Alameda Contra Costa Transit District

Climate Action Plan

Proposed Draft

Leading the way to a ZERO EMISSION FUTURE.
AC Transit Climate Action Plan
Reducing Greenhouse Gas (GHG) Emissions

Date: April 2022
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Executive Summary

On April 22, 2021, President Biden announced an ambitious goal: for the United States to achieve a 50-52 percent reduction from 2005 levels in economy-wide net greenhouse gas (GHG) pollution in 2030.

On June 15, 2021, FTA launched the Sustainable Transit for a Healthy Planet Challenge to encourage transit agencies to build on progress already made and to further reduce GHG emissions from public transportation to support President Biden’s GHG reduction goal.

On July 31, 2021, AC Transit enrolled in the FTA’s Sustainable Transit for a Healthy Planet Challenge. We understand that public transportation plays an important role in reducing a community’s transportation GHG emissions through transportation and land use efficiencies. AC Transit has already started to meet this challenge with the implementation of these sustainable transit programs:

1. Climate Action Plan (Draft-Proposed)
2. Transit Asset Management Plan
3. Zero Emission Bus (ZEB) Rollout Plan
4. Zero Emission Bus Technology Analysis (ZEBTA)
5. Clean Corridors Plan
6. Facility Utilization Plan

This Climate Action Plan (CAP) describes several initiatives and measures we will undertake to further reduce GHG emissions gained with public transportation and in doing so we advance the well-being of our riders, the East Bay communities, and our planet, one ride at a time.
General Manager’s Message

The AC Transit’s Board of Directors has endorsed the District’s renewed commitment to address the ongoing effects of climate change and contribute to a more sustainable San Francisco East Bay Region with this Proposed Draft Climate Action Plan (Plan). At present, this Plan is proposed but comprehensive, and it will be further developed in the coming months. Our main goal is to reduce greenhouse gas (GHG) emissions by leveraging the advantages of public transit over individual modes of transportation, replacing conventional fleets with zero emission vehicles, modernizing our infrastructure, securing cleaner energy resources where possible, and implementing innovative forms of service. Moreover, we intend to reduce GHG emissions throughout all aspects of our business operations and not just with our bus fleet.

California is moving towards a completely emission-free bus fleet in 2040, and AC Transit intends to meet that goal and move our community towards cleaner air. This plan supports the President’s Build Back Better Framework that focuses on taking bold steps to tackle the climate crisis as well as the state’s climate goals, including the Governor’s Executive Orders N-19-19 and N-79-20 to aggressively phase out fossil fuel powered vehicles and reduce our impact on the environment.

With this proposed Draft Climate Action Plan, we are taking an important step on our path to protect and sustain our natural environment and blaze a trail to expedite our goal of a zero-emission bus fleet and low emission facility operations. AC Transit is committed to providing our riders with a transit experience that is safe, clean, reliable, equitable, and protects the environment today and in the future.
1. Introduction

Alameda Contra Costa Transit District (AC Transit) has elected to prepare this Climate Action Plan (CAP) as an update to the February 2011 CAP and in response to the FTA’s Sustainable Transit for a Healthy Planet Challenge 2022. This plan presents a roadmap for how AC Transit will reduce its entity-wide carbon dioxide (CO2) emissions to achieve President Biden’s “2021 Build Back Better” goal of a 50-52 percent reduction from 2005 levels in economy-wide net greenhouse gas (GHG) pollution in 2030.

This plan summarizes AC Transit’s direct (Scope 1) and indirect (Scope 2) CO2 emissions, describes performance metrics and CO2 emissions reduction targets, and charts a path for reducing emissions through a combination of current and planned measures. It also includes a description of how progress will be monitored toward meeting the reduction targets.

This renewed plan will be developed through a combination of consultant professional services and District staff. Every department will be expected to support this plan and participate in delivering it.

The six primary GHGs are also known as the “Kyoto gases”\(^2\): CO2, methane (CH4), nitrous oxide (N2O) and sulfur hexafluoride (SF6), perfluorocarbons (PFCs), and hydrofluorocarbons (HFCs). These six GHGs have been identified as the gases that are primarily responsible for global warming. CO2 is the most important of these gases in terms of total atmospheric impact, and it typically represents more than 95% of total operational GHGs for an organization like AC Transit. This Draft Proposed Climate Action Plan will initially focus on CO2 since it is the only gas that AC Transit had previously been monitoring and reporting, but will expand to monitor the other GHGs if any are found to be generated in significant amounts by the District.

In 2008, transportation activities in aggregate accounted for 27 percent of U.S. GHG emissions (US EPA, 2010), second only to the electricity generation sector’s 35 percent contribution. While public transit operations make a direct contribution to transportation sector emissions, they generally contribute to a net reduction in emissions by getting people out of their personal automobiles (mode shift), relieving road congestion (improved overall fuel efficiency), and enabling more compact land uses that are conducive to automobile alternatives such as walking and biking. Recent studies provide evidence that overall, public transportation significantly reduces total CO2 emissions. In 2005, public transportation reduced CO2 emissions in the U.S. by 6.9 million metric tons (Davis, et al., 2007).

\(^2\) The Kyoto Protocol is an international agreement linked to the United Nations Framework Convention on Climate Change. The major feature of the Kyoto Protocol is that it sets binding targets for 37 industrialized countries and the European community for reducing emissions of the six GHGs. The Kyoto Protocol is set to expire in 2012.
This estimate considered several factors including direct CO2 emissions from public transit; CO2 emissions from personal vehicles if no transit service was available; and, CO2 emissions saved from transit reduced congestion.

Emissions from the transportation sector have increased steadily in recent years as urban areas have expanded and workers have moved further from their places of employment. There are four basic strategies available to curb the growth in transportation emissions:

- Transition to 100% Zero Emission Bus (ZEB) fleet
- Reduce the carbon intensity of fuels
- Improve vehicle fuel efficiency,
- Reduce overall vehicle miles traveled (VMT)

State and federal mandates are already in place to decrease the carbon intensity of fuels and to increase the fuel efficiency of new vehicles. The use of hydrogen fuel cell and battery electric drive technologies coupled with the planned use of diesel-electric buses will help reduce AC Transit’s fuel carbon intensity while increasing fuel efficiency, but the greatest opportunity for reducing total transportation emissions lies in reducing VMT. According to a recent study, two-vehicle households could reduce their GHG emissions by 25-30% by eliminating one car and taking public transportation (Davis, et al., 2007). Because the pandemic has impacted the VMT it will need to be reviewed, but it remains clear that by providing public transportation AC Transit is dramatically reducing regional CO2 emissions.
2. Agency Overview

The Alameda-Contra Costa Transit District (AC Transit), headquartered in Oakland, is a public transit agency serving the western portions of Alameda and Contra Costa counties in the East Bay of the San Francisco Bay Area and is constituted as a special district under California law. It is governed by a seven-member elected Board of Directors. It is not a part of or under the control of Alameda or Contra Costa counties or any local jurisdictions. AC Transit’s General Office is located at 1600 Franklin Street, Oakland, Alameda County, CA 94612. Operating in the Bay Area Air Quality Management District (BAAQMD), and the San Francisco Bay Area Air Basin, AC Transit has been serving the East Bay since 1960, taking over from the Key System and its predecessors that carried passengers via buses, horse-drawn rail streetcars, electric streetcars, and ferries over the previous 100 years.

The Alameda-Contra Costa Transit District (AC Transit) is the largest public bus-only transit operator in California and 3rd largest in the country, serving 13 cities and adjacent unincorporated areas covering 364 square miles in Alameda and Contra Costa counties. We operate a fleet of 640 buses, supported by 7 facilities, and a workforce of more than 2,100 employees. AC Transit plays a critical role in the Bay Area’s transportation network, connecting with 16 other public and private bus systems, 25 BART stations, 6 Amtrak stations and 5 ferry terminals. (3 in Alameda, 1 in Oakland, 1 in Richmond). AC Transit has a long-standing commitment to preserving and improving the quality and quantity of transit service for 1.5 million East Bay passengers that populate the East Bay. AC Transit currently carries about 90,000 riders on an average weekday (roughly 175,000 – 180,000 pre-pandemic), along 158 service lines while generating over 20 million annual miles on its fleet of 640 public transit buses. AC Transit also operates "Transbay" routes across San Francisco Bay to San Francisco and selected areas in San Mateo and Santa Clara counties.
Figure 1 – AC Transit System Map
In addition to the local lines that serve the Bay Area, AC Transit has several services that make getting around faster, more convenient and in conjunction with the environmental justice initiatives in our Clean Corridors Plan.

Transbay

Dumbarton Express

Rapid

Supplementary Service to Schools

Tempo

Paratransit
Our Vision
AC Transit is valued as a leader that helps the Bay Area thrive by connecting East Bay communities to each other and to regional destinations.

Our Mission
We deliver safe, reliable, sustainable transit service that responds to the needs of our customers and communities.

Core Values
As part of its Strategic Plan, AC Transit has established Environmental Sustainability as one of seven core values of:

Safety, Service, Equity, Sustainability, Innovation, Integrity, Trust

The proposed Draft Climate Action Plan is part of the District’s Sustainability Program which meets our core value of:

Environmental Sustainability
We will create a culture of environmental stewardship through the use of technologies, procedures, and policies that reduce the environmental impact of District operations and contribute to regional, state, and federal sustainability goals while supporting environmental justice in the communities most affected by the District’s decisions.
HISTORY OF SUSTAINABILITY AND CLIMATE CHANGE INITIATIVES IN THE DISTRICT

2004 - Launched the HyRoad program as the name of the hydrogen fuel cell system

2003 - Introduced a "rapid bus" line on San Pablo (72R)
2006 – 2010 - Launched three Van Hool A330 hydrogen powered buses

2007 - AC Transit enters into a 25-year partnership with SunPower, MMA Renewable Ventures, and PG&E to install solar energy systems at its facilities in an effort to reduce its carbon footprint, improve local air quality, and save money on energy costs.
2010 - The District adds 12 third-generation Van Hool A300L fuel cell buses

2014 - Construction begins for AC Transit's Bus Rapid Transit (BRT) system
2019 - Added 10 hydrogen fuel cell buses + 5 battery electric buses from New Flyer

2021 — Purchased 23 new battery electric buses from Gillig and 20 hydrogen fuel cell buses New Flyer

2021 — completed construction of the heavy-duty hydrogen fuel stations at D2 and D4; and Battery bus charging infrastructure at D2 and D4;
3. AC Transit’s CO₂ Emissions Profile

Established in 2007, The Climate Registry was formed to continue the work of the California Climate Action Registry (CCAR). Created by the State of California in 2001, CCAR promoted and protected businesses’ early actions to manage and reduce their greenhouse gas (GHG) emissions. The CCAR established protocols to guide emissions inventories and manage an online reporting tool, the Climate Action Registry Reporting Tool (CARROT), to serve as a central database for emissions reports. Together, CCAR and its members influenced California climate change policy, including Assembly Bill 32 (AB 32), and worked to ensure proper recognition from the state for early actions to reduce emissions. CCAR was instrumental in establishing TCR with the mission of expanding CCAR’s emissions reporting work to include all North America. CCAR accepted its last emissions inventory reports for 2009 in December 2010 and officially transitioned its members to The Climate Registry. CCAR is now a program of The Climate Registry’s sister organization, the Climate Action Reserve. The Climate Registry’s Voluntary Greenhouse Gas (GHG) Reporting Program is now called the Carbon Footprint Registry.

3.1 History of Emissions Profile

In 2005, AC Transit became the first transit agency in the nation to join the California Climate Action Registry (CCAR - California Registry) and commit to annual public reporting of their CO₂ emissions. AC Transit reported Calendar Year 2006 (CY2006) through CY2008 CO₂ emissions to the California Registry and was named a “Climate Action Leader” for having these emissions inventories independently verified. In 2007, AC Transit joined The Climate Registry (TCR), the leading voluntary registry for reporting North American GHG emissions and began reporting to TCR starting with the CY2009 emissions inventory. In the 2011 report to TCR, AC Transit expanded the GHG Inventory to include all six “Kyoto gases.” Since that time and until now no further action was taken to address GHG reductions in AC Transit and the program lapsed into dormancy.

3.2 Emissions Categories

Previously, AC Transit annually calculated and reported its CO₂ emissions in the “Scope 1” and “Scope 2” categories, as defined by the GHG Protocol Corporate Accounting and Reporting Standard. This Climate Action Plan focuses on the reduction of Scope 1 and Scope 2 CO₂ emissions which we will resume calculating and reporting in CY2023.

- The Scope 1 category includes direct emissions from the following sources owned or controlled by AC Transit:

  - Mobile combustion sources
  - Stationary combustion sources
  - Purchased natural gas
• The Scope 2 category includes indirect emissions from sources that occur because of AC Transit’s actions:
  o Purchased electricity
• AC Transit does not currently report Scope 3 emissions (other indirect emissions) to TCR. Scope 3 emissions tend to be difficult to quantify and, by definition, include sources that are not directly controlled by the reporting entity.

3.3 Planned Actions and Implementation

AC Transit will rejoin the Climate Registry and the voluntary Greenhouse Gas (GHG) reporting program now called the Carbon Footprint Registry. This will help us to provide an accounting of GHG emissions from our public transit operations and facilities by establishing baseline data and trends. This was last done from CY2006 through CY 2009. CY2023 will start with an inventory of current emission sources and continue with annual updates to help the District focus efforts on reducing the largest sources of GHG emissions, most likely CO₂ while tracking progress.

Emission sources to inventory could possibly include, but may not be limited to:

• Fleet operations, including revenue and non-revenue vehicles
• Facility operations, including stations, administrative buildings, maintenance facilities, and shops and yards
• Employee travel
• Solid Waste and Recycling
• Displaced emissions, i.e., GHG emissions avoided due to mode shift to transit

The emissions inventory will identify the data sources and data assumptions.

As the GHG emissions tracking program matures, AC Transit may consider using different metrics besides only reporting absolute emissions to meet certain objectives. Options for alternative metrics to report transit GHG emissions include:

• Emissions per passenger miles traveled
• Emissions per produced seat miles
• Emissions per vehicle revenue hours
• Emissions per revenue vehicle length
• Emissions per vehicle miles
• Emissions per service area population
• Emissions per vehicle revenue miles
• Emissions per number of employees
• Emissions per unlinked passenger trips
4. Performance Metrics & Reduction Targets

AC Transit has operated over 5 million zero emission miles with our ZEB fleet from the initial pilot buses in 2006 to present day, which has dramatically reduced regional CO2 emissions. We have decided to expand on this success by voluntarily electing to develop internal CO2 emission reduction targets based on TCR guidance and state-wide emission reduction goals mandated by the California Global Warming Solutions Act of 2006 (Assembly Bill 32).

The recommended TCR metrics are calculated based on the combined total Scope 1 and 2 emissions divided by operational data, as follows:

- Emissions per passenger miles traveled (PMT) – PMT represents the distance traveled by all passengers. This metric accounts for the combined effects of vehicle efficiency and changes in ridership. It measures operational efficiency and service effectiveness.
- Emissions per vehicle miles traveled – Measures operational efficiency and is sensitive to efforts to purchased lower-emission vehicles, switch to lower-carbon fuels, or facility energy efficiency improvements.
- Emissions per revenue vehicle hour - This metric is another measure of operational efficiency, but it also captures efforts to reduce deadheading and roadway congestion.

AC Transit will adopt a 15% reduction target for entity-wide Scope 1 and 2 emissions as measured by the TCR intensity metrics: emissions per total vehicles miles, revenue vehicle hours and PMT. By selecting these intensity targets rather than absolute targets, AC Transit will be seeking to reduce the carbon intensity of our operations. These metrics may not reflect changes in total emissions that result from service level changes because of the pandemic. CY2006 was used as AC Transit’s baseline year during the initial CAP. For this new plan we will use CY2023 as the organization’s first verified emissions year.
5. Existing CO₂ Emissions Reduction Measures

AC Transit has been a leader in advancing zero emission technology since the turn of the new millennium. Over the past several years and since the last CAP report in 2011, AC Transit has undertaken several additional CO2 emission reduction measures and sustainability initiatives that help to reduce GHG emissions from sources under their operational control and regionally. We have successfully designed and implemented one of the nation’s most comprehensive ZEB programs. For nearly 20 years, AC Transit has embraced the exhaust emission standards set by the CA Air Resources Board (CARB) and has been making strides to invest in healthy communities by leading the way to a zero-emission future through clean transit and green jobs.

The State of California has set forth the Innovative Clean Transit Rule, which is an unfunded mandate. AC Transit estimates that the cost to fully transition to zero-emission buses, which includes building out the infrastructure to support the technologies will cost $1.1B.

Today, we are operating 28 zero-emission buses and are slated to receive 41 more that were procured, pre-pandemic. Our current fleet in service, consists of a mix of battery electric (5 New Flyer) and hydrogen fuel cell buses. (9 Van Hool, 10 New Flyer, and 4 new New Flyer).

In June 2020, AC Transit Board of Directors adopted a Zero Emission Bus (ZEB) Rollout Plan that provides a roadmap for the agency to transition to fully zero emission fleet by 2040. The Plan integrates our Clean Corridors (CC) Plan which prioritizes deployment of our zero emission buses in 11 priority community areas serving disadvantaged communities:

- Ashland (San Leandro)
- East Oakland
- International Blvd./East 14th Street
- North Oakland
- Oakland International Airport
- Richmond
- Russell City (Hayward)
- San Pablo
- Union City
- West Berkeley
- West Oakland.

The Plan strives to decrease pollution, advance environmental justice and social equity, and align with the Federal “Justice40” Initiative.

We initially focused on hydrogen fuel cell bus technology and recently expanded to include
battery electric buses. The following sections summarize these initiatives.

5.1 Battery Electric Bus

2020 marked the launch of AC Transit’s deployment of Battery Electric Buses (BEB). Six stationary chargers and one mobile shop charger support our introductory fleet. The BEBs will allow AC Transit to conduct a side-by-side evaluation of Battery Electric Bus and Fuel Cell Electric Bus technologies, ultimately providing AC Transit with vital data to determine the technology best suited for Bay Area weather, topography, and other operational demands.

Upgrades on the Horizon: In 2021, the District began the process to upgrade its battery electric infrastructure capacity. Once completed in 2022, the District will have the capability to charge approximately 45 buses at two operating divisions. This upgrade has an estimated cost of $15,850,000.

5.2 ZEB Maintenance Bays

The outward appearance of a ZEB bus is identical to traditional buses; however, ZEBs house an array of advanced technologies that require specialized tooling. Many of those advanced operating components are assembled on the ZEBs rooftop. Therefore, maintenance bays will likely require overhead reconfiguration, including accommodations for high voltage charging, to achieve optimal occupational health and safety. Additionally, FCEB maintenance bays will require design augmentations that eliminate or minimize the risk of an inadvertent hydrogen release or leak.

5.3 Hydrogen Fuel Cell Bus

For nearly two decades, AC Transit has operated an innovative fleet of Fuel Cell Electric Buses (FCEB). Our success in zero emission operations began in 2003 with a single 30-foot bus, fueled by a small electrolyzer. By 2006, that single coach expanded to three FCEB buses, all fueled by twin-steam methane reformers. By 2010, AC Transit’s FCEB fleet grew to 12 new buses, fueled by a liquid hydrogen/vaporizer/compressor system based at our Emeryville bus division. In 2014, the success of liquid hydrogen fueling led to a duplicate system installed at our Oakland bus division. This year, AC Transit’s zero emission fleet broadened by an additional 10 new FCEB buses. To support our ever expanding zero emission fleet, the Emeryville fueling station has been upgraded with cryogenic pumps; generating a three-fold increase in capacity.

5.4 ZEB Future

Our transit district has also secured funding to purchase 23 BEBs and 20 FCEBs with the latest advancements in zero-emission technology. By the close of 2022, we are expecting to have 70
ZEBs in service. As a result of a partnership with Federal Transit Administration (FTA), CalStart, and New Flyer, we achieved another historic milestone by operating, in service, the first 60’ articulated hydrogen fuel cell bus manufactured.

As our ZEB fleet grows, so does the infrastructure required to energize it. We recently expanded our hydrogen fueling capacity for up to 78 buses between our two ZEB divisions in Oakland and Emeryville. At Oakland, we deploy both ZEB technologies side-by-side making it optimal for our technology analysis. We have capability to fuel 13 hydrogen fuel cell buses and 6 battery bus chargers.

We have plans to construct BEB charging infrastructure for up to 50 buses at Oakland and 26 buses at Emeryville; secured funding to expand hydrogen fueling capacity to 130 buses at the Oakland division and have Board approval to seek funding for a hydrogen fueling station at our Hayward division that includes purchase of 25 more hydrogen fuel cell buses. When these projects are completed, we will be able to operate ZEB technologies from three Divisions increasing our charging capacity for up to 82 BEBs and hydrogen fueling capacity for up to 338 FCEB.
6. Planned CO₂ Emissions Reduction Measures and Future Considerations

Because it has been more than 10 years since AC Transit had an active Climate Action Plan with realistic GHG emission reduction goals, we are essentially starting anew to develop new goals for reducing GHG emissions, including establishing specific GHG emission reduction targets. The District’s goals and targets outlined in this plan align with federal, state, regional, and local GHG emission reduction goals the maximum extent possible.

AC Transit’s goal statements (Planned Measures):

- Achieve net zero emissions by 2050 (Biden-Harris Administration goal)
- Achieve full zero emission bus fleet by 2040
- Achieve a 50-52 percent reduction in GHG emissions from 2005 levels by 2030 (Biden-Harris Administration goal)
- Decrease total GHG emissions from transit fleet by 50 percent by 2030
- Operate facilities using 100 percent renewable energy by 2040
- Plan and construct all new maintenance facilities to accommodate zero-emission technologies
- Decrease total energy use by 10 percent for all facilities by 2030

AC Transit’s CO₂ reduction Measures (Future Considerations):

Key Initiative – Zero Emissions Program: Key steps we are taking to achieve 100% zero emission bus operations follow. (NOTE: The workforce funding is not part of the $1.1B estimated for the purchase of zero emission buses and infrastructure build-out.)

- Procurement of 41 zero-emission buses – we need to replace our existing fleet of diesel buses on a phased schedule that aligns with funding and availability.
- Build-out our infrastructure to support the operations of a zero-emission fleet, which is expensive, but necessary. (Only 2 of the 4 operating divisions have zero-emission bus infrastructure which is not fully built out).
- Workforce development and training in green jobs. Transition from diesel engines to battery electric or hydrogen fuel cell technologies requires a different skill set that is not readily available in the current job market.
- Secure capital funding, estimated at $18M to modernize our training and education center (TEC) in Hayward into an Advanced Learning Lab to help us achieve a sustainable 100% zero emissions fleet transition by 2040.

6.1 Achieve net zero emissions by 2050 (Biden-Harris Administration goal)

- short-term strategies and actions to achieve the goal and target,
- longer-term strategies and actions to achieve the goal and target
• List the metrics for measuring performance, the targeted timeframe for completing the action (i.e., month or season and year), and the staff/department(s) responsible for implementing the action

6.2 Achieve full zero emission bus fleet by 2040 as described in the ZEB Rollout Plan
• short-term strategies and actions to achieve the goal and target,
• longer-term strategies and actions to achieve the goal and target
• List the metrics for measuring performance, the targeted timeframe for completing the action (i.e., month or season and year), and the staff/department(s) responsible for implementing the action

6.3 Achieve a 50-52 percent reduction in GHG emissions from 2005 levels by 2030 (Biden-Harris Administration goal)
• short-term strategies and actions to achieve the goal and target,
• longer-term strategies and actions to achieve the goal and target
• List the metrics for measuring performance, the targeted timeframe for completing the action (i.e., month or season and year), and the staff/department(s) responsible for implementing the action

6.4 Decrease total GHG emissions from transit fleet by 50 percent by 2030
• short-term strategies and actions to achieve the goal and target,
• longer-term strategies and actions to achieve the goal and target
• List the metrics for measuring performance, the targeted timeframe for completing the action (i.e., month or season and year), and the staff/department(s) responsible for implementing the action

6.5 Operate facilities using 100 percent renewable energy by 2040
• short-term strategies and actions to achieve the goal and target,
• longer-term strategies and actions to achieve the goal and target
• List the metrics for measuring performance, the targeted timeframe for completing the action (i.e., month or season and year), and the staff/department(s) responsible for implementing the action

6.6 Plan and construct all new maintenance facilities to accommodate zero-emission technologies
• short-term strategies and actions to achieve the goal and target,
• longer-term strategies and actions to achieve the goal and target
• List the metrics for measuring performance, the targeted timeframe for completing the action (i.e., month or season and year), and the staff/department(s) responsible for implementing the action

6.7 Decrease total energy use by 10 percent for all facilities by 2030
• short-term strategies and actions to achieve the goal and target,
• longer-term strategies and actions to achieve the goal and target
• List the metrics for measuring performance, the targeted timeframe for completing the action (i.e., month or season and year), and the staff/department(s) responsible for implementing the action
7. Achieving Reductions & Monitoring Progress

Our approach to achieving GHG reductions is based on the principle that one cannot manage what is not measured. AC Transit will further develop and refine this plan for tabulating GHG emissions and creating ways to reduce those emissions by Q2 FY 23 and have a plan in place by Q3 FY 23. We will first identify all the potential sources of GHGs generated from AC Transit operations, measure the amount of GHGs generated and then apply mitigation measures as developed and incorporated into the Final Climate Action Plan.

One aspect of GHG tabulating we can do is calculating the GHG emissions from a bus fleet as shown in Appendix B. We will use other means and methods to identify and tally GHG emissions from other parts of AC Transit operations. A comprehensive plan for achieving GHG reductions and monitoring progress will be produced by the end of CY 22.
Appendix A: Bibliography

The Climate Registry - California’s voluntary greenhouse gas reporting program, now called the Carbon Footprint Registry, offers flexible reporting options and enhanced recognition.

https://www.theclimateregistry.org

The following resources provide additional guidance on developing a GHG inventory:

- American Public Transportation Association’s Recommended Practice for Quantifying Greenhouse Gas Emissions from Transit available at

- The Climate Registry’s General Reporting Protocol for the Voluntary Reporting Program at
  https://www.theclimateregistry.org/tools-resources/reporting-protocols/general-reporting-protocol/

- Contact
  FTAClimatelnitiative@dot.gov
Appendix B: Methodology for Greenhouse Gas Emissions Inventory

AC Transit intends to adopt the FTA’s template for calculating the GHG emissions from a bus fleet as shown in the figure below.

<table>
<thead>
<tr>
<th>Year</th>
<th>Diesel Bus MY1960-2006</th>
<th>Diesel Bus MY 2007-2018</th>
<th>Biodiesel (100%) Bus</th>
<th>Gasoline Bus (MY18)*</th>
<th>CNG Bus</th>
<th>LPG Bus</th>
<th>Fleet Energy Usage</th>
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</thead>
<tbody>
<tr>
<td>2020</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

### Mileage Based Emission Factors

<table>
<thead>
<tr>
<th>Emission Factor</th>
<th>Diesel Bus MY1960-2006</th>
<th>Diesel Bus MY 2007-2018</th>
<th>Biodiesel (100%) Bus</th>
<th>Gasoline Bus (MY18)*</th>
<th>CNG Bus</th>
<th>LPG Bus</th>
<th>Standard C70</th>
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</thead>
<tbody>
<tr>
<td>Methane (CH4)</td>
<td>0.0051</td>
<td>0.0066</td>
<td>0.0102</td>
<td>0.0326</td>
<td>0.040</td>
<td>0.040</td>
<td>0.017</td>
</tr>
<tr>
<td>Nitrous oxide (N2O)</td>
<td>0.0048</td>
<td>0.0031</td>
<td>0.0044</td>
<td>0.0014</td>
<td>0.017</td>
<td>0.017</td>
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</tbody>
</table>

*Note: The emission rates for greenhouse gases vary each model year. Use the Climate Registry default emission source or fleet-based factor for emission rates for earlier model years.

### Volume Based Emission Factors

<table>
<thead>
<tr>
<th>Emission Factor</th>
<th>Diesel Bus MY1960-2006</th>
<th>Diesel Bus MY 2007-2018</th>
<th>Biodiesel (100%) Bus</th>
<th>Gasoline Bus (MY18)*</th>
<th>CNG Bus</th>
<th>LPG Bus</th>
<th>Standard C70</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon dioxide (CO2)</td>
<td>10,210</td>
<td>10,210</td>
<td>9,450</td>
<td>8,780</td>
<td>54.44</td>
<td>5,680</td>
<td>10</td>
</tr>
<tr>
<td>Methane (CH4)</td>
<td>0.0051</td>
<td>0.0066</td>
<td>0.0102</td>
<td>0.0326</td>
<td>0.040</td>
<td>0.040</td>
<td>0.017</td>
</tr>
<tr>
<td>Nitrous oxide (N2O)</td>
<td>0.0048</td>
<td>0.0031</td>
<td>0.0044</td>
<td>0.0014</td>
<td>0.017</td>
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</tbody>
</table>

*Note: The emission rates for greenhouse gases vary each model year. Use the Climate Registry default emission source or fleet-based factor for emission rates for earlier model years.

### Annual Emissions

<table>
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<tr>
<th>Year</th>
<th>Diesel Bus MY1960-2006</th>
<th>Diesel Bus MY 2007-2018</th>
<th>Biodiesel (100%) Bus</th>
<th>Gasoline Bus (MY18)*</th>
<th>CNG Bus</th>
<th>LPG Bus</th>
<th>Fleet Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2020</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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### Fleet Total

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### Annual MTCO2e

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AC Transit will enter agency specific data on annual fuel consumption and vehicle miles traveled for its bus fleet, and the spreadsheet will calculate annual GHG emissions, reported as metric tons of carbon dioxide equivalent.

Please note, the attached spreadsheet does not include emissions from electric buses. Since the emission rates for electricity use are location specific, we didn’t feel it was useful to include a default emission rate. For more guidance on quantifying indirect (scope 2) emission from electricity use see Section C of the Climate Registry’s General Reporting Protocol (https://www.theclimateregistry.org/protocols/General-Reporting-ProtocolV3.pdf).
Appendix C: References


- Source of standard cubic feet to diesel gallon equivalent is: https://afdc.energy.gov/fuels/equivalency_methodology.html

- To see examples of existing plans from FTA Member transit agencies, please visit www.transit.dot.gov/climate-challenge and look for the “Challenge Resources” section.

- AC Transit Programs and Plans
  - Strategic Plan
  - Transit Asset Management Plan
  - ZEB Rollout Plan
  - Clean Corridors Plan
  - Facilities Utilization Plan
  - Short-Range Transit Plan
  - Ridership, Bus Fleet and Service
  - Key Performance Indicators