



# Appendix C: GHG Emission Reductions

The following appendix provides a detailed description of the GHG emission reduction calculations within the attached GHG Emission Reduction Spreadsheets. The tables and narrative below describe the GHG emission reduction calculations for each GHG reduction measure, by output. Each output below is mapped to its applicable task in Table 5, Pg. 13-14 of the Work Plan.

**Table C.1. GHG Emission Reduction Summary**

	GHG Emission Reduction		\$/Ton CO2e	
	2025-2030	2025-2050	2025-2030	2025-2050
GHG Measure 1. Accelerating Clean & Efficient Building Adoption	3,730,198	31,404,616	\$46.14	\$5.48
GHG Measure 2. Deploying Clean Transportation & Freight	155,598	1,095,257	\$741.74	\$105.37
GHG Measure 3. Kick-starting Industry Decarbonization	1,951,296	14,959,940	\$12.74	\$1.66
GHG Measure 4. Expanding Climate-Smart Agriculture	2,180,380	7,585,695	\$51.24	\$14.73
GHG Measure 5. Keeping Clean Power Goals on Track	468,991	2,361,270	\$13.48	\$2.68
<b>Total</b>	<b>8,468,463</b>	<b>57,406,778</b>	<b>\$50.72</b>	<b>\$7.50</b>

## GHG Measure 1. Accelerating Clean & Efficient Building Adoption

**Output: Retrofit 12,469 units of housing**

**Performance Measure Description:** Units of housing fully electrified as a result of the Catalyst Fund, Navigator program, and Access Portal in Tasks 1.1, 1.2, and 1.3. Each of these tasks has associated performance measures, outlined in the budget spreadsheet. GHG reductions discussed here are a function of all three of these overlapping programs.

**GHG Reduction Estimate Method:** GHG reductions per unit are based on analysis of utility consumption data and NREL's Cambium model of national, regional, and state electricity grids. Methodology is described in detail in [Direct Testimony of Chris Neme before the Illinois Commerce Commission, docket 23-0068](#). Number of units provided by each program were reduced according to a series of assumptions regarding causation from other incentive programs. Resulting units were multiplied by per unit GHG reduction estimate.



**Models/Tools Used:** NREL's Cambium model

**Measure Implementation Assumptions:** Homes addressed are 75% single-family and 25% multi-family. Of single-family, 30% will be low-income, 30% moderate income, and 40% non-income-qualified. For multifamily, proportions will be 50%, 30%, and 20% respectively. Assumes full electrification.

**GHG Reduction Estimate Assumptions:** Homes' existing appliances generally comport with those found in People's Gas efficiency potential study for their Northern Illinois service territory.

**Reference Case Scenario:** Emissions reductions calculated against typical homes using fossil gas.

**Measure-Specific Activity Data:** Catalyst program results in 2,062 unit retrofits annually. Navigator program results in 500 unique retrofits in the first year and 1,200 in years 2-5. Portal results in 101 unique retrofits each year (resulting from 4,000 applications).

**Annual Projected Emission Reductions**

Year	2025-26	2027	2028	2029	2030	2025-30	2025-50
MTCO2e	15,629	19,813	29,827	38,655	47,834	151,758	1,250,171

**Output: Retrofit 2,360,000 sq ft. commercial buildings**

**Performance Measure Description:** Square feet of commercial buildings treated by Task 1.5.

**GHG Reduction Estimate Method:** Multiplied the estimated sq. ft. treated based on experience and costs of a similar program in Massachusetts by RMI per sq. ft. carbon reduction estimates. Reduced estimate to account for the portion (1.14%) attributable to federal tax credits.

**Models/Tools Used:** RMI's 2022 report, ["Medium-Size Commercial Retrofits"](#) for tons CO2e / sq. ft. and RMI's ["Guide to Building the Case for Deep Energy Retrofits"](#) for cost and federal tax credit information.

**Measure Implementation Assumptions:** Concierge program will achieve results similar to other states.

**GHG Reduction Estimate Assumptions:** 0.00028 tons / sq. ft. CO2e reduction for medium commercial space, per RMI 2022 report linked above.

**Reference Case Scenario:** Typical commercial office building space without retrofit.

**Measure-Specific Activity Data:** Program retrofits 472,000 sq. ft. per year.

**Annual Projected Emission Reductions**

Year	2025-26	2027	2028	2029	2030	2025-30	2025-50
MTCO2e	113	226	340	453	566	1,698	13,015

**Output: Train 52 building decarbonization workers and develop 26 new decarbonization contractor businesses every year**

**Performance Measure Description:** Expand Illinois' existing solar and energy efficiency worker training and clean energy contractor accelerator program to include building decarbonization. Task 1.4.

**GHG Reduction Estimate Method:** The GHG reductions from this effort were estimated using the [RMI Energy Policy Simulator for Illinois](#).



**Models/Tools Used:** RMI Energy Policy Simulator for Illinois

**Measure Implementation Assumptions:** Assumes training 2 employees at 2 decarbonization contractors (4 workers total) in each of 13 communities annually. Assumes 2 decarbonization contractors in each of 13 communities receive contractor accelerator services.

**GHG Reduction Estimate Assumptions:** Effect of additional services to workers and contractors will be typical of policies represented by RMI Energy Policy Simulator.

**Reference Case Scenario:** RMI Energy Policy Simulator Business as Usual scenario for Illinois.

**Measure-Specific Activity Data:** Train 52 workers per year and provide accelerator services to 26 contracting businesses annually.

Annual Projected Emission Reductions							
Year	2025-26	2027	2028	2029	2030	2025-30	2025-50
MTCO <sub>2</sub> e	208,067	416,133	624,200	832,267	1,040,333	3,121,000	26,486,000

#### Output: Deploy community geothermal to 1,100 households

**Performance Measure Description:** Deploy community geothermal pilots that reach 220 households per year for a total of 1,100 households over a 5-year period. Task 1.6.

**GHG Reduction Estimate Method:** Multiply GHG reductions from replacing a 90% efficient gas furnace with a 300% efficient geothermal system by the number of homes connected to the systems.

**Models/Tools Used:** NREL Cambium model for grid electricity carbon emissions.

**Measure Implementation Assumptions:** Pilots will replace 90% efficient gas furnaces with 300% efficient geothermal systems.

**GHG Reduction Estimate Assumptions:** NREL Cambium estimates of grid electricity carbon emissions.

**Reference Case Scenario:** Emissions from typical Illinois housing stock using fossil fuels for heat.

**Measure-Specific Activity Data:** Average of 220 households connected to community geothermal per year for a 5-year period.

Annual Projected Emission Reductions							
Year	2026	2027	2028	2029	2030	2025-30	2025-50
MTCO <sub>2</sub> e	893	1,901	3,027	4,092	5,185	15,099	128,562

#### Output: 90 communities serving 833,220 households adopt Illinois Stretch Energy Code

**Performance Measure Description:** 90 communities of average size among Illinois' top 100 largest municipalities adopt the Illinois Stretch Code for new construction and major renovation projects as a result of Task 1.7.

**GHG Reduction Estimate Method:** The GHG emission reductions resulting from improved codes in a typical mid-sized Illinois community were derived from data in PNNL's study (linked below) on the



emissions reductions from model building codes, population data from the US Census and Illinois emissions data.

**Models/Tools Used:** GHG reductions from adoption of codes from PNNL's [Impacts of Model Energy Codes](#), November 2023.

**Measure Implementation Assumptions:** Adopting municipalities have an average of 46,758 residents each with a typical rate of new construction.

**GHG Reduction Estimate Assumptions:** We assume that adoption of the Illinois Stretch Code will result in GHG emission reductions similar to adoption of the latest model codes, which have been adopted, albeit with amendments, by the State. Because local action will be important in realizing reductions, our calculations assign only 50% of the emission reduction value to the actions of the State of Illinois.

**Reference Case Scenario:** ASHRAE 90.1-2019 and the 2021 IECC codes are baselines in the PNNL study, against which improved codes are measured.

**Measure-Specific Activity Data:**

Annual Projected Emission Reductions							
Year	2025-26	2027	2028	2029	2030	2025-30	2025-50
MTCO <sub>2</sub> e	54,978	58,800	82,222	107,555	134,799	438,355	3,508,556

## GHG Measure 2. Deploying Clean Transportation & Freight

### Output: Replace 402 heavy duty diesel vehicles with electric vehicles and charging stations

**Performance Measure Description:** The programs in Task 2.1, 2.3, 2.4, 2.6, and 2.7 together will offer grants, loans, and supporting workforce development and technical assistance to entice heavy duty fleet owners to replace diesel vehicles with electric vehicles and shared chargers. The program will track both grants and loans, but GHG emissions reductions are a function of new vehicles with charging capability.

**GHG Reduction Estimate Method:** GHG reductions were attributed to vehicle/charger pairs based on the difference between typical diesel equipment emissions and emissions related to electric use by electric equipment. Adjustments were made to remove reductions attributable to federal incentives.

**Models/Tools Used:** NREL 2022 Cambium analysis of electric system GHG emissions, U.S. Department of Transportation Vehicle Inventory and Use Survey (VIUS).

**Measure Implementation Assumptions:** Program uptake will use the entire budget.

**GHG Reduction Estimate Assumptions:** Supporting programs such as workforce development, outreach, technical assistance, and market development impacts result in an initial 10% (+5% each program year) of additional, unsubsidized vehicles and chargers beyond those deployed directly through rebates.

**Reference Case Scenario:** Typical current diesel equipment emissions per US DOT VIUS.

**Measure-Specific Activity Data:** 402 heavy duty vehicles incentivized by a combination of rebates and loans over the 5 year program period, coupled with an equal number of charger rebates and/or loans.

Annual Projected Emission Reductions							
Year	2025-26	2027	2028	2029	2030	2025-30	2025-50



MTCO2e	6,808	7,844	11,594	15,077	15,353	56,677	402,536
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#### Output: Replace 240 medium-duty diesel vehicles with electric vehicles and chargers

**Performance Measure Description:** As with heavy-duty vehicles, the programs in Task 2.1, 2.3, 2.4, 2.6, and 2.7 together will offer grants, loans, and supporting workforce development and technical assistance to entice fleet owners to replace diesel medium-duty vehicles with electric vehicles and chargers. The program will track both grants and loans, but GHG emissions reductions are a function of new vehicles with charging capability. **The GHG reduction estimates for medium-duty vehicles were calculated using a method and assumptions identical to those used for heavy-duty vehicles, detailed above, and so are not repeated here.**

**Measure-Specific Activity Data:** 240 medium-duty vehicle rebates over the 5 year program period, with an equal number of charger rebates and/or loans.

Annual Projected Emission Reductions							
Year	2025-26	2027	2028	2029	2030	2025-30	2025-50
MTCO2e	924	1,036	1,503	1,947	1,975	7,383	50,810

#### Output: Deploy 761 heavy duty chargers

**Performance Measure Description:** As with heavy-duty vehicles, the programs in Task 2.1, 2.3, 2.4, 2.6, and 2.7 together will offer grants, loans, and supporting workforce development and technical assistance to entice fleet owners to replace diesel medium-duty vehicles with electric vehicles and chargers. The program will track both grants and loans, but GHG emissions reductions are a function of new vehicles with charging capability.

**GHG Reduction Estimate Method:** The majority of chargers deployed through this program are assumed to be “paired” with vehicles deployed through this program, and are accounted for in vehicles’ emissions reductions above. Only emissions reductions from chargers *beyond* the number of deployed vehicles in the program are counted here. Those chargers are assumed to support vehicles deployed outside the program, and are credited with one-half of the expected emissions reduction from the vehicles they support. This may be a conservative assumption, since one charger would in many instances likely serve more than one electric vehicle. Otherwise, GHG reduction estimates for chargers were calculated using a method and assumptions identical to those used for heavy-duty vehicles, detailed above.

**Measure-Specific Activity Data:** 500 charger grants and 385 charger low-cost loans over the 5 year program period.

Annual Projected Emission Reductions							
Year	2025-26	2027	2028	2029	2030	2025-30	2025-50
MTCO2e	3,967	3,865	5,483	6,898	7,024	27,238	185,474

#### Output: Replace 1,075 off-road diesel vehicles (forklifts) with electric vehicles

**Performance Measure Description:** As with heavy-duty vehicles, the programs in Task 2.1, 2.3, 2.4, 2.6, and 2.7 together will offer grants, loans, and supporting workforce development and technical assistance to entice fleet owners to replace diesel off-road vehicles, that is, forklifts, with electric vehicles and



shared chargers. The program will track both grants and loans, but GHG emissions reductions are a function of new vehicles with charging capability. **The GHG reduction estimates for off-road vehicles were calculated using a method and assumptions identical to those used for heavy-duty vehicles, detailed above, and so are not repeated here.**

**Measure-Specific Activity Data:** 1,075 off-road vehicle rebates over the 5 year program period.

Annual Projected Emission Reductions							
Year	2025-26	2027	2028	2029	2030	2025-30	2025-50
MTCO <sub>2</sub> e	8,054	4,893	7,590	9,933	10,176	36,807	274,557

#### Output: Deploy 5-7 trackside power systems

**Performance Measure Description:** IEPA will issue grants via the program in Task 2.2 for trackside power in a select number of higher-than-average traffic locomotive hubs to reduce diesel idling.

**GHG Reduction Estimate Method:** There is an extreme lack of data on emissions reductions from trackside power systems. Consequently, GHG reductions were estimated by proxy, using the reduction in GHGs accomplished by replacing 5.5 diesel locomotives with electric locomotives, which could be done under the same budget.

**Models/Tools Used:** Federal Railroad Administration's [Locomotive Emissions Comparison Tool](#).

**Measure Implementation Assumptions:** That per-dollar emissions reductions from a trackside power system would be the same or greater than those from replacing a diesel locomotive with an electric one.

**GHG Reduction Estimate Assumptions:** The locomotive to be replaced is a Tier 0 high emitting model.

**Reference Case Scenario:** Diesel emissions from a Tier 0 high emitting locomotive.

**Measure-Specific Activity Data:** Deploy 5-7 trackside power systems in high traffic rail hubs.

Annual Projected Emission Reductions							
Year	2026	2027	2028	2029	2030	2025-30	2025-50
MTCO <sub>2</sub> e	-	2,305	2,305	2,305	2,305	9,219	55,311

## GHG Measure 3. Kickstarting Industry Decarbonization

#### Output: Support Retrofit of 10 Industrial Facilities

**Performance Measure Description:** This initiative is an industrial decarbonization concierge service that supports the decarbonization of 2 industrial facilities per year. It is likely that the program could serve more facilities, but for purposes of these GHG reduction calculations, we assume 2 per year.

**GHG Reduction Estimate Method:** Estimate number of facilities program can serve and multiply by GHG reductions per facility, with assumptions regarding facility size and associated GHG savings per facility.

**Models/Tools Used:** Costs and GHG reduction estimates taken from a 2011 US Department of Energy [study](#), "Energy-Saving Opportunities for Manufacturing Enterprises."



**Measure Implementation Assumptions:** 80% of supported facilities are large, with GHG reductions averaging 12,000 MTCO<sub>2</sub>e, and 20% are small or medium, with reductions averaging 1400 MTCO<sub>2</sub>e.

**GHG Reduction Estimate Assumptions:** Emissions reductions figures from this study are conservatively discounted 15% to acknowledge that the study's age and that some industrial users may have implemented efficiency measures over this time.

**Reference Case Scenario:** Unaltered facilities as discussed in the 2011 US DOE study, with potential for GHG reductions discounted by 15%.

**Measure-Specific Activity Data:** Number of industrial facilities served.

Annual Projected Emission Reductions							
Year	2026	2027	2028	2029	2030	2025-30	2025-50
MTCO <sub>2</sub> e	16,796	33,592	50,388	67,184	83,980	251,940	1,931,549

#### Output: Replace 390 refrigerant systems

**Performance Measure Description:** Replace 390 refrigerant systems that use fluorinated gases (or "f-gases") with less polluting alternatives. The program will focus on the industrial food and beverage sector, particularly supermarket refrigeration systems.

**GHG Reduction Estimate Method:** The difference in GHG emissions was calculated between several models of commonly used refrigeration systems using R-404A refrigerant and similarly sized systems using less polluting refrigerants, R-744 and R-290. Assumptions were made about how many of each type of system would be replaced annually, and the reductions were summed.

**Models/Tools Used:** None.

**Measure Implementation Assumptions:** Incentives will be sufficient to entice food service providers to change refrigeration equipment. Replacements will be sought in the retail food service sector, likely supermarkets. Project costs are based on project data from California provided by the North American Sustainable Refrigeration Council.

**GHG Reduction Estimate Assumptions:** R-404A has a Global Warming Potential of 3922 and R-744 has a GWP of 1, while R-290 has a GWP of 3. GWP figures are from the [California Air Resources Board](#). The leakage rate of 25% is from [materials](#) distributed by the U.S. EPA GreenChill program.

**Reference Case Scenario:** Use of R-404A refrigerant, with 25% leak rate, in all equipment.

**Measure-Specific Activity Data:** Replace 390 refrigerant systems over the 5-year program period.

Annual Projected Emission Reductions							
Year	2026	2027	2028	2029	2030	2025-30	2025-50
MTCO <sub>2</sub> e	566,452	566,452	566,452	566,452	566,452	1,699,356	13,028,400

## GHG Measure 4. Expanding Climate-Smart Agriculture

**Output:** Add 230,702 acres of cover crops planted to existing programs and convert 324,000 acres to no-till agriculture





**Performance Measure Description:** This initiative expands Illinois' successful existing cover crop incentive program by an additional 230,702 acres and adds 324,000 acres to the state's no-till incentive program over the 5-years of the program.

**GHG Reduction Estimate Method:** GHG reductions are estimated by multiplying the additional acreage by the CO2 reduction from applying cover crops or converting to no-till agriculture.

**Models/Tools Used:** CO2 sequestration rates per acre are based on three scenarios conducted using the US Department of Agriculture's COMET-Planner Report.

**Measure Implementation Assumptions:** The offered incentive will be sufficient to entice farmers to plant cover crops.

**GHG Reduction Estimate Assumptions:** Three scenarios used assumed cropland in Champaign County, Illinois: (1) Converting intensive tilled land to no-till or strip-till, (2) converting reduced tilled land to no-till or strip-till, (3) converting reduced tilled land to no-till or strip-till and adding cover crops.

**Reference Case Scenario:** See three scenarios in GHG reduction estimate assumptions..

**Measure-Specific Activity Data:** Add 36,364 acres of cover crops planted to existing programs for each of the 5 program years and convert 324,000 acres to no-till agriculture.

#### Annual Projected Emission Reductions

Year	2025-26	2027	2028	2029	2025-30	2025-50
MTCO2e	349,085	180,662	180,989	185,943	896,677	896,677

#### Output: Adoption of 45,734 commercial electric lawn mowers

**Performance Measure Description:** Rebate program to spur replacement of almost 46,000 pieces of commercial gas-powered landscaping equipment with all-electric.

**GHG Reduction Estimate Method:** The MOVES4 tool model was used to estimate GHG emissions reductions for this program.

**Models/Tools Used:** Calculations for this section were conducted using the U.S. EPA Motor Vehicle Emission Simulator tool (MOVES4). Mark Janssen of the Lake Michigan Air Directors Consortium (LADCO) ran MOVES4 to generate average 2020 weekday activity and emission by month for lawn and garden equipment (LGE).

**Measure Implementation Assumptions:** Induce over 9,100 pieces of commercial electric landscaping equipment purchases per year during the 5-year program period. Over 45,000 of the pieces of equipment will be hand-held equipment with a \$100 rebate, and remaining mowers will be mower-tractors with a much higher rebate.

**GHG Reduction Estimate Assumptions:** Assumptions built into the MOVES4 model.

**Reference Case Scenario:** Reference case built into the MOVES4 model.

**Measure-Specific Activity Data:** Adoption of 46,734 pieces of commercial electric landscaping equipment.





#### Annual Projected Emission Reductions

Year	2026	2027	2028	2029	2030	2025-30	2025-50
MTCO <sub>2</sub> e	33,813	33,813	33,813	33,813	33,813	169,064	845,320

#### Output: Fund biomethane projects using approximately 5 million tons of solid waste

**Performance Measure Description:** This initiative would fund biomethane capture.

**GHG Reduction Estimate Method:** We used EPA's WARM model to estimate GHG emissions landfill methane capture with offsite use.

**Models/Tools Used:** Greenhouse gas reductions were calculated using the US EPA Waste Reduction Model ([WARM](#)).

**Measure Implementation Assumptions:** Cost assumptions for the project were taken from comparison of the 2021 NREL report "[Select Food Waste Utilization Options](#)."

**GHG Reduction Estimate Assumptions:** The analysis assumed 4,999,999 tons of mixed solid waste landfilled, located in Illinois, with the current mix of waste, with moderate moisture conditions, including emissions during transport with the default distances.

**Reference Case Scenario:** Emissions reductions were determined by first running a "business-as-usual" site with these assumptions that had no LFG recovery, then running the same site, but assuming it had LFG recovery which was recovered for energy (methane), using aggressive gas collection.

**Measure-Specific Activity Data:** Tons of manure processed.

#### Annual Projected Emission Reductions

Year	2026	2027	2028	2029	2030	2025-30	2025-50
MTCO <sub>2</sub> e	236,453	236,453	236,453	236,453	236,453	1,182,265	5,911,323

## GHG Measure 5. Keeping Clean Power Goals on Track

#### Output: Statewide Clean Energy Modelling

**Performance Measure Description:** The IPA would conduct a study to proactively identify clean energy resources to meet gaps in real or perceived energy needs, with the purpose of avoiding deviation from the state's emissions reductions schedule.

**GHG Reduction Estimate Method:** Estimate risk of Illinois' RTOs delaying statutory plant closures (55%), and associated emissions increases if that were to happen. Allocate those reductions based on a 2% chance that the study would allow Illinois to avoid delay in its statutory plant closure schedule.

**Models/Tools Used:** Statutory schedule for plant closures contained in IL state law.

**Measure Implementation Assumptions:** Study would result in a 2% chance of avoiding plant closure by identifying a pathway to avoid generation gap.



**GHG Reduction Estimate Assumptions:** 55% chance of the RTOs delaying these emissions reductions, and that the delay would be for only one year. Illinois' merchant power plants are scheduled to come offline in 2030 and 2045, so annual projections are not provided below.

**Reference Case Scenario:** Plant closures in Illinois face a 55% chance of one years' delay vs proceeding on the schedule set in statute.

**Measure-Specific Activity Data:** Study expected to be completed in 2026.

Annual Projected Emissions Reductions							
Year	2026	2027	2028	2029	2030	2025-30	2025-50
MTCO2e	Plants are scheduled to close in 2030 and 2045.				181,188	181,188	233,065

### Output: Small Utility Clean Energy Planning

**Performance Measure Description:** Municipal and rural electric cooperatives would undergo planning to proactively identify clean energy resources to meet gaps in real or perceived energy needs, with the purpose of avoiding deviation from the state's emissions reductions schedule.

**GHG Reduction Estimate Method:** Estimate risk of Illinois' RTOs delaying statutory plant closures (55%), and associated emissions increases if that were to happen. Allocate those reductions based on a 25% chance that planning would allow Illinois' municipal and rural electric cooperatives, who have direct control of their resource portfolios, to take action to avoid delay in its statutory plant closure schedule.

**Models/Tools Used:** Statutory schedule for plant closures contained in IL state law.

**Measure Implementation Assumptions:** Study would result in a 25% chance of avoiding plant closure by identifying a pathway to avoid a generation gap. Chance of action is higher here than in the statewide study because these utilities have direct control over their resource portfolio.

**GHG Reduction Estimate Assumptions:** 55% chance of the RTOs delaying these emissions reductions, and that the delay would be for only one year. There is one plant that could conceivably close before 2030 and another that is scheduled to reduce its emissions, but only in 2045. Because of the lumpiness of these possibilities, annual projections are not provided below.

**Reference Case Scenario:** Plant closures in Illinois face a 55% chance of one years' delay vs proceeding on the schedule set in statute.

**Measure-Specific Activity Data:** Planning processes to be undertaken by two small utilities each year.

Annual Projected Emissions Reductions							
Year	2026	2027	2028	2029	2030	2025-30	2025-50
MTCO2e	Plant closures are limited and so assigned to 2030 and 2045.					287,803	2,128,205