Appendix D: GHG Reduction Measures Technical Support Document

Integrated data analysis of a Comprehensive Climate Action Plan for the Atlanta Metropolitan Statistical Area

Provided by the Climate and Energy Policy Lab at the Carter School of Public Policy, Georgia Institute of Technology – Marilyn A. Brown, Bill Drummond, Oliver Chapman, Suprita Chakravarthy, Riley Chodak, Niraj Palsule, Derek McNutt, Andrew Dowdy, William Moore, and Amelia Tomasulo

Modified by the Atlanta Regional Commission, November 3, 2025

Table of Contents

Crosswalk of MACAP Measure Numbers with Appendix Measure Numbers

MACAP Measure Number	Measure	Measure Defined
Measure T1	Measure 1	Shift to light duty electric vehicles, installation of EV charging stations, and use EV batteries for grid balancing
Measure T2	Measure 2	Electrify fleets (medium- and heavy-duty) buses and trucks
Measure T3	Measure 3	Reduce vehicle miles traveled by shifting to different modes of transportation (e.g. walking, biking, transit, teleworking)
Measure R1	Measure 4	Increase energy efficiency retrofitting of existing homes
Measure R2	Measure 5	Support local governments in adopting more efficient residential energy codes and/or green building standards
Measure R3	Measure 6	Electrify existing homes
Measure C1	Measure 7	Increase energy efficiency retrofitting existing commercial buildings
Measure C2	Measure 8	Support local governments in adopting more efficient commercial energy codes and/or green building standards
Measure C3	Measure 9	Electrify existing commercial buildings
Measure WM1	Measure 10	Reduce construction and demolition waste
Measure WM2	Measure 11	Reduce the amount of food, yard, and tree waste that goes into landfills by composting
Measure I1	Measure 12	Increase energy efficiency retrofitting of existing industrial buildings
Measure I2	Measure 13	Electrify industrial buildings & processes
Measure I3	Measure 14	Retrofit industrial processes and equipment
Measure I4	Measure 15	Decrease non-CO_2 GHG emissions through improved industrial processes
Measure I5	Measure 16	Capture heat from industrial processes to provide HVAC or create electricity
Measure TG1	Measure 17	Increase tree canopy and vegetative coverage through afforestation and green infrastructure
Measure TG2	Measure 18	Improve forest management
Measure E1	Measure 19	Increase usage of "urban-scale" solar (e.g. solar on landfill and waste sites and community solar
Measure E2	Measure 20	Increase installation of rooftop solar and battery storage systems
Measure E4	Measure 21	Capture biosolids & biogas at wastewater treatment plants for waste-to-energy creation
Measure E3	Measure 22	Adopt demand response actions in local government facilities businesses, and homes (shift energy use to off-peak times; use power strips, etc.)
Measure E1	Measure 23	Capture methane from landfills for conversion into electricity
Measure CS1	Measure 24	Increase local government adoption of climate mitigation measures

A. Introduction

This document was completed by members of the Climate and Energy Policy Lab (CEPL) in the Carter School of Public Policy at the Georgia Institute of Technology. It was requested by the Atlanta Regional Commission (ARC) to support its development of a Comprehensive Climate Action Plan (CCAP), also known as the Metro Atlanta Climate Action Plan (MACAP) for the 29-county Atlanta Metropolitan Statistical Area (MSA). A Priority Climate Action Plan (PCAP) was published in 2024; it provided a preliminary assessment of opportunities and priorities. Both the PCAP and CCAP were funded by EPA's Climate Pollution Reduction Grant (CPRG) program.

ARC and its stakeholder identified a list of over 50 implementation measures to potentially meet the greenhouse gas (GHG) reduction targets for the CCAP (a 50% reduction of emissions by 2035 relative to 2005 and dropping to near net zero by 2050.) These 50 measures were examined, and 24 measures were selected for further analysis based primarily on prior research of the Drawdown Georgia research program (Brown, 2021), published research on the pollution reduction potential of individual measures, and the availability of data to support defensible analysis of impacts and costs.

A.1 Summary of Results

This appendix estimates the near-term (2035) and long-term (2050) emissions reductions of these 24 measures, spanning seven sectors of the Georgia economy (Table A.1).

Table A.1. GHG emission reductions by sector, in 2035 and 2050

Sectors	**Annual MMTCO$_2$e Reduction**	
	2035	**2050**
Transportation	8.31	11.59
Residential Buildings	3.40	19.68
Commercial Buildings	1.21	16.53
Waste & Recycling	0.54	0.85
Industry	1.04	2.93
Trees & Green Spaces	0.11	0.51
Electricity	-0.64*	9.15
Cross-Sector	0.65	2.90
Totals	**14.62**	**64.13**

Source: RMI/EPS energy policy simulator and CEPL/Georgia Tech research team

* The increase in emissions from electricity in 2035 reflect the trend towards electrification of buildings, industry and transportation. By 2050, electricity is generated by significantly cleaner fuels, which offsets its increased use.

The quantified impacts for each measure include four GHGs:

- Carbon dioxide (CO_2)
- Methane (CH^4)
- Nitrous Oxide (N_2O)
- Fluorinated Gases (F-gases)

Eight co-pollutant emission reductions are also estimated:

- Fine Particulate Matter ($PM_{2.5}$)
- Coarse Particulate Matter (PM_{10})
- Black Carbon (BC)
- Organic Carbon (OC)
- Nitrogen Oxides (NO_x)
- Volatile Organic Compounds (VOC)
- Sulfur Oxides (SO_x)
- Carbon Monoxide (CO)

In addition, the costs and social benefits of the 24 GHG reduction measures are estimated.

A.2 Overview of Methodology

The methodology used for each of the 24 measures is described at the beginning of each section. For most measures, we use the Energy Policy Simulator (EPS) Version 4.0.4 by the Rocky Mountain Institute (RMI). EPS is released under the GNU General Public License version 3 (GPLv3) or any later version and is free and open-source software. Other models were used, as needed, to fill gaps in the EPS coverage. These include the Georgia Tech National Energy Modeling System (GT-NEMS) and EPA's Waste Reduction Model (WARM).

EPS is a system dynamics model. It has much in common but is distinct from the general equilibrium model used in GT-NEMS. The key difference is that EPS uses stocks for every year of fuels, vehicles, and other inventories based on exogenous inputs. EPS creates changes in the model based on the definition of energy policies, but it does not optimize for least cost solutions or other goals. GT-NEMS, in contrast, is based on supply and demand optimization to achieve an equilibrium that minimizes system costs. EPS does not solve for prices; it takes prices as input based on macro-economic outlooks.

Throughout the analysis, we consider key interactions that could result from the joint implementation of co-dependent measures, as characterized in prior research (Brown, et al., 2021b). For six measures, we design EPS to consider these interactions. As a final step, we complete an EPS analysis with all EPS modelled measures included and compare these results to the summation of the independently modelled measures.

A.3 Business-as-Usual Scenario Documentation

The EPS includes three alternative scenarios that can be selected as a future baseline scenario to represent "business-as-usual (BAU)."

Nationally determined contribution (NCD): U.S. December 2024 submission to the United Nations Framework Convention on Climate Change. It includes plans to achieve a 61-66% reduction in GHG emissions from 2005 levels by 2035, and net zero by 2050.

January 2025 Frozen Policies: Policies put in place by the Biden administration based on the Inflation Reduction Act and Bipartisan Infrastructure Law.

Federal Policy Repeal and Rollback (FPRR): Policies at risk of repeal or rollback in the current federal administration.

The research project team has judged that the FPRR scenario is the most likely future trajectory both nationally and for the state of Georgia. The project's future business-as-usual scenario adopts the assumptions embedded in that scenario. Below is a list of the Inflation Reduction Act provisions and EPA rules that are not in the FPRR compared to the January 2025 Frozen Policies scenario:

Inflation Reduction Act Sections

- 30D passenger vehicle tax credits
- 45W commercial vehicle tax credits
- 45Y/48E tax credits for clean electricity
- 45U zero-emission nuclear power production tax credit
- 45Q tax credits for carbon capture and sequestration
- 45X advanced manufacturing production tax credit
- 45V clean hydrogen production tax credit
- 30C alternative fuel vehicle refueling property tax credit
- Agricultural conservation investments and conservation technical assistance (included in national model, not in state models)
- Forest system restoration and forestry conservation programs (included in national model, not in state models)

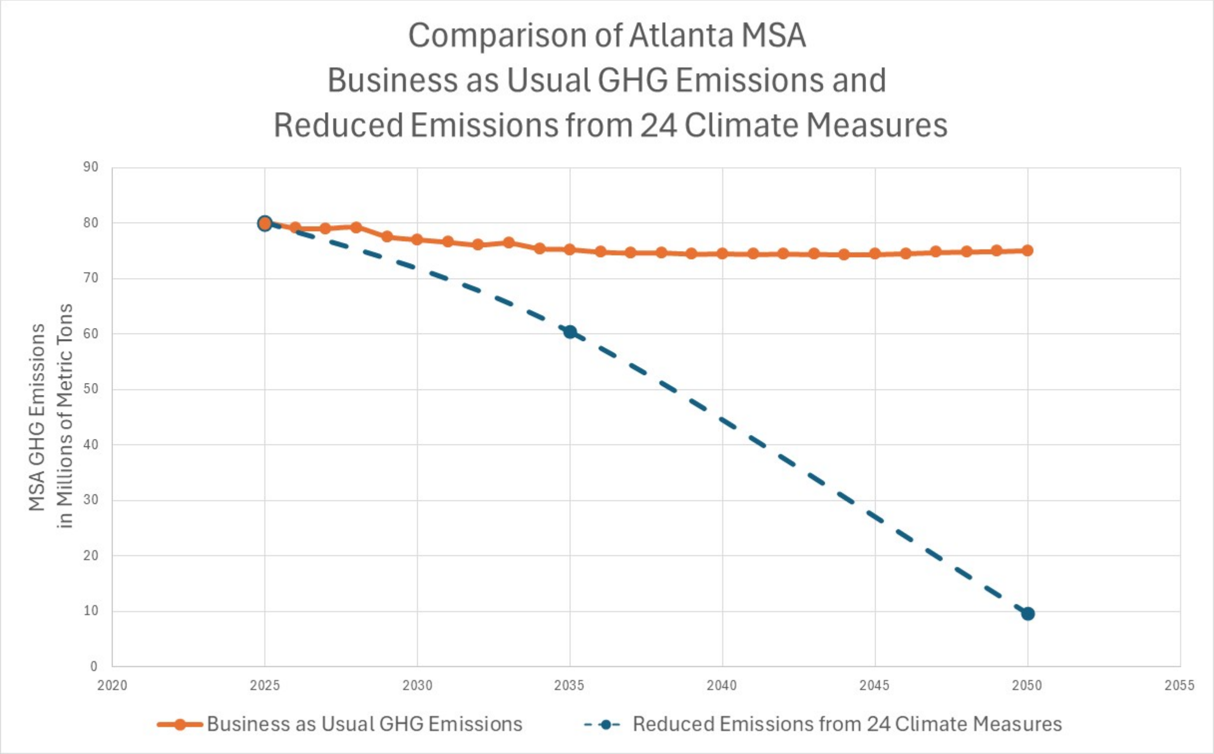
EPA Rules

- 111 Clean Air Act rules, Mercury and Air Toxics standards, and Steam Electric Power Generating Effluent Guidelines for power plants
- Tailpipe emission standards for light-, medium-, and heavy-duty vehicles (model years 2027 and later)
- Methane emission rules for oil and natural gas operations

Additional details on the implementation of this scenario are available from:
https://docs.energypolicy.solutions/repeal-documentation#modeled-scenario

Figure A.1 below portrays the business-as-usual scenario and estimates of the reductions in 2035 and 2050 from the 24 measures applied to the Atlanta MSA.

Figure A.1: Business-as-usual GHG emissions with estimated reduced emissions.



(Source: RMI/EPS energy policy simulator and CEPL/Georgia Tech research team)

To downscale statewide emissions to the 29-county MSA the following procedure was used.

1. Two sets of EPS FPRR emissions for Georgia were downloaded, one including removals from forestry and land use, and the other excluding forestry and land use.
2. Statewide emissions excluding forestry were downscaled to the MSA using the most recent set of county-level future population projections released by the Georgia Office of Planning and Budget (OPB).
3. Statewide forestry and land use emissions for Georgia and the MSA were extracted from the Drawdown Georgia GHG Emissions tracker. For the most recent year available (2024), MSA's GHG removals were 10% of the statewide removals. An analysis of the historical MSA and statewide removals shows that the MSA's 10% of the state is relatively stable, so future MSA removals were calculated as 10% of future EPS statewide removals.

The blue line in Figure A.1 shows current MSA business-as-usual emissions at 80 million metric tons (MMT) slowly declining to 75 MMT in 2050. We note that the 2022 EPS Georgia statewide total (including forestry and land use) is 115.1 MMT. This is higher than the corresponding EPA estimate of 110 MMT and the Drawdown

Georgia Emissions Tracker estimate of 94 MMT. The differences between the EPA and Tracker estimates have been reconciled within 5 MMT by identifying a handful of differences in emissions accounting, but there is not sufficient documentation of EPS emissions to explain their higher value. However, for the purpose of business-as-usual and emission reduction projections we will adopt the EPS values for consistency, with the caution that MSA emissions may be about 3 MMT lower than the EPS values.

Figure A.1 reflects the summation of 24 individual measures without accounting for the interactions between measures. One partial exception was made for the six measures that include substantial building electrification (measures 4, 6, 7, 9, 13 and 14). Those measures assume a moderate increase in solar generation to reduce the overall electricity carbon content to the level expected with the adoption of all 24 measures.

At present, the project team has compiled comprehensive emission reductions for 2035 and 2050. Figure A.1 shows an interpolated smooth spline curve between the emission values for 2025, 2035 and 2050. In the near future, the project team will consolidate the separate, annual, emissions reductions for all years from 2025 to 2050 and replace the spline curves estimates for each individual year. It is unlikely that the full annual values will depart substantially from the curves shown in Figure A.1.

A.4 Downscaling from Georgia to the Atlanta SMA

Eight distinct sets of chronological weights (from 2025 to 2050) were used to downscale results for Georgia to results for the Atlanta MSA (Table A.2).

Table A.2 Weights for Downscaling from Georgia to the Atlanta MSA

(Source: CEPL/Georgia Tech research team)

	Population	Transportation	Commercial Building	Commercial Employment	Industrial Energy	Industrial Employment	Forestry	Community Scale Solar
2025	57.22	49.11%	93.20%	66.55%	6.80%	16.42%	13.46%	0.20
2035	58.17	51.37%	93.20%	67.48%	6.80%	16.42%	13.20%	0.20
2050	59.25	53.46%	93.20%	68.88%	6.80%	16.42%	12.80%	0.20

Population-based downscaling weights were used for 14 measures, and alternatives were used for the remaining 10 (Table A.3) on the following page.

Table A.3 Type of Downscaling Used for Each Measure

Downscale Used for 24 Measures		
Downscale Type	**Measure**	**Measure Defined**
Population	Measure 1	Shift to light duty electric vehicles, installation of EV charging stations, and use EV batteries for grid balancing
Transportation	Measure 2	Electrify fleets (medium- and heavy-duty) buses and trucks
Population	Measure 3	Reduce vehicle miles traveled by shifting to different modes of transportation (e.g. walking, biking, transit, teleworking)
Population	Measure 4	Increase energy efficiency retrofitting of existing homes
Population	Measure 5	Support local governments in adopting more efficient residential energy codes and/or green building standards
Population	Measure 6	Electrify existing homes
Population	Measure 7	Increase energy efficiency retrofitting existing commercial buildings
Population	Measure 8	Support local governments in adopting more efficient commercial energy codes and/or green building standards
Population	Measure 9	Electrify existing commercial buildings
Population	Measure 10	Reduce construction and demolition waste
Population	Measure 11	Reduce the amount of food, yard, and tree waste that goes into landfills by composting
Population & Industrial Energy	Measure 12	Increase energy efficiency retrofitting of existing industrial buildings
Population & Industrial Energy	Measure 13	Electrify industrial buildings & processes
Industrial Employment	Measure 14	Retrofit industrial processes and equipment
Industrial Employment	Measure 15	Decrease non-CO$_2$ GHG emissions through improved industrial processes
Industrial Employment	Measure 16	Capture heat from industrial processes to provide HVAC or create electricity
Forestry	Measure 17	Increase tree canopy and vegetative coverage through afforestation and green infrastructure
Forestry	Measure 18	Improve forest management
Population & Community Scale Solar	Measure 19	Increase usage of "urban-scale" solar (e.g. solar on landfill and waste sites and community solar
Population	Measure 20	Increase installation of rooftop solar and battery storage systems
Population	Measure 21	Capture biosolids & biogas at wastewater treatment plants for waste-to-energy creation
Population	Measure 22	Adopt demand response actions in local government facilities businesses, and homes (shift energy use to off-peak times; use power strips, etc.)
Population	Measure 23	Capture methane from landfills for conversion into electricity
N/A	Measure 24	Increase local government adoption of climate mitigation measures

(Source: CEPL/Georgia Tech research team)

A.4 Results by Individual Greenhouse Gases

The Energy Policy Simulator tracks emissions of different GHGs separately such as CO_2, CH_4, N_2O, and various F-gases from each modeled sector. To report a single comparable emissions figure, the model multiplies each gas by its 100-year global warming potential (GWP) as published in the 2013 *Fifth Assessment Report* on the physical science of climate change authored by the Intergovernmental Panel on Climate Change (IPCC). (The GWP for non-fossil methane is slightly higher in the 2014 report than in the 2021 IPCC report, and there are a few other minor GWP differences for other gases.) The resulting totals are summed and presented as CO_2-equivalent (CO_2e). These GWP factors are applied in emissions accounting, scenario comparisons, and policy impact outputs.

F-gases. There are quite a few negative values for the F-gases. Negatives do mean increases, because the title of the field is "reductions."

The negative values occur in all of the efficiency and electrification measures in the residential, commercial and industrial sectors (Measures 4-9 and 12-14). That reflects the increase in air conditioning (we **are** facing a warmer future) and the transition to heat pumps. Many heat pumps use fluorinated refrigerants -- specifically hydrofluorocarbons (HFCs) and hydrofluoroolefins (HFOs), due to their energy efficiency and safety properties. However, due to concerns about their environmental impact, regulations are driving a transition to lower-Global Warming Potential (GWP) refrigerants, including some HFOs and non-fluorinated alternatives, for new heat pump systems. The principal regulation is the Kigali Amendment, the successor to the 2016 Montreal Protocol. Kigali may not be considered in the EPS.

In contrast, 2 industrial measures target F-gases and reduce the F-gas increases (Measures 19 and 20).

A.5 Estimation of Costs

All costs and benefits in EPS are reported in $2024. Results from other sources in alterative base years are inflated or deflated to $2024 using the U.S. Bureau of Labor Statistics CPI Calculator.

The Energy Policy Simulator includes a number of cost metrics:

1. The first important cost metric is "Change in Capital and Operational Expenditures." This is a useful total that expresses how much the policy package saves money or increases spending. It respects the user's settings for how government raises or spends revenue (discussed on the documentation page for the EPS's input-output model), so it correctly reflects user choices such as making carbon taxes revenue-neutral. It roughly expresses both the cost to domestic firms and the amount of economic stimulus the policy will provide. The simulator subdivides the metric into components (fuel and O&M, capital equipment, taxes and subsidies) to help users see what cost changes went into the metric. This is critical for evaluating if the type of spending driven by the policies is "good" or "bad" spending (or savings), with spending on fuel often considered bad and spending on capital equipment often considered good, or at least neutral.

2. Another important set of metrics concerns the impact of the policy package on the government's financial situation. Details are provided by the "Government Cash Flow Accounting" graph and the two national debt-related graphs in the web interface, which show the following effects of the policy package:
    a. Change in government spending
    b. Change in budget deficit
    c. Change in household taxes
    d. Change in payroll taxes
    e. Change in corporate income taxes
    f. Cumulative change in the national debt
    g. Change in interest paid on the national debt

Reviewing these metrics helps the model user understand some of the financial implications of the policy package for government. For example, a policy package that increases the budget deficit may provide short-term stimulus to the economy, but it will also increase interest payments on the national debt.

3. The third key metrics are the macroeconomic results of the EPS's input-output model. These results include the policy package's effects on:
    a. Number of jobs
    b. GDP / value added
    c. Employee compensation

These quantities can each be viewed via several different breakouts: by industry (e.g. which industries are gaining/losing jobs, value added, etc.), and by type of effect: direct, indirect, or induced.

EPS first calculates direct (or "first-order") financial effects of a policy package within each sector: Who gives how much more (or less) money to whom? Then, using its built-in input-output model, the EPS calculates higher-order (indirect and induced) effects. These come from the industries that supply industries affected by the policy package, and from the respending of money received by households or by government (or if less money is received due to the policy package, then how households or government make up for the reduction).

How money is used by households and government can have a large impact on the policy's outcome. A carbon price that raises government revenue will go farther if the government wisely spends the money (for example, on support for research and development, which can accelerate technological progress, or improving public transit systems, as public transit generates economic value far greater than its costs). If the revenue is spent unwisely, the policy will not do nearly so much good. In the EPS, how government uses or raises revenue for/from specific policies can be set using Government Revenue Accounting levers, discussed on the input-output model documentation page.

The proper simulation of policy effects on GDP (or jobs) requires accounting for higher-order effects. For example, a model must account for the re-integration of displaced workers into the economy and the long-term effects of efficiency gains on the economy. This is easiest to visualize in the context of an intervention (such as automation) that displaces workers and reduces spending while increasing productivity. In the short term, this sort of intervention looks bad, as it reduces jobs and GDP. But in the longer term, displaced workers find new places in the economy where they can work, and the entire economy produces more goods with fewer people. Many of the best policies to mitigate climate change, such as policies that improve products' energy efficiency, improve material efficiency in industry, and promote renewable electricity generation, have disruptive short-term effects because they save money (reduce GDP). In the longer term, the economy will be better off for these reductions, just as the economy is better off today because of all the labor-saving and energy-saving devices and techniques invented since the Middle Ages.

The EPS uses induced jobs, induced value added (GDP contribution), and induced employee compensation to capture how savings (for example, from reduced energy expenditures) can create jobs in other parts of the economy (when the money is spent on other things).

In sum, the EPS first calculates direct (or "first-order") financial effects of a policy package within each sector: Who gives how much more (or less) money to whom? Then, using its built-in input-output model, the EPS calculates higher-order (indirect and induced) effects. These come from the industries that supply industries affected by the policy package, and from the re-spending of money received by households or by government (or if less money is received due to the policy package, then how households or government make up for the reduction).

A.6 Integrated Analysis of Suite of Measures

Additional metrics will be explored and described in a final integrated EPS analysis. This integration will take advantage of additional analytic features offered by EPS.

Figure A.2 Greenhouse Gas Emissions by Sector for Georgia

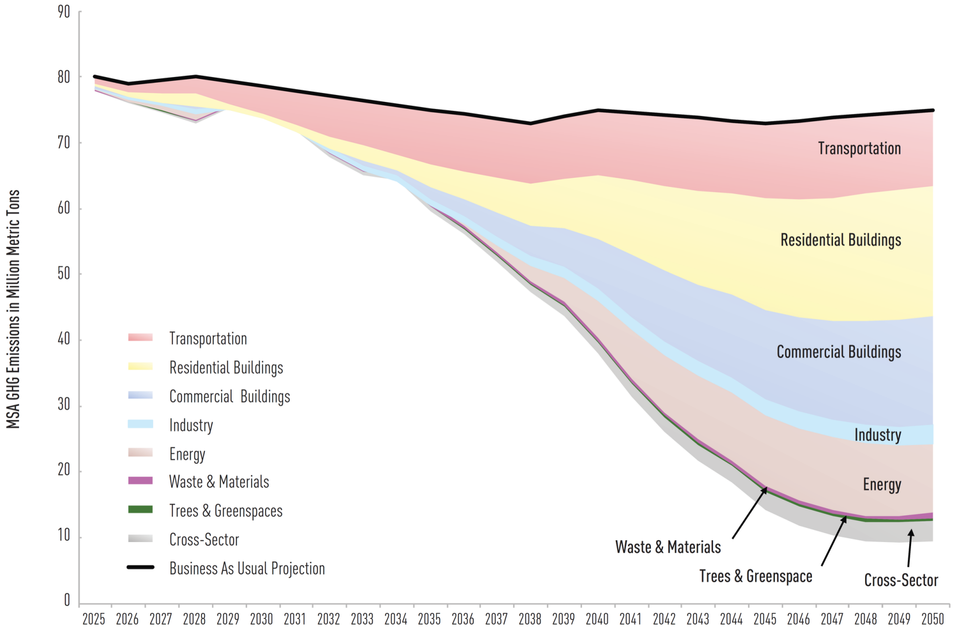

MSA GHG Emissions in Million Metric Tons
90
80
70
60
50
40
30
20
10
0
2025
2026
2027
2028
2029
2030
2031
2032
2033
2034
2035
2036
2037
2038
2039
2040
2041
2042
2043
2044
2045
2046
2047
2048
2049
2050
Transportation
Residential Buildings
Commercial Buildings
Industry
Energy
Waste & Materials
Trees & Greenspaces
Cross-Sector
Business As Usual Projection
Transportation
Residential Buildings
Commercial Buildings
Industry
Energy
Waste & Materials
Trees & Greenspace
Cross-Sector

Figure A.3 Estimated Deaths Avoided by Implementing Measures

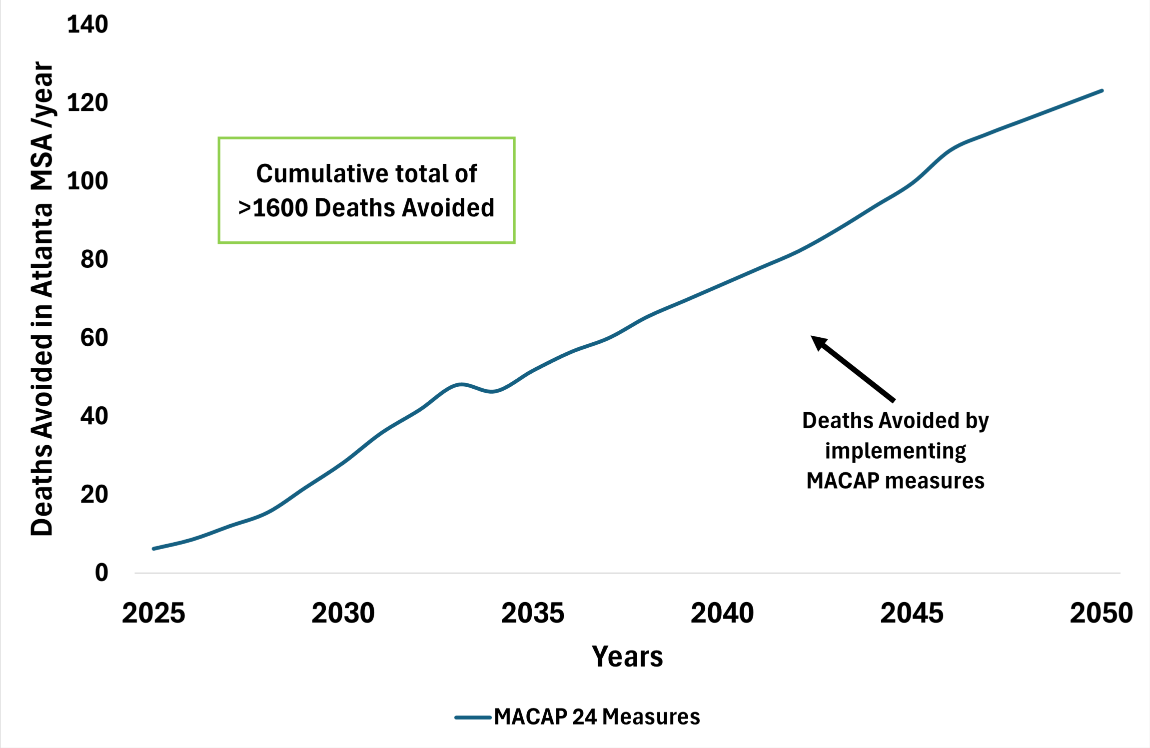
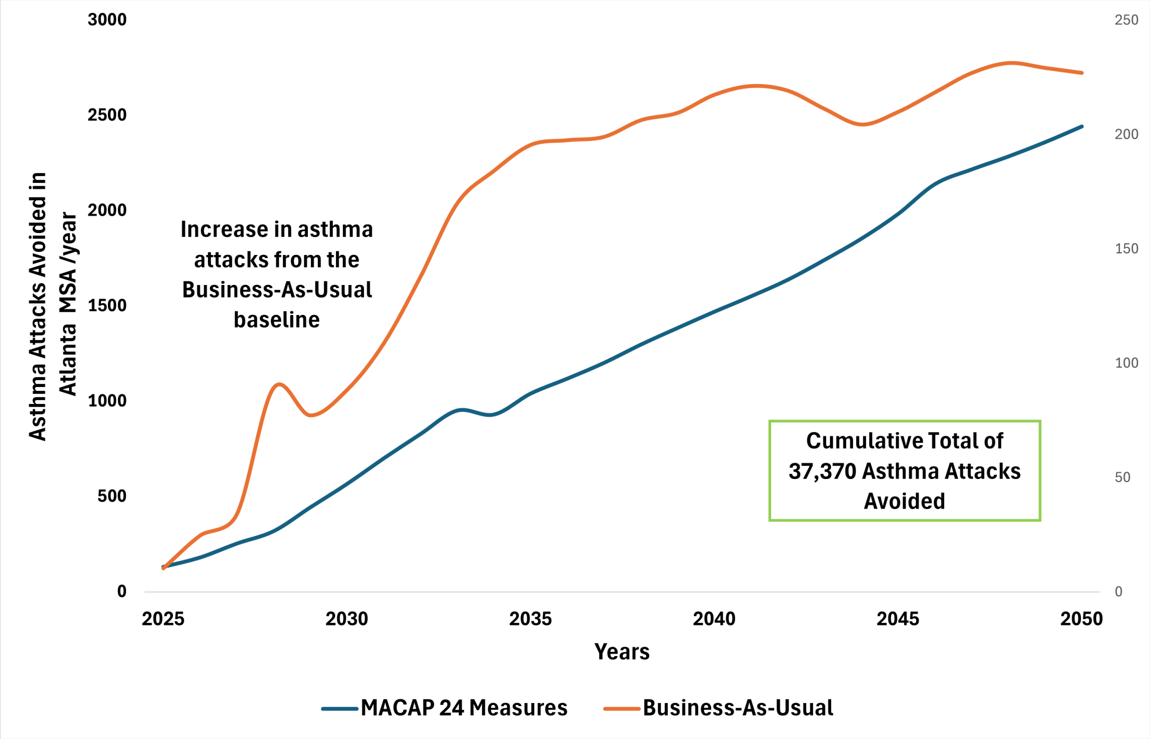


Figure A.4 Estimated Asthma Attacks Avoided by Implementing Measures



A.7 Definition of Terms

Macroeconomic results. EPS generates several macroeconomic metrics based on its input-output model. These include the number of jobs generated, eliminated, or displaced, and GDP. These will be reported in the final integrated EPS run.

Electricity generation, capacity, and demand. EPS estimates changes in electricity generation by power plant type due to enables policies, as well as capacity, policy-driven change in capacity, electricity demand by sector, share of generation from clean sources, carbon intensity of electricity generation and electricity intensity per unit GDP.

Levelized costs and water use. EPS estimates changes in levelized costs every 10 year by power plant type after policies and subsidies. It also estimates changes in annual average marginal dispatch cost of electricity, curtailed electricity from renewables, emissions, water withdrawals and consumption by power plant type.

Electricity hourly dispatch. EPS forecasts hourly dispatch by power plant type for average and peak days, by season.

Transport: Vehicles by transportation technology, travel demand, fuel use, and emissions are estimated.

Industry: Fuel use by industry and industrial process.

Buildings: Energy use by building component and building type.

Exports and imports: Change in energy imports and exports, changes in revenues, and expenditure from both domestic and non-domestic sources.

Fuel costs: Changes in fuel costs are estimated by fuel type, by sector.

Technology costs. Costs of key technologies are estimated, including batter pack cost per kilowatt-hour, CCS capital equipment, onshore wind turbines, offshore wind turbines, solar PV (utility scale) and hydrogen electrolyzers.

Transportation

Baseline inventory in 2022 = 60 MMTCO2

1. Shift to light duty electric vehicles, installation of EV charging stations, and use EV batteries for grid balancing

Table 1.1. Top-line values for target years

	2035	2050
GHG Emissions Reductions Compared to the Federal Rollback ($MMTCO_2e$)	4.8	5.68
Net Cost of Carbon Reduction (2024$/$MTCO_2e$)	222	669

1.1. Overview

This workbook estimates the GHG reduction potential and total costs/benefits of the "Shift to light duty electric vehicles, installation of EV charging stations, and use EV batteries for grid balancing" measure.

1.2. Modeling Assumptions

This measure was modeled using the RMI's EPS, an "open-source model for estimating the environmental, economic, and human health impacts of hundreds of climate and energy policies." Environmental, economic, and human health impacts resulting from each measure's implementation were estimated for two periods: 2035 and 2050.

To model the measure in the EPS, a FPRR and a "policy" scenario were developed, projecting out assumptions and key inputs related to the measure to 2050. The FPRR scenario assumes no implementation of the reduction measure while the policy scenario assumes full implementation of the measure.

The EPS provides emissions and policy impact estimates only at the state level, without geographic resolution for sub-state regions. To analyze impacts within the 29-county Atlanta MSA, we applied a population-based downscaling approach. Specifically, we used county-level population projections from official state demographic sources to calculate the share of Georgia's total population residing in the Atlanta metro counties for each year. This proportion was then used to scale down statewide EPS outputs (e.g., emissions, costs, and pollutant trajectories) to approximate regional values.

For the purposes of estimating the fleet size and effective charging infrastructure required for the Atlanta MSA, it was assumed that approximately 60–65% of all light-duty vehicles (LDVs) in Georgia are located within the MSA, and that about 50% of all electric vehicles (EVs) in the state are registered in this region. Regarding charging infrastructure, it was assumed that the MSA contains roughly 90% of Georgia's total charging ports, with the current public network comprising approximately 2,900 Level 2 charging ports and 576 DC fast charging (DCFC) ports, based on recent Atlanta Regional Commission data. These charger counts include both shared public and certain semi-public installations and serve as the baseline for projecting future infrastructure requirements in line with anticipated EV adoption in the region.

For the cost analysis, cumulative charger deployment costs were explicitly estimated and then treated as a separate cost component rather than being embedded in the broader policy cost totals. This approach allows the analysis to isolate the capital and installation expenses associated with expanding the charging network from other elements of the policy scenario, such as vehicle purchase incentives, grid upgrades, or operational programs. The charger cost estimates were derived by multiplying the projected number of additional DC fast charging (DCFC) ports required in each forecast year by per-unit cost assumptions that include hardware, installation, permitting, and, where applicable, site preparation. DCFC ports were assigned higher unit costs due to more complex electrical work, equipment expense, and potential grid connection upgrades. For the analysis, a 50 kW DCFC port was assumed to cost approximately $58,000 installed, while a 150 kW DCFC port was assumed to cost about $150,000 installed.

To model increased adoption of electric vehicles (EVs), the EPS policy “Zero-Emissions Vehicle Sales” was applied. This policy sets progressive targets for the share of new vehicle sales that must be zero-emission, in alignment with the EPA Light-Duty Vehicle (LDV) GHG Standards applicable to all new vehicle sales starting MY2027. Pathway A (Central analysis) with higher battery electric vehicles (BEV) sales adoption begins at 26% in 2027, rising to 56% by 2032, 65% by 2035, and ultimately 100% by 2050 was set in the implementation schedule, and the policy level was set to a 100%.

Table 1.1.1. Battery Electric Vehicles (BEV) adoption over time

Scenario	2027	2028	2029	2030	2031	2032
Pathway A—Higher BEV Pathway (central analysis case)	26%	31%	39%	44%	51%	56%

To support this projected EV uptake, a corresponding expansion of charging infrastructure was estimated. The required growth in EV chargers was calculated using the DOE EVI-Pro Lite tool, consistent with the methodology used in the FPRR scenario. Charger deployment was scaled at a rate of 1% increase in charging infrastructure for every 3% increase in EV market share, with a cap of 30% infrastructure coverage by 2050.

To approximate the role of EVs in grid stability, the EPS policy “Use EVs for Grid Balancing” was employed. This policy was set to represent the share of EVs contributing to grid services, increasing from 3% in 2035 to 10% by 2050. While simplified, this lever serves as a proxy for the potential of bidirectional charging and vehicle-to-grid (V2G) applications as EV adoption scales. The policy was modified via the implementation schedule to achieve effectiveness.

Table 1.1.2. Use of EVs for grid balancing over time

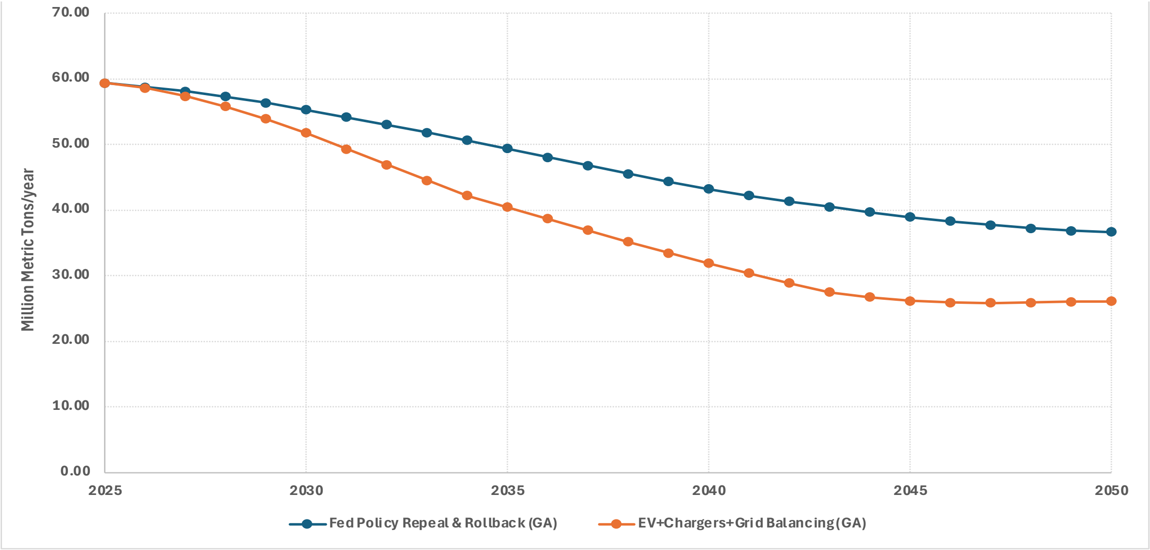
Scenario	2027	2030	2035	2040	2050
Use of EVs for Grid Balancing	10%	30%	50%	60%	100%

This modeling scenario focuses exclusively on light-duty EVs and associated charging infrastructure. It does not account for medium- or heavy-duty electrification or non-road applications. Furthermore, the policy modeled under the FPRR scenario excluded federal tailpipe emission standards for light, medium, and heavy-duty vehicles (model years 2027 and later), as well as state-level zero-emission vehicle (ZEV) sales requirements under California's Clean Air Act waiver. This means that the scenario assumed no binding federal ZEV sales requirements for any vehicle category and set all state-level ZEV requirements to zero for every state, effectively removing both federal and California-led ZEV adoption mandates from the policy framework.

1.3. Emissions Reductions

This measure drives significant reductions in GHG emissions over time. In 2035, emissions fall by 4.80 MMT CO_2e, increasing steadily to nearly 5.68 MMT CO_2e annually by 2050.

Figure 1.1. Projected GHG Emissions



GHG Emissions Reductions Compared to the FPRR (MMTCO$_2$e/year)		
Greenhouse Gases	**2035**	**2050**
Carbon Dioxide (CO_2)	8.87	10.48
Methane (CH_4)	0.0003	0.0003
Nitrous Oxide (N_2O)	0.0001	0.0002
Fluorinated Gases (F-gases)	0	0
Co-Pollutants Emissions Reductions Compared to the FPRR (Thousand Metric Tons/year)		
Co-Pollutants	**2035**	**2050**
Fine Particulate Matter ($PM_{2.5}$)	0.38	0.46
Coarse Particulate Matter (PM_{10})	1.06	1.14
Black Carbon (BC)	0.14	0.20
Organic Carbon (OC)	0.11	0.11
Nitrogen Oxides (NO_x)	0.01	0.01
Volatile Organic Compounds (VOC)	7.03	7.13
Sulfur Oxides (SO_x)	0.0001	0.0001
Carbon Monoxide (CO)	0.11	0.10

Changes in co-pollutants

The co-pollutants generally show a reduction compared with the FPRR scenario, with the most significant decreases observed in VOCs, coarse particulate matter (PM_{10}), and fine particulate matter ($PM_{2.5}$). Nitrogen oxides (NO_x), primarily emitted by light-duty vehicles, show consistent and notable reductions across both projection years. SOx show a very small absolute reduction, and CO also decreases slightly over time, indicating cumulative improvement in air quality alongside greenhouse gas reductions.

Table 1.2. Projected Annual Pollution Reduction

Charging Infrastructure

Based on the FPRR scenario, in this scenario, EV adoption grows steadily, driving a proportional expansion in the public fast-charging network. The modeled vehicle mix assumes 42% of new plug-in electric vehicles (PEVs) are sedans, 37% are C/SUVs, 16% are pickups, and 5% are vans, with plug-in hybrid electric vehicles (PHEVs) making up 21% of all PEVs. Charging demand from PHEVs is estimated under a partial-support assumption—meaning they contribute half the load compared to full support. Additionally, 75% of drivers are assumed to have access to home charging.

For ride-hailing services, a conservative electrification pathway is applied: transportation network companies (TNCs) maintain their current 1.5% market share and electrify at the same pace as the broader PEVs fleet. Under these inputs, the EV stock is projected to reach 203,284 by 2025, requiring 1,769 DCFC ports. By 2035, the fleet grows to 2.13 million vehicles, supported by 8,329 ports, and by 2050, 6.59 million EVs will require 19,341 ports.

Table 1.2.1. Projected EV growth and Charging ports required in FPRR

Year	Cumulative EV's	Cumulative Number of DCFC Ports Needed
2025	203,284	1,769
2035	2,130,092	8,329
2050	6,591,488	19,341

For the modeled policy scenario, the same vehicle mix is maintained—42% sedans, 37% C/SUVs, 16% pickups, and 5% vans—with PHEVs making up 21% of the PEVs fleet. Seventy-five percent of drivers are assumed to have access to home charging. In this case, ride-hail market share is modeled to grow fourfold to 6% while electrifying at three times the rate of the total PEV fleet ("TNC Growth and Aggressive Electrification" scenario). For comparison, an "Aggressive Electrification" sensitivity assumes TNCs maintain their current market share of 1.5% but still electrify at three times the rate of the broader PEV fleet.

Under the main modeled case, by 2025, approximately 209,185 cumulative EVs are projected to be on the road, requiring about 1,823 cumulative DCFC ports. By 2035, this increases sharply to 4,422,487 EVs and 12,975 ports. By 2050, EV adoption reaches 8,474,630 vehicles, necessitating 24,867 DCFC ports to meet charging demand.

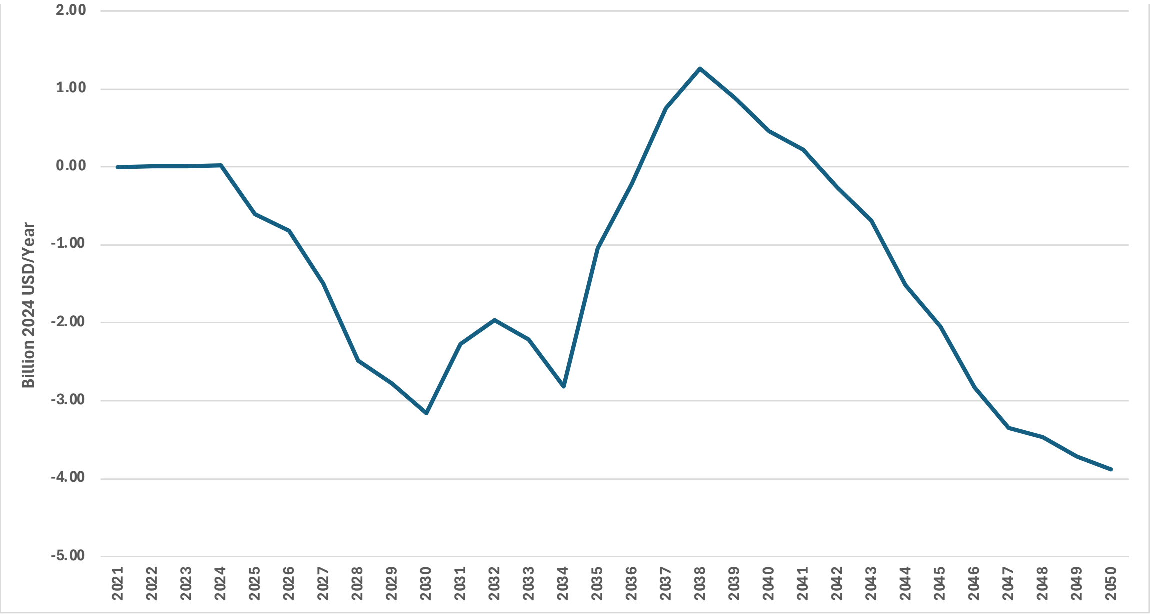
Table 1.2.2. Projected EV growth and Charging ports required in modeled scenario

Year	Cumulative EV's	Cumulative Number of DCFC Ports Needed
2025	209,185	1,823
2035	4,422,487	12,975
2050	8,474,630	24,867

1.4. Cost Savings

Results indicate a net cost for most years, with positive savings occurring only between 2037 and 2041. In 2035, the projected annual net savings are - 1.04 billion USD (negative sign indicates costs), while in 2050 they are - 3.88 billion USD, representing a continued net cost. The total cumulative net savings from 2025 to 2035 amount to approximately - 21.64 billion USD, highlighting that, without including charger costs, the policy does not achieve sustained net positive savings over the period.

Figure 1.2. Projected Annual Savings (not including chargers)



Charger Costs

The analysis of DCFC infrastructure requirements in Georgia reveals three cost scenarios based on charger capacity. In the first case, all chargers are assumed to be 150 kW units, costing approximately $150,000 per port (including installation). This high-power, high-cost option results in the largest infrastructure expenditure. For example, by 2035, 11,152 additional ports are required, with an estimated cost of about $1.673 billion for that year, bringing the cumulative cost to roughly $1.685 billion.

Table 1.2.3. Projected Charging Infrastructure Costs for 150kW DCFC

Year	Cumulative EV's	Cumulative Number of DCFC Ports Needed	Additional DCFC Ports	Additional Cost (150kW)	Cumulative Cost (at 150kW DCFC)
2025	209,185	1,823	80	12,000,000	12,000,000
2035	4,422,487	12,975	11,152	1,672,800,000	1,684,800,000
2050	8,474,630	24,867	11,892	1,783,800,000	3,468,600,000

The second case assumes all chargers are 50 kW units, at a cost of around $58,000 per port. This represents the lowest-cost approach, with the same number of additional chargers in 2035 costing approximately $646.82 million, for a cumulative total of $651.46 million.

Table 1.2.4. Projected Charging Infrastructure Costs for 50kW DCFC

Year	Cumulative EV's	Cumulative Number of DCFC Ports Needed	Additional DCFC Ports	Additional Cost (50kW)	Cumulative Cost (at 50kW DCFC)
2025	209,185	1,823	80	4,640,000	4,640,000
2035	4,422,487	12,975	11,152	646,816,000	651,456,000
2050	8,474,630	24,867	11,892	689,736,000	1,341,192,000

The third scenario models a 50/50 split between 150 kW and 50 kW DCFC units, balancing speed and cost. Under this approach, 2035 additional chargers are projected to cost about $1.16 billion, with cumulative costs reaching $1.168 billion.

Table 1.2.5. Projected Charging Infrastructure Costs for 50-50 split for 150kW and 50kW DCFC

Year	Cumulative EV's	Cumulative Number of DCFC Ports Needed	Additional DCFC Ports	Additional Cost (50kW)	Cumulative Cost (50-50 split at 50kW and 150kW DCFC)
2025	209,185	1,823	80	8,320,000	8,320,000
2035	4,422,487	12,975	11,152	1,159,808,000	1,168,128,000
2050	8,474,630	24,867	11,892	1,236,768,000	2,404,896,000

1.5. Summary of Metrics for Target Years

Table 1.3. Metrics for 2035

Metric	Value
Annual GHG Reductions	4.8 MMT CO_2e
Annual Net Savings	$-1.04 billion
GHG Reductions Since 2025 (cumulative)	43.95 MMT CO_2e
Cumulative Net Savings (2025–2035)	$ -21.59 million

Table 1.4 Metrics for 2050

Metric	Value
Annual GHG Reductions	5.68 MMT CO_2e
Annual Net Savings	$-3.88 billion
Total GHG Reductions (2025–2050)	215.76 MMT CO_2e
Total Net Savings (2025–2050)	$-39.97 million

2. Electrify fleets (medium- and heavy-duty buses and trucks)

Table 2.1. Top-line values for target years

	2035	2050
GHG Emissions Reductions Compared to the Federal Rollback ($MMTCO_2e$)	2.85	3.68
Net Cost of Carbon Reduction (2024$/$MTCO_2e$)*	1,926	-3,771

*Negative costs constitute positive savings.

Note: The initial net costs in 2035 reflect the significant build-out of charging stations. In 2050, this measure generates significant savings.

2.2. Modeling Assumptions

This measure was modeled using the 2023 version of National Energy Modeling System installed in Georgia Tech (GT-NEMS 2023) by Climate and Energy Policy Lab. NEMS is a dynamic energy system model based on computation general equilibrium. It considers the inter-dependencies between different sectors and markets in an economy. Akin to EPS, the 2023 version of NEMS considers 2022 as the base year and generates projections till 2050.

To model the measure in GT-NEMS 2023, a “No IRA” and “policy” scenario were developed, projecting out assumptions and key inputs related to the measure to 2050. The “No IRA” scenario in GT-NEMS 2023 is equivalent to the FPRR scenario modelled in EPS for other measures. It assumes no implementation of the reduction measure while the policy scenario assumes full implementation of the measure.

GT-NEMS 2023 provides emissions and policy impact estimates only at the census division level and North American Electric Reliability Corporation (NERC) subregion level. We estimate Georgia's share of regional fuel consumption projections based on the following assumption: Georgia consumes 12.5 % of the sum of all fuels consumed by the South Atlantic census division and East South Central census division. Although Georgia falls under the South Atlantic census division, it is historically and economically akin to states in the East South

Central census division. Hence, we include both divisions. We incorporate socioeconomic and population growth by increasing Georgia's share to 12.9 % by 2050, based on trends indicated by Hauer's Shared Socioeconomic Pathway 2 (SSP2) projections. Using the Environmental Protection Agency's (EPA) 2022 GHG emission factors and Intergovernmental Panel on Climate Change's (IPCC) Sixth Assessment Global Warming Potentials (GWP), we convert fuel use to carbon dioxide (CO2), methane (CH_4), and nitrogen oxides (NO_x) emissions leading us to estimate CO_2e emissions[1]. For co-pollutants, we use emission factors used by the EPS.

For this measure of electrifying medium and heavy-duty vehicles, we then downscale Georgia's emissions to 29-county Atlanta MSA based on their high-growth trucking tonnage for years 2019 and 2050 obtained from "Georgia Freight Plan 2023" and "2024 Atlanta Regional Freight Mobility Plan" respectively. The trucking tonnage data provided in "2024 Atlanta Regional Freight Mobility Plan" are limited to 11-county Atlanta Regional Commission and are hence upscaled to 29-county Atlanta MSA based on 2022 population data. The resulting proportion from Georgia to Atlanta MSA ranges from 48% in 2022 to 53% in 2050.

We estimate the net savings for this measure as change in transportation sector share of gross domestic product (GDP) consumption compared to No Inflation Reduction Act (IRA) scenario (i.e. FPRR). GT-NEMS 2023 computes this for the entire US which we proportion to Atlanta MSA. We first obtain the trucking tonnage projections from 2019 to 2050 from Freight Analysis Framework 5.7 for the entire US under a high-growth scenario. The trucking tonnage for Atlanta MSA, already calculated while proportioning emissions, ranges from 2% to 2.43% from 2022 to 2050 of the entire US trucking tonnage. We use this as a proportion to downscale net savings for the US to Atlanta MSA.

Modeling

To model increased electrification of medium and heavy-duty vehicles, EPA's heavy-duty greenhouse gas standards for model years 2027 - 2032 are modelled in GT-NEMS 2023. These standards are performance based and mainly regulate vehicles above 10,000 lbs Gross Vehicle Weight Rating (GVWR) such as buses, trucks and haulers. The standards are under consideration for repeal after change in administration and hence face uncertainty on whether they can be considered as business-as-usual[2]. However, their emission reduction potential can be met by a combination of several other policies.

---

[1] Brown, M. A., Palsule, N., & Hubbs, J. (2024). Anticipating the response of climate solutions to a policy paradigm shift: Case study of the U.S. and the state of Georgia. *Energy Strategy Reviews, 53,* 101411. https://doi.org/10.1016/j.esr.2024.101411

[2] Environmental Protection Agency. (2025, March 12). *EPA announces action to implement POTUS's termination of Biden-Harris electric vehicle mandate*. EPA News Release. https://www.epa.gov/newsreleases/epa-announces-action-implement-potuss-termination-biden-harris-electric-vehicle

EPA published two compliance pathways – hydrogen vehicle (FCEV) focus and PHEV focus - as examples in its regulatory impact assessment[3]. The table below is an excerpt from the regulatory impact assessment and indicates the projections of potential combinations of share of new sales by type of powertrain that can meet those standards. For this measure, we replicate the PHEV focus compliance pathway.

Table 2.1.1. Adoption rates of HDVs by 2032 under EPA's PHEV focus pathway.

Vehicle Type	ICE Vehicles	Natural Gas	HEV	PHEV
Light Heavy-Duty Vocational	5%	5%	0%	60%
Medium Heavy-Duty Vocational	19%	5%	24%	32%
Heavy Heavy-Duty Vocational	13%	5%	50%	18%
Day Cab Tractors	20%	5%	20%	55%
Sleeper Cab Tractors	30%	5%	30%	55%

GT-NEMS 2023 allows users to generate an Alternative Fuel Vehicle (AFV) Trend which we use to mimic the PHEV pathway to the best extent possible. The AFV market trend is based on a logistic function which relies on difference in fuel costs and following key inputs:

- number of years for maximum market penetration (set to 2032)
- maximum share of AFVs to be achieved by the specified year (values from EPA's PHEV focus pathway)

2.3. Emissions Reductions

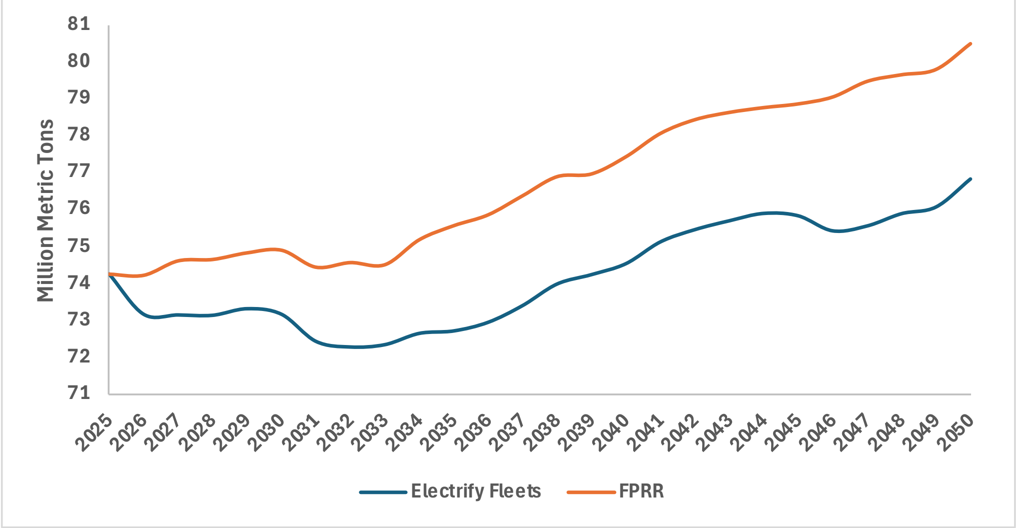
This measure drives significant reductions in GHG emissions over time. In 2035, emissions fall by 2.85 MMT CO_2e, increasing steadily to nearly 3.68 MMT CO_2e annually by 2050.

---

[3] Environmental Protection Agency. (2024, April 22). *Greenhouse gas emissions standards for heavy-duty vehicles—Phase 3: Final rule*. Federal Register, 89(78), 29440–29666.

https://www.epa.gov/regulations-emissions-vehicles-and-engines/final-rule-greenhouse-gas-emissions-standards-heavy-duty

Figure 2.1. Projected GHG Emissions



Changes in Co-Pollutants

The co-pollutants overall show a reduction when compared with the FPRR, except for a slight increase in sulfur oxide (SO_x) emissions. CO also shows an increase intermittently for some years but undergoes reductions cumulatively. HDVs are a major source of nitrogen oxide (NO_x) emissions, which show a consistent and significant reduction across all years.

Table 2.2. Projected Annual Pollution Reduction

GHG Emissions Reductions Compared to the FPRR (MMTCO$_2$e/year)

Greenhouse Gases	**2035**	**2050**
Carbon Dioxide (CO_2)	2.84	3.67
Methane (CH_4)	0.005	0.002
Nitrous Oxide (N_2O)	0.000	0.000
Fluorinated Gases (F-gases)	0.000	0.000

Co-Pollutants Emissions Reductions Compared to the FPRR (Thousand Metric Tons/year)

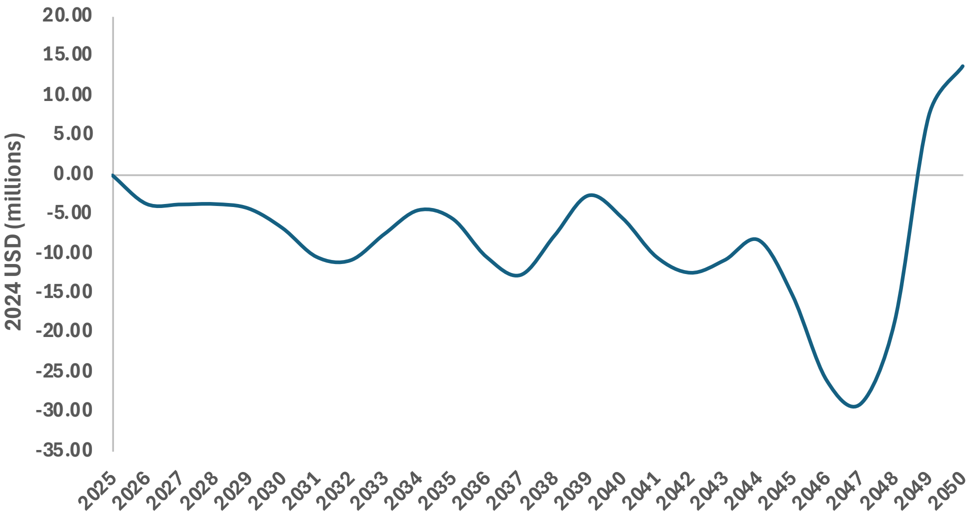
Co-Pollutants	**2035**	**2050**
Fine Particulate Matter ($PM_{2.5}$)	0.10	0.12
Coarse Particulate Matter (PM_{10})	0.18	0.22
Black Carbon (BC)	0.056	0.072
Organic Carbon (OC)	0.025	0.033

Nitrogen Oxides (NO_x)	3.48	4.38
Volatile Organic Compounds (VOC)	0.209	0.344
Sulfur Oxides (SO_x)	-0.007	-0.221
Carbon Monoxide (CO)	3.35	2.23

2.4. Cost Savings

Results indicate a net cost for all years except the last two. This measure results in projected cumulative net savings of – 5.49 million USD in 2035 (negative sign implies costs) and 13.84 million USD in 2050 (positive sign implies savings). The total net savings over 2022-2035 are -211.78 million USD.

Figure 2.2. Projected Annual Savings



2.6. Summary of Metrics for Target Years

Table 2.3. Metrics for 2035

Metric	Value
Annual GHG Reductions	2.85 MMT CO_2e
Annual Net Savings	- $5.49 million
GHG Reductions Since 2025 (cumulative)	19.06 MMT CO_2e
Cumulative Net Savings (2025–2035)	- $60.18 million

Table 2.4. Metrics for 2050

Metric	Value
Annual GHG Reductions	3.68 MMT CO_2e
Annual Net Savings	$13.84 million
Total GHG Reductions (2025–2050)	67.06 MMT CO_2e
Total Net Savings (2025–2050)	- $207.67 million

3. Reduce vehicle miles traveled by shifting to different modes of transportation (e.g. walking, biking, transit, teleworking)

Table 3.1. Top-line values for target years

	2035	2050
GHG Emissions Reductions Compared to the Federal Rollback ($MMTCO_2e$)	0.66	2.23
Net Cost of Carbon Reduction (2024$/$MTCO_2e$)*	-24	-318

*Negative costs constitute positive savings.

3.1. Overview

This workbook estimates the GHG reduction potential and total costs/benefits of the “Mode Shifting” measure. This measure is calculated by scaling down the estimated GHG reduction potential of Georgia's priority measures proportionally using the population of the Atlanta MSA relative to the total population of the state.

3.2. Modeling Assumptions

This measure was modeled using the RMI EPS, an “open-source model for estimating the environmental, economic, and human health impacts of hundreds of climate and energy policies.” Environmental, economic, and human health impacts resulting from each measure’s implementation were estimated for two periods: 2035 and 2050.

To model the measure in the EPS, the FPRR and a “policy” scenario were developed, projecting out assumptions and key inputs related to the measure to 2050. The FPRR scenario assumes no implementation of the reduction measure while the policy scenario assumes a linear implementation of the measure with 100% implementation (20% of vehicle trips shifting) occurring in 2050.

Downscaling Assumptions

We used the percentage of ARC's projected population within the 29-county

MSA as compared to the state as whole to downscale the results from the RMI's EPS tool, which provides results for the state of Georgia. Because people are a prerequisite for shifting modes of transportation, we use population.

Modeling

To model transportation mode shifting (i.e. shifting from automobile to active/mass transportation or telecommuting), the EPS policy lever "Mode Shifting" is used. This policy specifies that a target percentage of all trips in passenger cars and SUVs will be substituted for walking, biking, public transportation, or telecommuting. For the achievable potential scenario, this target is set at 20%, representing the share of vehicle trips in passenger vehicles.

The core modeling variable for this measure is the reduction in vehicle miles traveled, calculated as the difference between the FPRR and the relevant policy scenario.

This analysis focuses solely on shifting from the projected vehicle fleet to zero/lower emissions transportation options for modeling simplicity. However, it is important to acknowledge that the fuel mix and efficiency of the vehicle fleet will impact both emissions and financial results.

Output

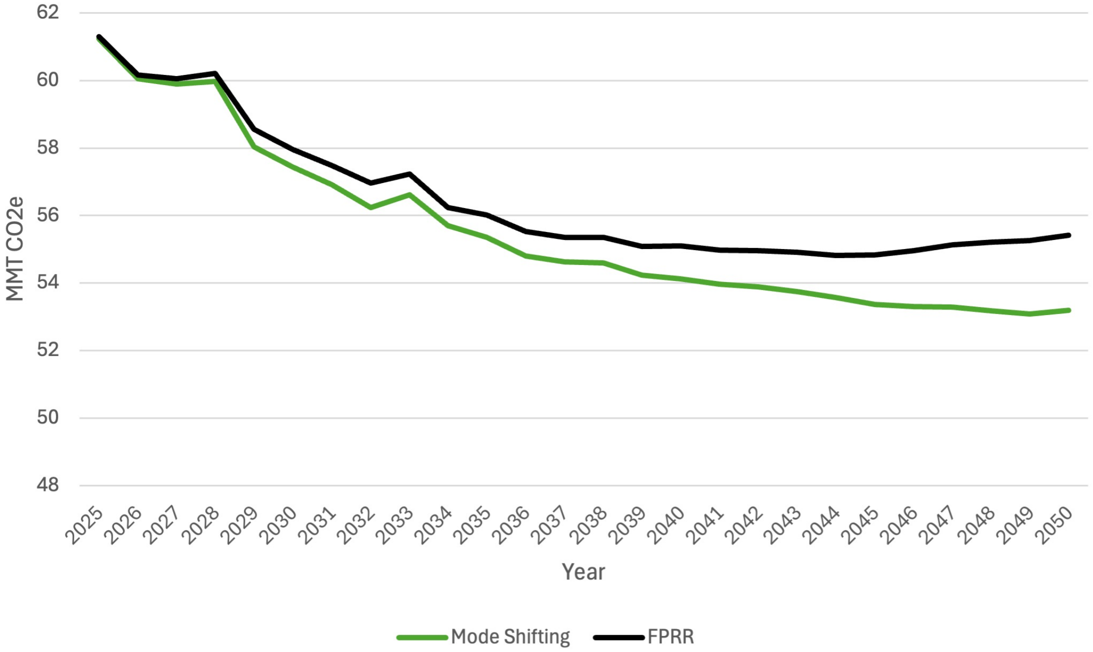
The policy measures to encourage mode shifting are modeled using the EPS, with the residents of the MSA changing 20% of their vehicle trips to active/public transportation or telecommuting. This measure supports decarbonization, reduced traffic congestion, and cost savings while delivering widespread public health and economic benefits.

3.3. Emissions Reductions

This measure drives significant reductions in GHG emissions over time. In 2025, annual emissions fall by 0.06 MMT CO_2e, increasing steadily to nearly 2.23 MMT CO_2e annually by 2050, compared to FPRR. Cumulatively, the measure is projected to reduce emissions by 24.61 MMT CO_2e between 2025 and 2050.

Annual emissions reductions increase steadily over study period, likely as a function of the linear implementation schedule with full implementation occurring in 2050. If this is the case, we expect more cumulative emissions saved over the study time frame by more swiftly achieving 20% passenger vehicle mode shifting.

Figure 3.1. Projected GHG Emissions



Changes in Co-Pollutants

The GHGs, disaggregated to individual contributors, is shown below in Table 3.2. The mode shifting policy results in a steady increase in the carbon dioxide (CO_2), but a more subtle effect on the other GHGs. There is very little change in the annual emissions of nitrogen oxides (NO_x) and methane (CH_4) with an initial increase followed by a decrease in annual emissions for both gases, resulting in a small net increase in emissions for CH_4 and a small net decrease in emission for NO_x. Fluorinated gases (F-gases) show reductions through 2043 and then begin to increase beyond the projected emissions in FPRR until 2050. There is still a net reduction in fluorinated gases, even with the increase in emissions towards the end of the modeling period.

The co-pollutants overall show a downward trend when comparing the policy scenario with FPRR, with the following exceptions. Sulfur oxide (SO_x) emissions are increasing and decreasing in comparison with FPRR, ultimately resulting in an increase in net SO_x emissions. Annual NO_x emissions are less in the policy scenario until 2043 when the policy scenario has a higher annual NO_x emission, however this results in a net decrease in NO_x emissions. Other co-pollutants typically associated with automobile travel like CO, VOCs, and coarse particulate matter (PM_{10}) show a steady decrease in annual emissions while fine particulate matter ($PM_{2.5}$) shows a small increase in annual emissions early but starting in 2028 the annual emissions begin to be less under the policy scenario.

Table 3.2. Projected Annual Pollution Reduction

GHG Emissions Reductions Compared to the FPRR ($MMTCO_2e$/year)

Greenhouse Gases	2035	2050
Carbon Dioxide (CO_2)	1.13	3.738
Methane (CH_4)	0.001	0.001
Nitrous Oxide (N_2O)	-0.000	0.000
Fluorinated Gases (F-gases)	0.013	-0.009

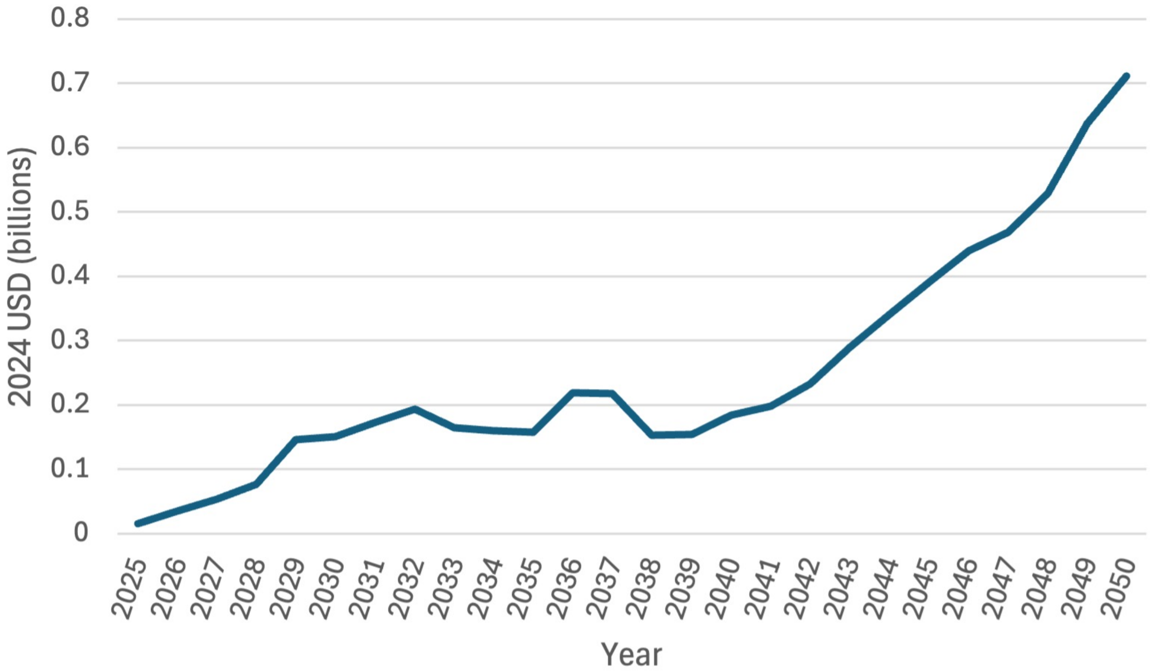
Co-Pollutants Emissions Reductions Compared to the FPRR (Thousand Metric Tons/year)

Co-Pollutants	2035	2050
Fine Particulate Matter ($PM_{2.5}$)	0.028	0.000
Coarse Particulate Matter (PM_{10})	0.164	0.162
Black Carbon (BC)	0.006	-0.066
Organic Carbon (OC)	0.015	0.025
Nitrogen Oxides (NO_x)	0.957	-2.322
Volatile Organic Compounds (VOC)	1.60	1.682
Sulfur Oxides (SO_x)	-0.30	0.172
Carbon Monoxide (CO)	24.17	27.91

3.4. Cost Savings

This measure results in annual savings from the very beginning with over $15 million in savings in the first year mostly increasing steadily until 2050 to over $711 million in annual savings in comparison with the FPRR. There are two slight dips during this time period from 2032-2035 and 2037-2038; however, these seem to be only mild setbacks in the mostly increasing annual savings.

Figure 3.2. Projected Annual Savings



Over the full period from 2025 to 2050, the measure is projected to yield $6.49 billion in net savings, primarily through avoided fossil fuel purchases, reduced capital expenditures on automobiles, and reduced maintenance cost from vehicles.

3.5. Summary of Metrics for Target Years

Table 3.3. Metrics for 2035

Metric	Value
Annual GHG Reductions	0.66 MMT CO_2e
Annual Net Savings	$16 million
GHG Reductions Since 2025 (cumulative)	~4.70 MMT CO_2e
Cumulative Net Savings (2025–2035)	~$1.32 billion

Table 3.4. Metrics for 2050

Metric	Value
Annual GHG Reductions	2.23 MMT CO_2e
Annual Net Savings	$710 million
Total GHG Reductions (2025–2050)	~24.61 MMT CO_2e
Total Net Savings (2025–2050)	~$6.49 billion

Residential Buildings

4. Increase energy efficiency retrofitting of existing homes

Table 4.1. Top-line values for target years

	2035	2050
GHG Emissions Reductions Compared to the Federal Rollback ($MMTCO_2e$)	1.92	5.92
Net Cost of Carbon Reduction (2024$/$MTCO_2e$)*	-47	118

*Negative costs constitute positive savings.

Note: The initial savings decline and become costs over time as homes are built more efficiently and opportunities for cost-effective retrofitting decrease.

4.1. Overview

This workbook estimates the GHG reduction potential and total costs/benefits of the "Increase Energy Efficiency Retrofitting of Existing Homes" measure.

4.2. Modeling Assumptions

This measure was modeled using the RMI's EPS, an "open-source model for estimating the environmental, economic, and human health impacts of hundreds of climate and energy policies." Environmental, economic, and human health impacts resulting from each measure's implementation were estimated for two periods: 2035 and 2050.

To model the measure in the EPS, a FPRR and a "policy" scenario were developed, projecting out assumptions and key inputs related to the measure to 2050. The FPRR scenario assumes no implementation of the reduction measure while the policy scenario assumes full implementation of the measure.

The EPS provides emissions and policy impact estimates only at the state level, without geographic resolution for sub-state regions. To analyze impacts within the 29-county Atlanta MSA, we applied a population-based downscaling approach.

Specifically, we used county-level population projections from official state demographic sources to calculate the share of Georgia's total population residing in the Atlanta 29 MSA counties for each year. This proportion was then used to scale down statewide EPS outputs (e.g., emissions, costs, and pollutant trajectories) to approximate regional values.

Modeling

This measure utilized the "Retrofit Existing Buildings" lever in the EPS under the "Buildings and Appliances" category. In this scenario, the model assumes that 100% of the urban and rural residential building stock is retrofitted by 2050. Retrofitting includes improvements in building efficiency, insulation, and appliance upgrades that collectively reduce overall energy demand in the residential sector.

The retrofit effort is paired with an increasing reliance on cleaner sources of electricity. Specifically, the "Distributed Solar Carve-out" lever is activated, with its maximum contribution set at 20%. Under this assumption, distributed solar deployment reaches

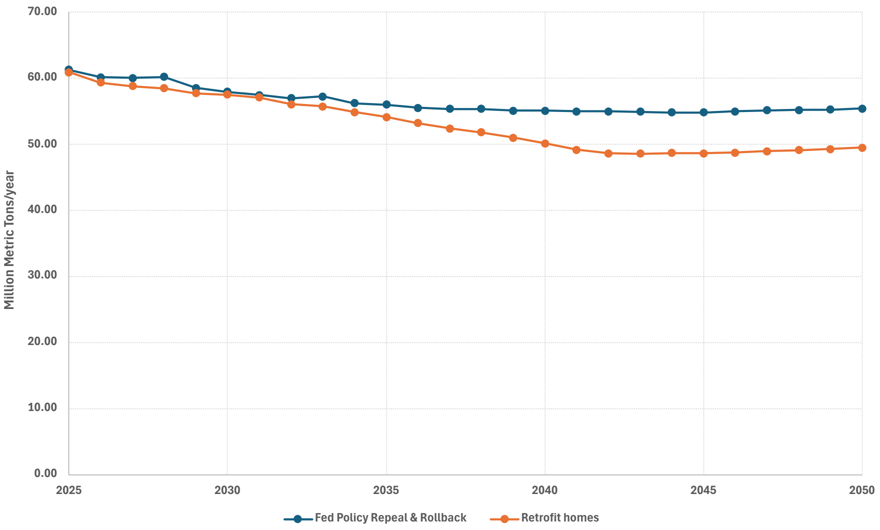
10% by 2035 and scales up to 50% by 2050. This gradual increase reflects both the technical feasibility of solar expansion and the expected pace of supportive policy implementation.

By combining a full retrofit of existing residential buildings with the expansion of distributed solar generation, the scenario captures both demand-side and supply-side strategies. On the demand side, retrofitting lowers energy intensity and reduces peak loads, while on the supply side, distributed solar displaces a growing share of fossil-based electricity with clean, renewable power.

4.3. Emission Reductions

Retrofitting reduces direct GHG emissions from residential heating, particularly by reducing energy demand and improving building envelope performance. These reductions stem primarily from lower energy-related CO_2 emissions, though process emissions also decline.

Figure 4.1. Projected CO_2e emissions over time



Changes in Co-Pollutants

Methane (CH_4) emissions consistently fall from the outset, while nitrogen oxides (NO_x) emissions spike at first before falling in the long-term. Notably, fluorinated gas (F-gas) emissions increase in the modeled scenario, potentially reflecting refrigerant use in some retrofit technologies.

In terms of criteria pollutants, this measure could provide significant reductions in fine and coarse particulate matter ($PM_{2.5}$ and PM_{10}) emissions, which would lead to major improvements in public health and air quality.

Table 4.2. Projected Annual Pollution Reduction

GHG Emissions Reductions Compared to the FPRR (MMTCO$_2$e/year)

Greenhouse Gases	**2035**	**2050**
Carbon Dioxide (CO_2)	1.859	5.748
Methane (CH_4)	0.004	0.007
Nitrous Oxide (N_2O)	0.000	0.000
Fluorinated Gases (F-gases)	-0.041	-0.032

Co-Pollutants Emissions Reductions Compared to the FPRR (Thousand Metric Tons/year)

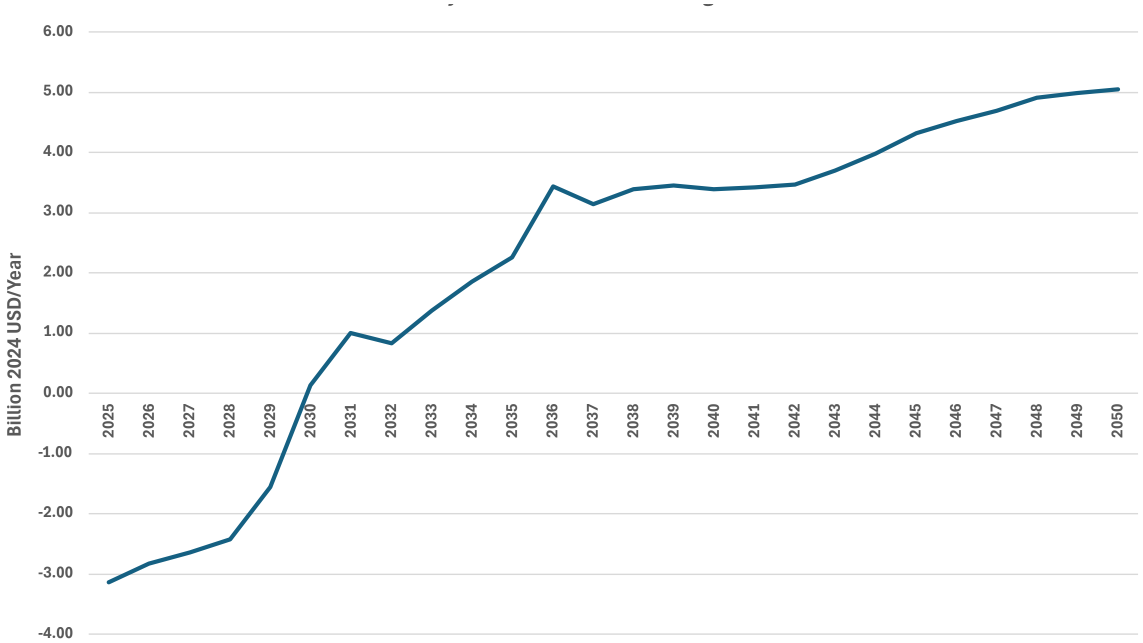
Co-Pollutants	**2035**	**2050**
Fine Particulate Matter ($PM_{2.5}$)	0.827	1.869
Coarse Particulate Matter (PM_{10})	0.858	1.995
Black Carbon (BC)	0.035	0.074
Organic Carbon (OC)	0.541	1.157
Nitrogen Oxides (NO_x)	0.000	0.004
Volatile Organic Compounds (VOC)	0.418	0.936
Sulfur Oxides (SO_x)	-0.001	0.000
Carbon Monoxide (CO)	0.003	0.005

4.4. Cost and Savings

Retrofitting results in steadily increasing net cost savings over time. In the early years (2025–2029), capital expenditures (CapEx) for retrofits outweigh operational savings, leading to negative net savings. However, beginning around 2030, substantial reductions in fuel and operations and maintenance (O&M) costs surpass initial investments, and net savings turn positive. From 2030 onward, savings grow consistently, with a sharp increase through the mid-2030s as deeper retrofits and efficiency measures compound. By the 2040s, the trajectory shows stable and accelerating gains, with annual net savings exceeding $5 billion (2024 USD) by 2050.

Retrofitting is therefore highly cost-effective in the long term, but achieving these benefits depends on sustained upfront investment, policy support, and programmatic continuity to ensure that cost savings, emissions reductions, and health co-benefits are fully realized.

Figure 4.2. Projected Annual Savings



4.5. Summary Metrics for Target Years

Table 4.3. Metrics for 2035

Metric	Value
Annual GHG Reductions	1.92 MMT CO_2e
Annual Non-GHG Reductions	0.45 MMT co-pollutants
Annual Net Savings	0.09 Billion 2024 USD
Total GHG Reductions (2025-2035)	11.52 MMT CO_2e
Total Non-GHG Reductions (2025-2035)	0.17 MMT Co-pollutants
Total Net Savings (2025–2035)	-5.76 Billion 2024 USD

Table 4.3. Metrics for 2050

Metric	Value
Annual GHG Reductions	5.92 MMT CO_2e
Annual Non-GHG Reductions	0.36 MMT Co-pollutants
Annual Net Savings	-0.70 Billion 2024 USD
Total GHG Reductions (2025-2050)	90.56 MMT CO_2e
Total Non-GHG Reductions (2025-2050)	0.124 MMT Co-pollutants
Total Net Savings (2025–2050)	5.05 Billion 2024 USD

5. Support local governments in adopting more efficient residential energy codes and/or green building standards

Table 5.1. Top-line values for target years

	2035	2050
GHG Emissions Reductions Compared to the Federal Rollback ($MMTCO_2e$)	0.88	11.61
Net Cost of Carbon Reduction (2024$/$MTCO_2e$)*	-1,272	-676

*Negative costs constitute positive savings.

5.1. Overview

This workbook estimates the GHG reduction potential and total costs/benefits of the “Support local governments in adopting more efficient energy codes and/or green building standards” measure.

5.2. Modeling Assumptions

This measure was modeled using the RMI’s EPS, an “open-source model for estimating the environmental, economic, and human health impacts of hundreds of climate and energy policies.” Environmental, economic, and human health impacts resulting from each measure’s implementation were estimated for two periods: 2035 and 2050.

To model the measure in the EPS, the FPRR and a “policy” scenario were developed, projecting out assumptions and key inputs related to the measure to 2050. The FPRR scenario assumes no implementation of the reduction measure while the policy scenario assumes full implementation of the measure.

The EPS provides emissions and policy impact estimates only at the state level, without geographic resolution for sub-state regions. To analyze impacts within the 29-county Atlanta MSA, we applied a population-based downscaling approach.

Specifically, we used county-level population projections from official state demographic sources to calculate the share of Georgia's total population residing in the Atlanta 29 MSA counties for each year. This proportion was then used to scale down statewide EPS outputs (e.g., emissions, costs, and pollutant trajectories) to approximate regional values.

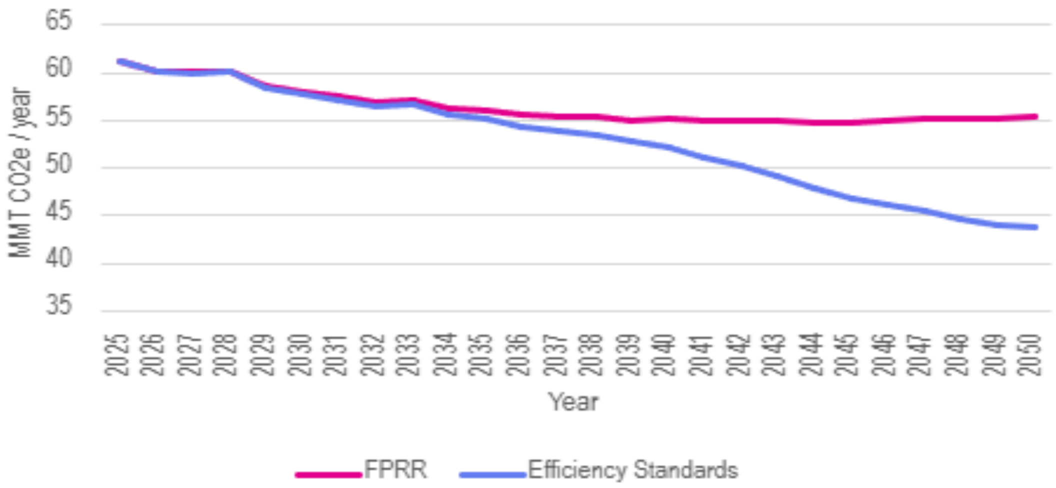
Modeling

This measure used the EPS "Building Energy Efficiency Standards" lever. For both urban and rural residential buildings, all component categories (heating, cooling, ventilation, lighting, appliances, and envelopes) were selected. The figures presented here reflect the impacts of the technical potential scenario, which was modeled as a 75% energy use reduction applied across all urban and rural residential components, to be achieved between 2027 and 2050. Data is also available for an achievable scenario, which is modeled as transitioning from the current residential codes, the 2015 International Energy Conservation Code (IECC), to the most recent 2024 IECC, projected to reduce energy use by 18.2% (DOE Infographics 2025). The EPS lever was adjusted to reflect an 18% reduction in energy use from all selected components by 2050, starting at 0% in 2026.

It should be noted that building codes in most states do not necessarily include all of the building components that are selected in the EPS; appliances, for example, are usually omitted from building energy efficiency standards. Thus, the EPS likely overestimates the true impact of changing only building codes. However, these additional emissions could be achieved through programs aimed at increasing the adoption of Energy Star technologies and other efficiency improvements.

5.3. Emission Reductions

Figure 5.1. Projected CO2e emissions over time



Changes in Co-Pollutants

In terms of criteria pollutants, this measure could provide significant reductions in fine and coarse particulate matter emissions, which would lead to major improvements in public health and air quality.

Table 5.2. Projected Annual Pollution Reduction

GHG Emissions Reductions Compared to the FPRR (MMTCO$_2$e/year)

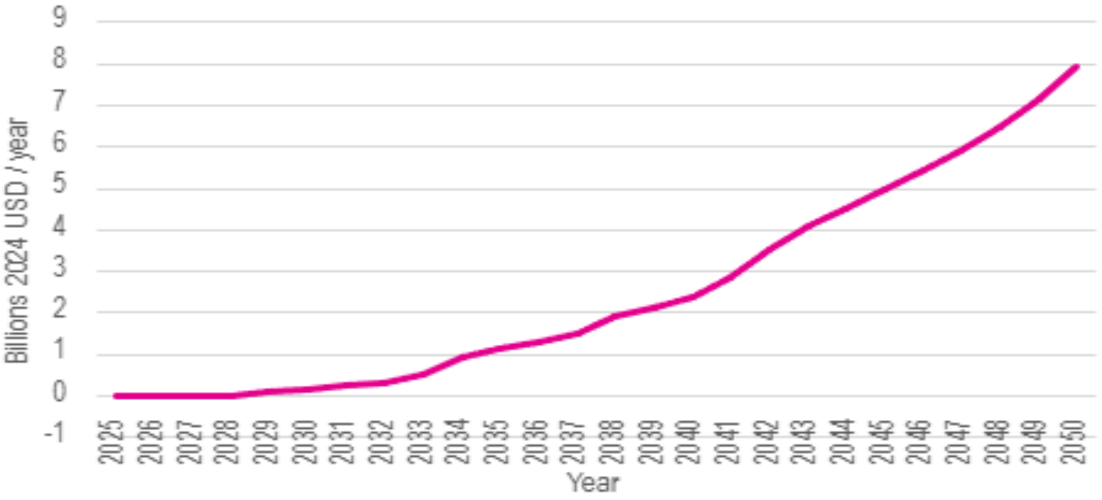
Greenhouse Gases	**2035**	**2050**
Carbon Dioxide (CO2)	0.83	11.17
Methane (CH_4)	0.054	0.45
Nitrous Oxide (N_2O)	-0.0011	0.038
Fluorinated Gases (F-gases)	-0.0024	-0.043

Co-Pollutants Emissions Reductions Compared to the FPRR (Thousand Metric Tons/year)

Co-Pollutants	**2035**	**2050**
Fine Particulate Matter (PM 2.5)	0.2807	1.9879
Coarse Particulate Matter (PM 10)	0.2929	2.1176
Black Carbon (BC)	0.0124	0.0902
Organic Carbon (OC)	0.1752	1.1597
Nitrogen Oxides (NO_x)	0.0003	0.0041
Volatile Organic Compounds (VOC)	0.1809	1.2394
Sulfur Oxides (SO_x)	-0.0005	0.0001
Carbon Monoxide (CO)	0.0008	0.0060

5.4. Cost Savings

Figure 5.2. Projected Annual Savings



5.5. Summary Metrics for Target Years

Table 5.3. Metrics for 2035

Metric	Value
Annual GHG Reductions	0.88 MMT CO_2e
Annual Non-GHG Reductions	0.94 MMT Co-pollutants
Annual Net Savings	1.12 Billion 2024 USD
Total GHG Reductions (2025-2035)	3.08 MMT CO_2e
Total Non-GHG Reductions (2025-2035)	3.43 MMT Co-pollutants
Total Net Savings (2025–2035)	3.32 Billion 2024 USD

Table 5.4. Metrics for 2050

Metric	Value
Annual GHG Reductions	11.61 MMT CO_2e
Annual Non-GHG Reductions	6.60 MMT Co-pollutants
Annual Net Savings	7.95 Billion 2024 USD
Total GHG Reductions (2025-2050)	94.42 MMT CO_2e
Total Non-GHG Reductions (2025-2050)	59.14 MMT Co-pollutants
Total Net Savings (2025–2050)	65.48 Billion 2024 USD

6. Electrify existing homes

Table 6.1. Top-line values for target years

	2035	2050
GHG Emissions Reductions Compared to the Federal Rollback ($MMTCO_2e$)	0.60	2.16
Net Cost of Carbon Reduction (2024$/$MTCO_2e$)*	-350	-190

*Negative costs constitute positive savings.

6.1. Overview

This workbook estimates the GHG reduction potential and total costs/benefits of the "Electrify existing homes" measure.

6.2. Modeling Assumptions

This measure was modeled using the RMI's EPS, an "open-source model for estimating the environmental, economic, and human health impacts of hundreds of climate and energy policies." Environmental, economic, and human health impacts resulting from each measure's implementation were estimated for two periods: 2035 and 2050.

To model the measure in the EPS, a FPRR and a "policy" scenario were developed, projecting out assumptions and key inputs related to the measure to 2050. The FPRR scenario assumes no implementation of the reduction measure while the policy scenario assumes full implementation of the measure.

The EPS provides emissions and policy impact estimates only at the state level, without geographic resolution for sub-state regions. To analyze impacts within the 29-county Atlanta MSA, we applied a population-based downscaling approach.

Specifically, we used county-level population projections from official state demographic sources to calculate the share of Georgia's total population residing in the Atlanta 29 MSA counties for each year. This proportion was then used to scale down statewide EPS outputs (e.g., emissions, costs, and pollutant trajectories) to approximate regional values.

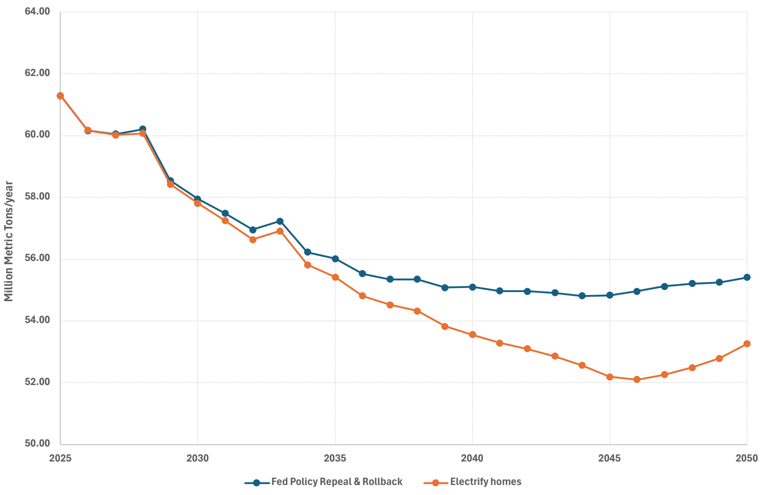
Modeling

Electrification was modeled using the EPS "Building Component Electrification" lever, which replaces a specified percentage of newly sold fossil-fueled systems with electric alternatives. The results presented here reflect the technical potential scenario, assuming 100% electrification of heating, appliances, and other components between 2027 and 2050 for both urban and rural residential buildings. This approach captures the effect of full stock turnover, as all new system sales are electric from 2027 onward, leading to the complete replacement of fossil-fueled systems over the lifetime of the equipment.

The electrification strategy is paired with greater reliance on clean electricity through the "Distributed Solar Carve-out" lever. In this scenario, distributed solar is capped at a maximum of 20%, with adoption reaching 10% by 2035 and scaling to 50% by 2050. This combined package reflects both the pace of equipment turnover in the building sector and the parallel shift in the electricity supply mix toward renewable sources.

6.3. Emission Reductions

Figure 6.1. Projected CO_2e emissions over time



Changes in Co-Pollutants

In terms of criteria pollutants, this measure could provide significant reductions in fine and coarse particulate matter emissions, which would lead to major improvements in public health and air quality.

Table 6.2. Projected Annual Pollution Reduction

GHG Emissions Reductions Compared to the FPRR (MMTCO$_2$e/year)

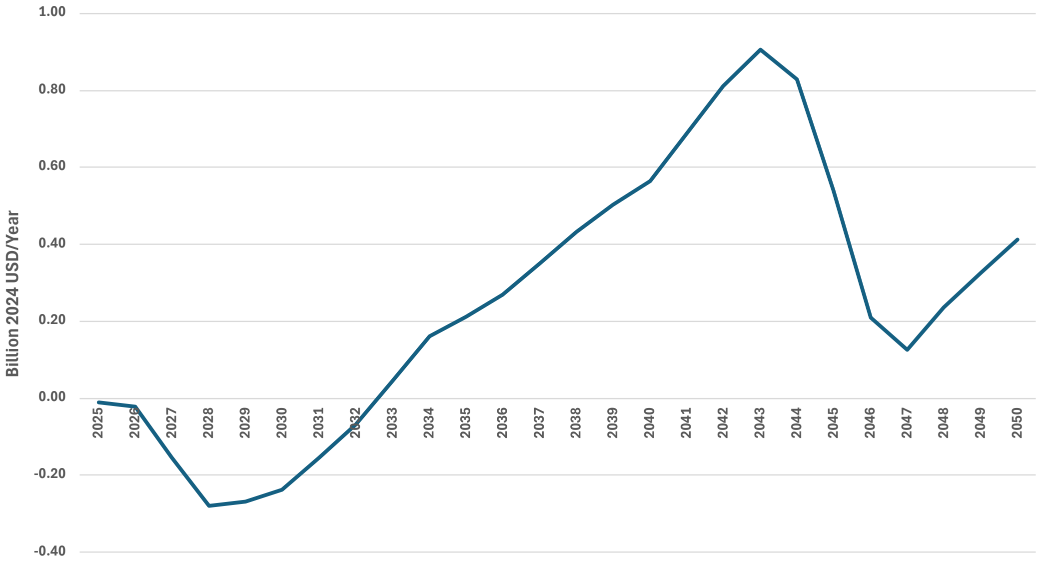
Greenhouse Gases	**2035**	**2050**
Carbon Dioxide (CO_2)	0.582	2.138
Methane (CH_4)	0.001	0.002
Nitrous Oxide (N_2O)	0.000	0.000
Fluorinated Gases (F-gases)	-0.006	-0.019

Co-Pollutants Emissions Reductions Compared to the FPRR (Thousand Metric Tons/year)

Co-Pollutants	**2035**	**2050**
Fine Particulate Matter ($PM_{2.5}$)	0.233	1.159
Coarse Particulate Matter (PM_{10})	0.248	1.252
Black Carbon (BC)	0.008	0.037
Organic Carbon (OC)	0.166	0.771
Nitrogen Oxides (NO_x)	0.000	0.002
Volatile Organic Compounds (VOC)	0.085	0.358
Sulfur Oxides (SO_x)	0.000	0.000
Carbon Monoxide (CO)	0.000	0.002

6.4. Cost Savings

Figure 6.2. Projected Annual Savings



6.5. Summary of Metrics for Target Years

Table 6.3. Metrics for 2035

Metric	Value
Annual GHG Reductions	0.60 MMT CO_2e
Annual Non-GHG Reductions	0.793 MMT Co-pollutants
Annual Net Savings	0.21 Billion 2024 USD
Total GHG Reductions (2025-2035)	2.32 MMT CO_2e
Total Non-GHG Reductions (2025-2035)	9.53 MMT Co-pollutants
Total Net Savings (2025–2035)	-0.78 Billion 2024 USD

Table 6.4. Metrics for 2050

Metric	Value
Annual GHG Reductions	2.16MMT CO_2e
Annual Non-GHG Reductions	0.601 MMT Co-pollutants
Annual Net Savings	0.41 Billion 2024 USD
Total GHG Reductions (2025-2050)	31.21 MMT CO_2e
Total Non-GHG Reductions (2025-2050)	19.59 MMT Co-pollutants
Total Net Savings (2025–2050)	6.43 Billion 2024 USD

Commercial Buildings

7. Increase energy efficiency retrofitting of existing commercial buildings

Table 7.1. Top-line values for target years

	2035	**2050**
GHG Emissions Reductions Compared to the Federal Rollback (MMTCO$_2$e)	0.60	3.55
Net Cost of Carbon Reduction (2024$/MTCO$_2$e)*	-4,217	606

*Negative costs constitute positive savings.

Note: The initial savings decline and become costs over time as commercial buildings are built more efficiently and opportunities for cost-effective retrofitting decrease.

Note: The initial savings decline and become costs over time as office and other commercial buildings are built more efficiently and opportunities for cost-effective retrofitting decrease.

7.1. Overview

This workbook estimates the GHG reduction potential and total costs/benefits of the “Increase Energy Efficiency Retrofitting of Existing Homes” measure.

7.2. Modeling Assumptions

This measure was modeled using the RMI’s EPS, an “open-source model for estimating the environmental, economic, and human health impacts of hundreds of climate and energy policies.” Environmental, economic, and human health impacts resulting from each measure’s implementation were estimated for two periods: 2035 and 2050.

To model the measure in the EPS, a FPRR and a “policy” scenario were developed, projecting out assumptions and key inputs related to the measure to 2050. The FPRR scenario assumes no implementation of the reduction measure while the policy scenario assumes full implementation of the measure.

The EPS provides emissions and policy impact estimates only at the state level, without geographic resolution for sub-state regions. To analyze impacts within the 29-county Atlanta MSA, we applied a population-based downscaling approach.

Specifically, we used historical county-level employment data by industry from the US Census Bureau data to project the share of Georgia’s total commercial jobs operating in the Atlanta 29 MSA counties for each year. This proportion was then used to scale down statewide EPS outputs (e.g., emissions, costs, and pollutant trajectories) to approximate regional values.

Modeling

This measure utilized the “Retrofit Existing Buildings” lever in the EPS under the “Buildings and Appliances” category. In this scenario, the model assumes that 100% of commercial and industrial building stock is retrofitted by 2050. Retrofitting includes improvements in building efficiency, insulation, and appliance upgrades that collectively reduce overall energy demand in the residential sector.

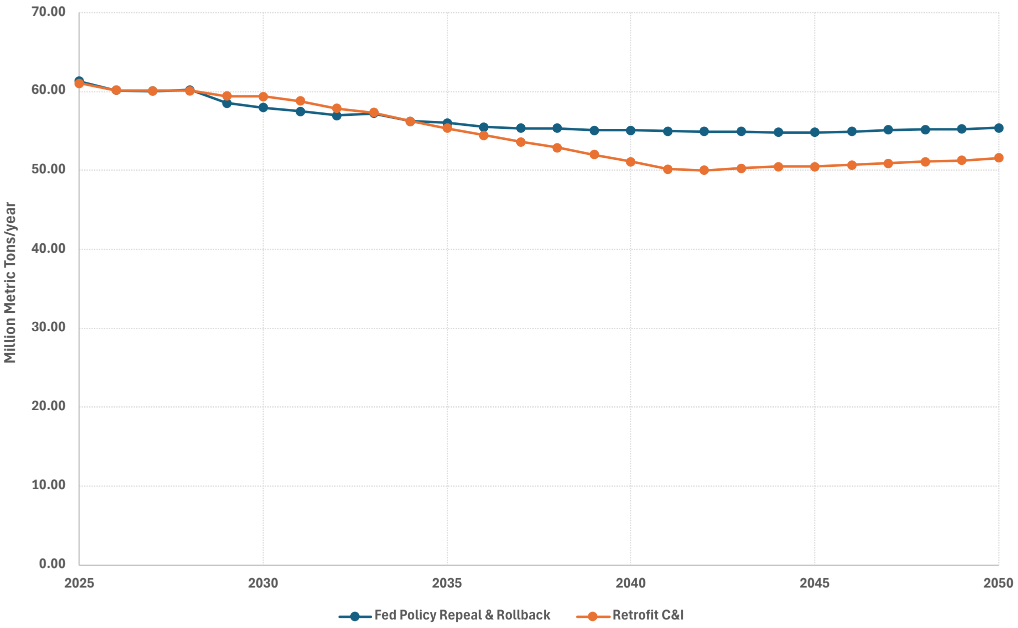
The retrofit effort is paired with an increasing reliance on cleaner sources of electricity. Specifically, the “Distributed Solar Carve-out” lever is activated, with its maximum contribution set at 20%. Under this assumption, distributed solar deployment reaches 10% by 2035 and scales up to 50% by 2050. This gradual increase reflects both the technical feasibility of solar expansion and the expected pace of supportive policy implementation.

The split between industrial and commercial buildings was based on relative energy consumption shares: industry accounts for ~6.8% and the commercial sector accounts for ~93.2% of the energy consumed in commercial and industrial (C&I) buildings in Georgia. These values were derived from the 2018 CBECS (Commercial Buildings Energy Consumption Survey) and MECS (Manufacturing Energy Consumption Survey) datasets for the U.S. It should also be noted that the C&I sector is expected to experience rapid growth nationally over the next decade, which makes achieving substantial emissions reductions by 2035 more challenging, even under aggressive retrofit assumptions.

7.3. Emission Reductions

Retrofitting reduces direct GHG emissions from commercial heating, cooling, and ventilation, particularly by reducing energy demand and improving building envelope performance. These reductions stem primarily from lower energy-related CO_2 emissions, though process emissions also decline.

Figure 7.1. Projected GHG Emissions



Changes in Co-Pollutants

In terms of criteria pollutants, this measure could provide significant reductions in fine and coarse particulate matter emissions, which would lead to major improvements in public health and air quality.

Table 7.2. Projected Annual Pollution Reduction

GHG Emissions Reductions Compared to the FPRR (MMTCO$_2$e/year)

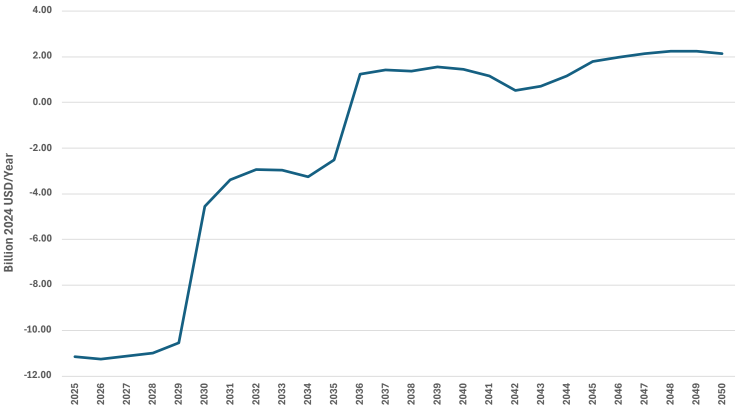
Greenhouse Gases	**2035**	**2050**
Carbon Dioxide (CO_2)	0.6602	3.4673
Methane (CH_4)	0.0008	0.0037
Nitrous Oxide (N_2O)	-0.0002	0.0000
Fluorinated Gases (F-gases)	-0.0543	-0.0252

Co-Pollutants Emissions Reductions Compared to the FPRR (Thousand Metric Tons/year)

Co-Pollutants	**2035**	**2050**
Fine Particulate Matter ($PM_{2.5}$)	0.1165	0.6869
Coarse Particulate Matter (PM_{10})	0.1016	0.7402
Black Carbon (BC)	0.0041	0.0320
Organic Carbon (OC)	0.1184	0.4121
Nitrogen Oxides (NO_x)	-0.0003	0.0024
Volatile Organic Compounds (VOC)	-0.1141	0.3019
Sulfur Oxides (SO_x)	-0.0006	0.0002
Carbon Monoxide (CO)	0.0001	0.0018

7.4. Cost Savings

Figure 7.2. Projected Annual Savings



7.5. Summary of Metrics for Target Years

Table 7.3. Metrics for 2035

Metric	**Value**
Annual GHG Reductions	0.60 MMT CO_2e
Annual Non-GHG Reductions	-0.10 MMT Co-pollutants
Annual Net Savings	-2.53 Billion 2024 USD
Total GHG Reductions (2025-2035)	-3.50 MMT CO_2e
Total Non-GHG Reductions (2025-2035)	-0.04 MMT Co-pollutants
Total Net Savings (2025–2035)	-74.65 Billion 2024 USD

Table 7.4. Metric for 2050

Metric	**Value**
Annual GHG Reductions	3.55 MMT CO2e
Annual Non-GHG Reductions	0.11 MMT Co-pollutants
Annual Net Savings	2.15 Billion 2024 USD
Total GHG Reductions (2025-2050)	48.41 MMT CO_2e
Total Non-GHG Reductions (2025-2050)	0.32 MMT Co-pollutants
Total Net Savings (2025–2050)	-51.51 Billion 2024 USD

8. Support local governments in adopting more efficient commercial energy codes and/or green building standards

Table 8.1. Top-line values for target years

	2035	**2050**
GHG Emissions Reductions Compared to the Federal Rollback ($MMTCO_2e$)	0.57	11.03
Net Cost of Carbon Reduction (2024$/$MTCO_2e$)*	-1,912.3	-517.7

*Negative costs constitute positive savings.

8.1. Overview

This workbook estimates the GHG reduction potential and total costs/benefits of the “Support local governments in adopting more efficient energy codes and/or green building standards” measure.

8.2. Modeling Assumptions

This measure was modeled using the RMI's EPS, an "open-source model for estimating the environmental, economic, and human health impacts of hundreds of climate and energy policies." Environmental, economic, and human health impacts resulting from each measure's implementation were estimated for two periods: 2035 and 2050.

To model the measure in the EPS, a FPRR and a "policy" scenario were developed, projecting out assumptions and key inputs related to the measure to 2050. The FPRR scenario assumes no implementation of the reduction measure while the policy scenario assumes full implementation of the measure.

The EPS provides emissions and policy impact estimates only at the state level, without geographic resolution for sub-state regions. To analyze impacts within the 29-county Atlanta MSA, we applied a population-based downscaling approach.

Specifically, we used historical county-level employment data by industry from the US Census Bureau data to project the share of Georgia's total commercial jobs operating in the Atlanta 29 MSA counties for each year. This proportion was then used to scale down statewide EPS outputs (e.g., emissions, costs, and pollutant trajectories) to approximate regional values.

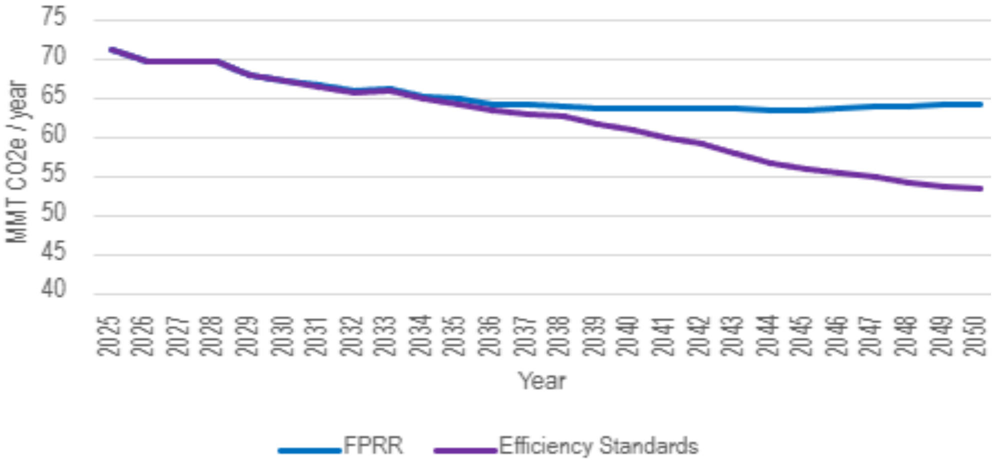
Modeling

This measure used the EPS "Building Energy Efficiency Standards" lever. For commercial buildings, all component categories (heating, cooling, ventilation, lighting, appliances, and envelopes) were selected. Data presented here reflects the impacts of the technical potential scenario, which was modeled as a 75% energy use reduction applied across all commercial components, to be achieved between 2027 and 2050. Data is also available for an achievable scenario, which is modeled as transitioning from the current commercial building codes (ASHRAE 90.1-2022) to the most recent 2022 version, projected to reduce energy use by 25.9% (DOE Infographics 2025). The EPS lever was adjusted to reflect an 26% reduction in energy use from selected building components by 2050, starting at 0% in 2026.

It should be noted that building codes in most states do not necessarily include all of the building components that are selected in the EPS; appliances, for example, are usually omitted from building energy efficiency standards. Thus, the EPS likely overestimates the true impact of changing only building codes. However, these additional emissions could be achieved through programs aimed at increasing the adoption of Energy Star technologies and other efficiency improvements.

8.3. Emission Reductions

Figure 8.1. Projected GHG Emissions



Changes in Co-Pollutants

In terms of criteria pollutants, this measure could provide significant reductions in fine and coarse particulate matter emissions, which would lead to major improvements in public health and air quality.

Table 8.2. Projected Annual Pollution Reduction

GHG Emissions Reductions Compared to the FPRR (MMTCO2e/year)

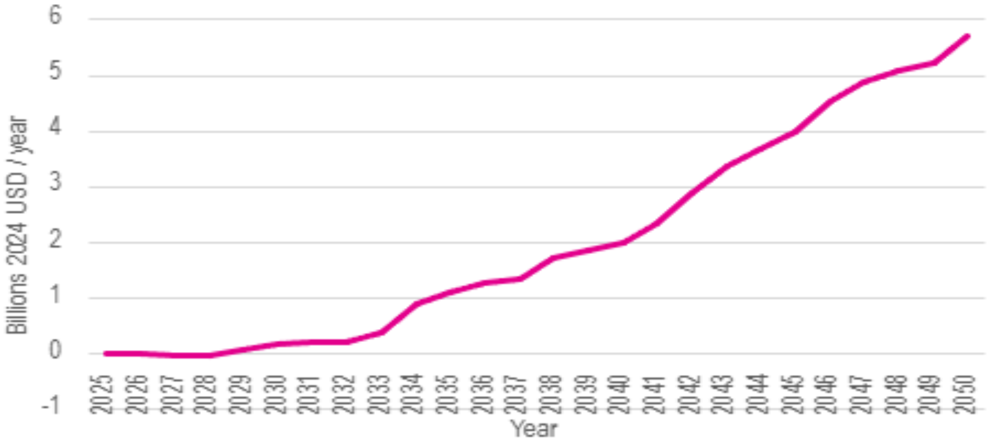
Greenhouse Gases	**2035**	**2050**
Carbon Dioxide (CO_2)	0.52	10.56
Methane (CH_4)	0.055	0.44
Nitrous Oxide (N_2O)	-0.0031	0.060
Fluorinated Gases (F-gases)	-0.0030	-0.031

Co-Pollutants Emissions Reductions Compared to the FPRR (Thousand Metric Tons/year)

Co-Pollutants	**2035**	**2050**
Fine Particulate Matter ($PM_{2.5}$)	0.0974	0.9976
Coarse Particulate Matter (PM_{10})	0.0974	1.0877
Black Carbon (BC)	0.0053	0.0541
Organic Carbon (OC)	0.0707	0.5425
Nitrogen Oxides (NO_x)	0.0000	0.0038
Volatile Organic Compounds (VOC)	0.0687	0.7464
Sulfur Oxides (SO_x)	-0.0005	0.0002
Carbon Monoxide (CO)	0.0000	0.0030

8.4. Cost Savings

Figure 8.2. Projected Annual Savings



8.5. Summary Metrics for Target Years

Table 8.3. Metrics for 2035

Metric	Value
Annual GHG Reductions	0.57 MMT CO_2e
Annual Non-GHG Reductions	0.34 MMT Co-pollutants
Annual Net Savings	1.09 Billion 2024 USD
Total GHG Reductions (2025-2035)	1.94 MMT CO_2e
Total Non-GHG Reductions (2025-2035)	0.97 MMT Co-pollutants
Total Net Savings (2025–2035)	2.95 Billion 2024 USD

Table 8.4. Metrics for 2050

Metric	Value
Annual GHG Reductions	11.03 MMT CO_2e
Annual Non-GHG Reductions	3.44 MMT Co-pollutants
Annual Net Savings	5.71 Billion 2024 USD
Total GHG Reductions (2025-2050)	87.06 MMT CO_2e
Total Non-GHG Reductions (2025-2050)	20.83 MMT Co-pollutants
Total Net Savings (2025–2050)	52.87 Billion 2024 USD

9. Electrify existing commercial buildings

Table 9.1. Top-line values for target years

	2035	2050
GHG Emissions Reductions Compared to the Federal Rollback (MMTCO$_2$e)	0.60	1.98
Net Cost of Carbon Reduction (2024$/MTCO$_2$e)*	-1.7	20.2

*Negative costs constitute positive savings.

Note: Unlike electrification of residential buildings which is cost-effective across the full 20-year period, initial savings convert to costs over time for electrifying commercial buildings. Most Georgia homes today have electric heat; few commercial buildings in Georgia today have electric heat. Electrification of these two sectors may address different energy uses in buildings.

9.1. Overview

This workbook estimates the GHG reduction potential and total costs/benefits of the "Support local governments in adopting more efficient energy codes and/or green building standards" measure.

9.2. Modeling Assumptions

This measure was modeled using the RMI's EPS, an "open-source model for estimating the environmental, economic, and human health impacts of hundreds of climate and energy policies." Environmental, economic, and human health impacts resulting from each measure's implementation were estimated for two periods: 2035 and 2050.

To model the measure in the EPS, a FPRR and a "policy" scenario were developed, projecting out assumptions and key inputs related to the measure to 2050. The FPRR scenario assumes no implementation of the reduction measure while the policy scenario assumes full implementation of the measure.

The EPS provides emissions and policy impact estimates only at the state level, without geographic resolution for sub-state regions. To analyze impacts within the 29-county Atlanta MSA, we applied a population-based downscaling approach.

Specifically, we used historical county-level employment data by industry from the US Census Bureau data to project the share of Georgia's total commercial jobs operating in the Atlanta 29 MSA counties for each year. This proportion was then used to scale down statewide EPS outputs (e.g., emissions, costs, and pollutant trajectories) to approximate regional values.

Modeling

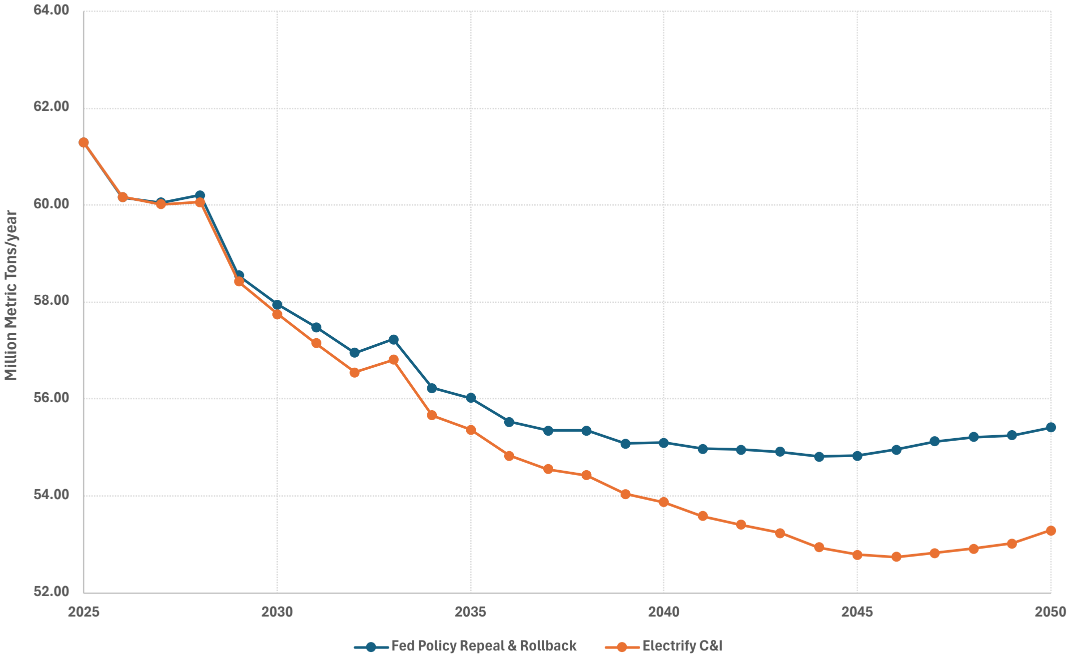
Electrification was modeled using the EPS "Building Component Electrification" lever, which replaces a specified percentage of newly sold fossil-fueled systems with electric alternatives. The results presented here reflect the technical potential scenario, assuming 100% electrification of heating, appliances, and other components between 2027 and 2050 for commercial & industrial buildings. This approach captures the effect of full stock turnover, as all new system sales are electric from 2027 onward, leading to the complete replacement of fossil-fueled systems over the lifetime of the equipment.

The electrification strategy is paired with greater reliance on clean electricity through the “Distributed Solar Carve-out” lever. In this scenario, distributed solar is capped at a maximum of 20%, The electrification strategy is paired with greater reliance on clean electricity through the “Distributed Solar Carve-out” lever. In this scenario, distributed solar is capped at a maximum of 20%, with adoption reaching 10% (equating to 2%) by 2035 and scaling to 50% (equating to 10%) by 2050. This combined package reflects both the pace of equipment turnover in the building sector and the parallel shift in the electricity supply mix toward renewable sources.

The split between industrial and commercial buildings was based on relative energy consumption shares: industry accounts for ~6.8% and the commercial sector accounts for ~93.2% of the energy consumed in commercial and industrial (C&I) buildings in Georgia. These values were derived from the 2018 CBECS (Commercial Buildings Energy Consumption Survey) and MECS (Manufacturing Energy Consumption Survey) datasets for the U.S. It should also be noted that the C&I sector is expected to experience rapid growth nationally over the next decade, which makes achieving substantial emissions reductions by 2035 more challenging, even under aggressive retrofit assumptions.

9.3. Emission Reductions

Figure 9.1. Projected GHG Emissions



Changes in Co-Pollutants

In terms of criteria pollutants, this measure could provide significant reductions in fine and coarse particulate matter emissions, which would lead to major improvements in public health and air quality.

Table 9.2. Projected Annual Pollution Reduction

GHG Emissions Reductions Compared to the FPRR (MMTCO$_2$e/year)

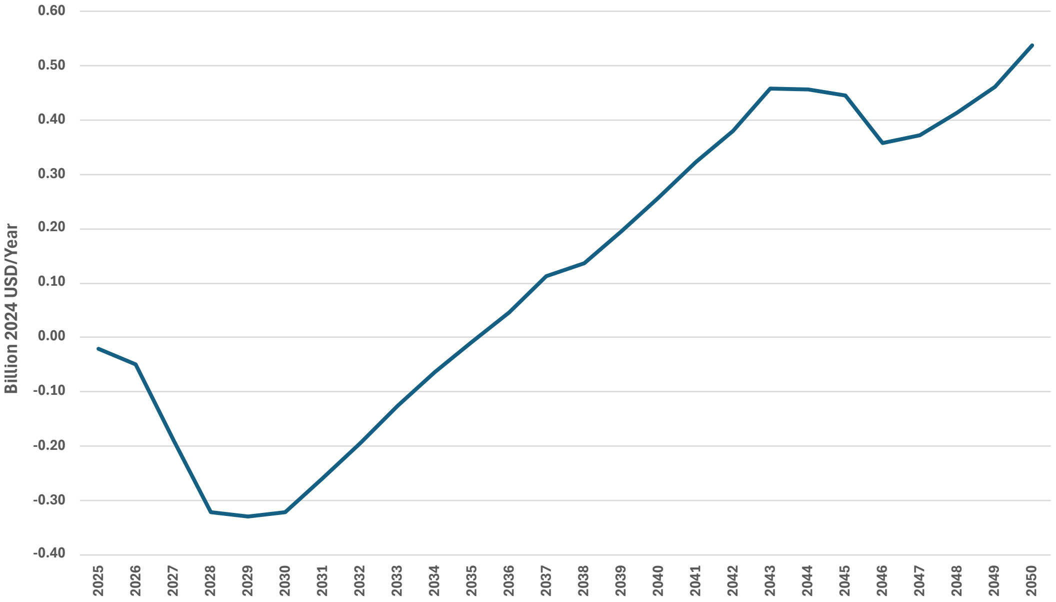
Greenhouse Gases	**2035**	**2050**
Carbon Dioxide (CO_2)	0.595	1.956
Methane (CH_4)	0.001	0.001
Nitrous Oxide (N_2O)	-0.000	0.000
Fluorinated Gases (F-gases)	-0.006	-0.015

Co-Pollutants Emissions Reductions Compared to the FPRR (Thousand Metric Tons/year)

Co-Pollutants	**2035**	**2050**
Fine Particulate Matter ($PM_{2.5}$)	0.1142	0.5386
Coarse Particulate Matter (PM_{10})	0.1215	0.5834
Black Carbon (BC)	0.0049	0.0229
Organic Carbon (OC)	0.0755	0.3338
Nitrogen Oxides (NO_x)	0.0001	0.0019
Volatile Organic Compounds (VOC)	0.0361	0.1855
Sulfur Oxides (SO_x)	-0.0001	0.0001
Carbon Monoxide (CO)	0.0002	0.0010

9.4. Cost Savings

Figure 9.2. Projected Annual Savings



9.5. Summary of Metrics for Target Years

Table 9.3. Metric for 2035

Metric	Value
Annual GHG Reductions	0.60 MMT CO_2e
Annual Non-GHG Reductions	0.1 MMT Co-pollutants
Annual Net Savings	-0.01 Billion 2024 USD
Total GHG Reductions (2025-2035)	2.67 MMT CO_2e
Total Non-GHG Reductions (2025-2035)	0 MMT Co-pollutants
Total Net Savings (2025–2035)	-1.88 Billion 2024 USD

Table 9.4. Metrics for 2050

Metric	Value
Annual GHG Reductions	1.98 MMT CO_2e
Annual Non-GHG Reductions	1 MMT Co-pollutants
Annual Net Savings	0.54 Billion2024 USD
Total GHG Reductions (2025-2050)	25.39 MMT CO_2e
Total Non-GHG Reductions (2025-2050)	1.5 MMT Co-pollutants
Total Net Savings (2025–2050)	3.07 Billion 2024 USD

Waste & Recycling

10. Reduce construction and demolition waste

Table 10.1. Top-line values for target years

	2035	**2050**
GHG Emissions Reductions Compared to the Federal Rollback (MMTCO$_2$e)	0.42	0.55
Net Cost of Carbon Reduction (2024$/MTCO$_2$e)*	-419	-538

*Negative costs constitute positive savings.

10.1. Overview

This workbook estimates the GHG reduction potential and total costs/benefits of the “Reduce construction and demolition waste” measure. This measure is calculated by scaling down the estimated GHG reduction potential of Georgia's priority measures proportionally using the population of the Atlanta MSA relative to the total population of the state.

10.2. Modeling Assumptions

This measure was modeled using the RMI’s EPS, an “open-source model for estimating the environmental, economic, and human health impacts of hundreds of climate and energy policies.” Environmental, economic, and human health impacts resulting from each measure’s implementation were estimated for two periods: 2035 and 2050.

To model the measure in the EPS, the FPRR and a “policy” scenario were developed, projecting out assumptions and key inputs related to the measure to 2050. The FPRR scenario assumes no implementation of the reduction measure while the policy scenario assumes a linear implementation of the measure with 50% implementation of the policy occurring in 2050.

Downscaling Assumptions

We used the percentage of ARC’s projected population within the 29-county MSA as compared to the state as whole to downscale the results from the RMI’s EPS tool, which provides results for the state of Georgia. Because people are a prerequisite for shifting modes of transportation, we use population.

Modeling

This measure used the EPS “Material Efficiency, Longevity, & Re-Use” lever. For the construction industry, all selected material categories (cement, iron, and steel waste) were included. Data presented here reflects the impacts of a 50% demand reduction applied across cement and iron & steel, to be achieved between 2027 and 2050. The EPS lever was adjusted to reflect a 50% reduction in material demand from selected construction materials by 2050, starting at 0% in 2026.

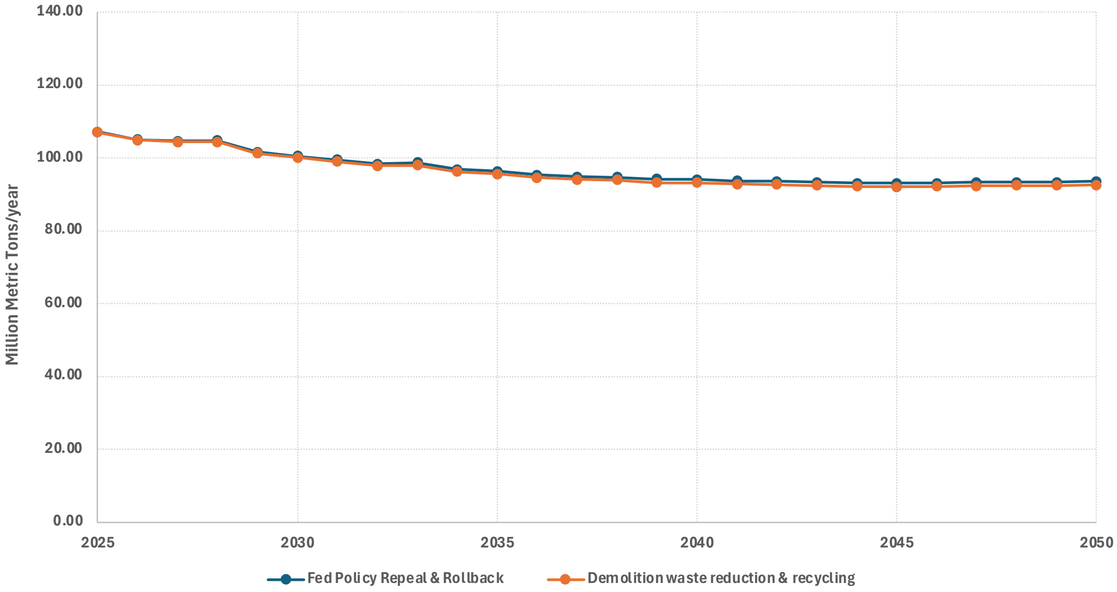
It should be noted that material efficiency policies in most jurisdictions do not necessarily include all the practices that are selected in the EPS; for example, requirements for re-use and longevity are often absent from current regulations. Thus, the EPS likely overestimates the true impact of changing only building codes. However, these additional reductions could be achieved through strategies such as material-efficient building design, optimized molds, requirements for greater building and infrastructure longevity, and increased re-use and re-purposing of buildings and materials.

Guidance from Allwood and Cullen (2015) (*Sustainable Materials Without the Hot Air*) suggests that concrete demand could ultimately be reduced by up to 70% through optimized molds and extended building lifetimes, while steel demand could be reduced by up to 65% through optimized designs, controlled loads, and doubled product lifetimes, if demand for floorspace and products reaches steady state.

10.3. Emissions Reductions

This measure drives reductions in GHG emissions over time. In 2035, emissions fall by 0.42 MMT CO_2e, increasing steadily to 0.55 MMT CO_2e annually by 2050, for a cumulative reduction of 8.64 MMT CO_2e from 2025 to 2050.

Figure 10.1. Projected Emissions GHG over time (Not scaled for MSA)



Changes in Co-Pollutants

Under the measure, pollutant-specific dynamics reflect reductions associated with lower demand for cement, iron, and steel, as well as avoided demolition waste. By reducing material throughput and extending the lifetime of buildings and infrastructure, the measure leads to decreases in co-pollutants linked to industrial production and construction activity. In terms of criteria pollutants, this measure could provide significant reductions in fine and coarse particulate matter emissions, which would lead to major improvements in public health and air quality.

Table 10.2. Projected Annual Pollution Reduction

GHG Emissions Reductions Compared to the FPRR ($MMTCO_2e$/year)

Greenhouse Gases	**2035**	**2050**
Carbon Dioxide (CO_2)	0.420	0.590
Methane (CH_4)	0.000	0.000
Nitrous Oxide (N_2O)	0.000	0.000
Fluorinated Gases (F-gases)	0.025	0.069

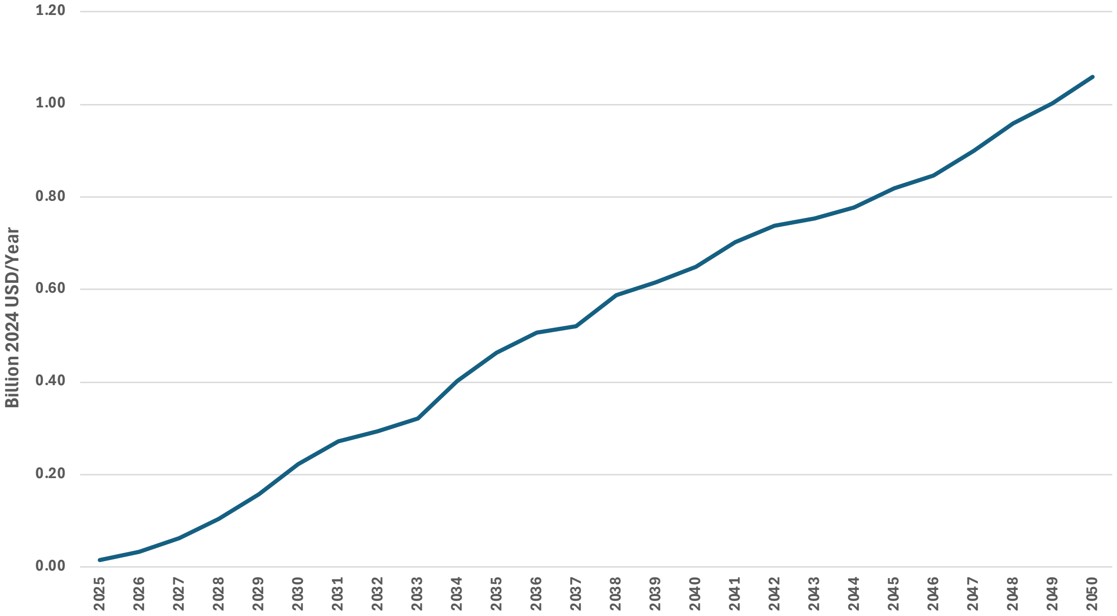
Co-Pollutants Emissions Reductions Compared to the FPRR (Thousand Metric Tons/year)

Co-Pollutants	**2035**	**2050**
Fine Particulate Matter ($PM_{2.5}$)	0.025	0.054
Coarse Particulate Matter (PM_{10})	0.030	0.065
Black Carbon (BC)	0.001	0.002
Organic Carbon (OC)	0.007	0.015
Nitrogen Oxides (NO_x)	0.000	0.000
Volatile Organic Compounds (VOC)	0.109	0.318
Sulfur Oxides (SO_x)	0.000	0.000
Carbon Monoxide (CO)	0.000	0.000

10.4. Cost Savings

The measure results in persistent net savings over the analysis period, reflecting the avoided costs of material demand, demolition waste, and associated processing. Annual net savings are relatively modest at first, beginning at $20 million in 2025 and $30 million in 2026, but rise steadily as efficiencies accumulate. By 2031, annual net savings reach $270 million, and they continue to grow thereafter.

Figure 10.2. Projected Annual Savings



By 2035, annual net savings increase to $460 million, and by 2050 they reach more than $1.06 billion per year. Cumulatively, from 2025 through 2050, the measure yields $13.79 billion in total net savings. This trajectory demonstrates that, unlike capital-intensive measures that depend on fuel offsets, the Material Efficiency (ME), Longevity, & Re-Use strategy generates consistent and growing financial benefits through reduced material demand and avoided waste generation.

10.5. Summary Metrics for Target Years

Table 10.3. Metrics for 2035

Metric	Value
Annual GHG Reductions	0.42MMT CO_2e
Annual Non-GHG Reductions	0.17 MMT Co-pollutants
Annual Net Savings	0.46 Billion 2024 USD
Total GHG Reductions (2025-2035)	2.65 MMT CO_2e
Total Non-GHG Reductions (2025-2035)	1.39 MMT Co-pollutants
Total Net Savings (2025–2035)	2.36 Billion 2024 USD

Table 10.4. Metrics for 2050

Metric	Value
Annual GHG Reductions	0.55 MMT CO_2e
Annual Non-GHG Reductions	0.78 MMT Co-pollutants
Annual Net Savings	1.06 Billion2024 USD
Total GHG Reductions (2025-2050)	10.52 MMT CO_2e
Total Non-GHG Reductions (2025-2050)	2.8 MMT Co-pollutants
Total Net Savings (2025–2050)	13.79 Billion 2024 USD

11. Reduce the amount of food, yard, and tree waste that goes into landfills by composting

Table 11.1. Top-line values for target years

	2035	2050
GHG Emissions Reductions Compared to the Federal Rollback ($MMTCO_2e$)	0.12	0.30
Net Cost of Carbon Reduction (2024$/$MTCO_2e$)*	22.4	22.4

*Negative costs constitute positive savings.

11.1. Overview

Increase diversion of waste from landfills.

Georgia's Environmental Protection Division (EPD) estimates that food waste in the Atlanta MSA averages 151 pounds per person/year.

- **Policy Options:** Strengthen home-pickup composting programs to divert waste from landfills in the Atlanta MSA by 22% by 2035 and 50% by 2050.
  - Offer personal composting equipment/education programs
- In comparison, the Atlanta MSA PCAP assumes higher rates of diversion: in Atlanta, 50% of waste was assumed to be diverted from landfills by 2030 and 75% by 2050; in other parts of the 29-county area, 40% of waste was assumed to be diverted by 2030 and 75% by 2050.

11.2. Modeling Assumptions

The EPA's WARM was utilized to estimate GHG emission reductions resulting from the diversion of waste from landfills. EPA's WARM model estimates life-cycle emissions impacts, which would occur over time. The Waste Reduction Model (WARM) also assumes that 0.15 metric tons of CO_2-equivalent (MTCO2-E) is avoided per ton of material composted. The WARM model also assumes that meat-only and non-meat are identical at 0.15 metric tons of CO_2e per ton of food waste composted.

Using these assumptions as input into the WARM model, the Atlanta MSA would experience an estimated reduction methane equivalent to: 118,862 tons of CO_{2e} in 2035 (i.e., 0.119 MMTCO2) and 299,105 tons of CO_{2e} in 2050 (i.e., 0.299 MMTCO2).

11.3. Cost and Savings

Based on the Drawdown Georgia project (Brown, et al., 2021, 2024), we assume that the net present value of the composting cost in 2035 per MMTCO2-e in 2035 is -$17 (in $2017), equivalent to approximately -$22 (in $2024), and there is no basis to support a change in that cost estimate over time.

Table 11.2. Projected Annual Pollution Reduction

GHG Emissions Reductions Compared to the FPRR (MMTCO$_2$e/year)

Greenhouse Gases	**2035**	**2050**
Carbon Dioxide (CO_2)	0.12	0.30
Methane (CH_4)	N/A	N/A
Nitrous Oxide (N_2O)	N/A	N/A
Fluorinated Gases (F-gases)	N/A	N/A

Co-Pollutants Emissions Reductions Compared to the FPRR (Thousand Metric Tons/year)

Co-Pollutants	**2035**	**2050**
Fine Particulate Matter ($PM_{2.5}$)	-0.0469	-0.1001
Coarse Particulate Matter (PM_{10})	-0.0575	-0.1202
Black Carbon (BC)	-0.029	-0.0071
Organic Carbon (OC)	-0.0158	-0.0347
Nitrogen Oxides (NO_x)	N/A	-0.0014
Volatile Organic Compounds (VOC)	N/A	-0.3481
Sulfur Oxides (SO_x)	-0.0001	-0.0002
Carbon Monoxide (CO)	-0.0003	-0.0009

Industrial

12. Increase energy efficiency retrofitting of existing industrial buildings

Table 12.1. Top-line values for target years

	2035	**2050**
GHG Emissions Reductions Compared to the Federal Rollback (MMTCO$_2$e)	0.04	0.26
Net Cost of Carbon Reduction (2024$/MTCO$_2$e)*	-4,500	615.4

*Negative costs constitute positive savings.

Note: The initial savings decline and become costs over time as office and other industrial buildings are built more efficiently and opportunities for cost-effective retrofitting decrease.

12.1. Overview

This workbook estimates the GHG reduction potential and total costs/benefits of the "Increase Energy Efficiency Retrofitting of Existing Homes" measure.

12.2. Modeling Assumptions

This measure was modeled using the RMI's EPS, an "open-source model for estimating the environmental, economic, and human health impacts of hundreds of climate and energy policies." Environmental, economic, and human health impacts resulting from each measure's implementation were estimated for two periods: 2035 and 2050.

To model the measure in the EPS, the FPRR and a "policy" scenario were developed, projecting out assumptions and key inputs related to the measure to 2050. The FPRR scenario assumes no implementation of the reduction measure while the policy scenario assumes full implementation of the measure.

The EPS provides emissions and policy impact estimates only at the state level, without geographic resolution for sub-state regions. To analyze impacts within the 29-county Atlanta MSA, we applied a population-based downscaling approach.

Specifically, we used historical county-level employment data by industry from the US Census Bureau data to project the share of Georgia's total commercial jobs operating in the Atlanta 29 MSA counties for each year. This proportion was then used to scale down statewide EPS outputs (e.g., emissions, costs, and pollutant trajectories) to approximate regional values.

Modeling

This measure utilized the "Retrofit Existing Buildings" lever in the EPS under the "Buildings and Appliances" category. In this scenario, the model assumes that 100% of commercial and industrial building stock is retrofitted by 2050. Retrofitting includes improvements in building efficiency, insulation, and appliance upgrades that collectively reduce overall energy demand in the residential sector.

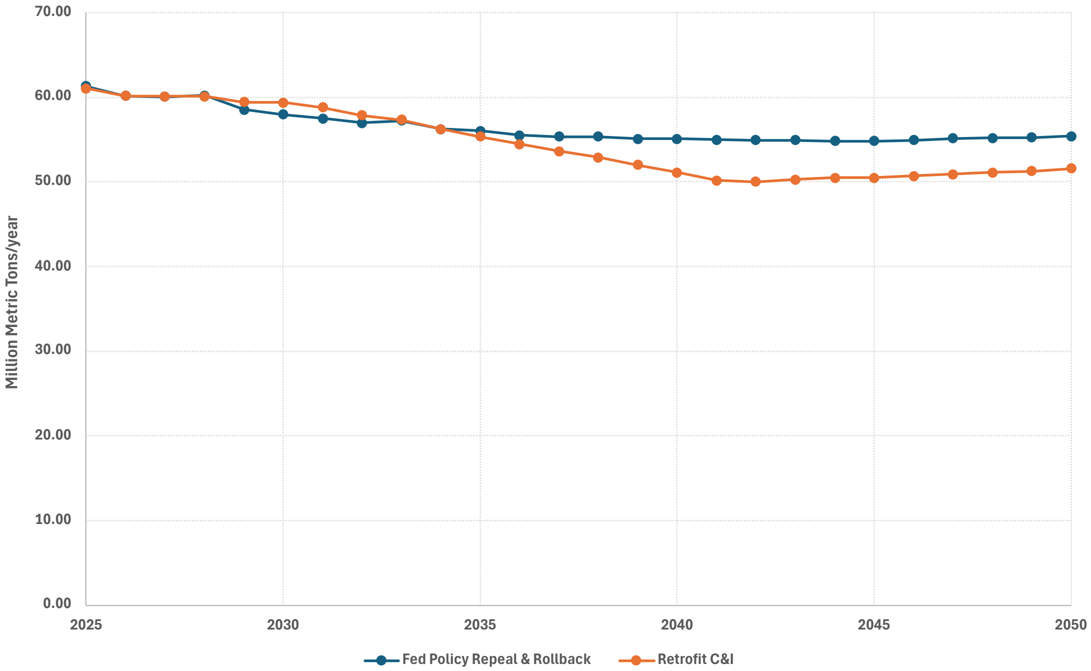
The retrofit effort is paired with an increasing reliance on cleaner sources of electricity. Specifically, the "Distributed Solar Carve-out" lever is activated, with its maximum contribution set at 20%. Under this assumption, distributed solar deployment reaches 10% by 2035 and scales up to 50% by 2050. This gradual increase reflects both the technical feasibility of solar expansion and the expected pace of supportive policy implementation.

The split between industrial and commercial buildings was based on relative energy consumption shares: industry accounts for ~6.8% and the commercial sector accounts for ~93.2% of the energy consumed in C&I buildings in Georgia. These values were derived from the 2018 CBECS and MECS datasets for the U.S. It should also be noted that the C&I sector is expected to experience rapid growth nationally over the next decade, which makes achieving substantial emissions reductions by 2035 more challenging, even under aggressive retrofit assumptions.

12.3. Emission Reductions

Retrofitting reduces direct GHG emissions from commercial heating, cooling, and ventilation, particularly by reducing energy demand and improving building envelope performance. These reductions stem primarily from lower energy-related CO_2 emissions, though process emissions also decline.

Figure 12.1. Projected GHG Emissions



Changes in Co-Pollutants

In terms of criteria pollutants, this measure could provide significant reductions in fine and coarse particulate matter emissions, which would lead to major improvements in public health and air quality.

Table 12.2. Projected Annual Pollution Reduction

GHG Emissions Reductions Compared to the FPRR (MMTCO$_2$e/year)

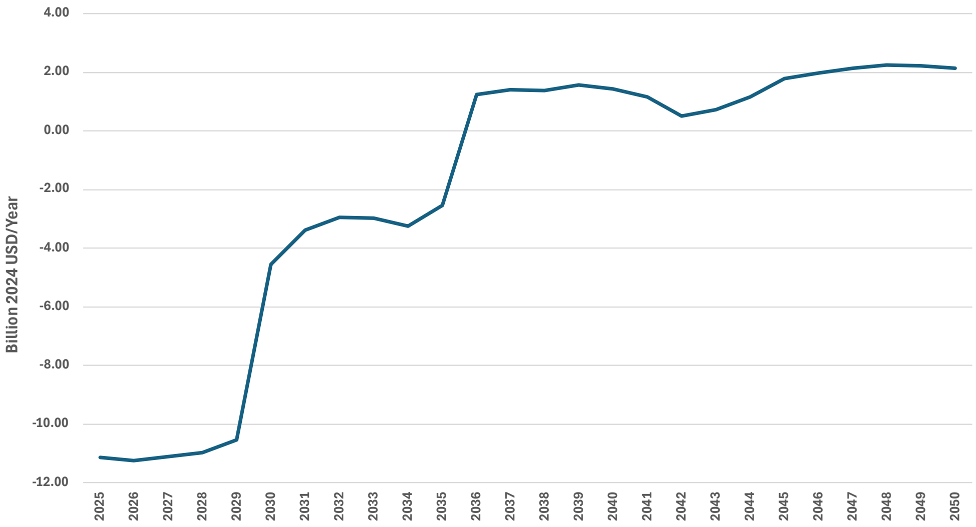
Greenhouse Gases	**2035**	**2050**
Carbon Dioxide (CO_2)	0.049	0.253
Methane (CH_4)	0.001	0.001
Nitrous Oxide (N_2O)	0.000	0.000
Fluorinated Gases (F-gases)	-0.004	-0.002

Co-Pollutants Emissions Reductions Compared to the FPRR (Thousand Metric Tons/year)

Co-Pollutants	**2035**	**2050**
Fine Particulate Matter ($PM_{2.5}$)	0.0085	0.0501
Coarse Particulate Matter (PM_{10})	0.0074	0.0540
Black Carbon (BC)	0.0003	0.0023
Organic Carbon (OC)	0.0086	0.0301
Nitrogen Oxides (NO_x)	0.0000	0.0002
Volatile Organic Compounds (VOC)	-0.0083	0.0220
Sulfur Oxides (SO_x)	0.0000	0.0000
Carbon Monoxide (CO)	0.0000	0.0001

12.4. Cost Savings

Figure 12.2. Projected Annual Savings



12.5. Summary Metrics for target years

Table 12.3. Metrics for 2035

Metric	Value
Annual GHG Reductions	0.04 MMT CO_2e
Annual Non-GHG Reductions	-0.10 MMT Co-pollutants
Annual Net Savings	-0.18 Billion 2024 USD
Total GHG Reductions (2025-2035)	-0.26 MMT CO_2e
Total Non-GHG Reductions (2025-2035)	-0.04 MMT Co-pollutants
Total Net Savings (2025–2035)	-5.45 Billion 2024 USD

Table 12.4. Metrics for 2050

Metric	Value
Annual GHG Reductions	0.26 MMT CO_2e
Annual Non-GHG Reductions	0.44 MMT Co-pollutants
Annual Net Savings	-0.16 Billion 2024 USD
Total GHG Reductions (2025-2050)	3.53 MMT CO_2e
Total Non-GHG Reductions (2025-2050)	0.59 MMT Co-pollutants
Total Net Savings (2025–2050)	-3.76 Billion 2024 USD

13. Electrify industrial buildings & processes

Table 13.1. Top-line values for target years

	2035	2050
GHG Emissions Reductions Compared to the Federal Rollback ($MMTCO_2e$)	0.04	0.14
Net Cost of Carbon Reduction (2024\$/$MTCO_2e$)*	3,226	-1,542

*Negative costs constitute positive savings.

Note: Unlike electrification of residential and commercial buildings which is cost-effective initially, electrifying industrial buildings is costly at first, but generates savings eventually. Industrial buildings are diverse and distinct from commercial buildings by their greater use of fossil fuels for space and water heating. This is related to the high-temperature processing characteristic of many industries. Perhaps the gradual electrification of industrial processes has spillover benefits to the management of their buildings.

13.1. Overview

This measure was modeled using the Rocky Mountain Institute's EPS. Impacts are reported for 2035 and 2050. State outputs were proportioned to the Atlanta MSA using sector-appropriate scalars, consistent with Appendix C.

13.2. Modeling Assumptions

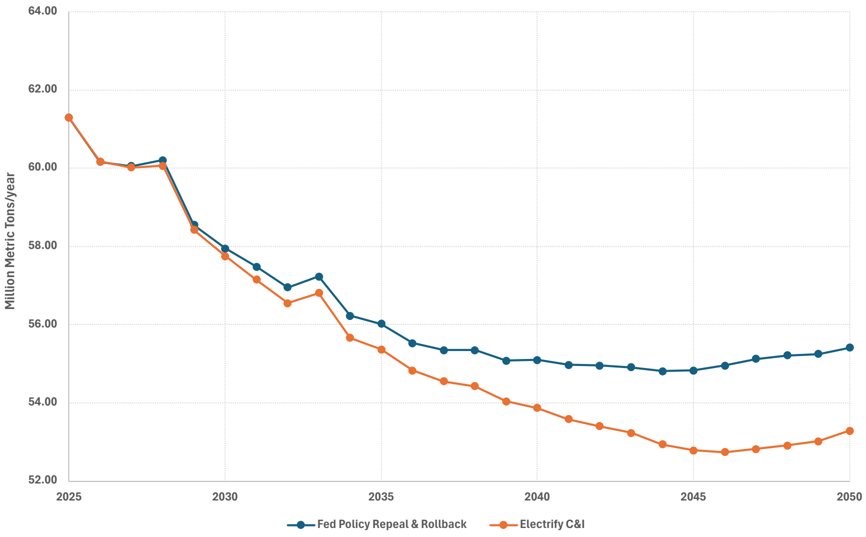
Electrification was modeled using the EPS "Building Component Electrification" lever, which replaces a specified percentage of newly sold fossil-fueled systems with electric alternatives. The results presented here reflect the technical potential scenario, assuming 100% electrification of heating, appliances, and other components between 2027 and 2050 for C&I buildings. This approach captures the effect of full stock turnover, as all new system sales are electric from 2027 onward, leading to the complete replacement of fossil-fueled systems over the lifetime of the equipment.

The electrification strategy is paired with greater reliance on clean electricity through the "Distributed Solar Carve-out" lever. In this scenario, distributed solar is capped at a maximum of 20%, with adoption reaching 10% (equating to 2%) by 2035 and scaling to 50% (equating to 10%) by 2050. This combined package reflects both the pace of equipment turnover in the building sector and the parallel shift in the electricity supply mix toward renewable sources.

The split between industrial and commercial buildings was based on relative energy consumption shares: industry accounts for ~6.8% and the commercial sector accounts for ~93.2% of the energy consumed in C&I buildings in Georgia. These values were derived from the 2018 CBECS and MECS datasets for the U.S. It should also be noted that the C&I sector is expected to experience rapid growth nationally over the next decade, which makes achieving substantial emissions reductions by 2035 more challenging, even under aggressive retrofit assumptions.

13.3. Emissions Reductions

Figure 13.1. Projected emissions GHG over time



The steepest growth in reductions occurs after 2030 as system deployment scales up and more existing buildings are electrified. The trajectory reflects increased penetration, declining technology costs, and growing efficiency in system integration.

Changes in Co-Pollutants

Under the measure, pollutant-specific dynamics reveal a nuanced trajectory of co-benefits that diverges meaningfully from the FPRR case. While total co-pollutant intensity is slightly higher under the “Electrify” pathway from 2025 through 2050, all GHGs with the exception of nitrogen oxides (NO_x) which remains flat decrease.

Table 13.2. Projected Annual Pollution Reduction

GHG Emissions Reductions Compared to the FPRR (MMTCO2e/year)

Greenhouse Gases	**2035**	**2050**
Carbon Dioxide (CO_2)	0.0434	0.1427
Methane (CH_4)	0.0001	0.0001
Nitrous Oxide (N_2O)	0.0000	0.0000
Fluorinated Gases (F-gases)	-0.0005	-0.0011

Co-Pollutants Emissions Reductions Compared to the FPRR (Thousand Metric Tons/year)

Co-Pollutants	**2035**	**2050**
Fine Particulate Matter ($PM_{2.5}$)	0.0083	0.0393
Coarse Particulate Matter (PM_{10})	0.0089	0.0426
Black Carbon (BC)	0.0004	0.0017
Organic Carbon (OC)	0.0055	0.0244
Nitrogen Oxides (NO_x)	0.0000	0.0001
Volatile Organic Compounds (VOC)	0.0026	0.0135
Sulfur Oxides (SO_x)	0.0000	0.0000
Carbon Monoxide (CO)	0.0000	0.0001

In 2035, GHG changes are mixed. Carbon dioxide (CO_2) declines by 0.231 million metric tons CO_2e, and CH_4 falls by 0.003 million metric tons CO_2e. Nitrous oxide (N_2O) shows no meaningful change at 0.000 million metric tons CO_2e, while fluorinated gases (F-gases) increase by 0.019 million metric tons CO_2e. These results reflect sectoral differences in the pace of electrification, refrigerant phase-downs, and displacement of combustion-based energy sources.

By 2050, net climate benefits grow. CO_2 reductions reach 0.792 million metric tons CO_2e, and CH_4 declines increase slightly to 0.004 million metric tons CO_2e. Nitrous oxide (N_2O) shifts from no change in 2035 to a reduction of 0.001 million metric tons CO_2e, while fluorinate gases (F-gases) see a larger increase of 0.045 million metric tons CO_2e. Although F-gas growth partially offsets the benefits, its magnitude remains small compared to CO_2 reductions.

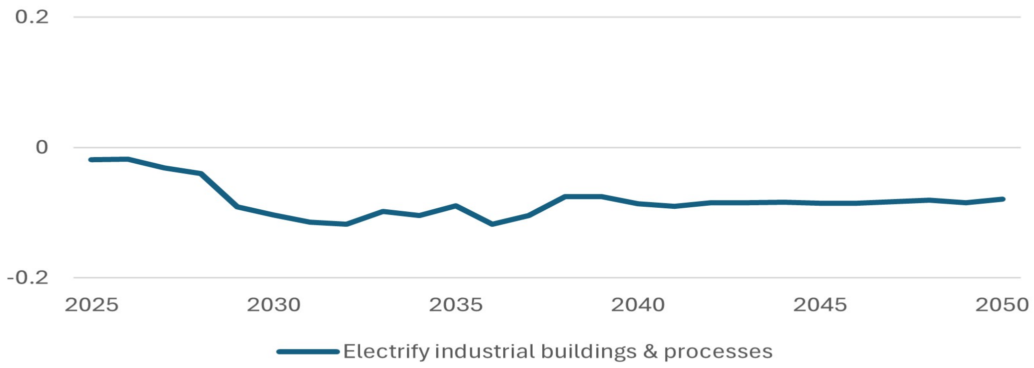
For co-pollutants in 2035, $PM_{2.5}$ increases by 0.0469 thousand metric tons, and PM_{10} increases by 0.0575 thousand metric tons. BC rises by 0.0029 thousand metric tons, OC by 0.0158 thousand metric tons, NO_x by 0.0005 thousand metric tons, sulfur oxides (SO_x) by 0.0001 thousand metric tons, and CO by 0.0003 thousand metric tons. VOCs increase by 0.1363 thousand metric tons.

By 2050, these co-pollutant increases remain. $PM_{2.5}$ grows by 0.1001 thousand metric tons, PM_{10} by 0.1202 thousand metric tons, BC by 0.0071 thousand metric tons, and OC by 0.0347 thousand metric tons. VOCs increases reach 0.3481 thousand metric tons, while NO_x grows by 0.0014 thousand metric tons, SO_x by 0.0002 thousand metric tons, and CO by 0.0009 thousand metric tons. These pollutant increases, many with public health implications, reflect slower reductions in combustion emissions in certain sectors and the continued presence of sources that do not directly benefit from decentralized solar deployment.

13.4. Cost Savings

The measure results in persistent net costs due to the upfront capital investments and the lack of savings in fuel cost to offset. Annual net costs are relatively small at first, about $18 million in 2025 and 2026, but rise to a peak of $118 million in 2031. Costs then fluctuate, remaining between roughly $76 million and $118 million annually through mid-century.

Figure 13.2. Projected Annual Savings



By 2035, the annual net cost is $104 million, and by 2050 it is $79 million, indicating that the measure does not transition to net savings within the analysis period. Over the full period from 2025 to 2050, the policy yields cumulative net costs rather than savings, driven largely by the capital-intensive nature of deployment and the absence of sufficient direct financial offsets from avoided fossil fuel purchases or deferred transmission investments to fully counterbalance expenditures.

13.5. Summary Metrics for Target Years

Table 13.3. Metrics for 2035

Metric	Value
GHG Reductions	0.0434 MMT CO_2e
Net Savings	-$140 Million
Savings/MMT CO_2e	-$3225.81 Million

Table 13.4. Metrics for 2050

Metric	Value
Annual GHG Reductions	0.1427 MMT CO_2e
Annual Net Savings	$220 Million
Savings/MMT CO_2e	$1541.7 Million

14. Retrofit industrial processes and equipment

Table 14.1. Top-line values for target years

	2035	2050
GHG Emissions Reductions Compared to the Federal Rollback ($MMTCO_2e$)	0.68	1.59
Net Cost of Carbon Reduction (2024$/$MTCO_2e$)*	-379	-538

*Negative costs constitute positive savings.

14.1. Overview

This measure was modeled using the Rocky Mountain Institute’s EPS. Impacts are reported for 2035 and 2050. State outputs were proportioned to the Atlanta MSA using sector-appropriate scalars, consistent with Appendix C.

14.2. Modeling Assumptions

To model retrofitting of industrial systems, the EPS policies “Improved System Design,” “Energy Efficiency Standards,” “F-Gas Retrofits,” and “Material Efficiency” are applied. These measures collectively target reductions in energy consumption, refrigerant emissions, and material use in industrial operations.

For the achievable potential scenario, “Improved System Design” is set to 100% of achievable adoption by 2050, “Energy Efficiency Standards” are tightened to achieve a 25% improvement by 2050, “F-Gas Retrofits” are deployed to 100% of achievable adoption, and Material Efficiency (ME) improvements reach full achievable potential (30%) by 2050. This represents comprehensive adoption of retrofit measures across feasible industrial applications.

Modeling

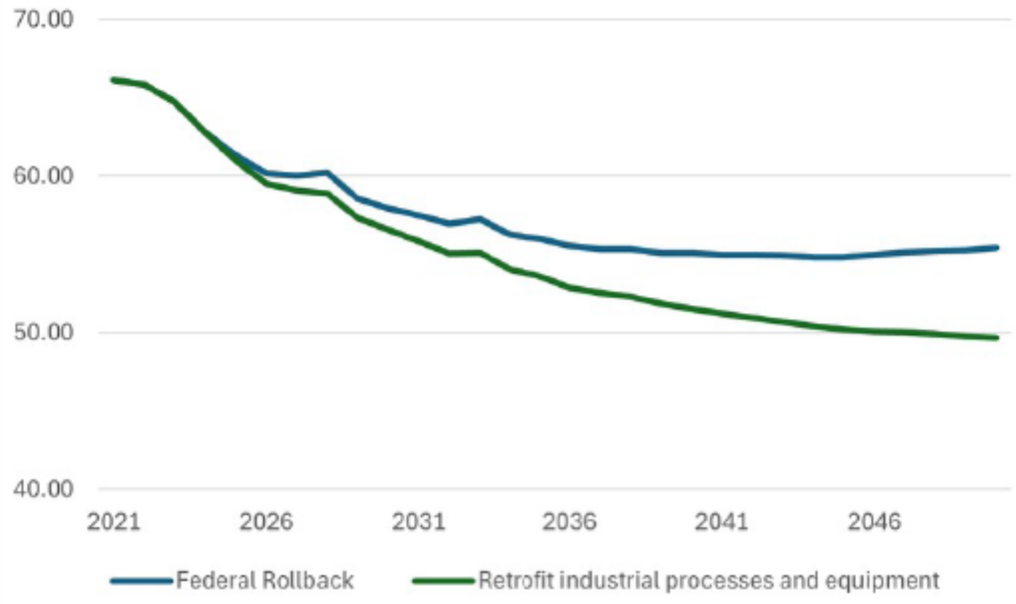
The core modeling variable for this measure is the incremental change in industrial energy demand, refrigerant-related emissions, and material throughput, calculated as the difference between the FPRR and the policy scenario.

This analysis focuses on retrofitting to improve system performance and reduce lifecycle emissions. It does not include other industrial decarbonization pathways such as process heat fuel switching, carbon capture at point sources, or major process redesign, which are addressed separately in other measures.

14.3. Emissions Reductions

This measure drives reductions in GHG emissions over time. In 2035, emissions fall by 0.68 MMT CO_2e, increasing steadily to 1.59 MMT CO_2e annually by 2050, for a cumulative reduction of 22.13 MMT CO_2e from 2025 to 2050.

Figure 14.1. Projected GHG Emissions



Changes in Co-Pollutants

Under the measure, pollutant-specific dynamics reveal a nuanced trajectory of co-benefits that diverges meaningfully from the FPRR case. While fluorinated gases (F-gases) increase over time, all other GHGs decline steadily, and most co-pollutants show consistent reductions through mid-century.

Table 14.2. Projected Annual Pollution Reduction

GHG Emissions Reductions Compared to the FPRR (MMTCO$_2$e/year)

Greenhouse Gases	**2035**	**2050**
Carbon Dioxide (CO_2)	0.460	1.105
Methane (CH_4)	0.206	0.494
Nitrous Oxide (N_2O)	0.015	0.030
Fluorinated Gases (F-gases)	-0.002	-0.042

Co-Pollutants Emissions Reductions Compared to the FPRR (Thousand Metric Tons/year)

Co-Pollutants	**2035**	**2050**
Fine Particulate Matter ($PM_{2.5}$)	0.0380	0.0441
Coarse Particulate Matter (PM_{10})	0.0475	0.0558
Black Carbon (BC)	0.0017	0.0028
Organic Carbon (OC)	0.0127	0.0173
Nitrogen Oxides (NO_x)	0.0002	0.0005
Volatile Organic Compounds (VOC)	0.0289	-0.1140
Sulfur Oxides (SO_x)	0.0000	0.0000
Carbon Monoxide (CO)	0.0002	0.0004

In 2035, GHG outcomes are strongly positive. Carbon dioxide (CO_2) declines by 0.460 million metric tons CO_2e, CH_4 falls by 0.206 million metric tons CO_2e, and nitrous oxide (N_2O) decreases modestly by 0.015 million metric tons CO_2e. The one exception is F-gases, which increase by 0.002 million metric tons CO_2e, reflecting continued reliance on refrigerants in specific industrial and commercial applications.

By 2050, net climate benefits expand further. CO_2 reductions reach 1.105 million metric tons, CH_4 declines grow to 0.494 million metric tons CO_2e, and nitrous oxide (N_2O) reductions deepen to 0.030 million metric tons CO_2e. However, F-gases rise more substantially, increasing by 0.042 million metric tons CO_2e, partially offsetting the overall gains but remaining small relative to CO_2 abatement.

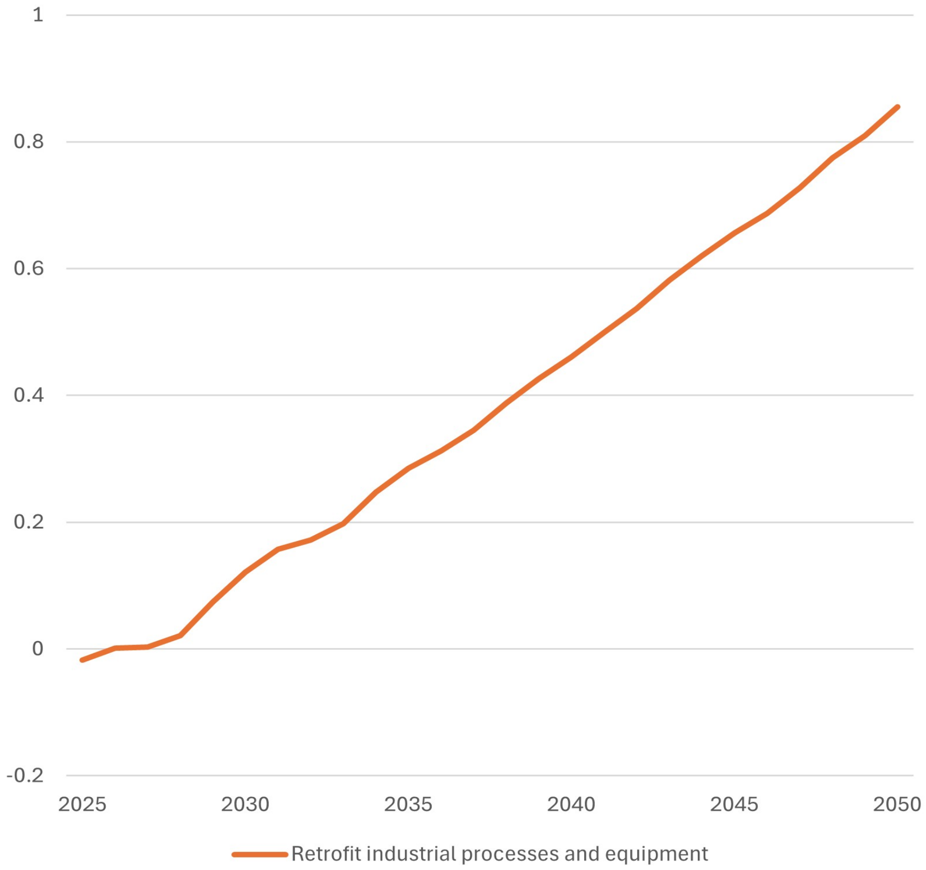
For co-pollutants in 2035, all major categories show reductions. $PM_{2.5}$ falls by 0.0380 thousand metric tons, PM_{10} by 0.0475 thousand metric tons, BC by 0.0017 thousand metric tons, and OC by 0.0127 thousand metric tons. NO_x and CO decline slightly, by 0.0002 thousand metric tons each, while VOCs drop by 0.0289 thousand metric tons. Sulfur oxides (SO_x) remain unchanged.

By 2050, most co-pollutant reductions will strengthen. $PM_{2.5}$ falls by 0.0441 thousand metric tons, PM_{10} by 0.0558 thousand metric tons, BC by 0.0028 thousand metric tons, and OC by 0.0173 thousand metric tons. NO_x and CO continue small but consistent reductions, by 0.0005 and 0.0004 thousand metric tons, respectively. VOCs diverge, shifting from reductions in 2035 to an increase of 0.1140 thousand metric tons by 2050. SO_x remains unchanged.

14.4. Cost Savings

The measure transitions from early costs to significant long-term net savings. In the initial years (2025–2030), annual net costs are incurred due to capital investments in new technologies and retrofits. However, by the mid-2030s, these upfront costs are outweighed by operational savings, primarily from reduced fossil fuel consumption and efficiency gains.

Figure 14.2. Projected Annual Savings



By 2035, the measure delivers $285 million in annual net savings. By 2050, savings grow further to $855 million per year. Over the full 2025–2050 period, the measure yields sustained positive returns, reflecting both avoided energy expenditures and improved system efficiency. When normalized by emissions reductions, savings amount to $419 million per MMT CO_2e avoided in 2035, and $538 million per MMT CO_2e avoided in 2050.

14.5. Summary Metrics for Target Years

Table 14.3. Metrics for 2035

Metric	Value
GHG Reductions	0.68 MMT CO_2e
Net Savings	$285 million
Savings/MMT CO_2e	$419 million

Table 14.4. Metrics for 2050

Metric	Value
Annual GHG Reductions	1.59 MMT CO_2e
Annual Net Savings	$855 million
Savings/MMT CO_2e	$538 million

15. Decrease non-CO2 GHG emissions through improved industrial processes

Table 15.1. Top-line values for target years

	2035	2050
GHG Emissions Reductions Compared to the Federal Rollback (MMTCO2e)	0.13	0.45
Net Cost of Carbon Reduction (2024$/MTCO2e)*	-8	358

*Negative costs constitute positive savings.

15.1. Overview

This measure was modeled using the Rocky Mountain Institute's EPS. Impacts are reported for 2035 and 2050. State outputs were proportioned to the Atlanta MSA using sector-appropriate scalars, consistent with Appendix C.

15.2. Modeling Assumptions

To model reductions in non-CO_2 GHG emissions, the EPS policies "Methane Capture," "N_2O Abatement," "F-Gas Substitution," "F-Gas Recovery," and "F-Gas Retrofits" are applied. These measures target the largest anthropogenic sources of methane, nitrous oxide, and fluorinated gases through technology upgrades, process changes, and gas recovery systems.

Modeling

For the achievable potential scenario, all five measures—Methane Capture, N_2O Abatement, F-Gas Substitution, F-Gas Recovery, and F-Gas Retrofits—are set to 100% of achievable adoption by 2050. This represents full deployment of available mitigation technologies and best practices across all applicable sectors.

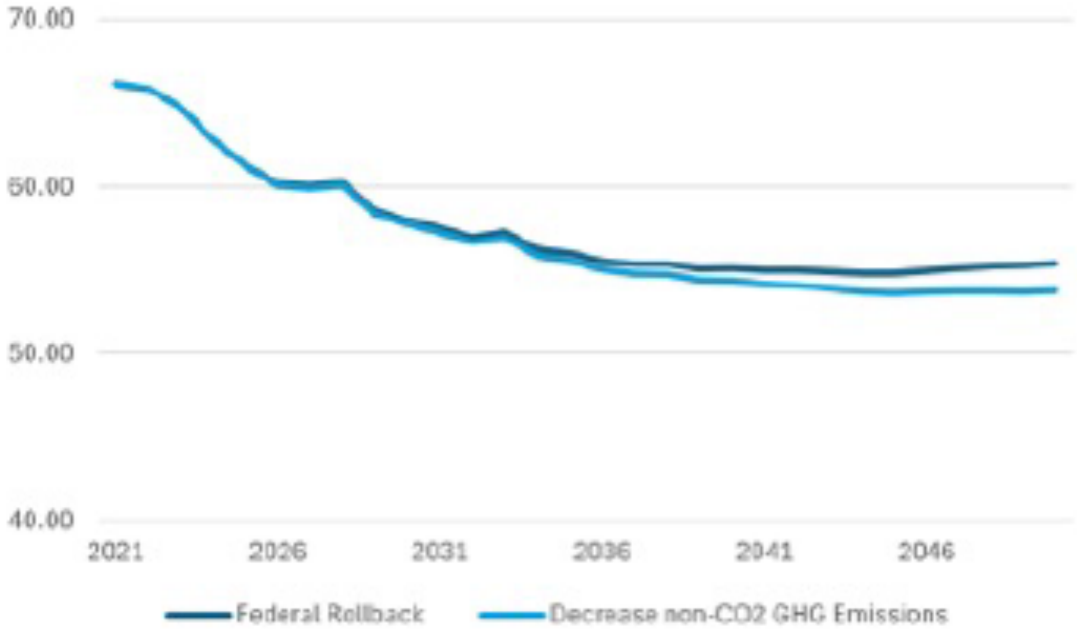
The core modeling variable for this measure is the incremental reduction in CH_4, nitrogen oxides (N_2O), and fluorinated gas (F-gas) emissions, calculated as the difference between the FPRR and the policy scenario.

This analysis focuses exclusively on direct non-CO_2 GHG abatement measures and does not include additional actions that may indirectly reduce these gases, such as large-scale fuel switching or structural shifts in industrial output, which are addressed separately in other measures.

15.3. Emissions Reductions

This measure drives reductions in GHG emissions over time. In 2035, emissions fall by 0.13 MMT CO_2e, increasing steadily to 0.45 MMT CO_2e annually by 2050, for a cumulative reduction of 5.04 MMT CO_2e from 2025 to 2050.

Figure 15.1. Projected GHG Emissions



Changes in Co-Pollutants

Under the measure, pollutant-specific dynamics reveal a nuanced trajectory of co-benefits that diverges from the FPRR case. Unlike the rollback scenario, GHGs consistently decline, with meaningful reductions in CH_4 and N_2O, although increases in F-gases offset part of the gains by mid-century. Co-pollutant effects are modest, with only small improvements observed in particulate matter ($PM_{2.5}$ and PM_{10}) and VOCs.

Table 15.2. Projected Annual Pollution Reduction

GHG Emissions Reductions Compared to the FPRR ($MMTCO_2e$/year)

Greenhouse Gases	**2035**	**2050**
Carbon Dioxide (CO_2)	0.001	0.002
Methane (CH_4)	0.100	0.315
Nitrous Oxide (N_2O)	0.027	0.052
Fluorinated Gases (F-gases)	0.000	0.080

Co-Pollutants Emissions Reductions Compared to the FPRR (Thousand Metric Tons/year)

Co-Pollutants	**2035**	**2050**
Fine Particulate Matter ($PM_{2.5}$)	0.0001	0.0001
Coarse Particulate Matter (PM_{10})	0.0002	0.0002
Black Carbon (BC)	0.0000	0.0000
Organic Carbon (OC)	0.0000	0.0000
Nitrogen Oxides (NO_x)	0.0000	0.0000
Volatile Organic Compounds (VOC)	0.0020	0.0072
Sulfur Oxides (SO_x)	0.0000	0.0000
Carbon Monoxide (CO)	0.0000	0.0000

In 2035, GHG reductions are measurable but limited in scale. Carbon dioxide (CO_2) falls by 0.001 million metric tons CO_2e, CH_4 by 0.100 million metric tons CO_2e, and nitrogen oxides (NO_x) by 0.027 million metric tons CO_2e. F-gases remain essentially unchanged at 0.000 million metric tons CO_2e. These outcomes reflect incremental efficiency gains and early transitions in fuel and process use.

By 2050, the reductions expand. CO_2 falls by 0.002 million metric tons CO_2e, CH_4 by 0.315 million metric tons CO_2e, and N_2O by 0.052 million metric tons CO_2e. However, F-gases increase by 0.080 million metric tons CO_2e, signaling that refrigerant-related emissions remain a persistent challenge. Still, the aggregate trajectory is strongly net-negative in terms of GHG emissions.

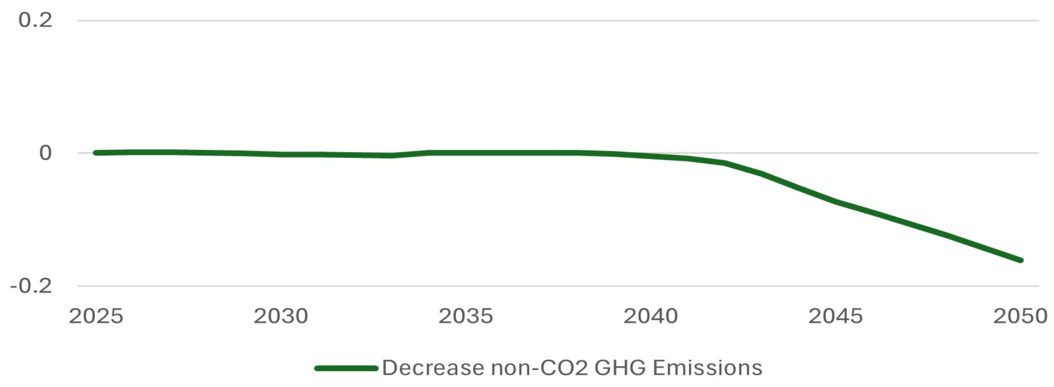
For co-pollutants, the effects are small but generally favorable. By 2035, $PM_{2.5}$ decreases by 0.0001 thousand metric tons, and PM_{10} falls by 0.0002 thousand metric tons. VOCs decline modestly by 0.0020 thousand metric tons, while BC, OC, NO_x, sulfur oxides (SO_x), and CO show no measurable change.

By 2050, co-pollutant reductions persist but remain minimal. $PM_{2.5}$ falls by 0.0001 thousand metric tons, PM_{10} by 0.0002 thousand metric tons, and VOCs by 0.0072 thousand metric tons, while all other pollutants remain flat. These small reductions, while limited in magnitude, nonetheless reinforce the climate benefits by delivering incremental air quality improvements alongside GHG reductions.

15.4. Cost Savings

The measure yields only marginal financial benefits in the near term before shifting to persistent net costs by mid-century. In 2035, the policy produces $1.0 million in annual net savings, equivalent to $7.6 million per MMT CO_2e reduced. However, by 2050 the financial outlook reverses, with annual net costs of $161 million, or -$358 million per MMT CO_2e reduced. This trajectory underscores that the measure does not deliver sustained financial returns within the analysis period. Instead, the capital-intensive nature of deployment combined with limited direct fuel cost offsets leads to cumulative net costs from 2025 through 2050.

Figure 15.2. Projected Annual Savings



15.5. Summary Metrics for Target Years

Table 15.3. Metrics for 2035

Metric	Value
GHG Reductions	0.13 MMT CO_2e
Net Savings	$1.0 million
Savings/MMT CO_2e	$7.6 million

Table 15.4. Metrics for 2050

Metric	Value
Annual GHG Reductions	0.45 MMT CO_2e
Annual Net Savings	-$161 million
Savings/MMT CO_2e	-$358 million

16. Capture heat from industrial processes to provide HVAC or create electricity

Table 16.1. Top-line values for target years

	2035	2050
GHG Emissions Reductions Compared to the Federal Rollback (MMTCO_2e)	0.16	0.49
Net Cost of Carbon Reduction (2024$/MT$CO_2e$)*	-775	-782

*Negative costs constitute positive savings.

16.1. Overview

This measure was modeled using the Rocky Mountain Institute's EPS. Impacts are reported for 2035 and 2050. State outputs were proportioned to the Atlanta MSA using sector-appropriate scalars, consistent with Appendix C.

16.2. Modeling Assumptions

To model the capture of heat from industrial processes, the EPS policies "Cogeneration & Waste Heat Recovery" and "Improved System Design" are applied. This measure utilizes waste heat streams from industrial operations to provide building heating, ventilation, and air conditioning (HVAC) services or to generate electricity, reducing overall fuel demand and improving system efficiency.

Modeling

For the achievable potential scenario, Cogeneration and Waste Heat Recovery is set to 100% of achievable adoption by 2050, while Improved System Design is also assumed to reach 100% adoption by 2050. Together, these measures represent full-scale utilization of industrial waste heat and system-level efficiency improvements across feasible sectors.

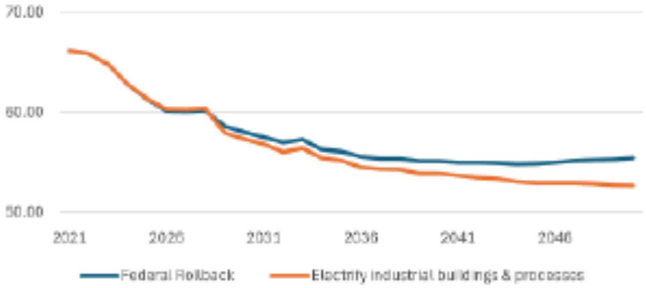
The core modeling variable for this measure is the incremental reduction in industrial fuel consumption and associated emissions, calculated as the difference between the FPRR and the policy scenario.

This analysis focuses on recovering and repurposing industrial waste heat to displace conventional energy inputs. It does not include additional industrial decarbonization pathways such as fuel switching, carbon capture, or material efficiency measures, which are addressed separately in other analyses.

16.3. Emissions Reductions

This measure drives reductions in GHG emissions over time. In 2035, emissions fall by 0.16 MMT CO_2e, increasing steadily to 0.49 MMT CO_2e annually by 2050, for a cumulative reduction of 5.90 MMT CO_2e from 2025 to 2050.

Figure 16.1. Projected GHG Emissions



Changes in Co-Pollutants

Under the measure, pollutant-specific dynamics reveal a nuanced trajectory of co-benefits compared to the FPRR case. While fluorinated gases (F-gases) rise slightly and nitrous oxide (N_2O) remains flat or marginally increases, all other GHGs decline through 2050. Co-pollutant outcomes are more consistently positive, with notable reductions in particulate matter ($PM_{2.5}$ and PM_{10}), OC, and BC, though VOCs show a late-century increase.

Table 16.2. Projected Annual Pollution Reduction

GHG Emissions Reductions Compared to the FPRR ($MMTCO_2e$/year)

Greenhouse Gases	2035	2050
Carbon Dioxide (CO_2)	0.146	0.497
Methane (CH_4)	0.011	0.016
Nitrous Oxide (N_2O)	0.000	-0.001
Fluorinated Gases (F-gases)	-0.001	-0.020

Co-Pollutants Emissions Reductions Compared to the FPRR (Thousand Metric Tons/year)

Co-Pollutants	2035	2050
Fine Particulate Matter ($PM_{2.5}$)	0.1442	0.3080
Coarse Particulate Matter (PM_{10})	0.1689	0.3583
Black Carbon (BC)	0.0054	0.0117
Organic Carbon (OC)	0.0506	0.1106
Nitrogen Oxides (NO_x)	0.0002	0.0004
Volatile Organic Compounds (VOC)	0.0256	-0.0466
Sulfur Oxides (SO_x)	0.0000	0.0000
Carbon Monoxide (CO)	0.0003	0.0006

In 2035, GHG changes are modest but favorable overall. CO_2 falls by 0.146 million metric tons, CH_4 by 0.011 million metric tons CO_2e, and NO_x shows no measurable change. F-gases, however, increase slightly by 0.001 million metric tons CO_2e, reflecting refrigerant-related emissions that are not offset by other measures.

By 2050, the trajectory strengthens for most gases. CO_2 reductions reach 0.497 million metric tons, CH_4 declines grow to 0.016 million metric tons CO_2e, and N_2O falls by 0.001 million metric tons CO_2e. F-gases, in contrast, increase by 0.020 million metric tons CO_2e, partially counteracting the gains but at a relatively small scale compared to CO_2 reductions.

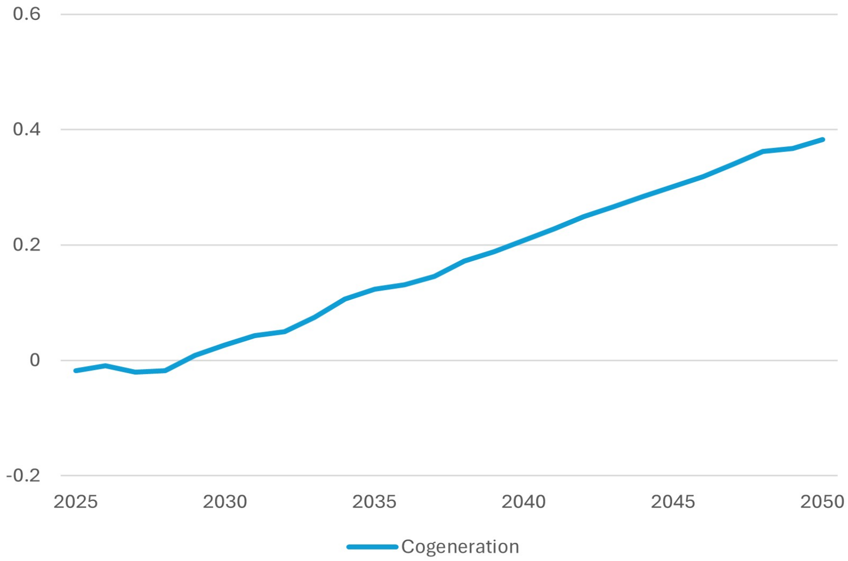
For co-pollutants, the measure delivers clearer improvements. In 2035, $PM_{2.5}$ decreases by 0.1442 thousand metric tons, and PM_{10} falls by 0.1689 thousand metric tons. BC declines by 0.0054 thousand metric tons, and OC by 0.0506 thousand metric tons. Small reductions also occur in NO_x, 0.0002 thousand metric tons, and CO, 0.0003 thousand metric tons, while SO_x remain unchanged. VOCs fall by 0.0256 thousand metric tons.

By 2050, these reductions deepen. $PM_{2.5}$ drops by 0.3080 thousand metric tons, PM_{10} by 0.3583 thousand metric tons, BC by 0.0117 thousand metric tons, and OC by 0.1106 thousand metric tons. NO_x and CO continue to decline modestly (0.0004 and 0.0006 thousand metric tons, respectively), while SO_x remains unchanged. VOCs diverge, shifting from reductions in 2035 to an increase of 0.0466 thousand metric tons in 2050.

16.4. Cost Savings

The measure delivers consistent financial benefits after initial capital investments, as avoided fossil fuel expenditures outweigh costs. In 2035, the policy generates $124 million in annual net savings, equivalent to $775 million per MMT CO_2e reduced. By 2050, savings increase further to $383 million annually, or $782 million per MMT CO_2e reduced. Over the full 2025–2050 period, the measure yields cumulative net savings, demonstrating that long-term efficiency and avoided energy costs more than offset the upfront deployment expenditures.

Figure 16.2. Projected Annual Savings



16.5. Summary Metrics for Target Years

Table 16.3. Metrics for 2035

Metric	Value
GHG Reductions	0.16 MMT CO_2e
Net Savings	$124 million
Savings/MMT CO_2e	$775 million

Table 16.4. Metrics for 2050

Metric	Value
Annual GHG Reductions	0.49 MMT CO_2e
Annual Net Savings	$383 million
Savings/MMT CO_2e	$782 million

Trees & Green Spaces

17. Increase tree canopy and vegetative coverage through afforestation and green infrastructure

Table 17.1. Top-line values for target years

	2035	2050
GHG Emissions Reductions Compared to the Federal Rollback (MMTCO$_2$e)	0.08	0.42
Net Cost of Carbon Reduction (2024$/MTCO$_2$e)*	-108.1	-107.7

*Negative costs constitute positive savings.

17.1. Overview

This workbook estimates the GHG reduction potential and total costs/benefits of the "Increase tree canopy and vegetative coverage through afforestation and green infrastructure" measure. This measure is calculated by scaling down the estimated GHG reduction potential of Georgia's priority measures proportionally using the percent of the forestry emissions of the Atlanta MSA relative to the forestry emissions of the state.

17.2. Modeling Assumptions

This measure was modeled using the RMI's EPS, an "open-source model for estimating the environmental, economic, and human health impacts of hundreds of climate and energy policies." Environmental, economic, and human health impacts resulting from each measure's implementation were estimated for two periods: 2035 and 2050.

To model the measure in the EPS, the FPRR and a "policy" scenario were developed, projecting out assumptions and key inputs related to the measure to 2050. The FPRR scenario assumes no implementation of the reduction measure while the policy scenario assumes a linear implementation of the measure with 100% implementation (82% of potential achieved, translating into about 100,000 new trees in the state, or ~13,000 for the MSA) occurring in 2050.

Downscaling assumptions

We used the percentage of ARC's projected forestry emissions within the 29-county MSA as compared to the state as whole to downscale the results from the RMI's EPS tool, which provides results for the state of Georgia. Because there is so little forestry emissions attributed to the MSA, this percentage is between 12.5-13.5% through 2050.

Modeling

To model increasing tree canopy and vegetative coverage through afforestation and green infrastructure, the EPS policy "Afforestation" is used. This policy specifies that the rate of afforestation/reforestation increase through 2050 until it reaches 100 thousand acres (82% in the EPS) per year in 2050 statewide. These numbers are then downscaled using the percentage of forestry emissions in the MSA compared to the rest of the state, as mentioned above.

The core modeling variable for this measure is the increase in carbon sequestration through increased forested acreage, calculated as the difference between the FPRR and the relevant policy scenario.

Output

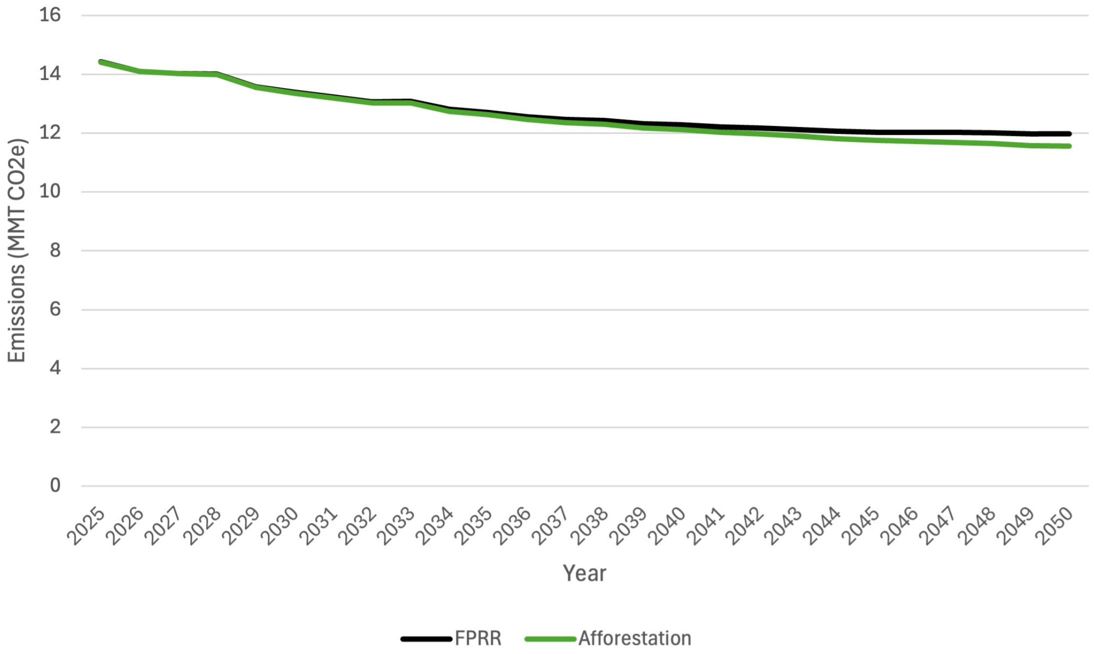
The policy measures to increase tree canopy and vegetative coverage through afforestation and green infrastructure are modeled using the EPS, with the afforestation policy lever. This measure supports increased carbon sequestration, increased air & water quality, and lower urban heat island effects while delivering widespread public health benefits.

17.3. Emissions Reductions

This measure drives reductions in GHG emissions over time. In 2025, annual emissions fall by 0.001 MMT CO2e, increasing steadily to nearly 0.417 MMT CO_2e annually by 2050, compared to FPRR. Cumulatively, the measure is projected to reduce emissions by 3.943 MMT CO_2e between 2025 and 2050.

Annual emissions reductions increase steadily over study period, likely as a function of the linear implementation schedule with full implementation occurring in 2050. If this is the case, we expect more cumulative emissions saved over the study time frame by more swiftly achieving afforestation/reforestation goals.

Figure 17.1: Projected GHG Emissions



Changes in Co-Pollutants

The GHGs, disaggregated to individual contributors are shown below in Table 17.2. The afforestation policy results in a steady decrease in annual carbon dioxide (CO_2) emissions, but a slight increase in the annual emissions of other GHGs. In fact, there are very small increases in annual emissions for methane (CH_4), nitrous oxide (N_2O), Fluorinated gases (F-gases), $PM_{2.5}$, PM_{10}, BC, VOCs, sulfur oxides (SO_x), and CO over the time period. Only carbon dioxide (CO_2), organic carbon (CO), and nitrogen oxides (NO_x) consistently show reductions through 2050 under this policy simulation. These findings further highlight that this measure mostly operates through an increase in carbon sequestration through photosynthesis.

Table 17.2. Projected Annual Pollution Reduction

GHG Emissions Reductions Compared to the FPRR ($MMTCO_2e$/year)

Greenhouse Gases	**2035**	**2050**
Carbon Dioxide (CO_2)	0.086	0.444
Methane (CH_4)	-0.0002	-0.00074
Nitrous Oxide (N_2O)	-0.0000	-0.00002
Fluorinated Gases (F-gases)	-0.0002	-0.00091

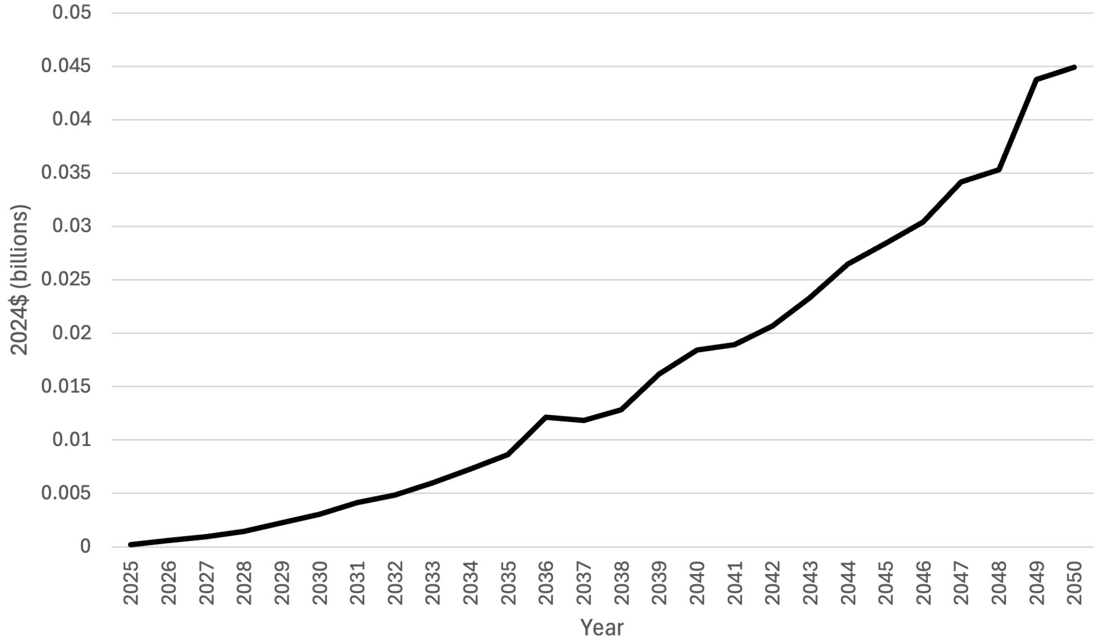
Co-Pollutants Emissions Reductions Compared to the FPRR (Thousand Metric Tons/year)

Co-Pollutants	**2035**	**2050**
Fine Particulate Matter ($PM_{2.5}$)	-0.0002	-0.0008
Coarse Particulate Matter (PM_{10})	-0.0003	-0.00098
Black Carbon (BC)	-0.0000	-0.00008
Organic Carbon (OC)	1.088	1.173
Nitrogen Oxides (NO_x)	19.037	16.693
Volatile Organic Compounds (VOC)	-0.0015	-0.0058
Sulfur Oxides (SO_x)	-0.0004	-0.0009
Carbon Monoxide (CO)	-0.0016	-0.0037

17.4. Cost Savings

This measure results in annual savings from the very beginning with over $220,000 in savings in the first year mostly increasing steadily until 2050 to over $44 million in annual savings in comparison with the FPRR. There are one slight dip during this time period from 2036 to 2037, however this seems to be only a mild setback in the mostly increasing annual savings.

Figure 17.2. Projected Annual Savings



Over the full period from 2025 to 2050, the measure is projected to yield $417 million in net savings, likely through reduced energy necessary for cooling buildings.

17.5. Summary Metrics for Target Years

Table 17.3. Metrics for 2035

Metric	**Value**
Annual GHG Reductions	0.080 MMT CO_2e
Annual Net Savings	$8.65 million
GHG Reductions Since 2025 (cumulative)	0.348 MMT CO_2e
Cumulative Net Savings (2025–2035)	$39.51 million

Table 17.4. Metrics for 2050

Metric	**Value**
Annual GHG Reductions	0.417 MMT CO_2e
Annual Net Savings	$44.92 million
Total GHG Reductions (2025–2050)	3.943 MMT CO_2e
Total Net Savings (2025–2050)	$417.36 million

18. Improved forest management

Table 18.1. Top-line values for target years

	2035	2050
GHG Emissions Reductions Compared to the Federal Rollback (MMTCO$_2$e)	0.03	0.085
Net Cost of Carbon Reduction (2024$/MTCO$_2$e)*	-154.7	-181.2

*Negative costs constitute positive savings.

18.1. Overview

This workbook estimates the GHG reduction potential and total costs/benefits of the "Improved forest management" measure. This measure is calculated by scaling down the estimated GHG reduction potential of Georgia's priority measures proportionally using the percent of the forestry emissions of the Atlanta MSA relative to the forestry emissions of the state.

18.2. Modeling Assumptions

This measure was modeled using the RMI's EPS, an "open-source model for estimating the environmental, economic, and human health impacts of hundreds of climate and energy policies." Environmental, economic, and human health impacts resulting from each measure's implementation were estimated for two periods: 2035 and 2050.

To model the measure in the EPS, a FPRR and a "policy" scenario were developed, projecting out assumptions and key inputs related to the measure to 2050. The FPRR scenario assumes no implementation of the reduction measure while the policy scenario assumes a linear implementation of the measure with 100% implementation (100% of potential achieved) occurring in 2050.

Downscaling assumptions

We used the percentage of ARC's projected forestry emissions within the 29-county MSA as compared to the state as whole to downscale the results from the RMI's EPS tool, which provides results for the state of Georgia. Because there is so little forestry emissions attributed to the MSA, this percentage is between 12.5-13.5% through 2050.

Modeling

To model improved forest management, the EPS policy "Improved forest management" is used. This policy specifies a percentage of existing forests that are managed more sustainably using "enhanced thinning techniques, longer rotation periods, and other changes to timber harvesting" including various certification programs statewide. These numbers are then downscaled using the percentage of forestry emissions in the MSA compared to the rest of the state, as mentioned above.

The core modeling variable for this measure is the increase in carbon sequestration through more sustainable forest management practices on existing forestland, calculated as the difference between the FPRR and the relevant policy scenario.

Output:

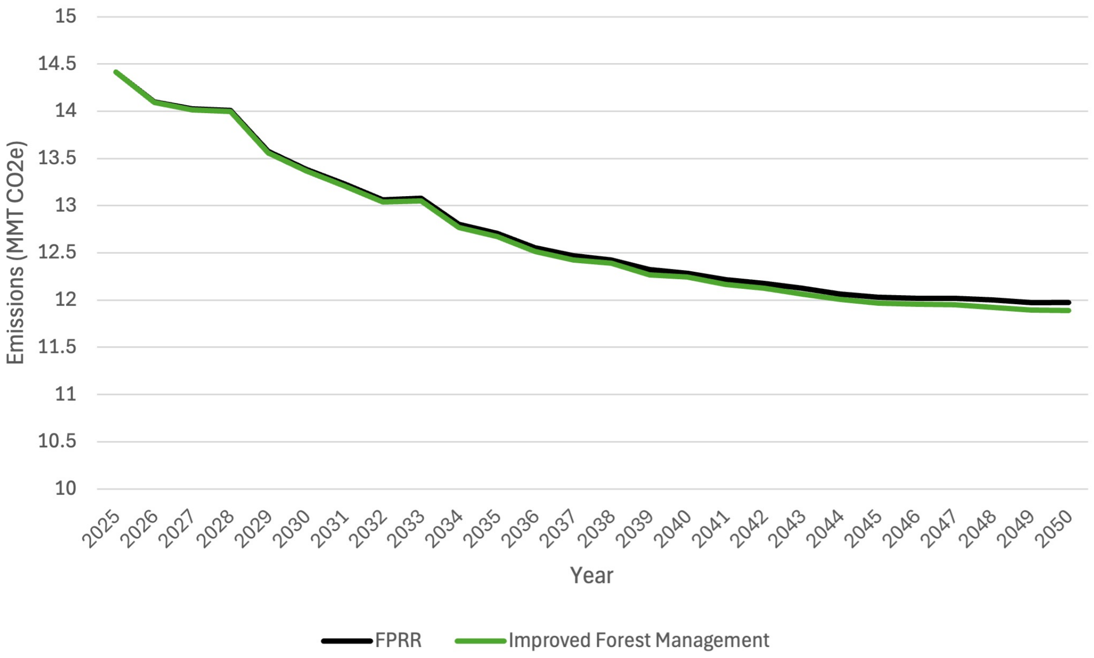
The policy measures to improve forest management modeled using the EPS, with the "Improved forest management" policy lever. This measure supports increased carbon sequestration and increased air & water quality while delivering widespread public health benefits.

18.3. Emissions Reductions

This measure drives reductions in GHG emissions over time. In 2025, annual emissions fall by 0.003 MMT CO2e, increasing steadily to nearly 0.085 MMT CO_2e annually by 2050, compared to FPRR. Cumulatively, the measure is projected to reduce emissions by 1.06 MMT CO_2e between 2025 and 2050.

Annual emissions reductions increase steadily over study period, likely as a function of the linear implementation schedule with full implementation occurring in 2050. If this is the case, we expect more cumulative emissions saved over the study time frame by more swiftly achieving afforestation/reforestation goals.

Figure 18.1: Projected GHG Emissions



Changes in Co-Pollutants

The GHGs, disaggregated to individual contributors are shown in Table 18.2. The improved forest management policy results in a steady decrease in annual carbon dioxide (CO_2) emissions, but a slight increase in the annual emissions of other GHGs. In fact, there are very small increases in annual emissions for methane (CH_4), nitrous oxide (N_2O), Fluorinated gases (F-gases), and VOCs over the time period. Only carbon dioxide (CO_2) consistently show reductions through 2050 under this policy simulation. The rest of the co-pollutants mentioned below show slight increases at the beginning of the time period with emissions lowering towards the end. Of these, only SO_x shows a cumulative reduction over the study period. These findings further highlight that this measure mostly operates through an increase in carbon sequestration through photosynthesis.

Table 18.2. Projected Annual Pollution Reduction

GHG Emissions Reductions Compared to the FPRR ($MMTCO_2e$/year)

Greenhouse Gases	**2035**	**2050**
Carbon Dioxide (CO_2)	0.0357	0.0905
Methane (CH_4)	-0.0001	-0.00014
Nitrous Oxide (N_2O)	-0.0000	-0.000004
Fluorinated Gases (F-gases)	-0.0002	-0.0003

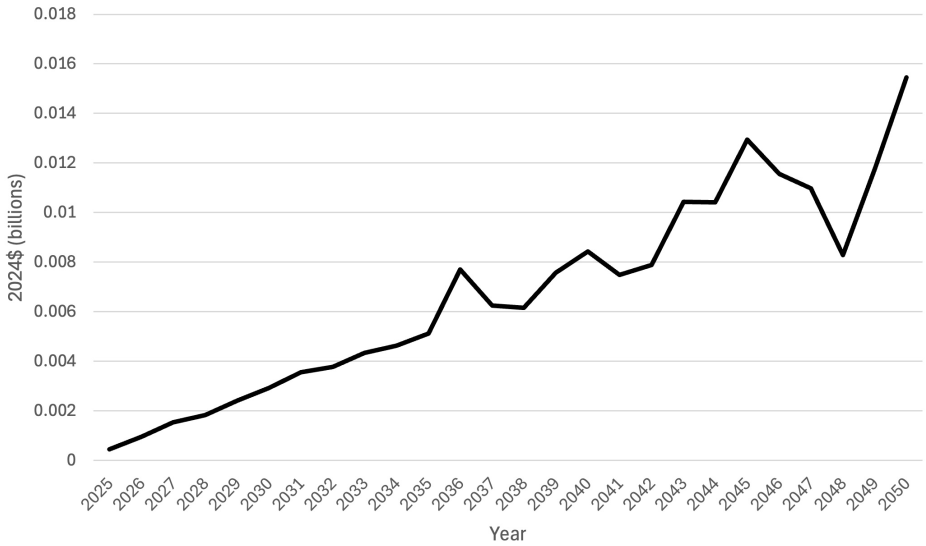
Co-Pollutants Emissions Reductions Compared to the FPRR (Thousand Metric Tons/year)

Co-Pollutants	**2035**	**2050**
Fine Particulate Matter ($PM_{2.5}$)	-0.00016	0.000130
Coarse Particulate Matter (PM_{10})	-0.00019	0.000143
Black Carbon (BC)	-0.00005	0.0000016
Organic Carbon (OC)	-0.00005	0.000089
Nitrogen Oxides (NO_x)	-0.00090	0.00089
Volatile Organic Compounds (VOC)	-0.994	-1.32
Sulfur Oxides (SO_x)	-0.00020	0.000031
Carbon Monoxide (CO)	-0.000001	0.000000

18.4. Cost Savings

This measure results in annual savings from the very beginning with over $5 million in savings in the first year mostly increasing steadily until 2050 to over $15 million in annual savings in comparison with the FPRR. The growth in savings is plagued by three decreases in growth, but overall remains increasing through the study time period.

Figure 18.2. Projected Annual Savings



Over the full period from 2025 to 2050, the measure is projected to yield nearly $175 million in net savings.

18.5. Summary Metrics for Target Years

Table 18.3. Metrics for 2035

Metric	Value
Annual GHG Reductions	0.0331 MMT CO2e
Annual Net Savings	$5.12 million
GHG Reductions Since 2025 (cumulative)	0.200 MMT CO2e
Cumulative Net Savings (2025–2035)	$31.50 million

Table 18.4. Metrics for 2050

Metric	Value
Annual GHG Reductions	0.0853 MMT CO2e
Annual Net Savings	$15.46 million
Total GHG Reductions (2025–2050)	1.062 MMT CO2e
Total Net Savings (2025–2050)	$174.85 million

Energy

19. Increase usage of "urban-scale" solar (e.g., solar on landfill and wastewater sites and community solar)

Table 19.1. Top-line values for target years

	2035	2050
GHG Emissions Reductions Compared to the Federal Rollback (MMTCO2e)	0.02	0.70
Net Cost of Carbon Reduction (2024$/MTCO$_2$e)*	-11	-849

*Negative costs constitute positive savings.

19.1. Overview

This workbook estimates the GHG reduction potential and total costs/benefits of the "Increased Usage of Urban-Scale Solar" measure.

19.2. Modeling Assumptions

This measure was modeled using the RMI's EPS, an "open-source model for estimating the environmental, economic, and human health impacts of hundreds of climate and energy policies." Environmental, economic, and human health impacts resulting from each measure's implementation were estimated for two periods: 2035 and 2050.

To model the measure in the EPS, a FPRR and a "policy" scenario were developed, projecting out assumptions and key inputs related to the measure to 2050. The FPRR scenario assumes no implementation of the reduction measure, while the policy scenario assumes full implementation of the measure.

The EPS provides emissions and policy impact estimates only at the state level, without geographic resolution for sub-state regions. To analyze impacts within the 29-county Atlanta MSA, we applied a population-based downscaling approach.

Specifically, we used county-level population projections from official state demographic sources to calculate the share of Georgia's total population residing in the Atlanta 29 MSA counties for each year. This proportion was then used to scale down statewide EPS outputs (e.g., emissions, costs, and pollutant trajectories) to approximate regional values.

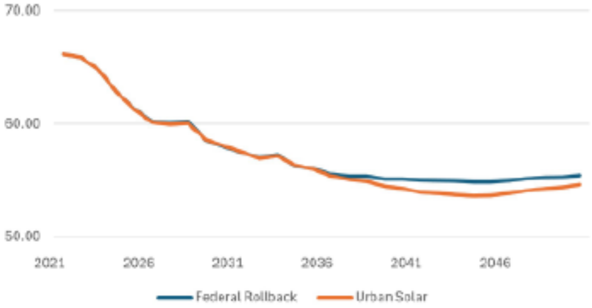
Modeling

Urban scale solar is modeled identically to rooftop solar, except it is allocated 20% of the total distributed solar carve-out and associated battery deployment. Costs and benefits follow the same EPS policies and assumptions but scaled to the smaller share.

19.3. Emissions Reductions

This measure drives moderate reductions in GHG emissions over time. In 2025, emissions fall by 0.02 MMT CO_2e, increasing steadily to 0.70 MMT CO_2e annually by 2050.

Figure 19.1. Projected GHG Emissions



Changes in Co-Pollutants

Under the measure, pollutant-specific dynamics reveal a nuanced trajectory of co-benefits that diverges meaningfully from the FPRR case. While total pollutant intensity is slightly higher under the pathway from 2025 through 2040, a closer look at individual pollutants highlights important long-term improvements.

Table 19.2. Projected Annual Pollution Reduction

GHG Emissions Reductions Compared to the FPRR (MMTCO$_2$e/year)

Greenhouse Gases	**2035**	**2050**
Carbon Dioxide (CO_2)	0.017	0.667
Methane (CH_4)	0.013	0.027
Nitrous Oxide (N_2O)	-0.004	0.003
Fluorinated Gases (F-gases)	-0.004	-0.006

Co-Pollutants Emissions Reductions Compared to the FPRR (Thousand Metric Tons/year)

Co-Pollutants	**2035**	**2050**
Fine Particulate Matter ($PM_{2.5}$)	0.0035	-0.0299
Coarse Particulate Matter (PM_{10})	0.0078	-0.0312
Black Carbon (BC)	-0.0003	-0.0020
Organic Carbon (OC)	-0.0055	-0.0132
Nitrogen Oxides (NO_x)	0.0001	-0.0002
Volatile Organic Compounds (VOC)	-0.0019	-0.0123
Sulfur Oxides (SO_x)	0.0003	0.0000
Carbon Monoxide (CO)	0.0001	-0.0001

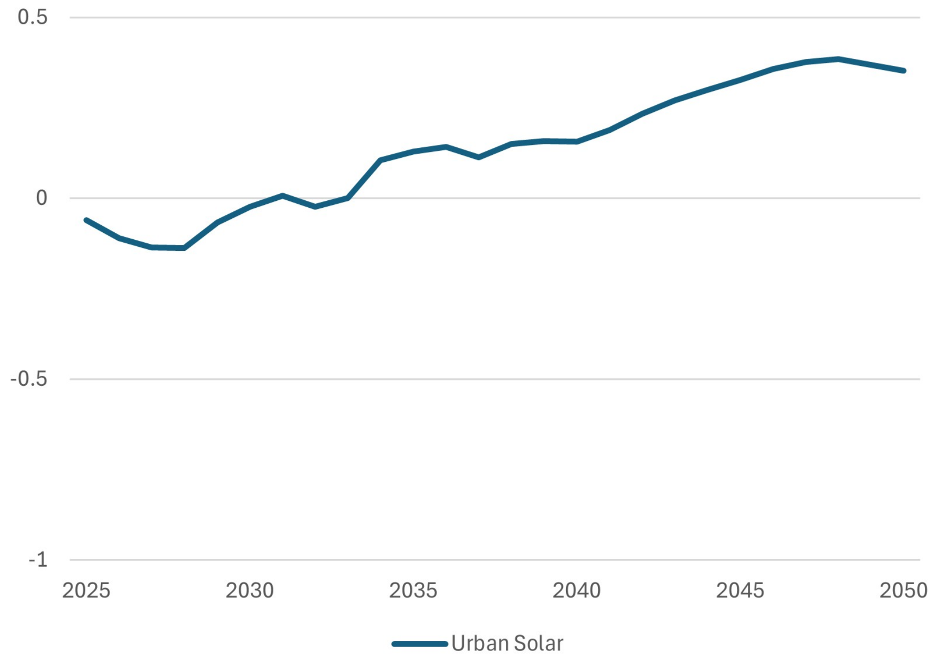
In 2035, carbon dioxide (CO_2) (0.017 $MMTCO_2e$) and CH_4 (0.013 $MMTCO_2e$) decline, but nitrous oxide (N_2O) and fluorinated gases (F-gases) both increase slightly (0.004 MMT CO_2e each). By 2050, carbon dioxide (CO_2) reductions expand to 0.667 $MMTCO_2e$ and CH_4 to 0.027 $MMTCO_2e$, while nitrogen oxides (NO_x) falls modestly (0.003 $MMTCO_2e$). F-gases continue to increase (0.006 $MMTCO_2e$).

Co-pollutant outcomes are mixed. By 2035, small reductions occur in $PM_{2.5}$ (0.0035k tons), PM_{10} (0.0078k tons), nitrogen oxides (NO_x) (0.0001k tons), sulfur oxides (SO_x) (0.0003k tons), and CO (0.0001k tons). At the same time, BC, OC, and VOCs increase. By 2050, reductions in $PM_{2.5}$ (0.0299k tons), PM_{10} (0.0312k tons), NO_x, and CO are offset by increases in BC, OC, and VOCs.

19.4. Cost Savings

The financial outlook for urban-scale solar is favorable. By 2035, the measure produces $220 million in annual net savings, equivalent to $11 billion per $MMTCO_2e$ reduced. By 2050, annual net savings rise to $594 million, or $849 million per $MMTCO_2e$ reduced.

Figure 19.3. Projected Annual Savings



Over the full period from 2025 to 2050, the measure is projected to yield $3.55 billion in net savings, primarily through avoided fossil fuel purchases, deferred transmission investments, and resilience benefits.

19.5. Summary Metrics for Target Years

Table 19.3. Metrics for 2035

Metric	Value
GHG Reductions	0.02 million metric tons CO_2e
Net Savings	$220 million
Savings/MMT CO2e	$11 billion
Social Benefits	$3 million

Table 19.4. Metrics for 2050

Metric	Value
GHG Reductions	0.70 million metric tons CO_2e
Net Savings	$594 million
Savings/MMT CO2e	$849 million
Social Benefits	$274 million

20. Increase installation of rooftop solar and battery storage systems

Table 20.1. Top-level values for target years

	2035	2050
GHG Emissions Reductions Compared to the Federal Rollback ($MMTCO_2e$)	0.09	2.80
Net Cost of Carbon Reduction (2024$/$MTCO_2e$)*	-9,778	-846

*Negative costs constitute positive savings.

20.1. Overview

This measure was modeled using the RMI's EPS, an open-source tool for estimating the environmental, economic, and human health impacts of climate and energy policies. Impacts were assessed for two periods, 2035 and 2050.

20.2. Modeling Assumptions

The EPS was run under two scenarios: a FPRR baseline with no implementation of the measure, and a "policy" case assuming full adoption. The distributed solar carve-out was modeled at 24% of retail electricity demand by 2050, consistent with achievable potential. Battery storage costs were modeled using $45/kWh and 41.6% of production cost assumptions aligned with Inflation Reduction Act (IRA) incentives. For rooftop solar, 80% of the total solar carve-out was assigned to this measure, with the remaining 20% allocated to community solar.

Modeling:

As EPS outputs are state-level, results were downscaled to the Atlanta 29-county MSA using county-level population projections from official state sources.

20.3. Emissions Reductions

This measure drives meaningful reductions in GHG emissions over time. By 2035, total GHG reductions reach 0.09 $MMTCO_2e$, and by 2050, reductions expand to 2.80 $MMTCO_2e$.

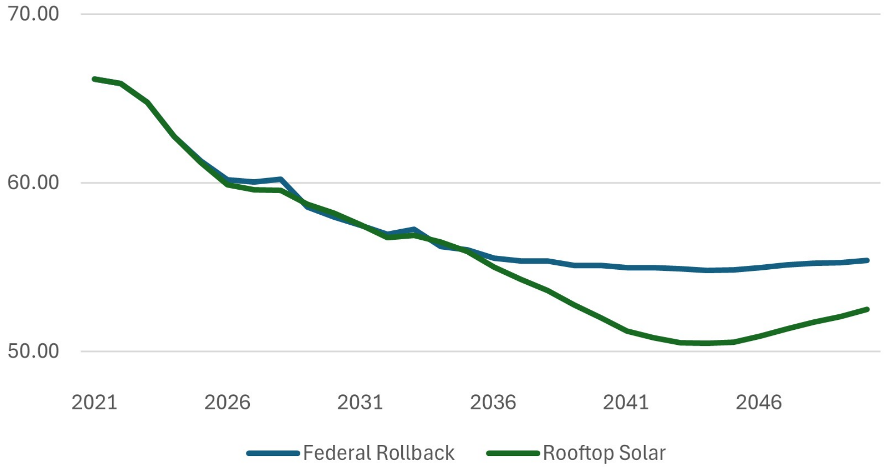


Figure 20.1. Projected GHG emissions reductions

The steepest growth in reductions occurs after 2030 as system deployment scales up and more existing buildings are retrofitted with rooftop solar photovoltaic (PV) and batteries. The trajectory reflects increased penetration, declining technology costs, and growing efficiency in system integration.

Changes in Co-Pollutants

Pollutant-specific dynamics reveal a nuanced mix of co-benefits. By 2035, carbon dioxide (CO_2) reductions are supported by declines in methane (CH_4, 0.052 $MMTCO_2e$) but partly offset by small increases in nitrous oxide (N_2O, -0.015 $MMTCO_2e$) and F-gases (-0.015 $MMTCO_2e$).

By 2050, climate benefits strengthen: carbon dioxide (CO_2) reductions grow to 2.710 $MMTCO_2e$, CH_4 declines reach 0.107 $MMTCO_2e$ and nitrous oxide (N_2O) falls modestly (0.012 $MMTCO_2e$.) F-gases continue to increase (-0.025 $MMTCO_2e$), though the scale remains minor compared to carbon dioxide (CO_2) abatement.

Table 20.2. Projected Annual Pollution Reduction

GHG Emissions Reductions Compared to the FPRR ($MMTCO_2e$/year)

Greenhouse Gases	**2035**	**2050**
Carbon Dioxide (CO_2)	0.068	2.710
Methane (CH_4)	0.052	0.107
Nitrous Oxide (N_2O)	-0.015	0.012
Fluorinated Gases (F-gases)	-0.015	-0.025

Co-Pollutants Emissions Reductions Compared to the FPRR (Thousand Metric Tons/year)

Co-Pollutants	**2035**	**2050**
Fine Particulate Matter ($PM_{2.5}$)	0.0141	-0.1197
Coarse Particulate Matter (PM_{10})	0.0313	-0.1248
Black Carbon (BC)	-0.0011	-0.0080
Organic Carbon (OC)	-0.0218	-0.0529
Nitrogen Oxides (NO_x)	0.0005	-0.0007
Volatile Organic Compounds (VOC)	-0.0078	-0.0493
Sulfur Oxides (SO_x)	0.0011	-0.0001
Carbon Monoxide (CO)	0.0002	-0.0004

For co-pollutants, outcomes are mixed. In 2035, $PM_{2.5}$ (0.0141k tons) and course particulate matter (PM_{10}) (0.0313k tons) both decline slightly, as do NO_x (0.0005k tons) and CO (0.0002k tons). At the same time, BC (0.0011k tons), OC (0.0218k tons), VOCs (0.0078k tons), and sulfur oxides (SO_x) (0.0011k tons) all increase modestly.

By 2050, larger reductions occur in $PM_{2.5}$ (0.1197k tons), PM_{10} (0.1248k tons), NO_x (0.0007k tons), and CO (0.0004k tons). In contrast, BC (0.0080k tons), OC (0.0529k tons), and VOCs (0.0493k tons) increase compared to the baseline. SO_x remains essentially flat.

20.4. Cost Savings

Financial outcomes are strongly positive by mid-century. In 2035, the measure produces $880 million in annual net savings, equivalent to $9.78 billion per $MMTCO_2e$ reduced. By 2050, annual net savings grow to $2.37 billion, or $846 million per $MMTCO_2e$ reduced.

Figure 20.2. Projected Annual Net Savings

Over the full period from 2025 to 2050, the measure is projected to yield $14.2 billion in net savings, primarily through avoided fossil fuel purchases, deferred transmission investments, and resilience benefits.

20.5. Summary of Metrics for Target Years

Table 20.3. Metrics for 2035

Metric	**Value**
GHG Reductions	0.09 million metric tons CO_2e
Net Savings	$880 million
Savings/MMT CO2e	$9.78 billion
Social Benefits	$12 million

Table 20.4. Metrics for 2050

Metric	**Value**
GHG Reductions	2.8 million metric tons CO_2e
Net Savings	$2.37 billion
Savings/MMT CO2e	$846 million
Social Benefits	$1.10 billion

21. Capture biosolids & biogas at wastewater treatment plants for waste-to-energy creation

Table 21.1. Top-line values for target years

	2035	2050
GHG Emissions Reductions Compared to the Federal Rollback ($MMTCO_2e$)	0.25	0.66
Net Cost of Carbon Reduction (2024$/$MTCO_2e$)*	-12	753

*Negative costs constitute positive savings.

21.1. Overview

This measure was modeled using the Rocky Mountain Institute's EPS. Impacts are reported for 2035 and 2050, with statewide EPS outputs scaled to the Atlanta MSA using sector-appropriate scalars, consistent with Appendix C.

21.2. Modeling Assumptions

The EPS policy specifications applied for this measure are "100% Achievable Methane Capture (water) by 2050" paired with a $20/kWh subsidy for electricity generation from municipal solid waste, consistent with similar Inflation Reduction Act (IRA) provisions. This reflects full deployment of technologies to capture methane from wastewater treatment plants and convert it into useful energy.

Modeling

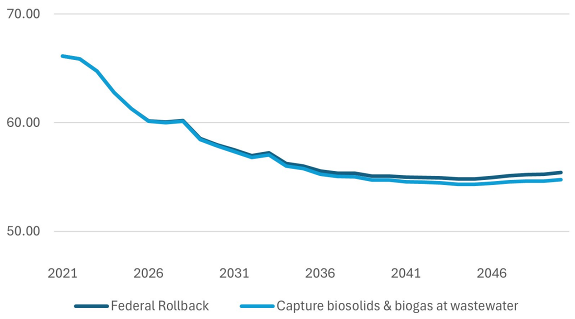
The core modeling variable is the incremental change in methane emissions relative to the FPRR. Carbon dioxide (CO_2), nitrogen oxides (NO_x), and fluorinated gases (F-gases) show only marginal changes, while methane (CH_4) capture provides the primary driver of reductions.

This analysis focuses specifically on wastewater biosolids and biogas utilization. Other measures in the waste sector, such as landfill methane capture or industrial Carbon Capture Sequestration (CCS), are modeled separately.

21.3. Emissions Reductions

The results show that this measure produces consistent methane reductions, though its overall greenhouse gas profile is modest. By 2035, total reductions equal 0.25 million metric tons CO_2e, nearly all from avoided methane (CH_4) emissions (0.246 MMT). Carbon dioxide (CO_2), nitrogen oxides (NO_x), and fluorinated gases (F-gases) show no change at that stage.

Figure 21.1. Projected GHG Emissions



By 2050, annual reductions reach 0.66 MMT CO_2e, again dominated by methane capture (0.665 MMT). However, both carbon dioxide and fluorinated gases show small increases of 0.004 MMT and 0.001 MMT respectively, while nitrous oxide remains unchanged. The steepest growth in reductions occurs after 2040 as system deployment scales up. The trajectory reflects increased penetration, declining technology costs, and growing efficiency in system integration.

Changes in Co-Pollutants

Co-pollutant outcomes are very small in scale, but their trends are still notable. In 2035, $PM_{2.5}$ falls by 0.0004 thousand metric tons and PM_{10} by 0.0006 thousand metric tons. OC declines slightly by 0.0001 thousand metric tons. At the same time, VOCs increase by 0.0071 thousand metric tons, while BC, nitrogen oxides (NO_x), SO_x, and CO remain flat.

Table 21.2. Projected Annual Pollution Reduction

GHG Emissions Reductions Compared to the FPRR (MMTCO2e/year)

Greenhouse Gases	**2035**	**2050**
Carbon Dioxide (CO2)	0.000	-0.004
Methane (CH$_4$)	0.246	0.665
Nitrous Oxide (N$_2$O)	0.000	0.000
Fluorinated Gases (F-gases)	0.000	-0.001

Co-Pollutants Emissions Reductions Compared to the FPRR (Thousand Metric Tons/year)

Co-Pollutants	**2035**	**2050**
Fine Particulate Matter (PM 2.5)	0.0004	0.0003
Coarse Particulate Matter (PM 10)	0.0006	0.0006
Black Carbon (BC)	0.0000	0.0000
Organic Carbon (OC)	0.0001	-0.0001
Nitrogen Oxides (NO$_x$)	0.0000	0.0000
Volatile Organic Compounds (VOC)	0.0071	0.0261

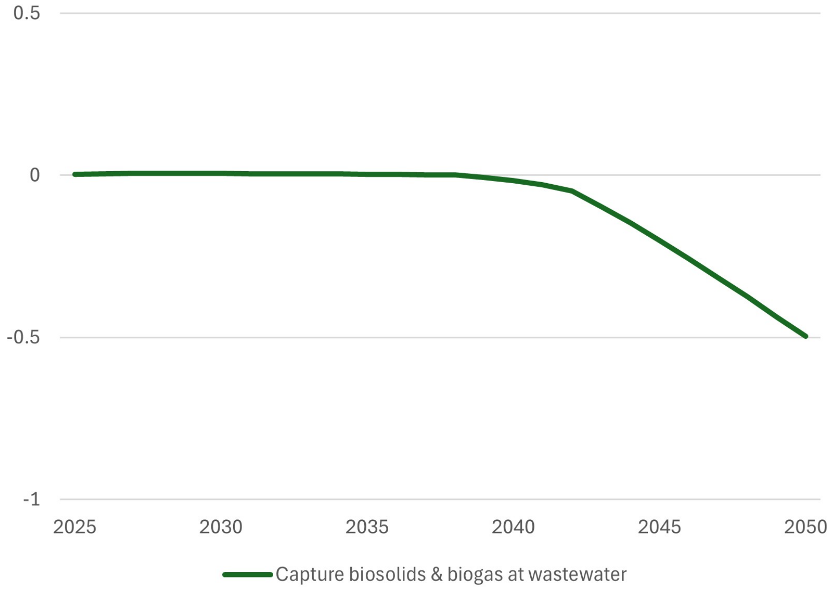
Sulfur Oxides (SO_x)	0.0000	0.0000
Carbon Monoxide (CO)	0.0003	0.0000

By 2050, $PM_{2.5}$ and PM_{10} remain modestly lower than baseline, but volatile organic compounds rise further to 0.0261 thousand metric tons, and organic carbon shifts to a net increase of 0.0001 thousand metric tons. Other co-pollutants show no measurable change.

21.4. Cost Savings

The cost profile of this measure is unfavorable. By 2035, the annual net savings are minimal, totaling just $3 million, which equates to about $12 million per $MMTCO_2e$ reduced. By 2050, the measure imposes significant annual net costs of $497 million, or –$753 million per $MMTCO_2e$ reduced. Across the analysis horizon, the technology remains capital-intensive, with no offsetting fuel cost savings large enough to shift it into net-positive territory.

Figure 21.2. Projected Annual Savings



21.6. Summary Metrics for Target Values

Table 21.3. Metrics for 2035

Metric	Value
GHG Reductions	0.25 MMT CO_2e
Net Savings	$3 million
Savings/CO_2e	$12 million

Table 21.4. Metrics for 2050

Metric	Value
Annual GHG Reductions	0.66 MMT CO_2e
Annual Net Savings	-$497 million
Savings/CO_2e	-$753 million

22. Adopt demand response actions in local government facilities, businesses, and homes (shift energy use to off-peak times; use power strips, etc.)

Table 22.1. Top-line values for target years

	2035	2050
GHG Emissions Reductions Compared to the Federal Rollback (MMTCO_2e)	-0.92	5.61
Net Cost of Carbon Reduction (2024$/MT$CO_2e$)*	-105	176

*Negative costs constitute positive savings.

22.1. Overview

This measure was modeled using the Rocky Mountain Institute's EPS. Impacts are reported for 2035 and 2050, with statewide outputs scaled to the Atlanta MSA using sector-appropriate scalars, consistent with Appendix C.

22.2. Modeling Assumptions

The EPS policy specification applied is "100% Achievable Potential Demand Response by 2050." This represents full adoption of technologies and programs that shift or curtail electricity consumption during peak demand periods. Demand response reduces the need for fossil-fuel peaker plants, lowers grid stress, and enhances reliability.

Modeling

The core modeling variable is the incremental reduction in peak load and corresponding emissions relative to the FPRR. By flattening demand curves, this measure reduces both greenhouse gas emissions and co-pollutants from combustion-based generation.

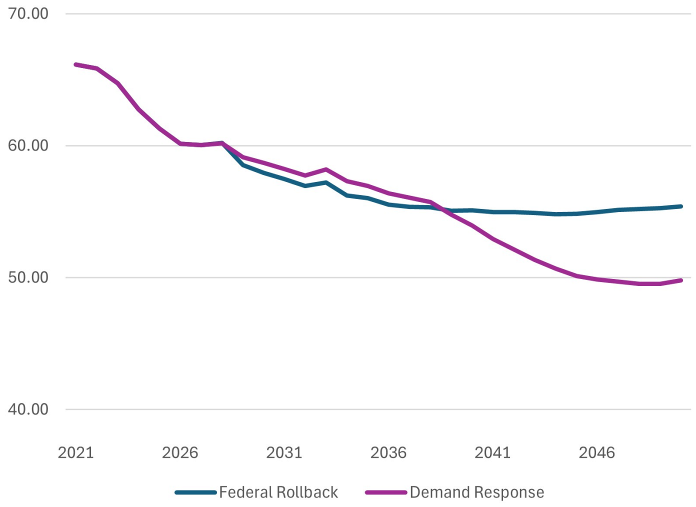
This analysis isolates demand response as a standalone strategy, though in practice it complements distributed solar, storage, and energy efficiency by reducing system costs and smoothing integration of renewable energy.

22.3. Emissions Reductions

This measure produces both near-term increases and long-term reductions in greenhouse gas (GHG) emissions. In 2035, total emissions increase by 0.92 MMT CO_2e, driven by higher carbon dioxide (+0.92 MMT) and nitrous oxide (+0.02 MMT), with only small offsets from methane reductions (–0.01 MMT). Fluorinated gases remain flat.

By 2050, the profile shifts decisively toward net benefits. Annual reductions reach 5.61 MMT CO_2e, with carbon dioxide reductions accounting for 5.39 MMT, methane for 0.20 MMT, and nitrous oxide for 0.03 MMT. Fluorinated gases increase slightly (0.01 MMT), but their scale is negligible relative to CO_2 reductions.

Figure 22.1. Projected GHG Emissions



Emissions rise steadily through 2039 before falling sharply as system deployment scales up and older fossil plants are retired. This trajectory reflects demand response's ability to flatten load curves, reduce reliance on peaker plants, and improve integration of renewable energy.

Changes in Co-Pollutants

Co-pollutant dynamics mirror the GHG trajectory. In 2035, emissions of $PM_{2.5}$ (–0.059k tons), PM_{10} (–0.079k tons), BC (–0.002k tons), NO_x (–0.001k tons), SO_x (–0.001k tons), and VOCs (–0.010k tons) all increase relative to baseline. In contrast, organic carbon (OC) rises by 0.004k tons, and CO remains flat.

Table 22.2. Projected Annual Pollution Reduction

GHG Emissions Reductions Compared to the FPRR ($MMTCO_2e$/year)

Greenhouse Gases	**2035**	**2050**
Carbon Dioxide (CO_2)	-0.92	5.39
Methane (CH_4)	0.01	0.20
Nitrous Oxide (N_2O)	-0.02	0.03
Fluorinated Gases (F-gases)	0.000	-0.01

Co-Pollutants Emissions Reductions Compared to the FPRR (Thousand Metric Tons/year)

Co-Pollutants	**2035**	**2050**
Fine Particulate Matter ($PM_{2.5}$)	-0.059	0.227
Coarse Particulate Matter (PM_{10})	-0.079	0.236
Black Carbon (BC)	-0.002	0.015
Organic Carbon (OC)	0.004	0.102
Nitrogen Oxides (NO_x)	-0.001	0.001
Volatile Organic Compounds (VOC)	-0.010	0.095
Sulfur Oxides (SO_x)	-0.001	0.000
Carbon Monoxide (CO)	0.000	0.001

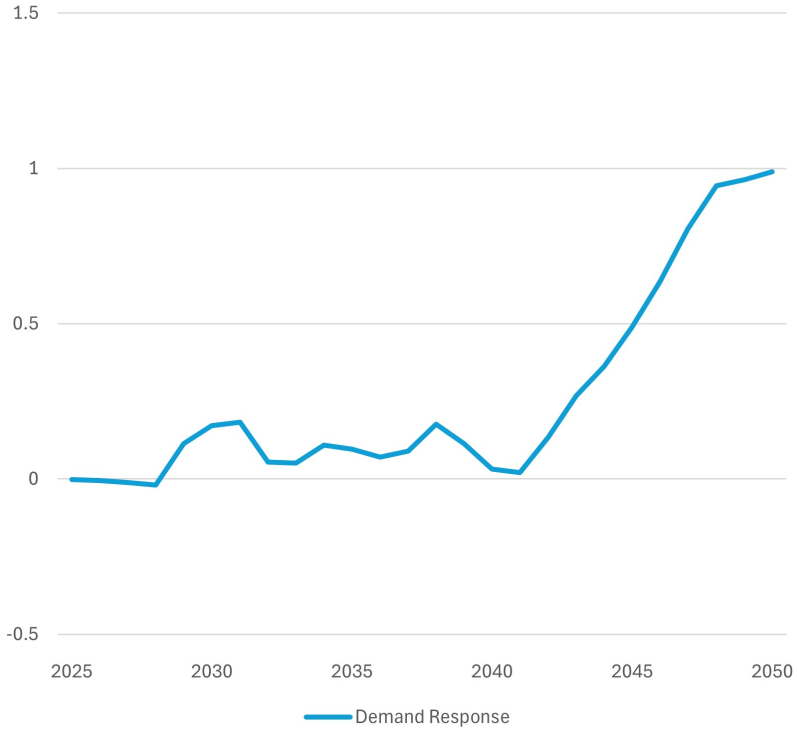
By 2050, significant reductions emerge: $PM_{2.5}$ (0.227k tons), PM_{10} (0.236k tons), BC (0.015k tons), VOCs (0.095k tons), and NO_x (0.001k tons) all decline. Organic carbon increases substantially (0.102k tons), while SO_x and CO remain essentially unchanged. These shifts reflect declining combustion-related emissions as fossil generation is displaced.

22.4. Cost Savings

The financial outlook improves markedly after 2030. In the early years (2025–2030), net costs are incurred due to program setup and system integration. By 2035, however, the measure generates $97 million in net annual savings, equivalent to $105 million per MMT CO_2e reduced. By 2050, annual savings rise to $989 million, or $176 million per MMT CO_2e reduced.

Over 2025–2050, cumulative savings total tens of billions of dollars, primarily through avoided fossil fuel purchases, deferred transmission infrastructure, and improved grid efficiency.

Figure 22.2. Projected Annual Savings



Over the full period from 2025 to 2050, the measure is projected to yield $6.8 billion in net savings, primarily through avoided fossil fuel purchases, deferred transmission investments, and resilience benefits.

22.5. Summary Metrics for Target Years

Table 22.3. Metrics for 2035

Metric	Value
GHG Reductions	-0.92 million metric tons CO_2e
Net Savings	$97 million
Net Savings/Annual MMT CO_2e	$105 million

Table 22.4. Metrics for 2050

Metric	Value
GHG Reductions	5.61 million metric tons CO_2e
Net Savings	$989 million
Net Savings/MMT CO_2e	$176 million

23. Capture methane from landfills for conversion into electricity

Table 23.1. Top-line values for target years

	2035	2050
GHG Emissions Reductions Compared to the Federal Rollback (MMTCO$_2$e)	0.07	0.60
Net Cost of Carbon Reduction (2024$/MTCO$_2$e)*	-614	677

*Negative costs constitute positive savings.

23.1. Overview

This measure was also modeled in the EPS, with results scaled to the Atlanta MSA using the same approach.

23.2. Modeling Assumptions

The EPS policy specifications applied are “100% Achievable Methane Capture (waste) by 2050” and a 41% subsidy for capacity construction of biomass facilities, aligned with similar Inflation Reduction Act (IRA) policies. The measure assumes landfill methane capture at all feasible sites, with gas routed into electricity generation.

Modeling

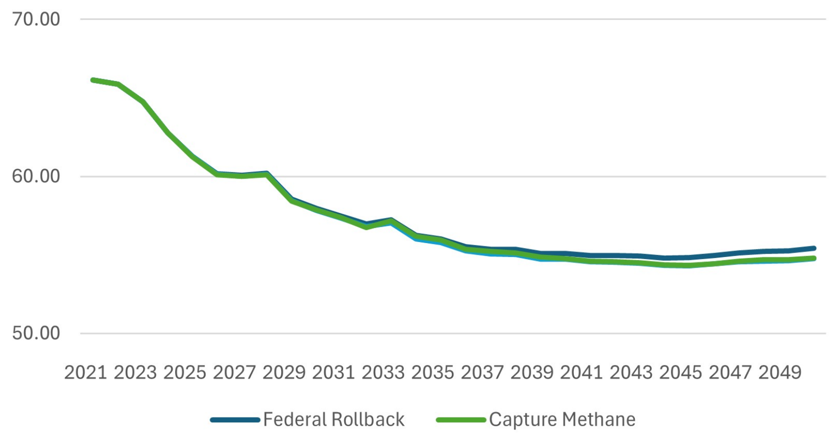
The core modeling mechanism is avoided methane (CH_4) emissions to the atmosphere, partially offset by small increases in carbon dioxide (CO_2) and nitrogen oxides (NO_x) from combustion processes. Deployment is phased in over time, with the steepest growth in reductions occurring after 2040 as landfill gas recovery systems scale up.

This measure is modeled distinctly from wastewater methane (CH_4) recovery to prevent overlap, and its performance is tracked as the difference between the FPRR baseline and the policy scenario.

23.3. Emissions Reductions

This measure drives moderate but important reductions in GHG emissions, primarily through avoided methane (CH_4) releases from landfills. By 2035, total reductions reach 0.07 MMT CO_2e, nearly all from methane (CH_4) capture (0.252 MMT). At the same time, other gases show offsetting increases: carbon dioxide (CO_2) rises by 0.176 MMT, and nitrogen oxide (NO_x) increases slightly (0.004 MMT). Fluorinated gases (F-gases) remain essentially flat.

Figure 23.1. Projected GHG Emissions



By 2050, annual reductions grow to 0.60 MMT CO_2e, again dominated by methane (CH_4) capture (0.669 MMT). However, carbon dioxide (CO_2) continues to rise relative to the baseline (0.061 MMT), nitrogen oxides (NO_x) increases slightly (0.002 MMT), and fluorinated gases (F-gases) also show a net increase (0.005 MMT). These results reflect the strong climate benefit of methane (CH_4) capture but also reveal small offsetting emissions in other categories.

Changes in Co-Pollutants

Co-pollutant effects are minimal in scale but directionally mixed. In 2035, $PM_{2.5}$ decreases slightly by 0.0004 thousand metric tons and PM_{10} by 0.0006 thousand metric tons, with OC falling by 0.0001 thousand metric tons. At the same time, VOCs increase by 0.0071 thousand metric tons, while BC, nitrogen oxides (NO_x), sulfur oxides, and CO show no change.

Table 23.2. Projected Annual Pollution Reduction

GHG Emissions Reductions Compared to the FPRR ($MMTCO_2e$/year)

Greenhouse Gases	**2035**	**2050**
Carbon Dioxide (CO_2)	-0.176	-0.061
Methane (CH_4)	0.252	0.669
Nitrous Oxide (N_2O)	-0.004	-0.002
Fluorinated Gases (F-gases)	0.001	-0.005

Co-Pollutants Emissions Reductions Compared to the FPRR (Thousand Metric Tons/year)

Co-Pollutants	**2035**	**2050**
Fine Particulate Matter ($PM_{2.5}$)	0.0004	0.0003
Coarse Particulate Matter (PM_{10})	0.0006	0.0006
Black Carbon (BC)	0.0000	0.0000

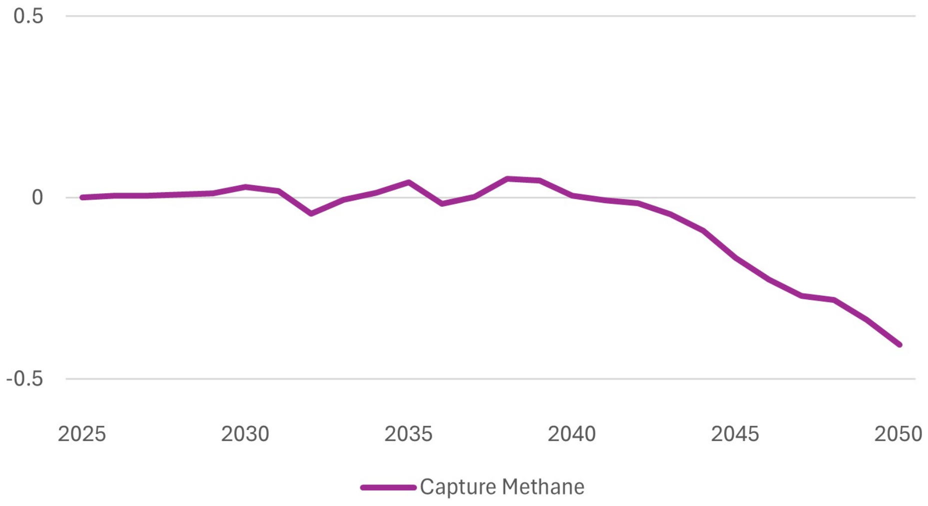
Organic Carbon (OC)	0.0001	-0.0001
Nitrogen Oxides (NO_x)	0.0000	0.0000
Volatile Organic Compounds (VOC)	0.0071	0.0261
Sulfur Oxides (SO_x)	0.0000	0.0000
Carbon Monoxide (CO)	0.0003	0.0000

By 2050, $PM_{2.5}$ and PM_{10} remain modestly reduced relative to the baseline, but VOCs rise further to 0.0261 thousand metric tons, and organic carbon shifts to a net increase of 0.0001 thousand metric tons. All other co-pollutants remain flat.

23.4. Cost Savings

The financial profile of landfill gas-to-electricity is unfavorable. In 2035, annual net savings are limited, at just \$43 million, equivalent to \$614 million per MMT CO_2e reduced. By 2050, costs outweigh benefits: annual net costs reach \$406 million, or –\$677 million per MMT CO_2e reduced. Over the full analysis horizon, the technology remains capital-intensive, with insufficient offsets from avoided fuel costs to achieve net-positive savings.

Figure 23.2: Projected Annual Savings



23.6. Summary Metrics for Target Years

Table 23.3. Margins for 2035

Metric	Value
GHG Reductions	0.07 MMT CO_2e
Net Savings	$43 million
Savings/MMT CO_2e	$614 million

Table 23.4. Metrics for 2050

Metric	Value
Annual GHG Reductions	0.60 MMT CO_2e
Annual Net Savings	-$406 million
Annual Net Savings/Annual MMT CO_2e	-$677 million

Cross-Sector

24. Increase local government adoption of climate mitigating measures

Table 24.1. Top-line values for target years

	2035	2050
GHG Emissions Reductions Compared to the Federal Rollback (MMTCO_2e)	0.64	2.90
Net Cost of Carbon Reduction (2024$/MT$CO_2e$)*	-51.6	3,796.3

*Negative costs constitute positive savings.

The ARC Green Communities program has been in place for over 15 years. This is a voluntary sustainability certification program that helps local governments reduce their environmental impact through actionable measures. The current program includes, but is not limited to, the following:

- conducting energy audits on their facilities and making retrofits;
- incorporating high performance building requirements into their codes of ordinance;
- adopting no-net-loss of trees policies;
- developing greenspace plans and greenspace goals;
- encouraging the diversion of waste from landfills through recycling and composting of yard waste materials;
- transitioning fleets to alternative-fuels and EVs;
- expanding EV charging infrastructure and requiring EV chargers in new developments; and

- encouraging transportation mode shifts through pedestrian and bike planning as well as participation in nation bike/walk friendly programs.

This climate pollution reduction measure will be implemented by expanding the Green Communities program to include scoring for 18 of the other 23 measures included in the CCAP. Five measures are excluded since local governments have a limited ability to implement those measures. The excluded measures are:

- Electrify industrial buildings & processes,
- Retrofit industrial processes and equipment,
- Decrease non-CO2 GHG Emissions through improved industrial processes,
- Capture heat from industrial processes to provide HVAC or create electricity, and
- Capture methane from landfills for conversion into electricity

The GHG reductions projected to be achieved by this measure are based on ARC's observation of the Green Communities program for over a decade. The friendly competition between jurisdictions is expected to produce an extra 5% increase in the body of the 18 included measures, resulting in an additional reduction of 0.64 MMT CO_2e in 2025 and 2.90 MMT CO_2e in 2050. The extra costs of the program are expected to be minimal: a small amount of ARC staff time to include the climate pollution reduction measures during the next cycle in which the program structure is revised.

A.8 Glossary of Terms

AFV = Alternative Fuel Vehicle

ASHRAE = American Society of Heating Refrigerating, and Air-Conditioning Engineers

BC = Black Carbon

BEV = Battery Electric Vehicle

CapEx = Capital Expenditures

CBECS = Commercial Buildings Energy Consumption Survey

CCS = Carbon Capture Sequestration

CH_4 = Methane

C&I = Commercial and Industrial

CO = Carbon Monoxide

DCFC = Direct Current Fast Charging

DOE = Department of Energy

EPA = Environmental Protection Agency

EPD = Environmental Protection Division

EPS = Energy Policy Simulator

EVI Pro-Lite = Electric Vehicle Infrastructure

FCEV = Fuel Cell Electric Vehicle or “hydrogen vehicle”

F-gases = Fluorinated gases

FPRR = Federal Policy Repeal and Rollback

GDP = Gross Domestic Product

GHG = Greenhouse Gas

GT-NEMS 2023 = Georgia Tech’s National Energy Modeling System (2023)

GWP = Global Warming Potential

GVWR = Gross Vehicle Weight Rating

HEV = Hybrid Electric

HVAC = Heating, Ventilation, and Air Conditioning

ICE = Internal Combustion Engine

IECC = International Energy Conservation Code

IPCC = Intergovernmental Panel on Climate Change

IRA = Inflation Reduction Act

ME = Material Efficiency

MECS = Manufacturing Energy Consumption Survey

MMT CO_2e = Million Metric Tons of Carbon Dioxide Equivalents

MSA = Metropolitan Statistical Area

$MTCO_2e$ = Metric Tons of Carbon Dioxide Equivalents

NERC = North American Electric Reliability Corporation

NO_x = Nitrogen Oxides

O&M = Operations and Maintenance

OC = Organic Carbon

PCAP = Priority Climate Action Plan

PEVs = Plug-in Vehicles

PHEVs = Plug-in Hybrid Electric Vehicles

PM_{10} = Coarse Particulate Matter (diameter of 10 micrometers)

$PM_{2.5}$ = Fine Particulate Matter (diameter of 2.5 micrometers)

PV = Photovoltaic

RMI = Rocky Mountain Institute

SO_x = Sulfur Oxides

SSP2 = Shared Socioeconomic Pathway 2

TNC = Transportation Network Companies

V2G = Vehicle-to-grid

VOCs = Volatile Organic Compounds

WARM = Waste Reduction Model (EPA)

ZEV = Zero-Emission Vehicle

A.9 References

Allwood and Cullen. 2015. Sustainable Materials Without the Hot Air

Brown, Marilyn A., Puneet Dwivedi, Sudhagar Mani, Daniel Matisoff, Jacqueline E. Mohan, Jeffrey Mullen, Michael Oxman, Michael Rodgers, Richard Simmons, Blair Beasley, Lalith Polepeddi (2021). "A Framework for Localizing Global Climate Solutions and their Carbon Reduction Potential," *Proceedings of the National Academy of Sciences,* 118 (31); https://doi.org/10.1073/.2100008118

Brown, Marilyn A., Blair Beasley, **Fikret Atalay**, Kim M. Cobb, Puneet Dwivedi, **Jeffrey Hubbs,** David M. Iwaniec, Sudhagar Mani, Daniel Matisoff, Jacqueline E. Mohan, Jeffrey Mullen, Michael Oxman, Daniel Rochberg, Michael Rodgers, Marshall Shepherd, Richard Simmons, Laura Taylor, L. Beril Toktay. (2021) "Translating a Global Emission-Reduction Framework for Subnational Climate Action: A Case Study from the State of Georgia," *Environmental Management.* 67: 205-227. https://doi.org/10.1007/s00267-020-01406-1.

A.10 Acknowledgements

Two faculty members of the Georgia Institute of Technology designed and oversaw the completion of this research: Dr. Marilyn Brown (Jimmy and Roselynn Carter School of Public Policy) and Dr. Bill Drummond (School of City and Regional Planning). Oliver Chapman and Suprita Chakravarthy played leadership roles on our team of Georgia Tech graduate students, which also included Riley Chodak, Niraj Palsule, Derek McNutt, Andrew Dowdy, William Moore, and Amelia Tomasulo. The Atlanta Regional Commission (ARC) was the primary sponsor of this research, and Crystal Jackson was our principal point of contact at ARC who provided valuable insights and feedback throughout. Supplemental funding for this work was provided by the Drawdown Georgia Research project funded by the Ray C. Anderson Foundation and by the Brook Byers Institute of Sustainable Systems at Georgia Tech.

A.11 Access to Data

For further information or access to data, please contact Dr. Marilyn Brown through her email: mbrown9@gatech.edu.