

RETROFIT NJ Program - Emissions and Energy Calculation Guidance

V 1.2: Updated 01/14/26

Applicants to the RETROFIT NJ Program are required to provide a verified projection from a qualified third-party professional for reducing/avoiding at least one metric ton of carbon dioxide equivalent (CO₂e) for every \$250 in requested NJEDA grant award amount over the project's useful life. All greenhouse gas emissions projections are to be reported in both annual and lifetime avoidance of greenhouse gases in carbon dioxide equivalent metric tons (MT CO₂e).

In addition, where relevant, estimates for annual and lifetime emissions avoidance of co-pollutants are also required. This reporting is required by the Regional Greenhouse Gas Initiative (RGGI), the source of funding for the RETROFIT NJ Program. These co-pollutants include:

NO_x (Nitrogen oxides)

PM_{2.5} (Fine particulate matter)

PM₁₀ (Particulate matter)

VOC (Volatile organic compounds)

CO (Carbon monoxide)

SO_x (Sulfur oxides)

Co-pollutant estimates are for program reporting and tracking purposes. The magnitude of these projected emissions avoidance does not affect program eligibility or potential award size.

Projections should include supporting documentation and/or calculations as appropriate. Calculations can include modeling software application outputs. Projections must be prepared by one of the following:

- Licensed engineer (NJ state professional engineer or other state's equivalent)
- Licensed architect (NJ state registered architect or other state's equivalent)
- Certified Energy Auditor (CEA certification from Association of Energy Engineers)
- Certified Energy Manager (CEM certification from Association of Energy Engineers)
- Energy Management Professional (EMP certification from Energy Management Association)
- Building Energy Assessment Professional (BEAP certification from ASHRAE)
- Similarly qualified building design or energy professional

Summary of Information Requested:

Scope Applicability Note:

Not all sections subsequently outlined will be applicable to every project. Applicants are only required to complete and report information relevant to the measures included in their proposed RETROFIT NJ project.

Applicants must report emissions and energy data included in this document. A sample Summary Form found at the end of this document demonstrates how applicants may enter annual and lifetime emissions impacts and serves as the primary reporting tool for NJEDA review. The narrative guidance below explains the types of information that is required to complete the summary form, depending on project scope.

A) Building Systems Details

Details on existing and proposed building systems used for heating and cooling (fossil fuel-based and alternatives), as well as any other fossil fuel combustion-based systems used for other applications (cooking, laundry, etc.).

B) Current and Projected Reduction in Operating Emissions due to On-Site Electricity use and Renewable Generation.

Calculation of both current annual electric consumption/emissions and proposed annual and lifetime reduction in emissions achieved by replacing grid electricity, or onsite combustion-based energy generation, with on-site renewable energy. Increases to grid electricity consumption and related emissions should also be captured (e.g. resulting from heating electrification). Electric vehicle (EV) charging energy use and related emissions should not be included in these calculations.

C) Projected Reduction in Operating Emissions due to On-Site Energy Storage.

Calculation on reduction in annual and lifetime emissions achieved through the use of on-site energy storage.

D) Current and Projected Reduction in Operating Emissions due to Heating Fuel Switching

Calculation of both current annual and proposed reduction in annual and lifetime emissions achieved by replacing combustion-based heating system(s) with non-combustion alternatives.

E) Current and Projected Reduction in Operating Emissions due to Refrigerant Replacement

Calculation of both current annual and proposed reduction in annual and lifetime emissions achieved by replacing high global warming potential (GWP) refrigerant(s) with lower GWP alternatives.

F) Projected Reduction in Operating Emissions due to other Energy Efficiency Measures

Calculation on reduction in annual and lifetime emissions achieved by the implementation of BMS, envelope sealing, heat recovery, lighting upgrades, green roofs/cool roofs, electrifying appliances and/or through other energy efficiency measures.

G) Estimated Total Annual and Lifetime Reduction in Operating Emissions

Summation of calculations B, C, D, E, and F and projection of total project lifetime emissions reductions based on the useful life of emissions-reducing measures undertaken.

*NOTE: for all current and projected energy consumption and related emissions calculations, the unit of measure for each energy source should be specified and the total annual energy consumption should be multiplied by the appropriate marginal or average emissions factor/coefficient for each respective source of energy in order to calculate the total CO₂e emissions output. Each building impacted by the proposed project should have its own energy consumption and emissions profile that provides current energy consumption and emissions data (i.e. 12 months of cumulative data prior to the project initiation) and both annual and lifetime projected energy consumption and emissions data (i.e. after the project has completed construction and building systems are operational). Lifetime projections should be based on multiplying the annual estimated energy/emissions by the useful life of the technology or measure being implemented.

A. BUILDING SYSTEM DETAILS:

1) Existing Building Systems:

Provide the following information for each existing building system. Building systems are permanently installed, stationary equipment. Include both primary and supporting systems. Please indicate whether each existing building system is to remain in service or be replaced as part of the project.

- Space Heating
- Water Heating
- Space Cooling
- Systems used for other applications (cooking, laundry, etc.) that utilize fossil fuel combustion

Equipment Type:

Quantity:

Equipment Manufacturer and/or Brand:

Equipment Model/Description:

Equipment Model Year:

Capacity/Size:

To Remain/To be Replaced:

2) Proposed Building Systems:

Provide the following information for each proposed building system to be installed as part of the project. Include both primary and supporting systems:

- Space Heating
- Water Heating
- Space Cooling
- New equipment/systems replacing existing fossil fuel powered equipment for other applications (cooking, laundry, etc.)

Equipment Type:

Quantity:

Equipment Manufacturer and/or Brand:

Equipment Model/Description:

Equipment Model Year:

Capacity/Size:

3) Existing Refrigerant Usage:

Provide the following information for each high GWP (100-year GWP of 700 or greater) refrigerant system utilized in the building, including both primary and supporting refrigerant usage. Please indicate whether each high GWP existing building system is to remain in service or be replaced.

Equipment Type:

Equipment Manufacturer and/or Brand:

Equipment Model/Description:

Equipment Model Year:

Equipment Use:

Temperature Classification [Low (frozen products)/Medium (chilled products)/Other]:

Full Charge (lbs.):

Annual Leak Rate (%/year):

Operational Year(s) for which annual leak rate is based on:

Refrigerant Type Used:
 Refrigerant GWP:
 GWP Data Reference/Source:
 Date of Installation (estimated if unknown):
 To Remain/To be Replaced:

4) Proposed Refrigerant Usage:

Provide the following information for each new refrigerant system proposed to be installed during the project, including both primary and supporting refrigerant usage:

Equipment Type:
 Equipment Manufacturer and/or Brand:
 Equipment Model/Description:
 Equipment Model Year:
 Equipment Use:
 Temperature Classification ([Low (frozen products)/Medium (chilled products)/Other]:
 Full Charge (lbs.):
 Estimated Annual Leak Rate (% loss/year) *:
 Refrigerant Type Used:
 Refrigerant GWP:
 GWP Data Reference/Source:

*Note, if the same refrigerant system is being used without any additional improvements/repairs and only the refrigerant itself is being replaced, use the same leak rate for proposed as existing. If a new system is being installed, please refer to manufacturer guidance for estimated leak rate. If this is not available, please refer to estimates below determined from US EPA guidance:

Equipment	Assumed Annual Operational Leak Rate (%)
Stand-Alone or Self-Contained Systems	< 1%
Remote Condensing Unit Systems	12.5%
Multiplex Rack Systems	22.5%
Small Split AC	2.5%
Single Split and Multi-Split (Large)	2.5%
VRF Systems (Large)	3%
Ducted Systems (Large)	4%
Small/Medium Chillers	3%
Large Chillers	3%

Source: <https://www.epa.gov/ozone-layer-protection/transitioning-low-gwp-alternatives-commercial-refrigeration>

B. CURRENT AND PROJECTED ON-SITE ELECTRICITY CONSUMPTION:

Calculate the annual current CO2e emissions resulting from electricity used on-site based on the annual electric consumption of the building(s) impacted by the project.

Calculate the projected annual and lifetime electricity consumption and related emissions for both grid-supplied electricity and on-site renewable generation. All calculations should clearly identify:

- The baseline energy source(s) displaced,
- The total annual renewable energy generation,
- The emissions factors applied, and
- The resulting annual and lifetime emissions avoided (in metric tons of CO2e).

Applicants may use any defensible, transparent, and professionally accepted data sources or methodologies to determine electricity-related emissions factors and avoided emissions, provided that the approach is clearly documented and consistent with RGGI reporting expectations.

The following EPA-published resources are provided as optional reference sources that applicants may use to obtain grid emissions factors, avoided emissions rates, and supporting emissions data. Use of these specific resources is not required, provided that alternative sources are clearly cited and technically justified.

<https://www.epa.gov/egrid>

<https://www.epa.gov/avert>

<https://www.epa.gov/egrid/power-profiler>

<https://www.epa.gov/climateleadership/ghg-emission-factors-hub>

C. ON-SITE ENERGY STORAGE:

Calculate the projected annual greenhouse gas (GHG) emissions avoided through the integration of energy storage systems (e.g., battery, thermal, or other storage technologies) that enable displacement or reduction of grid electricity or fossil fuel-based energy consumption. Avoided emissions may result from storing electricity generated from renewable sources or from charging during lower-carbon grid periods and discharging during higher-carbon periods, thereby reducing the carbon intensity of consumed electricity.

Projects should quantify:

- The annual amount of energy stored and discharged (in kWh or MMBtu),
- The carbon intensity of electricity or thermal energy displaced during discharge, and
- Round-trip efficiency or other relevant system losses.

If storage enables increased utilization of on-site renewable generation (e.g., reducing curtailment or grid export), include those incremental avoided emissions within the calculation.

All calculations should clearly identify:

- The baseline operating profile without storage,
- The modeled storage charge/discharge cycle assumptions, The emissions factors applied for grid or on-site energy, and
- The resulting annual and lifetime emissions avoided (in metric tons of CO₂e).

D. HEATING FUEL SWITCHING EMISSIONS REDUCTIONS

Calculate the projected annual current fuel emissions and emissions avoided per reduction in fuel quantity combusted for each fossil fuel or other combustion-based heating system replaced with a non-combustion alternative.

If replacing a system that burns more than one fuel type, calculate the potential emissions based on proportional emissions factors accounting for the ratio of different fuel types historically used by the system. If information is unavailable on how different fuel sources were used by the system, utilize the compatible fuel source with the highest emissions factor.

$$\text{Annual Avoided Emissions (MT or lbs)} = \text{Annual Reduction in Fuel Consumption} * \frac{\text{Emissions Factor}}{\text{Unit of Fuel}}$$

Emission Factors for Common Heating Fuels:

Fuel (unit)	CO ₂ e (metric tons)	NO _x (pounds)	PM _{2.5} (pounds)	PM ₁₀ (pounds)	VOC (pounds)	CO (pounds)	SO _x (pounds)
Natural Gas (therm)	0.00525	3.083 X 10 ⁻³	7.322 X 10 ⁻⁴	7.322 X 10 ⁻⁴	5.299 X 10 ⁻⁴	3.854 X 10 ⁻³	5.780 X 10 ⁻⁵
Distillate Heating Oil #2 (gallon)	0.01024	2.000 X 10 ⁻²	1.541 X 10 ⁻³	2.293 X 10 ⁻³	3.400 X 10 ⁻⁴	5.000 X 10 ⁻³	2.160 X 10 ⁻⁴
Propane (gallon)	0.00574	1.300 X 10 ⁻²	7.000 X 10 ⁻⁴	7.000 X 10 ⁻⁴	8.000 X 10 ⁻⁴	7.500 X 10 ⁻³	4.872 X 10 ⁻⁵

For any other heating fuels beyond the common ones listed above, please determine relevant emission factors from the EPA sources listed below. If using alternative emission factors based on the unique configuration of the building’s heating system, please provide source reference and justification.

EPA Greenhouse Gas Emissions Factors Hub: <https://www.epa.gov/climateleadership/ghg-emission-factors-hub>

EPA AP-42 Air Emission Factors: <https://www.epa.gov/air-emissions-factors-and-quantification/ap-42-fifth-edition-volume-i-chapter-1-external-0>

Multiply the annual avoided emissions by the estimate useful life of the technology to obtain the avoided lifecycle emissions.

E. REFRIGERANT REPLACEMENT EMISSIONS REDUCTIONS:

Calculate both current and projected annual lifetime MT CO₂e emissions for refrigerant systems. In addition, calculate the annual and lifetime avoided emissions per each high GWP refrigerant replaced by the project.

$$\text{Annual Avoided Emissions (MT CO}_2\text{e)} = \frac{(\text{GWP}_E * \text{Charge}_E * \text{Leakage}_E) - (\text{GWP}_R * \text{Charge}_R * \text{Leakage}_R)}{2204.6}$$

Where,

GWP_E = GWP of the refrigerant in the existing system (100-year GWP)

Charge_E = pounds of refrigerant charge of the old refrigerant (lbs.)

Leakage_E = annual leakage rate of the existing system (% loss/year)

GWP_R = GWP of the new replacement refrigerant (100-year GWP)

Charge_R = pounds of refrigerant charge of the new refrigerant (lbs.)

Leakage_R = estimated future annual leakage rate (% loss/year)

2204.6 is a standard conversion factor from pounds to metric tons

Note: Adopted from MassDEP Commercial Refrigeration Grant Program

For refrigerants, please use the 100-year global warming potential (GWP) values available from the latest version of EPA’s published Emission Factors for Greenhouse Gas Inventories.

Source: <https://www.epa.gov/climateleadership/ghg-emission-factors-hub>

Alternatively: <https://www.epa.gov/climate-hfcs-reduction/technology-transitions-gwp-reference-table>

For any refrigerant or blend not included in this list, please refer to a similar credible 3rd party evaluation (such as IPCC AR or ASHRAE) for GWP value designation and provide the source of this value.

Multiply the annual avoided emissions by the estimate useful life of the technology to obtain the avoided lifecycle emissions.

F. OTHER ENERGY EFFICIENCY & OPERATING EMISSIONS REDUCTIONS:

For all other energy efficiency measures not captured in earlier sections—such as building envelope improvements, enhanced building management system (BMS) controls, heat recovery systems, efficient lighting upgrades, green or cool roofs, appliance electrification, or optimization of existing equipment—applicants must calculate the projected annual and lifetime emissions avoided based on the reduction in fossil fuel or grid-provided energy consumption resulting from the proposed improvements.

Applicants should quantify the annual energy savings attributable to each measure (e.g., reductions in kWh, therms, gallons, or MMBtu) and convert those savings into emissions reductions using the appropriate emissions factors. Calculations should clearly identify the baseline operating conditions, the methodology used to estimate savings (such as engineering calculations, energy audits, or modeling outputs), and all major assumptions related to equipment efficiency, operating hours, or system performance. If a measure indirectly reduces emissions by improving the performance of other systems—such as envelope sealing that reduces heating and cooling loads—applicants should describe the interaction and incorporate both direct and indirect savings into the calculation.

All calculations must be supported by documentation such as audit findings, modeling files, manufacturer data, or engineering analyses. Applicants should report the resulting avoided emissions in both annual and lifetime metric tons of CO₂e, as well as the associated avoided co-pollutants where applicable. Avoided emissions reported in this section will be included in the project’s total operational emissions reductions summarized in Section G.

G. TOTAL ESTIMATED OPERATING EMISSIONS REDUCTIONS:

Sum the projected operational annual and lifetime emissions avoided by the entire project, including due to onsite energy generation, onsite energy storage, heating fuel switching, refrigerant replacement, or other fossil fuel equipment replacement/energy efficiency measures. See **sample** below:

$$\begin{aligned} \text{Total Annual Emissions Avoided (MT or lbs)} \\ = \text{Avoidance (Fuel)} + \text{Avoidance (Refrigerants)} + \text{Avoidance (Other Measures)} \end{aligned}$$

$$\text{Lifetime Emissions Avoided (MT or lbs)} = \text{years projected project lifetime} * \text{Total Annual Avoided Emissions}$$

<u>Pollutant</u>	<u>Symbol</u>	<u>Unit</u>	<u>B. Annual Emissions Avoided due to On-Site Generation</u>	<u>C. Annual Emissions Avoided due to On-Site Storage</u>	<u>D. Annual Emissions Avoided due to Heating Fuel Switching</u>	<u>E. Annual Emissions Avoided due to Refrigerant Replacement</u>	<u>F. Annual Emissions Avoided due to Energy Efficiency/Other Measures</u>	<u>G. Total Annual Emissions Avoided</u> =B+C+D+E+F	<u>H. Projected Project Lifetime</u>	<u>Lifetime Emissions Avoided</u> =G X H
Greenhouse gases	CO ₂ e	metric tons								
Nitrogen oxides	NO _x	pounds								
Fine particulate matter	PM _{2.5}	pounds								
Particulate matter	PM ₁₀	pounds								
Volatile organic compounds	VOC	pounds								
Carbon monoxide	CO	pounds								
Sulfur oxides	SO _x	pounds								