

Technical Appendix for Greenhouse Gas Emissions Reductions Calculations

Summary of Methodology:

The Reducing Emissions in Lowell through Infrastructure and Efficiency First (RELIEF) initiative contains multiple measures to reduce greenhouse gas emissions over time. Some measures are covered by CPRG. Some will be covered by other funding sources. We have calculated GHG emission reductions based on both CPRG-funded and non-CPRG-funded projects so that EPA can see the impact of the larger RELIEF effort. Only savings attributable to CPRG funding are included in the narrative section for savings from 2025-2030 and 2025-2050.

Lowell developed a robust methodology for estimating GHG emissions reductions for the measures funded by CPRG and other sources. The methodology consists of the following: professional energy audits to assess savings potential, cost estimates, and availability of utility incentives; conversion of energy savings to emissions savings via GHG equivalency calculators; and calculation of annualized GHG savings based on estimated installation dates and measure longevity.

Professional Energy Audits to Assess Savings Potential, Cost Estimates, and Utility Incentives

For deep energy retrofit measures, calculations begin with estimated energy savings from energy audits that have already been completed by NGRID Project Expeditors (PEX) vendors for LED lighting upgrades and WX. PEX vendors have been pre-vetted by NGRID for proven capabilities in providing turnkey energy solutions for municipalities. They provide no-cost energy auditing for various energy efficiency measures across the municipal portfolio.

With the expectation of increased federal funding opportunities from the Bipartisan Infrastructure Law and Inflation Reduction Act, in the Spring of 2022, a PEX vendor working with Lowell began completing energy audits for our municipal and school portfolio of buildings. Audits were completed for LED lighting by performing site visits, inventorying existing lighting, and assessing appropriate LED replacements for existing lighting, including the possibility of integration with smart controls. Because PEX vendors work with municipalities like Lowell, they are required to adhere to prevailing wage requirements. Pricing for prevailing wages is included in the cost estimates. Cost estimates were most recently updated to include recent material costs and prevailing wage in March 2024. Because we know that pricing can vary, our team is also including an additional 3% cost adder for project contingency. Although we would typically carry closer to a 10% contingency, we believe that the recent pricing update will allow us to complete all projects with a smaller contingency.

The audits and energy savings attributed to specific measures are then input into NGRID's online portal to determine the availability and magnitude of incentives to maximize the funds we can recoup. Costs, savings, and incentives for lighting upgrades have been determined based on current conditions. These data are used in budget and GHG reduction calculations. Since LED lighting is estimated to have a lifetime of 15 years, according to utility sources, it is assumed that savings will continue to accrue for this period vs. the business-as-usual scenario.

Per grant question and answer guidelines, only GHG savings attributable to CPRG funding was included in the comparative metrics. To calculate this total, the share of CPRG as a percentage was multiplied by the total GHG's attributable to that measures on a facility level.

Estimating Potential Savings and Costs for Solar-Enabling Infrastructure

For solar-enabling infrastructure, savings are estimated based on renewable energy production made possible by the new roof structures funded through CPRG. Lowell has partnered with Solect Energy, LLC, the solar vendor for the Power Options group buying consortium that serves over 500 organizations in

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the Northeast. Solect has modeled solar output for systems across our portfolio with Year 1 solar production numbers. Since solar has a long measure life, savings are expected to accrue through 2050 vs. business-as-usual scenarios. However, solar panels are known to have an annual degradation factor of around 0.5% per year in productive output. This degradation factor is included in GHG savings assumptions. Because the full cost of the solar-enabling infrastructure is attributable to the grant, the full claimed savings were used in GHG reduction calculations.

Selection of GHG Equivalency Calculator:

Although there are many different GHG equivalency calculators available, Lowell believed that the pathway that would provide us the best comparison for projects in the same grant range (under \$10 million), was EPA's general GHG equivalency calculator ([Greenhouse Gas Equivalencies Calculator | US EPA](#)). To calculate GHG reductions, savings for "Kilowatt-hours avoided" and "Therms of natural gas" were input into the tool and summed. These calculations can be seen in the attached spreadsheet.

Results:

Overall, though, with the front-loading of CPRG measures in RELIEF, cumulative GHG savings from CPRG funds for 2025-2030 are estimated to be **5,728 MTCO₂e**. When factoring in CPRG grant funds requested, this equates to approximately \$1,740/MTCO₂e reduced. For 2025-2050, CPRG funds are estimated to reduce GHGs **25,390 MTCO₂e**. This equates to approximately \$393/MTCO₂e. This represents a school portfolio reduction of 14% vs. FY 23 baseline levels. Greater detail is available in the attached spreadsheet.