Peach State Voluntary Emission Reduction Plan

GEORGIA
DEPARTMENT OF NATURAL RESOURCES
ENVIRONMENTAL PROTECTION DIVISION

Air Protection Branch

March 8, 2024

EXECUTIVE SUMMARY

The Georgia Environmental Protection Division (Georgia EPD) drafted this Peach State Voluntary Emission Reduction Plan (PSVERP) in accordance with the U.S. Environmental Protection Agency's (EPA) Climate Pollution Reduction Grant (CPRG) Program, funded through the 2022 Inflation Reduction Act.

This PSVERP builds upon existing plans at the city, county, and regional level. Throughout the PSVERP development period, Georgia EPD sought continuous input from government and public stakeholders. This included convening a steering committee that assisted with identifying voluntary reduction measures and soliciting input from the 12 regional commissions across the state.

Georgia EPD engaged the public through a variety of formats including in-person events, virtual meetings, and an online survey.

The elements contained within this PSVERP include the following:

- Overview of the plan context and development process,
- Emissions inventories,
- Voluntary reduction strategies and measures, including the emissions reduction potential of each measure,
- Low-income and disadvantaged communities benefits analysis, and
- Review of the State of Georgia's authority to implement the priority measures.

Current State of Emissions in Georgia

According to EPA data, in 2021, 159 million metric tons of carbon dioxide equivalent ($MMTCO_2e$) emissions are attributable to Georgia, which equates to 2.5% of total U.S. emissions that year.[1] As shown in Figure 1, this was reduced by 47 $MMTCO_2e$ from carbon sinks in the land-use, land-use change and forestry (LULUCF) sector, resulting in net emissions of 112 $MMTCO_2e$. Georgia's total emissions have trended downward since 2005 primarily due to decreases in emissions from the electric power industry as coal-powered plants have been retired and replaced with new natural gas-powered plants, natural gas- conversion plants, new nuclear, renewables including solar. As emissions from the electric power industry decreased, transportation became the largest emitting sector, displayed in Figure 2.

[1] U.S. Environmental Protection Agency, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2021. April 2023.

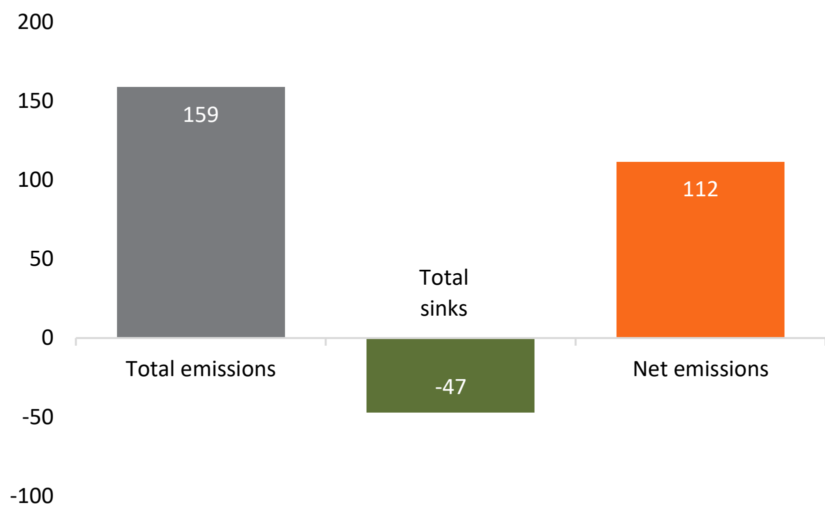

Figure 1. Georgia's 2021 GHG Emissions

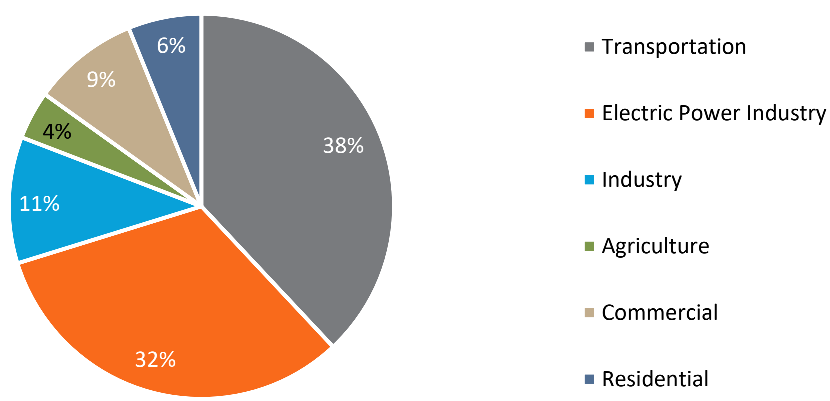

Figure 2. Georgia's 2021 GHG Emissions by Sector

Voluntary Emission Reduction Measures

This PSVERP includes 21 near-term and implementation-ready emissions reduction measures, categorized into seven overarching strategies, as presented in Table 1 below. Most of the emission reduction potentials were assessed using the Rocky Mountain Institute's Energy Policy Simulator.

Table 1. Priority Emission Reduction Strategies and Measures

1.	Electrify transportation sector and adapt to consumer mode shift
	1.1 Zero-emission buses
	1.2 Electric vehicle charging infrastructure
	1.3 Bikes and bike infrastructure
	1.4 Zero-emission fleet deployment
	1.5 Manufacturing of raw materials and intermediate and finished products to support EV uptake
2.	Improve energy efficiency and promote electrification
	2.1 Weatherization for residential buildings
	2.2 Home energy rebates for the purchase of electric and energy efficient products
	2.3 Incentive programs for implementation of end-use energy efficiency measures in commercial buildings
	2.4 Incentive programs for the purchase of certified energy-efficient lighting in commercial and industrial buildings, as well as streetlights
3.	Increase availability and use of renewable energy
	3.1 Transmission and distribution upgrades
	3.2 Increasing renewable energy
4.	Improve waste diversion and landfill management
	4.1 Landfill gas management and utilization
	4.2 Organic waste diversion from landfills
	4.3 Recycling
5.	Promote use of alternative fuels
	5.1 Hydrogen refueling stations
	5.2 Sustainable aviation fuel production
	5.3 Renewable natural gas production from biodigesters
6.	Refrigerant management
	6.1 Management of fluorinated (F-gas) leakage and replacement of equipment
7.	Advance conservation and sustainable land use
	7.1 Afforestation and reforestation
	7.2 Cropland and soil management improvements and conservation
	7.3 Coastal and waterway conservation and restoration

Benefits for Low-Income and Disadvantaged Communities

One of the requirements for states submitting a plan is for an analysis to be conducted on how priority measures will benefit low-income and disadvantaged communities (LIDACs). The priority measures in this PSVERP have the potential to benefit LIDACs across the state, which are defined by the EPA as census tracts that are both low-income or have limited formal education and are experiencing specific "categories of burden," such as high instances of respiratory illness, high energy or housing costs, and exposure to legacy pollution.[2]

[2] These categories of burden are defined by the by the Climate and Economic Justice Screening Tool. See: Council on Environmental Quality, Climate and Economic Justice Screening Tool. November 22, 2022.

Authority to Implement

Because the measures included in this plan are voluntary in nature, no additional regulatory authority is required to enable their implementation.

Next Steps

Upon publication of this PSVERP, eligible entities across Georgia will have the opportunity to apply for funding to implement the emissions reduction measures quantified in the plan, and Georgia will begin the process of developing a Comprehensive Peach State Voluntary Emission Reduction Plan (CPSVERP).

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1.0 Plan Context

This Peach State Voluntary Emission Reduction Plan (PSVERP) supports the State of Georgia, local governments, regional commissions, and private sector partners with reducing sector emissions. This section provides an overview of the Climate Pollution Reduction Grant (CPRG) program, under which the PSVERP is funded, and defines the scope of the PSVERP.

1.1 Climate Pollution Reduction Grant Overview

The Climate Pollution Reduction Grants program is an initiative of the U.S. Environmental Protection Agency (EPA) to support state, territory, tribal, and local actions to reduce emissions through the deployment of new technologies, operational efficiencies, and solutions.[3] The CPRG program is authorized under Section 60114 of the Inflation Reduction Act (IRA).[4]

The CPRG program was made available to all 50 states, territories, tribal governments, and 67 of the largest metropolitan statistical areas. It is a two-phased program, that includes:

- **Phase 1: Planning** provides a total of $250 million to states, local governments, tribes, and territories to design voluntary action plans that incorporate a variety of measures to reduce emissions from across their economies.[5]
- **Phase 2: Implementation** provides a total of $4.6 billion to implement Greenhouse Gas (GHG) reduction programs, policies, projects, and measures—collectively referred to as reduction measures, or "measures"[6]—from the plans developed in Phase 1.

This document is Georgia's PSVERP, developed by Georgia EPD under Phase I of the CPRG program, through a process of intergovernmental and interagency coordination, public and stakeholder engagement, research, and industry consultation in the State of Georgia. The PSVERP identified a focused list of near-term,priority, and implementation-ready measures with the potential to reduce pollution in Georgia. It is accompanied by an analysis of emission reductions, co-benefits, and considerations that could be realized through the implementation of those measures.[7]

With the publishing of this Georgia PSVERP in March 2024, eligible entities in the State of Georgia may apply for funding to implement the measures listed in this plan. Georgia will expand upon the PSVERP with a Comprehensive Peach State Voluntary Emission Reduction Plan (CPSVERP), which should be published on June 1, 2025.

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3 U.S. Environmental Protection Agency, Climate Pollution Reduction Grants Program: Formula Grants for Planning. March 1, 2023.
4 U.S. Environmental Protection Agency, Climate Pollution Reduction Grants. Retrieved February 8, 2024.
5 U.S. Environmental Protection Agency, About CPRG Planning Grant Information. Retrieved January 27, 2024.
6 U.S. Environmental Protection Agency, Climate Pollution Reduction Grants Program: Implementation Grants General Competition. January 16, 2024.
7 U.S. Environmental Protection Agency, Climate Pollution Reduction Grants Program: Formula Grants for Planning. March 1, 2023.

1.2 Scope of the Peach State Voluntary Emission Reduction Plan

This PSVERP's geographic scope is the State of Georgia. All elements of this PSVERP – including the emissions inventory, the voluntary emission reduction measures, agencies, departments, and public stakeholders involved in its creation – are focused on Georgia. Georgia EPD coordinated with the Atlanta Regional Commission (ARC) which developed its own plan for the Atlanta-Sandy Springs-Alpharetta metropolitan statistical area (MSA), expanded for the purposes of CPRG planning.

Georgia's GHG inventory is comprehensive in covering the following emissions sectors:

- Transportation
- Electric power industry
- Industry
- Agriculture
- Commercial
- Residential

As per EPA guidance, the PSVERP's voluntary emission reduction measures were selected to include near-term, -priority, implementation-ready measures; it is a not a comprehensive list of all measures nor does it cover every possible emissions source. For the Comprehensive PSVERP, Georgia EPD may choose to expand the scope and coverage of its voluntary emission reductions measures.

2.0 Plan Development

This Peach State Voluntary Emission Reduction Plan (PSVERP) is Georgia's first, building upon years of engagement with state and local entities, non-profit organizations, academic institutions, the private sector, and Georgia residents.

During the five-month PSVERP development period, Georgia EPD took a "bottom-up" approach to developing the list of measures included in this PSVERP by seeking the opinions, perspectives, and feedback of interested stakeholders across a variety of sectors and organizations. Georgia EPD did so through diverse means of communication including virtual meetings, in-person meetings and town halls, informational sessions, public surveys, and direct outreach. The following sections summarize Georgia EPD's process of engaging stakeholders across the state to create a PSVERP that reflects their priorities.

2.1 Stakeholder Groups

Georgia EPD engaged with government agencies and offices at the state, municipal, and regional commission level to coordinate planning efforts for the PSVERP. This collaboration process was designed to solicit early input and incorporate feedback from various governmental stakeholders so that the PSVERP would reflect the priorities and voluntary reduction measures of public sector entities across the state; those same entities may then be eligible to apply for implementation funding under this PSVERP.

Figure 3. Georgia EPD Addressing the Georgia House Sub-Committee

Intergovernmental and interagency coordination with state-level agencies was primarily achieved through a steering committee comprised of several state-level agencies. Coordination with municipalities was accomplished through Georgia's 12 regional commissions which assist local governments with comprehensive planning; this included coordinating with the Atlanta Regional Commission (ARC), which developed its own plan for the Atlanta-Sandy Springs-Alpharetta MSA, expanded for the purposes of CPRG planning.

Public outreach was conducted through eleven in-person events and town halls across the state, as well as virtual and hybrid meetings. Additionally, Georgia EPD distributed a public survey to reach a broader population of residents.

2.1.1 Steering Committee

Georgia EPD led a steering committee comprised of state-level agencies and departments to align the PSVERP with State of Georgia interests and capacities. The following entities participated as members of the Steering Committee:

- Georgia Environmental Protection Division (EPD)
- Georgia Department of Transportation (GDOT)
- Georgia Environmental Finance Authority (GEFA)
- Georgia Department of Economic Development (GDEcD)
- The Atlanta-Region Transit Link Authority (ATL)

The Steering Committee convened for the first time at the outset of the development of the PSVERP on October 31, 2023, to discuss and confirm a preliminary list of emissions reduction measures for inclusion in the PSVERP. The Steering Committee met for a second time on January 19, 2024, to review the work done to-date, review a refined list of measures, and provide input and feedback. Additionally, the Steering Committee met on February 23, 2024, to discuss the draft PSVERP and receive their input. Other state agencies were consulted on their respective policy and program areas in development of this plan.

2.1.2 Regional Commissions

As shown in Figure 4, the State of Georgia is comprised of 12 regions, represented by regional commissions. The regional commissions are tasked with assisting local governments within their respective regions and supporting the development of coordinated and comprehensive planning across the state.[8] They were an important conduit through which local governments were able to provide input into the PSVERP.

[8] Georgia Department of Community Affairs. Regional Commissions. DCA.GA.gov. Retrieved February 8, 2024.

Figure 4. Georgia's 12 regions

Georgia EPD conducted outreach to all 12 regional commissions through surveys, emails, and in-person meetings to obtain their feedback on voluntary reduction measures for inclusion in the PSVERP. Georgia EPD presented and discussed the CPRG program in person with three regional commissions: Middle Georgia, Northeast, and River Valley. Ultimately, six regional commissions participated in the CPRG program outreach and provided a total of 59 suggested reduction measures across all sectors through Georgia EPD's Emission Reduction Measures Survey.

In Georgia, besides Georgia EPD, the ARC also received CPRG planning grant funds as Metropolitan Statistical Areas, territories, and tribal governments were also eligible to participate in the CPRG program. The ARC's priority action plan covers the Atlanta-Sandy Springs-Alpharetta metropolitan statistical area (MSA), expanded for the purposes of CPRG planning. Georgia EPD met bi-weekly to coordinate with the ARC to ensure compatibility between the respective plans and to share best practices.

2.1.3 The Public

Public engagement is a key component of the PSVERP – it helps confirm that the plan is reflective of Georgia's communities and that interests and concerns from diverse stakeholder groups are considered and incorporated. Georgia EPD engaged stakeholders through a variety of formats including in-person events, virtual meetings, and an online survey.

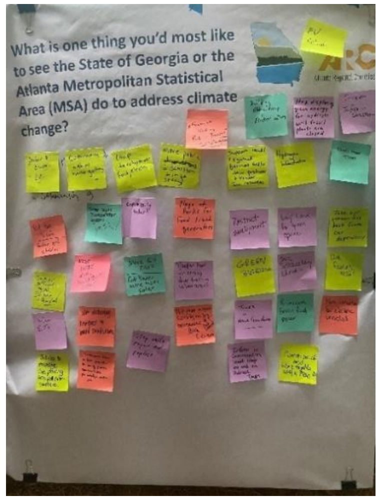

Figure 5. Public input collected at Ray Day, 2023

2.1.4 Other Government Stakeholders

Other government stakeholders included representatives from cities, towns, and counties throughout the State of Georgia. These government stakeholders were briefed throughout the PSVERP development period so that they were aware of the CPRG program implementation funding opportunity and able to request that specific measures be included in the PSVERP.

2.2 Outreach Methods

Georgia EPD collected input during the PSVERP development period to understand the perspectives of a range of stakeholders, including local government bodies, academic institutions, non-governmental organizations, and utilities. Through multiple surveys as well as virtual and in-person meetings, Georgia EPD provided frequent and numerous opportunities for engagement and incorporated stakeholder feedback into the PSVERP.

2.2.1 Request for Information

At the outset of CPRG planning, Georgia EPD published a request for information (RFI) hosted on Georgia EPD's website for the purposes of collecting initial information from interested parties including state agencies, municipalities, nonprofits, academic institutions, and more. The RFI was open from August 7, 2023, until December 31, 2023.

The RFI asked questions about organization type, interest in the CPRG program, and whether organizations had already developed climate action plans. Analysis of responses revealed that respondents were most interested in the quantified reduction measures (31%) followed by the low-income and disadvantaged communities (LIDAC) benefits analysis (23%), and intersection with other funding availability (11%). As shown in Figure 6, the emissions reduction inventory, workforce planning analysis, reduction targets, and co-pollutant benefits analysis were of relatively less interest to respondents, and 17% indicated they were interested in another feature of the CPRG program.

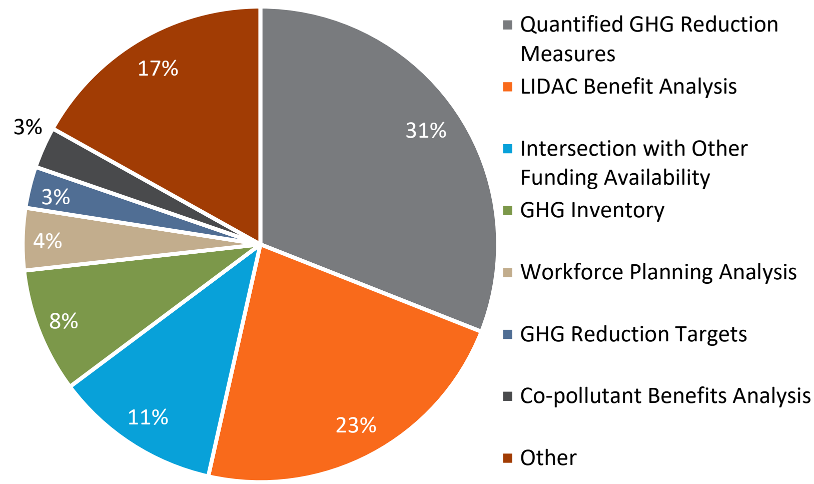

Figure 6. Reponses to "What is your primary interest in the CPRG?"

In total, 71 entities responded to the RFI, providing 14 documents including climate, resilience and energy plans, roadmaps, and reduction measures for Georgia EPD's consideration and analysis. The RFI demonstrated that a broad, cross-sectoral collection of stakeholders were interested in the CPRG program, particularly the reduction measures and LIDAC benefits analysis. Georgia EPD reviewed RFI responses and materials to identify potential near-term,priority, and implementation-ready projects that could be included in the PSVERP. Georgia EPD then conducted targeted outreach to the stakeholders who submitted those projects to support refining the preliminary list of emissions reduction measures provided by the Steering Committee.

2.2.2 Emission Reduction Measures Survey

Georgia EPD distributed an Emission Reduction Measures Survey (ERMS) to identify priority measures of interest to Georgia governments. Whereas the RFI was targeted to understand broader interest in the CPRG program, the ERMS sought to uncover specific interest and action in the State of Georgia, including:

- What Georgia entities have already published climate action plans?
- What types of reduction measures are stakeholders interested in?
- What reduction measures are currently shovel-ready?
- What are existing levels of funding for existing reduction programs?

The ERMS was distributed by email to partners and posted on Georgia EPD's website from December 1, 2023, to December 31, 2023, and received responses from 74 respondents who submitted 134 individual reduction measures. A further seven climate action plans were submitted (in addition to those submitted previously through the RFI).

A wide variety of stakeholder types submitted measures, including local governments, nonprofit organizations, academic institutions, state agencies, and utility providers. This demonstrated a broad, cross-sectoral interest in the CPRG program. Local governments were the most frequent respondents, comprising 42% of total respondents.

Figure 7 shows the inventory sector associated with reduction measures. The measures submitted by stakeholders through the ERMS demonstrated a relatively even distribution across emissions sectors. Transportation, electric power industry, commercial, residential, and land use, land use change and forestry (LULUCF) each received over 10% of the share of measures submitted, as shown in Figure 7. This distribution may speak to the diverse nature of Georgia's environmental and economic landscape, the varied opportunities to reduce emissions, and the many types of interested stakeholders.

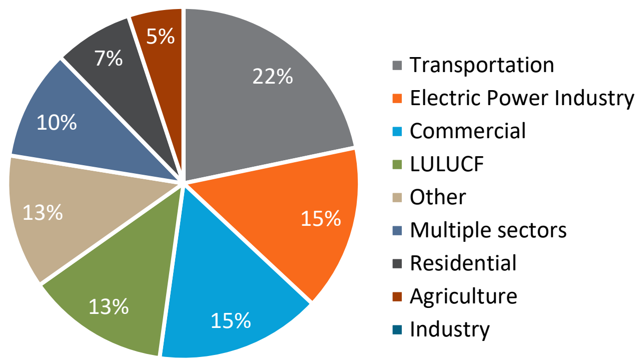

Figure 7. Inventory Sector Associated with Reduction Measures

Table 2 shows the breakdown of funding status of programs submitted to the ERMS. One key finding of the ERMS is that current funding levels for emission reduction measures are not sufficient to implement the actions identified by stakeholders. Of the 36 respondents answering the question regarding funding status, only six (17%) responded that their program was fully funded while 30 (83%) responded that their program was either only partially funded or not funded at all.

Table 2. Funding Status of Programs Submitted to the ERMS

Response to the question, "What is your program's funding status?"	
Partial funding	50%
No funding	33%
Fully funded	17%

Georgia EPD used the results of the ERMS to validate that the many of the types of measures submitted by Georgia stakeholders through the survey were represented in the PSVERP. In cases where they were not, Georgia EPD conducted follow-up with survey respondents to understand the status of relevant measures, including implementation progress and the need for additional funding. As a result of this analysis and outreach, recycling, cropland and soil management improvements, and coastal and waterway conservation and restoration were added as priority measures.

2.2.3 Public Survey

Georgia EPD conducted an online public survey to identify priorities and concerns related to reduction measure implementation. Figure 8 shows the flier that was distributed via email to solicit responses.

A total of 670 responses were collected, 500 of which were complete. Responses from low-income and disadvantaged communities (LIDACs) were used to inform Section 6: Low-Income and Disadvantaged Communities Benefits Analysis.

Figure 8. Public survey flier

2.2.4 Speaking Opportunities at Public, Government, and Industry Events

During the PSVERP development period, Georgia EPD was invited to attend and speak about CPRG program at 11 events for different audiences including public, government, and industry stakeholders.

- **Public events:** Georgia EPD attended, presented, and solicited feedback at five public events throughout the state.
- **Government events**: Four events geared toward government stakeholders included meetings of a Georgia General Assembly House Sub-committee meeting, those hosted by the Association of Air Pollution Control Agencies, Georgia Planning Association, Air and Waste Management Association, and Southeast Sustainability Directors Network.
- **Industry events:** Three events targeting an industry audience included the Georgia Solar Summit, Georgia Chamber of Commerce's Energy and Natural Resources Policy Committee, and the Small Business Compliance Advisory Panel.

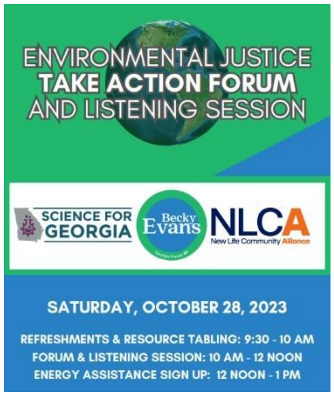

Figure 9. Example Flier for Public Forums

At each of these events, Georgia EPD provided information about the CPRG program and the PSVERP development process, provided ways for interested stakeholders to get involved, and solicited feedback on strategies and measures that stakeholders were interested in having included in the PSVERP.

2.2.5 Virtual and Hybrid Meetings

Georgia EPD hosted a series of meetings, both virtually and in hybrid settings, for government and public stakeholders. These meetings served to brief interested stakeholders on the CPRG program, solicit input on reduction measures and strategies, and review and validate the final list of reduction measures.

The following meetings were convened by Georgia EPD and included both public and intergovernmental engagement:

- **PSVERP Kick-Off (August 29, 2023):** Georgia EPD hosted a stakeholder meeting focused on informing public and intergovernmental stakeholders about the CPRG program and kicking off the development of the PSVERP.
- **Public and Government Stakeholder Briefing (November 2, 2023)**: Georgia EPD hosted a virtual stakeholder meeting briefing participants on progress to date and soliciting feedback on direction.
- **Public Stakeholder Briefing (February 6, 2024)**: Georgia EPD hosted a hybrid public meeting to review the PSVERP development process, share the preliminary list of reduction measures, answer questions, and solicit feedback.
- **Government Stakeholder Briefing (February 7, 2024)**: Georgia EPD hosted a hybrid meeting for government stakeholders for the same purposes as the public meeting held on February 6, 2024.

Meeting announcements were distributed via Georgia EPD's listserv in both English and Spanish, and Spanish translation services were made available to attendees. Georgia EPD had a Spanish translator present at the February 6 and February 7 meetings.

2.2.6 One-on-One Stakeholder Meetings

A wide variety of individual stakeholders and organizations expressed interested in the CPRG program, and Georgia EPD met with interested parties to discuss various elements of the process. This included nine meetings with academic institutions, including colleges and universities. These organizations had, in some cases, also responded to the RFI and ERMS with their own reduction measures and climate action plans. They both provided feedback on priority reduction measures as well as valuable input on the current science of the measures, enabling more specific framing of measures for the State of Georgia and improved quantifications.

Georgia EPD also convened 21 meetings with industry stakeholders for purposes including requesting additional information about the CPRG and consideration of specific measures for inclusion in the PSVERP. These organizations have a unique perspective being on the frontlines of new technologies, implementation, and Georgia's workforce and, likewise, provided valuable input on reduction measures for Georgia.

3.0 Georgia's Greenhouse Gas Inventory

Georgia EPD developed a statewide inventory of greenhouse gas (GHG) emissions sources for 2021, which was selected as a base year as it is the most recent year for which reliable data was available across a wide variety of sectors and data sets. The base year inventory provides a reference point against which future emissions reduction progress can be measured.

This section presents the scope, data, and methods used to develop the base year inventory, as well as an overview of the base year inventory. The complete base year inventory may be found in Section D of the Appendix.

3.1 Data, Scope, and Methods

Georgia's GHG inventory was prepared using EPA's State GHG Emissions and Removals[9] and is a generation-based inventory except for the addition of carbon dioxide (CO_2) emissions from electricity imported into the state. In general, for 2021, Georgia was an overall net importer of energy. Based on the gathered data referenced below the majority of the imported energy most likely came from the neighboring state of Alabama, but additional energy could have come from other sources. The emissions used in the inventory are estimates and actual emissions associated with the importing of electricity may vary depending on various factors. The inventory is supplemented by research and estimates for the following two categories prepared by the Georgia Tech Research Corporation (GTRC) using their emissions tracker.[10]

- CO_2 emissions for electricity imported from Alabama: 9.61 $MMTCO_2e$ in 2021
- CO_2 uptake from harvested wood products[11]: -8.85 $MMTCO_2e$ in 2021

The additions of the above two categories resulted in a net increase of 0.76 $MMTCO_2e$, or 0.685%, in 2021 compared to the state-level GHG inventory prepared by the EPA.

Table 3 shows the six sectors included in Georgia's inventory and the emissions across each sector, aligned with the EPA's State GHG Emissions and Removals categorizations.

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[9] Environmental Protection Agency, State GHG Emissions and Reductions. *US EPA*. Retrieved January 2024.

[10] Drawdown Georgia Emissions Tracker. *Drawdownga.org.* Retrieved February 23, 2024. The Emissions Tracker uses data from the following sources: Census Bureau's American Community Survey; Census Bureau's Quarterly Workforce Indicators; Department of Agriculture's Census of Agriculture; National Land Cover Database; U.S. Department of Energy's Energy Information Administration; U.S. Department of Transportation; U.S. EPA's FLIGHT large facility emissions database; U.S. EPA's State Inventory Tool (SIT)

[11] For example, carbon stored by forests grown for lumber.

Table 3. Georgia's Inventory Sectors

Sectors	Greenhouse Gases (across all sectors)
• Transportation • Electric Power Industry • Industry • Agriculture • Commercial • Residential	• Carbon dioxide (CO_2) • Methane (CH_4) • Nitrous oxide (N_2O) • Fluorinated gases (F-gases) including hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF_6), and nitrogen trifluoride (NF_3)

3.2 Greenhouse Gas Emissions by Sector and Pollutant

In 2021, Georgia emitted 159 $MMTCO_2e$, which equates to 2.5% of total U.S. emissions that same year.[12] As shown in Figure 10, this was reduced by 47 $MMTCO_2e$ from carbon sinks in the land-use, land-use change and forestry (LULUCF) sector, resulting in net emissions of 112 $MMTCO_2e$. Georgia's total emissions have followed a downward trend on average since 2005, primarily led by decreases in emissions from the electric power industry as coal-powered plants have been retired and replaced with natural gas-powered plants.

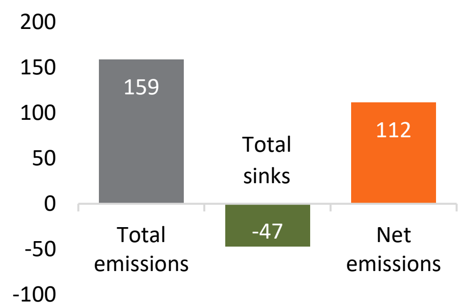

Figure 10. Georgia's 2021 GHG Emissions in $MMTCO_2e$

Georgia has vast agricultural and forested land: over 27% percent of the state is farmland[13] and over 64% of the state is forested.[14] The agriculture and LULUCF sectors therefore play a significant role in Georgia's emissions profile and offer opportunities to sequester carbon as part of overall emissions reduction strategy. Highlighting this, in 2021, carbon sinks from the LULUCF sector (-47 $MMTCO_2e$, as shown in Figure 10) were enough to offset almost the entirety of emissions from the electric power industry or nearly 85% of emissions from the transportation sector (51 $MMTCO_2e$, corresponding with 32% or 38% of total emissions, respectively, as shown in Figure 11).

[12] U.S. Environmental Protection Agency, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2021. April 2023.

[13] National Agricultural Statistics Service. 2022 State Agriculture Review. Retrieved February 12, 2024.

[14] U.S. Department of Agriculture Forest Service. Forests of Georgia, 2019. Resource Update FS-310. Asheville, NC:2p.

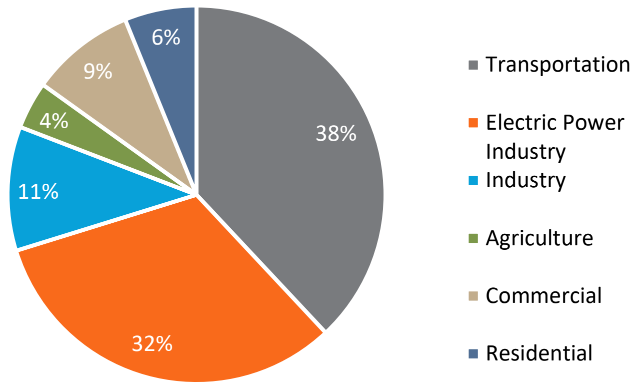

Figure 11. Georgia's 2021 GHG Emissions by Sector

Figure 11 presents an overview of Georgia's 2021 GHG emissions by economic sector. Transportation and the electric power industry are the largest sectors, together comprising 70% of all emissions. Between July 2018 and June 2023 at least 45 e-mobility projects contributing over $25 billion in investments were announced in Georgia.[15] Notably, transportation electrification reduces tailpipe emissions, including CO_2.

[15] Georgia Department of Economic Development, Electric Mobility Manufacturing. *Georgia.org*. Retrieved February 4, 2024.

4.0 Priority Reduction Strategies and Measures

Through the previously described processes of stakeholder engagement and alignment with state priorities, Georgia EPD developed the following set of 21 reduction measures, categorized into seven overarching strategies, to address emissions reduction in Georgia. These measures are near-term, priority, and implementation-ready, as defined by the CPRG Program Guidance.[16] For each measure, the reduction potential was assessed using the Rocky Mountain Institute's Energy Policy Simulator, unless otherwise noted as an alternate calculation method. The Energy Policy Simulator or other tools (as noted) used include assumptions and forecasts that can have at times a high degree of uncertainty. As such, actual emission reductions may differ from these projections. For modeling assumptions, see Section C of the Appendix. For Implementation Schedule and Milestones, see Section E of the appendix.

Each strategy and corresponding set of measures is discussed in more detail later in this section. In addition, this section evaluates how each measure intersects with other funding opportunities. Table 4 shows the projected cumulative emissions reductions in the near-term (i.e., 2025-2030) and long-term (i.e., 2025-2050).

Table 4. Georgia's Priority Reduction Measures and Emission Reduction Potential

	Cumulative emission reductions ($MMTCO_2e$)	
Priority measure	2025-2030	2025-2050
1. Electrify transportation sector and adapt to consumer mode shift		
1.1 Zero-emission buses	- 0.001	- 0.020
1.2 Electric vehicle charging infrastructure	- 0.000	+ 0.005 [a]
1.3 Bikes and bike infrastructure	- 0.034	- 0.283
1.4 Zero-emission fleet deployment	+ 0.333 [b]	-2.954
1.5 Manufacturing of raw materials and intermediate and finished products to support EV uptake	+ 0.115 [b]	- 160.048
2. Improve energy efficiency and promote electrification		
2.1 Weatherization for residential buildings	- 0.000; - 2.508 [c]	- 0.016; - 8.835 [c]
2.2 Home energy rebates for the purchase of electric and energy efficient products	- 1.120; - 2.017 [c]	- 28.537; - 21.520 [c]
2.3 Incentive programs for implementation of end-use energy efficiency measures in commercial buildings	- 0.182; - 3.568 [c]	- 0.727; - 28.417 [c]

[16] U.S. Environmental Protection, Agency Office of Air and Radiation, EPA CPRG Planning Grants Program Guidance for States, Municipalities, and Air Agencies.. March 1, 2023.

	Cumulative emission reductions ($MMTCO_2e$)	
Priority measure	2025-2030	2025-2050
2.4 Incentive programs for the purchase of certified energy-efficient lighting in commercial and industrial buildings, as well as streetlights	Commercial lighting: - 0.000 [d]; -0.200 [c]	Commercial lighting: - 0.000 [d]; -1.400 [c]
	Municipal streetlights: - 0.072	Municipal streetlights: - 1.222
3. Increase availability and use of renewable energy		
3.1 Transmission and distribution upgrades	- 4.818; - 0.291 [c]	- 12.534; - 1.455 [c]
3.2 Increasing renewable energy	- 1.923	- 7.397
4. Improve waste diversion and landfill management		
4.1 Landfill gas management and utilization	- 0.314	- 17.541
4.2 Organic waste diversion from landfills	- 0.706	- 13.566
4.3 Recycling	- 5.546	- 126.607
5. Promote use of alternative fuels		
5.1 Hydrogen refueling stations	- 0.768	- 140.443
5.2 Sustainable aviation fuel production	- 1.220	- 146.244
5.3 Renewable natural gas production from biodigesters	- 0.001	- 0.053
6. Refrigerant management		
6.1 Management of F-gas leakage and replacement of equipment	- 0.496	- 2.138
7. Advance conservation and sustainable land use		
7.1 Afforestation and reforestation	- 2.348	- 57.232
7.2 Cropland and soil management improvements and conservation	- 0.395	- 12.271
7.3 Coastal and waterway conservation and restoration	- 0.036	- 0.657
Total	-19.532	-730.495

[a] *Increased emissions in the long-term due to the manufacturing and utilization of EV chargers. The long-term emissions impact of switching from internal combustion engine vehicles to EVs is captured in measures 1.4 and 1.5.*
[b] *Increased emissions in the short-term due to increased electricity generation required for EV charging and production of EVs and associated materials.*
[c] *Alternate calculation method*
[d] *Energy-efficient lighting in commercial and industrial buildings was modeled as an energy efficiency measure under 2.3*

Figure 12 below summarizes emissions reductions by strategy. From 2025 to 2050, Strategy 5: Promote use of alternative fuels, is projected to have the greatest emissions reduction potential, accounting for a reduction of over 287 million metric tons of carbon dioxide equivalent. Hydrogen refueling stations and sustainable aviation fuel production measures are the largest drivers within Strategy 5. Strategy 1, Electrify transportation sector and adapt to consumer mode shift, is projected to reduce the next greatest amount of emissions from 2025 to 2050, primarily due to decreases in emissions from manufacturing of raw materials and intermediate and finished products to support EV uptake.

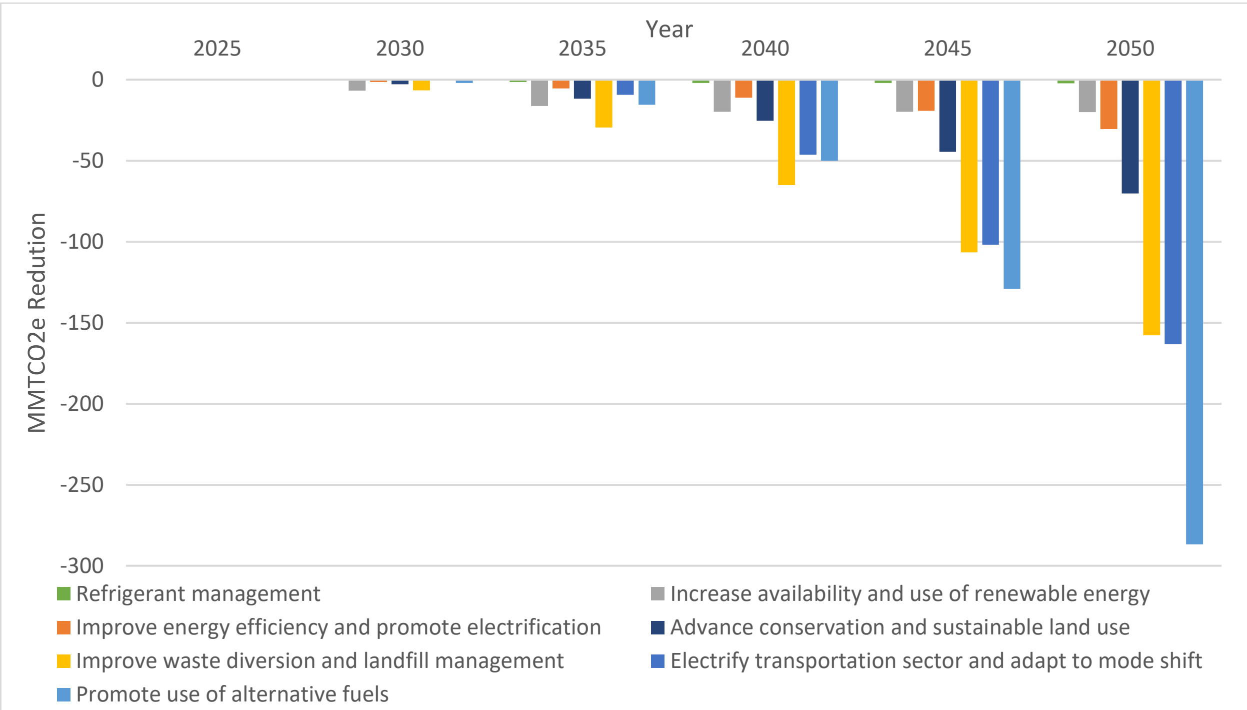

Figure 12. Cumulative Emissions Reductions by Strategy

4.1 Strategy 1: Electrify Transportation Sector and Adapt to Consumer Mode Shift

The transportation sector accounts for 38% of overall emissions. This strategy addresses emissions from the transportation sector through reducing vehicle miles traveled by enabling alternative forms of transportation and electrifying vehicles. Georgia recognizes consumers have been and may continue to shift their modes of transportation. This strategy allows consumers more options when choosing a mode of transportation.

Specific measures include (1.1) zero-emission buses, (1.2) electric vehicle charging infrastructure, (1.3) bikes and bike infrastructure, (1.4) zero-emission fleet deployment, and (1.5) manufacturing of raw materials and intermediate and finished products to support EV uptake.

4.1.1 Measure 1.1: Zero-Emission Buses

This measure replaces public and private buses powered by diesel with electric buses. It could be supported by expanding charging infrastructure and motivating ridership, thus reducing total vehicle miles traveled within the state.

Intersection with other funding availability

Two existing programs support zero emissions buses within the State of Georgia: (i) the Clean School Bus Program and (ii) the Low or No Emission Grant Program.

- **Clean School Bus Program**: With funding from the Bipartisan Infrastructure Law, the EPA's Clean School Bus program provides $5 billion over five years to replace existing school buses with zero-emission and low-emission models. Under the program's multiple grant and rebate funding opportunities to date, the EPA has awarded almost $2 billion to fund approximately 5,000 school bus replacements at over 600 schools. In 2022 through 2023, Georgia schools received over $170 million in funding.[17]
- **Low or No Emission Grant Program**: The Federal Transit Administration's (FTA) Low or No Emission Grant Program is a discretionary program which provides funding to state and local governments for the purchase or lease of zero-emission and low-emission transit buses as well as acquisition, construction, and leasing of required supporting facilities.[18] For example, in 2023, Georgia State University received funding to electric buses and charging equipment to replace older diesel buses in its transition to an all-electric fleet.

4.1.2 Measure 1.2: Electric Vehicle Charging Infrastructure

This measure expands electric vehicle (EV) charging infrastructure across Georgia, supporting the adoption of electric vehicles by reducing range anxiety and enhancing convenience for EV owners.

Intersection with other funding availability

Three existing programs and a tax credit support expanding electric vehicle charging infrastructure within the State of Georgia: (i) the Alternative Fuel Vehicle Infrastructure Tax Credit; (ii) Charging and Fueling Infrastructure Discretionary Grant Program; (iii) National Electric Vehicle Infrastructure Formula Program; and (iv) the Rebuilding American Infrastructure with Sustainability and Equity Discretionary Grant Program.

- **Alternative Fuel Vehicle Infrastructure Tax Credit**: The Alternative Fuel Vehicle (AFV) Tax Credit is available for qualified AFV fueling stations installed in low-income communities or rural areas. The credit includes funding for electric vehicle charging stations, and tax-exempt entities including state and local governments are eligible to receive the credit through IRS elective pay provisions. [19]
- **Charging and Fueling Infrastructure Discretionary Grant Program:** The U.S. Department of Transportation's (U.S. DOT) Federal Highway Administration (FHWA) Charging and Fueling Infrastructure (CFI) program offers funding to deploy publicly accessible electric vehicle charging and alternative fueling infrastructure in urban and rural

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[17] U.S. Environmental Protection Agency, Clean School Bus Program Rebates. February 14, 2024.

[18] U.S. Department of Energy, Low or No Emission Grant Program. Retrieved February 23, 2024.

[19] U.S. Department of Energy, Alternative Fuels Data Center: Alternative Fuel Infrastructure Tax Credit. Retrieved February 23, 2024.

communities and along alternative fuel corridors. The CFI program offers two types of funding opportunities: The Community Charging and Fueling Grants (Community Program) and the Alternative Fuel Corridor Grants (Corridor Program).[20] Georgia, led by the Atlanta Regional Commission, received $6.1 million in funding to increase EV charging access through the Community Program.[21]

- **National Electric Vehicle Infrastructure Formula Program**: The U.S. DOT FHWA National Electric Vehicle Infrastructure (NEVI) Formula Program provides funding to states to strategically deploy electric vehicle charging stations and to establish an interconnected network to facilitate data collection, access, and reliability. The FHWA approved $28.8 million in NEVI funding for the State of Georgia for fiscal year 2024 and GDOT recently completed a first round of awards of $3.6 million of NEVI funds to four private-sector partners to install direct current fast chargers at five sites in southeast Georgia.[22]
- **Rebuilding American Infrastructure with Sustainability and Equity Discretionary Grant Program**: The Rebuilding American Infrastructure with Sustainability and Equity (RAISE) Discretionary Grant program provides an opportunity for the U.S. DOT to invest in road, rail, transit, and port projects that promise to achieve national objectives. Congress has dedicated nearly $14.3 billion for fifteen rounds of National Infrastructure Investments to fund projects that have a significant local or regional impact. In FY21, the program increased its focus on zero-emission vehicle infrastructure, including EV charging. Georgia received multiple funding allocations, totaling $50 million, within the 2023 round of RAISE grants, notably to Trails to Transit: Reconnecting Atlanta Communities ($25 million), Gwinnett Place Transit Center ($20 million), Oconee Heights Streetscape and Safety Improvements ($5 million), and Thomasville Multimodal Transportation Plan ($175 thousand).[23]

4.1.3 Measure 1.3: Bikes and Bike Infrastructure

This measure promotes e-bike adoption. This could be accomplished through multiple means including motivating and supporting bicycle adoption and developing more bike infrastructure such as multiuse paths, dedicated bike lanes and shared lanes.

Intersection with other funding availability

One existing program within the state which supports bikes and bike infrastructure: the Atlanta E-Bike Rebate Program.

- **Atlanta E-Bike Rebate Program**: The ARC, partnered with the City of Atlanta, is offering an e-bike rebate program designed to provide affordable transportation options for City of

[20] U.S. Department of Transportation, Federal Highway Administration, Biden-Harris Administration Opens Applications for First Round of $2.5 Billion Program to Build EV Charging in Communities & Neighborhoods Nationwide. March 14, 2023.

[21] Reverend Raphael Warnock U.S. Senator for Georgia, IT'S ELECTRIC: Senator Reverend Warnock Announces Over $6 Million in Bipartisan Infrastructure Law Funding for EV Charging Ports Across Metro-Atlanta Region. January 11, 2024.

[22] U.S. Department of Transportation, Federal Highway Administration, Bipartisan Infrastructure Law - National Electric Vehicle Infrastructure (NEVI) Formula Program Fact Sheet. February 10, 2023.

[23] U.S. Department of Transportation, About RAISE Grants. July 5, 2023.

Atlanta residents, particularly moderate and low-income individuals. The City of Atlanta invested $1 million into the initiative. The program is expected to launch in spring 2024. [24]

4.1.4 Measure 1.4: Zero-Emission Fleet Deployment

This measure supports public sector entities at the municipal, county, and state level with transitioning their public fleets to zero-emissions vehicles (ZEVs). ZEV fleets could be light-duty vehicles or trucks; buses are covered in the relevant measure listed above.

Intersection with other funding availability
One existing program within the state supports zero-emissions fleet deployment:

Athens-Clarke County Unified Government (ACCGov) "Electrify the Fleet Program": This program will provide funding for the addition, upgrade and/or replacement of any vehicles used by the ACCGov Transportation and Public Works and Transit Departments for transportation purposes to electric powered vehicles and/or for other supporting capital improvements.[25]

4.1.5 Measure 1.5: Manufacturing of Raw Materials and Intermediate and Finished Products to Support EV Uptake

This measure supports the manufacturing of raw materials as well as intermediate and finished products for EVs. This includes the creation and assembly of key components like batteries and motors. This process plays a crucial role in supporting the growth of the EV market by ensuring the availability and quality of parts essential to EV production.

Intersection with other funding availability
Three existing programs support the manufacturing of raw materials and intermediate and finished products to support EV uptake: (i) the Battery Materials Processing Grants; (ii) Battery Manufacturing and Recycling Grants; and (iii) the Domestic Manufacturing Conversion Grants.

- **Battery Materials Processing Grants**: The Battery Materials Processing Grants Program offers grants for battery materials processing to support the battery materials processing industry in the United States. Funds can also be used to expand capabilities in battery manufacturing and enhance processing capacity.[26] Solvay Specialty Polymers USA, a global leader in advanced materials and specialty chemicals, received $178 million from the battery materials processing grant program in 2022 to build a new battery-grade polyvinylidene fluoride (PVDF) facility in Augusta, GA, to supply the needs of the North American electric stationary energy storage market.[27]

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[24] Atlanta Regional Commission. Atlanta E-Bike Rebate Program. atlantaregional.org. Retrieved February 23, 2024.

[25] Athens-Clarke County Unified Government, https://www.accgov.com/10130/Project-20-Electrify-the-Fleet-Program. Retrieved March 6, 2024.

[26] U.S. Department of Energy, Office of Manufacturing and Energy Supply Chains, Battery Materials Processing Grants. Retrieved February 23, 2024.

[27] U.S. Department of Energy, DOE BIL Battery FOA-2678 Selectee Fact Sheets. October 29, 2022.

- **Battery Manufacturing and Recycling Grants:** The Battery Manufacturing and Recycling Grants Program provides grants to support domestic battery manufacturing and recycling capabilities.[28]
- **Domestic Manufacturing Conversion Grants**: The Domestic Manufacturing Conversion Grants program provides cost-shared grants for domestic production of efficient hybrid, plug-in electric hybrid, plug-in electric drive, and hydrogen fuel cell electric vehicles.[29]

4.2 Strategy 2: Improve Energy Efficiency and Promote Electrification

This strategy addresses emissions from the residential sector, which was responsible for 6% of Georgia's emissions in 2021, through supporting building weatherization, energy efficiency upgrades, and appliance electrification.

Measures under this strategy include (2.1) weatherization for residential buildings, (2.2) home energy rebates for the purchase of electric and energy efficient products, (2.3) incentive programs for implementation of end-use energy efficiency measures in commercial buildings, and (2.4) incentive programs for the purchase of certified energy-efficient lighting in commercial buildings, as well as streetlights.

4.2.1 Measure 2.1: Weatherization for Residential Buildings

This measure reduces energy costs for homeowners by increasing the energy efficiency of their homes through sealing gaps and cracks, improving heating and cooling systems, adding insulation, and other interventions.

Intersection with other funding availability
One existing program supports weatherization and energy efficiency for residential buildings within the State of Georgia: The Weatherization Assistance Program.

- **Weatherization Assistance Program:** The U.S. Department of Energy (DOE) Weatherization Assistance Program (WAP) reduces energy costs for low-income households by increasing the energy efficiency of their homes while ensuring their health and safety. There are two types of grants under WAP: Enhancement & Innovation (E&I) grants; and Sustainable Energy Resources for Customers (SERC) grants. E&I grants fund enhanced community partnerships to perform deep energy retrofits of low-income residential buildings and empower local community representation within the energy workforce. SERC grants fund materials, benefits, and renewable and domestic energy technologies not currently covered in WAP. The State of Georgia has received around $5 million dollars in funding under the Weatherization Assistance Program the past three years.[30]

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[28] U.S. Department of Energy, Office of Manufacturing and Energy Supply Chains, Battery Manufacturing and Recycling Grants. Retrieved February 23, 2024.
[29] U.S. Department of Energy, Biden-Harris Administration Announces $15.5 Billion to Support a Strong and Just Transition to Electric Vehicles, Retooling Existing Plants, and Rehiring Existing Workers. August 31, 2023.
[30] U.S. Department of Energy, Weatherization Assistance Program. Retrieved February 23, 2024.

4.2.2 Measure 2.2: Home Energy Rebates for the Purchase of Electric and Energy Efficient Products

This measure provides households with funds to purchase more energy efficient products and transition to more electric products.

Intersection with other funding availability

One existing program supports home energy rebates for the purchase of electric and energy efficient products within the State of Georgia: The Home Energy Efficiency Rebate Program.

- **Home Energy Efficiency Rebate Program**: Georgia has applied for administrative funding from the DOE's Home Efficiency Rebate Program and Home Electrification and Appliance Rebate Program, both funded by the Home Energy Efficiency Rebate Program. The DOE expects many state programs to come into effect in 2024. Through these programs, states will implement funds to provide single-family and multi-family households with discounts for efficiency upgrades predicted to save at least 20% of the home's energy use, and discounts for high efficiency home appliances and equipment. [31]

4.2.3 Measure 2.3: Incentive Programs for Implementation of End-Use Energy Efficiency Measures in Commercial Buildings

This measure addresses the commercial building sector from the perspective of energy efficiency improvements that can be made to existing buildings. Examples include but are not limited to the replacement of existing products (e.g., space heating, ventilation, air-cooling systems, cooking appliances, etc.) with certified energy-efficient products.

Intersection with other funding availability

One existing program supports incentive programs for implementation of end-use energy efficiency measures in commercial buildings within the State of Georgia: the Building Codes Implementation for Efficiency and Resilience Program.

- **Building Codes Implementation for Efficiency and Resilience Program**: Institutions in Georgia, including the Southeast Energy Efficiency Alliance, have applied for funding from the DOE's 2023 Building Codes Implementation for Efficiency and Resilience Program, which is a competitive grant program to enable sustained, cost-effective implementation of updated building energy codes to save customers money on their energy bills. As of January 2024, organizations within the state have received $7.6 million dollars to increase workforce knowledge and expertise to effectively implement the state's recent energy code update, among other uses relevant to increase energy efficiency measures in Georgia buildings.[32]

[31] U.S. Department of Energy, Home Energy Rebates Programs. Retrieved February 23, 2024.

[32] U.S. Department of Energy, Office of Energy Efficiency & Renewable Energy. Building Codes Implementation for Efficiency and Resilience. Retrieved February 23, 2024.

4.2.4 Measure 2.4: Incentive Programs for the Purchase of Certified Energy-Efficient Lighting in Commercial and Industrial Buildings, Including Streetlights

This measure aims to reduce emissions by improving lighting efficiency and thereby saving energy and associated emissions that would otherwise be generated. The ultimate emission sources are the existing and future fleet of electricity generating units serving Georgia. However, this measure focuses on the end-use of lighting specifically, so emission reductions are translated from energy saved (e.g., kilowatt-hour (kWh)) to emissions reduced in the production of the electricity.

Intersection with other funding availability

Two existing programs support incentive programs for the purchase of certified energy-efficient lighting in commercial and industrial buildings, as well as streetlights, within the State of Georgia: (i) the National Clean Investment Fund and Clean Communities Investment Accelerator; and (ii) the Rural Energy for America Program.

- **National Clean Investment Fund and Clean Communities Investment Accelerator:** This Accelerator competition provided $6 billion in grants to two to seven hub nonprofits with a funding opportunity round closing in late 2023, that will, in turn, deliver funding and technical assistance to build the clean financing capacity of local community lenders working in low-income and disadvantaged communities so that underinvested communities have the capital they need to deploy clean technology projects.[33]
- **Rural Energy for America Program:** The U.S. Department of Agriculture announced the expansion of the Rural Energy for America Program (REAP) in 2023. REAP allows for areas that have fewer than 50,000 inhabitants to receive funding to develop distributed renewable energy and form electric co-ops.[34] Businesses and organizations within Georgia have received over $24.4 million in funding as of January 2024, supporting a wide range of energy projects.

4.3 Strategy 3: Increase Availability and Use of Renewable Energy

This strategy addresses emissions from the electric power industry, which was responsible for 32% of Georgia's emissions in 2021, by improving electric grid infrastructure and supporting renewable energy adoption.

Measures under this strategy include (3.1) transmission and distribution upgrades and (3.2) Increasing renewable energy.

4.3.1 Measure 3.1: Transmission and Distribution Upgrades

This measure aims to improve transmission infrastructure and the electricity distribution system to maintain system reliability and to: position the state for increased load growth in response to economic development, accommodate the continued increase in renewable energy generation, and reduce losses from transmission and distribution. Upgrades can include but are not limited to high-voltage power lines that carry electricity over long distances, substations, transformers, repairing

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[33] U.S. Environmental Protection Agency, Clean Communities Investment Accelerator. February 7, 2023.

[34] U.S. Department of Agriculture, Rural Development, Rural Energy For America Program (REAP). Retrieved February 23, 2024.

or replacing outdated infrastructure, enhancing capacities of existing lines, adding new transmission lines, integrating modern technology, and improving operational protocols.

Intersection with other funding availability

Five existing programs support transmission upgrades within the State of Georgia: (i) the Grid Innovation Program, (ii) Grid Resilience Utility and Industry Grants, (iii) Smart Grid Grants, (iv) Transmission Facilitation Program, and (v) the Transmission Facility Financing Program.

- **Grid Innovation Program:** As part of the Grid Resilience and Innovation Partnerships (GRIP) Program, the Grid Innovation Program will provide $5 billion for 2022-2026 to support projects that use innovative approaches to transmission, storage, and distribution infrastructure to enhance grid resilience and reliability. Projects selected under this program will include interregional transmission projects, investments that accelerate interconnection of clean energy generation, and utilization of distribution grid assets to provide backup power and reduce transmission requirements. The Georgia Environmental Finance Authority and Family of Companies that supports the Georgia electric cooperatives were awarded $250 million by the DOE in October 2023 to improve resilience and clean energy development under the Grid Innovation Program.[35,36]
- **Grid Resilience Utility and Industry Grants:** As part of the GRIP Program, the Grid Resilience Utility and Industry Grants will provide $2.5 billion in funding between 2022 and 2026 to support the modernization of the electric grid to reduce impacts due to extreme weather and natural disasters. Georgia received $250 million in funding through the GRIP Program.[37] The program will fund comprehensive transformational transmission and distribution technology solutions that will mitigate multiple hazards across a region or within a community.[38]
- **Smart Grid Grants:** As part of the GRIP Program, the Smart Grid Grants will provide $3 billion between 2024 and 2025 in funding to increase the flexibility, efficiency, and reliability of the electric power system, with particular focus on increasing capacity of the transmission system, preventing faults that may lead to wildfires or other system disturbances, integrating renewable energy at the transmission and distribution levels, and facilitating the integration of increasing electrified vehicles, buildings, and other grid-edge devices.[39]
- **Transmission Facilitation Program:** The $2.5 billion Transmission Facilitation Program (TFP) will help build out new interregional transmission lines across the country. The TFP, administered through the Building a Better Grid Initiative, is a revolving fund program that will provide federal support to overcome the financial hurdles in the development of large-scale new transmission lines and upgrading existing transmission as well as the connection

[35] U.S. Department of Energy, Grid Deployment Office, Grid Innovation Program. Retrieved February 23, 2024.

[36] U.S. Department of Energy, Grid Deployment Office, Fact Sheet, Grid Resilience and Innovation Partnerships Program. October, 2023.

[37] Hills, S., Georgia Selected for $250M Grant for Grid Resilience & Clean Energy Projects. *GeorgiaTrend*. January 31, 2024.

[38] U.S. Department of Energy, Grid Deployment Office. Grid Resilience Utility and Industry Grants. Retrieved February 23, 2024.

[39] U.S. Department of Energy, Grid Deployment Office, Smart Grid Grants. Retrieved February 23, 2024.

of microgrids in select States and U.S. territories. Funding applications are currently open, and selections are not yet made.[40]

- **Transmission Facility Financing Program:** Supported by the Inflation Reduction Act and administered by the Grid Deployment Office, the Transmission Facility Financing program will provide $2 billion in direct loan authority for facility financing. This program is currently under development.[41]

4.3.2 Measure 3.2: Increasing Renewable Energy

Georgia has significantly increased renewable energy capacity, especially solar, and is expected to continue to do so for the next ten years. Also, while this measure is focused on three targeted areas, renewable energy use in Georgia is expected to continue to grow through a variety of solar power installations, including utility-scale solar. This measure supports increased renewable energy use through solar photovoltaic (PV) projects in three targeted areas: rooftop solar on government-owned buildings, community solar, and renewable energy at industrial facilities.

Intersection with other funding availability

Three existing programs support increase renewable energy within the State of Georgia: (i) Powering Affordable Clean Energy, (ii) Rural Energy for America Program, and (iii) Solar for All.

- **Powering Affordable Clean Energy:** The Powering Affordable Clean Energy (PACE) funding program is part of the Inflation Reduction Act and will harness $1 billion in funding to forgive up to 60 percent of loans for renewable energy projects that use wind, solar, hydropower, geothermal, or biomass, as well as for renewable energy storage projects. PACE aims to make it more affordable for rural Americans to use clean, reliable energy to heat and cool their homes, run their businesses, and power their cars, schools, and hospitals.[42]
- **Rural Energy for America Program:** The U.S. Department of Agriculture announced the expansion of the Rural Energy for America Program (REAP) in 2023. REAP allows for areas that have fewer than 50,000 inhabitants to receive funding to develop distributed renewable energy and form electric co-ops. Businesses and organizations within Georgia have received over $24.4 million in funding as of January 2024, supporting a wide range of energy projects.[43]
- **Solar for All:** The purpose of the EPA Solar for All funds is to develop statewide incentives and programs to help enable community solar adoption in low to moderate income and disadvantaged communities.[44] The State of Georgia has applied for the maximum funding level available to the state of $250 million over the five-year program period. The funding will impact Georgia by providing funding mechanisms to cover every

[40] U.S. Department of Energy, Grid Deployment Office, Transmission Facilitation Program. Retrieved February 23, 2024.

[41] U.S. Department of Energy, Grid Deployment Office, Transmission Facility Financing Program. Retrieved February 23, 2024.

[42] U.S. Department of Agriculture, Office of Rural Development, Powering Affordable Clean Energy PACE Program. Retrieved February 23, 2024.

[43] U.S. Department of Agriculture, Rural Energy For America Program (REAP). Retrieved February 23, 2023.

[44] U.S. Environmental Protection Agency, Solar for All. February 7, 2024

corner of the state and reach an estimated 15,000 homes through community solar deployment.[45]

4.4 Strategy 4: Improve Waste Diversion and Landfill Management

This strategy addresses emissions from various waste streams in Georgia that end up in municipal landfills and contribute to the state's methane and CO_2 emissions. In 2021, municipal landfills accounted for 5.3% of the state's net emissions.

Measures under this strategy include (4.1) landfill gas management and utilization; (4.2) organic waste diversion from landfills; and (4.3) recycling.

4.4.1 Measure 4.1: Landfill Gas Management and Utilization

This measure increases the generation of energy or alternative fuels at landfill sites across the state by increasing technical capacity for gas collection and control systems (GCCS).

Intersection with other funding availability
One existing program supports landfill gas management and utilization within the State of Georgia: Section 45 Production Tax Credit.

- **Section 45 Production Tax Credit:** The renewable energy production tax credit (PTC) is a per kilowatt-hour (kWh) federal tax credit included under section 45 of the U.S. tax code for electricity generated by qualified renewable energy resources. The PTC can help Georgia fund projects to recover landfill methane and convert it to renewable energy. [46]

4.4.2 Measure 4.2: Organic Waste Diversion from Landfills

This measure increases the capacity for composting in Georgia to sequester carbon and reduce organic waste in landfills through the utilization of compost and food waste reduction measures.

Intersection with other funding availability
One existing program supports organic waste diversion from landfills within the State of Georgia: Solid Waste Infrastructure for Recycling Grant Program.

- **Solid Waste Infrastructure for Recycling Grant Program:** The Bipartisan Infrastructure Law provides $275 million for Solid Waste Infrastructure for Recycling Grants to improve post-consumer materials management and infrastructure; support improvements to local post-consumer management and recycling programs; and assist local waste management authorities in making improvements to local waste management systems. [47] The EPA selected Georgia EPD to receive $713K of funding within the Solid Waste Infrastructure for Recycling Grant Program.[48]

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[45] U.S. Environmental Protection Agency, Solar for All Notices of Intent from States and Territories. September 8, 2023.
[46] U.S. Department of Energy, Renewable Electricity Production Tax Credit Information. December 18, 2023
[47] U.S. Environmental Protection Agency, Solid Waste Infrastructure for Recycling Grant Program 2023
[48] Georgia Recycling Coalition, Green Sheet. October 2023.

4.4.3 Measure 4.3: Recycling

This measure increases capture of valuable post-consumer resources that can be processed, reused, and delivered back to businesses or consumers for continued use. Increasing the lifecycle of valuable resources can support Georgia's energy ecosystems and economies.[49]

Intersection with other funding availability

Georgia EPD offers the Recycling and Waste Diversion (RWD) Grant as part of the Solid Waste Trust Fund (SWTF) Grant Program.

4.5 Strategy 5: Promote Use of Alternative Fuels

Alternative fuels are derived from sources other than petroleum and may include hydrogen, natural gas, propane, ethanol, methanol, butanol, and vegetable and waste-derived oils. [50,51] Alternative fuels have many uses in a low-carbon economy, such as using hydrogen for commercial trucking, sustainable aviation fuel for air transportation, and renewable natural gas for energy production. Alternative fuels typically have lower emissions than fossil fuels, but it is important to consider their lifecycle emissions including how they are produced.

Measures under this strategy include (5.1) hydrogen refueling stations; (5.2) sustainable aviation fuel production; and (5.3) renewable natural gas production from biodigesters.

4.5.1 Measure 5.1: Hydrogen Refueling Stations

This measure allows construction of hydrogen refueling stations (HRS) as one element in a broader strategy to expand the hydrogen ecosystem within Georgia. The measure is supported by hydrogen production and hydrogen pipe network infrastructure. These HRS would serve medium- and heavy-duty fuel cell electric vehicles (FCEV) trucks to support decarbonizing commercial trucking.

Intersection with other funding availability

Three existing programs support hydrogen refueling stations within the State of Georgia: (i) Alternative Fuel Vehicle Infrastructure Tax Credit, (ii) Charging and Fueling Infrastructure Discretionary Grant Program, and (iii) Hydrogen and Fuel Cell Technologies Office funding to advance the National Clean Hydrogen Strategy.

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[49] Georgia Department of Economic Development, Recycling and Sustainability in Georgia. Retrieved 6 February 2024.

[50] U.S. Department of Energy, Alternative Fuels. *Department of Energy*. Retrieved 6 February 2024.

[51] U.S. Environmental Protection Agency, Alternative Fuels. Retrieved 6 February 2024.

- **Alternative Fuel Vehicle Infrastructure Tax Credit**: The Alternative Fuel Vehicle (AFV) Tax Credit is available for qualified AFV fueling property installed in low-income communities or rural areas. The credit includes funding for hydrogen refueling locations, and tax-exempt entities including state and local governments are eligible to receive the credit through IRS elective pay provisions.[52]
- **Charging and Fueling Infrastructure Discretionary Grant Program:** The Federal Highway Administration's (FWHA) Charging and Fueling Infrastructure (CFI) program offers funding to deploy publicly accessible electric vehicle charging and alternative fueling infrastructure in urban and rural communities and along alternative fuel corridors. The CFI program offers two types of funding opportunities: The Community Charging and Fueling Grants (Community Program) and the Alternative Fuel Corridor Grants (Corridor Program).[53] The ARC received $6.1 million in funding in January 2024 from the FHWA to install 300-400 electric vehicle charging ports across the 20-county Atlanta region.[54]
- **Hydrogen and Fuel Cell Technologies Office funding to advance the National Clean Hydrogen Strategy:** The Hydrogen and Fuel Cell Technologies Office (HFTO) issues funding to coordinate hydrogen activities across the U.S. DOE and promote research, development, demonstration, and deployment of hydrogen technologies. As of December 15, 2023, funding is available for hydrogen refueling stations as part of the $8 billion initiative from the U.S. DOE to enhance local connective infrastructure for hydrogen.[55]

4.5.2 Measure 5.2: Sustainable Aviation Fuel Production

This measure focuses on increasing sustainable aviation fuel production in Georgia. Sustainable aviation fuel (SAF) production is immature in Georgia but is growing with a SAF plant in Soperton, Georgia completing construction in late 2023 and producing 10 million gallons annually. As numerous airlines have set net-zero targets, there is a recognition to support this industry by increasing the production capacity of sustainable aviation fuel within the state.

Intersection with other funding availability

One existing program supports sustainable aviation fuel production within the State of Georgia: Fueling Aviation's Sustainable Transition program.

- **Fueling Aviation's Sustainable Transition Program**: The U.S. Federal Aviation Administration (FAA) provides grants to support the development of SAF as part of the Fueling Aviation's Sustainable Transition (FAST) program. The program is part of the SAF Grand Challenge, established under the Inflation Reduction Act of 2022. Eligible projects include SAF production, transportation, blending, and storage. Qualifying SAF must reduce greenhouse gas emissions by more than 50% and be derived from biomass, waste streams, renewable energy, or gaseous carbon oxides. The Notice of Funding

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52 U.S. Department of Energy, Alternative Fuels Data Center: Alternative Fuel Vehicle (AFV) Conversion and Infrastructure Tax Credit. Retrieved February 23, 2023

53 U.S. Department of Transportation, Biden-Harris Administration Opens Applications for First Round of $2.5 Billion Program to Build EV Charging in Communities & Neighborhoods Nationwide. March 14, 2023.

54 Atlanta Regional Commission, ARC Receives $6.1M Federal Grant to Install 300-400 EV Charging Ports in metro Atlanta, with Focus on Underserved Areas. January 11, 2024.

55 U.S. Department of Energy, Hydrogen and Fuel Cell Technologies Office, Hydrogen and Fuel Cell Technologies Office Funding Opportunities. Retrieved February 23, 2024.

Opportunity (NOFO) application window closed in late December 2023, and the FAA is currently evaluating applications. [56]

4.5.3 Measure 5.3: Renewable Natural Gas Production from Biodigesters

This measure increases the production of renewable natural gas (RNG) by using anaerobic biodigesters and gas upgrading systems that have the capacity to decompose organic or agricultural waste (e.g., poultry litter, food waste).

Intersection with other funding availability

One existing program and one tax credit supports renewable natural gas production from biodigesters within the State of Georgia: (i) the Rural Energy for America Program and (ii) the Section 45 Production Tax Credit.

- **Rural Energy for America Program:** The U.S. Department of Agriculture announced the expansion of the Rural Energy for America Program (REAP) in 2023.[57] REAP allows for areas that have fewer than 50,000 inhabitants to receive funding to develop distributed renewable energy and form electric co-ops. Businesses and organizations within Georgia have received over $24.4 million in funding as of January 2024, supporting a wide range of energy projects.
- **Section 45 Production Tax Credit:** The renewable energy production tax credit is a per kilowatt-hour (kWh) federal tax credit included under section 45 of the U.S. tax code for electricity generated by qualified renewable energy resources. It can help states fund projects involving production of natural gas from biodigesters.[58]

4.6 Strategy 6: Refrigerant Management

This strategy addresses the fugitive emissions from chemicals, including hydrofluorocarbons (HFCs), traditionally used in refrigeration. Hydrofluorocarbons are over 10,000 times more potent than CO_2. They are released to the atmosphere as fugitive emissions through leakage from the installation, operation, or disposal of equipment.

This strategy includes one measure, (6.1) management of fluorinated gas (F-gas) leakage and replacement of equipment.

4.6.1 Measure 6.1: Management of Fluorinated Gas Leakage and Replacement of Equipment

This measure supports residential, commercial, and industrial entities reduction of emissions of F-gas by repairing or retrofitting existing refrigeration equipment to reduce gas leakage or by replacing existing refrigeration equipment with next generation technologies.

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56 U.S. Department of Transportation, Federal Aviation Administration, Fueling Aviation's Sustainable Transition (FAST) Grants. December 4, 2023.

57 U.S. Department of Agriculture, Rural Development, Rural Energy For America Program (REAP). Retrieved February 23, 2024.

58 U.S. Department of Energy, Renewable Electricity Production Tax Credit Information. December 18, 2023

Intersection with other funding availability
No existing federal programs exist to support management of F-gas leakage and replacement of equipment.

4.7 Strategy 7: Advance Conservation and Sustainable Land Use

This strategy increases Georgia's capacity to sequester carbon through improved management of its natural resources, which also supports the health of Georgia's timber and agricultural industries in the short- and long-term. In 2021, Georgia's natural carbon sinks sequestered 47 $MMTCO_2e$ which accounted for an offset of almost 30% of the state's total emissions.

Measures under this strategy include (7.1) afforestation and reforestation; (7.2) cropland and soil management improvements and conservation; and (7.3) coastal and waterway conservation and restoration.

4.7.1 Measure 7.1: Afforestation and Reforestation

This measure increases temperate forest coverage in Georgia, including urban canopies to increase carbon sequestration capacity.

Intersection with other funding availability
Two existing programs support afforestation and reforestation within the State of Georgia: (i) Georgia ReLeaf and (ii) Trees Across Georgia Urban and Community Forestry Grant Program.

- **Georgia ReLeaf:** Administered by the Georgia Tree Council and funded by the Georgia Forestry Commission, Georgia ReLeaf received U.S. Department of Agriculture funding through the 2023 year that resulted in 207 trees being planted and 2,312 trees being distributed. If all trees live to maturity, more than 58 acres of canopy will be generated. [59]
- **Trees Across Georgia Urban and Community Forestry Grant Program**: The Georgia Forestry Commission has awarded almost $7 million to communities, cities, and organizations across the state. The funding is being used for tree planting, staffing needs in the communities and organizations, as well as Urban and Community Forest program development for the communities, cities, and organizations. The Trees Across Georgia program will help further protect the investment in past and current tree planting initiatives throughout the state, providing tree canopy for future generations to enjoy, and promoting sustainability and resilience in Georgia's urban forest.[60]
- **Forest Land Protection Act:** The Forest Land Protection Act of 2008 provides for an ad valorem tax exemption for property primarily used for the good faith subsistence or commercial production of trees, timber, or other wood and wood fiber products. Property may have secondary uses such as promotion, preservation, or management of wildlife habitat: carbon sequestration in accordance with the Georgia Carbon Sequestration Registry; mitigation and conservation banking that results in restoration or conservation of

[59] Georgia Forestry Commission, Georgia ReLeaf Grant Program. Retrieved February 23, 2024.
[60] Georgia Forestry Commission, Trees Across Georgia (TAG) Grant Program. Retrieved February 27, 2024.

wetlands and other natural resources; or the production and maintenance of ecosystem products and services such as, but not limited to, clean air and water.[61]

4.7.2 Measure 7.2: Cropland and Soil Management Improvements and conservation

This measure promotes reduced-till or no-till farming, cover cropping, and improved nitrogen management. It also encourages and supports participation in long-term and permanent conservation programs of land facing development pressure. Many farmers throughout the state are already using the reduced-till or no-till farming methods. Georgia farmers have the highest rates of adoption of cover crop use in the nation.[62]

Intersection with other funding availability

One existing program supports cropland and soil management improvements within the State of Georgia: The Environmental Quality Incentives Program.

- **Environmental Quality Incentives Conservation Innovation Grants Program:** The U.S. Department of Agriculture Natural Resources Conservation Service (USDA NRCS) currently administers the Environmental Quality Incentives Program (EQIP) to provide financial assistance per acre to farms to implement eligible farming practices, including reduced-till or no-till farming, cover cropping, and improved nitrogen management. The Conservation Innovative Grants program is a competitive funding initiative that supports the development of new tools, approaches, practices, and technologies to further natural resource conservation on private lands. Soil health is one focus area of the agriculture-focused initiative. The USDA NRCS in Georgia received $150,000 in federal funding from the Conservation Innovative Grants program to administer a state-wide grants program for 2023 with Soil Health as a key priority.[63]
- **Georgia Farmland Conservation Fund Program:** This program housed within the Georgia Department of Agriculture, led by the Georgia Farmland Advisory Council, and funded by state, nonprofit, public, private, and government entities seeks to protect the ecological benefits, community character, and established conservation practices through the targeted purchase of permanent agricultural conservation easements.
- **Conservation Use Value Assessment:** This program provides 10-year termed land covenants that limit activity on enrolled property to established conservation uses and practices in exchange for decreased ad valorem tax rates, protecting against increased development pressure.

4.7.3 Measure 7.3: Coastal and Waterway Conservation and Restoration

This measure improves carbon sequestration along Georgia's coast and waterways through the maintenance of watershed water levels, conservation, and improvement of landscape buffers.

Intersection with other funding availability

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[61] Georgia Department of Revenue, https://dor.georgia.gov/georgia-forest-land-protection-act. Retrieved March 6, 2024.

[62] US Department of Agriculture, USDA - National Agricultural Statistics Service - 2017 Census of Agriculture - Volume 1, Chapter 1: State Level Data. Retrieved March 7, 2024.

[63] U.S. Department of Agriculture, Natural Resources Conservation Service, USDA-NRCS In Georgia Announces Conservation Innovation Grants Funding Opportunity. March 28, 2023.

Three existing programs support coastal and waterway conservation and restoration within the State of Georgia: (i) the Land and Water Conservation Fund, (ii) National Coastal Resilience Fund, and (iii) the National Coastal Wetlands Conservation Grants.

- **Land and Water Conservation Fund:** The Land and Water Conservation Fund (LWCF) supports increased public access to and protection for federal public lands and waters — including national parks, forests, wildlife refuges and recreation areas — and provides matching grants to state governments for the acquisition and development of public parks and other outdoor recreation sites. Agencies also partner with landowners to support voluntary conservation activities on private lands. Since its inception, LWCF has funded $5.2 billion to support more than 45,000 projects in every county in the country. The Great American Outdoors Act (GAOA) of 2020 authorized $900 million of annual permanent funding for LWCF. Georgia has received over $120 million in matching grant funds from LWCF.[64]
- **National Coastal Resilience Fund:** The National Coastal Resilience Fund (NCRF) was established in 2018 to invest in conservation projects that restore or expand natural features such as coastal marshes and wetlands, dune and beach systems, oyster and coral reefs, forests, coastal rivers and floodplains, and barrier islands that minimize the impacts of storms and other naturally occurring events on nearby communities. The 2023 round of funding closed in August, and organizations in Georgia received over $1.1 million in funding for various coastal programs.
- **National Coastal Wetlands Conservation Grants:** The National Coastal Wetlands Conservation Grants Program annually provides grants of up to $1 million to coastal and Great Lakes states and U.S. territories to protect, restore, and enhance coastal wetland ecosystems and associated uplands. Eligible projects include acquisition of real property interest in coastal lands or waters and the restoration, enhancement, or management of coastal wetlands ecosystems.[65]

[64] U.S. Department of the Interior, Land and Water Conservation Fund. February 23, 2024.
[65] U.S. Fish & Wildlife Service. National Coastal Wetlands Conservation Grants. February 23, 2024.

5.0 Co-Pollutant Benefits Analysis

Criteria air pollutants (CAPs), hazardous air pollutants (HAPs), and volatile organic compounds (VOCs) are three prominent categories of air pollutants. The priority measures identified in this plan have the potential to reduce CAPs, HAPs, and VOCs.

This section includes the 2017 National Emissions Inventory (NEI) for co-pollutants for the State of Georgia by sector and county, and estimations of the impact of measure implementation on CAPs, HAPs, and VOCs.

5.1 Georgia's Co-Pollutant Inventory

Georgia EPD obtained emissions data from EPA's 2017 NEI and extracted CAP, HAP, and VOC emissions data for the State of Georgia to create a statewide co-pollutant inventory. This inventory includes five out of the six pollutants the EPA defines as CAPs (i.e., particulate matter, carbon monoxide, lead, sulfur dioxide, nitrogen dioxide),[66] HAPs, and VOCs. The inventory displays emissions by NEI categorized sectors,[67] which can be found in Section D of the Appendix. The inventory may also be viewed by county using the attached Excel titled "Final GA 2017 Co-pollutant Baseline."

Each of the NEI sectors is categorized into one of 13 sector groupings.[68] Figure 13 presents the top five sector groupings responsible for the highest total of CAP, HAP, and VOC emissions, with each of the colors within the stacked bar chart representing a pollutant or pollutant type.[69]. The 2017 NEI contains 187 of the 188 EPA listed HAPs. The HAPs were combined into one total HAP value in Figure 13.

[66] Ozone was excluded from Georgia's co-pollutant inventory as ozone is not directly emitted but formed as a secondary reaction from other pollutants.

[67] U.S. Environmental Protection Agency, 2017 National Emissions Inventory Report. January 2021. The NEI divides emissions of air pollution from major source types into 60 sectors.

[68] The 13 sector groupings are biogenics, mobile on-road vehicles, fires, mobile non-road equipment and vehicles, waste disposal, dust, fuel combustion, solvent, industrial processes, agriculture, gasoline, commercial cooking, and miscellaneous. The mapping of the 60 NEI sectors to the 13 sector groupings can be found in the Sector Mapping sheet of the Final GA 2017 Co-pollutant Baseline excel workbook.

[69] Because the 2017 NEI describes biogenic emissions as naturally occurring emissions, the biogenics sector grouping was excluded from Figure 13. The bar representing lead is not visible in Figure 13 because lead emissions are relatively low compared to the other pollutants displayed. Lead emissions are typically measured in pounds. Lead emissions can be viewed in Table 1 of the Final GA 2017 Co-pollutant Baseline Excel workbook.

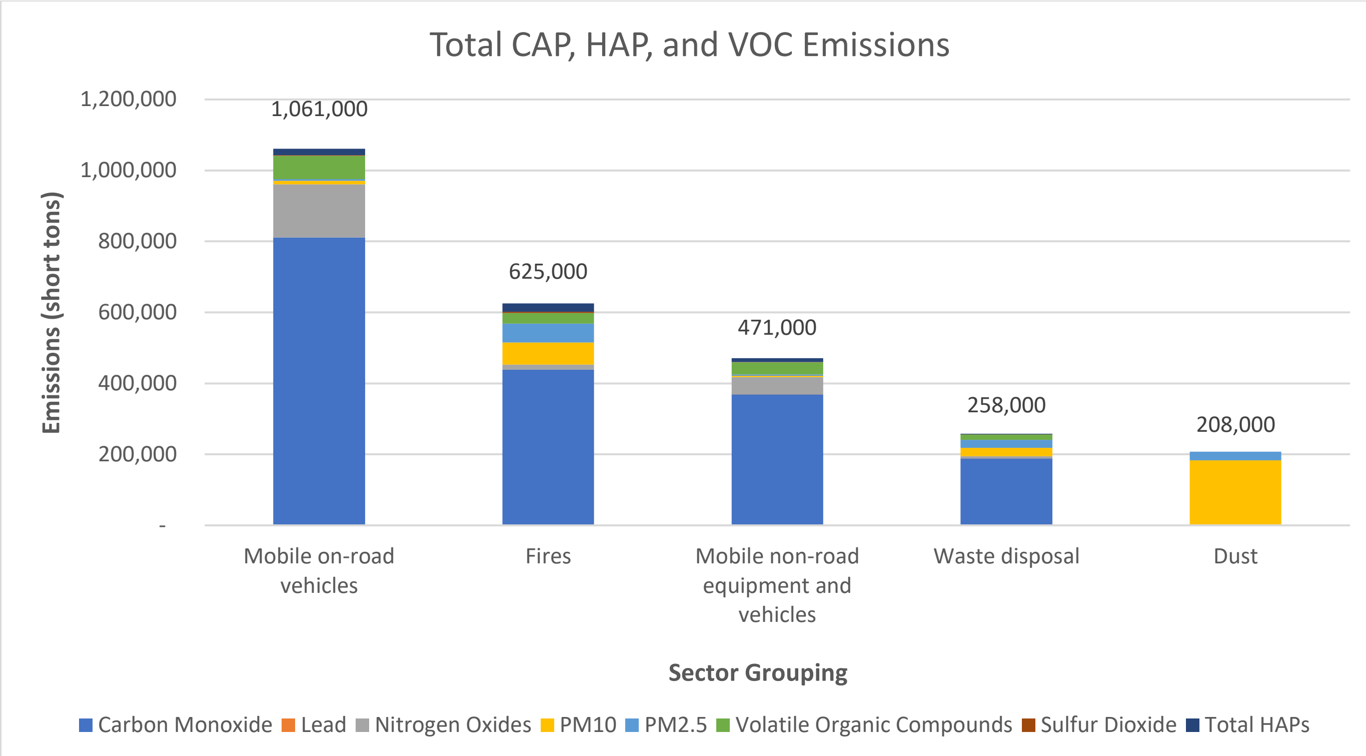

Figure 13. Georgia's 2017 CAP, HAP, and VOC Emissions by Sector Grouping

The "mobile on-road vehicles" sector grouping provides for the largest total of CAP, HAP, and VOC emissions, primarily composed of carbon monoxide emissions. In each of the top five sector groupings, apart from the dust sector grouping, carbon monoxide is the highest emitted pollutant. The highest emitted pollutant in the dust sector grouping is PM_{10}.

5.2 Co-pollutant Emission Changes from Priority Measures

The implementation of the priority reduction measures will result in co-pollutant emission changes throughout the State of Georgia. For each measure, the co-pollutant emission changes in carbon monoxide (CO), nitrogen oxides (NO_X), particulate matter 2.5 ($PM_{2.5}$), particulate matter 10 (PM_{10}), sulfur oxides (SO_X), and volatile organic compounds (VOCs) are estimated from 2025 to 2030 and from 2025 to 2050.[70]

Table 5 presents the co-pollutant changes from each measure's implementation from 2025 to 2030, and Table 6 presents co-pollutant changes from 2025 to 2050. Tables 5 and 6 also present the total amount of co-pollutant changes expected from implementing the full suite of measures along the same timelines.

[70] The co-pollutants quantified in the benefits analysis were limited to those modellable within the Rocky Mountain Institute Energy Policy Simulator (EPS) tool. The EPS tool did not have the capability to model lead, ozone, or HAPs.

Table 5. Estimated Co-Pollutant Emission Changes Resulting from Implementation of Priority Reduction Measures from 2025 – 2030 (Short Tons)

Priority measure	CO	NO_x	$PM_{2.5}$	PM_{10}	SO_x	VOC
1.1 Zero-emission buses	-1.86	-0.90	-0.02	-0.13	-0.15	0.00
1.2 Electric vehicle charging infrastructure	0.00	0.00	0.00	0.00	0.00	0.00
1.3 Bikes and bike infrastructure	-664.10	-57.53	-1.90	-4.90	-1.51	-59.13
1.4 Zero-emission fleet deployment	-7880.50	-1072.98	-2.94	-35.48	587.52	-685.48
1.5 Manufacturing of raw materials and intermediate and finished products to support EV uptake	-19910.65	-1467.92	6.31	-76.59	759.75	-1639.55
2.1 Weatherization for residential buildings	-0.60	1.31	0.00	-0.12	-0.05	0.26
2.2 Home energy rebates for the purchase of electric and energy efficient products	415.53	-506.66	-86.78	-90.11	-606.27	348.92
2.3 Incentive programs for implementation of end-use energy efficiency measures in commercial buildings	-56.23	-115.15	-13.12	-16.03	-118.68	-7.09
2.4 Incentive programs for the purchase of certified energy-efficient lighting in commercial and industrial buildings, as well as streetlights	NA	-33.07	NA	NA	-22.05	NA
3.1 Transmission and distribution upgrades	-1473.03	-2931.31	-268.30	-335.09	-3499.13	-99.27
3.2 Increasing renewable energy	-397.52	-1109.12	-91.03	-115.03	-1415.82	32.08 [a]
4.1 Landfill gas management and utilization	12.94	-0.64	-0.71	-0.84	-0.24	-0.14
4.2 Organic waste diversion from landfills	0.32 [b]	0.15 [b]	-0.41	-0.78	-0.73	-1.92
4.3 Recycling	632.22 [c]	-152.43	5.45 [c]	6.57[c]	-336.16	107.08 [c]
5.1 Hydrogen refueling stations	-14264.59	-4821.19	-70.72	-194.62	142.37	-618.63
5.2 Sustainable aviation fuel production	-4249.75	-1274.37	-61.92	-70.45	-175.72	-579.06
5.3 Renewable natural gas production from biodigesters	-1.49	-4.87	0.06	0.00	0.38	1.34
6.1 Management of F-gas leakage and replacement of equipment	-1632.66	-703.36	-116.78	-145.51	-479.66	-2252.21
7.1 Afforestation and reforestation	176.21 [d]	55.84 [d]	11.38 [d]	13.59 [d]	13.43 [d]	99.25 [d]
7.2 Cropland and soil management improvements and conservation	45.93	8.03	0.98	1.16	-0.05	10.58
7.3 Coastal and waterway conservation and restoration	2.53 [e]	1.99 [e]	0.26 [e]	0.17 [e]	0.00	1.99 [e]
All measures	-49247.32	-14184.18	-701.09	-1077.33	-5152.76	-5340.97

Table 6. Estimated Co-Pollutant Emission Changes Resulting from Implementation of Priority Reduction Measures from 2025 – 2050 (Short Tons)

Priority measure	CO	NO_x	$PM_{2.5}$	PM_{10}	SO_x	VOC
1.1 Zero-emission buses	-32.42	-60.14	-1.53	-1.91	-0.48	-4.26
1.2 Electric vehicle charging infrastructure	0.00	0.00	0.00	0.00	0.00	0.00
1.3 Bikes and bike infrastructure	-5642.47	-453.26	-14.02	-39.44	-18.58	-512.96
1.4 Zero-emission fleet deployment	-101070.48	-19968.29	-732.42	-1284.44	1989.09	-9182.01
1.5 Manufacturing of raw materials and intermediate and finished products to support EV uptake	-3140075.64	-329701.52	-6111.05	-21125.49	-10973.49	-241835.01
2.1 Weatherization for residential buildings	-31.10	-4.47	-7.05	-6.81	-3.14	-6.49
2.2 Home energy rebates for the purchase of electric and energy efficient products	-20464.98	-16987.64	-9960.44	-10192.57	-1802.01	3702.92
2.3 Incentive programs for implementation of end-use energy efficiency measures in commercial buildings	-352.28	-518.07	-80.84	-94.74	-361.79	-73.44
2.4 Incentive programs for the purchase of certified energy-efficient lighting in commercial and industrial buildings, as well as streetlights	NA	-606.27	NA	NA	-341.72	NA
3.1 Transmission and distribution upgrades	-4380.52	-7868.60	-422.56	-558.36	-9038.90	684.41
3.2 Increasing renewable energy	537.26 [a]	-3518.83	352.81 [a]	391.40 [a]	-5104.38	2574.26 [a]
4.1 Landfill gas management and utilization	309.89	-355.33	-142.47	-173.38	-173.73	-571.50
4.2 Organic waste diversion from landfills	-14.17	133.33 [b]	61.05 [b]	72.67 [b]	52.09 [b]	183.38 [b]
4.3 Recycling	18328.97 [c]	2787.03 [c]	673.75 [c]	829.22 [c]	-540.98	3707.37 [c]
5.1 Hydrogen refueling stations	-1616645.20	-645543.66	-20387.38	-37303.24	4417.09	-113609.20
5.2 Sustainable aviation fuel production	-508845.23	-152453.23	-7249.69	-8274.80	-21122.22	-68499.38
5.3 Renewable natural gas production from biodigesters	-70.84	-162.08	0.64	-2.83	2.49	27.92
6.1 Management of F-gas leakage and replacement of equipment	-9112.38	-3600.67	-656.39	-813.18	-2206.51	-12196.62
7.1 Afforestation and reforestation	6109.41 [d]	1586.32 [d]	371.75 [d]	441.49 [d]	431.83 [d]	3345.22 [d]
7.2 Cropland and soil management improvements and conservation	-533.07	-10.84	-5.48	-5.19	29.66	-106.50

7.3 Coastal and waterway conservation and restoration	81.31 [e]	31.12 [e]	6.28 [e]	7.10 [e]	5.44 [e]	46.32 [e]
All measures	-5381903.94	-1177275.09	-44305.05	-78134.48	-44760.24	-432325.57

[a] *Increasing the deployment of solar photovoltaic (PV) energy can lead to an increase in co-pollutant emissions due to various indirect factors. These include energy-intensive manufacturing processes for solar panels, emissions from transportation in the supply chain, and considerations for end-of-life management, which include developing and expanding recycling infrastructure to efficiently recover materials from decommissioned solar panels and proper handling and disposal of hazardous materials present in solar panels.*

[b] *As the amount of organic waste diverted from landfills increases, there is a possibility of increased co-pollutants due to factors such as shifts in waste composition, transportation variations, energy consumption changes, and shifts in industrial outputs. The largest increase in emissions within the industry sector is attributed largely to wood products, chemicals, rubber and plastic products, cement and other nonmetallic minerals, iron and steel, and other manufacturing.*

[c] *As the volume of recycled materials grows, there is a possibility of increased co-pollutants due to factors such as shifts in waste composition, transportation variations, energy consumption changes, and shifts in industrial outputs. The largest increase in emissions within the industry sector is attributed largely to chemicals, agriculture and forestry, wood products, rubber and plastic products, cement and other nonmetallic minerals, construction, and energy pipelines and gas processing.*

[d] *Afforestation efforts can lead to increased emissions due to factors such as soil disturbance accelerating organic matter decomposition, emissions from machinery use and transportation, and emissions associated with water and waste and, and energy pipelines and gas processing.*

[e] *The small increase in co-pollutants can be attributed to changes in land use, vegetation management practices, water quality management, and increased transportation to the newly restored areas.*

Figure 14 depicts the potential reduction in air pollution resulting from the proposed priority measures from 2025 to 2050. Carbon monoxide is the co-pollutant projected to experience the largest reduction in emissions, approximately 5.5 million short tons, followed by nitrogen oxides, volatile organic compounds, particulate matter with diameters 10 micrometers and smaller (PM_{10}), particulate matter with diameters 2.5 micrometers and smaller ($PM_{2.5}$), and sulfur oxides. Measure 1.5: manufacturing of raw materials and intermediate and finished products to support EV uptake is the largest driver of reductions in carbon monoxide and volatile organic compounds, while measure 5.1: hydrogen refueling stations, is the largest driver of reductions in nitrous oxides, $PM_{2.5}$, and PM_{10}. Measure 5.2: sustainable aviation fuel, is the largest driver of reductions in sulfur oxides.

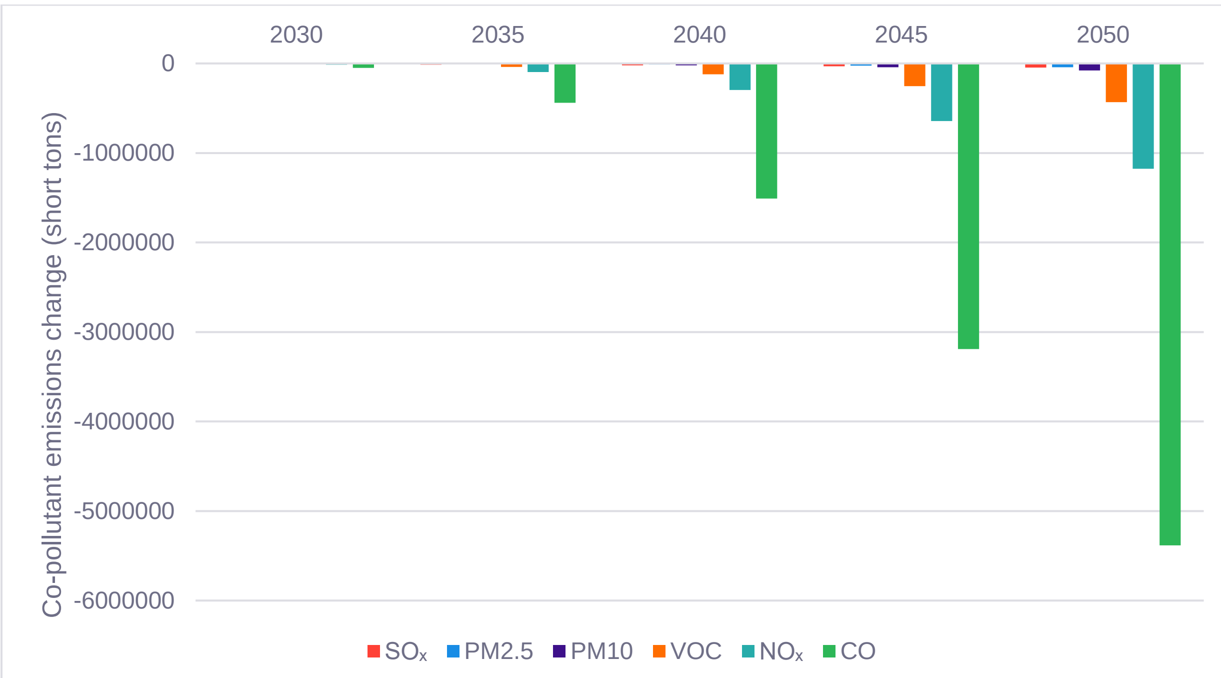

Figure 14. Cumulative Air Pollution Emissions Reductions Resulting from Priority Measure Implementation

6.0 Low-Income and Disadvantaged Communities Benefits Analysis

The voluntary emission reduction measures in this PSVERP have the potential to benefit low-income and disadvantaged communities (LIDACs) across the state. LIDACs are defined by the EPA as census tracts that are both low-income or have limited formal education and are experiencing specific "categories of burden," such as high instances of respiratory illness, high energy or housing costs, or exposure to legacy pollution.[71]

This section identifies (i) LIDACs in the State of Georgia, (ii) risks and vulnerabilities among LIDACs, (iii) LIDAC engagement methods, and (iv) potential benefits of reduction measures for LIDACs.

6.1 LIDACs in Georgia

As shown in Figure 15 below, LIDACs exist throughout the state and are concentrated in the rural south, inner cities, and Appalachian region of north Georgia. In Georgia, 42.2% of census tracts meet the Climate and Economic Justice Screening Tool (CEJST) definition of low-income and disadvantaged communities.[72] These tracts vary in size and include many large rural tracts, covering over 42.2% of the state by area. For a list of LIDACs within the State of Georgia, please see Excel data file "GA LIDAC Communities."

[71] These categories of burden are defined by the by the Climate and Economic Justice Screening Tool. See: Council on Environmental Quality, Climate and Economic Justice Screening Tool. November 22, 2022.

[72] Council on Environmental Quality, Climate and Economic Justice Screening Tool. November 22, 2022.

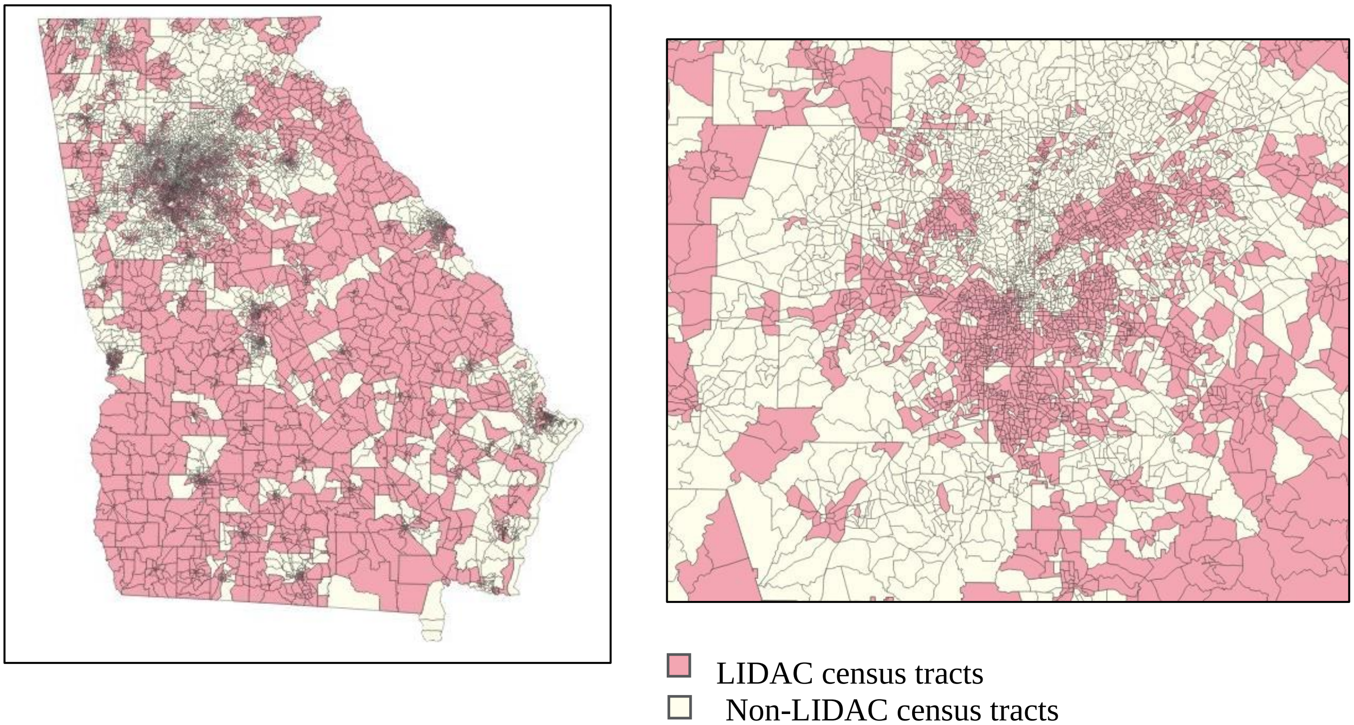

Figure 15. LIDACs in GA by Census Tract
Statewide (left) and Focused View on the Atlanta Metropolitan Area (right)

According to CJEST data, common categories of burden for rural LIDACs in Georgia include agricultural loss and high rates of poverty.

Many LIDACs across Georgia experience transportation barriers, such as greater than average transit times, and poor health, such as high rates of coronary heart disease.

In Georgia's densely populated inner cities, LIDACs tend to commonly experience health and housing burdens. Many of the LIDAC census tracts in these counties face high rates of asthma diagnoses and are above the 70th percentile for diesel particulate matter exposure and housing burden.

6.2 Engagement with LIDACs

This section provides a summary of (i) the methods used to engage LIDACs throughout the development of the plan and (ii) LIDAC priorities and concerns.

6.2.1 Engagement Methods

Georgia EPD's primary engagement methods with LIDACs included community meetings hosted by regional commissions and a public survey, distributed statewide. Of the 12 regional commissions across the state, Georgia EPD held in-person meetings with three of the regional commissions and hosted virtual meetings with another two regional commissions. The three regional commissions that hosted in-person meetings were the Middle Georgia, Northeast Georgia, and River Valley Regional Commissions which include LIDACs in Athens and Columbus. The Coastal Regional Commission and the Northwest Georgia Regional Commission participated in virtual meetings.

During these community meetings, Georgia EPD provided an overview of Georgia's PSVERP, introduced the CPRG program, and distributed the public survey.

Georgia EPD also engaged with LIDACs through a public survey, which was distributed via email by the Partnership for Southern Equity, a nonprofit working on a range of social and economic issues in the South. The survey included rank-based and open-ended questions to better understand which sectors Georgia residents prioritize for carbon reductions, their motivations to reduce emissions, current actions taken to reduce emissions, priority co-benefits of reducing emissions, and challenges and concerns with emissions reduction measures. In line with EPA's meaningful involvement policy, the survey was accessible in both English and Spanish.[73]

Because the survey requested home address location from respondents, and thus responses could be tied to LIDACs census tracts, it was the primary tool used to evaluate LIDAC priorities and concerns. The survey received 670 total responses. Of the 430 respondents who opted to provide their home address, 112 were in LIDACs.

Figure 16 below shows the geographic spread of survey respondents across the state based on home location data. The base layer shows LIDAC census tracts as defined by the EPA's Climate and Economic Justice Tool (CEJST).[74] LIDAC responses are clustered in population centers such as Atlanta, Columbus, and Savannah, reflecting areas of focus for community outreach.

[73] U.S. Environmental Protection Agency, Achieving Health and Environmental Protection Through EPA's Meaningful Involvement Policy. October 2023.

[74] Council on Environmental Quality, Climate & Economic Justice Screening Tool. November 22, 2022.

LIDAC census tracts Non-LIDAC census tracts Approximate respondent home location

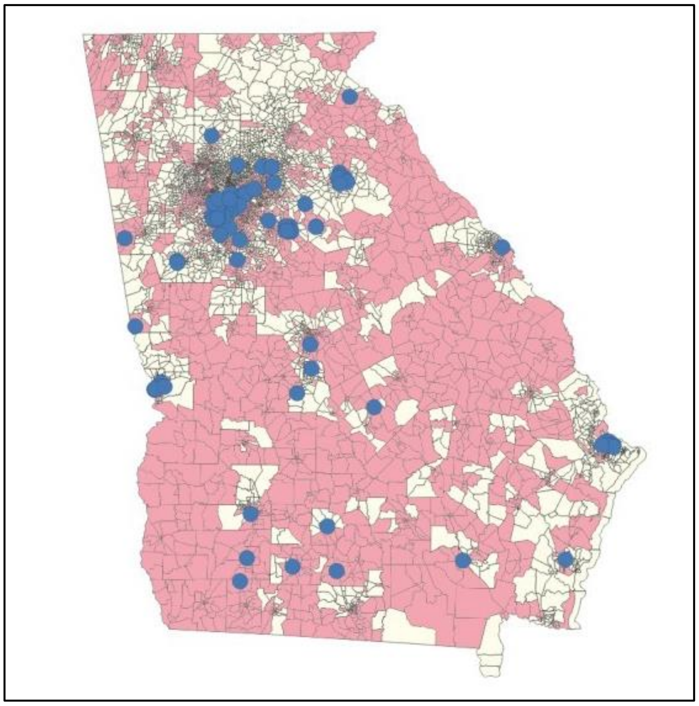

Figure 16. LIDAC Survey Responses

6.3 Potential Benefits of Reduction Measures for LIDACs

This section outlines the potential benefits of implementing emission reduction measures for LIDACs. Each measure was assessed to determine if it enhanced the benefits outlined in Table 7 below. For further details on the criteria used to define each benefit refer to Section F of the Appendix LIDAC customers utilization of utility bill savings is dependent on many factors. Even with funding support, these statements may not be true for all customers or all projects. Further, it is important to not overly burden non-participating customers (especially in LIDACs) through redistribution of costs of participation to all customers. Utilities have many programs that are focused on LIDACs but must carefully balance program cost and impact considerations. With the appropriate funding support and program design, certain energy efficiency and renewable measures may have the potential to reduce utility bills.

Table 7 provides a summary of the potential benefits associated with each priority reduction measure. Measures capable of offering direct benefits are denoted by a solid circle (●), those with potential indirect benefits are denoted by an unfilled circle (◯), and measures not relevant to a particular benefit are denoted by a gray dash (–). These benefits are discussed below:

Table 7: Qualitative Assessment of Potential LIDAC Benefits Resulting from Reduction Measure Implementation

	Potential benefit							
Priority measure	Improved air quality	Transportation improvements	Housing affordability	Community beautification	Community resilience	Reduced noise pollution	Workforce development	Lower utility bills
1. Electrify transportation sector and adapt to consumer mode shift								
1.1 Zero-emission buses	●	●	–	–	●	●	–	–
1.2 Electric vehicle charging infrastructure	○	●	–	–	●	○	●	–
1.3 Bikes and bike infrastructure	○	●	–	–	●	○	●	–
1.4 Zero-emission fleet deployment	●	●	–	–	●	●	–	–
1.5 Manufacturing of raw materials and intermediate and finished products to support EV uptake	○	○	–	–	●	○	–	–
2. Improve energy efficiency and promote electrification								
2.1 Weatherization for residential buildings	○	–	–	–	●	–	●	●
2.2 Home energy rebates for the purchase of electric and energy efficient products	○	–	–	–	–	–	–	●
2.3 Incentive programs for implementation of end-use energy efficiency measures in commercial buildings	○	–	–	–	–	–	–	–
2.4 Incentive programs for the purchase of certified energy-efficient lighting in commercial and industrial buildings, including streetlights	○	–	–	○	–	–	–	–
3. Increase availability and use of renewable energy								
3.1 Transmission and distribution upgrades	○	–	–	–	●	–	●	●
3.2 Increasing renewable energy	○	–	–	–	●	–	●	○
4. Improve waste diversion and landfill management								
4.1 Landfill gas management and utilization	●	–	–	–	–	–	●	–
4.1 Organic waste diversion from landfills	○	–	–	–	–	–	●	–
4.1 Recycling	○	–	–	–	–	–	●	–
5. Promote use of alternative fuels								
5.1 Hydrogen refueling stations	○	●	–	–	●	○	●	–

5.2 Sustainable aviation fuel production	●	–	–	–	–	–	●	–
5.3 Renewable natural gas production from biodigesters	○	–	–	–	–	–	●	–
6. Refrigerant management								
6.1 Management of F-gas leakage and replacement of equipment	○	–	–	–	–	–	–	–
7. Advance conservation and sustainable land use								
7.1 Afforestation and reforestation	●	–	–	●	●	–	●	–
7.2 Cropland and soil management improvements and conservation	●	–	–	–	●	–	–	–
7.3 Coastal and waterway conservation and restoration	●	–	–	●	●	–	●	–

6.3.1 Potential Benefits of Strategy 1: Electrify Transportation Sector and Adapt to Consumer Mode Shift

Measures within this category support transportation improvements, improved air quality, community resilience, workforce development, and reduced noise pollution, as shown in Table 8 below.

Table 8. LIDAC Priorities Related to Strategy 1: Electrify Transportation Sector and Adapt to Consumer Mode Shift

LIDAC Ranking	Benefit
1	Transportation improvements
2	Improved air quality
3	Community resilience
7	Workforce development
8	Reduced noise pollution

- **Transportation improvements:** Investing in EVs and bikes has the potential to enhance transportation affordability and reliability in Georgia over time through decreasing reliance on fuel, which is vulnerable to price fluctuations.
- **Improved air quality:** Replacing gas vehicles with electric vehicles and reducing vehicle miles traveled by shifting from cars to bikes are both strategies that reduce tailpipe emissions and improve air quality.
- **Community resilience:** Reducing dependence on gas can support resilience during extreme weather events. For example, electric vehicles are not subject to gas shortages during hurricane evacuations.
- **Workforce development:** The implementation of EV and bike infrastructure demands labor, thereby stimulating the state economy through job creation to support Georgia's transition to EVs.
- **Reduced noise pollution:** Electric motors produce considerably less noise compared to conventional internal combustion engines, thereby reducing traffic noise levels in urban and suburban areas. This reduction in noise can enhance the ambiance of public spaces, densely populated residential neighborhoods, and public transportation systems.

6.3.2 Potential Benefits of Strategy 2: Improve Energy Efficiency and Promote Electrification

Measures within this category support improved air quality, community resilience, community beautification, lower utility bills, and workforce development, as shown in Table 9 below.

Table 9. LIDAC Priorities Related to Strategy 2: Improve Energy Efficiency and Promoting Electrification

LIDAC Ranking	Benefit
2	Improved air quality
3	Community resilience
5	Community beautification
6	Lower utility bills
7	Workforce development

- **Improved air quality:** Energy efficiency improvements reduce energy losses and demand. Electrification reduces dependence on natural gas-powered appliances which in turn improves indoor air quality and reduces emissions overall.
- **Community resilience:** Home weatherization, in addition to insulating homes to save on utility costs, also protects homes against extreme weather events. This measure can help Georgians stay safe during extreme heat, cold, or storms.
- **Community beautification:** Streetlighting enhances community beautification by providing illumination while improving safety for residents.
- **Lower utility bills:** Weatherization and energy efficiency upgrades reduce energy demand, thereby lowering utility costs for consumers.
- **Workforce development:** The process of weatherizing homes to make them more energy efficient requires a range of skills and occupations, including weatherization technicians,

energy auditors, insulation installers, heating, ventilation, and air conditioning (HVAC) technicians, and others.

6.3.3 Potential Benefits of Strategy 3: Increasing Availability and Use of Renewable Energy

Measures within this category support improved air quality, community resilience, lower utility bills and workforce development, as shown in Table 10 below.

Table 10. LIDAC Priorities Related to Strategy 3: Increase Availability and Use of Renewable Energy

LIDAC Ranking	Benefit
2	Improved air quality
3	Community resilience
6	Lower utility costs
7	Workforce development

- **Improved air quality:** In Georgia, the adoption of renewable energy can improve air quality by mitigating emissions of gases associated with fossil fuel combustion. These reductions have the potential to positively impact public health outcomes, including reducing the prevalence of respiratory diseases.
- **Community resilience:** The advancement of renewable energy can also bolster community resilience against extreme weather events in Georgia. Decentralized renewable energy systems can offer power during emergencies, diminishing community vulnerability and addressing concerns regarding energy security and emergency readiness, especially in LIDACs.
- **Lower utility bills:** Increased utilization of renewable energy in Georgia has potential to alleviate utility costs over time, particularly when coupled with efforts to modernize electricity distribution, thereby enhancing energy reliability. This is particularly beneficial for low-income households facing barriers to energy access due to aging infrastructure and escalating utility costs.
- **Workforce development:** Georgia's renewable energy sector is labor-intensive and demands a workforce proficient in harnessing various renewable energy sources, such as solar or biomass, as well as the installation and maintenance of energy infrastructure. The planning, installation, upkeep, and management of renewable energy systems present opportunities for the creation of sustainable employment opportunities, facilitating the sector's long-term growth.

6.3.4 Potential Benefits of Strategy 4: Improve Waste Diversion and Landfill Management

Measures within this category support improved air quality and workforce development, as shown in Table 11 below.

Table 11. LIDAC Priorities Related to Strategy 4: Improve Waste Diversion and Landfill Management

LIDAC Ranking	Benefit
2	Improved air quality
7	Workforce development

- **Improved air quality:** Diverting waste from landfills can improve air quality by reducing methane emissions from organic waste decomposition, minimizing air pollution from waste incineration, and transportation-related emissions associated with waste disposal. Effective waste diversion strategies can support communities in mitigating the negative environmental impacts of landfilling, contributing to clearer air.
- **Workforce development:** Improving waste diversion and landfill management can create work opportunities in recycling, composting, waste-to-energy, construction, engineering, and education.

6.3.5 Potential Benefits of Strategy 5: Promote the Use of Alternative Fuels

Measures within this category support transportation improvements, improved air quality, community resilience, workforce development and reduced noise pollution, as shown in Table 12 below.

Table 12. LIDAC Priorities Related to Strategy 5: Promote Use of Alternative Fuels

LIDAC Ranking	Benefit
1	Transportation improvements
2	Improved air quality
3	Community resilience
7	Workforce development
8	Reduced noise pollution

- **Transportation improvements:** Alternative fuels, such as biofuels, electricity, and hydrogen, can diversify the transportation sector, reducing dependence on fossil fuels and vulnerability to fuel price fluctuations. This diversification can foster innovation in vehicle technology and infrastructure development for electric vehicles.
- **Improved air quality:** Alternative fuels produce fewer emissions compared to fossil fuels, resulting in improved air quality, and reducing health risks for communities. By substituting conventional gasoline and diesel with cleaner alternatives, pollutants like particulate matter can be significantly reduced, leading to cleaner air and better respiratory health outcomes.
- **Community resilience:** Promoting alternative fuels can bolster community resilience by diversifying energy sources and reducing reliance on finite and environmentally damaging fossil fuels. In the event of energy supply disruptions, communities with access to alternative fuel infrastructure, are better equipped to maintain essential services and mobility, ensuring resilience in the face of challenges.

- **Workforce development:** The transition to alternative fuels generates workforce opportunities in sectors such as renewable energy, clean transportation, and advanced manufacturing. Workers are needed for the production, installation and maintenance of alternative fuel infrastructure and vehicles, driving job growth and economic development.
- **Reduced noise pollution:** Alternative fuel vehicles, particularly electric (EVs) and hydrogen fuel cell vehicles, produce less noise compared to conventional internal combustion engine vehicles. This reduction in noise can improve the quality of life in urban areas, reducing traffic-related stress. Additionally, quieter transportation modes create a more pleasant urban experience for residents and visitors alike.

6.3.6 Potential Benefits of Strategy 6: Refrigerant Management

Measures within this category support improved air quality, as shown in Table 13 below.

Table 13. LIDAC Priorities Related to Strategy 6: Refrigerant Management

LIDAC Ranking	Benefit
2	Improved air quality

- **Improved air quality**: Initiatives aimed at improving refrigerant management minimize emissions of ozone-depleting substances and greenhouse gases, enhancing air quality. By transitioning to low-GWP refrigerants, preventing leaks, and implementing proper recovery and recycling practices, these efforts can contribute to improved air quality and public health outcomes.

6.3.7 Potential Benefits of Strategy 7: Advance Conservation and Sustainable Land Use

Measures within this category support improved air quality, community resilience, community beautification and workforce development, as shown in Table 14 below.

Table 14. LIDAC Priorities Related to Strategy 7: Advance Conservation and Sustainable Land Use

LIDAC Ranking	Benefit
2	Improved air quality
3	Community resilience
5	Community beautification
7	Workforce development

- **Improved air quality**: Conservation and sustainable land use practices in Georgia have the potential to contribute significantly to improved air quality. By preserving natural habitats, reducing deforestation, and promoting sustainable agricultural practices, these efforts can help mitigate the release of pollutants into the atmosphere, thereby benefiting public health outcomes. Additionally, the conservation of green spaces and forests serves as a natural carbon sink and reduces overall air pollution levels.
- **Community resilience**: Conservation and sustainable land use strategies enhance community resilience, particularly in the face of extreme weather events. Preserving

wetlands, restoring natural buffers such as coastal mangroves, and implementing green infrastructure projects can mitigate the impact of floods, storms, and other environmental hazards. These efforts not only protect communities from damage, but also promote long-term sustainability and adaptability.

- **Community beautification**: Conservation initiatives directly contribute to community beautification by preserving and enhancing natural landscapes and ecosystems.
- **Workforce development**: Afforestation, reforestation, and coastal restoration projects all require dedicated workforces to realize their full benefits. By creating comprehensive programs to improve current land use practices and enhance benefits, especially in areas at higher risk of weather-related damages, Georgia can create impactful jobs localized in LIDACs in the state.

7.0 Authority to Implement

The Clean Air Act (CAA) section 137 (42 U.S.C. § 7437) states that CPRG implementation grants shall be awarded to eligible entities including municipalities, state agencies, and air pollution control agencies.[75] Per the CPRG Implementation Notice of Funding Opportunity (assistance listing number 66.046), these entities have the authority to apply for, administer, and subaward CPRG funds to implement the measures included in this Peach State Voluntary Emission Reduction Plan, provided that subawards are consistent with the EPA's Subaward Policy.[76]

Because the measures included in this plan are voluntary in nature, no additional regulatory authority is required to enable their implementation.

[75] United States House of Representatives, 42 USC 7437: Greenhouse gas air pollution plans and implementation grants. February 2024.
[76] U.S. Environmental Protection Agency, Climate Pollution Reduction Grants Program: Implementation Grants General Competition. September 2023.

8.0 Next Steps

In this section, we look forward to next steps, including (i) implementation grant applications, (ii) the Comprehensive Peach State Voluntary Emission Reduction Plan (CPSVERP), (iii) the Status Report, and (iv) continued stakeholder engagement.

8.1 Implementation Grant Applications

Upon publication of this PSVERP, eligible entities across Georgia will have the opportunity to apply for funding to implement the reduction measures quantified in the plan. Eligible entities include state and municipal agencies, councils of government, and other regional organizations. Approximately $4.6 billion is available across all states for implementation funding, and EPA anticipates awarding between 30 to 115 grants ranging from $2 million to $500 million across five funding tiers.

8.2 Comprehensive Peach State Voluntary Emission Reduction Plan

Following the publication of this PSVERP, Georgia will begin the process of developing a CPSVERP. The CPSVERP will build upon PSVERP and include two additional elements:

- Emission projections: near-term (e.g., 2030 – 2035) and long-term (e.g., 2050) projections of emissions that compare a scenario where emission reduction measures are implemented with a scenario where they are not implemented.
- Reduction targets: economy-wide near-term and long-term reduction targets.
- Workforce Planning Analysis: Identifies the impact of emission reduction measure implementation on jobs, wages, and gross domestic product (GDP).

Georgia EPD plans to publish the CPSVERP by June 1, 2025.

8.3 Status Report

A Status Report is due to EPA at the close of the four-year grant period, expected on June 1, 2027. This report will include:

- The implementation status of quantified reduction measures included in the CPSVERP.
- Any relevant updated analyses or projections supporting CPSVERP implementation.
- Next steps and future budget and staffing needs to support CPSVERP implementation.
- Updates to emissions analyses, reduction measures, or other items as necessary to reflect recent and forecasted changes in programs and emissions.

8.4 Continued Stakeholder Engagement

Georgia conducted extensive interagency, intergovernmental, and public stakeholder engagement to inform the development of this PSVERP and will continue to do so while developing the CPSVERP.

To stay apprised of upcoming events and other opportunities to share feedback with Georgia EPD, a sign up is available for email updates on Georgia EPD's CPRG website.[77]

[77] Georgia Environmental Protection Division, Georgia Climate Pollution Reduction Grant. February 2024.

Section A – Glossary of Terms

Climate Pollution Reduction Grant (CPRG):
Program under the Inflation Reduction Act providing $5 billion in grants to states, local governments, tribes, and territories to develop and implement plans for reducing greenhouse gas emissions and other air pollutants.

Climate Pollution Reduction Grant (CPRG) Notice of Funding Opportunity (NOFO):
A request for applications for CPRG funding to implement priority greenhouse gas reduction measures.

Comprehensive Peach State Voluntary Emission Reduction Plan (CPSVERP):
Report that provides an overview of significant greenhouse gas sources and sinks by sector, establishes near-term and long-term emission reduction goals, and provides strategies and measures to achieve those goals.

Co-pollutant benefits analysis:
Greenhouse gas reduction measures often support improvements to air quality. This section of the plan quantifies the co-pollutant reduction potential of each priority reduction measure.

Criteria Air Pollutants (CAPs):
According to the EPA, CAPs include particulate matter (PM), ozone, sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), and lead. Exposure to these pollutants can cause respiratory difficulties, cardiac issues, and other health problems.[78]

Greenhouse gas (GHG) inventory:
A list of emissions sources and sinks. The Peach State Voluntary Emission Reduction Plan must include a "simplified" inventory based on existing data. The Comprehensive Peach State Voluntary Emission Reduction Plan must include a comprehensive inventory of emissions and sinks for the following sectors: industry, electricity generation and use, transportation, commercial and residential buildings, agriculture, natural and working lands, and waste and materials management.

Greenhouse gas (GHG) reduction measures:
These are programs, policies, projects, and measures (collectively referred to as "reduction measures," "emission reduction measures," or "measures") that will reduce greenhouse gas emissions in Georgia.

Hazardous Air Pollutants (HAPs):
The EPA has listed 188 substances as HAPs, including substances like benzene, found in gasoline; and methylene chloride, which is used as a paint stripper by numerous industries. Exposure to HAPs can cause cancer or other serious health effects, such as reproductive effects or birth defects.[79]

Intersection with other funding availability:
Assessment of funding availability that complements Climate Pollution Reduction Grant funding.

Low-income and disadvantaged community (LIDAC):
Communities with residents that have low incomes, limited access to resources, or disproportionate exposure to environmental or other burdens. Climate Pollution Reduction Grant

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[78] U.S. Environmental Protection Administration, Criteria Air Pollutants. February 16, 2024.
[79] U.S. Environmental Protection Administration, National Emissions Inventory (NEI). May 26, 2023.

grantees may identify LIDACs using a layer combining geospatial data from the Climate and Economic Justice Screening Tool (CEJST) and Environmental Justice Screening and Mapping Tool (EJScreen).

Low-income and disadvantaged community (LIDAC) benefits analysis:

This section of the Peach State Voluntary Emission Reduction Plan identifies the ways emission reduction measures may benefit LIDACs. Benefits include improved air quality, transportation improvements, housing affordability, community beautification, community resilience, reduced noise pollution, and workforce development.

Metropolitan statistical area (MSA):

Area containing substantial population, along with its adjacent communities. MSAs are based on 2020 US Census data. MSAs eligible for Climate Pollution Reduction Grant funding are listed in the Program Guidance for States, Municipalities, and Air Pollution Control Agencies.[80]

National Emissions Inventory (NEI):

A national inventory of air emissions estimates published by the EPA every three years, including criteria pollutants, criteria precursors, and hazardous air pollutants.[81]

Peach State Voluntary Emission Reduction Plan (PSVERP):

A report that includes a list of near-term, priority, and implementation-ready measures to reduce emissions.

Review of authority to implement:

The statutory or regulatory authority to implement reduction measures.

State:

All 50 U.S. states and the District of Columbia and Puerto Rico.

Volatile organic compounds (VOCs):

The EPA defines VOCs as “any compound of carbon, excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate, which participates in atmospheric photochemical reactions, except those designated by EPA as having negligible photochemical reactivity”.[82]

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[80] U.S. Environmental Protection Administration, Office of Air and Radiation, Climate Pollution Reduction Grants Program: Formula Grants for Planning. March 1, 2023.

[81] U.S. Environmental Protection Administration, National Emissions Inventory (NEI). May 2023.

[82] U.S. Environmental Protection Administration, What are volatile organic compounds (VOCs)? May 2023.

Section B – Greenhouse Gas Inventory

Table 15. Georgia's GHG Emissions in Metric Tons of Carbon Dioxide Equivalent ($MTCO_2e$) by Sector

Sector/source	GHG emissions ($MTCO_2e$)
Transportation	**60,352,187**
CO_2 from Fossil Fuel Combustion	58,275,495
Substitution of Ozone Depleting Substances	1,347,864
Mobile Combustion	471,942
Non-Energy Use of Fuels	256,886
Electric Power Industry	**51,128,076**
CO_2 from Fossil Fuel Combustion	40,825,235
Interstate electricity from Alabama[83]	9,605,786
Stationary Combustion	501,057
Incineration of Waste	0
Electrical Equipment	68,035
Other Process Uses of Carbonates	127,964
Industry	**16,856,107**
CO_2 from Fossil Fuel Combustion	10,217,477
Natural Gas Systems	1,446,242
Non-Energy Use of Fuels	433,654
Petroleum Systems	0
Coal Mining	0
Iron and Steel Production	34,430
Cement Production	216,398
Substitution of Ozone Depleting Substances	1,292,663
Petrochemical Production	0
Lime Production	0
Ammonia Production	633,851
Nitric Acid Production	398,969
Abandoned Oil and Gas Wells	0
Wastewater Treatment	417,319
Urea Consumption for Non-Agricultural Purposes	160,587
Mobile Combustion	129,850
Abandoned Underground Coal Mines	0
Adipic Acid Production	0
Carbon Dioxide Consumption	160,611
Electronics Industry	258
N_2O from Product Uses	120,709
Stationary Combustion	336,493
Other Process Uses of Carbonates	127,964
Fluorochemical Production	0
Aluminum Production	0
Soda Ash Production	0
Ferroalloy Production	0
Titanium Dioxide Production	0
Caprolactam, Glyoxal, and Glyoxylic Acid Production	0

83 Electricity imported from Alabama is not included in the EPA's State GHG Emissions and Removals for Georgia.

Sector/source	GHG emissions ($MTCO_2e$)
Glass Production	19,674
Magnesium Production and Processing	0
Zinc Production	0
Phosphoric Acid Production	0
Lead Production	0
Landfills (Industrial)	706,371
Carbide Production and Consumption	2,589
Agriculture	**6,436,192**
N_2O from Agricultural Soil Management	2,444,164
Enteric Fermentation	2,208,548
Manure Management	1,140,976
CO_2 from Fossil Fuel Combustion	536,217
Rice Cultivation	0
Urea Fertilization	63,372
Liming	0
Mobile Combustion	16,718
Field Burning of Agricultural Residues	24,608
Stationary Combustion	1,588
Commercial	**14,208,442**
CO_2 from Fossil Fuel Combustion	4,271,098
Landfills (Municipal)	5,939,050
Substitution of Ozone Depleting Substances	2,828,802
Wastewater Treatment	1,096,076
Composting	48,720
Stationary Combustion	21,592
Anaerobic Digestion at Biogas Facilities	3,105
Residential	**9,783,135**
CO_2 from Fossil Fuel Combustion	7,358,814
Substitution of Ozone Depleting Substances	2,374,967
Stationary Combustion	49,355
Total Emissions (Sources)	**158,764,140**
Land-Use, Land-Use Change, and Forestry (LULUCF) Sector Net Total (Sinks) [84]	**(47,167,977)**
Net Emissions (Sources and Sinks)	**111,596,163**

[84] Harvested wood products are not included in the EPA's State GHG Emissions and Removals for Georgia.

Table 16. Georgia GHG Emissions in $MTCO_2e$ by Gas and Source

Gas/source	GHG emissions ($MTCO_2e$)
CO_2	**133,343,164**
Fossil Fuel Combustion	131,090,122
Electric Power Sector	40,825,235
Interstate electricity from Alabama[85]	9,605,786
Transportation	58,275,495
Industrial	10,753,694
Residential	7,358,814
Commercial	4,271,098
Non-Energy Use of Fuels	690,540
Natural Gas Systems	14,942
Cement Production	216,398
Lime Production	0
Other Process Uses of Carbonates	255,927
Glass Production	19,674
Soda Ash Production	0
Carbon Dioxide Consumption	160,611
Incineration of Waste	0
Titanium Dioxide Production	0
Aluminum Production	0
Iron and Steel Production & Metallurgical Coke Production	34,430
Ferroalloy Production	0
Ammonia Production	633,851
Urea Consumption for Non-Agricultural Purposes	160,587
Phosphoric Acid Production	0
Petrochemical Production	0
Carbide Production and Consumption	2,589
Lead Production	0
Zinc Production	0
Petroleum Systems	0
Abandoned Oil and Gas Wells	0
Magnesium Production and Processing	0
Coal Mining	0
Liming	0
Urea Fertilization	63,372
Substitution of Ozone Depleting Substances	120
International Bunker Fuels[86]	1,985,988
Wood Biomass, Ethanol, and Biodiesel Consumption[87]	22,860,800
CH_4	**12,435,262**
Stationary Combustion	255,012

85 Electricity imported from Alabama is not included in the EPA's State GHG Emissions and Removals for Georgia.

86 Emissions from International Bunker Fuels are not included in totals.

87 Emissions from Wood Biomass, Ethanol, and Biodiesel Consumption are not included specifically in summing Energy sector totals. Net carbon fluxes from changes in biogenic carbon reservoirs are accounted for in the estimates for Land Use, Land-Use Change, and Forestry.

Gas/source	GHG emissions ($MTCO_2e$)
Mobile Combustion	71,097
Coal Mining	0
Abandoned Underground Coal Mines	0
Natural Gas Systems	1,431,293
Petroleum Systems	0
Abandoned Oil and Gas Wells	0
Petrochemical Production	0
Carbide Production and Consumption	0
Iron and Steel Production & Metallurgical Coke Production	0
Ferroalloy Production	0
Enteric Fermentation	2,208,548
Manure Management	966,043
Rice Cultivation	0
Field Burning of Agricultural Residues	17,115
Landfills	6,645,421
Wastewater Treatment	809,134
Composting	28,494
Anaerobic Digestion at Biogas Facilities	3,105
Incineration of Waste	0
International Bunker Fuels[88]	590
N_2O	**5,073,260**
Stationary Combustion	655,072
Mobile Combustion	547,413
Adipic Acid Production	0
Nitric Acid Production	398,969
Manure Management	174,933
Agricultural Soil Management	2,444,164
Field Burning of Agricultural Residues	7,493
Wastewater Treatment	704,261
N_2O from Product Uses	120,709
Caprolactam, Glyoxal, and Glyoxylic Acid Production	0
Incineration of Waste	0
Composting	20,226
Electronics Industry	14
Natural Gas Systems	7
Petroleum Systems	0
International Bunker Fuels[89]	16,243
HFCs, PFCs, SF_6 and NF_3	**7,912,453**
HFCs	7,842,574
Substitution of Ozone Depleting Substances	7,842,568
Fluorochemical Production	0
Electronics Industry	7
Magnesium Production	0

88 Emissions from International Bunker Fuels are not included in totals.
89 Emissions from International Bunker Fuels are not included in totals.

Gas/source	GHG emissions ($MTCO_2e$)
PFCs	1,841
Aluminum Production	0
Electronics Industry	235
Electrical Equipment	0
Substitution of Ozone Depleting Substances[90]	1,607
SF_6	68,037
Electrical Equipment	68,035
Electronics Industry	2
Magnesium Production	0
NF_3	0
Electronics Industry	0
Total Emissions (Sources) [91]	**158,764,140**
LULUCF Emissions (Sources)[92]	**1,997,503**
LULUCF CH_4 Emissions	1,886,324
LULUCF N_2O Emissions	111,179
LULUCF Carbon Stock Change (Sinks) [93]	(49,165,479)
LULUCF Harvested wood products[94]	(8,846,923)
LULUCF Sector Net Total (Sinks) [95]	(47,167,977)
Net Emissions (Sources and Sinks)[96]	**111,596,163**

90 Small amounts of PFC emissions also result from this source.
91 Total emissions presented without LULUCF.
92 LULUCF emissions of CH_4 and N_2O are reported separately from gross emissions totals.
93 LULUCF Carbon Stock Change is the net carbon stock change from the following categories: Forest Land Remaining Forest Land, Land Converted to Forest Land, Cropland Remaining Cropland, Land Converted to Cropland, Grassland Remaining Grassland, Land Converted to Grassland, Wetlands Remaining Wetlands, Land Converted to Wetlands, Settlements Remaining Settlements, and Land Converted to Settlements.
94 Harvested wood products are not included in the EPA's State GHG Emissions and Removals for Georgia.
95 The LULUCF Sector Net Total is the net sum of all CH_4 and N_2O emissions to the atmosphere plus net carbon stock changes.
96 Net emissions include LULUCF.

Section C – Modeling Assumptions

All 21 voluntary emission reduction measures included in this PSVERP were quantified for a variety of metrics previously detailed in the plan including emissions reductions and co-pollutant reductions.

Measures, except where noted, were modeled using the Rocky Mountain Institute's (RMI's) Energy Policy Simulator (EPS), an "open-source model for estimating the environmental, economic, and human health impacts of hundreds of climate and energy policies."[97] Environmental, economic, and human health impacts resulting from each measure's implementation were estimated for two periods: 2025 to 2030 and 2025 to 2050. The impacts for 2025 to 2030 were quantified through December 31, 2029, and the impacts for 2025 to 2050 were quantified through December 31, 2049.

Some measures were quantified using GLIMPSE, a graphical user interface built on the Global Change Assessment Model (GCAM), developed by the Pacific Northwest National Laboratory (PNNL), or an alternative calculation method.

To model each of the 21 measures, a "business-as-usual" (BAU) and a "policy" scenario were developed, projecting out assumptions and key inputs related to the measure to 2050. The BAU scenario assumes no implementation of the reduction measure while the policy scenario assumes varying scales of implementation of the measure.

Corresponding policies were run off-model using the BAU and policy scenarios and their key inputs; the difference in impact between the two scenarios was then used to quantify the impact of the measure. The following section details the scenarios, assumptions, and metrics that served as key inputs to modeling measures.

Strategy 1: Electrify Transportation Sector and Adapt to Consumer Mode Shift

Measure 1.1: Zero-Emission Buses

This measure replaces public and private diesel buses in Georgia with zero-emission buses. It could be supported by expanding charging infrastructure and motivating ridership, thus reducing total vehicle miles traveled within the state.

The EPS policy "Electric Vehicle Sales Standard" used to model the impacts of this policy assumes a specified percentage of new buses sold are electric as opposed to conventional diesel. This policy models the adoption of electric buses for school, transit and intercity. This policy models the impact of electric buses, but other vehicle types could also be considered for zero-emission buses.

Zero-emission buses were modeled under two scenarios: (1) a business-as-usual (BAU) scenario, extending the current state and (2) a policy scenario. Each scenario is defined in detail below.

Current state

[97] Rocky Mountain Institute, Energy Policy Simulator. 2024.

There are no state-level policies or initiatives in Georgia pertaining to zero-emission buses. At the federal level, 21 Georgia school districts received $170 million in total funding in 2022 and 2023 from the EPA's Clean School Bus Program.[98] In addition, Georgia transport entities have received 9 grant awards since 2016 under the U.S. Federal Transit Administration's Low or No Emission Grant Program.[99]

Business-as-usual scenario

There were 874 commuter buses reported to the National Transit Database in Georgia in 2022.[100] MARTA (the Metropolitan Atlanta Rapid Transit Authority) plans to add 63 fully electric buses starting in 2025,[101] which equates to 8% of the total statewide fleet; it is assumed that those buses will be added by 2030 and that an 8% replacement rate per decade follows. Additionally, it is assumed that the total number of buses will remain stagnant (instead of continuing its recent trend of decline) due to uncertainty on future projections of demand for bus transit. Given the above assumptions, the business-as-usual trend for electric buses is shown in Table 17, below.

Table 17: BAU Projection for Zero-Emission Buses in Georgia

Year	% of buses that are electric	Total buses	Electric buses
2022	<1%	874	~9
2030	8%	874	70
2040	16%	874	140
2050	24%	874	210

Policy scenario

The policy scenario attempts to replace 50% commuter and school buses with electric buses by the year 2050.

The policy scenario assumes a yearly replacement of 2% of Georgia commuter buses with electric buses. Given the limited number of buses and current implementation of electric buses without policy enforcement, reaching a 50% electric bus fleet in Georgia is technically achievable.

Table 18 shows the projected portion of electric buses in Georgia by year, based off the policy scenario with a 2% annual electric bus replacement rate.

Table 18: Policy Scenario Projection for Zero-Emission Buses in Georgia

Year	% of buses that are electric	Total Buses	Electric Buses
2022	<1%	874	~9
2030	10%	874	88
2040	30%	874	262
2050	50%	874	437

98 U.S. Environmental Protection Agency. Clean School Bus Program Awards. February 7, 2024.
99 U.S. Department of Transportation, Federal Transit Administration. Low or No Emission Grant Program – 5339(c). 2024.
100 U.S. Department of Transportation. 2022 NTD Annual Data - Vehicles (Type Count by Agency). Retrieved February 23, 2024.
101 WSBTV.com News Staff, MARTA adding nearly 200 electric and natural-gas powered buses. *WSB-TV*.com. July 27, 2023.

Measure 1.2: Electric Vehicle Charging Infrastructure

This measure focuses on the strategic expansion of electric vehicle (EV) charging infrastructure for light-duty vehicles across Georgia, aiming to increase the availability and accessibility of EV charging stations and thereby supporting the adoption of electric vehicles by reducing range anxiety and enhancing convenience for EV owners.

The modeling looks specifically at the deployment of public level 2 charging ports and public direct current fast chargers (DCFC) across Georgia. The EPS policy "New EV Chargers This Year" is used to quantify the impacts of measure implementation.

The expansion of EV charging infrastructure was modeled under two scenarios: (1) a business-as-usual (BAU) scenario, extending the current state, and (2) policy scenario. Each scenario is defined in detail below. Compared to the BAU scenario, the policy scenario increases the expansion of public level 2 charging stations by 177% and public DCFCs by 66%.

Current state

In 2022, 9,542,400 light-duty vehicles were registered in the State of Georgia, of which 50,0490 (0.526%) were EVs.[102] In 2023, there were 4,977 level 2 charging ports and 1,084 DCFC ports in Georgia.[103]

Business-as-usual scenario

The business-as-usual scenario assumes a modest growth rate from the current state, reflecting national average increases in EV adoption and corresponding infrastructure needs based on data from the U.S. DOE Alternative Fuels Data Center.[104] This data contains projections for level 1, level 2, and DCFC stations. However, the scope of this analysis was limited to level 2 and DCFC stations, as level 1 stations are typically privately owned. Given the above assumptions, the business-as-usual trend for level 2 and direct current fast charging stations is shown in Table 19, below.

Table 19: BAU Scenario Projection for EV Charging in Georgia

Year	Public level 2 charging ports	Public DCFC ports
2022	4,977	1,084
2025	6,232	1,146
2030	8,323	1,248
2040	13,247	1,987
2050	18,171	2,726

[102] U.S. Department of Energy, Alternative Fuels Data Center: Vehicle Registration Counts by State. Retrieved February 23, 2024 and Georgia Department of Revenue 2022 Vehicle Registration Database

[103] U.S. Department of Energy, Alternative Fuels Data Center: Vehicle Registration Counts by State. Retrieved February 23, 2024.

[104] U.S. Department of Energy, Alternative Fuels Data Center. Retrieved February 23, 2024.

Policy scenario

The policy scenario assumes increased EV uptake and thereby increased need for charging stations.

Projections for the increase in light-duty vehicles in Georgia are based on the "high uptake of Inflation Reduction Act" scenario defined by the Energy Information Administration's (EIA's) 2023 Annual Energy Outlook Table 39, as shown in Table 20 below.[105] This scenario projects sales of both EVs and non-EVs.

Table 20: Policy Scenario Projection for Increase in Light-Duty Vehicles in Georgia

	2022	2025	2030	2040	2050
National light-duty vehicles	261,612,793	264,455,627	269,727,356	277,696,228	294,364,471
% increase from 2022	N/A	1.09%	3.10%	6.15%	12.52%
Georgia light-duty vehicles	9,542,400	9,646,093	9,838,381	10,129,048	10,737,027

The "high uptake of Inflation Reduction Act" scenario was also used to project the proportion of light-duty vehicles that are also electric, per Table 21 below.

Table 21: Policy Scenario Projection for % of Light-Duty Vehicles That Are Electric

	2022	2025	2030	2040	2050
National % of light-duty vehicles that are EV	0.777%	1.703%	4.306%	9.771%	12.262%

The U.S. DOE Electric Vehicle Infrastructure Projection Tool (EVI-Pro) Lite was used to calculate how many chargers would be required to support this uptake in EVs.[106] For each year, the following was assumed for default mix of plug-in electric vehicles: 40% sedans, 35% crossover or SUV, 21% pickup trucks, and 4% vans. It was assumed that 75% of drivers had access to at home charging, assuming the low-end of an estimate.[107]

Additionally, for the policy scenario base year, 2022, light-duty EV registration in Georgia is 50,049, however, the projection tool requires that the number of vehicles required for a result is 1% of the total vehicles. To satisfy this requirement, the base year projection value used was 88,600.

[105] U.S. Energy Information Administration. Annual Energy Outlook 2023, Table 39. March 16, 2023.
[106] U.S. Department of Energy, Electric Vehicle Infrastructure Projection Tool (EVI-Pro) Lite. Retrieved February 23, 2024.
[107] Hagenmaier, M. et al., What Electric Vehicle Owners Really Want from Charging Networks.. *Boston Consulting Group*. January 17, 2023.

Table 22: Policy Scenario Projection for Level 2 and DCFC Charging Stations in Georgia

Year	Total GA light-duty vehicles	% EVs	# GA light-duty EVs	Public level 2 ports	Public DCFC ports
2022	9,542,400	0.52%	88,600	4,977	1,084
2025	9,646,093	1.703%	164,273	8,752	1,286
2030	9,838,381	4.306%	423,641	18,785	2,520
2040	10,129,048	9.771%	989,709	40,334	4,126
2050	10,737,027	12.262%	1,316,574	50,404	4,530

Measure 1.3: Bikes and Bike Infrastructure

This measure focuses on consumers shifting modes of transportation from light-duty vehicles to e-bikes, especially for trips under five miles. Consumer mode shifting may represent an unmet source of demand, with a recent study finding that its participants generally preferred to walk distances up to one mile and use e-bikes for distances between one and four miles.[108]

The EPS scenario "Mode Shifting" was used to model the impacts of this measure. The policy represents a set of measures aimed at reducing demand for consumer passenger or freight transportation in the selected vehicle type. In this case, consumer passenger cars and SUVs were selected.

Consumer mode shifting was modeled under two scenarios: (1) a BAU scenario, extending the current state and (2) a policy scenario. Compared to the business-as-usual scenario, the policy scenario saw 2.2% of vehicle miles traveled by light-duty vehicles replaced with e-bikes.

Current state

In 2022, 0.22% of all Georgians biked to work.[109]

There are currently no state-wide programs to support bike adoption, however legislation has been recently passed by the Atlanta City Council to launch an e-bike rebate program.[110]

Business-as-usual scenario

The BAU was defined based on equivalent modeling done by the Atlanta Regional Commission (ARC) for the Atlanta-Sandy Springs-Alpharetta metropolitan statistical area (Atlanta MSA), expanded for the purposes of CPRG planning. ARC's modeling evaluates the e-bike rebate program in the Atlanta MSA. This PSVERP evaluates the same program and includes an additional five cities outside of the Atlanta MSA: Athens, Augusta, Columbus, Macon, and Savannah.

ARC defined the BAU in the absence of the e-bike program using the Rocky Mountain Institute's (RMI's) E-Bike Environment and Economics Impact Assessment Calculator, which includes population projections as well as e-bike uptake projections for the 10 years from 2025-2034.[111]

[108] Headland, N. Small But Mighty: Electric Bicycles Can Bridge Gap in Access to Transportation. *National Renewable Energy Laboratory.* July 3, 2023.
[109] The League of American Bicyclists, Bicycle Friendly State Report Card, Georgia. 2022.
[110] Serna, R., E-bike affordability takes a step forward) Propel ATL. Retrieved February 23, 2024.
[111] Grunwald, B., House, H., Korn, J., and Kennedy, E., E-Bike Environment and Economics Impact Assessment Calculator Rocky Mountain Institute. 2023.

Because of uncertainty on both population growth and e-bike uptake after that time, the year 2034 was used as a proxy for each year from 2035-2050.

This PSVERP adopted the same assumptions used by ARC and modeled the addition of the five additional Georgia cities listed above to account for program adoption outside of the Atlanta MSA. Table 23 below shows the projected total vehicle miles traveled for light duty vehicles within those cities without an e-bike program.

Table 23: BAU Scenario Projection for Vehicle Miles Traveled in Georgia

Year	E-bike miles traveled	Vehicle miles traveled
2025	0	5,544,736,175
2030	0	6,136,709,998
2040	0	6,695,888,685
2050	0	6,695,888,685

Policy scenario

For the policy scenario, the impact of an e-bike program in the Atlanta MSA, Athens, Augusta, Columbus, Macon, and Savannah was calculated using the RMI E-Bike Environment and Economics Impact Assessment Calculator, which estimates the reduction in vehicle miles traveled attributable to e-bike programs. The results of this analysis are presented in Table 24 below.

Table 24: Policy Scenario Projection for Vehicle Miles Traveled in Georgia

Year	E-bike miles traveled	Vehicle miles traveled
2025	35,074,339	5,509,661,836
2030	144,588,820	5,992,121,178
2040	144,588,820	6,551,299,865
2050	144,588,820	6,551,299,865

Measure 1.4 Zero-Emission Fleet Deployment

This measure transitions public municipal, county, and state fleets to zero-emission vehicles (ZEVs), defined as any vehicle that, when operating, produces zero tailpipe exhaust emissions of certain pollutants or greenhouse gases, such as an electric vehicle.[112] For this measure, ZEV fleets include light-duty vehicles, including trucks; buses are excluded as they are covered in Measure 1.1.

The EPS policy "Electric Vehicle Sales Standard" is used to quantify the impact of this measure. The EPS policy specifies that a percentage of newly sold vehicles of selected types are electric vehicles (EV), assuming that most light-duty vehicles and trucks will be EV rather than another technology (e.g., hydrogen fuel cell electric vehicles, which are included under Measure 5.1).

[112] U.S. Government Accountability Office, Federal Fleets: Zero-Emission Vehicle Implementation. July 19, 2023.

The growth of EV adoption in public fleets was modeled under two scenarios: (1) a business-as-usual scenario, extending the current state, and (2) a policy scenario.

Current state
In 2022, state, county, and municipal entities in Georgia owned 49,034 automobiles (i.e., light-duty vehicles) and 78,672 trucks and truck tractors.[113]

Growth projections for vehicles in public fleets were not included as trends by vehicles type were inverse (automobiles have decreased while trucks and truck tractors have increased) and there are not clear projections for the composition of public sector fleets in 2050.

Business-as-usual scenario
Projections for the increase in light-duty vehicles in Georgia are based on the "no uptake of Inflation Reduction Act" scenario defined by the Energy Information Administration's (EIA's) 2023 Annual Energy Outlook, as shown in Table 25 below.[114]

Table 25: BAU Scenario Projection for % Light-Duty Vehicles and Trucks That Are Electric

	2022	2025	2030	2040	2050
National % of light-duty vehicles that are EV	1.5%	3.0%	6.5%	16.4%	23.0%
National % of light-duty trucks that are EV	0.1%	0.4%	1.5%	4.2%	6.3%

The BAU scenario applies the above growth projections for total EVs to the existing government fleet stock in Georgia to project fleet electrification through 2050.

Table 26: BAU Projection for EVs in Government Fleets in Georgia

Item	2022	2025	2030	2040	2050
Total automobiles in government fleets	49,034	49,034	49,034	49,034	49,034
Total trucks and truck tractors in government fleets	78,672	78,672	78,672	78,672	78,672
% LDV EVs	1.5%	3.0%	6.5%	16.4%	23.0%
% LDT EVs	0.1%	0.4%	1.5%	4.2%	6.3%
EV automobiles in government fleets	736	1,471	3,187	8,042	11,278
EV trucks and truck tractors in government fleets	79	315	1,180	3,304	4,956

Policy scenario
To model the impacts of a technologically feasible policy target, the policy scenario testing the assumption of 50 percent zero-emission vehicle (ZEV) acquisitions by 2035, including 50 percent zero-emission light-duty vehicle acquisitions by 2027.[115] The proportion of ZEVs are assumed to increase linearly from the current year until the target years, as shown below in Table 27.

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[113] U.S. Department of Transportation, Federal Highway Administration, Highway Statistics Series, Highway Statistics 2022, Table MV-7, November 2023.
[114] U.S. Energy Information Administration. Annual Energy Outlook 2023, Table 39. March 16, 2023.
[115] Presidential Documents, Executive Order 14057 of December 8, 2021. *Federal Register Vol. 86, No. 236.* December 13, 2021.

Table 27: Policy Scenario Projection for EVs in Government Fleets in Georgia

Item	2022	2025	2030	2040	2050
Total automobiles in government fleets	49,034	49,034	49,034	49,034	49,034
Total trucks and truck tractors in government fleets	78,672	78,672	78,672	78,672	78,672
% LDV EV	1.5%	3.0%	50.00%	50.00%	50.00%
% LDT EV	0.1%	0.4%	27.25%	50.00%	50.00%
EV automobiles in government fleets	736	1,471	24,517	24,517	24,517
EV trucks and truck tractors in government fleets	79	315	21,438	39,336	39,336

1.5 Manufacturing of Raw Materials and Intermediate and Finished Products to Support EV Uptake

This measure aims to increase the manufacturing of electric vehicle batteries including raw materials and intermediate and finished products in Georgia to meet increased demand for electric vehicles and charging across the state.

The EPS policy "Electric Vehicle Sales Standard" requires a specified percentage of newly sold vehicles to consist of battery electric vehicles. This policy was selected assuming that new batteries developed within the state would support EV uptake.

The manufacturing of raw materials and intermediate and finished products to support EV uptake was modeled under two scenarios: (1) a business-as-usual scenario, extending the current state, and (2) a policy scenario. Compared to the business-as-usual scenario, the policy scenario increases the number of EVs in Georgia by upwards of 5.5 million in 2050. For the purpose of this model, the increase in the number of EV batteries produced in Georgia is assumed to correspond 1:1 with the increase in EVs on the road in the state.

Current state

Currently Georgia has the capacity to manufacture between 22-50 gigawatt hour (GWh) of electric vehicle batteries[116,117] and there are plans announced that would expand this capacity to 136 GWh by 2030.[118]

Business-as-usual scenario

In a BAU scenario, it is assumed that Georgia will meet currently planned manufacturing capacity projections out to 2032 based on announced capacities within the state,[119] but would not expand beyond this capacity. Thus, the number of EV batteries manufactured stays constant in 2032 and beyond in the BAU scenario.

[116] Johnson, P., Hyundai and SK On finalize $5B US battery factory. *Electrek*. April 25, 2023.
[117] Governor Brian P. Kemp, Office of the Governor, SK Battery America Exceeds Hiring Goal, On Track to Reach 3,000 Workers. January 30, 2023.
[118] Clifford, C., These states will dominate EV battery manufacturing in 2030. *CNBC*. January 5, 2023.
[119] Environmental Defense Fund, U.S Electric Vehicle Battery Manufacturing on Track to Meet Demand. December 2023.

Table 28. BAU scenario for EV Batteries Manufactured in Georgia

Year	Current state	2025	2030	2040	2050
Number of EV batteries manufactured	310,000	704,545	2,554,227	3,192,091	3,192,091

Policy scenario
In the policy scenario, it is assumed that Georgia will meet currently planned manufacturing capacities and build additional manufacturing capacity to align with U.S. EV battery manufacturing capacity projections[120] and global demand for EV battery projections starting in 2029 out to 2050.[121]

Table 29. Policy Scenario for EV Batteries Manufactured in Georgia

Year	Current state	2025	2030	2040	2050
Number of EV batteries manufactured	310,000	704,545	2,735,664	7,903,394	8,732,514
Global demand for electric vehicle batteries (GWh)	110	650	1,910	5,910	6,530

Strategy 2: Improve Energy Efficiency and Promote Electrification

Strategy 2.1: Weatherization for Residential Buildings
This option was modeled using the U.S. EPA Global Change Analysis Model Long-term Interactive Multi-Pollutant Scenario Evaluator (GLIMPSE).

Emissions reduction potential was calculated using GLIMPSE data for this residential weatherization measure. This approach was based on the existing GLIMPSE baseline projections and widely available ENERGY STAR data.

Business-as-usual scenario
Projected emissions were pulled from the GLIMPSE tool; GLIMPSE outputs only provide data for every five years, so emissions from 2025-2030 and 2025-2050 were determined using linear interpolation. This data was then summed and converted to million metric tons of carbon dioxide equivalent (MMTCO$_2$e).

Policy scenario
GLIMPSE does not specifically separate weatherization of building envelopes from other more general residential energy efficiency improvements. As such, baseline GLIMPSE data was multiplied by estimated annual utility savings from the ENERGY STAR website.[122] This data is

120 Environmental Defense Fund, U.S Electric Vehicle Battery Manufacturing on Track to Meet Demand. December 2023.
121 Statista, Forecasted demand for electric vehicle batteries worldwide from 2020 to 2050. October 24, 2023.
122 Energy Star, Methodology for Estimated Energy Savings from Cost-Effective Air Sealing and Insulating. Retrieved February 23, 2024.

specially targeted for the continental U.S. Climate Zone 3, of which Georgia is a part, and reflective of savings from increased energy use, which are directly correlated with emissions.

Table 30. BAU Projection for Estimated Savings from Residential Weatherization in Georgia

Estimated Savings from Home Sealing and Insulation	
Climate Zone	Estimated Annual Utility Bill Savings (%)
Climate Zone 3 (South), Total House	8%

Using the BAU scenario determined above, total emissions reductions potential from this measure were determined as shown below.

Table 31. Policy Scenario Projection for Residential Weatherization in Georgia

Total Residential Buildings Projected Emissions & Emission Reductions		
	2025-2030	2025-2050
Projected Emissions (MT CO_2e)	31,350,000	110,436,335
Projected Emissions ($MMTCO_2e$)	31.350	110.436
Projected Emissions Reductions (%)	-8%	-8%
Projected Emissions Reductions ($MMTCO_2e$)	-2.508	-8.835

Measure 2.2: Home Energy Rebates for the Purchase of Electric and Energy Efficient Products

<u>GHG Methodology</u>

This measure was evaluated with GLIMPSE with the "Tech-HighEffTechs-bldgs" scenario. This scenario is defined as: High efficiency technology adoption in buildings by no longer purchasing non-high efficiency technology options in residences starting in 2025. An adjustment was made to this scenario by (1) excluding commercial buildings high efficiency upgrades, and (2) applying it to only Georgia. Specifically, this evaluation assumes that the standard efficiency (not high efficiency) technologies included in the table below, are no longer purchased.

Table 32. No-longer Purchased Standard Efficiency Technologies Under GLIMPSE Policy Scenario

Sector	Subsector	Technology
Residential clothes dryers	Electricity	Clothes dryer
Residential clothes washers	Electricity	Clothes washers
Residential cooking	Gas	Gas
Residential cooking	Refined liquids	Refined liquids
Residential cooling	Electricity	Air conditioning
Residential cooling	Electricity	Electricity
Residential dishwashers	Electricity	Dishwashers
Residential freezers	Electricity	Freezer
Residential heating	Coal	Coal
Residential heating	Coal	Coal furnace
Residential heating	Electricity	Electric furnace
Residential heating	Electricity	Electricity
Residential heating	Gas	Gas
Residential heating	Gas	Gas furnace
Residential heating	Refined liquids	Fuel furnace
Residential heating	Refined liquids	Refined liquids
Residential hot water	Electricity	Electric resistance water heater
Residential hot water	Gas	Gas water heater
Residential hot water	Refined liquids	Fuel water heater
Residential lighting	Electricity	Incandescent
Residential others	Refined liquids	Refined liquids
Residential others	Refined liquids	Refined liquids
Residential refrigerators	Electricity	Refrigerator

Co-Pollutant Methodology

GLIMPSE output in electricity consumption savings was converted to mass emissions rates using EPA eGRID factors for sulfur dioxide (SO_2) in pounds per megawatt hour (0.594 lb/MWh) and nitrogen oxides (NO_x) in pounds per megawatt hour (0.403 lb/MWh).

Results

The table below provides the total CO_2e emissions that would be preserved for 2025 to 2030 and 2025 to 2050.

Table 33. Policy Scenario Projection of CO_2e Reduction Measure Results from Home Energy Rebates in $MMTCO_2e$

	2025 to 2030 ($MMTCO_2e$)	2025 to 2050 ($MMTCO_2e$)
Avoided Emissions	2.017	21.520

The table below provides the total co-pollutant emissions that would be preserved for 2025 to 2030 and 2025 to 2050.

Table 34. Policy Scenario Projection Co-Pollutant Reduction Measure Results from Home Energy Rebates in Tons

	2025 to 2030 (Tons)	2025 to 2050 (Tons)
Sulfur Dioxide (SO_2)	-37	-354
Nitrogen Oxides (NO_x)	-1,379	-15,351
Respirable Particulate Matter ($PM_{2.5}$)	-50	-671
Volatile Organic Compounds (VOC)	-92	-1,213

Measure 2.3: Incentive Programs for Implementation of End-Use Energy Efficiency Measures in Commercial Buildings

GHG Methodology

This measure was evaluated GLIMPSE and results were produced using the preexisting GLIMPSE component of "Tech-HighEffTechs-bldgs." This scenario is defined as: High efficiency technology adoption in buildings by no longer purchasing non-high efficiency technology options starting in 2025. Adjustments were made to the scenario by (1) excluding residential buildings high efficiency upgrades, and (2) applying it to only Georgia.

Specifically, this preexisting GLIMPSE component assumes that the following standard efficiency (not high efficiency) technologies included in the table below, as defined in GLIMPSE, are no longer purchased.

Table 35. No-Longer Purchased Standard Efficiency Technologies Under GLIMPSE Policy Scenario

Sector	Subsector	Technology
Commercial cooking	Electricity	Electric range
Commercial cooking	Gas	Gas range
Commercial cooling	Electricity	Air conditioning
Commercial cooling	Electricity	Electricity
Commercial heating	Coal	Coal
Commercial heating	Coal	Coal furnace
Commercial heating	Electricity	Electric furnace
Commercial heating	Electricity	Electricity
Commercial heating	Gas	Gas
Commercial heating	Gas	Gas furnace
Commercial heating	Refined liquids	Fuel furnace
Commercial heating	Refined liquids	Refined liquids
Commercial hot water	Electricity	Electric resistance water heater
Commercial hot water	Gas	Gas water heater
Commercial lighting	Electricity	Incandescent
Commercial other	Refined liquids	Refined liquids
Commercial other	Coal	Coal
Commercial other	Refined liquids	Refined liquids
Commercial refrigeration	Electricity	Refrigeration
Commercial ventilation	Electricity	Ventilation

Co-Pollutant Methodology

GLIMPSE output in electricity consumption savings was converted to mass emissions rates using EPA eGRID factors for SO_2 (0.594 lb/MWh) and NO_x (0.403 lb/MWh).

Results

The table below provides the total CO_2e emissions that would be reduced for 2025 to 2030 and 2025 to 2050.

Table 36. Policy Scenario Projection for CO_2e Reduction Measure Results from Commercial Energy Efficiency in $MMTCO_2e$

	2025 to 2030 ($MMTCO_2e$)	2025 to 2050 ($MMTCO_2e$)
Avoided Emissions	-3.568	-28.417

The table below provides the total co-pollutant emissions that would be preserved for 2025 to 2030 and 2025 to 2050.

Table 37. Policy Scenario Projection for Co-Pollutant Reduction Measure Results from Commercial Energy Efficiency in Tons

	2025 to 2030 (Tons)	2025 to 2050 (Tons)
Sulfur Dioxide (SO_2)	-162	-1,340
Nitrogen Oxides (NO_x)	-<0.5	-<0.5
Respirable Particulate Matter ($PM_{2.5}$)	-13	-152
Volatile Organic Compounds (VOC)	-<0.5	-<0.5

Measure 2.4: Incentive Programs for the Purchase of Certified Energy-Efficient Lighting in Commercial and Industrial Buildings, Including Streetlights

GHG Methodology
This measure was evaluated using GLIMPSE with default settings. The results associated with this measure were produced using a scenario in which there are no purchases of (1) commercial fluorescent lighting and (2) commercial incandescent lighting starting in 2030.

Co-Pollutant Methodology
GLIMPSE output in electricity consumption savings was converted to mass emissions rates using EPA eGRID factors for SO_2 (0.594 lb/MWh) and NO_x (0.403 lb/MWh).

Results
The table below provides the total CO_2e emissions that would be reduced for 2025 to 2030 and 2025 to 2050.

Table 38. Policy Scenario Projection for CO_2e Reduction Measure Results from Energy Efficient Lighting in $MMTCO_2e$

	2025 to 2030 ($MMTCO_2e$)	2025 to 2050 ($MMTCO_2e$)
Avoided Emissions	-0.2	-1.4

The table below provides the total co-pollutant emissions that would be reduced for 2025 to 2030 and 2025 to 2050.

Table 39. Policy Scenario Projection for Co-Pollutant Reduction Measure Results from Energy Efficient Lighting in Tons

	2025 to 2030 (Tons)	2025 to 2050 (Tons)
Sulfur Dioxide (SO_2)	-6	-49
Nitrogen Oxides (NO_x)	-24	-207
Respirable Particulate Matter ($PM_{2.5}$)	-2	-20
Volatile Organic Compounds (VOC)	-<0.5	-13

Strategy 3: Increase Availability and Use of Renewable Energy

Measure 3.1: Transmission and Distribution Upgrades
Measure 3.1 was modeled using the EPA Global Change Analysis Model Long-term Interactive Multi-Pollutant Scenario Evaluator (GLIMPSE).

GHG Methodology
A calculation utilizing the Georgia 2020 baseline data included in the EPA State Inventory Tool (SIT)[123] Electricity Consumption module version 2024.1 was completed to estimate the potential emission reductions that can be gained by increasing transmission line efficiencies.
The following assumptions were made to complete the calculation:

- Transmission improvements apply to all sectors (residential, commercial, transportation, industrial).
- The 2020 SIT default electricity emission factor of 0.72 pounds of carbon dioxide equivalent to kilowatt-hour ($lbCO_2e/kWh$) is constant for 2025 to 2050.
- The 2020 SIT default electricity consumption is constant for 2025 to 2050.
- The business-as-usual case includes utilizing the 2020 SIT default transmission loss factor of 5.3% as a constant for 2025 to 2050.

The measure models the transmission lines improving within a range of 0.5% to 4.0% compared to the business-as-usual transmission loss factor (5.30%). The transmission loss factor with the improvement is calculated using the equation below. The following table displays the improvement percentage (%) and corresponding transmission loss factor with improvements.

$$Transmission\ Loss\ Factor\ with\ Improvements\ (\%) = 5.30\% \times (1 - \%\ \text{improvement})$$

Table 40. Transmission Loss Factor with Improvements

% improvements	Transmission loss factor (w/ improvements)
0.0%	5.300%
0.5%	5.274%
1.0%	5.247%
1.5%	5.221%
2.0%	5.194%
2.5%	5.168%
3.0%	5.141%
3.5%	5.115%
4.0%	5.088%

The business-as-usual emissions were calculated utilizing the SIT electricity consumption module default 2020 transmission loss factor of 5.30% in the SIT module.

[123] U.S. Environmental Protection Agency, State Inventory and Projection Tool. February 5, 2024.

The alternative transmission loss emissions were calculated for each percentage improvement listed in the table above. The transmission loss factor with improvements was entered into the "EF Selection" tab for 2020. Total electricity consumption emissions were pulled from the summary sheet for 2020.

The avoided emissions were calculated by subtracting the alternative transmission loss emissions from the business-as-usual emissions. Emissions for 2025 to 2030 and 2025 to 2050 were calculated by multiplying the annual avoided emissions by 5 years and 25 years, respectively. The table below shows the avoided emission for each improvement.

Table 41. Policy Projection for Avoided Emissions by Percentage Improvement of Transmission and Distribution (MMTCO$_2$e)

Business-as-Usual		Alternative Transmission Loss		Avoided Emissions		
Transmission Loss Factor %	Electricity Consumption Emissions (MMTCO$_2$e)	% Improvement	Electricity Consumption Emissions (MMTCO$_2$e)	Annual Avoided Emissions (MMTCO$_2$e)	2025 - 2030 (MMTCO$_2$e)	2025 - 2050 (MMTCO$_2$e)
5.30%	46.288	0.5%	46.275	0.013	0.065	0.324
		1.0%	46.262	0.026	0.129	0.647
		1.5%	46.249	0.039	0.194	0.971
		2.0%	46.237	0.052	0.259	1.294
		2.5%	46.224	0.065	0.323	1.617
		3.0%	46.211	0.078	0.388	1.940
		3.5%	46.198	0.090	0.452	2.262
		4.0%	46.185	0.103	0.517	2.585

Co-Pollutant Methodology

To model the co-pollutants, the EPA eGRID Power Profiler for SRSO (SERC South)[124] emission factors for SO_2 (0.212 lb/MWh) and NO_x (0.385 lb/MWh) were utilized. Additionally, the 2020 SIT default electricity emission factor of 0.72 lbCO_2e/kWh was utilized to convert the CO_2e reductions for 2025 to 2050 and 2025 to 2050 into electricity reductions in terms of megawatt hour(mWh). The electricity reductions were multiplied by the emission factors to calculate the co-pollutant emission reductions.

Results

The following table details the range of avoided CO_2e emissions in both the near term and long term:

Table 42. Policy Projection for Avoided GHG Emissions in Near Term and Long Term (MMTCO$_2$e)

	2025 to 2030 (MMTCO$_2$e)	2025 to 2050 (MMTCO$_2$e)
Avoided Emissions	0.065 to 0.517	0.324 to 2.585

The following table details the ranges of avoided co-pollutants in both the near term and long term in metric tons (MT):

Table 43. Policy Projection for Avoided Co-Pollutant Emissions in Near Term and Long Term (MT)

	2025 to 2030 (MT)	2025 to 2050 (MT)
Sulfur Dioxide (SO_2)	-18.97 to -151.48	-94.86 to -757.38
Nitrogen Oxides (NO_x)	-34.45 to -275.09	-173.27 to -1,375.44

[124] eGRID, Power Profiler. *U.S. Environmental Protection Agency*. February 13, 2024.

Full implementation of this measure would be a 4% improvement of the transmission loss factor, which would reduce an average of 0.103 million metric tons (MMT) of CO_2e each year.

Measure 3.2: Increasing Renewable Energy

The EPS scenario "Distributed solar carve-out" is used to form an assumption and quantify the increase in electricity generation from increased renewable energy resources resulting from the measure. The model requires the specified percentage of total retail electricity demand to be generated by distributed solar systems. To enable the modeling of the "increasing renewable energy" measure, the key variable that will be the focus of the analysis will be the difference in electricity generated by increasing renewable energy resources between a business-as-usual scenario and a policy scenario. The scope of the modeling approach of this measure will only focus on electricity generation by solar photovoltaics (PVs); however, it is important to note that increased renewable energy can also include combined heat and power systems at commercial and industrial facilities. Three types of solar PV generation will be analyzed when calculating total electricity generation from increased renewable energy resources: 1) rooftop solar on government buildings, 2) community solar projects, and 3) renewable energy generation for industrial facilities.

Current state

1. In Georgia, solar photovoltaics generated a total of 7,332,000 MWh of electricity in 2022, with small-scale solar photovoltaics in the industrial, commercial, and residential sectors (PV solar systems less than 1 megawatt (MW) in size) producing a total of 385,000 MWh, representing 5% of total generation.[145] As of December 2022, Georgia contained 242 megawatts (MW) of installed small-scale solar PVs. It will be assumed the 242 MW of small-scale solar PV capacity will act as a proxy to represent the current state of the generating capacity of rooftop solar projects on government buildings in Georgia in both the business-as-usual scenario and the policy scenario. This assumption will be made due to a lack of data available characterizing the total capacity of rooftop solar projects on government buildings today.

2. According to the National Renewable Energy Laboratory (NREL's) Sharing the Sun Community Solar Project, Georgia contains 22 community solar projects with a total generating capacity of 136 MW[146]. These projects range between under 1 MW of generating capacity to over 50 MW, with the majority of projects being under 5 MW. The 136 MW of community solar generating capacity will serve as the current state of community solar PV capacity for both the business-as-usual scenario and the policy scenario.

3. To apply a growth rate to model future projections, it will be assumed the current state of generating capacity of utility scale solar PV projects in the industrial sector in Georgia is 5 MW. It is important to note estimated small-scale generation in the industrial sector is not being ignored as it was included in the current state of small-scale solar PV capacity above which was used to represent the current state of rooftop solar projects on government buildings in Georgia.

Details of how the BAU and policy scenarios were estimated are below:

Business-as-usual scenario

1. For this analysis, it is assumed the amount of small-scale solar PV generating capacity in Georgia in the BAU scenario will grow at the same rate as the generating capacity of solar PVs in end-use sectors[125] in the U.S. projected by the Annual Energy Outlook (AEO) 2023's Reference case[126]. The AEO 2023 reference case scenario projects the generating capacity of solar PVs in end-use sectors grows at an average annual rate of 7.4% from 2025 to 2030, 6.1% from 2030 to 2035, 5.2% from 2035 to 2040, 4.5% from 2040 to 2045 and 4.1% from 2045 to 2050. Table 61 below shows these average annual rates of growth applied to Georgia's small-scale PV generating capacity to project electricity generation in the BAU scenario from 2022 to 2050 in the table shown below.

2. In addition, it is assumed the amount of community solar PV generating capacity in Georgia in the BAU scenario will grow at the same rate as the generating capacity of solar PVs in the electric power sector[127] in the U.S. projected by the Annual Energy Outlook (AEO) 2023's Reference case. The AEO 2023 reference case scenario projects the generating capacity of solar PVs in the electric power sector grows at an average annual rate of 17.1% from 2025 to 2030, 5.7% from 2030 to 2035, 3.7% from 2035 to 2040, 3.4% from 2040 to 2045 and 3.1% from 2045 to 2050. Table 61 below shows these average annual rates of growth are applied to Georgia's community solar PV generating capacity to project electricity generation in the BAU scenario from 2022 to 2050 in the table shown below.

3. It is assumed the amount of utility-scale PV generating capacity in the industrial sector in Georgia in the BAU scenario will grow at the same rate as the generating capacity of solar PVs in the electric power sector in the US projected by the Annual Energy Outlook (AEO) 2023's Reference case. As described above, the AEO 2023 reference case scenario projects the generating capacity of solar PVs in the electric power sector grows at an average annual rate of 17.1% from 2025 to 2030, 5.7% from 2030 to 2035, 3.7% from 2035 to 2040, 3.4% from 2040 to 2045 and 3.1% from 2045 to 2050. Table 63 below shows these average annual rates of growth are applied to Georgia's industrial sector's utility-scale PV generating capacity to project electricity generation in the BAU scenario from 2022 to 2050 in the table shown below.

[125] The EIA defines end-use sectors as including combined-heat-and-power plants and electricity-only plants in the commercial and industrial sectors that have a non-regulatory status. It also includes small on-site generating systems in the residential, commercial, and industrial sectors used primarily for own-use generation, but which may also sell some power to the grid.

[126] U.S. Energy Information Administration, Annual Energy Outlook 2023, Narrative. March 16, 2023. The reference case represents EIAs best guess under nominal conditions, which presumes no new policy or laws over the modeled time horizon.

[127] U.S. Energy Information Administration, Annual Energy Outlook. Table 16. Renewable Energy Generating Capacity and Generation. Retrieved February 23, 2024

Table 44. BAU Projection for Electricity Generation Capacity

Item	2022	2025	2030	2035	2040	2045	2050
End-use sector solar PV generating capacity each year (GW)	48.59	67.56	92.51	120.79	151.89	185.80	224.26
Small-scale PV generating capacity in Georgia each year (GW)	0.24	0.34	0.46	0.60	0.76	0.93	1.12
Electric power sector PV solar generating capacity each year (GW)	74.98	182.28	338.26	434.82	515.31	602.75	694.69
Community solar PV generating capacity in Georgia each year (GW)	0.14	0.33	0.61	0.79	0.93	1.09	1.26
Utility-scale PV generating capacity in the industrial sector in Georgia (GW)	0.01	0.01	0.02	0.03	0.03	0.04	0.05
Total solar PV generating capacity each year (GW)	0.38	0.68	1.10	1.42	1.72	2.06	2.42

Policy scenario

In the policy scenario, the assumption is made that both small scale PV capacity and community solar capacity in Georgia grow at a faster rate than they would without CPRG funds, which in this case would be the implementation of a measure to incentivize small scale PV generation and community solar PV generation. The generating capacity of solar PVs in end-use sectors in the AEO 2023 Low Zero- Carbon Technology Cost case from 2025 to 2050 was used as a reference point for the policy scenario and is shown in the table below.

1. It is assumed the amount of generating capacity in Georgia of small-scale solar PVs in the policy scenario will grow at the same rate as the amount of generating capacity of solar PVs by end-use sectors in the U.S. projected by the AEO 2023 Low Zero- Carbon Technology Cost case.[128] The AEO 2023 Low Zero- Carbon Technology Cost case projects the amount of generating capacity of solar PVs by end-use sectors grows at an average annual rate of 7.6% from 2025 to 2030, 5.9% from 2030 to 2035, 6.0% from 2035 to 2040, 6.8% from 2040 to 2045 and 5.9% from 2045 to 2050. These average annual rates of growth are applied to Georgia's small-scale PV generating capacity to project generating capacity in the policy scenario from 2022 to 2050 in the table shown below.

2. In addition, the assumption that the amount of generating capacity of community solar PV in Georgia in the policy scenario will grow at the same rate as the amount of generating capacity of solar PVs in the electric power sector in the U.S. projected by the AEO 2023 Low Zero- Carbon Technology Cost case was applied. The AEO 2023 Low Zero- Carbon Technology Cost case projects the amount of generating capacity of solar PVs in the electric power sector grows at an average annual rate of 21.8% from 2025 to 2030, 8.6% from 2030 to 2035, 4.2% from 2035 to 2040, 4.7% from 2040 to 2045 and 4.2% from 2045 to 2050. These average annual rates of growth are applied to Georgia's community solar PV generating capacity to project generating capacity in the policy scenario from 2022 to 2050 in the table shown below.

3. The assumption that the amount of utility-scale PV generating capacity in the industrial sector in Georgia in the policy scenario will grow at the same rate as the generating capacity

[128] U.S. Energy Information Administration, Annual Energy Outlook. Retrieved February 23, 2024.The AEO 2023 Low Zero-Carbon Technology Cost case assumes technology costs of power generation technologies that produce zero emissions are lower than the Reference case. Specifically, it is assumed that overnight capital costs and fixed operating and maintenance costs decline more rapidly than in the Reference case.

of solar PVs in the electric power sector[152] in the U.S. projected by the Annual Energy Outlook (AEO) 2023's Reference case was applied. As described above, the AEO 2023 Low Zero- Carbon Technology Cost case projects the amount of generating capacity of solar PVs in the electric power sector grows at an average annual rate of 21.8% from 2025 to 2030, 8.6% from 2030 to 2035, 4.2% from 2035 to 2040, 4.7% from 2040 to 2045 and 4.2% from 2045 to 2050. These average annual rates of growth are applied to Georgia's industrial sector's utility-scale PV generating capacity to project electricity generation in the BAU scenario from 2022 to 2050 in table 63.

Table 45. Policy Projection for Annual Generating Capacities

Item	2022	2025	2030	2035	2040	2045	2050
End-use sector solar PV generating capacity each year (GW)	48.63	67.48	93.27	120.92	156.93	210.17	272.29
Small-scale PV generating capacity in Georgia each year (GW)	0.24	0.34	0.47	0.60	0.78	1.05	1.36
Electric power sector PV solar generating capacity each year (GW)	74.98	182.28	380.85	544.95	658.66	813.14	982.65
Community solar PV generating capacity in Georgia each year (GW)	0.14	0.33	0.69	0.99	1.19	1.47	1.78
Utility-scale PV generating capacity in the industrial sector in Georgia (GW)	0.01	0.01	0.03	0.04	0.04	0.05	0.07
Total solar PV generating capacity each year (GW)	0.38	0.68	1.18	1.63	2.02	2.57	3.20

Strategy 4: Improve Waste Diversion and Landfill Management

Measure 4.1: Landfill Gas Management and Utilization

This measure addresses emissions from landfill gas (LFG), a natural byproduct of the decomposition of organic material (e.g., food waste, paper waste) in landfills. Landfill gas is composed of approximately 50% methane, 50% CO_2e, and trace amounts of non-methane organic compounds.[129] Methane accounts for 12% of all anthropogenic GHG emissions in the U.S.[130] and landfills are the third-largest source of methane (14.3% from municipal solid waste ["MSW"] landfills and 2.6% from industrial landfills).[131] These projects can have both direct and avoided emissions impacts.

When LFG is created at landfills, it may be emitted to the atmosphere, flared, or utilized. Flaring mitigates the environmental damage of methane but does not capitalize on utilization opportunities. If utilized, LFG may be used to generate electricity on-site (68%), used directly in place of another fuel (16%), or refined into renewable natural gas (16%).[132]

The EPS policy "Methane Capture" is used to model the impacts of this measure with the "Water and Waste" sub-category selected.

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[129] U.S. Environmental Protection Agency, Basic Information about Landfill Gas. February 12, 2024.
[130] U.S. Environmental Protection Agency, Overview of Greenhouse Gases. February 16, 2024.
[131] U.S. Environmental Protection Agency, Frequent Questions about Landfill Gas. November 16, 2023.
[132] U.S. Environmental Protection Agency, Basic Information about Landfill Gas. February 12, 2024.

Landfill gas management and utilization was modeled under two scenarios: (1) BAU scenario and (2) policy scenario. The policy scenario saw nearly 1 million $MTCO_2e$ more methane reduced annually than under the BAU scenario.

Current state

The EPA's Landfill Methane Outreach Program (LMOP) tracks 68 landfills designated as candidate, future potential, low potential, operational, and planned. An additional 4 unknown and 20 shutdown landfills were excluded from this analysis.[133] The following is a key summary of the current state of landfills in Georgia tracked by LMOP:

Table 46. Current Condition of Landfills in Georgia

Status	#	Waste in place (tons)	LFG collection system in place	LFG collected (mmscf/year)[a]	Annual direct methane reduced ($MMTCO_2e$ / year)
Operational	18	193,129,733	18	13,781.31	3.701961
Planned	4	28,564,746	2	3,095.93	0.831635
Candidate	20	123,971,210	9	7,720.12	2.073792
Future Potential	4	2,275,557	0	0	0
Low Potential	22	28,619,626	12	2,580.04	0.693055
Total	68	376,560,872	41	27,177.39	7.300443

[a] mmscf/yr is million standard cubic feet per year

- Operational: Of Georgia's 18 operational LFG projects, 14 (78%) are electricity-generation projects, 3 (17%) are direct-use projects, and 1 (6%) is a renewable natural gas project. In total, they generate 47.95 MW of electricity, reduce 2.8725 $MTCO_2e$, and avoid 0.2705 $MTCO_2e$.
- Planned: All 4 of Georgia's planned LFG projects are renewable natural gas projects. They do not currently reduce or avoid emission as they are not online yet.
- Candidate: There are 20 MSW landfills designated as a "Candidate", indicating that the landfill is accepting waste or has been closed for five years or less, has at least one million tons of waste, and does not have an operational, under-construction, or planned project; designation can also be based on actual interest by the site.
- Future potential: There are 4 MSW landfills designated as "Future potential", indicating that the landfill is open but does not meet the technical criteria for Candidate status yet; or the landfill already has an Operational project but there is opportunity for additional energy recovery.
- Low potential: There are 22 MSW landfills designated as "Low potential", indicating that the landfill is closed and does not meet the technical criteria for Candidate status; or the landfill is not considered a Candidate due to site-specific information.

There are 27 landfills without any LFG collection systems, meaning LFG is released to the atmosphere without being flared or collected. The following breakdown describes those landfills:

[133] The LMOP data base tracks MSW landfills only; it does not claim to track every MSW landfill in the country.

Table 47. Current Condition of Landfills Without LFG Collection Systems in Georgia

Status	#	Waste in place (tons)
Planned	2	6,751,509
Candidate	11	22,568,174
Future Potential	4	2,275,557
Low Potential	10	4,722,302
Total	27	36,317,542

Additional assumptions include:

- Methane content of landfill gas: 50% and
- Additional default assumptions from the EPA's LFGcost-WebV3.6 tool[134]

Business-as-usual scenario

In the BAU scenario, it is assumed that all 4 planned LFG projects are constructed in 2025 as renewable natural gas (RNG) projects. As two of the planned projects already have an LFG collection system in place, the BAU reductions are impacted primarily by the collection and destruction of methane in the remaining two planned projects. It is assumed that none of the other MSW landfills develop LFG projects.

Table 48. BAU Projections for Emissions Reductions from Landfills by Condition

Status	Current LFG collected (mmscf/y)	Current direct methane reduced ($MMTCO_2e$ / year)	BAU add. direct methane reduced ($MMTCO_2e$ / year)	BAU annual direct methane reduced ($MMTCO_2e$ / year)
Operational	13,781.31	3.701961	0	3.701961
Planned	3,095.93	0.831635	0.301082	1.132717
Candidate	7,720.115	2.073792	0	2.073792
Future Potential	0	0	0	0
Low Potential	2,580.039	0.693055	0	0.693055
Total	27,177.389	7.300443	540.42	7.601525

Policy scenario

The Policy scenario makes the following assumptions:

- The 4 planned landfills come online in 2025 as in the BAU scenario,
- All 18 candidate landfills develop an LFG project,
- All 4 future potential landfills develop an LFG project, and
- None of the low potential landfills develop an LFG project.

[134] U.S. Environmental Protection Agency, LFGcost-Web – Landfill Gas Energy Cost Model. February 12, 2024.

Table 49. Policy Scenario Projection for Emissions Reductions from Landfills by Condition

Status	Current LFG collected (mmscf/y)	Current direct methane reduced ($MMTCO_2e$ / year)	Policy add. direct methane reduced ($MMTCO_2e$ / year)	Policy annual direct methane reduced ($MMTCO_2e$ / year)
Operational	13,781.31	3.701961	0	3.701961
Planned	3,095.93	0.831635	0.301082	1.132717
Candidate	7,720.12	2.073792	0.846926	2.920718
Future Potential	0	0	0.098537	0.098537
Low Potential	2,580.04	0.693055	0	0.693055
Total	27,177.40	7.300443	1.246545	8.546988

Policy implementation timing

As in the BAU scenario, it is assumed that planned landfills come online in 2025. For the candidate and future potential landfills, given that there is no current information about if or when any projects would be implemented, one third of implementation of initial projects are assumed to come online in 2025, one third come online in 2030, and one third come online in 2040.

Policy implementation co-benefits

In addition, the benefits of reducing methane from landfills, the policy scenario introduces a number of additional benefits related to energy generation and potential avoided emissions.

- If all the candidate and future potential landfills decide to generate electric on-site with a standard turbine, the expected energy generation could be 77.697 MW.
- Alternatively, if all of the LFG collected is not used to generate energy on-site, it could be refined into RNG which would then have avoided emissions from the displacement of other fossil-fuel use.

Measure 4.2: Organic Waste Diversion from Landfills

The EPS policy ‘methane capture’ is used to quantify the impact of the ‘organic waste diversion from landfills’ measure. To focus on the impact of organic waste diversion in methane capture the specific key input selected under this policy is ‘water and waste.’

To select a realistic target for this policy, the future food waste makeup in landfills was estimated under two scenarios: (1) BAU scenario and (2) policy scenario.

In 2050, total food waste makeup in landfills across Georgia amounts to 33.55% in all facilities statewide (BAU scenario) and 0% food waste in the landfill policy scenario. The comparison of BAU to the policy scenario indicates that the measure will increase organic waste diversion statewide notably through investment in compost facilities. The measure is assumed to be effective January 1, 2025.

Current state

The Georgia Governor’s Office of Planning and Budget is responsible for official demographic and population projections for the state. Projections for the residential population of Georgia are available through 2060.

Business-as-usual scenario

To project the business-as-usual scenario for organic waste diversion in landfills, the main variable used for modeling is the amount of methane capture from food waste diversion. The Georgia Department of Human Services estimated that an average of 151 pounds of food is disposed of per Georgian every year. [135] To estimate food waste landfilled every year, the Governor's Office population projections are multiplied by 151 to yield the total annual food waste projections for Georgia and then converted to 1000 tons. The EPA estimates that 5% of food waste is composted annually.[136] In the case of the BAU scenario, this 5% compost rate is assumed to be constant from present day to 2050.

To determine the amount of methane capture from composting, first the amount of methane released from the total annual food waste was calculated. The EPA estimated in a report that for every 1000 tons of food waste landfilled, 34 metric tons (MT) of methane are released.[137] The BAU scenario assumes that only 5% of this methane is captured through composting from present day to 2050, yielding:

Table 50. BAU Projection for Population, Waste, and Emissions

Year	Current state	2025	2030	2040	2050
Population Growth[138]	10,992,292	11,213,080 (2.00%)	11,764,473 (4.92%)	12,786,367 (8.69%)	13,545,662 (5.94%)
Total Annual Food Waste (1000 Tons)	829.918	846.588	888.217	965.371	1,022.697
Methane generation (MT)	28,217.21356	28,783.97636	30,199.40219	32,822.60409	34,771.71435
Methane captured (MT)	1,410.860678	1,439.198818	1,509.97011	1,641.130205	1,738.585718

Policy scenario

The EPA has a public national food loss and waste reduction goal for the year 2030. The goal aims to reduce food loss and waste to half of present-day rates by 2030. For this model, it is assumed that the achievement of this target depends solely on increasing food waste composting in Georgia. Projecting this food waste target out to 2050 means that all of Georgia's food waste is composted by 2050. Leveraging the same approach as the BAU scenario, but changing methane capture to increase from current day rates at 5% to capturing all methane from food waste through composting in 2050, yields:

[135] Georgia Department of Human Services, Division of Aging Services, Food Waste and Reclamation. Retrieved February 23, 2024.
[136] U.S. Environmental Protection Agency, 2019 Wasted Food Report. April 2023.
[137] U.S. Environmental Protection Agency, Quantifying Methane Emissions from Landfilled Food Waste. October 2023.
[138] Governor's Office of Planning and Budget, Population Projections. Retrieved February 23, 2024.

Table 51. Policy Projection for Population, Waste, and Emissions

Year	Current state	2025	2030	2040	2050
Population Growth[139]	10,992,292	11,213,080	11,764,473	12,786,367	13,545,662
Total Annual Food Waste (1000 Tons)	829.918046	622.4385345	414.959023	207.4795115	0
Methane captured (MT)	1,410.860678	7,621.066187	14,108.60678	25,768.3007	34,771.71435

	Current state	2025	2030	2040	2050
Food waste makeup in landfills	12%[140]	9%	6%[141]	3%	0%

Measure 4.3: Recycling

The EPS policy 'Material Efficiency, Longevity, & Re-Use' is used to quantify the impact of the 'expansion of recycling capacity' measure. This measure aims to divert waste from landfills, such as paper, plastic, and metals by recycling them and therefore increasing landfill capacity over time. Recycling programs can support a reduction in disposable packaging, greater product longevity, and greater repair and re-use of products. The EPS policy models specified percentages of reduction in demand between 0-100.

Current state

As state-wide waste diversion or recycling targets have not been identified in Georgia, the EPA's National Recycling Goal is used as a benchmark for full technical potential of expanding recycling capacity. The National Recycling Goal is to increase the national recycling rate to 50 percent by 2030.[142] The technical potential in 2050 is therefore approximated to be 100%, aligned to this ambition and to Measure 4.2.

The Georgia Governor's Office of Planning and Budget is responsible for official demographic and population projections for the state. Projections for the residential population of Georgia are available through 2060[143]

Business-as-usual scenario

Municipal solid waste from Georgia's regulated solid waste facilities was equivalent to 26,691,259 tons[144] in 2023. The World Bank estimates the following rates of solid waste generated per capita in North America[145]. This data was used to determine an annual average increase of 0.01 tons of waste generated per person in North America. Using these national estimates, Census population projections in Georgia[146] were used to estimate the tons of waste produced per person in Georgia by 2050.

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[139] Governor's Office of Planning and Budget, Population Projections. Retrieved February 23, 2024.
[140] Georgia Environmental Protection Division, Food Residuals Diversion. Retrieved February 23, 2024.
[141] U.S. Environmental Protection Division, United States 2030 Food Loss and Waste Reduction Goal. February 21, 2024.
[142] U.S. Environmental Protection Agency, U.S. National Recycling Goal. February 22, 2024.
[143] Governor's Office of Planning and Budget, Population Projections. Retrieved February 23, 2024.
[144] Georgia Environmental Protection Division, Regulated Solid Waste Facilities. Retrieved February 23, 2024.
[145] Kaza, S., Yao, L., Bhadra-Tata, P., Van Woerden, F., What a Waste 2.0: A Global Snapshot of Solid Waste Management to 2050. World Bank Group, Urban Development Series. September 20, 2018
[146] Governor's Office of Planning and Budget, Population Projections. Retrieved February 23, 2024.

The average recycling rate in the State of Georgia is estimated to be 13% annually as of 2023[147]. This average annual rate of recycling is applied linearly to all years in under the BAU scenario.

The average cost of waste disposal per ton is estimated to be $256, comprised of a $209 average cost per ton of waste collected[148] and a $47 average tipping fee per ton[149]. This cost estimate per ton is applied to the total amount of solid waste diverted to recycling to determine the dollar amount associated with waste reduction due to recycling.

Table 52. BAU Projections for Waste Projections

Item	Current state	2025	2030	2040	2050
Solid waste generated per capita in North America (tons)	-	2.34	2.37	2.44	2.50
Solid waste generated per capita in Georgia (tons)	2.43	2.44	2.47	2.54	2.60
Population in Georgia	10,992,292	11,213,080	11,764,473	12,786,367	13,545,662
Solid waste generated in Georgia (tons)	26,691,259	27,373,142	29,101,537	32,460,489	35,268,564
Annual recycling rate (%)	13%	13%	13%	13%	13%
Amount of waste recycled in Georgia (tons)	3,184,565	3,558,508	3,783,200	4,219,864	4,584,913
Cost of waste services reduced due to recycling (USD)[a]	$816,458,728	$912,330,396	$969,936,754	$1,081,888,615	$1,175,480,061

[a]USD is U.S. dollars

Policy scenario

The annual recycling rates below are estimated rates that align with the EPA National Recycling Goal to increase the national recycling rate to 50 percent by 2030. As larger proportions of waste are diverted from landfills to recycled material under the policy scenario, the costs associated with waste management services are projected to significantly reduce through 2050.

Table 53. Policy Projections for Waste

Item	Current state	2025	2030	2040	2050
Annual recycling rate	13%	26%	50%	75%	100%
Amount of waste recycled in Georgia (tons)	3,184,565	7,234,330	14,550,768	24,345,367	35,268,564
Dollar amount of waste services reduced due to recycling ($)	$816,458,728	$1,854,737,617	$3,730,525,977	$6,241,665,084	$9,042,154,313

[147] The Recycling Partnership, State of Recycling. January 31, 2024.
[148] U.S. Environmental Protection Agency, Wastes – Resources Conservation – Tools for Local Government Recycling Programs. February 21, 2016.
[149] Environmental Research and Education Foundation, 2022 MSW Landfill Tipping Fees. Retrieved February 23, 2024.

Strategy 5: Promote Use of Alternative Fuels

Measure 5.1: Hydrogen Refueling Stations
In this measure entities in Georgia construct hydrogen refueling stations (HRS) as one element in a broader strategy to expand the hydrogen ecosystem within Georgia; other related elements not included in this measure are hydrogen production and hydrogen pipe network infrastructure. These HRS would serve medium- and heavy-duty fuel cell electric vehicles (FCEV) trucks to support decarbonizing commercial trucking.

The EPS policy 'Hydrogen Vehicle Sales Standard' is used to quantify the impact of Measure 5.1. The EPS policy models specified percentages of newly sold vehicles of selected types to consist of hydrogen FCEVs.

Georgia's initial interest in HRS is to decarbonize on-road freight and commercial vehicles. For this reason, the vehicle types selected for inclusion in modeling were (1) Freight light commercial trucks and (2) freight heavy and medium duty trucks.

Expansion of HRS was modeled under two scenarios: (1) BAU scenario and (2) policy scenario. The policy scenario saw more than 800 HRS constructed supporting 160,000 more FCEVs compared to BAU.

Current state
In 2021, all Georgia trucks by registration were classified as follows:[150]

Table 54. Current Georgia Truck Classification (2021)

Class	#
Light Duty (Class 1 & 2)	5,807,000
Medium Duty (Class, 3, 4, 5, 6)	162,600
Medium-Heavy Duty (Class 7)	18,900
Heavy Duty (Class 8)	99,000
Total	6,087,600

Measure 5.1 applies only to Classes 3 through 8 which totaled 280,500 vehicles in 2021.
Trucking in Georgia is expected to increase between now and 2050. According to projections from the Georgia Freight Plan by GDOT[151], the total tonnage of shipments in Georgia, including domestic, import, and export as well as within the state, outbound, and inbound, is:

Table 55. Current GDOT Projections of Georgia Trucking Industry by Tonnage Through 2050

Year	Tonnage	% increase from 2021
2021	473,984.72	n/a
2025	521,383.02	10.02
2030	587,490.23	123.97
2040	745,913.00	57.40
2050	947,056.10	99.85

[150] U.S. Census Bureau, Economic Surveys, Table VI2US213A. Retrieved 30 January 2024.
[151] Georgia Department of Transportation,, Georgia Freight Plan, Retrieved March 31, 2023

According to projections from the U.S. Federal Highway Administration[152], the total tonnage of shipments in Georgia, including domestic, import, and export as well as within the state, outbound, and inbound, is:

Table 56. Current Federal Projections of Georgia Trucking Industry by Tonnage Through 2050

Year	Tonnage	% increase from 2021
2021	458,712.2	n/a
2025	503,407.2	9.74
2030	543,862.5	18.56
2040	644,879.5	40.58
2050	769,203.6	67.69

The increase in tonnage from 2021 through 2050 is used to model the increase of trucks on the road at the same ratio. The model uses the more conservative federal projections for total tonnage of shipments.

No U.S. state has a hydrogen vehicle sales mandate and only about 5000 hydrogen vehicles are on U.S. roads today (roughly 0.002% of U.S. vehicles).[153] Based this, it can be assumed that there are negligible FCEVs operating in Georgia. As of 2022, no HRS had been constructed in Georgia.[154]

A study found that by 2035 in Europe, up to 850,000 medium- and heavy-duty FCEV trucks could be on the road and require up to 4,800 HRS, indicating a need of one HRS per 177 FCEVs to support the ecosystem.[155]

Business-as-usual scenario

The BAU scenario takes the assumptions detailed in the overview and applies the following conservative growth projections for sales of FCEVs as a percentage of overall truck sales[156]:

- 2030: 2%
- 2040: 7%
- 2050: 5%

Applying these sales figures to the assumptions described in the overview results in the following BAU scenario:

[152] U.S. Department of Transportation, Federal Highway Administration, . Retrieved 30 January 2024. Freight Analysis Framework. Retrieved 30 January 2024.
[153] Rocky Mountain Institute, Energy Policy Simulator. Retrieved 30 January 2024.
[154] U.S. Department of Transportation, Bureau of Transportation Statistics, Alternative Fuel Stations. Retrieved 30 January 2024.
[155] Heid, B., Martens, C., Wilthaner, M., Unlocking hydrogen's power for long-haul freight transport. *McKinsey*. August 2, 2022.
[156] National Renewable Energy Laboratory, Decarbonizing Medium- & Heavy-Duty On-Road Vehicles. March 2022.

Table 57. BAU Projection of Georgia FCEV Sales

Item	2021	2025	2030	2040	2050
Total trucks	280,500	307,821	332,561	394,327	470,370
% FCEV sales	0%	0%	2%	7%	5%
# FCEVs sold	0	0	6,651	27,603	23,519
HRS	0	0	38	156	133

Policy scenario
The policy scenario takes the assumptions detailed in the overview and applies the following conservative growth projections for sales of FCEVs as a percentage of overall truck sales[157]:

- 2030: 6%
- 2040: 21%
- 2050: 37%

Applying these sales figures to the assumptions described in the overview results in the following policy scenario:

Table 58. Policy Projections of Georgia FCEV Sales

Item	2021	2025	2030	2040	2050
Total trucks	280,500	307,821	332,561	394,327	470,370
% FCEV sales	0%	0%	6%	21%	37%
# FCEVs sold	0	0	19,954	82,809	174,037
HRS	0	0	113	468	983

Measure 5.2: Sustainable Aviation Fuel Production
The EPS policy "low carbon fuel standard" is used to quantify the impact of the 'sustainable aviation fuel' measure. The model requires an input of % reduction in carbon emissions; however, this input will be simulated by identifying the difference in the percentage of aviation fuel consumed that is sustainable aviation fuel between the business-as-usual scenario and the policy scenario.

[157] National Renewable Energy Laboratory, Decarbonizing Medium- & Heavy-Duty On-Road Vehicles. March 2022.

The consumption of jet fuel by U.S. air carriers is expected to increase between now and 2050. According to projections by the Federal Aviation Administration (FAA), in the FAA Aerospace Forecast, the total amount of jet fuel, in millions of gallons, consumed by U.S air carriers traveling domestically and internationally is[158]:

- 2022: 20,086
- 2028: 23,502
- 2033: 25,677
- 2038: 28,501
- 2043: 31,804
- 2050: 35,000

A linear growth rate is assumed between the FAA forecasted years to interpolate projected jet fuel consumption in 2025, 2030, and 2040. These projections will inform jet fuel consumption in both the BAU and policy scenarios.

Hartsfield-Jackson Atlanta Airport aviation fuel consumption

In both the BAU and Policy scenarios, the consumption of aviation fuel by U.S. air carriers was translated to the consumption of aviation fuel by U.S. air carriers navigating to and from Hartsfield Jackson Atlanta Airport. This was done by dividing the total revenue passenger enplanements of U.S. mainline air carriers in 2021, which the FAA recorded to be 449 million[159], by the total revenue passenger enplanements of Hartsfield Jackson Atlanta Airport, which the FAA recorded to be 45.4 million[160]. The resulting percentage of 8.17% will be used as a proportion to calculate aviation fuel consumption in Hartsfield Jackson Atlanta Airport from aviation fuel consumption in the U.S. For this analysis, consumption of aviation fuel at Hartfield Jackson Atlanta Airport will be used to represent the total amount of consumption of aviation fuel in Georgia.

Energy produced from combustion of SAF

The combustion of one gallon of jet fuel results in 135,000 British thermal units (BTUs) of energy[161]. Because sustainable aviation fuels have the same basic chemical makeup as fossil fuels, this analysis will assume the combustion of one gallon of sustainable aviation fuels will result in approximately the same output of energy as the combustion of jet fuel.

Business-as-usual scenario

The BAU Scenario and Policy Scenario will first be characterized by the most recent year that data has been collected for SAF consumption in the U.S. As part of the Renewable Fuel Standard, EPA collects data on biofuel consumption, and EPA's data shows that over 14 million gallons of SAF were consumed in 2022[162]. The Air Transport Action Group (ATAG) published the Way Point

[158] U.S. Federal Aviation Administration. FAA Aerospace Forecast, Table 23. May 8, 2023.
[159] U.S. Federal Aviation Administration. FAA Aerospace Forecast, Table 10. May 8, 2023.
[160] U.S. Federal Aviation Administration. CY 2022 Enplanements at All Airports. August 31, 2023
[161] U.S. Department of Transportation, Bureau of Transportation Statistics, Energy Consumption by Mode of Transportation. Retrieved February 23, 2024.
[162] U.S. Department of Energy, Alternative Fuels Data Center: Sustainable Aviation Fuel. Retrieved February 23, 2024.

2050 report in which it examines sustainable aviation fuel production globally in a business-as-usual scenario. The scenario estimates in 2050, sustainable aviation fuel will compose between 6% of fuel use in the low volume-case to 39% of fuel use in the high-volume case.[163] The average of these fuel percentages, 22.5% will be used to represent the percentage of fuel use that will be attributed to sustainable aviation fuel in 2050 in the business-as-usual scenario in the U.S. when modeling the measure, translating to 7,875 million gallons of SAF. To estimate SAF consumption in 2025, 2030 and 2040, it will be assumed that the growth from 14 million gallons of SAF consumed in 2022 to 7,875 million gallons of SAF projected to be consumed in 2050 will be linear.

Table 59. BAU Projection for Aviation Fuel

Item	2022	2025	2030	2040	2050
Gallons of jet fuel consumed in the US per year (millions)	20,086	21,794	24,372	29,822	35,000
Gallons of SAF consumed in the US per year (millions)	14	856.25	2,260	5067.5	7,875
Gallons of SAF consumed in GA per year (millions)	1.1	70.0	184.6	414.0	643.4
Energy produced from GA SAF combustion (MMBtu)[a]	0.2	9.4	24.9	55.9	86.9

[a] MMBTU is million British thermal units

Policy scenario

As numerous airlines have set net-zero targets, it is important to support this industry by increasing the production capacity of sustainable aviation fuel within the state. By 2030, testing the assumption to enable the production and use of SAF to 3 billion gallons per year and by 2050, to enable the production and use of SAF to 35 billion gallons per year to meet 100% of domestic aviation fuel demand. [164] To estimate consumption of SAF in 2025 and 2040, it will be assumed the growth in SAF consumption from 14 million gallons in 2022 to 3 billion gallons in 2030 will be linear, and the growth from 3 billion gallons to 35 billion gallons in 2050 will be linear.

Table 60. Policy Scenario Projection for Aviation Fuel

Item	2022	2025	2030	2040	2050
Gallons of jet fuel consumed in the US per year (millions)	20,086	21,794	24,372	29,822	35,000
Gallons of SAF consumed in the US per year (millions)	14	1,133.75	3,000	19,000	35,000
Gallons of SAF consumed in GA per year (millions)	1.1	92.6	245.1	1,552.3	2,859.5
Energy produced from GA SAF combustion (MMBtu)	0.2	12.5	33.1	209.6	386.0

Measure 5.3: Renewable Natural Gas Production from Biodigesters

The EPS policy ‘subsidy for capacity construction’ is used to quantify the impact of the ‘renewable natural gas production from biodigesters’ measure. This EPS policy requires that an energy source for construction is specified. To align with the energy source and output from anaerobic digesters (biodigesters), the source ‘biomass’ is selected.

[163] Air Transport Action Group, Waypoint 2025. September 2021. 3

[164] The White House, FACT SHEET: Biden Administration Advances the Future of Sustainable Fuels in American Aviation. September 9, 2021.

To select a realistic subsidy and targets for capacity for this policy, the future operation of anaerobic digestion facilities was estimated under two scenarios: (1) BAU scenario and (2) policy scenario.

In 2050, total presence of anaerobic digestion facilities in Georgia amounts to 28 facilities statewide (BAU scenario) and 32 facilities statewide under the policy scenario. The comparison of BAU to the policy scenario indicates that the measure will increase the number of operational anaerobic digestion facilities by approximately 3.7% in 2030 and 14.3% in 2050. The measure is assumed to be effective January 1, 2025.

- In the policy scenario, the number of operational anaerobic digestion facilities increases by 3.7% more than BAU by 2030 and 14.3% more than BAU by 2050.

Details of how the BAU and policy scenarios were estimated are below:

Business-as-usual scenario
Historical data was sourced on operational status and presence of food and farm waste anaerobic digestion facilities in Georgia from the American Biogas Council.[165] There are a total of 26 anaerobic digestion or biogas facilities in Georgia, excluding digesters leveraged for wastewater processing. The growth and construction of new biogas facilities utilizing bioenergy market share growth was estimated to 2040 given the cumulative total number of anaerobic digesters currently in Georgia; for this, data from International Energy Agency (IEA) was used. IEA's estimates for each scenario start with a 5% market share of bioenergy demand, that is attributed to biogas and biomethane, baseline which grows more aggressively in the policy scenario.[166]

The BAU estimate leveraged data from IEA's Stated Policies Scenario (STEPS) and applied the market share growth rate to 2040 projection to the number of anaerobic digesters in the state and extended the projections linearly into 2050. In this scenario, the number of biodigesters in Georgia grows from 26 to 28 in 2050.

For each biodigester, the following assumptions are made:
- Each digester has a capacity of 1,000,000 gallons and
- Each unit can process 80 tons of waste per day and operates annually at this full capacity.
- All biodigesters currently in operation stay in operation during the modeling period.

Once the annual green waste processed per biodigester was determined, this number was plugged into Renergon's Biogas Calculator[167] to determine the amount of electricity produced annually by each unit. This number was then multiplied by the number of biodigesters projected to be operational in each period yielding the annual electricity production from biodigesters in Georgia.

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[165] American Biogas Council, Biogas State Profiles: Georgia. Retrieved February 12, 2024.
[166] International Energy Agency, The outlook for biogas and biomethane to 2040. Retrieved February 12, 2024.
[167] Renergon, Biogas Calculator. Retrieved February 12, 2024.

Table 61. BAU Projection for Biogas in Georgia

Year	Current state[168]	2025	2030	2040	2050
Anaerobic biodigesters	26	26	27	27	28
Biogas market share (IEA STEPS scenario)[169]	5%	7.33%	9.66%	12%	14.33%
Green waste processed annually per unit[170]	80 tons/day				
Total green waste processed annually per unit	29,200				
Electricity production potential per unit annually (kWh)[171]	4,438,400				
Electricity production per unit annually (MWh)	4,438.4				
Electricity production annually from biogas (MWh)	115,398.4	115,398.4	119,836.8	119,836.8	124,275.2

Policy scenario
The policy scenario estimate leveraged data from IEA's Sustainable Development Scenario (SDS) and applied the market share growth rate to 2040 projection to the number of anaerobic digesters in the state and extended the projections linearly into 2050. The same approach as the BAU scenario was followed to determine the annual electricity production from biogas in the policy scenario. The increase in market share for biogas in the policy scenario is more aggressive than the BAU scenario yielding 32 biodigesters total across the state in 2050.

Table 62. Policy Scenario Projections for Biogas in Georgia

Year	Current state[172]	2025	2030	2040	2050
Anaerobic biodigesters	26	26	28	30	32
Biogas market share (IEA STEPS scenario)[173]	5%	10%	15%	20%	25%
Green waste processed annually per unit	80 tons/day				
Total green waste capacity annually per unit	29,200				
Electricity production potential per unit annually (kWh)	4,438,400				
Electricity production per unit annually (MWh)	4,438.4				
Electricity production annually from biogas (MWh)	115,398.4	115,398.4	124,275.2	133,152	142,028.8

[168] American Biogas Council, Biogas State Profiles: Georgia. Retrieved February 12, 2024.
[169] International Energy Agency, The outlook for biogas and biomethane to 2040. Retrieved February 12, 2024.
[170] BioCycle, 101 for Digester Sizing and RNG Performance Modeling. March 20, 2023.
[171] Renergon, Biogas Calculator. Retrieved February 12, 2024.
[172] American Biogas Council, Biogas State Profiles: Georgia. Retrieved February 12, 2024.
[173] International Energy Agency, The outlook for biogas and biomethane to 2040. Retrieved February 12, 2024.

Strategy 6: Refrigerant Management

Measure 6.1: Management of F-gas Leakage and Replacement of Equipment
Measure 6.1: Management of F-gas leakage and replacement of equipment is a measure in which residential, commercial, and industrial entities reduce emissions of F-gasses by repairing or retrofitting existing refrigeration equipment to reduce-gas leakage or by replacing existing refrigeration equipment with new equipment that utilizes lower-GWP F-gases.

The EPS policies F-Gas Substitution, F-Gas Destruction, F-Gas Recovery, and F-Gas Equipment Maintenance and Retrofits are used to quantify the impact of Measure 6.1.

Management of F-gas leakage and replacement of equipment was modeled under two scenarios: (1) BAU scenario and (2) policy scenario. The policy scenario saw an over 90% reduction in emissions from F-gases.

Current state
In 2021, Georgia F-gases listed in Georgia's inventory were comprised of HFCs, PFCs, SF_6, and NF_3, and totaled 7,912,451 $MTCO_2e$.

For the purposes of Measure 6.1, relevant F-gases are assumed to be those applicable to refrigeration, which are comprised of HFC-125, HFC-134a, HFC-143a, Other HFCs and PFCs, HFC-32, HFC-236fa, and HFC-23. These F-gases, under the GHG inventory category "Substitution of Ozone Depleting Substances", totaled 7,842,568 $MTCO_2e$ in 2021.

Over the previous five-year period 2017 to 2021, F-gas emissions in Georgia increased by 14.9%, or an average of 3.725% per year linearly from 2017.[174]

Table 63. Historic F-gas Emissions in Georgia

F Gases	2017	2018	2019	2020	2021
HFC-125	2.424	2.561	3.544	3.103	3.548
HFC-134a	2.494	2.706	2.717	2.321	2.141
HFC-143a	1.08	1.324	1.435	1.143	1.142
Other HFCs and PFCs	0.49	0.508	0.515	0.51	0.525
HFC-32	0.304	0.349	0.472	0.377	0.458
HFC-23	0.032	0.03	0.029	0.028	0.027
HFC-236fa	0.001	0.001	0.001	0.001	0.001
Total	6.825	7.479	8.713	7.483	7.842

[174] U.S. Environmental Protection Agency, Greenhouse Gas Inventory Data Explorer. Retrieved February 2, 2023.

Current state
Georgia at present does not have regulations limiting F-gas emissions.[175] However, F-gas emissions are subject to a variety of federal policies and regulations as well as global treaties.

F-gas treaties by the United Nations
The Kigali Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer is an international agreement to phase down the production and consumption of HFCs by 80 – 85% by 2047.[176] The U.S. ratified the Kigali Amendment in 2022.[177]

F-gas regulation and policy by the U.S.
The American Innovation and Manufacturing Act of 2020 (AIM Act) was enacted on December 27, 2020. The AIM Act mandates the phasedown of HFCs by 85 percent from historic baseline levels by 2036 (aligned with the U.S. commitment to the Kigali Amendment) and authorizes EPA to address HFCs in three main ways[178]:

1. Phasing down HFC production and consumption through an allowance allocation program,
2. Facilitating sector-based transitions to next-generation technologies, and
3. Issuing certain regulations for purposes of maximizing reclamation and minimizing releases of HFCs from equipment.

To achieve the first part, the phasedown of HFCs, the EPA established the HFC Allocation Program in the Allocation Framework Rule which codifies the AIM Act's production and consumption phasedown schedule of HFCs[179]:

Table 64. HFC Production and Consumption Phasedown Schedule Under AIM Act

Year	Consumption & Production Allowance Caps as a Percentage of Baseline
2020-2023	90%
2024-2028	60%
2029-2033	30%
2034-2035	20%
2036 & after	15%

F-gases in Georgia's inventory, including HFC-125, HFC-134a, HFC-143a, Other HFCs and PFCs, HFC-32, HFC-23, and HFC-236fa, are all listed in AIM Act.[180]

[175] North American Sustainable Refrigeration Council, HFC Policies & Refrigerant Regulations by State. Retrieved February 2, 2023.
[176] U.S. Environmental Protection Agency, Background on HFCs and the AIM Act. Retrieved February 2, 2024.
[177] U.S. Department of State, U.S. Ratification of the Kigali Amendment. September 21, 2022.
[178] U.S. Environmental Protection Agency, Frequent Questions on the Phasedown of Hydrofluorocarbons. Retrieved February 3, 2024.
[179] U.S. Environmental Protection Agency, Fact Sheet. January 2024.
[180] U.S. Environmental Protection Agency, Final Rule. January 2024.

The AIM Act has additionally set guidance on transitioning to substitutes through sector-based restrictions, which cites the same schedule as above, and applies to refrigeration, air conditioning, and heat pump systems.[181]

Business-as-usual scenario

The U.S. estimated the impacts of the growth of F-gas emissions in the absence of the Kigali Amendment.[182] These are used here and applied to Georgia as a business-as-usual case as the Kigali Amendment and the AIM Act were only recently ratified and enacted. Applying the U.S. BAU projections, as well as the assumptions detailed in the overview, projects the following F-gas emissions from 2021 – 2050:

Table 65. BAU Projection for F-gas Emissions in Georgia

Year	U.S. BAU projection[183]	% increase from 2021	Georgia BAU projection
2022	309.88	0%	8.096[184]
2024	324.43	5%	8.476
2025	322.85	4%	8.435
2029	316.55	2%	8.271
2030	318.53	3%	8.322
2034	326.44	5%	8.529
2036	326.98	6%	8.543
2040	338.16	9%	8.835
2045	352.14	14%	9.200
2050	365.93	18%	9.561

Policy scenario

To model the impacts of a technologically feasible policy, the policy scenario adopts the AIM Act's production and consumption phasedown schedule of HFCs and applies it to Georgia's F-gas emissions:

Table 66. Policy Scenario Projection for F-gas Emissions in Georgia

Year	U.S. POLICY projection	Georgia POLICY projection
2020-2023	90%	8.096
2024-2028	60%	4.858
2029-2033	30%	2.429
2034-2035	20%	1.619
2036 & after	15%	1.214

[181] U.S. Environmental Protection Agency, Technology Transitions Program. December 2023.
[182] U.S. Environmental Protection Agency, Regulatory Impact Analysis for Phasing Down Production and Consumption of Hydrofluorocarbons (HFCs). June 2022.
[183] U.S. BAU projections for 2025, 2030, and 2040 were linearly extrapolated based on existing years.
[184] Georgia's 2022 baseline is scaled up from its 2021 reported emissions based on the average increase of the previous 5-year period.

Strategy 7: Advance conservation and sustainable land use

Measure 7.1: Afforestation and Reforestation

This measure encompasses a variety of practices to enhance and expand the ability of Georgia's trees and forestland to sequester carbon. In addition to sequestering CO_2, increased tree planting has a variety of environmental and human health impacts.

This measure is modeled through increased planting and management in a key areas including agricultural pastureland, where open pastures are converted to "silvopasture" with high enough tree density that they can be considered forest; temperate forest management techniques that can also maximize tree health and density, increasing sequestration efficiency; and urban areas (including urban parks and forests) can be planted and managed to increase the carbon sink potential of cities and towns.

To estimate the impact of planting trees under these various scenarios, policies that encourage all solutions with a BAU scenario were compared. The EPS Policy Simulator accounts for carbon land sinks, including tree and forest sinks, and is useful for a BAU scenario.

Current state

In 2023, Georgia was home to 24,418,200 acres of forest[185], an area that has remained relatively stable over the past 50 years[186] and comprises 64.2% of Georgia's total land mass of 38,031,900 million acres. Approximately 54.5% of forested areas are hardwood and 45.5% are softwood.

An additional 10% of Georgia's land area is cropland, with another 5% devoted to pasture and 2% split among other miscellaneous agricultural types.[187]

Reforestation poses a major opportunity for Georgia. The total available opportunity for reforestation in Georgia may be as high as 6.73 million acres; the 4th highest of any state; 1.64 million of those acres relate to urban open spaces, the 2nd highest total of any state.[188]
Georgia's reforestation opportunities by type include:

[185] U.S. Department of Agriculture, Forest Service, Georgia's Forests, 2019. Southern Research Station, Resource Bulletin SRS-236. June 2023.
[186] Georgia Forestry Commission, Sustainability Report for Georgia's Forests. January 2019.
[187] U.S. Department of Agriculture, Forest Service, Georgia's Forests, 2019. Southern Research Station, Resource Bulletin SRS-236. June 2023.
[188] Reforestation Hub, State Summaries. Retrieved February 23, 2024.

Table 67. Current Reforestation Opportunities in Georgia by Type

Type	Acres
Biological corridors	403,000
Floodplains	266,000
Marginal croplands	286,000
Grassy areas	1,350,000
Pasture	2,390,000
Shrub	1,080,000
Streamside buffers	64,600
Urban open space	1,640,000
Total opportunity	6,730,000

Land use changes have been observed both in a reduction in Georgia forests of ~1.2% every 10 years[189] and in a reduction of urban tree canopy coverage of ~1.4% in the last 10 years.[190]

Business-as-usual scenario
The BAU scenario applies the trends on land use to the acres of reforestation opportunity above. Many of the solutions involving planting trees and forest management may be competitive with industrial forestry and agriculture, as well as with the current development practices of Georgia's cities:

Table 68. BAU Projection for Change in Georgia Forestland

Year	Decline in forestland (acres)
2023	n/a
2025	-83,720
2030	-209,299
2040	-289,502
2050	-286,028

Policy scenario
For the policy scenario, it was assumed that all tree-planting and management solutions would take effect immediately in base year 2025. It was assumed that all opportunity by acreage would be planted at an average of 4% per year to 2050.

[189] Brown, M., et. al., A framework for localizing global climate solutions and their carbon reduction potential. *PNAS.* July 26, 2021.
[190] Potapov, et. al. The Global 2000-2020 Land Cover and Land Use Change Dataset Derived From the Landsat Archive: First Results. *Frontiers in Remote Sensing*. April 13, 2022.

Table 69. Policy Projection for Change in Georgia Forestland

Year	Decline in forestland (acres)
2025	0
2030	1,346,000
2040	4,038,000
2050	6,730,000

Measure 7.2: Cropland and Soil Management Improvements and Conservation
Cropland can be simultaneously a source of emissions and a carbon sink. Emissions can be sequestered in soil, especially when using reduced or no-till farming methods or cover cropping.

Fertilizers are also a major source of nitrous oxide. By transitioning away from commercial nitrogen fertilizers and towards compost, manure, or reduced fertilizer levels, Georgia can also reduce emissions from this sector.

Two EPS policies are used to quantify the impacts of this measure – "Improved Soil Measures" for reduced or no-till and cover cropping, and "Cropland and Rice Measures" for nutrient (fertilizer) management.

Details of how the BAU and policy scenarios were estimated are below:

Business-as-usual scenario
The U.S. National Agricultural Statistics Service regularly releases a Census of Agriculture giving key statistics for each state. The most recent year with data available as of this PSVERP is 2017.[191] The average change in area of cropland in Georgia was also pulled from peer-reviewed scientific research and extended to 2050 to reflect anticipated growth.[192]

Emission reduction factors were pulled from the COMET-Planner tool with support from Georgia EPD. These factors represent the potential reductions (in $MTCO_2e$/acre/year) from various cropland management strategies, namely reduced-till, no-till, cover cropping, and nutrient (fertilizer) management.[193] Where possible, specific factors were used, but for general emission reduction estimates or where data was unavailable, an average of emission reduction factors was used. For instance, no specific type of cover crop is mandated under the measure. Therefore, a general average emission reduction factor is used to show reduction potential.

For CO_2 reductions from reduced and no-till farming and cover cropping, the percentages of cropland using these strategies in 2017 (the last year for which data is available) were taken. These percentages were then projected through 2050, while incorporating anticipated growth. The acreage of cropland projected to use reduced and no-till farming and cover cropping in each year

[191] U.S. Department of Agriculture, National Agricultural Statistics Service, Georgia Agricultural Census Historical Highlights: 2017. 2017.
[192] Lark, T.J., Spawn, S.A., Bougie, M. et al., Cropland expansion in the United States produces marginal yields at high costs to wildlife. *Nature Communications*, *11*, *4295*. 2020.
[193] Swan, A., et al. COMET-Planner. *USDA National Resources Conservation Service and Colorado State University*. December 2023.

was then multiplied by the COMET factor to produce projected annual emissions reductions under a BAU scenario.

Table 70. BAU Projection for Emissions Reductions from Reduced or No-Till Farming and Cover Cropping

Projected emissions reductions from reduced or no-till farming and cover cropping under a BAU scenario ($MTCO_2e$)			
2025	2030	2040	2050
807,976	813,647	825,110	836,735

Due to the nature of the nutrient (fertilizer) management emission reduction factors, a BAU scenario was not calculated. This measure represents a marked changed in farming practices. Fertilizer use can be difficult to track, and the team did not identify any well-documented projections on changes in fertilizer use. Reductions were calculated as defined below.

Policy scenario
To determine the targeted increase in acreage using reduced and no-till farming and cover cropping, the team conducted research of other states' practices and consulted on technical potential. Given the relatively low level of adoption of these practices in 2017, the targets were set to be two times 2017 levels in 2050. This linear growth was projected to start from 2025. Acreage using these strategies was then projected out using these percentages and again multiplied by the COMET emissions reductions factors to produce projected emissions reductions for each year under a more intensive policy scenario.

Table 71. Policy Scenario Projections for Emissions Reductions from Reduced or No-Till Farming and Cover Cropping

Projected emissions reductions from reduce or no-till farming and cover cropping under a policy scenario ($MTCO_2e$)			
2025	2030	2040	2050
807,976	975,856	1,318,593	1,670,794

For nitrous oxide, N_2O, reductions (measured in CO_2e), very little data is available, as fertilizer use can be difficult to track. However, the 2017 Agricultural Census reports that approximately 55% of cropland in Georgia was treated with commercial fertilizer in 2017.[194] Again considering other states' practices and additional desktop research, the team set a target of shifting away from commercial nitrogen fertilizers by 15% of 2021 levels. A specific line item in the state inventory is "N_2O from Agricultural Soil Management". Using this data as the baseline and the same projected growth as above, emissions reductions were calculated linearly from 2025 to 2050. Reductions begin in 2026 and end in 2050 at 15% of total projected N_2O emissions from agricultural soil management.

[194] U.S. Department of Agriculture, National Agricultural Statistics Service, Georgia Agricultural Census Historical Highlights: 2017. 2017.

Measure 7.3: Coastal and Waterway Conservation and Restoration
This measure focuses on preserving and restoring wetlands, salt marshes, mangroves, and other coastal ecosystems in coastal Georgia that help capture and store carbon dioxide from the atmosphere.

The EPS policy "Wetland Restoration" is used to quantify the impact of this measure. The EPS policy models specified percentages of potential achieved between 0-100%.
Coastal and waterway conservation and restoration are modeled under two scenarios: (1) a business-as-usual (BAU) scenario, extending the current state and (2) a policy scenario. Each scenario is defined in detail below. Compared to the business-as-usual scenario, the policy scenario increases wetland restored by an average of 1,467 acres per year.

Current state
The National Wetlands Inventory indicates that in 2012, there we 804,227 acres of coastal wetland in Georgia's six coastal counties.[195]

Wetland loss in Georgia from 2006-2011 was 7,338 acres.[196] An average annual loss rate during these years is therefore assumed to be about 1,467 acres per year. This average annual loss rate was used to project wetland loss to 2050 by scaling the factor linearly to 2050.

Average annual wetland loss rate: 7,338 acres / 5 years = 1,467.60 acres per year

Business-as-usual scenario
As shown in Table 72 below, the BAU scenario assumes a linear reduction of 1,467 acres of wetland per year from the current state to 2050.

Table 72: BAU Projection for Wetland Loss and Restoration in Georgia

Item	2021	2025	2030	2040	2050
Change in acres of wetland	-	(5,870)	(7,338)	(14,676)	(14,676)
Acres of wetland restored	-	0	0	0	0
Total estimated acres of wetland	791,019	785,148	777,810	763,134	748,458

Policy scenario
The policy scenario estimates a restoration of the annual wetland acreage projected to be lost under the BAU scenario. This results in the following percentage wetland restorations per time frame:

- 2030: 0.74%
- 2040: 0.96%
- 2050: 1.95%

[195] Georgia Department of Natural Resources, Wetlands of Coastal Georgia. October 2012.
[196] Georgia Department of Natural Resources, Georgia Coastal Management Program, Section 309 Assessment. September 2015.

Table 73: Policy Scenario Projection for Wetland Loss and Restoration in Georgia

Item	2021	2025	2030	2040	2050
Change in acres of wetland	-	(5,870)	7,338	14,676	14,676
Acres of wetland restored	-	0	7,338	14,676	14,676
Total estimated acres of wetland	791,019	785,148	792,486	807,162	821,838

Section D – Co-Pollutant Inventory

This section of the appendix presents Georgia's air pollution emissions in short tons by sector.

The co-pollutant inventory is comprised of the base year estimates of Criteria Air Pollutants (CAP) and Hazardous Air Pollutants (HAP) in all 159 counties in Georgia using the National Emissions Inventory's (NEI) 2017 data.
The inventory was used as a part of the co-pollutant analysis to estimate co-pollutant reduction potential of the identified emission reduction measures in this PSVERP.

2017 was selected as the base year according to data quality and availability, following EPA guidelines for selecting a base year. As the NEI releases data every three years, the latest available data is from 2020 and 2017. Due to the impacts of COVID-19 on emissions, 2020 was not deemed an appropriate base year due to lower than usual activity data.

Table 74. Criteria Air Pollutants (CAPs), Volatile Organic Compounds (VOCs), and Hazardous Air Pollutants (HAPs) in Georgia by National Emissions Inventory sector in Short Tons

Sector	CO (tons)	Lead (tons)	NO_x (tons)	$PM_{2.5}$ (tons)	PM_{10} (tons)	SO_2 (tons)	VOC (tons)	HAP (tons)
Agriculture - Crops & Livestock Dust	-	-	-	9,088	48,602	-	-	-
Agriculture - Fertilizer Application	-	-	-	-	-	-	-	-
Agriculture - Livestock Waste	-	-	-	-	-	-	5,044	738
Biogenics - Vegetation and Soil	143,472	-	29,721	-	-	-	1,341,361	112,720
Bulk Gasoline Terminals	19	-	13	-	-	-	3,218	128
Commercial Cooking	1,859	-	-	4,527	4,876	-	677	331
Dust - Construction Dust	-	-	-	1,665	16,657	-	-	-
Dust - Paved Road Dust	-	-	-	10,412	41,663	-	-	-
Dust - Unpaved Road Dust	-	-	-	12,429	125,134	-	-	-
Fires - Agricultural Field Burning	19,438	-	676	2,076	3,015	237	1,338	847
Fires - Prescribed Fires	358,676	-	11,883	42,911	48,755	3,260	23,637	17,376
Fires – Wildfires	60,128	-	2,523	8,450	9,808	678	4,851	4,378
Fuel Comb - Comm/Institutional - Biomass	44	-	58	7	10	47	2	0
Fuel Comb - Comm/Institutional - Coal	2	0.02	38	1	1	100	-	234
Fuel Comb - Comm/Institutional - Natural Gas	1,804	0.14	2,287	37	38	18	110	5
Fuel Comb - Comm/Institutional - Oil	2	0.05	11	7	7	-	-	0
Fuel Comb - Comm/Institutional - Other	111	-	206	2	2	-	5	0
Fuel Comb - Electric Generation - Biomass	1,332	0.20	729	126	163	83	128	49
Fuel Comb - Electric Generation - Coal	4,939	0.06	22,192	708	904	14,762	503	49
Fuel Comb - Electric Generation - Natural Gas	574	0.01	1,755	1,038	1,038	99	376	110
Fuel Comb - Electric Generation - Oil	38	-	238	6	9	56	3	0
Fuel Comb - Electric Generation - Other	608	0.00	359	68	73	107	92	0

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Sector	CO (tons)	Lead (tons)	NO_x (tons)	$PM_{2.5}$ (tons)	PM_{10} (tons)	SO_2 (tons)	VOC (tons)	HAP (tons)
Fuel Comb - Industrial Boilers, ICEs - Biomass	8,850	0.75	5,003	1,117	1,282	784	525	432
Fuel Comb - Industrial Boilers, ICEs - Coal	684	0.26	2,437	178	214	2,140	16	1,635
Fuel Comb - Industrial Boilers, ICEs - Natural Gas	3,845	0.12	7,754	907	925	1,769	752	398
Fuel Comb - Industrial Boilers, ICEs - Oil	806	0.01	3,705	242	266	549	237	4
Fuel Comb - Industrial Boilers, ICEs - Other	354	0.02	903	144	155	1,619	22	38
Fuel Comb - Residential - Natural Gas	2,220	-	5,229	19	25	29	294	4
Fuel Comb - Residential - Oil	-	-	2	-	-	-	-	0
Fuel Comb - Residential - Other	167	-	609	-	-	-	6	0
Fuel Comb - Residential - Wood	49,505	-	800	6,538	6,545	135	7,448	1,466
Gas Stations	-	0.00	-	-	-	-	20,929	2,854
Industrial Processes - Cement Manuf	1,284	0.00	969	157	190	127	116	0
Industrial Processes - Chemical Manuf	723	-	557	294	362	933	1,054	120
Industrial Processes - Ferrous Metals	233	0.41	77	34	58	72	24	2
Industrial Processes - Mining	-	-	-	528	4,350	-	-	-
Industrial Processes - NEC	5,595	1.02	3,791	4,561	5,834	1,988	9,853	1,478
Industrial Processes - Non-ferrous Metals	47	0.01	112	29	39	-	8	44
Industrial Processes - Oil & Gas Production	2	-	11	1	1	2	1	0
Industrial Processes - Petroleum Refineries	-	-	-	-	-	-	2	-
Industrial Processes - Pulp & Paper	10,658	0.42	9,294	3,154	3,728	6,159	13,963	3,803
Industrial Processes - Storage and Transfer	5	-	4	872	1,217	-	3,976	169
Miscellaneous Non-Industrial NEC	2,991	0.01	54	468	580	-	2,313	500
Mobile - Aircraft	12,229	10.64	7,127	222	256	692	1,687	454
Mobile - Commercial Marine Vessels	508	0.01	3,435	73	77	83	280	23
Mobile - Locomotives	2,537	-	13,287	368	379	1	635	280
Mobile - Non-Road Equipment - Diesel	9,050	-	18,829	1,387	1,429	16	1,765	851
Mobile - Non-Road Equipment - Gasoline	337,828	-	5,437	1,232	1,338	21	29,708	9,496
Mobile - Non-Road Equipment - Other	6,627	-	1,271	61	61	25	231	50
Mobile - On-Road Diesel Heavy Duty Vehicles	19,313	-	58,191	2,653	4,311	157	4,581	988
Mobile - On-Road Diesel Light Duty Vehicles	12,548	-	4,206	172	260	3	1,188	209
Mobile - On-Road non-Diesel Heavy Duty Vehicles	18,606	-	2,360	22	131	14	938	268
Mobile - On-Road non-Diesel Light Duty Vehicles	760,640	-	85,297	1,655	5,295	1,053	59,350	16,478
Solvent - Consumer & Commercial Solvent Use	-	-	-	-	-	-	53,807	4,835
Solvent - Degreasing	-	-	-	-	-	-	5,250	1,890
Solvent - Dry Cleaning	-	-	-	-	-	-	35	249
Solvent - Graphic Arts	-	-	1	-	-	-	17,107	1,163
Solvent - Industrial Surface Coating & Solvent Use	35	0.00	46	46	48	-	15,390	1,403
Solvent - Non-Industrial Surface Coating	-	-	-	-	-	-	12,314	1,632
Waste Disposal	189,140	0.37	6,249	22,527	23,229	216	15,126	1,575

Section E – Implementation Schedule and Milestones

For any entity applying for implementation funding, Table 75 outlines projected milestones for reduction measure implementation.

Table 75. Implementation Schedule and Milestones for Reduction Measures

Implementation milestones	Date
Deadline to submit applications for CPRG implementation grant funding	April 1, 2024
Anticipated notification of funding selection	July 2024
Anticipated award	October 2024
Project initiation	November 2024 – April 2025
Project implementation and tracking	May 2024 – September 2029
Projected project close	October 2029

Section F – Public Survey Analysis Guidelines
Determining if the Measure Addressed Benefits or Concerns

Each measure was individually reviewed and vetted against criteria for benefits to determine if the emissions reduction measure addressed a benefit from the survey. The criteria helped determine if a measure addressed a benefit by providing guidance on how it could be addressed.

Table 76. Criteria Developed to Determine if Measures Address Survey Benefits

Survey options	Improved air quality and public health resulting from decreased air pollution	Transportation improvements, such as bike, walk, and transit options and electric vehicle infrastructure	Community resilience, or the ability to withstand extreme weather events	Community beautification, such as new or improved green spaces, bike paths, or walking trails	Workforce development and the creation of new jobs	Housing and housing affordability, including reduced utility costs	Reduced noise pollution, including traffic and construction noise	Assistance with home weatherization to improve heating and cooling and to lower utility bills
	Criteria to determine how a reduction measure may address benefits							
Yes (Y)	Likely to decrease NO_x, methane, and other emissions that contribute to air pollution	Likely to have direct impacts to create, fund or incentivize new or update existing transportation modes	Likely to directly increase community resilience to withstand extreme weather (e.g., vulnerability assessments, interventions to help respond to events and recovery)	Likely to directly increase beautification (e.g., infrastructure for bikes and walking)	Likely to directly require additional workforce to complete the measure (e.g., new infrastructure)	Likely to directly increase housing affordability or utility costs (e.g., solar rebates)	Likely to directly reduce noise pollution (e.g., traffic and construction - switch from diesel engines to electric engines)	Likely to directly improve effectiveness of heating and cooling or to reduce the cost of utility bills
No (N)	Likely to directly increase NO_x, methane, and other emissions that contribute to air pollution	Likely to counter or decrease measures to create, fund or incentivize new or update existing transpiration modes	Likely to counter community resilience measures	Likely to counter beautification efforts	Likely to decrease workforce in a specific sector due to the measure	Likely to directly decrease housing affordability or utility costs	Likely to increase noise pollution (e.g., traffic and construction noise)	Likely to decrease the effectiveness of heating and cooling or to increase the cost of utility bills
NA	No direct impact on air pollution	No direct transportation benefits	No direct community resilience benefits	No direct beautification benefits	No direct workforce implications	No direct implications for housing affordability or utility costs	No direct noise pollution implications	No direct implications for heating or cooling effectiveness or utility costs

Attachment A GA 2017 Co-pollutant Baseline

Attachment B GA LIDAC Communities