (FEED) must meet or exceed 400kW and/or 4,000 DTh.

Example: Entity submits DEEP/FEED for two buildings. Building one has a metered peak demand of 200kW, building two has a metered peak demand of 600kW. Per the above guideline, both buildings would be considered for incentives as the average would be equal to 400kW.

Entities interested in applying to participate in the program will submit the following information with the Pre-Qualification application. **The Pre-Qualification application form and template for providing utility account information is available at www.NJCleanEnergy.com/LEUP.**

- Number of buildings/sites and list of all associated fiscal year 2017 investor-owned utility accounts (JCP&L, PSE&G, Atlantic City Electric, Rockland Electric, Elizabethtown Gas, South Jersey Gas, and NJ Natural Gas).
- Total usage and premise IDs (if available) as provided by utility.
- Monthly breakdown of kWh usage, peak kW demand and therm usage for each utility account for the period July 1, 2016 – June 30, 2017. If the applicant is applying for the banking option, monthly breakdown of usage must also be provided for the period July 1, 2015 – June 30, 2016.
- Calculation of total contribution to New Jersey's Clean Energy Program fund in previous fiscal year(s) from above buildings/sites. The total contribution is calculated as \$0.025905/therm times total therms plus \$0.003437/kWh times total kWh or by updated conversion factors provided and approved by BPU staff.

Program Website Links

- This link routes to the overall LEUP homepage where both online and pdf format applications can be found: www.NJCleanEnergy.com/LEUP

Financial Incentives

The Program will offer a maximum incentive per entity which will be the lesser of:

- \$4 million
- 75% of total project(s) cost as identified in the Final Energy Efficiency Plan (FEEP)
- Total project costs may include pre-engineering costs, soft costs, and other costs associated with the preparation of the FEEP
- 90% of total NJCEP fund contribution in previous year (i.e. from all entity facilities), as calculated during enrollment
- \$0.33 per projected kWh saved annually; \$3.75 per projected Therm saved annually

The program has a minimum incentive commitment of \$100,000. Projects with incentives below this threshold will be redirected to other programs for C&I customers. Incentives shall be reserved upon approval of the DEEP. Program funds will be committed upon approval of FEEP by the Program Manager and, if required, by the Board of Public Utilities. Funding commitment of the FEEP will not exceed the lesser of the DEEP reservation or enrollment approval. Incentive shall be paid upon project completion and verification that all program requirements are met.

Energy Plan Requirements

Applicants must submit their first energy plan to the program no more than 3 months after the approval of their Enrollment application. The initial energy plan may be either a Draft Energy Efficiency Plan (DEEP) or Final Energy Efficiency Plan (FEEP). The DEEP submission is optional. Applicants may skip the DEEP submittal and proceed directly to the FEEP.

The DEEP should provide a high-level overview of the proposed scope of work including, at a minimum, the information listed in section 6. If approved, an incentive will be reserved for the project.

The FEEP must be submitted no later than three months from date of the DEEP approval letter, if a DEEP was approved, or from the date of the Enrollment approval. Upon receipt of the FEEP, the program has sixty (60) days to review each submittal and provide comments to entity. The program will in turn present FEEPs to New Jersey Board of Public Utilities (BPU) staff for approval as required by Board policy and commitment of incentive.

[A Microsoft Word template for the DEEP and FEEP format is available for download at www.NJCleanEnergy.com/LEUP.](http://www.NJCleanEnergy.com/LEUP) The energy plan may be submitted in Word or PDF format.

Draft Energy Efficiency Plan (DEEP) Requirements

The DEEP is a succinct report that outlines an applicant's proposed energy efficiency project plans. The DEEP shall include the following necessary components and be organized in a report format with a cover and table of contents. The program will review the DEEP report and, upon acceptance, issue a DEEP approval letter noting the incentive amount reserved and due date for the FEEP.

The DEEP should include, at a minimum, the following sections and information:

1. Executive Summary including:
 - The summary should detail existing energy use by source for the previous 12 months (kWh, kW, MMBtu).
 - Projected annual energy savings by source (kWh, kW, MMBtu, and %)
 - Projected annual total site energy savings (kBtu/sqft and %)
 - Total estimated project cost
 - Total estimated annual energy cost savings
2. Site Overview

The Site Overview section of the DEEP shall include, but is not limited to, the following information for each facility where energy-efficiency work is to be performed:

 - Name and address
 - Short description and use
 - Year built
 - Square footage
3. Utilities Overview

The Utilities Overview section of the DEEP shall include a summary of the utility services for the facilities listed in the Site Overview, including

 1. Total annual usage

2. Total annual cost (supply and delivery)
3. Average cost per unit (\$/kWh, \$/therm, etc).

4. Table of Energy Conservation Measures (ECMs) to be implemented including the following information by measure:
 - Estimated Installed Cost
 - Estimated Annual Energy Savings by source (kWh, kW, MMBtu)
 - Estimated Annual Energy Cost Savings (\$)
 - Estimated Simple Payback or IRR % (*total of all measures*)

5. ECM Descriptions including:
 - General description of equipment being replaced/augmented
 - Anticipated Implementation Schedule
 - Estimated construction start and end dates for each measure

Final Energy Efficiency Plan (FEEP) Requirements

The FEEP will build upon the contents of the DEEP submittal and include more specific scope of work information as well as a measurement and verification plan and Appendices to support the savings, costs and other project information.

The FEEP also must be submitted in report format and must include, at a minimum:

- Executive Summary including:
 1. Existing energy use by source from previous 12 months (kWh, kW, MMBtu).
 2. Existing total site energy use from previous 12 months (kBtu/sqft).
 3. Calculated annual energy savings by source (kWh, kW, MMBtu, and %)
 4. Calculated annual total site energy savings (kBtu/sqft and %)
 5. Total estimated project cost (note - prevailing wage rates required)
 6. Total estimated annual energy cost savings

- Site Overview
The Site Overview section of the FEEP shall include, but is not limited to, the following information for each facility where energy-efficiency work is to be performed:
 1. Name and address
 2. Short description and use
 3. Year built
 4. Square footage

- Utilities Overview
The Utilities Overview section of the FEEP shall include a summary of the utility services for the facilities listed in the Site Overview, including
 4. Total annual usage
 5. Total annual cost (supply and delivery)
 6. Average cost per unit (\$/kWh, \$/therm, etc).

- Table of Energy Conservation Measures (ECMs) to be implemented in next 12 months. Including the following information by measure:
 1. Estimated Installed Cost (Material, Labor, Construction Management, Other)
 2. Estimated Annual Calculated Energy Savings by source (kWh, kW, MMBtu)
 3. Estimated Annual O&M Savings (\$)
 4. Estimated Annual Calculated Energy Cost Savings (\$)
 5. Estimated Simple Payback or IRR % (*total of all measures*)
 6. Anticipated sources of all funding not including Large Energy Users incentive
- ECM Descriptions including:
 1. Detailed description of equipment being replaced/augmented
 2. Detailed description of recommended measure (including quantities, EER, AFUE, etc.)
 3. Basis for calculating energy savings and O&M savings (including all assumptions)
 4. Basis for calculating installed cost (including all assumptions)
 5. Anticipated implementation schedule
 6. Estimated construction start and end dates for each measure
- Measurement & Verification (M&V) Plan:

Description of pre/post M&V to be implemented. Must be in accordance with IPMVP Options or other method pre-approved by Program Manager. **Refer to Appendix C of this program guide for complete M&V guidelines.**

For each measure, the M&V plan should address the following:

1. **Method:** Identify the IPMVP option and energy metering procedure that will be followed, key parameters that will be measured and explain how as-built annual energy savings will be extrapolated from this data
 2. **Assumptions:** State all substantive assumptions for the post-retrofit energy consumption for the equipment that may differ from pre-retrofit conditions. Include a description of any variables that affect energy consumption, such as outside temperature, time of day, etc.
 3. **Schedule:** State the schedule for performing all metering, analysis and reporting.
- FEEP Appendix A: Professional Engineer (PE) Certification:

This will be requested from the applicant at the conclusion of the FEEP review. PE Certification does not need to be included with the initial FEEP submission. A signed and stamped letter on letterhead from a Professional Engineer attesting to the contents of the final FEEP revision will be required.
 - FEEP Appendix B: Utility bills
One utility bill is required for each facility submitted with the FEEP only for the month of peak demand. The utility bills will be used to confirm that the average billed peak demand of all facilities submitted in the FEEP meet or exceed 400kW and/or 4,000 DTh. Copies of 12 months of utility bills are NOT required in the appendix.

- FEEP Appendix C: Energy Savings Calculations
Energy savings calculations must be submitted as support for the annual energy savings proposed in the FEEP. The savings calculations should clearly indicate annual energy savings. Spreadsheets should be submitted in Excel format with formulas accessible, where permissible.

Please note the following in regard to the annual calculated energy savings by source: Depending upon the complexity of the energy conservation measures in the FEEP, the associated calculations may require building modeling to properly estimate the energy savings for particular measures. These measures may include building shell upgrades, building management systems, etc. Typical ECMs such as lighting, HVAC, motors, and others will likely not require these efforts and may be presented with generally accepted energy savings calculations and methodologies. Applicants for these typical ECMs may elect to use SmartStart Buildings incentive worksheets.

Note: Metered data must be submitted in an appropriate format to facilitate review, such as Excel.

- FEEP Appendix D: Project Cost Documentation
Copies of quotes and/or proposals to support project costs identified in the FEEP. Material, labor, construction management and other costs should be separated, where possible.
- FEEP Appendix E: Manufacturer's specification sheets and proof of Qualified Product Listing
Specification sheets in this section should document equipment metrics such as capacity and efficiency that are used in energy savings calculations *for both existing and proposed equipment*. For specification sheets with multiple options/configurations, circle or highlight the specific model number or configuration which will be installed.

For lighting projects, existing fixture wattages should align with standard wattages provided in this document

<https://www.sceonlineapp.com/documents/169/App%20B%20Standard%20Fixture%20Watts.pdf> or otherwise be supported by manufacturer's specification sheets.

Proof of applicable qualified product listing for proposed equipment should be submitted in Appendix E of the FEEP where required by the minimum performance standards of the program.

Refer to Appendix A of this program guide for a full list of specific qualified product listing requirements. Qualified product listings may include:

- For LED lighting, attach a printout/screenshot of the specific model number that will be installed from www.desighlights.org or www.energystar.gov. The wattage used
- For HVAC projects, attach the equipment AHRI certificate from www.ahridirectory.org.

Eligible & Non-Eligible ECMs

The list below provides a broad overview of the types of ECMs that qualify for the program. This list is to be used as a guide other measures may also qualify. Eligible ECMs include:

- Window and Skylight Glazing
- Air Distribution in all building types
- Fume hood exhaust systems
- Water Source Heat Pump Systems
- Chilled Water Plant
- Building Controls and EMS
- Boiler equipment
- Package Humidification
- Retail display refrigeration
- Ice Rinks
- Plastic Injection Molding Machines
- Interior/Exterior Lighting
- Lighting Controls
- CHP systems (with the exception of 100% renewable fuel sources)

The following ECMs are ineligible:

- Maintenance projects such as fixing steam leaks, repairing broken insulation, etc.
- Renewable energy systems (Solar panels, Wind turbines, Hydro power)
- Monitoring software that strictly monitors/reports usage but does not control equipment

Program Standards

1. All ECMs must meet Minimum Performance Standards, which may be fulfilled during Professional Engineer review, which shall be understood as the most stringent of:
 - a. Appendix A of this program guide
 - b. ASHRAE 90.1-2013
 - c. Local code

Limitations/Restrictions:

1. New construction and major rehabilitation projects are not eligible under the program; however, these projects may be eligible for other NJCEP incentives.
2. Incentive will be limited to energy-efficiency measures. The following shall not be included as part of this program:
 - a. Renewable energy
 - b. Maintenance energy saving projects
3. Incentive shall only be available for ECMs approved in the FEEP. Program Manager may waive this restriction on a case-by-case basis.

4. ECMs already installed or under construction will not be considered for incentives and shall not be included in FEEP. Program Manager may waive this restriction on a case-by-case basis.
5. Projects funded by federal grants/incentives are allowed; other state/utility incentives are allowed so long as they are not originating from NJCEP funds; NJCEP loan funds are allowed. However, the total of Federal, state, utility, and LEU Program funding shall not exceed 100% of total project cost.

Inspections

Pre-inspection of measures will occur after the applicant has submitted a FEEP with necessary scope of work information. LEUP applicants may proceed with removal of existing equipment and installation of proposed measures only after successful pre-inspection of the measure, which occurs after submittal of the FEEP.

The program may conduct up to three site inspections per FEEP submission including a pre inspection, at 50% completion, and 100% completion, as required. A pre inspection will be scheduled within 30 days of FEEP submittal, granted sufficient data is provided. Entity will need to provide access to site and notification upon reaching specific percent completions as mentioned above.

Measures which require an inspection at 50% completion will be identified by the Program upon submittal of the FEEP. These measures may include building shell upgrades or equipment which will be inaccessible once installed. If ECMs are not completed within the specified timeframe, incentive commitment may be forfeited. Entity will provide M&V data as requested and will comply with any program evaluation activities.

Post-inspection will occur after the applicant notifies the Program Manager of project completion and submittal of project invoices.

Incentive Payment Requirements

ECMs must be fully installed no later than twelve (12) months from approval of the FEEP. Extensions may be granted for a period of up to six months with satisfactory proof of project advancement. (This could be in the form of copies of permits, equipment invoices, installation invoices indicating percentage complete, updated project schedules, etc.) If the as-built scope of work will deviate from the approved FEEP, please consult the Program Manager for guidance prior to starting construction.

Once the work defined in the FEEP has been completed, entity shall submit proof of construction completion for all measures, which may include but is not limited to the following:

- Differences between the FEEP and as-built project must be documented and will require a revised FEEP submitted for review. In the event the scope of work, and/or cost estimates does not match as-built documentation, an incentive true-up will occur. The true-up is not to exceed the original incentive commitment.
- Invoices for material/labor

- Completed M&V report(s) accompanied by a signed and stamped letter on letterhead from a Professional Engineer attesting to accuracy of the M&V report. The M&V report should extrapolate as-built annual savings values for the project (energy and cost).
- Certification of compliance with prevailing wage. This should be a signed letter on applicant letterhead attesting that prevailing wage rates were paid where necessary.
 - Projects with a contract threshold of \$15,444 are required to pay no less than prevailing wage rate to workers employed in the performance of any construction undertaken in connection with Board of Public Utilities financial assistance, or undertaken to fulfill any condition of receiving Board of Public Utilities financial assistance, including the performance of any contract to construct, renovate or otherwise prepare a facility, the operations of which are necessary for the receipt of Board of Public Utilities financial assistance. By submitting an application, or accepting program incentives, applicant agrees to adhere to New Jersey Prevailing Wage requirements, as applicable.
- Valid tax clearance certificate from the NJ Division of Taxation.
 - Tax clearances may be requested by the customer online at no cost through the Division of Taxation's portal: https://www16.state.nj.us/NJ_PREMIER_EBIZ/jsp/home.jsp Under the Tax & Revenue Center, Tax Services, select Business Incentive Tax Clearance. For help with the Premier Business Services portal, contact 609-292-9292.

Quality Control Provisions

Documented policies and procedures provide proper guidelines to ensure consistency in the processing and quality control for all Program participants. All energy efficiency plans are reviewed upon receipt to verify adherence to eligibility requirements. Applicant eligibility information is verified, along with all technical information in support of energy efficient measure qualification and incentive calculation. Applicant supplied information and program manager performed incentive calculations are entered into the database, and files are created for all documents and ongoing project correspondence. Pre and/or post inspections will be conducted as required.

Program Dispute Resolution

Disputes, concerns, or complaints that arise will be addressed initially by the Program Manager or Program Staff at the point of contact. If resolution for whatever reason is not possible, there is a [dispute resolution process](#) backed by the NJ Board of Public Utilities.

The program is designed to allow for participation by applicant in-house staff or any third party contractor that meets the program requirements. There are BPU approved contractor remediation procedures that will be followed if a contractor is found to violate program procedures and rules or consistently violates program requirements which may include being barred from participating in the program.

Call Center Support

New Jersey's Clean Energy Program operates a call center staffed weekdays between 9 AM and 5 PM. The phone number is 866-NJSMART. The call center is trained in answering general questions about the program and application processes as well as able to provide specific information pertaining to an application.

Appendix A: Minimum Performance Standards

This Appendix contains information on minimum performance standards for measures included in the project work scope (derived from the NJ SmartStart Buildings Program).

Proposed measures must meet or exceed the minimum efficiencies and/or requirements as listed within this Appendix. For equipment not listed here, minimum efficiencies and/or requirements must meet or exceed the more stringent of ASHRAE 90.1-2013 for non-residential buildings or local code. Equipment not regulated by these codes must be more efficient than industry standard. Requirements may be waived or modified by Program Manager on a case by case basis due to limited market availability of equipment.

Additionally, all applicable equipment must be new and listed by UL or other OSHA approved Nationally Recognized Testing Laboratory (NRTL), such as CSA, in accordance with applicable US standards. Manufacturer's specification sheets may be requested by Program Manager to confirm performance.

A-1. Chillers

Electric Chillers: Proposed equipment must comply with both Full Load and Part Load (IPLV) values below.

	Constant Speed		Variable Speed		Constant Speed		Variable Speed	
	Full Load kW/ton	IPLV kW/ton	Full Load kW/ton	IPLV kW/ton	Full Load EER	IPLV EER	Full Load EER	IPLV EER
Air Cooled								
tons < 150					10.30	13.70	9.70	16.12
tons ≥ 150					10.30	14.00	9.70	16.42
Water Cooled Positive Displacement								
tons < 75	0.735	0.600	0.780	0.490				
75 ≤ tons < 150	0.706	0.560	0.750	0.480				
150 ≤ tons < 300	0.647	0.540	0.680	0.431				
300 ≤ tons < 600	0.598	0.520	0.625	0.402				
tons ≥ 600	0.549	0.500	0.585	0.372				

Water Cooled Centrifugal				
tons < 150	0.598	0.550	0.695	0.431
150 ≤ tons < 300	0.598	0.550	0.635	0.392
300 ≤ tons < 400	0.549	0.520	0.595	0.382
400 ≤ tons < 600	0.549	0.500	0.585	0.372
tons ≥ 600	0.549	0.500	0.585	0.372

- Air-cooled chillers - Efficiencies above are based on the unit's compressor kW per capacity (tons) at AHRI conditions.
- Water-cooled chillers - All water cooled chillers must be submitted at AHRI conditions of: (a) Evaporator - 54 °F entering water temperature (EWT) and 44 °F leaving water temperature (LWT), (b) Condenser - 85 °F EWT and 95 °F LWT. If an applicant has a water cooled centrifugal chiller that is designed to operate at other than the AHRI standard conditions the procedure in ASHRAE Standard 90.1-2013, Section 6.4.1.2.1 may be used by the applicant to adjust the manufacturer's published efficiency at non-AHRI conditions to the efficiency at AHRI standard conditions. The applicant will need to provide the manufacturer's non-AHRI ratings as well as the calculations for the chiller efficiency at AHRI conditions.

Gas Absorption Chillers and Gas Engine Driven Chillers

Full or part load efficiency, all sizes	> 1.1 COP.
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- Gas Absorption Chillers - Full and part-load efficiencies are determined in accordance with AHRI Standard 550/590/2003. Chillers > 400 tons must be two-stage in order to qualify.

A-2. Electric Unitary HVAC

- Proposed equipment must meet all efficiency requirements as stated in the tables below:

Equipment Type	Cooling Capacity		Minimum Qualifying Efficiency				
	tons	Btu/hr	SEER	HSPF	EER	IEER	COP
Unitary HVAC Split System	< 5.4		14.0				
Unitary HVAC Single Package	< 5.4		14.3				
Unitary HVAC Single Package or Split System	≥ 5.4 and < 11.25				11.5	13.0	
	≥ 11.25 and < 20				11.5	12.4	
Central DX AC	≥ 20 and < 63				10.5	11.6	
	≥ 63				9.7	11.2	
Air Source Heat Pump Split System	< 5.4		14.3	8.4			
Air Source Heat Pump Single Package	< 5.4		14.3	8.2			
Air Source Heat Pump Single Package or Split System	≥ 5.4 and < 11.25				11.5	12.2	3.4
	≥ 11.25 and < 20				11.5	11.6	3.3
	≥ 20				9.5	10.5	3.2
Water Source Heat Pump	< 1.4				12.4		4.3
	≥ 1.4 and < 5.4				13.3		4.3
	≥ 5.4 and < 11.25				13.3		4.3
Packaged Terminal AC - PTAC		< 7,000			12.0		
		≥ 7,000 and < 8,000			12.0		
		≥ 8,000 and < 9,000			11.7		
		≥ 9,000 and < 10,000			11.4		
		≥ 10,000 and < 11,000			11.1		
		≥ 11,000 and < 12,000			10.8		
		≥ 12,000 and < 13,000			10.5		
		≥ 13,000 and < 14,000			10.2		
Packaged Terminal Heat Pump - PTHP		< 7,000			12.0		3.4
		≥ 7,000 and < 8,000			12.0		3.4
		≥ 8,000 and < 9,000			11.7		3.3
		≥ 9,000 and < 10,000			11.4		3.3
		≥ 10,000 and < 11,000			11.1		3.2
		≥ 11,000 and < 12,000			10.8		3.2
		≥ 12,000 and < 13,000			10.5		3.1
		≥ 13,000 and < 14,000			10.2		3.1
Single Packaged Vertical AC - SPVAC	< 5.4				10.2		
	≥ 5.4 and < 11.25				10.2		
	≥ 11.25 and < 20				10.2		
Single Packaged Vertical Heat Pump - SPVHP	< 5.4				10.2		3.1
	≥ 5.4 and < 11.25				10.2		3.1
	≥ 11.25 and < 20				10.2		3.1

- Efficiencies listed above are based on equipment capacity at AHRI Certified Net Capacity and Rating at operating conditions.
- Both indoor and outdoor components of a Split System must be replaced to qualify for an incentive

A-3. Ground Source Heat Pumps

- Proposed equipment must meet all efficiency requirements as stated in the table below:

Equipment Type	Cooling Capacity	Minimum Qualifying Efficiency	
	tons	EER	COP
Groundwater Source Heat Pump	< 11.25	18.4	3.7
Ground Source Heat Pump	< 11.25	14.4	3.2

- Performance ratings (EER, COP) for qualifying closed loop Ground Source Heat Pump equipment are calculated at 77 degrees Fahrenheit entering water temperature per test procedure ISO-13256-1.
- No incentives are available for open loop Ground Source Heat Pump equipment.

A-4. Gas Heating

Gas Boilers			
	Size Category (MBH input)	Non-Condensing	Condensing
Hot Water	< 300	85% AFUE	88% AFUE
Hot Water	≥ 300 and ≤ 2,500	85% Et	88% Et
Hot Water	> 2,500	85% Ec	88% Ec
Steam, all	< 300	82% AFUE	N/A
Steam, all except natural draft	≥ 300	81% Et	N/A
Steam, natural draft	≥ 300	79% Et	N/A

Gas Furnaces	
Capacity	Minimum Efficiency
All size	95% AFUE

A-5. Gas Water Heating

Gas Water Heating equipment capacity at AHRI Certified Net Capacity and Rating at operating conditions.

Tank Style Water Heaters	
Capacity - MBH	Minimum Efficiency
≤ 75 MBH	≥ 0.67 EF
> 75 MBH	≥ 82% Et
Tankless Water Heater	
Minimum Efficiency	
≥ 82% EF,	
90% Et	

A-6. Premium Motors

- Motors must meet Federal Standards as shown below, or ASHRAE 90.1-2013, whichever is more stringent:

TABLE 5—NOMINAL FULL-LOAD EFFICIENCIES OF NEMA DESIGN A, NEMA DESIGN B AND IEC DESIGN N MOTORS (EXCLUDING FIRE PUMP ELECTRIC MOTORS) AT 60 Hz

Motor horsepower/ standard kilowatt equivalent	Nominal full-load efficiency (%)											
	2 Pole		4 Pole		6 Pole		8 Pole					
	Enclosed	Open	Enclosed	Open	Enclosed	Open	Enclosed	Open				
1/75		77.0	77.0		85.5	85.5		82.5	82.5		75.5	75.5
1.5/1.1		84.0	84.0		86.5	86.5		87.5	86.5		78.5	77.0
2/1.5		85.5	85.5		86.5	86.5		88.5	87.5		84.0	86.5
3/2.2		86.5	85.5		89.5	89.5		89.5	88.5		85.5	87.5
5/3.7		88.5	86.5		89.5	89.5		89.5	89.5		86.5	88.5
7.5/5.5		89.5	88.5		91.7	91.0		91.0	90.2		86.5	89.5
10/7.5		90.2	89.5		91.7	91.7		91.0	91.7		89.5	90.2
15/11		91.0	90.2		92.4	93.0		91.7	91.7		89.5	90.2
20/15		91.0	91.0		93.0	93.0		91.7	92.4		90.2	91.0
25/18.5		91.7	91.7		93.6	93.6		93.0	93.0		90.2	91.0
30/22		91.7	91.7		93.6	94.1		93.0	93.6		91.7	91.7
40/30		92.4	92.4		94.1	94.1		94.1	94.1		91.7	91.7
50/37		93.0	93.0		94.5	94.5		94.1	94.1		92.4	92.4
60/45		93.6	93.6		95.0	95.0		94.5	94.5		92.4	93.0
75/55		93.6	93.6		95.4	95.0		94.5	94.5		93.6	94.1
100/75		94.1	93.6		95.4	95.4		95.0	95.0		93.6	94.1
125/90		95.0	94.1		95.4	95.4		95.0	95.0		94.1	94.1
150/110		95.0	94.1		95.8	95.8		95.8	95.4		94.1	94.1
200/150		95.4	95.0		96.2	95.8		95.8	95.4		94.5	94.1
250/186		95.8	95.0		96.2	95.8		95.8	95.8		95.0	95.0
300/224		95.8	95.4		96.2	95.8		95.8	95.8			
350/261		95.8	95.4		96.2	95.8		95.8	95.8			
400/298		95.8	95.8		96.2	95.8						
450/336		95.8	96.2		96.2	96.2						
500/373		95.8	96.2		96.2	96.2						

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TABLE 6—NOMINAL FULL-LOAD EFFICIENCIES OF NEMA DESIGN C AND IEC DESIGN H MOTORS AT 60 HZ

Motor horsepower/standard kilowatt equivalent	Nominal full-load efficiency (%)					
	4 Pole		6 Pole		8 Pole	
	Enclosed	Open	Enclosed	Open	Enclosed	Open
1/.75	85.5	85.5	82.5	82.5	75.5	75.5
1.5/1.1	86.5	86.5	87.5	86.5	78.5	77.0
2/1.5	86.5	86.5	88.5	87.5	84.0	86.5
3/2.2	89.5	89.5	89.5	88.5	85.5	87.5
5/3.7	89.5	89.5	89.5	89.5	86.5	88.5
7.5/5.5	91.7	91.0	91.0	90.2	86.5	89.5
10/7.5	91.7	91.7	91.0	91.7	89.5	90.2
15/11	92.4	93.0	91.7	91.7	89.5	90.2
20/15	93.0	93.0	91.7	92.4	90.2	91.0
25/18.5	93.6	93.6	93.0	93.0	90.2	91.0
30/22	93.6	94.1	93.0	93.6	91.7	91.7
40/30	94.1	94.1	94.1	94.1	91.7	91.7
50/37	94.5	94.5	94.1	94.1	92.4	92.4
60/45	95.0	95.0	94.5	94.5	92.4	93.0
75/55	95.4	95.0	94.5	94.5	93.6	94.1
100/75	95.4	95.4	95.0	95.0	93.6	94.1
125/90	95.4	95.4	95.0	95.0	94.1	94.1
150/110	95.8	95.8	95.8	95.4	94.1	94.1
200/150	96.2	95.8	95.8	95.4	94.5	94.1

TABLE 7—NOMINAL FULL-LOAD EFFICIENCIES OF FIRE PUMP ELECTRIC MOTORS AT 60 HZ

Motor horsepower/standard kilowatt equivalent	Nominal full-load efficiency (%)							
	2 Pole		4 Pole		6 Pole		8 Pole	
	Enclosed	Open	Enclosed	Open	Enclosed	Open	Enclosed	Open
1/.75	75.5		82.5	82.5	80.0	80.0	74.0	74.0
1.5/1.1	82.5	82.5	84.0	84.0	85.5	84.0	77.0	75.5
2/1.5	84.0	84.0	84.0	84.0	86.5	85.5	82.5	85.5
3/2.2	85.5	84.0	87.5	86.5	87.5	86.5	84.0	86.5
5/3.7	87.5	85.5	87.5	87.5	87.5	87.5	85.5	87.5
7.5/5.5	88.5	87.5	89.5	88.5	89.5	88.5	85.5	88.5
10/7.5	89.5	88.5	89.5	89.5	89.5	90.2	88.5	89.5
15/11	90.2	89.5	91.0	91.0	90.2	90.2	88.5	89.5
20/15	90.2	90.2	91.0	91.0	90.2	91.0	89.5	90.2
25/18.5	91.0	91.0	92.4	91.7	91.7	91.7	89.5	90.2
30/22	91.0	91.0	92.4	92.4	91.7	92.4	91.0	91.0
40/30	91.7	91.7	93.0	93.0	93.0	93.0	91.0	91.0
50/37	92.4	92.4	93.0	93.0	93.0	93.0	91.7	91.7
60/45	93.0	93.0	93.6	93.6	93.6	93.6	91.7	92.4
75/55	93.0	93.0	94.1	94.1	93.6	93.6	93.0	93.6
100/75	93.6	93.0	94.5	94.1	94.1	94.1	93.0	93.6
125/90	94.5	93.6	94.5	94.5	94.1	94.1	93.6	93.6
150/110	94.5	93.6	95.0	95.0	95.0	94.5	93.6	93.6
200/150	95.0	94.5	95.0	95.0	95.0	94.5	94.1	93.6
250/186	95.4	94.5	95.0	95.4	95.0	95.4	94.5	94.5
300/224	95.4	95.0	95.4	95.4	95.0	95.4		
350/261	95.4	95.0	95.4	95.4	95.0	95.4		
400/298	95.4	95.4	95.4	95.4				
450/336	95.4	95.8	95.4	95.8				
500/373	95.4	95.8	95.8	95.8				

Motor horsepower/standard kilowatt equivalent	Average full load efficiency		
	Polyphase		
	Open motors (number of poles)		
	6	4	2
0.25/0.18	67.5	69.5	65.6
0.33/0.25	71.4	73.4	69.5
0.5/0.37	75.3	78.2	73.4
0.75/0.55	81.7	81.1	76.8
1/0.75	82.5	83.5	77.0
1.5/1.1	83.8	86.5	84.0
2/1.5	N/A	86.5	85.5
3/2.2	N/A	86.9	85.5

Motor horsepower/standard kilowatt equivalent	Average full load efficiency		
	Capacitor-start capacitor-run and capacitor-start induction-run		
	Open motors (number of poles)		
	6	4	2
0.25/0.18	62.2	68.5	66.6
0.33/0.25	66.6	72.4	70.5
0.5/0.37	76.2	76.2	72.4
0.75/0.55	80.2	81.8	76.2
1/0.75	81.1	82.6	80.4
1.5/1.1	N/A	83.8	81.5
2/1.5	N/A	84.5	82.9
3/2.2	N/A	N/A	84.1

A-7. Variable Frequency Drives

- For HVAC Systems - VFDs must be installed in a system that incorporates pressure sensors (or other applicable sensor devices) in the flow stream.
- For Boiler Systems – VFDs must be controlled by an automatic signal in response to modulating air/water flows.

A-8. Lighting - Fixtures

General:

- Applicant and/or contractor shall be responsible for maintaining and confirming adequate light levels.
- Incentives will not be provided for the installation of screw-in or plug-in lighting measures in non-permanent fixtures. For example, screw-in or plug-in lamps installed in refrigerator, oven, floor or desk lamps are not eligible for incentives.
- Lighting measures installed for use as retail display lighting do not qualify for incentives (i.e. lamps/fixtures for sale).

LED:

- LED product must be listed on ENERGY STAR® or Design Lights Consortium (DLC) qualified products list.
- DLC qualified products must be installed in line with the Primary Use Category (For example, a fixture designated by DLC under the primary use category Outdoor Full-Cutoff Wall-Mounted Area Luminaires will not receive an incentive when installed in an interior space).
- Must replace existing incandescent/halogen, fluorescent or HID lighting only.

Linear Fluorescents:

- Retrofit/replacement of existing fixtures <200W to T-8 lighting requires high performance or reduced wattage lamps and ballasts.
- Retrofit/replacement of existing fixtures ≥ 200W to T-8 or T-5 lighting shall comply as follows:
 - T-5 fixtures shall have a ballast factor greater than or equal to 1.0; have reflectivity greater than or equal to 91%; have a minimum 2 lamps; and be designated as F54T5 HO.
 - T-8 fixtures shall have a ballast factor greater than or equal to 1.14; have reflectivity greater than or equal to 91%; have a minimum of 4 lamps; and be designated as F32T8, minimum 32 watts.
- All new linear T-5 and T-8 fluorescent fixtures must be installed with new electronic ballasts and maintain minimum or required light levels.
- All electronic ballasts must have a Total Harmonic Distortion of ≤ 20%.

Compact Fluorescents:

- Hard-wired:
 - Fixtures must be ENERGY STAR® qualified.
 - Fixtures must have replaceable electronic ballasts.
 - Total Harmonic Distortion (THD) must not exceed 33%.
 - Power factor of the ballast must be no less than 90%.
- Screw-In:
 - Must be ENERGY STAR® qualified.

Other:

- Pulse Start Metal Halide (including pole-mounted parking lot lighting) must have a 12% minimum wattage reduction.
- Induction Lighting fixtures replacing HID must use 30% less wattage per fixture than HID system.

A-9. Lighting - Controls

- Lighting controls, where installed, must control eligible energy efficient lighting fixtures meeting standards in section A-8.
- Occupancy sensors shall not be installed in a space where they are prohibited by state or local building or safety code. For example, lighting controls in stairways (except bi-level), elevators, corridors/hallways, lobbies, and closet/storage areas are not eligible for incentives.

Occupancy Sensor Wall Mounted (OSW):

- OSW sensors must not allow manual override to the “ON” position.

High-Low Controls (OHLC):

- Not eligible in spaces smaller than 250 square feet.
- “Low level” shall be no more than 60% of “high level.”

Daylight Dimming Controls (DDC):

- Dimming shall be continuous or stepped at 4 or more levels.
- Daylight dimming control systems must be designed in accordance with IESNA practice as delineated in “RP-5-99, IESNA Recommended Practice of Daylighting.”

A-11. Refrigeration Covers/Doors

- Doors must have either heat reflective treated glass, be gas filled, or both.
- Aluminum night curtains only applicable for refrigerated cases, used for non-frozen products which do not have doors or other means of full or partial closure to reduce cold air loss to ambient room air.

A-12. Food Service Equipment

Equipment	Minimum Efficiency Requirements
Commercial Dishwashers	Must be qualified by ENERGY STAR® or Consortium for Energy Efficiency (CEE).
Commercial Combination Oven/Steamer (Electric)	Equipment must meet performance requirements of the SmartStart Food Service Application, or otherwise be qualified by ENERGY STAR® or CEE or meet ASTM criteria defined below: <ul style="list-style-type: none"> • Must meet the idle energy rate requirements in the Electric Combination Oven/Steamer Table, utilizing American Society for Testing and Materials (ASTM) F2861. • Must have a cooking energy efficiency of 50 percent or greater in steam mode and 70 percent cooking energy efficiency or greater in convection mode, utilizing (ASTM) F2861.

<p>Commercial Combination Oven/Steamer (Gas)</p>	<p>Equipment must meet performance requirements of the SmartStart Food Service Application, or otherwise be qualified by ENERGY STAR® or CEE or meet ASTM criteria defined below:</p> <ul style="list-style-type: none"> • Must have a cooking energy efficiency of 38 percent or greater in steam mode and 44 percent or greater in convection mode, utilizing ASTM F2861. • Must meet the idle energy rate requirements in the Gas Commercial Combination Oven/Steamer Table, utilizing ASTM F2861.
<p>Commercial Convection Oven (Electric)</p>	<p>Equipment must be qualified by ENERGY STAR® or CEE or meet ASTM criteria defined below:</p> <ul style="list-style-type: none"> • Must have a tested heavy load (potato) cooking energy efficiency of 70 percent or more, utilizing ASTM F1496. • Full-size electric ovens must have a tested idle energy rate of 1.6 kW or less, utilizing ASTM F1496. • Half-size electric ovens must have a tested idle energy rate of 1.0 kW or less, utilizing ASTM F1496.
<p>Commercial Convection Oven (Gas)</p>	<p>Equipment must be qualified by ENERGY STAR® or CEE or meet ASTM criteria defined below:</p> <ul style="list-style-type: none"> • Must have a tested heavy load (potato) cooking energy efficiency of 44 percent or greater and an idle energy rate of 13,000 Btu/h or less, utilizing ASTM F1496.
<p>Commercial Rack Oven (Gas)</p>	<p>Equipment must be qualified by ENERGY STAR® or CEE or meet ASTM criteria defined below:</p> <ul style="list-style-type: none"> • Must have a tested baking energy efficiency of 50 percent or greater, utilizing ASTM F2093.
<p>Commercial Conveyor Oven (Gas)</p>	<p>Equipment must be qualified by ENERGY STAR® or CEE or meet ASTM criteria defined below:</p> <ul style="list-style-type: none"> • Must have a tested baking energy efficiency of 42 percent or greater, utilizing ASTM F1817. • Small conveyor ovens with total conveyor width 25 inches or less must have a tested idle energy rate that is 29,000 Btu/h or less, utilizing ASTM F1817. • Large conveyor ovens with total conveyor width greater than 25 inches must have a tested idle energy rate that is 57,000 Btu/h or less, utilizing ASTM F1817.
<p>Commercial Fryer (Electric)</p>	<p>Equipment must be qualified by ENERGY STAR® or CEE or meet ASTM criteria defined below:</p> <ul style="list-style-type: none"> • Must have a tested heavy load cooking energy efficiency of 80 percent or greater and an idle energy rate of 1.0 kW or less, utilizing ASTM F1361.

Commercial Fryer (Gas)	<p>Equipment must be qualified by ENERGY STAR® or CEE or meet ASTM criteria defined below:</p> <ul style="list-style-type: none"> • Must meet a tested heavy load cooking energy efficiency of 50 percent or greater and an idle energy rate of 9,000 Btu/h or less, utilizing ASTM F1361.
Commercial Large Vat Fryer (Electric)	<p>Equipment must be qualified by ENERGY STAR® or CEE or meet ASTM criteria defined below:</p> <ul style="list-style-type: none"> • Must have a tested heavy load (French fry) cooking energy efficiency of 80 percent or greater, utilizing ASTM F2144.
Commercial Large Vat Fryer (Gas)	<p>Equipment must be qualified by ENERGY STAR® or CEE or meet ASTM criteria defined below:</p> <ul style="list-style-type: none"> • Must have a tested heavy load (French fry) cooking energy efficiency of 50 percent or greater, utilizing ASTM F2144.
Commercial Griddle (Electric)	<p>Equipment must be qualified by ENERGY STAR® or CEE or meet ASTM criteria defined below:</p> <ul style="list-style-type: none"> • Must have a tested heavy load cooking energy efficiency of 70 percent or greater and an idle energy rate of 355 watts per square foot of cooking surface or less, utilizing ASTM F1275.
Commercial Griddle (Gas)	<p>Equipment must be qualified by ENERGY STAR® or CEE or meet ASTM criteria defined below:</p> <ul style="list-style-type: none"> • Must have a tested heavy load cooking energy efficiency of 38 percent or greater and an idle energy rate of 2,650 Btu/h per square foot of cooking surface or less, utilizing ASTM F1275.
Commercial Steam Cooker (Electric)	<p>Equipment must be qualified by ENERGY STAR® or CEE or meet ASTM criteria defined below:</p> <ul style="list-style-type: none"> • Must have a tested heavy load (potato) cooking energy efficiency of 50 percent or greater, utilizing ASTM F1484.
Commercial Steam Cooker (Gas)	<p>Equipment must be qualified by ENERGY STAR® or CEE or meet ASTM criteria defined below:</p> <ul style="list-style-type: none"> • Must have a tested heavy load (potato) cooking energy efficiency of 38 percent or greater, utilizing ASTM F1484.
Insulated Holding Cabinets	<ul style="list-style-type: none"> • Must meet CEE Tier II specifications. • Cabinets must be fully insulated and have solid doors.
Commercial Glass and Solid Door Refrigerators and Freezers	<ul style="list-style-type: none"> • Must be ENERGY STAR® qualified. • Refrigeration system must be built-in (packaged).

Commercial Ice Machines	<ul style="list-style-type: none">• Proposed ice machines must qualify on one of the two following lists:<ul style="list-style-type: none">○ EnergyStar Commercial Kitchens Package: www.energystar.gov/cfs○ Super-efficient ice machines can be found here: http://fishnick.com/saveenergy/rebates/icemakers.pdf• Ice machines must be tested in accordance with the Air Conditioning and Refrigeration Institute (ARI) Standard 810.• Includes machines generating ice cubes that are 60 grams (2 oz.) or lighter. It also includes flaked, crushed and fragmented ice makers.• Only air-cooled machines (self-contained, ice making heads, or remote condensing) qualify.• The entire ARI tested ice making system must be purchased.• Remote machines must be purchased with qualifying remote condenser or remote condenser/compressor unit.
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A-13. Pipe Insulation

- Levels of new insulation must meet or exceed ASHRAE Standard 90.1-2013.

A-14. Envelope Insulation, Windows, and Doors

- Refer to ASHRAE Standard 90.1-2013 Tables 5.5-4 and 5.5-5. For example:
 - Attic insulation must be minimum R-49, or maximum U-0.021
 - Insulation of floors between conditioned and semi-heated spaces must be minimum R-19 / maximum U-0.051
 - Insulation of floors of conditioned spaces adjacent to exterior must be minimum R-30, or maximum U-0.033.
- Lower insulation levels may be permitted when existing conditions prevent from installing required insulation thickness, as described in 90.1 Section 5.1.3.
- Windows and doors shall be ENERGY STAR® rated where available and comply with current NJCEP Protocols to Measure Resource Savings.

Appendix B: Measure Lives

The measure lives listed below should be used for IRR calculations. Deviation from the below stipulated measure lives must be supported by appropriate documentation.

Non-Residential Programs	
C&I Construction	
Commercial Lighting — New	15
Commercial Lighting — Remodel/Replacement	15
Commercial Lighting Controls — Remodel/Replacement	18
Commercial Custom — New	18
Commercial Chiller Optimization	18
Commercial Unitary HVAC — New - Tier 1	15
Commercial Unitary HVAC — Replacement - Tier 1	15
Commercial Unitary HVAC — New - Tier 2	15
Commercial Unitary HVAC — Replacement Tier 2	15
Commercial Chillers — New	25
Commercial Chillers — Replacement	25
Commercial Small Motors (1-10 HP) — New or Replacement	20
Commercial Medium Motors (11-75 HP) — New or Replacement	20
Commercial Large Motors (76-200 HP) — New or Replacement	20
Commercial VSDs — New	15
Commercial VSDs — Retrofit	15
Commercial Air Handlers Units	20
Commercial Heat Exchangers	24
Commercial Burner Replacement	20
Commercial Boilers	25
Commercial Controls (electric/electronic)	15
Commercial Controls (Pneumatic)	10
Commercial Custom — Replacement	18
Industrial Lighting — New	15
Industrial Lighting — Remodel/Replacement	15
Industrial Unitary HVAC — New - Tier 1	15
Industrial Unitary HVAC — Replacement - Tier 1	15
Industrial Unitary HVAC — New - Tier 2	15
Industrial Unitary HVAC — Replacement Tier 2	15
Industrial Chillers — New	25
Industrial Chillers — Replacement	25
Industrial Small Motors (1-10 HP) — New or Replacement	20
Industrial Medium Motors (11-75 HP) — New or Replacement	20
Industrial Large Motors (76-200 HP) — New or Replacement	20
Industrial VSDs — New	15
Industrial VSDs — Retrofit	15
Industrial Custom — Non-Process	18

Industrial Custom — Process	10
Industrial Air Handler Units	20
Industrial Heat Exchangers	20
Industrial Burner Replacements	20
Small Commercial Gas Furnace — New or Replacement	20
Infrared Heating	17
Small Commercial Gas Boiler — New or Replacement	20
Small Commercial Gas DHW — New or Replacement	10
C&I Gas Absorption Chiller — New or Replacement	25
C&I Gas Custom — New or Replacement (Engine Driven Chiller)	25
C&I Gas Custom — New or Replacement (Gas Efficiency Measures)	18
O&M savings	3
Compressed Air (GWh participant)	8
Refrigeration	
Evaporator Fan Control	10
Cooler and Freezer Door Heater Control	10
Polyethylene Strip Curtains	4
Food Service	
Fryers	12
Steamers	10
Griddles	12
Ovens	12

Appendix C: Measurement and Verification Guidelines

A building-specific pre and post metering plan is a required component of each FEEP and must, in general, address the following for each measure and building in order to properly determine energy savings:

1. How will the pre-retrofit equipment usage be determined?
2. How will the post-retrofit equipment usage be determined and how will that relate to the pre-retrofit conditions?
3. What factors or variables affect energy consumption of both pre and post-retrofit conditions (e.g. outside and indoor air temperature, humidity, occupancy, and operating hours)?
4. How will these factors/variables be measured and used to adjust the pre or post-retrofit energy usage, if necessary, so savings can be determined?

Measurement and Verification Procedure

The following chart presents four different options for determining pre and post-retrofit equipment energy consumption. Entities and their contractors are required to follow one of the options outlined below when preparing the FEEP. The FEEP should include the entities plan and methodology to calculate the savings of the project(s). The entity does not need to select only one option and has the flexibility to select different plans for different ECMs. Alternative methods for M&V must be pre-approved by Program Manager.

The M&V options and methods below are adopted from the *2011 International Performance Measurement and Verifications Protocol (IPMVP), Volume I*¹.

IPMVP Option	How Savings Are Calculated	Typical Applications
<p>A. Retrofit Isolation: Key Parameter Measurement</p> <p>Savings are determined by field measurement of the key performance parameter(s) which define the energy use of the ECM's affected system(s) and/or the success of the project.</p> <p>Measurement frequency ranges from short-term to continuous, depending on the expected variations in the measured parameter, and the length of the reporting period.</p> <p>Parameters not selected for field measurement are estimated. Estimates can based on historical data, manufacturer's specifications, or engineering judgment. Documentation of the source or justification of the estimated</p>	<p>Engineering calculation of baseline and reporting period energy from:</p> <ul style="list-style-type: none"> ▪ short-term or continuous measurements of key operating parameter(s); and ▪ estimated values <p>Routine and non-routine adjustments as required.</p>	<p>A lighting retrofit where power draw is the key performance parameter that is measured periodically. Estimate operating hours of the lights based on building schedules and occupant behavior.</p>

¹ Free for download at:

http://www.evo-world.org/index.php?option=com_content&view=article&id=272&Itemid=504&lang=en

<p>parameter is required. The plausible savings error arising from estimation rather than measurement is evaluated.</p>		
<p>IPMVP Option</p>	<p>How Savings Are Calculated</p>	<p>Typical Applications</p>
<p>B. Retrofit Isolation: All Parameter Measurement</p> <p>Savings are determined by field measurement of the energy use of the ECM-affected system.</p> <p>Measurement frequency ranges from short-term to continuous, depending on the expected variations in the savings and the length of the reporting period.</p>	<p>Short-term or continuous measurements of baseline and reporting period energy, and/or engineering computations using measurements of proxies of energy use.</p> <p>Routine and non-routine adjustments as required.</p>	<p>Application of a variable speed drive and controls to a motor to adjust pump flow. Measure electric power with a kW meter installed on the electrical supply to the motor, which reads the power every minute. In the baseline period this meter is in place for a week to verify constant loading. The meter is in place throughout the reporting period to track variations in power use.</p>
<p>C. Whole Facility</p> <p>Savings are determined by measuring energy use at the whole facility or sub-facility level.</p> <p>Continuous measurements of the entire facility's energy use are taken throughout the reporting period.</p>	<p>Analysis of whole facility baseline and reporting period (utility) meter data.</p> <p>Routine adjustments as required, using techniques such as simple comparison or regression analysis.</p> <p>Non-routine adjustments as required.</p>	<p>Multifaceted energy management program affecting many systems in a facility. Measure energy use with the gas and electric utility meters for a twelve month baseline period and throughout the reporting period.</p>
<p>D. Calibrated Simulation</p> <p>Savings are determined through simulation of the energy use of the whole facility, or of a sub-facility.</p> <p>Simulation routines are demonstrated to adequately model actual energy performance measured in the facility.</p> <p>This Option usually requires considerable skill in calibrated simulation.</p>	<p>Energy use simulation, calibrated with hourly or monthly utility billing data. (Energy end use metering may be used to help refine input data.)</p>	<p>Multifaceted energy management program affecting many systems in a Facility, but where no meter existed in the baseline period.</p> <p>Energy use measurements, after installation of gas and electric meters, are used to calibrate a simulation.</p>

		Baseline energy use, determined using the calibrated simulation, is compared to a simulation of reporting period energy use.
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Metering Plan Outline

The following items must be addressed in the Metering Plan for each proposed ECM.

- **Method:** Identify the energy metering procedure that will be followed.
- **Assumptions:** State all substantive assumptions for the post-retrofit energy consumption for the equipment that may differ from pre-retrofit conditions. Include a description of any variables that affect energy consumption, such as outside temperature, time of day, etc.
- **Schedule:** State the schedule for performing all metering, analysis and reporting.

Determining Metering Duration

The metering and monitoring period must be long enough to accurately represent the annual amount of energy consumed by the affected equipment. The required duration depends on the measure. For instance, if a system that operates according to a well-defined schedule under a constant load, such as a constant-speed exhaust fan motor, the period required for determining annual savings could be short. In this case, measured energy savings can be extrapolated to account for the entire year.

If, however, the equipment's use varies across both day and season, as with air-conditioning equipment, a much longer metering or monitoring period may be required to characterize the system. In this case, long-term metering (3-6 months) is used to determine annual energy savings. A chiller retrofit may require metering throughout the cooling season or perhaps for one month each season of the year.

If energy consumption varies by more than 10% from one month to the next, measurement duration should be sufficient enough to document these variances. In addition, changes that will affect the baseline adjustment by more than 10% should also be documented and explained. Any major energy consumption variances due to seasonal activity increases or periodic fluctuations must also be monitored. If these variances cannot be monitored for whatever reason, they must be included in the annual energy consumption figure through a mathematical adjustment agreeable to the Program Manager. Note that any auxiliary energy-consuming equipment must be metered or modeled if its energy consumption changes as a result of project installation.

Multiple Buildings

Using the multiple building plan approach will reduce the required total number of monitoring points. A multiple building Metering Plan can be used only for multiple buildings with common measures and similar occupancy, usage, and energy consumption patterns. If any of these variables are significantly different, an individual Metering Plan must be prepared for each building. The Program Manager encourages the use of multiple building approaches when possible to minimize M&V costs. As buildings are aggregated together into a multiple building Metering Plan it is imperative to carefully select the usage groups. Spaces within a single usage group should have an expected range in hours of operation of no more than $\pm 15\%$. Failure to follow this guideline can result in incorrect calculation of energy savings, and hence incentive amounts.

Submitting Metered Data

Please be aware, pre and post-metered data itself is not required to be included in the FEEP however the Program Manager reserves the right to request metered data at any time. Data must be provided in formats usable by the Program Manager and not based on products or software that are not publicly available. If special software products are required for the reading or analysis of entity submittals, the Program Manager may reject the data or request the entity to provide the software. Both "raw" and "compiled" data may be required by the Program Manager to support surveys, savings estimates, and calculations.