

CPRG Technical Appendix

ANNUAL GHG MTCO2e 2025-2050										
	Industrial Decarbonization			Waste	Public Sector Buildings					Total
	Energy Eff	Refrigeration	Renewables		Libraries	CHA	CPS	Cook	HACC	
2025	32,348.01	51,059.39	867.26	7,549.01	214	0	602	0	0	92,639
2026	97,044.02	153,178.17	2,601.79	59,861.41	535	835	6,833	970	278	322,136
2027	129,392.03	204,237.56	3,469.06	95,278.18	748	2,040	7,261	2,656	680	445,762
2028	129,392.03	204,237.56	3,469.06	135,751.68	748	2,459	7,261	2,785	820	486,924
2029	129,392.03	204,237.56	3,469.06	165,215.44	748	2,711	7,261	2,785	904	516,723
2030	129,392.03	204,237.56	3,469.06	165,215.44	748	2,940	7,261	2,785	980	517,029
2030 subtotal	646,960.14	1,021,187.82	17,345.28	628,871.16	3,742	10,985	36,479	11,983	3,662	2,381,214
2031	129,392.03	204,237.56	3,469.06	165,215.44	748	1,492	7,261	2,785	497	515,098
2032	129,392.03	204,237.56	3,469.06	165,215.44	748	1,492	7,261	2,785	497	515,098
2033	129,392.03	204,237.56	3,469.06	165,215.44	748	1,268	7,261	2,785	423	514,799
2034	129,392.03	204,237.56	3,469.06	165,215.44	748	1,268	7,261	2,785	423	514,799
2035	129,392.03	204,237.56	3,469.06	165,215.44	748	1,268	7,261	2,785	423	514,799
2036	129,392.03	204,237.56	3,469.06	165,215.44	748	1,268	7,261	2,785	423	514,799
2037	129,392.03	204,237.56	3,469.06	165,215.44	748	1,268	7,261	2,785	423	514,799
2038	129,392.03	204,237.56	3,469.06	165,215.44	748	1,268	7,261	2,785	423	514,799
2039	129,392.03	204,237.56	3,469.06	165,215.44	748	1,268	7,261	2,785	423	514,799
2040	129,392.03	204,237.56	3,469.06	165,215.44	748	1,268	7,261	2,785	423	514,799
2041	129,392.03	204,237.56	3,469.06	165,215.44	748	1,268	7,261	2,785	423	514,799
2042	129,392.03	204,237.56	3,469.06	165,215.44	748	1,268	7,261	2,785	423	514,799
2043	129,392.03	204,237.56	3,469.06	165,215.44	748	1,268	7,261	2,785	423	514,799
2044	129,392.03	204,237.56	3,469.06	165,215.44	748	1,268	7,261	2,785	423	514,799
2045	129,392.03	204,237.56	3,469.06	165,215.44	748	1,268	7,261	2,785	423	514,799
2046	129,392.03	204,237.56	3,469.06	165,215.44	748	1,268	7,261	2,785	423	514,799
2047	129,392.03	204,237.56	3,469.06	165,215.44	748	1,268	7,261	2,785	423	514,799
2048	129,392.03	204,237.56	3,469.06	165,215.44	748	1,268	7,261	2,785	423	514,799
2049	129,392.03	204,237.56	3,469.06	165,215.44	748	1,268	7,261	2,785	423	514,799
2050	129,392.03	204,237.56	3,469.06	165,215.44	748	1,268	7,261	2,785	423	514,799
2050 total	3,234,800.68	5,105,939.10	86,726.40	3,933,179.96	18,708	36,791	181,695	67,691	12,264	12,677,794

CPRG MEASURE 1: Industrial Decarbonization

Industrial Efficiency and Decarbonization works to improve the energy and material efficiency, productivity, and competitiveness of manufacturers in Chicagoland's medium and light industrial sectors. The Industrial Efficiency and Decarbonization efforts are aimed at phasing out atmospheric greenhouse gas emissions from all aspects of industry, in support of the administration's plan to achieve net-zero carbon emissions by 2050.

Decarbonize Energy Sources Increase renewable energy supply and energy storage capacity for residential, commercial, municipal, institutional and industrial electricity use. Manage non-CO2 GHG emissions including CH4, HFC, SF6 and others through improved industrial processes, alternative solutions, efficiency, leak detection and reduction, and recovery. This measure is organized into four proposed projects. The impact of these actions will result in an emissions reduction of 1,685,493.24 MTCO2 in 2030, and 8,427,466.18 MTCO2e by the end of 2050:

	Industrial Sector GHG Reductions (MTCO2e)	
	2025 - 2030	2025 - 2050
Energy Efficiency	646,960.14	3,234,800.68
Refrigeration	1,021,187.82	5,105,939.10
Onsite Renewables	17,345.28	86,726.40
	1,685,493.24	8,427,466.18

Project 1: Increase energy efficiency, including non-fossil fuel based alternatives, for HVAC, lighting, envelope, appliances, and other components at industrial facilities by 10%.

GHG Reduction Method and Assumptions: Using the 2020 EPA National Emissions Inventory (NEI) of all sites that require air permits in the City of Chicago, Cook County, and DuPage County greenhouse gas emission data was totaled (5,690,960.14 MTCO₂e) and a 10% estimate savings was applied to estimate 569,960.14 MTCO₂e reductions annually. In addition, per 2023 ComEd energy efficiency assessment data for multiple food and beverage and metal finishing facilities, variable speed drives (VSD) offer a kWh savings of 110,290 kWh or 77 MTCO₂e per VSD. Multiple VSDs can be used within an industrial facility. This methodology assumes 10 VSDs are installed at 100 facilities separately from the 10% estimated energy efficiency GHG emission reduction. Adding this 77,000 MTCO₂e to the other 569,960 MTCO₂e reductions, the total estimated GHG reductions would be 646,960 MTCO₂e by 2030.

Models/Tools Used: The emissions reductions from implementing energy efficiency standards for industrial facilities by 10% by 2030 were measured by the 2020 EPA NEI for the region. To reaffirm our assumptions above, we referenced the U.S. Department of Energy (DOE) Industrial Assessment Center's (IAC) database, showing that industrial energy assessments have the potential to save facilities 8%–10% in energy and cost savings ([U.S. Department of Energy](#), 2021). This information is based on over 21,000 assessments and over 158,000 recommendations nationally. Based on previously assessed facilities in the BRITE program, we are confident we can reach 10% savings in industrial facilities in the region.

Measure-Specific Activity Data: Based on DOE IAC Database and on benchmarking of BRITE Program

GHG Emissions Reduced

2025-2030: 646,960.14 MTCO₂e

2025-2050: 3,234,800.68 MTCO₂e

Project 2: Replace high GWP F-gas refrigeration systems with natural refrigerant systems at 50% of grocery stores/supermarkets in Suburban Cook County, City of Chicago, and DuPage County.

Estimated reduction: 1,021,187.82 MTCO₂e by 2030 or 204,237.56 MTCO₂e annually.

GHG Reduction Method and Assumptions: The California Fluorinated Gas Reduction Incentive Program (FRIP) is a model that can be reproduced by Chicago, Cook County, and DuPage County. According to the North American Sustainable Refrigeration Council (NASRC), FRIP is one of the most impactful and cost-effective programs administered by the California Air Resource Board (\$27/MTCO₂e)[Source: California Climate Investments 2023 Annual Report (Appendix A, pg. 65),

https://ww2.arb.ca.gov/sites/default/files/auction-proceeds/cci_annual_report_2023.pdf], initially providing \$1M in funding to support food retail installations of low-GWP refrigeration equipment. The NASRC predicts a GHG reduction cost of \$39/MTCO₂e for programs attempting to replicate FRIP. **GHG Measure Specific Activity Data:** Chicago, Cook County, and DuPage County have approximately 1,142 supermarkets that on average use 4,000 lbs of R404-A. This methodology uses EPA Green Chill Calculator to calculate MTCO₂e and assumes 571 supermarkets that hold a charge of 2 tons of high GWP refrigerant with an average leak rate of 25% per year. The AR-5 GWP for R-22 is 1,760. However, R404-A has a GWP of 3,942.80. This methodology assumes complete replacement of high GWP refrigerant based systems at supermarkets across Suburban Cook County, Chicago, and DuPage County with a natural refrigerant with low GWP, such as ammonia, with a GWP of 0. A leak rate change from 25% to 0% was used in the Green Chill Calculator to represent a move to a refrigerant with a GWP of 0. GHG reduction may change if using another natural refrigerant, such as propane or CO₂, that have a GWP of 3 and 1, respectively, compared to ammonia with a GWP of 0. This estimates that GHG reduction of

1788.42 MTCO₂e could be reduced at each supermarket which estimates approximately 1,021,187.82 MTCO₂e could be reduced if 50% of sites replace their current refrigeration systems.

GHG Emissions Reduced

2025-2030: 1,021,187.82 MTCO₂e

2025-2050: 5,105,939.10 MTCO₂e

Project 3: Increase on-site renewable energy by installing solar arrays at 20% of food and beverage, metal manufacturing, and commercial facilities.

Scope: Chicago, Cook County, DuPage County

Measure Implementation Justification and Assumptions: The PCAP identified this as a Priority Greenhouse Gas Reduction Strategy to reduce industrial sector GHG emissions and create economic opportunities. This measure assumes solar arrays are installed at 20% of food and beverage, metal manufacturing, and small commercial facilities, such as grocery stores/supermarkets.

Models/Tools Used: This model was derived from the Chicago MSA PCAP. Per 2023 ComEd energy efficiency and solar assessment reports for 2 food and beverage manufacturers, 2 small commercial facilities (dry cleaners), and 1 metal finisher in Suburban Cook County. a single solar panel may save 0.29 MTCO₂e/yr. An average solar array on an industrial facility may save an average of 1,236,930 kWh/yr, or 864 MTCO₂e/yr. Per 2020 NEI emissions data, there are 75 total food and beverage and metal manufacturers in Chicago, Suburban Cook County, and DuPage County combined. 864 MTCO₂e was extrapolated onto 20% of those sites (15 facilities). Due to limited data sample size and time constraints, this data should be used as a rough sample size of industrial facilities capable of installing solar.

For the same limitations listed above, the dry cleaner solar averages were used to represent small commercial facilities generally. An average solar array on a small commercial facility may save an average of 27,461 kWh/yr, or 19.2 MTCO₂/yr. Using the previously mentioned 1,142 supermarkets in Chicago, Cook County, and DuPage County to represent one category of small commercial facilities, installing solar arrays at these facilities would potentially lead to reductions of about 22,000 MTCO₂e/yr. Together with the industrial arrays, the overall potential GHG reduction from solar arrays could be about 167,000 MTCO₂e reduced.

GHG Emissions Reduced

2025-2030: 17,345.28 MTCO₂e

2025-2050: 86,726.40 MTCO₂e

GHG Emissions Reduction Cost/Metric Ton: \$32.63 per MTCO₂e Methodology: Cost effectiveness of GHG reductions = (Requested CPRG funding) / (Sum of Quantified GHG reductions from CPRG funding from 2025-2030) \$55,000,000/1,685,493.24 = \$32.63 per MTCO₂e

CPRG MEASURE 2: Public Buildings Energy Retrofit and Decarbonization

To avoid the earth warming more than 1.5°C degrees over pre-industrial levels, we must take action now to drastically reduce greenhouse gas emissions (GHGs). In northeastern Illinois where the built environment is responsible for more than 2/3 of all GHGs, this means aggressively reducing our reliance on fossil fuels by both reducing energy consumption overall while converting what we can to renewable resources. The proposed five-project approach will allow the City of Chicago and its sister agencies, and Cook County to jumpstart the transition from traditional energy efficiency to whole-building

electrification and result in emissions reductions that will increase each year as our electric grid continues to meet its decarbonization targets on a pathway to 100% carbon neutral by 2050.

The impact of these actions will result in an emissions reduction of 66,851 MTCO₂e in 2030, and 317,149 MTCO₂e in 2050:

	Public Sector Buildings GHG Reductions (MTCO ₂ e)	
	2025-2030	2025-2050
Libraries	3,742.0	18,708.0
Public Housing (Chi)	10,985.0	36,791.0
Public Schools	36,479.0	181,695.0
Cook County Public Sector	11,983.0	67,691.0
Hsng Authority (County)	3,662.0	12,264.0
	66,851.0	317,149.0

Project 1: Library Electrification Retrofit Project (City of Chicago)

GHG Reduction Estimate Method: The City selected a 15,000ft² neighborhood library as its “average neighborhood library” by analysis of library energy assessments (Source: Trane Technologies, contractor); actual electricity and natural gas consumption data for 2022 was used (Sources: utility data retrieved by Department of Fleet and Facility Management; GHG baseline and post-retrofit calculations were completed with use of EPA calculator, while measure calculations through GHG data factors

Models/Tools Used: US EPA Simplified GHG Emissions Calculator, v May 2023; eGRID Summary Tables 2022, Subregion Output Emissions Rates; US EPA Climate Leadership Emissions Factors for Greenhouse Gas Inventories, v February 13, 2024, Table 1

Measure Implementation Assumptions: Assumptions drawn from our existing site include: capital project costs and incentives for both lighting and controls; Assumptions from an energy engineer at the Department of Fleet and Facility Management include: capital project costs for air sealing/insulation and variable refrigerant flow; Assumptions from the contractor for our existing library program: estimated capital project costs for electrical service upgrades; Assumptions from utility: lack of incentives available for VRF. Operational Cost assumptions (\$0.13/kWh and \$1.00 therm) were provided by an energy engineer at the Department of Fleet and Facility Management.

GHG Reduction Estimate Assumptions: 1. Calculated new kWh per measure-specific activity data and assumptions as described in the following sections. 2. Subtracted kWh for 4 measures to identify “per library electrification retrofit” total. 3. Adjusted portion of kWh savings related to lighting and controls utility incentives that would not be covered by CPRG. This was done by identifying the percentage of the project cost defrayed, then reducing that same percentage from the measures expected kWh savings. 4. Used calculator tool/factors (above) to calculate emissions for each measure, and new emissions total for each building. All remaining emissions will be fully offset with onsite solar, which due to limited rooftop space, may not have been possible without the high efficiency electrification of the site.

Reference Case Scenario (GHG Emissions or Activity Level): The City of Chicago’s Reference Case Scenario and baseline is the 2022 calendar year.

Measure-Specific Activity Data: The City’s assumptions were sourced actual data from the “average neighborhood library” in the existing Library Solar Project via contractor or Dept of Fleet and Facility Management (2FM), estimated via analysis by 2FM energy manager, or technical support from Chief Building Scientist at Argonne National Laboratory:

1. Amount of kWh needed for heating: *.85 therms x 29.3 kWh factor/2.5*; Source: ANL
2. Total kWh for fully electrified retrofit: *.85 therms x 29.3 kWh factor/2.5 + baseline kWh*; Source: ANL

3. Lighting Savings: 20% savings Source: actual data/avg neigh library
4. Air Sealing/Insulation Savings: 7% savings; Source: ANL
5. Controls/Optimization Savings: 10% savings; Source: actual data/avg neigh library
6. VRF Savings: Estimate (conservative) 15% savings off fully electrified kWh; Source: 2FM estimate

GHG Emissions Reduced

2025-2030: 3,742 MTCO₂e

2025-2050: 18,708 MTCO₂e

Project 2: Public Housing Electrification Project (Chicago Housing Authority)

GHG Reduction Estimate Method: CHA used a baseline of 2023 CHA building emissions as calculated by ENERGY STAR Portfolio Manager, then assumed a multiplier of 1.75 increase in electricity demand due to electrification and applied a regional eGRID factor.

Models/Tools Used: ENERGY STAR Portfolio Manager; eGRID Summary Tables 2022, Subregion Output Emissions Rates

Measure Implementation Assumptions:

Capital Cost Assumptions: Chicago Housing Authority secured a Residential Building Electrification Rough Order of Magnitude Cost Estimate completed by Rider Levett Bucknall on March 28, 2024 for the measure-specific activity data (section below). Home Energy Rebate Program through USDOE: At this time, funding for the two residential programs has not yet been processed by or provided to Illinois EPA for administration or distribution. CHA will make full use of Home Energy Rebates for which it is eligible and invest any savings not captured in this budget into additional electrification projects. Utility Incentives:: Incentive level of \$5.30/SF assumed and subtracted from project costs. Incentive rate calculated using current ComEd Affordable Housing New Construction Major Renovation program by summing rates for meeting the current ComEd Multi-Family Standard requirements (\$3.00/SF), Dwelling-Unit Heat Pumps (\$0.80/SF), Heat Pump Water Heaters (\$1.20/SF), and Dwelling-Unit Electrification (\$0.30/SF). Based on square footage of buildings included in this electrification project, 447,700 SF, total incentives over years 1-5 are projected to be \$2,373,200. Operational Cost Assumptions: \$236,000 of annual energy cost avoidance from electrification (Sources: ComEd Go Electric Assessment Reports, 2023; Citizens Utility Board Report “Better Heat: The Economics of Residential Building Electrification in the City of Chicago”, 2021).

GHG Reduction Estimate Assumptions: Using base of 2023 CHA building emissions as calculated by ENERGY STAR Portfolio Manager. Location-based – assuming 1.75x increase in electricity demand due to electrification. Next, CHA assumes a 15% energy use reduction from baseline by 2033, and from a market-based perspective, buildings will be supplied by an offsite renewable PPA by 2030.

Reference Case Scenario (GHG Emissions or Activity Level): Chicago Housing Authority’s Reference Case Scenario and baseline is the 2023 calendar year.

Measure-Specific Activity Data: CHA’s public housing portfolio is comprised of scattered-site units, campus-style properties, and elevator buildings. This project focuses on retrofits at a combination of campus and mid-rise elevator buildings serving families and seniors in LIDAC communities. CHA estimates that approximately 474 units at 32 buildings will be retrofitted. Measures will include 1) Removing central hydronic boilers/steam systems and installing individual ductless air source heat pumps at Family Campuses 2) Removing central hydronic boilers and installing variable refrigerant flow systems and Elevator Buildings 3) Removing gas water heaters and installing central heat pump water heaters 4) Replacing shared commercial gas dryers with shared commercial heat pump dryers 5) Replacing gas stoves with induction stoves 6) Upgrading electrical service when necessary 7) Air sealing

and insulation, when appropriate. CHA assumes a 15% energy use reduction from baseline by 2033, and an offsite renewable PPA by 2030.

GHG Emissions Reduced

2025-2030: 10,985 MTCO_{2e}

2025-2050: 36,791 MTCO_{2e}

Project 3: Resiliency Network Energy Efficiency & Electrification Project (Chicago Public Schools)

GHG Reduction Estimate Method: GHG reductions numbers were calculated using the estimated kWh and therm reductions listed in each school's energy audit reports completed by the local utility and/or energy service companies. A market-based emission factor of 114kg co₂/MMBtu was used in the calculations.

Models/Tools Used: GHG reductions numbers were calculated using the estimated kWh and therm reductions listed in each school's energy audit reports completed by the local utility and/or energy service companies. A market-based emission factor of 114kg co₂/MMBtu was used in the calculations.

Measure Implementation Assumptions: Capital Cost Assumptions: LED Lighting Retrofits: Scope identified in utility or energy service company facility energy audit. Costs calculated at \$230.00 per fixture which includes all design, project management, equipment purchase and installation costs. This average per fixture is derived from recent, public bid pricing received by CPS for full school retrofit projects using LED strip or door frame kits. Incentive as listed, per project, in each school's energy audit report. BAS Upgrades: Scope identified in utility or energy service company facility energy audit, including potential mechanical equipment replacement / upgrades required for an effective control system upgrade. Costs were identified in the same utility or energy service company report, with an additional 30% applied, 15% for soft costs such as design, project management and environmental and a 15% project contingency. Incentives as listed, per project, in each school's energy audit report. Building Electrification: Scope identified in local utility carbon free energy assessment report. Costs were identified in same carbon free reports with an additional 35% applied, 15% for soft costs such as design, project management and environmental and 20% project contingency, with the increase in contingency due to larger risks of unknown conditions and varying costs with new technologies. Incentives not yet applicable. Federal Investment Tax Credit: CPS calculated at 40% of total cost. 30% base credit plus 10% low-income bonus. Location does not qualify for energy community bonus and unknown if project would qualify for domestic content bonus. Operational Cost Assumptions: \$0.13/kWh and \$1.00/therm. **GHG Reduction Estimate Assumptions:** CPS is utilizing site-specific assumptions on the GHG reduction potentials that were analyzed during site visits to each school, and resulted in three different types of reports: utility energy assessments, energy audits from a contracted energy service company, and carbon free assessments.

Reference Case Scenario (GHG Emissions or Activity Level): Chicago Public School's Reference Case Scenario and baseline is the 2022 calendar year.

Measure-Specific Activity Data: CPS is utilizing site-specific assumptions on the GHG reduction potentials that were analyzed during site visits to each school, and resulted in three different types of reports: utility energy assessments, energy audits from a contracted energy service company, and carbon free assessments.

GHG Emissions Reduced

2025-2030: 36,479 MTCO_{2e}

2025-2050: 181,695 MTCO_{2e}

Project 4: Build Up Cook Public Buildings Energy Efficiency Project (Cook County)

GHG Reduction Estimate Method: Cook County is applying a blended methodology to estimate GHG reductions. For yet-to-be determined public facilities, the County is applying the City of Chicago's methodology and its average 15,000ft² building. In this method, the City used 2022 electricity and natural gas consumption data (Sources: utility data retrieved by Department of Fleet and Facility Management; GHG baseline and post-retrofit calculations were completed with use of EPA calculator, while measure calculations through GHG data factors. Next, the County is applying CPS methodology for yet-to-be determined schools. In particular, the County has isolated data from schools most representative of County school building typology.

Models/Tools Used: General Public Facilities - US EPA Simplified GHG Emissions Calculator, v May 2023; eGRID Summary Tables 2022, Subregion Output Emissions Rates; US EPA Climate Leadership Emissions Factors for Greenhouse Gas Inventories, v February 13, 2024, Table 1. Schools - GHG reductions numbers were calculated using the estimated kWh and therm reductions listed in each school's energy audit reports completed by the local utility and/or energy service companies. A market-based emission factor of 114kg co₂/MMBtu was used in the calculations.

Measure Implementation Assumptions: General Public Facilities - Capital project cost assumptions came from the City's assumptions from actual project costs, project cost estimates by internal Facilities staff, or contractor estimates. Utility Incentive cost/values were applied from actual incentives or estimates sourced by current utility incentive descriptions for public sector buildings. Schools - Capital Cost Assumptions were applied from CPS' detailed energy assessments and audits, including LED lighting retrofits at \$230.00 per fixture which includes all design, project management, equipment purchase and installation costs; BAS Upgrades, with scope and costs from assessments and a 30% contingency applied for soft costs and project contingencies; Building Electrification, with scope and costs from assessments, and a 35% contingency applied for soft costs, plus pricing/other project contingencies. Incentives for schools are not yet applicable, but the County assumes a Federal Investment Tax Credit: CPS calculated at 40% of total cost with 30% base credit plus 10% low-income bonus. Operational Cost Assumptions: \$0.13/kWh and \$1.00/therm.

GHG Reduction Estimate Assumptions: The County applied GHG reduction potentials for general county buildings and schools, applying the City's methodology as representative of a typical public sector building in Cook County, and two specific schools from CPS' deep collection of completed energy assessments and carbon free assessments. General Public Facilities - 1. Calculated new kWh per measure-specific activity data and assumptions as described in the following sections. 2. Subtracted kWh for four measures to identify "per library electrification retrofit" total. 3. Adjusted a portion of kWh savings related to lighting and controls utility incentives that would not be covered by CPRG. This was done by identifying the percentage of the project cost defrayed by the incentive, then reducing that same percentage from the measures expected kWh savings. 4. Used calculator tool and factors (above) to calculate emissions for each measure, and new emissions total for each building. While normally we would then subtract this from the baseline emissions. Schools - GHG reduction potentials that were calculated during site visits to the two schools that are representative of County schools.

Reference Case Scenario (GHG Emissions or Activity Level): The City of Chicago's Reference Case Scenario and baseline is the 2022 calendar year.

Measure-Specific Activity Data: The County's assumptions were sourced actual data from a representative public sector building, as noted above, and is applying the same measure-specific assumptions below, and projecting to complete lighting, air sealing, VRF, controls and automation and electrical service upgrades retrofits at 10 facilities, with lighting and air sealing/insulation at one additional facility.

1. Amount of kWh needed for heating: *.85 therms x 29.3 kWh factor/2.5*; Source: ANL

2. Total kWh for fully electrified retrofit: $.85 \text{ therms} \times 29.3 \text{ kWh factor} / 2.5 + \text{baseline kWh}$; Source: ANL
3. Lighting Savings: 20% savings Source: actual data/avg neigh library
4. Air Sealing/Insulation Savings: 7% savings; Source: ANL
5. Controls/Optimization Savings: 10% savings; Source: actual data/avg neigh library
6. VRF Savings: Estimate (conservative) 15% savings off fully electrified kWh; Source: 2FM estimate

For Schools, the County is utilizing CPS' site-specific assumptions on the GHG reduction potentials that were analyzed during site visits to Hubbard and Washington schools.

GHG Emissions Reduced

2025-2030: 11,983 MTCO₂e

2025-2050: 67,691 MTCO₂e

Project 5: Public Housing Energy Efficiency and Electrification Project (Housing Authority of Cook County)

GHG Reduction Estimate Method: The Housing Authority of Cook County maintains similar building types as Chicago Housing Authority. With similar building types, energy profiles, utilities and supplies, HACC is confident in using GHG and cost estimates at a scaled rate to implement electrification in buildings of the same type. The County applied CHA's 2023 baseline as calculated by ENERGY STAR Portfolio Manager, then assumed a multiplier of 1.75 increase in electricity demand due to electrification and applied a regional eGRID factor.

Models/Tools Used: ENERGY STAR Portfolio Manager; eGRID Summary Tables 2022, Subregion Output Emissions Rates

Measure Implementation Assumptions:

Capital Cost Assumptions: Cook County is applying the assumptions from CHA's rough order of magnitude cost by contractor Rider Levett Bucknall for the measure-specific activity data (section below). **Home Energy Rebate Program through USDOE:** At this time, funding for the two residential programs has not yet been processed by or provided to Illinois EPA for administration or distribution. CHA will make full use of Home Energy Rebates for which it is eligible and invest any savings not captured in this budget into additional electrification projects. **Utility Incentives:** Incentive level of \$5.30/SF assumed and subtracted from project costs. Incentive rate calculated using current ComEd Affordable Housing New Construction Major Renovation program by summing rates for meeting the current ComEd Multi-Family Standard requirements (\$3.00/SF), Dwelling-Unit Heat Pumps (\$0.80/SF), Heat Pump Water Heaters (\$1.20/SF), and Dwelling-Unit Electrification (\$0.30/SF). Based on square footage of buildings included in this electrification project, 149,000ft² total incentives over years 1-5 are projected to be \$791,000. **Operational Cost Assumptions:** \$78,666 of annual energy cost avoidance from electrification (Sources: ComEd Go Electric Assessment Reports, 2023; Citizens Utility Board Report "Better Heat: The Economics of Residential Building Electrification in the City of Chicago", 2021).

GHG Reduction Estimate Assumptions: Cook County is applying the assumptions configured by Chicago Housing Authority. CHA is using baseline 2023 building emissions as calculated by ENERGY STAR Portfolio Manager. Location-based – assuming 1.75x increase in electricity demand due to electrification. There is an applied assumption of 15% energy use reduction from baseline by 2033.

Reference Case Scenario (GHG Emissions or Activity Level): Cook County's Reference Case Scenario baseline is the 2023 calendar year.

Measure-Specific Activity Data: HACC's jurisdiction spans 108 communities from the northernmost reaches of Cook County to the southernmost. HACC serves all Cook County municipalities except for 6 that have their own public housing agencies. For this project, only HACC facilities located within LIDC

communities will be eligible. These communities include Chicago Heights, Park Forest, Harvey, Robbins, Summit, Ford Heights, Evanston, Niles, and Wheeling. HACC will retrofit 10 potential facilities either in family campuses or elevator buildings. Measures will include 1) Removing central hydronic boilers/steam systems and installing individual ductless air source heat pumps at Family Campuses 2) Removing central hydronic boilers and installing variable refrigerant flow systems and Elevator Buildings 3) Removing gas water heaters and installing central heat pump water heaters 4) Replacing shared commercial gas dryers with shared commercial heat pump dryers 5) Replacing gas stoves with induction stoves 6) Upgrading electrical service when necessary 7) Air sealing and insulation, when appropriate. HACC assumes a 15% energy use reduction from baseline by 2033.

GHG Emissions Reduced

2025-2030: 3,662 MTCO₂e

2025-2050: 12,264 MTCO₂e

CPRG MEASURE 3: Food Waste Prevention and Diversion Program

Circular economy strategies are playing a pivotal role in transforming wastewater, traditionally considered a waste product, into resources through water reuse and recycling, nutrient recovery and energy generation. The use of advanced oxidation, reverse osmosis and membrane filtration technologies, waste water can be reused. With struvite precipitation and anaerobic digestion, nitrogen and phosphorus can be produced. Anaerobic digestion and generation of biogas from wastewater treatment creates better circularity. The City of Chicago and Cook County plan to invest \$48.3MM in implementation measures in the circular economy focused on food and solid waste management. The planned implementation measures are based on the MSA PCAP and on deep study and research by the Department of Streets and Sanitation of Chicago with academic, municipal and elected/appointed officials. With CPRG funding of the Food Waste Prevention & Diversion Program, the City of Chicago and Cook County will be able to produce the following results (conservatively) during the five year grant period:

- Prevent 51,200 tons of wasted food from being generated due to education and outreach initiatives incorporated into each of the Food Waste Prevention & Diversion Programs
- Recover 15,000 tons of currently disposed edible food for redistribution to feed people in need;
- Collect and compost 189,542 tons of food scraps
- Collect and anaerobically digest 615,000 tons of food scraps
- Generate approximately 2,800,000 MMBtu of Renewable Natural Gas (RNG).

The impact of these actions will result in an emissions reduction of 628,871.16 MTCO₂ in 2030, and 3,933,179.96 MTCO₂e by the end of 2050:

	Prevention		Compost		Anaerobic Digestion		Annual Reduction
	Tons	MTCO ₂ e	Tons	MTCO ₂ e	Tons	MTCO ₂ e	
2025	3,500	7,549.01	0	0	0	0	7,549.01
2026	5,850	17,327.86	15,217	9,945.78	60,000	32,587.77	59,861.41
2027	8,250	27,314.76	29,195	19,081.78	90,000	48,881.64	95,278.18
2028	9,600	32,932.38	45,130	29,496.84	135,000	73,322.46	135,751.68
2029	12,000	42,919.29	50,000	32,679.85	165,000	89,616.30	165,215.44
2030	12,000	42,919.29	50,000	32,679.85	165,000	89,616.30	165,215.44
	2030 Cumulative MTCO₂e Reduced						628,871.16
	2050 Cumulative MTCO₂e Reduced						3,933,179.96

GHG Reduction Estimate Method: The City of Chicago and Cook County identified implementation measures that are based on the MSA PCAP and on deep study and research by the Chicago Department of Streets and Sanitation and with academic, municipal and elected/appointed officials. With these numbers, the team then utilized a publicly available tool to assess GHG emissions reduction potential.

Models/Tools Used: US EPA Waste Reduction Model - WARM v 16

Measure Implementation Assumptions: The City of Chicago team on Food Waste Sustainable Materials Management utilizes the WARM v16 Model to analyze and determine specific GHG reductions based on proposed measures. WARM is a tool that provides high-level comparative estimates of the potential GHG emissions, energy savings, and economic impacts of materials managed in baseline and alternative materials management practices, including source reduction, recycling, composting, anaerobic digestion, combustion, and landfilling.

The model estimates emissions, energy units and economic factors across a wide range of material types commonly found in municipal solid waste and construction and demolition debris in the following categories: Metric tons of carbon dioxide equivalent (MTCO₂e), energy units (million British Thermal Unit - BTU), labor hours, wages (\$), and taxes (\$). The team applied the following analysis to our CPRG request for funding: *Cost effectiveness of GHG reductions = (Requested CPRG funding) / (Sum of Quantified GHG reductions from CPRG funding from 2025-2030)* \$48,300,000/628,871.22 = \$76.80

GHG Reduction Estimate Assumptions: EPA created the Waste Reduction Model (WARM) to provide high-level comparisons of potential greenhouse gas (GHG) emissions reductions, energy savings, and economic impacts when considering different materials management practices. Materials management practices include - source reduction, recycling, anaerobic digestion, combustion, composting and landfilling.

Reference Case Scenario (GHG Emissions or Activity Level): Baseline is against current practices with a representative year of 2023.

Measure-Specific Activity Data: The City of Chicago and Cook County will engage key participating stakeholders and anticipate uptake from large food waste generators, retail grocery stores, grant programs for local governments, and a residential curbside food scrap collection program. This work builds off of a small pilot project for residential food scrap drop-offs and composting dropoff sites in six Chicago community gardens.

The following are projections by subsector from 2025 through 2030:

	GHG Reductions (MTCO ₂ e)						
	2025	2026	2027	2028	2029	2030	Cumulative
Large Food Waste Generators	2,080.61	21,025.99	34,540.08	48,689.20	59,588.89	59,588.89	225,513.66
Retail Grocery Stores	1,040.30	13,686.12	21,435.49	31,692.44	39,356.85	39,356.85	146,568.05
Grant Program for Local Govts	2,080.61	21,025.99	34,540.08	48,689.20	59,588.89	59,588.89	225,513.66
Res Curbside Food Scrap Collections	1,040.30	1,537.03	1,537.03	1,537.03	1,537.03	1,537.03	8,725.45
Districtwide Composting Program	1,307.19	2,586.28	3,225.50	5,143.81	5,143.81	5,143.81	22,550.40
	2030 Cumulative						628,871.22

GHG Emissions Reduced

2025-2030: 628,871.16 MTCO₂e

2025-2050: 3,933,179.96 MTCO₂e