FAIRFAX COUNTY COMMUNITY-WIDE ENERGY AND CLIMATE ACTION PLAN

DRAFT VERSION 1

APRIL 30, 2021

PREPARED BY ICF

1 Acknowledgements (to be developed in next draft)

2 Executive Summary (to be developed in next draft)

3 Introduction

Climate change is an existential crisis that is affecting human populations, natural systems, infrastructure, and economies across the globe, and is already causing impacts in Fairfax County. As of 2021, 2019 was the second warmest year on record, at the end of the warmest decade ever. Global temperatures have already increased 1.8 degrees Fahrenheit (^{o}F) since the end of the 19th century and will continue to rise for the foreseeable future (UN, 2021). This global warming has led to climate change, creating various effects such as altered precipitation patterns, more frequent and intense storms, longer and harsher droughts, larger wildfires, and much more. To reduce the impacts of climate change and to contribute to the solution, the Community-wide Energy and Climate Action Plan, or CECAP, is Fairfax County's first-ever GHG emissions reduction plan for the community.

CECAP is the first effort to involve the community in GHG emission reduction efforts, and the first opportunity to add individual efforts to existing efforts by the county and to highlight opportunities for county, state, and federal action. The plan includes goals to help chart a path forward for Fairfax County residents, businesses, organizations, and other stakeholders, to reduce our collective GHG emissions. The plan also includes strategies and actions that individuals and organizations can take to help achieve the goals.

The success of the plan depends on community member's voluntary actions. This is not a top-down plan full of programs and policies being implemented or to be developed by the government—it is truly a community-driven plan that seeks the involvement of people across the county.

The plan is part of Fairfax County's multi-level approach to tackling climate change, which involves:

- Community, which the level that this plan is addressing;
- Fairfax County government, which is addressing climate change through other policies, programs, and planning processes; and
- State and federal governments, which both community members and the Fairfax County government can influence through collective advocacy.

Through a separate process, Fairfax County is looking to address climate change adaptation and resilience opportunities. Those issues are acknowledged throughout strategies in this plan, but are not discussed in depth.

This section provides an overview of the science behind climate change and its effects, focusing on the implications for Fairfax County. It also describes how Fairfax County is taking a lead on climate change, introduces the CECAP process and its origins, and explains the core values that guided the development of the plan.

3.1 Climate Change Impacts in Fairfax County

Climate change is already occurring in Fairfax County, and it is causing impacts on our environment, health, infrastructure, and daily lives. The scientific evidence demonstrating global climate change is clear and growing. The evidence demonstrates that human activities—such as burning fossil fuels, land use change, and waste management—are overwhelmingly responsible for causing climate change. Certain activities like burning fossil fuels emit GHGs, including carbon dioxide (CO_2), that enter the atmosphere and trap heat. Over time, the trapped heat slowly increases global temperatures, causing cascading climate effects such as altered precipitation patterns, extreme storms, extreme temperatures, and much more. These effects cause impacts that will increase over the coming years, even if drastic action is taken and significant resources are immediately applied to the crisis.

In recent years, extreme weather and catastrophic natural disasters have become more frequent and more intense. Like many parts of the United States, Fairfax County is expected to experience increased impacts and risk due to climate change in the coming decades. Fairfax County is already experiencing the following effects of climate change:

- More extreme weather events and natural disasters, such as large storms, flooding, and heavy snowfalls.
- Changes in precipitation patterns, including more droughts and heavy rainfalls.
- Hotter average temperatures, including more extremely hot days.
- Changing growing seasons and conditions, such as earlier springs and later winters.

These effects create impacts and risks that affect Fairfax County citizens and industries in many ways, including:

- Increased adverse health impacts due to greater air and water pollution and heat stress;
- Increased range of vectors and diseases such as Lyme disease and West Nile Virus spread by ticks and mosquitoes, respectively;
- Increased energy demand and costs, which can threaten the reliable energy supply; and
- Reduced wildlife habitat and biodiversity.

To prevent the worst effects and impacts of future climate change, we must take action, we must do so now, and we must do so boldly. Current and past local actions have contributed to global climate change, but the county can change those actions and adopt new ones to become part of the solution rather than part of the problem. Doing so will improve the environment and the lives of Fairfax County residents and help to limit climate change impacts.

The cost of inaction grows every day. The economic losses attributed to the effects of climate change, such as natural disasters, and the negative health impacts, such as increased mortality and chronic illness, increase every year we fail to act. The proverb that "an ounce of prevention is worth a pound of cure" is an apt analogy in this case—we cannot continue to treat the increasingly costly symptoms of climate change; instead, we must address the root cause. Therefore, Fairfax County recognizes that climate change is an existential problem that affects everyone in the county, but also around the world, and that the county can play a part in solving the problem, to the benefit of everyone.

Projected Climate Impacts on Virginians:
The typical number of heat wave days in Virginia is projected to increase **from more than 10 to nearly 60 days** a year by 2050.

Today, Virginia has 164,000 people at risk of coastal flooding. By 2050, an **additional 137,000 people** are projected to be at risk due to sea level rise.

Source: Climate Central: States at Risk – Virginia Profile.

3.2 Reducing Emissions

There is no "silver bullet" simple and elegant solution to reduce GHG emissions. Instead, the solution will comprise multiple strategies and will require unified commitment and action from all groups across our society. To take effective climate action, Fairfax County residents, businesses, and stakeholders must tackle the root cause: activities that emit GHGs and activities that reduce natural CO_2 sequestration, such as clearing forests. The Fairfax County CECAP Working

Group (See textbox below) has set GHG emission reduction goals to help guide local reductions, described in Section 6: **Error! Reference source not found.**.

The key sources of GHG emissions in Fairfax County are carbon dioxide from fuel combustion in transportation and commercial and residential buildings; methane from water treatment, solid waste, and agriculture; and process and fugitive GHG emissions from industrial facilities and energy supply systems. There are opportunities to reduce GHG emissions from each of these sources and thereby reduce the local contribution to global climate change. For each emissions source, there are many potential actions that can reduce emissions. Some actions are less expensive, easier, and faster to deploy than others. Some actions reduce emissions a great deal, while others may reduce emissions to a lesser degree, but every action helps. Some actions may have additional co-benefits, such as improved health outcomes or increased equity. These and other factors were considered by the community in selecting and prioritizing actions that the community can undertake. This plan includes community-informed actions to reduce GHG emissions, and creates a foundation for Fairfax County leadership in climate action planning by describing what schools, businesses, nonprofit organizations, and residents can do to be part of the solution. These strategies are described in detail in Section 7: Emission Reduction Strategies.

3.3 Why Develop a CECAP?

The Fairfax County Board of Supervisors, through the Office of Environmental and Energy Coordination (OEEC), initiated development of CECAP to:

- Develop a roadmap for the community to reduce GHG emissions as a first effort to involve the community in GHG emission reduction efforts and first opportunity to add individual efforts to existing county, state, and federal emission reduction efforts; and
- Provide citizens and local stakeholders a voice in the climate planning process to ensure the plan addresses local priorities and needs.

The community-driven nature of the plan is unique. Many state and local jurisdictions across the country have developed or are developing climate action plans, but many do not engage the community throughout the entire process. Because more than 95 percent of all GHG emissions in the county come from sources other than government and school operations, everyone must get involved to significantly reduce Fairfax County’s emissions.

CECAP focuses on strategies and actions that community members can voluntarily take to reduce their carbon emissions. A voluntary plan educates the community on actions that members can take to reduce their own carbon emissions while also drawing attention to legislative and regulatory initiatives related to climate issues. Voluntary individual action is an important and necessary supplement to federal, state, and local laws and regulations intended to reduce carbon emissions. The plan is akin to existing visioning documents that guide behaviors but do not mandate or legislate.

3.3.1 Fairfax County Government’s Role

The Fairfax County government recognizes that about five percent of GHG emissions in Fairfax County come from government and school operations. The Fairfax County government can use policy tools and strategic investments to reduce the community’s GHG emissions by creating programs, providing incentives, and planning smart infrastructure. Virginia is a Dillon Rule state: this means that state law is generally pre-emptive of local law unless the state confers specific powers to local government. The Dillon Rule is strictly interpreted so that if there is reasonable doubt of whether a power has been conferred to a local government, then that power is deemed not to have been conferred. In other words, the Dillon Rule limits the power of the Fairfax County government to roles that the state government has explicitly stated it has.

There are, however, areas that Fairfax County government can influence. In particular, Fairfax County government has greater influence over decisions such as local transportation planning, urban development, and waste management. A few examples of county action include the purple bin glass recycling program as well as the development of activity centers like the Mosaic District. The Fairfax County government is actively taking measures to reduce its carbon footprint and to further reduce emissions through plans, programs, and policies such as the Fairfax County Operational Energy Strategy and the Fairfax County Environmental Vision and the accompanying FY2020 Sustainability Initiatives report.

Examples of existing environmental programs and tools that can help the community in Fairfax County reduce GHG emissions include:

- Fairfax Employees for Environmental Excellence (FEEE)
- Fairfax County energy dashboard
- Energy Action Fairfax
- Solarize Fairfax County
- Fairfax County HomeWise Program
- Fairfax County Green Business Partners

See section 9 for a more detailed description of these and other policies, plans, and programs that will be part of the implementation of CECAP.

3.3.2 How Does CECAP Align with Fairfax's Goals and Values?

CECAP aligns with the Metropolitan Washington Council of Governments (MWCOG) regional GHG goals and Fairfax County's strategic goals and values, as well as the Board of Supervisors' Environmental Vision and the county's One Fairfax Policy.

The Fairfax County Board of Supervisors updated its Environmental Vision in 2017 to better protect and enhance the environment. The vision is centered on two principles:

1. The conservation of limited natural resources must be interwoven into all government decisions; and
2. The Board must provide the necessary resources to protect and improve the environment for quality of life now and for future generations.

Furthermore, the vision is focused on seven core service areas: land use, transportation, water, waste management, parks and ecological resources, climate and energy, and environmental stewardship (Fairfax County Board of Supervisors, 2017).[1] These service areas are reflected in the sectors included in CECAP , and the principles of the vision are infused throughout CECAP.

[1] See: https://www.fairfaxcounty.gov/environment/sites/environment/files/assets/documents/pdf/environmental-vision-2017.pdf.

CECAP incorporated the One Fairfax policy in its development process and in the final plan by applying an equity lens to the analysis and decision-making aspects of the process. Each action included in CECAP was assessed for its impact on equity, and the CECAP Working Group considered equity in the selection and prioritization of emission reduction strategies and actions, and in the identification of best practices for implementation. The approach taken worked to solicit feedback and input through community surveys which were published in four languages, English, Spanish, Vietnamese, and Korean. It is important to maximize equitable outcomes because climate planning actions can and have had disparate and disproportionate impacts on different people and communities. When climate planning is designed equitably, everyone benefits, and this can lead to additional benefits such as stronger economic growth and a thriving community.

In addition to aligning with Fairfax's values, CECAP aligns with the goals of other local jurisdictions in the region and MWCOG's regional goals. MWCOG is an independent, nonprofit association comprised of 300 elected officials representing 24 local governments, the Maryland and Virginia state legislatures, and U.S. Congress. COG serves as a regional partnership by creating a network for policy and planning officials to work cohesively to discuss and address the region's top priorities. To this end, COG developed the Region Forward vision, which sets ambitious goals for a more prosperous, accessible, livable, and sustainable future (MWCOG, 2021a).

COG's priorities are focused on improving housing, equity, and economic competitiveness of the region, and strengthening the Metro system, which all factor into climate action planning. More specific to the environment, COG is committed to clean air, land, and water, and fostering a more sustainable region. To achieve these outcomes, COG and member governments have focused efforts on ensuring safe water supply, revitalizing local waterways though improved wastewater and stormwater management, promoting energy conservation and alternative energy sources, supporting recycling and waste reduction efforts, and preserving forestry and agriculture resources (MWCOG, 2021b).

4 CECAP Process and Methodology

In 2018, the Board of Supervisors Environmental Quality Advisory Council (EQAC) recommended that Fairfax County create a CECAP to reduce GHG emissions in the private sector to ensure a transparent and collaborative planning process. In addition to being transparent and collaborative, CECAP is informed by the community and other stakeholders, ensuring that they have a voice in the process and final plan. This makes the process more inclusive, promotes discussion of topics that may be otherwise unchallenged or critically analyzed, and generates greater buy-in from stakeholders. In the end, the iterative process between community groups, local organizations, and other stakeholders resulted in a well-informed roadmap for the community to achieve its GHG emissions reduction goals.

The CECAP planning process, including key actors and their roles, is outlined below. For more information on the process, please visit https://www.fairfaxcounty.gov/environment-energy-coordination/cecap-process.

4.1 Key Actors and Roles

The key actors involved in the development of CECAP and their roles are described below:

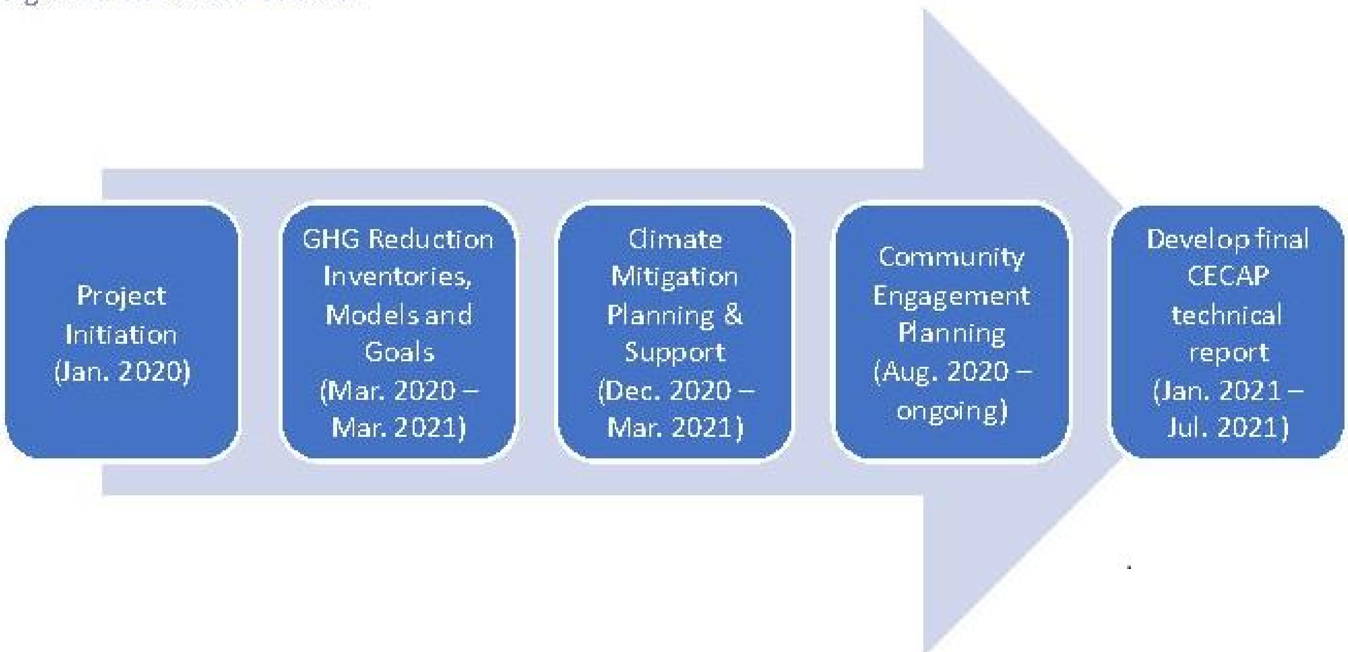
- The **Office of Environmental and Energy Coordination (OEEC)** led the process and coordinated among all the various actors.
- **ICF** supported climate action planning, technical analyses, facilitation of meetings with the community, and the development of the final CECAP report.
- **Metropolitan Washington Council of Governments (COG)** led the update of the greenhouse gas inventory and development of emissions models and goals.
- The **CECAP Working Group** served as the community decision-making body. The evolution of the Working Group is described below.
    - At the beginning of the process, members of the **Task Force** were chosen by organizations identified by the Board of Supervisors and **nine district-level Focus Groups** were nominated by their Supervisors based on their demonstrated interest and/or experience in energy and climate work. The Task Force served in a decision-making capacity and the Focus Groups served as the voice of each of Fairfax County's nine districts in an advisory capacity to the Task Force. The Task Force and Focus Groups were dissolved in October 2020 and members were invited to join the CECAP Working Group.
    - The **CECAP Working Group** ("Working Group") was comprised of members of both the Task Force and Focus Groups, and served in a decision-making role. The process shifted to a Working Group model, with two sector-based sub-groups, to allow for more voices to be heard and to allow for sector-based discussions to occur in smaller groups.
- The **Board of Supervisors** was notified of progress and process changes on a regular basis and provided key input on the process.

For clarity, when there is discussion of a specific decision in this report, the name of the group that made that decision--either the Task Force or Working Group--is used.

4.2 Timeline

There were five main steps in the CECAP development process. Each step had a distinct purpose and included several supporting actions. The five steps are shown in Figure 2 and are described in detail below.

Figure 1. The CECAP Process



Month	Milestones
January 2020	Task Force and Focus Group kickoff meetings
March 2020	Task Force meeting, focused on GHG inventory, GHG models & preliminary goal setting
July 2020	Task Force meeting, focused on setting goals for CECAP
August 2020	Public feedback sessions and survey
September 2020	Task Force meeting, focusing on reviewing public input on goals, setting goals, and beginning to discuss strategies for meeting these goals
December 2020	Task Force subgroup meetings, focusing on brainstorming draft list of strategies
January 2021	Task Force subgroup meetings, focusing on brainstorming draft list of strategies
February 2021	Public feedback sessions and surveys
March 2021	Task Force meeting, focusing on finalizing and prioritizing strategies
March 2021	Task Force meeting, focusing on finalizing and prioritizing strategies
May 2021	Task Force meeting, focusing on review of materials produced to date / draft CECAP report
June 2021	Final Task Force meeting, focusing on reviewing public feedback and finalizing the CECAP report
July 2021	Final draft of CECAP anticipated to be presented to BOS at committee meeting

4.3 Step 1: Project Initiation

To commence the project, the Board of Supervisors selected members of the community to serve on the nine district-level Focus Groups, while organizations identified by the Board of Supervisors nominated members to serve on the CECAP Task Force. Members were selected based on their demonstrated interest and/or experience in energy and climate work. In November and December 2019, the Office of Environmental and Energy Coordination (OEEC) developed a number of guiding documents and charters to inform the process and the formation of the Task Force and Focus Groups, and in January 2020 hosted kickoff meetings for each group, in coordination with ICF and COG.

4.4 Step 2: GHG Reduction Inventories, Models, and Goals

The purpose of step two was to take stock of historical and current GHG emissions to then project the likely emissions of future years and to set a goal for future emission reductions. To accomplish this, COG prepared a comprehensive GHG inventory for Fairfax County, incorporating available data for the period from 2015–2018. Based on that data, COG and ICF created four emissions models, including a business-as-usual (BAU) model that estimated future annual emissions under the assumption that no new policies or actions would be made beyond those being implemented as of 2020. Each of the models included an emission reduction goal and key strategies that could meet the goal.

Next, the Task Force provided their preference for the long-term emission reduction goal, guided by the emission reduction models. To gather input from stakeholders on goal selection, the models were presented to the Focus Groups and the broader community was engaged through public meetings in August 2020. All the input from the Focus Groups and the community was documented along with the inventory and modeling results in a summary analysis that was shared with the Task Force. The Task Force then reviewed feedback from the Focus Groups and broader community and voted on the long-term emission reduction goal and interim goal to be included in CECAP. These goals are described in Section 6: **Error! Reference source not found.**.

In March 2020, the COVID-19 pandemic disrupted daily life across the county and country. To overcome the health and logistical challenges presented by the pandemic, the CECAP planning team transitioned first to a virtual webinar-style model and then to electronic meetings for the remainder of the process as a means of engaging the various community groups, stakeholders, and project team members and to complete the process. Meetings and public forums were hosted via WebEx, a videoconferencing software that allowed CECAP project teams, the Working Group, and the public to gather virtually and to continue the CECAP planning process effectively and safely.

4.5 Step 3: Emission Reduction Planning and Support

Step three began in October 2020 with a shift in the planning approach, dissolving the Task Force and nine Focus Groups and transitioning to a Working Group model that was retained for the remainder of the CECAP planning process. The CECAP Working Group included members of the Focus Groups and Task Force, and was divided into sector-specific subgroups, one that was focused on energy and another that was focused on transportation, development, and waste. The transition to a different planning model was intended to improve the efficiency and efficacy of the CECAP process and to provide an equitable opportunity for all voices to be heard. In addition, the sector-specific Working Group model is a climate action planning best practice and allowed the group to leverage the sector-specific expertise and interests of the Working Group members.

The purpose of step three was to clearly define the actions and strategies that the community could implement to meet the emission reduction goals set in step two. ICF developed an initial set of 20 potential emission reduction actions for the various sectors mentioned previously. The set of strategies and actions was then presented to the Working Group to review and discuss which to select, and also to recommend any additional options. Once the actions and strategies were selected, ICF analyzed the economic, environmental, and social impacts of each and presented the results to the Working Group, along with a set of evaluation criteria to help the Working Group prioritize the actions and strategies. The Working Group reviewed the analysis results and applied the evaluation criteria to develop a final list of emission reduction actions and strategies for the community.

4.6 Step 4: Community Engagement Planning

OEEC undertook step four to ensure that the broader community was included in the CECAP planning process and to welcome input from all voices. To do so, the county developed messaging and outreach tools, including online materials to present the results of step two, and deployed targeted, strategic, and evidence-based outreach campaigns, including surveys, to collect and assess public opinions on the plan. Finally, public meetings were held in August 2020, February

2021, and May 2021 to provide an open and inclusive dialogue and to gather additional feedback on the plan. This community engagement will be ongoing past the planning stage into the implementation of CECAP.

4.7 Step 5: Final CECAP Technical Report Development

The purpose of step five was to compile all of the data gathered and to develop a cohesive plan describing how Fairfax County would implement the selected actions and strategies to achieve the emission reduction goals. To accomplish this task, ICF, COG and OEEC drafted this CECAP technical report, which include the GHG inventory, goals, actions, and strategies approved by the Working Group. This draft was reviewed by the Working Group and updated to integrate the group's feedback. OEEC shared the products of CECAP – goals, strategies, and action – with the broader community to foster discussion and to solicit additional feedback. The Working Group reviewed that feedback and then decided on the final revisions to the report. The final product of step five and the entire CECAP process is this technical report, which outlines the selected strategies and actions.

5 Greenhouse Gas Emissions

This section describes the community-wide greenhouse gas (GHG) emissions inventory developed for Fairfax County. After providing an overview of the results, it identifies and discusses the sectors responsible for GHG emissions in the county – principally building energy use and transportation. This section then discusses six emissions reduction scenarios that were developed for the Working Group to consider in determining an appropriate emissions reduction goal. In addition to a Business-as-Usual (BAU) scenario, five more scenarios were modeled, with resulting emissions reductions by 2050 ranging from 33 percent to 82 percent, depending on the assumptions made. In response to the Working Group's request, an additional scenario that projected an 87 percent reduction in emissions by 2050 was also modeled.

5.1 Overview: 2005-2018

The community-wide GHG inventory measured GHG-emitting activities undertaken by residents, businesses, industry, and government located in Fairfax County, as well as emissions from visitors. This inventory provided a snapshot of GHG emissions in Fairfax County in 2018, as measured in million metric tons of carbon dioxide equivalent $MMTCO_2e$).

Community-wide GHG emissions have been tracked in Fairfax County since 2005. Between 2005 and 2018, the county experienced a 15 percent growth in population, increasing from about 1.03 million to nearly 1.2 million. The 2018 inventory results show that, despite this growth, over this period total GHG emissions decreased 13 percent, from 14.52 $MMTCO_2e$ in 2005 to 12.56 $MMTCO_2e$ in 2018. Per capita emissions decreased 24 percent, dropping from 14.5 $MTCO_2e$ in 2005 to 11.0 $MTCO_2e$ in 2018.

According to the 2018 inventory, more than 90 percent of GHG emissions were the result of residential and commercial building energy consumption and transportation. As shown in Figure 3, building energy consumption (residential and commercial) accounted for 49 percent of emissions, while transportation accounted for 44 percent. The remainder of emissions comes from other activities and sources including solid waste, wastewater treatment, and process and fugitive emissions, including those associated with the release of hydroflurocarbons.

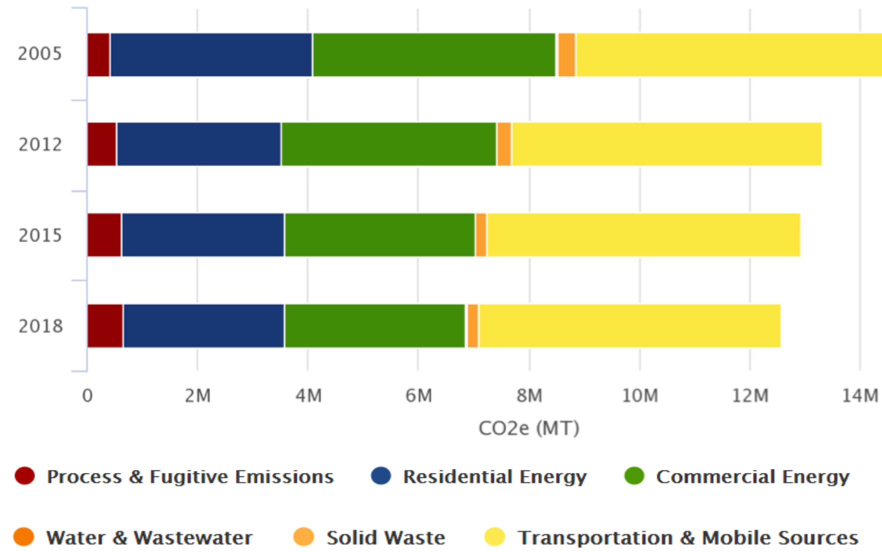


Figure 1. Fairfax County GHG Emissions by Activity

5.2 Community Inventory Methodology: 2005-2018

The Metropolitan Washington Council of Governments' (COG) Climate, Energy and Environment Policy Committee (CEEPC), created by the COG Board in 2009, has made it a priority since its inception to track progress towards local and regional GHG emission reduction goals. COG has completed local and regional GHG inventories for all COG members, including Fairfax County, and metropolitan Washington for 2005, 2012, 2015, and 2018.

COG community-wide GHG inventories are compliant with the U.S. Communities Protocol for Accounting and Reporting Greenhouse Gas Emissions (USCP), Global Protocol for Community-Scale Greenhouse Gas Inventories (GPC), and the Global Covenant of Mayors for Climate and Energy (GCoM) reporting framework guidance. COG uses ICLEI's ClearPath Community Scale Inventory Module for preparing GHG inventories, which is consistent with the US and global protocols and guidance. COG inventories use global warming potential factors from the Intergovernmental Panel on Climate Change Fourth Assessment Report (IPCC AR4).[2]

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[2] ICLEI. (2019). *U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions Version 1.2*. Retrieved from https://icleiusa.org/publications/us-community-protocol/.

In conducting its GHG emissions inventories, COG makes every effort to capture a complete and accurate picture of local GHG trends and provide for a consistent methodology that is replicable across communities and inventory years. COG inventories use public data readily-available on a consistent basis for all its local government members. COG inventories follow an *activities-based approach*, meaning emissions are calculated based on the result of activities undertaken by residents, businesses, industry, and government located in the jurisdiction, as well as emissions from visitors.

The broad categories of emission types covered by COG's GHG inventory work include the built environment (residential and commercial energy), transportation and mobile emissions, wastewater treatment, agriculture, solid waste treatment, and some process and fugitive emissions. These emission types are further broken down into 16 emissions activities and 22 separate inventory records that are calculated and added together to obtain total emissions by type and overall emissions. The gases calculated within these inventory records include carbon dioxide (CO_2), methane (CH_4), Nitrous oxide (N_2O), Hydrofluorocarbons (HFCs), and Perfluorocarbons (PFCs).

For a detailed description of the methodology, see Appendix X. This appendix outlines the methodologies of COG's GHG inventory work, providing for completeness, consistency, accuracy, replicability, transparency, and quality control.

5.3 Drivers of GHG Change: 2005-2018

ICLEI, a global network of more than 2,500 local and regional governments committed to sustainable urban development, has created a GHG Contribution Analysis tool to evaluate the biggest drivers influencing the GHG performance of cities, counties, and regions. The tool provides for a deeper understanding of the factors driving emissions changes between community-wide GHG inventory years, thereby helping to identify and prioritize more effective actions to reduce GHG emissions.[3]

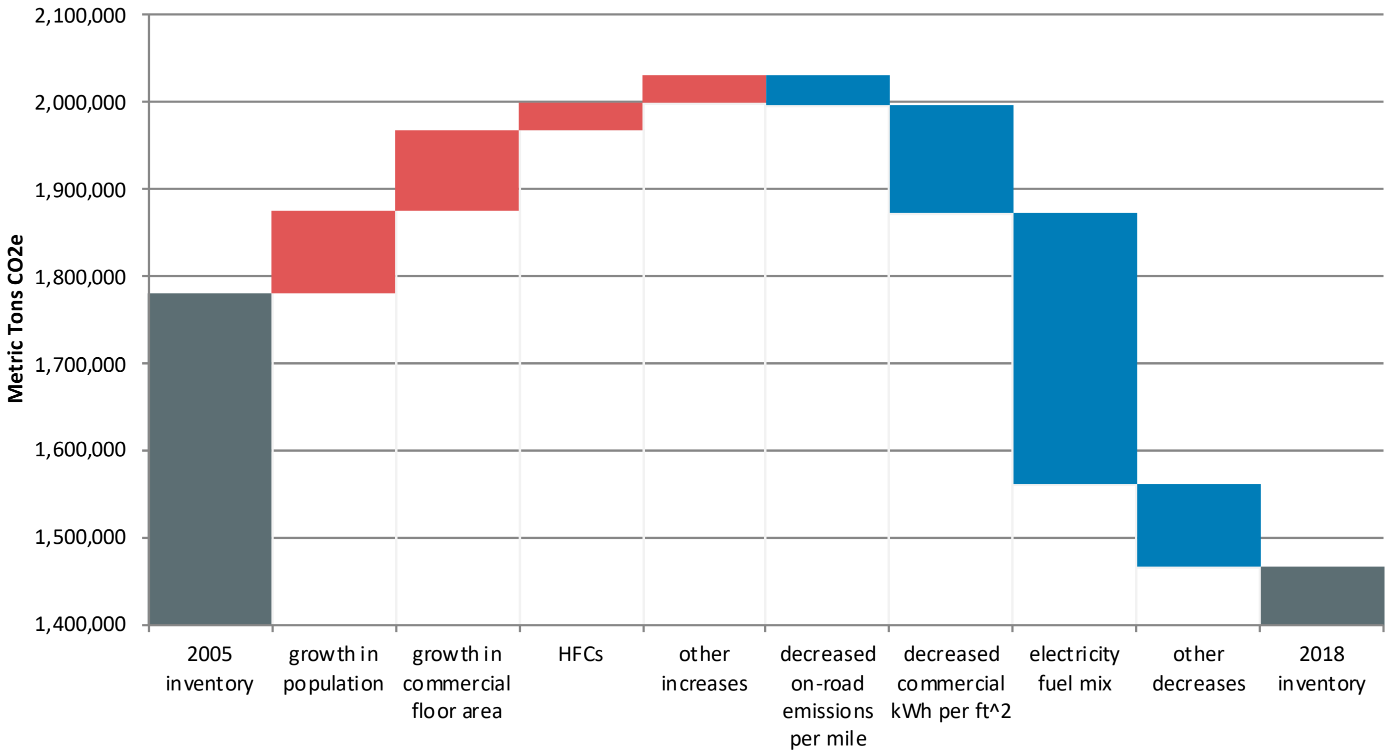
The GHG Contribution Analysis results for Fairfax County between inventory years 2005 and 2018 are shown in Figure 4. The main drivers increasing emissions, which are shown by the red bars, are primarily growth in population, commercial space, and emissions from hydrofluorocarbons (HFCs). Factors reducing emissions, which are shown by the blue bars, are primarily a less carbon-intensive electric grid, decreased commercial electricity energy intensity, and less-polluting cars.

ICLEI. (2020). *ClearPath Webpage*. Retrieved from https://icleiusa.org/clearpath/.

World Resources Institute, C40, and ICLEI. (2014). *Global Protocol for Community-Scale Greenhouse Gas Emission Inventories*. Retrieved from https://ghgprotocol.org/greenhouse-gas-protocol-accounting-reporting-standard-cities.

[3] ICLEI. (2018). *GHG Contribution Analysis Webpage*. Retrieved from https://icleiusa.org/ghg-contribution-analysis/.

Figure 2. Drivers of GHG Changes in Fairfax County



Sources: ICLEI's Contribution Analysis Model and COG GHG Inventories

5.4 COMPONENTS OF THE EMISSIONS INVENTORY: SPECIFIC SECTORS

In Fairfax County, GHG emissions are primarily attributable to energy use by buildings and by vehicle use. Together, these categories account for 93 percent of the community's GHG emissions. The remaining 7 percent of emissions are due to process and fugitive emissions and solid waste.

5.4.1 Building Energy Use

In 2018, energy consumption by Fairfax County's residential and commercial building stock accounted for 49 percent of GHG emissions. The use of electricity to light, heat, and cool buildings and to power appliances and electronics accounted for 35 percent of total GHG emissions in 2018. Natural gas consumption, primarily for heating and cooking applications, accounted for 14 percent of total GHG emissions in 2018. Less than 1.5 percent of energy-related GHG emissions in Fairfax County were due to the use of fuel oil and liquified petroleum gas (LPG), including propane.

The primary providers of electricity to the Fairfax County building sector are state-regulated electric utilities. According to data from the U.S. Energy Information Administration, in 2019, Virginia's electricity net generation was supplied primarily by natural gas (60 percent), followed by nuclear power (30 percent), biomass and other renewable resources (6 percent) and coal (4 percent). Virginia law grants electric utilities virtual monopolies in their defined service areas, so Fairfax County customers currently have only a limited ability to select their electric provider based on the provider's mix of generation resources. Nonetheless, Fairfax County residents and businesses are pursing renewable energy, with on-site solar growing significantly over the past decade. In 2010, there were 52 on-site solar systems installed in the county with a total capacity of 242 kilowatts (kW). By 2019, that figure had grown to 1,239 on-site systems with a total capacity of more than 8 megawatts (MW).

The Virginia Clean Economy Act, enacted in 2020, puts Virginia on a path to a carbon-neutral electricity sector. It mandates new measures to promote energy efficiency, sets a schedule for closing old fossil fuel power plants, and requires electricity provided by the state's largest electric utilities to be generated from 100 percent renewable sources such as solar or wind.

5.4.2 Transportation

Fairfax County's transportation emissions accounted for about 44 percent of total GHG emissions in 2018, with on-road mobile emissions the largest contributor, at about 37 percent of the county's total GHG emissions. The remaining 7 percent of transportation emissions are due to off road mobile emissions, rail transportation including emissions from the Virginia Railway Express commuter trains, and air passenger travel emissions.

All vehicle movement on Fairfax County roads are accounted for in the community-wide GHG inventory. This includes all passenger cars, passenger trucks, motorcycles, school buses, transit buses, intercity buses, refuse trucks, light commercial trucks, motor homes, single unit short-haul trucks, single-unit long-haul trucks, combination short-haul trucks, and combination long-haul trucks. The inventory accounts for all travel occurring on the roadways in Fairfax County, regardless of where the trips originate and terminate. Vehicles that start or stop a trip in the County or pass through the county are incorporated into the emissions inventory.

The category of off-road mobile emissions captures emissions from nonroad equipment using gasoline, diesel, compressed natural gas and LPG. Nonroad mobile sources include lawn and garden equipment, light commercial equipment, industrial equipment, construction equipment, agricultural or farm equipment, recreational land vehicles or equipment, and railroad maintenance equipment.

Commercial aircraft emissions are calculated for air passenger trips originating in the region. This includes all air passengers leaving Fairfax County that fly out of Baltimore-Washington International Thurgood Marshall Airport (BWI), Ronald Reagan Washington National Airport (DCA), and Washington Dulles International Airport (IAD). This includes personal travel and business travel by people who live, work, or were visiting Fairfax County.

5.4.3 Process and Fugitive Emissions

Process and fugitive emissions accounted for about 5 percent of Fairfax County's 2018 GHG emissions. These emissions include hydrofluorocarbon (HFC) emissions commonly used in air conditioning and refrigerants, as well as fugitive emissions, which are mainly attributable to leaks in the natural gas distribution systems serving Fairfax County.

HFCs are potent greenhouse gases - 3,830 times more potent than CO_2 – with high global warming potentials. They are comprised of several organic compounds, including hydrogen, fluorine, and carbon, that are produced synthetically. Because they have an ozone depletion potential of zero, they have gradually replaced chlorofluorocarbons (CFCs). Local HFC emissions are estimated by downscaling national numbers calculated by the U.S. Environmental Protection Agency (EPA).

While leaks in natural gas distribution systems are the primary source of fugitive emissions, there are two other sources: water and wastewater treatment, including septic and sewer systems in Fairfax County, and agriculture. Each of these two categories accounted for less than 0.1 percent of total 2018 Fairfax County emissions.

5.4.4 Solid Waste

Municipal solid waste (MSW) combustion accounted for remaining Fairfax County 2018 GHG emissions, at almost 2 percent. Fairfax County no longer landfills solid waste; instead, it disposes of it at a commercially-operated waste-to-energy (WTE) facility located within the county that generates electricity from waste incineration. In 2018, local jurisdictions in the region sent approximately 1.07 million tons of MSW to this WTE facility, with Fairfax County contributing approximately 58 percent of the total.

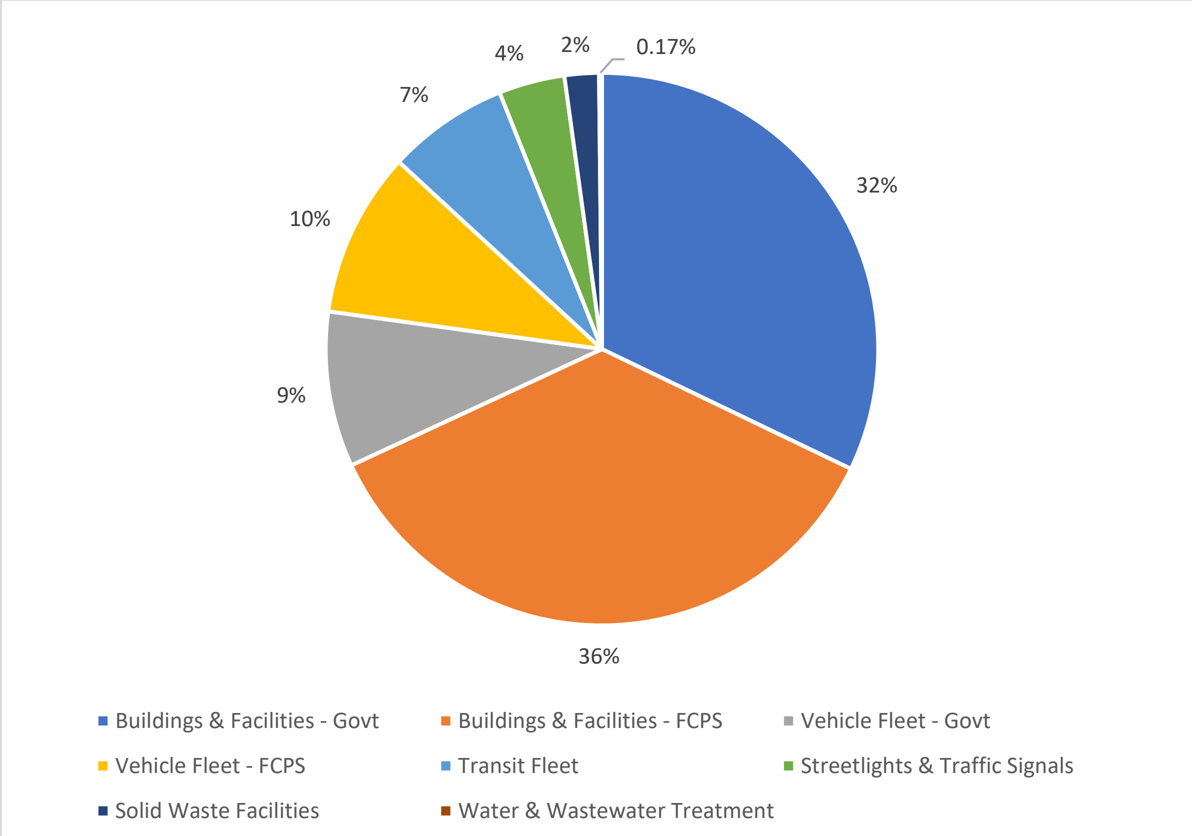
5.5 County Operations Emissions Inventory

The emissions inventory also measured GHG-emitting activities attributable to Fairfax County Government and the Fairfax County Public Schools (FCPS), following ICLEI's Local Government Operations Protocol (LGOP). Inventory results showed that approximately 4 to 5 percent of Fairfax County's community-wide GHG emissions result from government operations. or 562,439 $MTCO_2e$ (metric tons of carbon dioxide equivalent).

The inventory of local government operations addressed five categories, with the results shown in Figure 5 and described below:

- The built environment, which accounted for 68 percent of total county operational emissions, with:
  - 36 percent attributable to FCPS buildings; and
  - 32 percent attributable to Fairfax County government buildings.
- Transportation emissions, which accounted for 26 percent of total county operational emissions, with:
  - 10 percent from the FCPS vehicle fleet;
  - 9 percent from the county government vehicle fleet; and
  - 7 percent from the transit fleet.
- The remaining 6 percent of total county operational emissions were attributable to solid waste treatment for both county government and schools (4 percent), streetlights, traffic signals and outdoor lighting (2 percent), and wastewater treatment (0.17 percent).

Figure 3. Fairfax County 2018 Government and Schools GHG Emission Sources



5.6 Modeled Scenarios for Consideration in Goal-Setting

Several scenarios were modeled to assist the Working Group in setting goals for greenhouse gas emissions reductions. A Business-as-Usual scenario allowed the Working Group to consider emissions levels in the absence of significant change in policies, technologies, practices and behaviors. Five emissions reduction scenarios were developed to analyze the potential of mitigation actions that could be taken to reach certain percent reductions in GHG emissions by 2030 and 2050.

5.6.1 Business-As-Usual Projections and Methodologies[4]

Business-as-usual (BAU) projections provide a baseline scenario for evaluating future GHG emissions. BAU projections take into account driving factors such as growth in population, housing and commercial development and the impact they will have on future GHG emissions. BAU projections reflect policies, technologies and practice that have been in

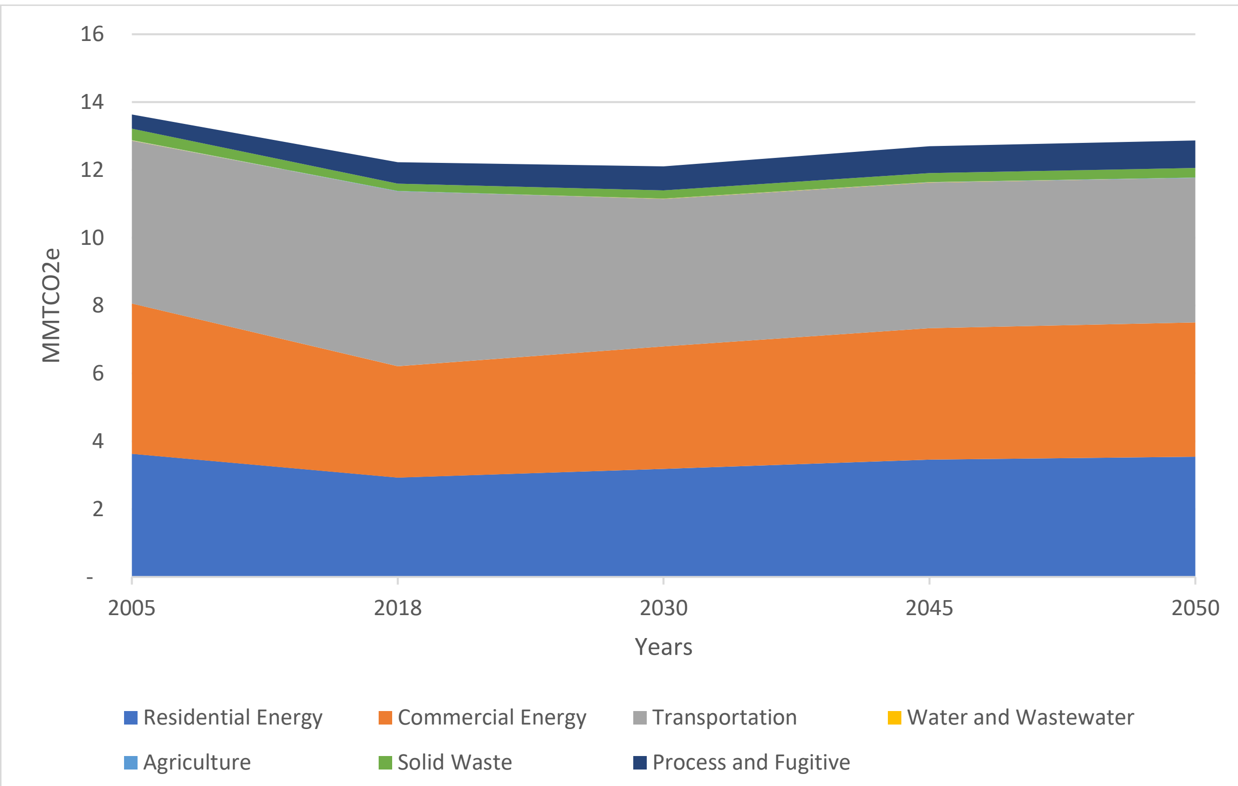
[4] Intergovernmental Panel on Climate Change. (2018). AR5 Annex II Glossary. Retrieved from https://www.ipcc.ch/site/assets/uploads/2018/02/WGIIAR5-AnnexII_FINAL.pdf.
Metropolitan Washington Council of Governments. (2019). *Climate Planning Work Session Meeting Documents*. Washington D.C. Retrieved from https://www.mwcog.org/events/2019/11/20/climate-planning-work-sessions/.

place and implemented to-date to reduce GHG emissions, but do not assume or incorporate any additional GHG emission reductions from anticipated future action. BUA projections assume there will be no significant change in the public's attitudes and behaviors.

A Fairfax County BAU scenario was developed to project emissions out to 2030 and 2050. Figure 6 shows Fairfax County's anticipated BAU emissions projected out to 2050. Results indicate that on-road transportation emissions decrease from 2018 until about 2030 but are offset by increases in building energy consumption.

Section XX through XX below describe the methodology used to derive BAU projections for each of the emissions sectors.

Figure 4. Fairfax County Business-As-Usual Projections



Note: Includes effects of population on residential energy, vehicle miles (VMT), and waste generation.

5.6.1.1 Building Energy Emissions

Energy projections for both residential and commercial buildings include electricity, natural gas, fuel oil, and liquefied petroleum gas (LPG) for existing buildings as well as new construction.

Energy consumption for existing residential and commercial buildings for all fuel types was held constant from 2018 to 2050.

For new construction, projections regarding annual electricity and natural gas consumption differed, depending on whether the building was residential or commercial:

- Projections for residential buildings were derived from household growth in conjunction with a composite household energy use intensity (EUI). This composite EUI factors in average site energy consumption by housing unit type and the distribution of housing types in the county.

- Projections for commercial buildings were derived from anticipated commercial sector growth in conjunction with commercial energy use intensity (EUI) statistics. Commercial building space per 1,000 jobs was estimated for 2018, then used along with employment projections to project new commercial space by year. EUI was then applied to estimate projected energy consumption.

Total electricity emissions projections for residential and commercial buildings were calculated by applying the 2018 electric grid emissions factor to total residential and commercial electricity consumption projections from 2019 to 2050, respectively.

Similarly, total natural gas emissions projections were calculated by applying the existing natural gas emissions factor to total residential and commercial natural gas consumption projections from 2019 to 2050, respectively.

5.6.1.2 Transportation Emissions

The BAU forecast for On Road transportation utilizes Fairfax County Summary data for Vehicle Miles Travelled (VMT) and $MTCO_2e$ as estimated by EPA's MOVES model to 2045. These are used to derive simple $MTCO_2e$/mi rates that vary across the region as a result of the differences in road network and other factors between counties. As there is currently no official projection for 2050 VMT or GHG emissions from on road transportation, the trends from the MOVES model were used to project the final five years.

The emissions rate from off road mobile sources was held constant from inventory year 2018.

Commuter rail emissions were projected forward based on expected annual percent increases in transit ridership from 2018 to 2030. This same annual percent increase was used to project emissions growth from 2030 to 2050.

5.6.1.3 Process and Fugitive Emissions

Fugitive hydrofluorocarbon (HFC) emissions are based on emissions per capita, multiplied by expected population increases. Natural gas fugitive emissions are projected using the annual natural gas consumption in therms taken from residential and commercial gas estimates and an emissions rate from the 2018 inventory.

As noted, the two remaining sources of process and fugitive emissions in Fairfax County – wastewater and agricultural emissions – are de minimis, accounting for approximately 0.2 percent of total emissions. Wastewater emissions for both septic and sewer treatment were based on emissions per capita and the percentage of the population using the treatment method, multiplied by expected population increases. Changes in agricultural emissions were based on recent trends in acres of land in production as a proxy.

5.6.1.4 Solid Waste Emissions

Solid Waste combustion emissions projections were based on waste generation per capita, multiplied by expected population growth, similar to wastewater treatment projections. These projections assume no change in disposal practices.

5.6.2 The 2050 Emissions Reduction Scenarios[5]

Fairfax County's GHG emissions reduction scenarios were developed by the COG emissions team to analyze the potential of mitigation actions that could be taken by county residents and businesses to reach certain percent reductions in GHG emissions by 2030 and 2050. These scenarios leverage a previous scenario analysis conducted in 2015 by the COG Multi-Sector Working Group (MSWG). The work of the MSWG, which included professionals from COG member jurisdictions, included identifying viable, implementable local, regional, and state actions with respect to buildings, energy, transportation and land use.

The MSWG results were updated based on new data and progress since the MSWG completed its work. In addition, based on the assumptions made in the MSWG report:

- Reduction estimates related to energy efficiency, grid improvements and renewable energy were applied only to the electricity segment of the building energy categories, equating to approximately 58 percent of residential energy GHG emissions and 82 percent of commercial energy GHG emissions.
- Reduction estimates applied to transportation were focused on improvements to on-road mobile emissions, which accounts for 92 percent of mobile emissions, with improvements further focused on improvements to light duty vehicles, which account for 64$ of on-road transportation emissions.

Five main emission reduction scenarios were developed for 2030 and 2050 milestone years. The five initial scenarios produced emissions reductions by 2050 from 2005 levels that ranged from 33 percent to 82 percent. These five scenarios, described in order of increasing level of resulting emissions reductions, are:

A. **A low-moderate reduction scenario** for both energy and transportation (both 2030 and 2050), resulting in a 33 percent emissions reduction below 2005 levels by 2050.
   Key assumptions: By 2050, (i) a 43 percent reduction in emissions from the electric grid; and (ii) growth in low carbon transportation improvements leading to a 41 percent emissions reduction for light duty vehicles.

B. A **more aggressive reduction scenario than (A)** for both energy and transportation (both 2030 and 2050), resulting in a 37 percent emissions reduction below 2005 levels by 2050.
   Key assumptions: By 2050, (i) a 52 percent reduction in emissions from the electric grid; and (ii) a more rapid expansion of low carbon transportation leading to a 47 percent emissions reduction for light duty vehicles.

C. A **Net Zero Grid and Low Carbon Transportation Scenario** (only 2050), resulting in a 59 percent emissions reduction below 2005 levels by 2050.

[5] Metropolitan Washington Council of Governments. (2016). *Multi-Sector Approach to Reducing Greenhouse Gas Emissions in the Metropolitan Washington Region Final Technical Report.* Washington D.C. Retrieved from https://www.mwcog.org/documents/2016/08/01/multi-sector-approach-to-reducing-greenhouse-gas-emissions-in-the-metropolitan-washington-region-final-technical-report/.

Metropolitan Washington Council of Governments. (2019). *The Future of Housing in Greater Washington*. Washington D.C. Retrieved from https://www.mwcog.org/documents/2019/09/10/the-future-of-housing-in-greater-washington/.

National Renewable Energy Laboratory. (2018). *Electrification Futures Study: Scenarios of Electric Technology Adoption and Power Consumption for the United States*. Golden, CO. Retrieved from https://www.nrel.gov/analysis/electrification-futures.html.

Derived from: ICF. (2020). Study on the Use of Biofuels (Renewable Natural Gas) in the Greater Washington, D.C. Metropolitan Area. Fairfax, VA. Retrieved from https://washingtongasdcclimatebusinessplan.com/.

Key assumptions: By 2050, (i) a Net Zero Grid – that is, an electric grid powered 100 percent by renewable generation – and; (ii) near -complete expansion of low carbon transportation for light duty vehicles, resulting in an 85 percent emissions reduction in transportation emissions.

D. **Net Zero Grid, Low Carbon Transportation and Low/High Penetration of Low Carbon Gas Scenario** (only 2050), resulting in a 71 percent emissions reduction below 2005 levels by 2050. This scenario differs from Scenario C in that it assumes significant use of renewable natural gas.

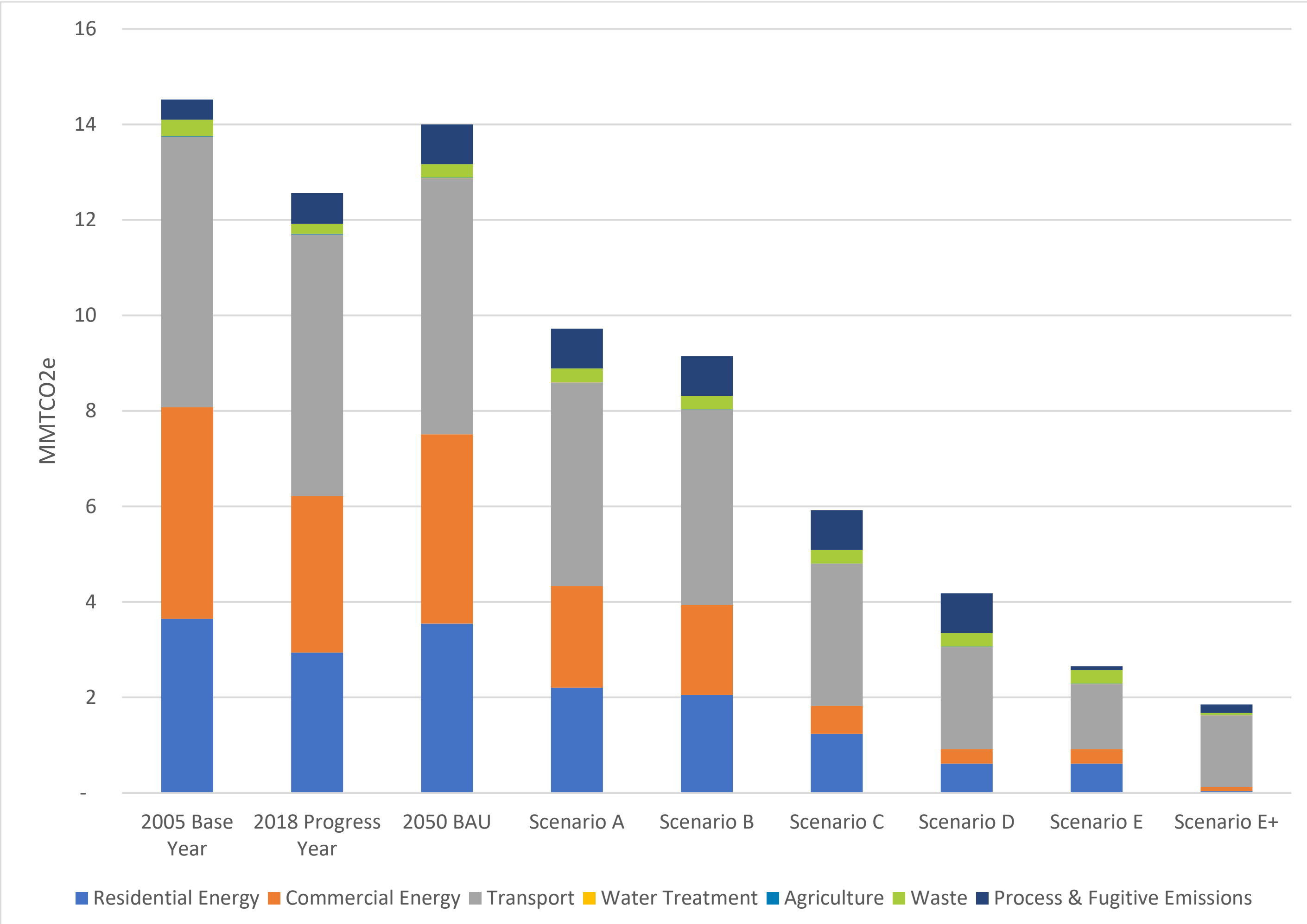
   Key assumptions: By 2050, (i) a Net Zero Grid; (ii) near-complete expansion of low carbon transportation for light duty vehicles; (and (iii) a high penetration (50 percent) of renewable natural gas (RNG).

E. **An 80 percent Total Emissions Reduction by 2050 (80x50) Scenario** (only 2050). Though captioned as "80x50," the result of the actions undertaken in this scenario resulted in an 82 percent emissions reduction below 2005 levels by 2050.

   Key assumptions: By 2050, (i) a Net Zero Grid; (ii) low carbon transportation penetration for both on-road and off-road vehicles and equipment leading to a75 percent emissions reduction in mobile emissions; (iii) a 50 percent penetration of RNG; and (iv) the phase-out of hydrofluorocarbons (HFCs).

After these scenarios were presented, the Working Group requested an even more aggressive emissions reduction scenario. In response to this request, the COG team developed **Scenario E+**, which resulted in an 87 percent total GHG emissions reduction by 2050, or an additional emissions reduction of 5 percent as compared to Scenario E. Scenario E+ supplemented Scenario E by (i) increasing the penetration of RNG from 50 percent to 97 percent for residential use and to 85 percent for commercial use and (ii) assuming an 80 percent reduction in solid waste emissions. The results and emissions reduction impacts of Scenarios A through E+ are illustrated in Figure 7 below.

Figure 5. Fairfax County's 2050 GHG Emission Reduction Scenario Results



6 Greenhouse Gas Reduction Goals

This section presents the goal setting process and the long-term, interim, and sector-specific goals selected by the CECAP Working Group, with input from the community and key stakeholders. The selected goals will guide emissions-related activities in the county for decades to come.

6.1 Goal-Setting Process

Fairfax County's GHG reduction goals were developed through a deliberative, evidence-based, and communal process to ensure the final goals were based on science, community priorities, and stakeholder input. After the GHG inventory, models, and summary analysis of the results and stakeholder input were completed by ICF and COG, they shared the results with the Task Force to update it on the findings and to facilitate a goal-setting exercise. The GHG inventory, the business-as-usual (BAU) projections, and other scenario data are the most critical data for goal setting, as they indicate the most recent historical emissions levels, and the likely future emissions levels given certain assumptions. Given this historical data and considering the various future scenarios, the Task Force was able to determine goals that struck the right balance between what was ambitious and science-based and what was technically feasible and realistic and was able to identify key emissions sources on which to focus reduction efforts.

Base year: The historical year against which the future reduction goal will be compared.

Target year: The future year by which the communities aim to achieve its goal.

Goal boundary: Defines what emissions sources are included in the base and target years.

Goal type: The type can vary and may include short-term, long-term, sector-based, and others.

In addition to the inventory and scenario data, the county used the internationally accepted GHG goal setting framework developed by the Greenhouse Gas Protocol[6] to effectively set its GHG reduction goals. This process includes selecting a base year, a target year, the goal boundary, and the goal type. The base year is the historical year against which the future reduction goal will be compared. The target year is the future year by which the communities aim to achieve its goal. The goal boundary defines what emissions sources are included in the base and target years. Multiple target years can be set—often, jurisdictions set a long-term goal, e.g., for 2050, and one or several interim goals, e.g., 2030 or 2040, that act as milestones guiding the trajectory to the long-term goal. Once the base year, target year, and boundaries were set, Fairfax County had to decide what kind of goal to set, and if they wanted multiple goals and sector-specific goals, i.e., specific sector goals that track key metrics for sectors.

The Task Force considered all of this information and undertook the goal-setting process. The Task Force members initially voiced preferences for a long-term goal to be carbon neutral by 2050 and an interim GHG emissions reduction goal for 2025 or 2030. Additionally, the Task Force indicated interest in setting sector-specific goals for the transportation and energy sectors. Community members weighed in on the initial progress via online surveys and at three community meetings. Nearly 2,000 individual responses were received from all over the county. See section 8: Community Engagement for more information about this process. In September 2020, the Task Force met and reviewed

[6] See: https://ghgprotocol.org/mitigation-goal-standard.

the public input and additional data before discussing the various options. Finally, after discussions were complete, the Task Force voted on initial GHG reduction goals for Fairfax County.

6.2 Selected Goals

Ultimately, the Task Force set two goals, a long-term goal for 2050 and an interim goal for 2030 **(TO BE UPDATED)**.

- **Long-term target goal:** Fairfax County will aim to achieve carbon neutrality by 2050 from a 2005 base year, with at least 87 percent coming from GHG emission reductions. A 2005 base year was selected for GHG reduction goals in order to align with international emission reduction targets such as the Paris Agreement as well as for consistency and comparability to other jurisdictions.

- **Interim year goal: 2030:** Fairfax County will reduce GHG emissions by 50 percent by 2030, compared to 2005.

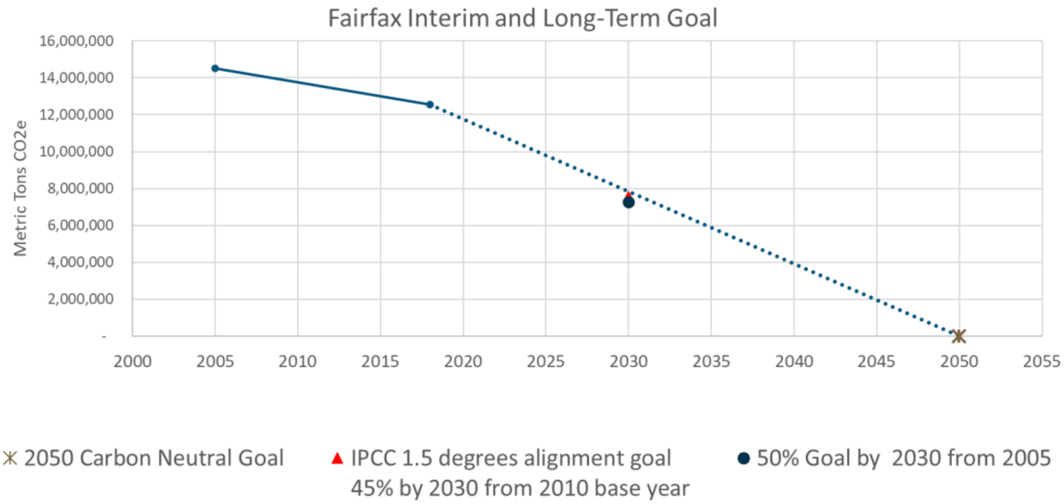
- **Interim year goal: 2040**: This goal is in progress. Based on discussions at the March Working Group sector subgroup meetings, there is a preference for a 2040 interim year goal. The final vote for the goal and percent reduction will occur at the May meeting.

- **Sector-specific goals**: This goal is in progress. Based on discussions at the March sub-group meetings, there is a preference for sector-specific goals. The final vote for the goal(s) will occur at the May meeting.

During the goal-setting process, several Task Force members voiced a preference for a carbon neutrality goal that emphasizes actual emission reductions over the use of carbon offsets. Carbon offsets comprise a range of emission reduction measures not directly covered in a defined emission reduction policy framework that can be used to "offset" emissions that are deemed difficult and or costly to reduce under the policy scheme. The scenario modeling conducted by MWCOG and ICF determined that an 87 percent reduction in emissions was technically feasible given today's technologies, and future technologies may offer additional reduction opportunities. It is for this reason that the community's long-term goal specifies at least an 87 percent reduction in actual emissions.

The 2030 interim goal was selected because it aligns with the Intergovernmental Panel on Climate Change (IPCC)'s finding that a science-based goal should consider the level of decarbonization required to keep global temperatures below a 1.5^{o}C increase. Keeping temperatures below this threshold will avert the more dangerous impacts of climate change (IPCC, 2018).

Figure 6: Fairfax County Long-term and Interim Targets



The 2040 GHG target will be added to the chart when/if the percent reduction is voted on by the Working Group at the May Meeting. There was a preference expressed by some Working Group members to hold on selecting a percent reduction until later on (e.g., in 2030).

7 Emission Reduction Strategies

7.1 Introduction to the CECAP Framework

CECAP includes strategies and actions that community members can take to reduce emissions. The CECAP Framework was developed by the Working Group, in consultation with consultants and the broader public. See Section 4: CECAP Process and Methodology for more on the planning process.

Within this framework, the terms sector, strategy, action, implementation, and impact have specific meanings and are defined in the textbox to the right.

This section provides background on the CECAP strategy framework and is followed by a discussion of each of the actions that can be taken to reduce emissions.

Some definitions:

Implementation: Programs or policies that support realization of actions.

Sector: An area of emissions focus or an economic sector which generates GHG emissions from its energy use or economic activity.

Strategy: A broader set of actions or set of sub-sector work that can be modeled to understand emissions reductions.

Action: A project or specific technology that impacts greenhouse gas emissions within a strategy or sector.

Impact: Effect of a strategy or action on a specific value or indicator.

7.1.1 CECAP Framework

The framework includes five sectors, 12 strategies, and 36 actions. Each action impacts the community differently and has different implementation methods. Each strategy and its associated actions are described in greater detail in the following sections.

Buildings and Energy Efficiency

- Strategy #1: Increase energy efficiency and conservation in existing buildings.
- Strategy #2: Pursue beneficial electrification in existing buildings.
- Strategy #3: Implement green building standards for new buildings.

Energy Supply

- Strategy #4: Increase renewable energy in grid mix.
- Strategy #5: Increase production of onsite renewable energy.
- Strategy #6: Increase energy supply from renewable natural gas (RNG), hydrogen, and power-to-gas.

Transportation

- Strategy #7: Increase electric vehicle (EV) adoption.
- Strategy #8: Support efficient land use, active transportation, public transportation, and transportation demand management (TDM) to reduce vehicle miles traveled.
- Strategy #9: Increase fuel economy and use of low carbon fuels for transportation.

Waste

- Strategy #10: Reduce the amount of waste generated and divert waste from landfills and waste-to-energy facilities.
- Strategy #11: Responsibly manage all waste generated including collected residential and commercial waste, wastewater and other items.

Forestry and Land Use

- Strategy #12: Support preservation, restoration, and expansion of natural systems and green spaces.

7.1.2 Impact Categories

All of the activities described in the CECAP Framework will need to be undertaken in order to achieve emission reduction goals. Still, Fairfax County residents, businesses, and other stakeholders have diverse priorities and values that may lead to the selection of one action over another. To help community members decide which actions to take, each action section describes the action's various potential impacts.

These impact categories assessed include:

- **Greenhouse Gas (GHG)**: A measure of the total GHG reduction potential from each strategy. GHG emissions were estimated based on ICF's quantitative modeling of the various strategies and actions. For each strategy, ICF estimated the GHG impact measured in metric tons of carbon dioxide equivalent (MTCO2e) that represents the fully implemented technical potential.
- **Public Health:** A measure of how the action benefits the health of Fairfax residents and visitors by improving air or water quality, increasing active commuting, or supporting wellness.
- **Environmental Resource:** A measure of how the action impacts the preservation, improvement, and restoration of environmental resources such as air, water, and land; this impact category does not encompass GHG emission impacts, since that impact is captured under the GHG impact category.
- **Economic Opportunity:** A measure of how the action might lead to local or regional job and/or business growth in economy.
- **Equity, i.e., One Fairfax:** A measure on how and if the action has an impact on eliminating social and/or racial inequities in alignment with Fairfax County's One Fairfax policy.
- **Payback:** A measure of total costs divided by cost saved from the action. A simple payback is meant to serve as a proxy for cost effectiveness. The payback is based on the cost to the individual or organization that pays for the action.
- **Cost to Community Member:** A measure of initial investment of dollars spent by a community member (i.e., individual) to implement the action at one location or in one instance. The community member is the individual or organization that pays for the action.
- **Timeframe:** A measure of when this action might be taken and when the technology is mature. Some technologies and actions are already available in the customer marketplace, while others are not yet deployed at scale, not yet available at all, or currently are restricted by either local or state policy.
- **Other Considerations:** A measure of other considerations specific to the action not included in other impact categories. This impact category is designed to cover considerations that are unique to a particular action or strategy. These may include a variety of considerations such as feasibility and scalability; life cycle emissions impact (as opposed to annual emissions); impact on climate adaptation, resiliency, and/or hazard mitigation;

and evaluation of whether the action is holistic in its approach (e.g., how it might influence and interact with another action) and how it aligns with other Fairfax plans and stakeholder work; among others.

Note on costs: Not all actions selected by community members to reduce GHG emissions will incur costs. Some actions simply involve behavior change. To the extent that a cost is associated with an action, that cost can be recovered by the community member through the member's own resources (e.g., through savings that result as a result of the action) or through applicable programs including federal, state, and local programs, such as grant, incentive and tax-credit and tax rebate programs. Available programs are expected to expand over time and will likely include governmental programs as well as programs offered by non-governmental entities, including businesses (including energy utilities), manufacturers, and other non-governmental organizations.

7.1.2.1 Impact Category Symbols

Impacts are visualized in the report using notations, as presented in the table below.

Impact Indicators	Notation
Impact Indicators for Social Impacts	
Detrimental or unfavorable Impact	--
Slighting detrimental or unfavorable impact	-
Neutral or no potential Impact	=
Slightly beneficial or favorable impact	+
Beneficial or favorable Impact	++
Impact Indicators for Payback	
Not Applicable	N/A
High or Quick Payback (1-3 years)	1-3 years
Medium Payback (3-7 years)	3-7 years
Low or Slow Payback (over 7 years)	> 7 years
Impact Indicators for Cost to Community Member	
Not Applicable	N/A
No Cost	$0
Low Cost	<$300
Medium Cost	$300-$2000
High Cost	>$2000
Impact Indicators for Timeframe:	
Action/Technology is currently available, and is being commercially deployed at significant scale	Immediate (Available presently)
Action/Technology is currently available, but not yet commercially deployed at significant scale (1-10 years from broad implementation)	Soon (Available before 2030)
Action/Technology is not yet available, emerging technology (Over 10 years from broad implementation)	Future (Available after 2030)

7.1.3 Implementation Categories

Implementation best practices were developed by the Working Group. Each strategy has implementation methods that are grouped into one of four categories, which indicate where the ability to impact change might exist. These implementation categories were developed because Virginia is a Dillon Rule state. The Dillon Rule declares that state law is pre-emptive of local law unless the state confers the power to local government. The Dillon Rule is strictly interpreted so that if there is reasonable doubt of whether a power has been conferred to a local government, then it has not been.

Implementation best practices may fall into one or more the following categories.

- **Individual**: Voluntary actions that individuals, businesses and organizations can take now.
- **County - Implementation programs and policies <u>currently available</u> to Fairfax County:** County measures and voluntary programs that the county can do right now.
- **State-Enabling - Implementation programs and policies that <u>might become available</u> to the county in the future:** County programs and policies that the county might someday be able to do with state enabling legislation. Items in this section is work that the county and its stakeholders can advocate for at the state level.
- **State & Federal - Implementation programs and policies that <u>need regional, state or federal action</u>:** State and federal measures and programs that the county will likely have the authority to do on its own. Items in this section is work that the county and its stakeholders can advocate for the state, regional or federal to do to support county goals.

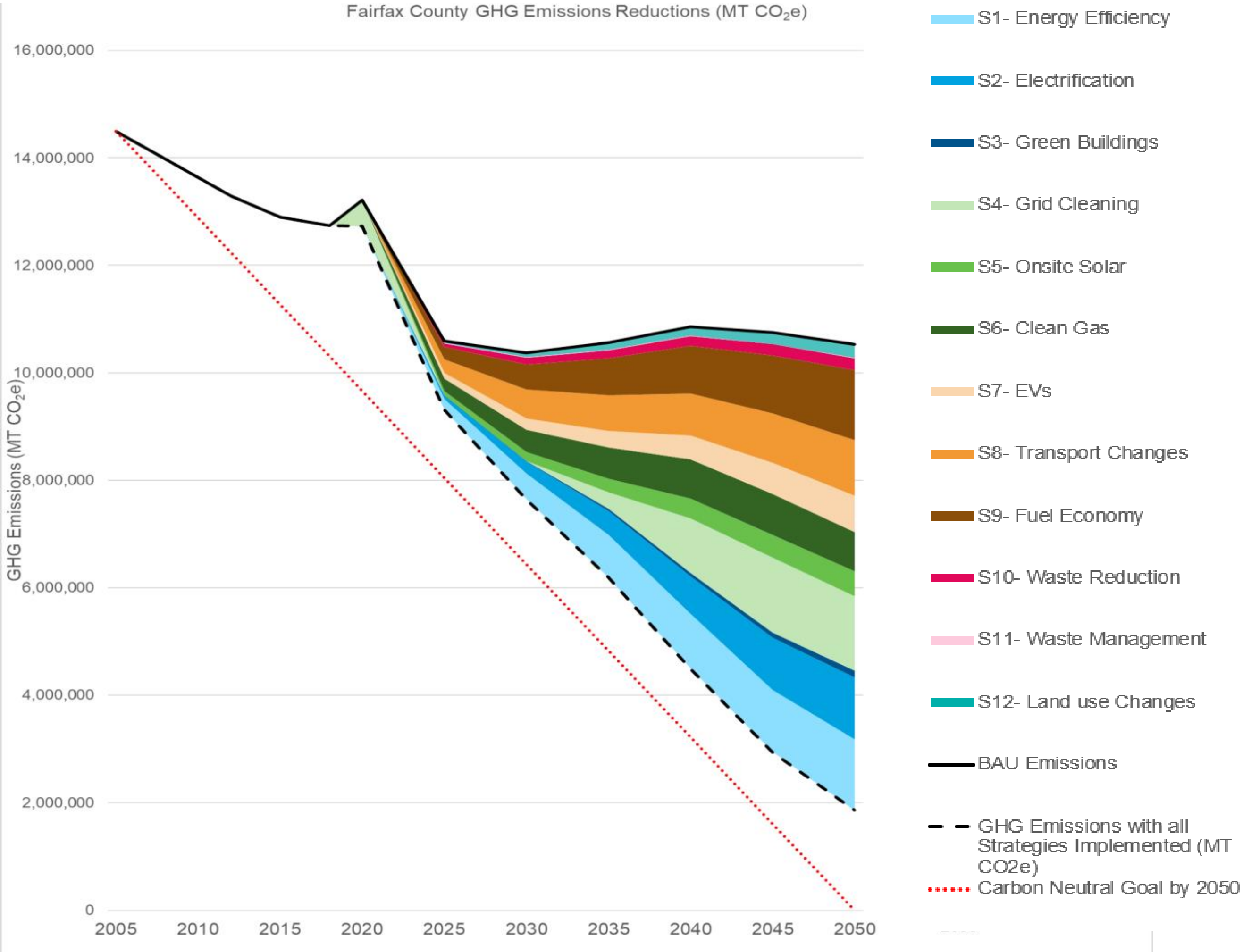
7.2 Strategies and Actions

7.2.1 Greenhouse Gas Emission Reduction Modeling

Actions taken within each of strategies in the CECAP framework will help Fairfax County to achieve the selected GHG goals. Each of the twelve strategies were modeled to show the emission reduction potential in terms of metric tonnes of carbon dioxide equivalent ($MTCO_2e$) by 2050. In general, GHG reductions were estimated by applying the technical potential of full implementation for each strategy as compared to a business-as-usual case. The assumptions underlying full implementation are based on actions prioritized by Working Group members and in consultation with industry experts.

The modeled GHG emission reductions from each strategy are presented in Figure 9: Modeled GHG Emission Reductions from 2005 to 2050. GHG modeling assumptions are described in each strategy section.

Figure 7: Modeled GHG Emission Reductions from 2005 to 2050



7.2.2 Impact Category Matrix by Action

Due to the ambitious nature of the GHG goals, all strategies and actions must be part of the solution. Community members are encouraged to prioritize which actions to take based on the various impact categories, and how those impact categories align with their resource levels and values.

For example, if a member of the community wants take action to reduce emissions at a low cost while enhancing public health, they might consider Action 8a. Bicycle and pedestrian infrastructure, which has two plus signs (++) indicating a favorable impact on public health, has a short payback between 1-3 years, and has a low cost to the community member.

A note on the **Working Group's Priorities:**

Based on the analysis of the impact categories, the Working Group prioritized actions under **Strategy 1: Increase energy efficiency and conservation in existing buildings** and **Strategy 8**: **Support efficient land use, active transportation, public transportation and transportation demand management (TDM)** to reduce vehicle miles traveled. The Working

Group emphasized Strategy 1 because of its potential to significantly reduce GHG emissions, and emphasized Strategy 8 because of its high GHG reduction potential as well as the possibility to promote equity through access to job centers, transit, and affordable housing. See Appendix X for more on the Working Group's prioritization exercise and discussion.

Table 1 provides the impact categories and symbols by action and GHG impact by strategy. Further details about each impact are provided for each individual action under Section 7.2.3: Overview of Strategies and Action Sections.

Table 1: Summary of All Impact Categories by Action

No.	Description	GHG ($MTCO_2e$ Reduced) by Strategy	Public Health	Environ-mental Resource	Economic Opport-unity	One Fairfax	Pay-Back (yrs)	Cost to Comm-unity Member	Timeframe
S1	**Increase energy efficiency and conservation in existing buildings**								
1a	Energy efficiency in residential buildings	1,325,026	++	+	++	=	3-7	>$2000	Immediate
1b	Energy efficiency in commercial buildings		++	+	++	=	>7	$0	Immediate
1c	Energy efficiency in local government existing buildings and streetlights		+	+	+	+	3-7	<$300	Immediate
1d	District energy and CHP systems		+	+	+	+	3-7	<$300	Immediate
1e	Gas and electricity demand programs		=	+	=	=	1-3	<$300	Immediate
S2	**Pursue beneficial electrification in existing buildings**								
2a	Beneficial electrification in existing residential buildings	1,147,491	+	++	+	=	3-7	>$2000	Immediate
2b	Beneficial electrification in existing commercial buildings		+	++	+	=	>7	$0	Immediate
2c	Reduction in the use of high GWP refrigerants		=	=	=	=	N/A	$0	Soon
S3	**Implement green building standards for new buildings**								
3a	Increased building code stringency for residential and commercial buildings	128,518	++	+	=	=	>7	$300-$2000	Immediate
3b	All-electric new residential and commercial construction		+	++	=	=	>7	$300-$2000	Immediate
3c	Green building principles and practices		+	+	=	=	1-3	$0	Immediate
3d	Reuse of existing buildings		=	++	=	=	3-7	$0	Immediate
S4	**Increase renewable energy in grid**								
4a	Offsite grid renewable energy in region including solar, on and off-shore wind, hydroelectric, and other emerging technologies	1,387,127	=	++	++	=	1-3	<$300	Immediate
4b	Grid storage technologies that support growth of renewable electricity on the grid		=	++	++	=	>7	$0	Soon
4c	Continued operation of existing nuclear electricity production in the region		=	=	=	=	N/A	$0	Immediate
S5	**Increase production of onsite renewable energy**								
5a	Solar PV on existing buildings	461,607	=	+	++	=	1-3	<$300	Immediate
5b	Solar PV in all new construction		=	+	++	=	1-3	<$300	Soon
5c	Community Solar projects		=	+	++	=	1-3	<$300	Soon
5d	Battery storage projects		=	+	++	=	1-3	$300-$2000	Soon
S6	**Increase energy supply from renewable natural gas (RNG), hydrogen, and power-to-gas**								

7.2.3 Overview of Strategies and Action Sections

Each action impacts the community differently and has varied implementation best practices. Detailed descriptions of the strategies and actions are provided in the sections below.

A strategy is a broader set of actions or set of sub-sector work that can be modeled to understand emissions reductions. Each **strategy section** includes:

- A description of the strategy, including the technologies and actions to be used.
- The GHG emission reduction potential for each strategy by the year 2050.
- A description of implementation best practices identified by the CECAP Working Group.
- Associated existing programs as well as needs for new policies and program.[7]

An action is a project or specific technology that impacts greenhouse gas emissions within a strategy. Each **action section** includes:

- A description of the action.
- A discussion of each impact category
- Potential key indicators and metrics to be used to track progress.

[7] CECAP expresses needs for new policies and programs but will not set a legislative agenda or Board of Supervisors action.

7.2.3.1 Strategy 2: Pursue Beneficial Electrification in Existing Buildings

GHG Emissions Reduced by 2050
1,147,491 $MTCO_2e$

Beneficial electrification reduces emissions by switching fuels from natural gas to electricity, which is a lower carbon fuel, provided that there is a low carbon electricity grid. This strategy includes incentivizing building electrification (e.g., heating and hot water) for the residential and commercial sectors. This strategy includes:

- Action 2a: Retrofitting existing residential buildings through electrification technologies,
- Action 2b: Retrofitting existing commercial buildings through electrification technologies, and
- Action 2c: Reducing the use of high-GWP refrigerants.

This strategy results in lower GHG emissions from residential and commercial buildings as buildings switch from use of natural gas to electricity, especially as the electric grid becomes cleaner in accordance with the Virginia Clean Economy Act (VCEA) of 2020. Lower GHG emissions from HFCs are also expected as lower-GWP alternatives and equipment with less leakage are replaced with current HFC refrigerants in building systems.

Working Group Priorities: The Working Group emphasized that beneficial electrification of existing buildings is an important strategy for GHG reductions. However, members of the Working Group voiced concerns over the high cost of electrification strategies and potential reliability issues of switching to all electric. Working Group members also emphasized the importance of pairing this strategy with Strategy 4: Increase Renewable Energy in Grid Mix, to ensure the use of clean electricity sources in electrified buildings.

GHG Reductions

This strategy results in GHG reductions of 1,147,491 MT CO_2e through 2050.

GHG Modeling Methodology

For electrification, the methodology to estimate GHG reductions assumes switching of fuel source from natural gas to electricity for 75 percent of single-family homes, 50 percent of multifamily homes, and 20 percent of commercial buildings by 2050. Electrification factors were used to represent the electricity used once natural gas system were replaced. For Residential buildings (both single and multifamily), an HSPF or Heating Seasonal Performance Factor of 8.2 was used (the equivalent of an ENERGY STAR air sourced heat pump[8]). For Commercial buildings, an overall electrification factor of 18 percent was used in alignment with a ACEEE study on commercial buildings[9]. For HFCs, the methodology assumes reduction in total emissions from HFCs following the Kigali Amendment schedule (35 percent reduction by 2025, 70 percent in 2029, 80 percent in 2034, 85 percent in 2035) and in line with the AIM Act. The model also assumes a 20-year life of equipment.

[8] ENERGY STAR, Accessed April 2, 2021. Available at: https://www.energystar.gov/products/heating_cooling/heat_pumps_air_source/key_product_criteria

[9] Electrifying Space Heating in Existing Commercial Buildings, ACEEE 2020, p. 56. Available at: https://www.aceee.org/sites/default/files/pdfs/b2004.pdf

Implementation Best Practices

A list of implementation best practices for this strategy, developed by the Working Group, includes:

- Business Growth Opportunities and Innovation
- County Voluntary Programs
- Development Partnerships
- Energy Education
- Financing Programs
- Residential Incentive Programs
- Technology Pilots
- Regulations and Mandates

Broad electrification is still challenged by cost-effectiveness as well as limited customer awareness and confidence in the technologies. However, there are a variety of implementation options that can be taken.

- **Incentive Programs:** Beneficial electrification incentives and programs are growing in popularity in the United States and can occur from the state, county, or utility, depending on how they are designed. Examples includes New York Clean Heat programs, which aim to implement solar hot water heating (outlined in Strategy 5) and air/ground source heat pumps. The Commonwealth or Fairfax County could establish new programs that provide financial benefit through grants, rebates, and tax credits. Other examples of incentives include high performance building density zoning bonuses, permit streamlining, and/or property tax incentives.
- **Financing programs:** Financing programs already support a variety of energy efficiency work and could be expanded to electrification measures. Government green banks and commercial lending could establish programs to support implementation of the electrification technologies. In Virginia, Commercial Property Assessed Clean Energy (CPACE), a form of financing which provides financing through a tax assessment, can serve as an implementation method for commercial buildings. In the future, Residential Property Assessed Clean Energy (RPACE), could be established in Virginia, allowing tax assessment financing in residential buildings.
- **Business Growth Opportunities and Development Partnerships:** Broad electrification provides an avenue for Business Growth and Development Partnerships. To be successful, supply chains for heat pump technologies will need to grow and installation contractors will need to develop their offerings to include a broader set of solutions. Support for startups and opportunities for partnerships with businesses could provide bulk services to homes and businesses. Programs can also partner with businesses, energy service companies (ESCOs) or other technology providers to create job training programs, leveraging Community Colleges, trade unions, apprenticeships.
- **Education**: Education is key to advancing a variety of strategies, and especially for electrification measures which use a variety of new technologies. As low carbon strategies are implemented, residents, business owners and visitors will see a variety of changes to their day-to-day life. Electrification will affect the buildings they live in, work in, and visit and individuals will need to learn how to use and maintain different building systems. Many of these interactions will be seamless, however educational programs can help earn broad understanding of the changes and why they are happening and may help the county to realize higher adoption rates. Educational programs can take a lot of shapes and forms including:
    - Public Education events, by neighborhood, homeowner’s associations, schools, and libraries on a variety of subjects (technologies, financing, audits).
    - Contests, competitions, and awards for related to electrification. These can be showcased for homes and businesses, or be performance-related.
    - Educational videos, websites, and other media content.
    - School programming and youth education.

    - Tenant engagement programs.
- **Technology Pilots:** To support market growth, government entities could explore technology pilots to scale solutions in government buildings and incorporate heat pumps solutions with the goal of growing the market and demonstrating the technologies use and effectiveness.
- **Regulation or Mandates**: There are additional roles for state legislature which could act to require utilities to implement beneficial electrification solutions through regulation or mandates that require natural gas reducing strategies. Models for statewide legislation and programming are available in a variety of states including New York, Maine, and Vermont. In addition to direct state action, the Virginia legislature has the potential to provide Fairfax County with the ability to implement its own regulations or mandates related to electrification.

7.2.3.1.1 Action 2a: Residential Electrification

Public Health +
Environmental Resource ++
Economic Opportunity ++
One Fairfax =
Payback 3-7 years
Cost to Community Member >$2,000
Timeframe Immediate

This action includes retrofitting existing residential buildings through heat pumps, split systems, ground source heat pumps (geothermal) and other cost-effective electrification technologies in residential buildings, including both single family and multifamily. This strategy also includes a switch to electric heat pump hot water heating and to electric or induction ovens and stovetops.

Timeframe: Immediate implementation, starting in 2021.

Technology considerations:

Virginia's electricity grid has a low enough carbon intensity as of 2021 that an immediate reduction in carbon emissions will take place in residential buildings that switch to electricity. Over time, as the grid electricity moves to zero carbon, buildings that have implemented beneficial electrification through heat pumps and other technologies will provide zero-carbon heating, hot water and cooking.

Individual homeowners who implement electrification techniques by switching to electricity for heating, hot water and cooking will see a variety of changes to their homes and the implementation of electrification in homes would need to be supported by a variety of educational programs to help homeowners understand their options. Some homes will be easier to switch than others, as upgrades to electrical service may be needed to allow some residential buildings to install new equipment.

Heat pumps are a primary heating source in many southern states, and technology limits had previously prevented broad implementation in colder climates. Upgrades to technology have enabled cold-climate air source heat pumps that can operate at temperatures as low as 15 degrees Fahrenheit. Ground source heat pumps provide a highly efficient source of heating and cooling using the ground's constant temperature.

Table 2: A Description of the types of residential building retrofits that homeowners could pursue under Action 2a

Retrofit Type	Current Technology:	Retrofitted to:
Home heating	Natural Gas and Fuel Oil furnaces and Boilers	Air and Ground Source Heat Pumps, split systems
Domestic Hot water	Gas tank and tankless hot water heaters	Heat pump hot water heaters
Cooking	Gas Ranges and Ovens	Electric and Induction

Impacts:

- **Public Health:** This action will improve public health outcomes as gas systems are replaced with electric systems that increasingly rely on cleaner fuels in alignment with VCEA. As residential building energy becomes less reliant on fossil fuels, air quality improvements are expected that will lead to better public health outcomes, such as fewer cases of asthma.
- **Environmental Resource:** This action benefits environmental resource use. As electric systems replace gas systems and the electric grid becomes increasingly clean through the VCEA, fewer fossil fuels will be combusted for building energy as natural gas is replaced and the electric grid is comprised of more renewable energy. As fewer fossil fuels are combusted in the region, the county could see regional air quality improvements.
- **Economic Opportunity:** This action will provide job opportunities to replace current gas infrastructure and building systems with electric systems.
- **One Fairfax:** This action will not have an impact on One Fairfax, as most public health impacts from improvements to air quality in the region will result from electricity grid changes and be experienced by all population groups in the county. However, programs and policies supporting electrification should be designed carefully to ensure that they do not exacerbate existing racial and social inequities.
- **Payback:** The payback from this action is moderate, however it varies based on specific building types. In some residential buildings, additional electrical upgrades will be needed to enable technologies to be used, thereby increasing costs and the payback period. Over time, costs for heat pumps and other items should decrease as contractors become more accustomed to installing and maintaining them in the region and as cold climate technology becomes more mature. Electrification will also lead to changes to operations and maintenance, however significant costs increases are not anticipated.
- **Cost to Community Member:** The cost to community members from this action is high. Retrofitting building systems is costly and, to mitigate high costs, the action is recommended when existing equipment has reached the end of its useful life. Cost reductions and efficiency gains from technology efficiency are critical to the adoption of electrification. Cold climate air source heat pump technology has advanced significantly in recent years; however, costs remain high for many electrification cases.[10] Opportunities for implementing electrification solutions have been successful in Maine through the use of a rebate program. Heat pumps have been installed and incentivized as a secondary heating source (adjacent to fuel oil, propane, and other fuels) and as a source for air conditioning in the summer.[11]
- **Other Considerations:** Implementation of electrification measures should consider resiliency issues because heat pumps and most electrification would need grid electricity to provide heat. Electrically heated homes are a problem when the power goes out, but are better when there are heating fuel supply limitations such as natural gas or fuel oil interruptions. If combined with either onsite renewables and/or energy storage, electrification measures can maintain or grow their resiliency.

[10] NYSERDA, 2019 New Efficiency: New York Analysis of Residential Heat Pump Potential and Economic. Available at: https://www.nyserda.ny.gov/-/media/Files/Publications/PPSER/NYSERDA/18-44-HeatPump.pdf
[11] Efficiency Maine, Accessed March 19, 2021. Available at: https://www.efficiencymaine.com/heat-pumps/

7.2.3.2 Strategy 9: Increase fuel economy and use of low carbon fuels for transportation

Description:

GHG Emissions Reduced by 2050
1,295,124 $MTCO_2e$

This strategy models the reduction of GHG emissions from the transportation sector including aviation by implementing three primary actions:

- Action 9a: Lowering the carbon footprint of fuels
- Action 9b: Supporting higher federal fuel economy standards, and
- Action 9c: Supporting measures that improve fuel efficiency and provide low carbon fuels to aviation.

Examples of low-carbon fuels include alternative fuels such as biodiesel, refuse-derived fuels, non-fossil (or renewable) methane from anaerobic digestion, vegetable oil, and zero-emission technologies such as battery electric and fuel cell vehicles. While commercially available in some U.S. states, many of the renewable fuels have limited applications and supply chain constraints. However, low-carbon fuels and alternate technologies are expected to represent an increasing share of the total fuel use in transportation especially for vehicles that cannot be readily or cost-effectively fully electrified. Likewise, more stringent policies to increase the fuel economy of combustion engines are expected to be released in the coming years as a complementary strategy to vehicle electrification. However, the fuel economy targets after 2026 are currently unknown.

Taken together, these actions that lower fuel consumption and/or reduce the emissions per gallon of fuel used are expected to generate costs savings overtime as well as bring positive public health benefits. While these health and economic positive impacts are not as strong as the ones generated by vehicle electrification or reduction of vehicle miles traveled, any amount of pollution reduction represents a step forward compared to business as usual. In particular, the substitution of jet fuel with a cleaner choice can help advance the One Fairfax Policy overtime.

Working Group Priorities: The Working Group emphasized the importance of reducing transportation emissions and underscored the relative cost effectiveness of fuel efficiency and the various health benefits from these measures. However, members of the Working Group also cautioned that low carbon fuels still emit carbon pollution. Further, continued reliance on vehicles encourages road infrastructure and vehicle-focused land development, the production of biofuels may displace natural vegetation, and many of the levers for change for this strategy are at the state and federal level.

GHG Reductions

The GHG reductions resulting from this strategy are 1,295,124 MT CO_2e.

GHG Modeling Methodology

The modeling of this strategy included the following assumptions. First, the modeling excludes vehicles that have already transitioned to EVs. In modeling the adoption of low-carbon fuels for Action 9a, the average GHG reduction from using alternative fuels such as biofuels was set at 25 percent. This number is based on emission factors reported by the Argonne National Laboratory (the number only reflects the emission from fuel burning, and doesn't include emissions from fuel production, which can be up to 80 percent lower than petroleum-based fuels in the case of soy-derived fuel).[12] A 25 percent GHG emission reduction would also occur from gasoline and diesel vehicles conversion into hybrid-electric, also an alternate fuel technology that is readily available today. Action 9a assumes that the percentage of new on-road vehicles using alternate fuels and technology is 100 percent for light-duty vehicles and 80 percent for medium- and heavy-duty vehicles by 2030. For off-road vehicles, it is assumed that the switch to low carbon fuels yields a 2 percent GHG emission reduction by 2025, 50 percent reduction by 2035, and 80 percent reduction by 2050. Finally, low-carbon fuel adoption was also modeled for aviation based on the Sustainable Aviation Fuel Act (Action 9c). In the case of aviation, it is assumed that the switch to low carbon fuels yields a 2 percent GHG emission reduction by 2025, 35 percent reduction by 2035, and 100 percent reduction by 2050.

To model the increased fuel economy (Action 9b), the current federal fuel economy standards (i.e., SAFE standards) are applied to new light-duty passenger vehicles and trucks through 2026, reaching 40 miles per gallons (mpg) in 2026. After that, the fuel economy is increased by ~1 percent ever year and reaches 52 mpg through 2050.

Implementation Best Practices

The outcomes of this strategy are tied to federal regulations over which Fairfax County has little or no control (at the time of this report, Virginia is not among the states that has obtained a federal waiver to adopt the more stringent California fuel economy standards). However, there are actions that can be taken to make sure that the most fuel efficient and lowest carbon emitting fuels are used whenever possible.

The list of implementation best practices, developed with the Working Group, includes:

- **Business Opportunities:** Local businesses can start or participate in programs to collect and reuse waste cooking oil for fuels, as they could be viable for some applications.
- **Education:** Education campaigns might educate the community about vehicles with the highest fuel economy, how to increase the fuel efficiency of their vehicles, and ways to promote good practices such as anti-idling.
- **Federal Regulation:** Community members can support federal regulations to increase fuel economy for all vehicles, including aviation, and to support the implementation of a Low Carbon Fuels Standard (LCFS).
- **County Programs and Policies**: County programs and policies could encourage the use of low carbon fuels or the conversion to hybrid-electric retrofits of county-owned diesel powered medium and heavy-duty vehicles that are not commercially available as fully electric. In the long term the county can explore the creation of financing programs for low/no carbon fuel technologies and the enactment of property tax credits for consumers purchasing higher fuel economy vehicles.

[12] Alternative Fuels Data Center: Biodiesel Vehicle Emissions (energy.gov)

7.2.3.2.1 Action 9b: Fuel Efficiency Improvements

This action supports enhancement of fuel economy standards.

Timeframe: Immediate

As vehicle turnover occurs in the Fairfax County community, immediate carbon benefits occur as more fuel-efficient vehicles will take their place in the vehicle fleet. Over time, the GHG reduction benefits will increase as the fleet is increasingly comprised of more fuel-efficient vehicles.

Public Health ++
Environmental Resource =
Economic Opportunity +
One Fairfax =
Payback 3-7 years
Cost to Community Member >$2,000
Timeframe Immediate

Technology considerations

This strategy is supported by federal legislation [i.e., Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule rule/ Corporate Average Fuel Economy (CAFE) standards] and compliance will be required of Fairfax County. Possible challenges to implementing these strategies include policy acceptance and consumer behaviors.

Impacts:

- **Public Health:** This strategy will have a positive impact on public health as fewer gallons of fuel are used in fuel efficient vehicles and thereby fewer pollutants will be released into the atmosphere. Reducing vehicle pollution generates immediate improvements in air quality and leads to a healthier environment overtime. These changes bring economic benefits directly stemming from reduced fuel consumption and improvements in public health, e.g., reduced illness-related expenses from asthma and other respiratory and cardiovascular diseases linked to air pollution from vehicles.
- **Environmental Resource:** This strategy will not have any impact on environmental resources.
- **Economic Opportunity:** The strategy will have a positive impact on economic opportunity as people face lower fuel costs, which overtime result in higher disposable income for private consumers.
- **One Fairfax:** Improving fuel economy would not tangibly impact social or racial inequities. This action has an equal sign (=) to indicate a neutral or unknown impact for its One Fairfax Policy. Support for low- and moderate-income populations should be considered in implementation to help offset upfront costs of new vehicle purchases.
- **Payback:** This strategy will result in fuel savings as fewer gallons will be used in more fuel-efficient vehicles.
- **Cost to Community Member:** Community members may face high upfront costs when purchasing new vehicles that comply with federal fuel economy standards.

7.3 Emerging Technologies (to be developed in next draft)

8 Community Engagement (to be developed in next draft)

9 Current Programs / Implementation (to be developed in next draft)

10 References (To be finalized in the next draft)

Fairfax County. N.d. “One Fairfax.” Available at: https://www.fairfaxcounty.gov/topics/one-fairfax#:~:text=One%20Fairfax%20is%20a%20joint,or%20delivering%20programs%20and%20services.

Fairfax County Board of Supervisors. 2017. *Fairfax County Environmental Vision*. June 2017. Available at: https://www.fairfaxcounty.gov/environment/sites/environment/files/assets/documents/pdf/environmental-vision-2017.pdf.

IPCC, 2018: Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.)]. In Press.

Metropolitan Washington Council of Governments (MWCOG). 2021a. “About Us.” Available at: https://www.mwcog.org/about-us/cog-and-our-region/.

MWCOG. 2021. “Environment: Planning Areas.” Available at: https://www.mwcog.org/environment/planning-areas/.

MWCOG. 2020. *Metropolitan Washington 2030 Climate and Energy Action Plan*. Available at: https://www.mwcog.org/documents/2020/11/18/metropolitan-washington-2030-climate-and-energy-action-plan/.

Tysons Reporter. 2019. “Flash Flooding Damage in Fairfax County Costing Millions for Repairs.” July 30, 2019. Catherine Douglas Moran. Available at: https://www.tysonsreporter.com/2019/07/30/flash-flooding-damage-in-fairfax-county-costing-millions-for-repairs/.

United Nations (UN). 2021b. “Goal 13: take urgent action to combat climate change and its impacts.” Available at: https://www.un.org/sustainabledevelopment/climate-change/.

11 Appendices

Appendices will include items such as a glossary, the full GHG inventory report, results of public surveys, etc.