San Joaquin Joint Powers Authority (SJJPA)

Climate Action Plan Framework

April 15, 2022

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Executive Summary

Executive Summary

- SJJPA is committed to reducing operational greenhouse gas (GHG) emissions by 50% below 2005 base year levels. This CAP Framework is based on a partial GHG inventory that includes the largest operational GHG emissions sources – fuel use in locomotives and buses.
  - 2005 GHG emissions – ~39,600 MT CO_2e/yr
  - 2019 GHG emissions – ~ 47,900 MT CO_2e/yr
- Absent further GHG mitigation solutions, emissions from locomotives are forecast to decrease through 2030 due to anticipated operation of high-speed rail that will replace a portion of the San Joaquins trips with a new fully-electrified service, while Thruway bus service is anticipated to increase significantly causing a modest increase in total GHG emissions.
  - 2030 GHG emissions – 50,125 MT CO_2e/yr
- To achieve the 2030 GHG emissions target level of 19,820 MT CO_2e/yr, the agency will need to reduce emissions by approximately 30,300 MT CO_2e/yr below the 2030 forecast emissions levels.
- SJJPA is committed to using 100% renewable diesel in its locomotive and bus fleets prior to the 2030 GHG target year, which will reduce operational emissions to approximately 340 MT CO_2e/yr – 99.2% below 2005 levels.
  - The agency is also committed to working with the State to meet its goal to transition all off-road vehicles to zero-emissions technology by 2035

Agency Background

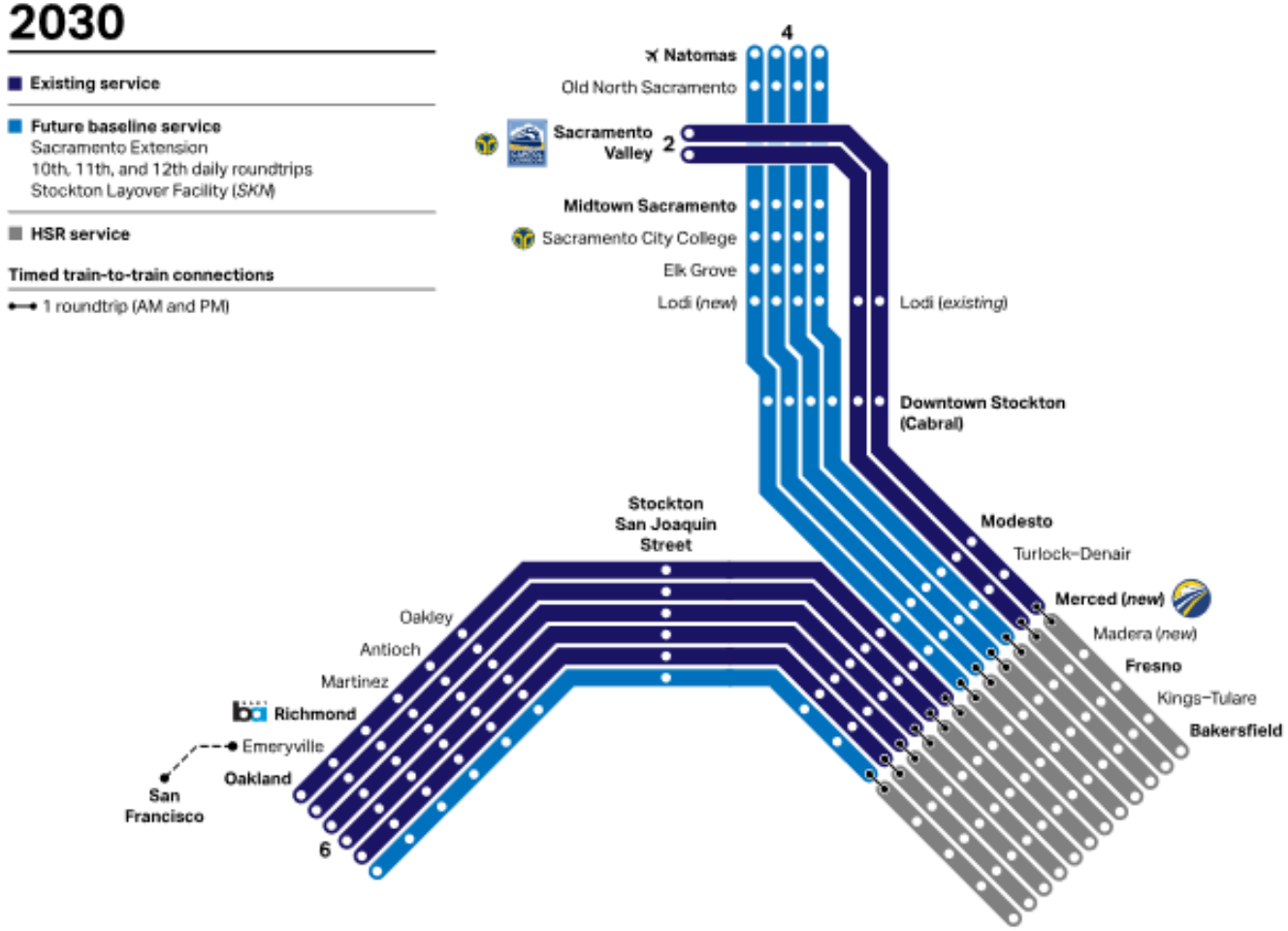
Climate Action Plan Framework Purpose

- The San Joaquin Joint Powers Authority (SJJPA) developed this Climate Action Plan (CAP) Framework in response to the Federal Transit Administration (FTA) Climate Challenge that recommends transit agencies develop CAPs by April 2022 to define strategies that achieve greenhouse gas (GHG) reductions in line with the Biden administration's national goals (i.e., 50-52% below 2005 GHG levels).
- This framework is a precursor to a more complete CAP that can be developed pending the identification of additional funding sources. It provides an initial analysis of a sub-set of operational GHG emissions sources and corresponding reduction opportunities that can be further expanded following the FTA Climate Challenge period.

Agency Service

- SJJPA operates the Amtrak San Joaquins regional/intercity passenger rail service between Sacramento, Oakland, and Bakersfield, as well as Thruway bus service for destinations throughout California.

SJJPA 2030 Vision



GHG Context

GHG Inventory Context

- SJJPA analyzed a sub-set of GHG emissions activities for 2005 and 2019 to define the magnitude of contribution from the most significant operational activity source - fuel use from rail and bus service.
- Pending identification of future funding sources, SJJPA will expand its scope of GHG emissions analysis in future years to include other emissions activity sources, such as:
  - Stationary energy use in buildings/facilities
  - Other fleet vehicles
  - Off-road equipment

GHG Inventory Protocol

- Several GHG inventory protocol options are available to guide development of the agency's GHG inventory, including The Climate Registry General Reporting Protocol (GRP) and the Corporate Standard. Both are applicable options to guide the agency's future full inventory development.
- Inventory protocols describe what emissions sources should be included for inventory completeness. For example, the GRP Required Sources for Completeness include:
  - Mobile combustion – e.g., trains, buses, agency vehicle fleet, off-road equipment
  - Stationary combustion (buildings/facilities) – e.g., natural gas, propane
  - Purchased electricity
  - Physical & chemical processes (e.g., cement manufacturing)
  - Fugitive sources (e.g., natural distribution leaks, refrigerant use)

GHG Inventory Protocol

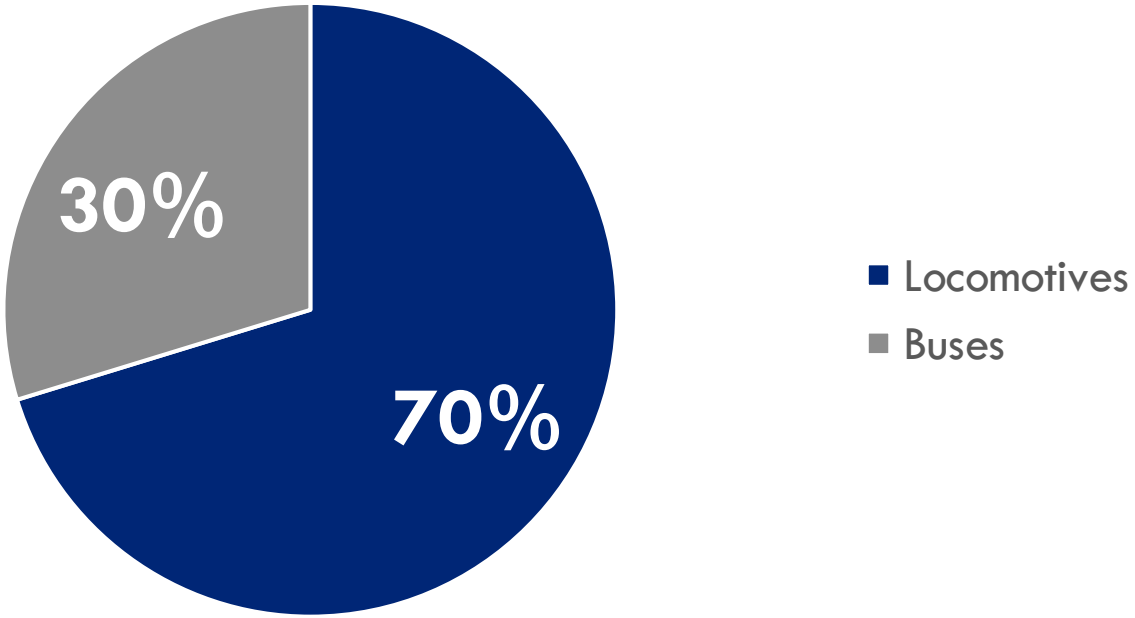
- Inventory protocols often identify other 'Optional Sources' that can be included in a GHG inventory to provide additional context or tell a more complete story about an organization's GHG contributions.
- Examples of optional emissions sources from the Corporate Standard include:
  - Waste disposal
  - Employee commute, business travel
  - Electricity transmission & distribution loss
- As part of future GHG inventory development processes, the agency will evaluate what new emissions sources can feasibly be integrated into the initial GHG inventory developed as part of this CAP Framework, potentially including some optional sources. These future inventory efforts are contingent upon funding availability and data availability and completeness (e.g., 2005 base year, current years).

Partial GHG Inventory

- A sub-set of the GRP/Corporate Standard required emission sources were evaluated in the CAP Framework to understand the agency's 2005 base year and 2019 GHG emissions levels.
  - The sub-set of emissions selected are assumed to be the greatest contributors to operational GHG emissions, are directly relevant to the agency's primary service, and were generally supported by readily available data.
- The partial GHG inventory includes mobile combustion from:
  - Locomotives
    - Amtrak San Joaquins – diesel fuel use
  - Buses/Shuttles
    - San Joaquins (Amtrak Thruway buses) – diesel fuel use

2005 Base Year GHG Emissions

- In 2005, 70% of the agency's GHG emissions came from diesel fuel combustion in locomotives while the remaining 30% were from diesel use in Thruway buses.
- These emissions represent the partial GHG inventory developed for this initial CAP Framework, not the agency's total operational emissions.



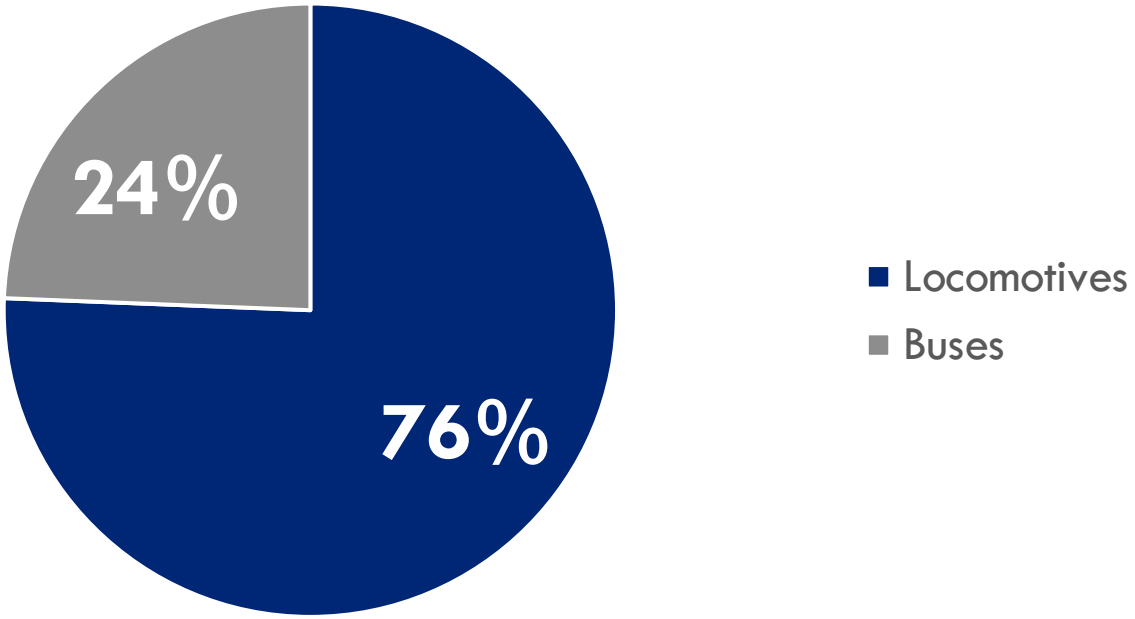
2005 Base Year GHG Emissions

- 2005 base year emissions totaled nearly 40,000 metric tons of carbon dioxide equivalent (MT CO_2e/yr).

Emissions Source	Fuel Use (gal)	Fuel Type	MT CO_2e/yr
Locomotives	2,703,781	Diesel	27,852
Buses	1,149,479	Diesel	11,787
Total	**3,853,260**		**39,639**

2019 GHG Emissions

- In 2019, approximately 75% of the agency's GHG emissions were from locomotive diesel fuel use with the remaining 25% from diesel use in Thruway buses.



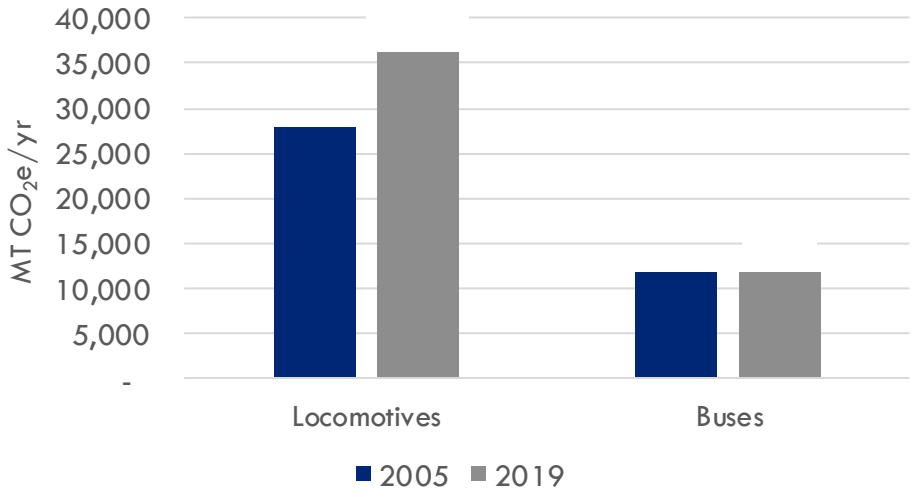
2019 GHG Emissions

- 2019 emissions totaled nearly 48,000 MT CO_2e/yr, or approximately 21% higher than in 2005.

Emissions Source	Fuel Use (gal)	Fuel Type	MT CO_2e/yr
Locomotives	3,516,899	Diesel	36,229
Buses	1,138,574	Diesel	11,675
Total	**4,655,473**		**47,904**

2005 & 2019 Emissions Comparison

- From 2005 to 2019, locomotive emissions increased 30%. This is partially due to an increase in service within the SJJPA system moving from 6 roundtrips to 7 roundtrips between 2005 and 2019.
- Bus emissions decreased 1% during this same period, potentially due to fuel use data gaps associated with switching bus operators. Collecting fuel use data for the agency's Amtrak Thruway bus service has been identified as an opportunity for improvement in future GHG monitoring efforts.



2005 and 2019 Inventory Caveats

- The 2005 and 2019 results are not normalized to reflect the number of passengers or passenger miles compared to fuel consumption, so they do not provide any context regarding operational service changes between the inventory years (e.g., service expansion).
- Notes on the San Joaquins – Amtrak Thruway Buses:
  - There were data gaps for 2005 and 2019 for some bus routes, but not the same routes in each year
  - The analysis assumed an annualization factor of 365 to convert daily trip mileage to annual mileage
  - The analysis assumed a fuel economy factor collected from the US Department of Energy to convert trip mileage to gallons of diesel
  - A sample Amtrak data request table is provided on the following page that can guide future GHG inventory efforts to optimize Thruway bus fuel use reporting

Sample – Amtrak Data Request

Bus Route	Fuel Use (annual) & Fuel Type	Mileage Driven (annual)	Passengers Served
1A	[gallons], [fuel type]	[miles]	[number served]
1B	[gallons], [fuel type]	[miles]	[number served]
1C	[gallons], [fuel type]	[miles]	[number served]

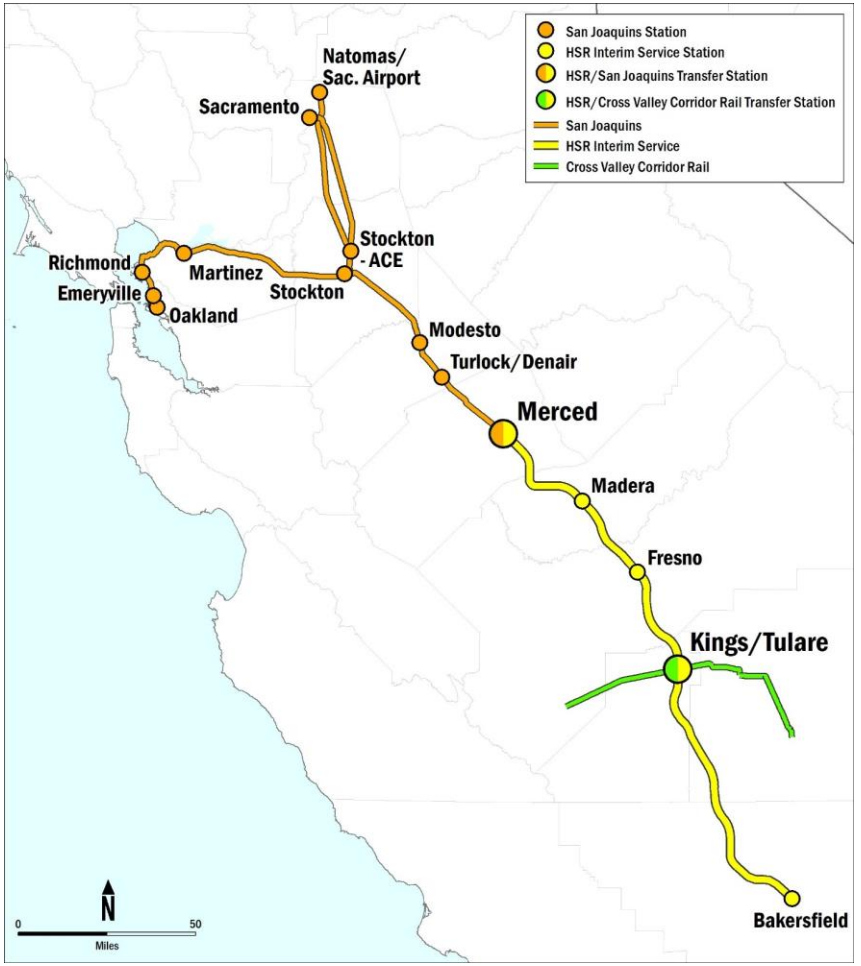
- Need a process to easily collect relevant GHG inventory data on an annual basis:
  - Fuel use and vehicle miles traveled (VMT) by route (annualized)
- Determine additional contextual metrics that are beneficial to collect:
  - Passengers served or passenger miles
  - Revenue miles

2030 Emissions Forecasts

- SJJPA emissions forecasts were estimated from 2019 through 2030 based on recent system service planning efforts. The result is an estimated increase of approximately 26% in GHG emissions from 2005 to 2030.
- For this analysis, the estimated change in annual rail service miles from 2019 to the 2030 planning scenario served as a proxy for changes in locomotive fuel use demand.

2030 Emissions Forecasts

- The greatest contributing factor to estimated future emissions reductions in locomotive fuel use is from the anticipated operation of high-speed rail (HSR). HSR will replace the San Joaquins between Bakersfield and Merced, where passengers will be able to transfer to / from the new, shortened San Joaquins route. The HSR route from Merced to Bakersfield will be fully electrified, reducing the agency's future diesel fuel use, despite a service expansion from 7 roundtrips in 2019 to 12 roundtrips (north of Merced) and 18 roundtrips (south of Merced) in 2030. SJJPA will also be the operating agency for the interim HSR service between Bakersfield and Merced.



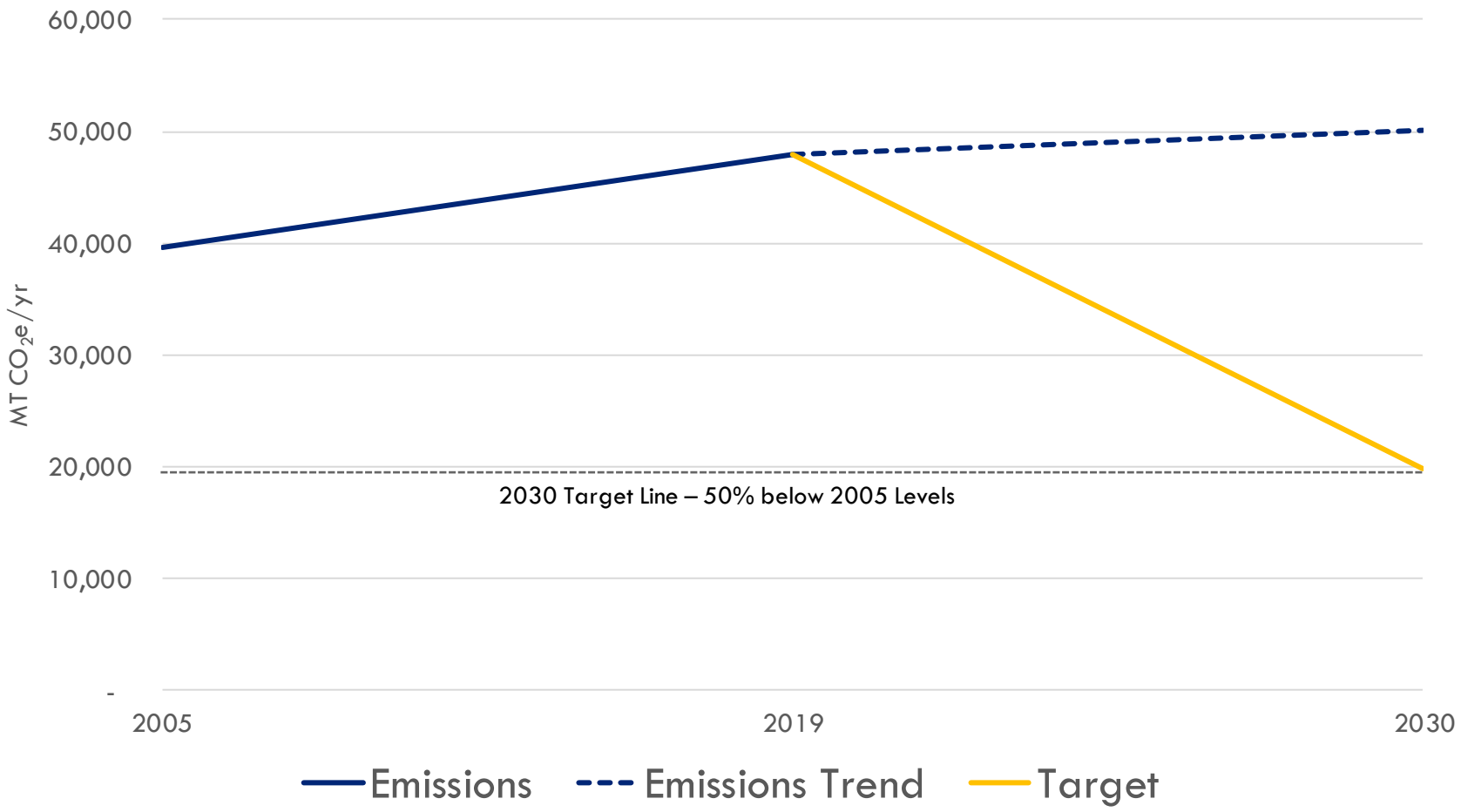
2030 Emissions Forecasts

- To estimate future Thruway bus GHG emissions, a scaling factor for fuel use was developed by estimating daily revenue-miles for Thruway buses in 2019 and 2030.
- Thruway bus routes and service levels in 2030 were primarily based on the Early Train Operator (ETO) operations planning report for interim HSR service (Merced–Bakersfield).
- The Thruway bus forecasting analysis also incorporated some minor adjustments to the ETO plan, such as accounting for changes to Thruway service from 2019 to 2022. This analysis also excluded Capitol Corridor Thruway routes (Sacramento–Reno and Sacramento–South Lake Tahoe).
- The analysis results show an approximate doubling of Thruway bus mileage from 2019 to 2030.

2030 Emissions Forecasts

- SJJPA is committed to using 100% renewable diesel in its bus fleet in the near-term and converting to zero emissions vehicles over the medium-term. The strategies would result in near-zero and zero GHG emissions, respectively, regardless of how SJJPA bus services ultimately change through 2030 in response to the expansion of train services.

GHG Emissions Forecasts & Target



Inventory Comparison & 2030 Target

- Based on the 2005 base year inventory results, the agency's 2030 GHG target is 19,820 MT CO_2e/yr.
- Target achievement will require GHG reductions totaling 30,306 MT CO_2e/yr in 2030.

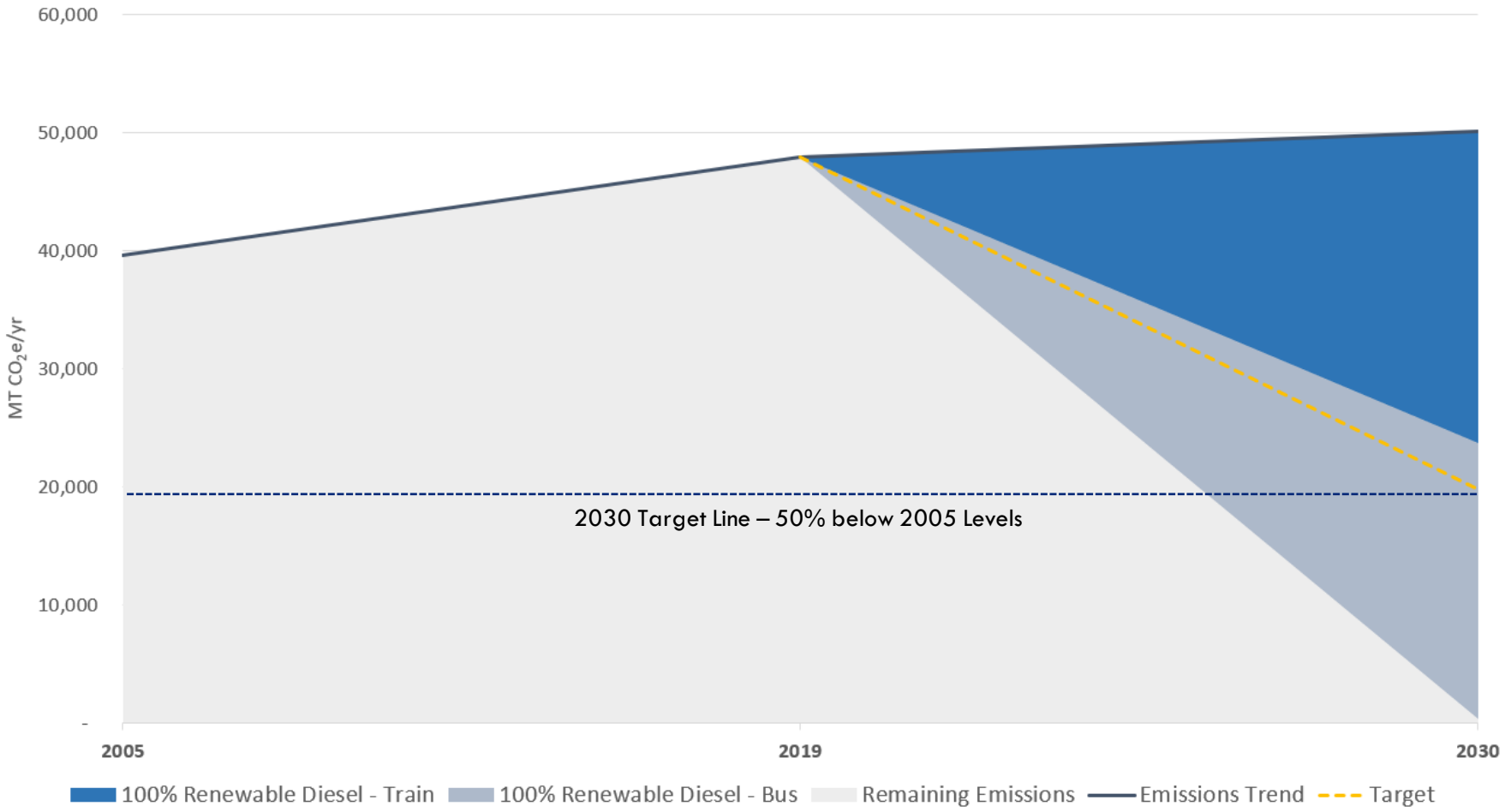
Emissions Source	2005 MT CO_2e/yr	2019 MT CO_2e/yr	2030 MT CO_2e/yr
Locomotives	27,852	36,229	26,633
Buses	11,787	11,675	23,492
Total	**39,639**	**47,904**	**50,125**
2030 Target	50% below 2005 levels = **19,820 MT CO_2e/yr**		
2030 Reductions Needed	**30,306 MT CO_2e/yr**		

GHG Reduction Pathway

GHG Reduction Actions

- SJJPA is committed to using 100% renewable diesel in its trains by 2023, and in its buses by 2025. This renewable fuel use commitment will bring the agency's operational emissions analyzed in this initial CAP Framework to near zero by 2030.
- The remaining emissions would total 336 MT CO_2e/yr. in 2030, which represents the methane (CH_4) and nitrous oxide (N_2O) emissions associated with renewable diesel use; the carbon component of this fuel is biogenic in nature because the fuel is derived from biomass materials that naturally sequester carbon. For GHG inventory purposes, biogenic carbon emissions should be reported separately, but are not included in the GHG emissions total.

2030 Target Achievement Pathway



2030 Target Achievement

Emissions Source	2005 MT CO_2e/yr	2019 MT CO_2e/yr	2030 MT CO_2e/yr
Locomotives	27,852	36,229	26,633
Buses	11,787	11,675	23,492
Total	**39,639**	**47,904**	**50,125**
2030 Target	50% below 2005 levels = **19,820 MT CO_2e/yr**		
100% Renewable Diesel - Trains	-	-	-26,397
100% Renewable Diesel - Buses	-	-	-23,391
Sub-total	**-**	**-**	**-49,789**
Remaining Emission	-	-	336
% below 2050 Levels	**-**	**-**	**99.2%**

Future GHG Reduction Actions

- In 2020, Governor Newsom signed Executive Order N-79-20 that calls for decarbonization within the transportation industry, including a target of 100% zero-emission off-road vehicles by 2035.
- To achieve the goals of this Executive Order, SJJPA will take a phased approach to decarbonizing its transit services. This includes the initial commitment to transition fuel use to renewable diesel, followed by a transition to a zero-emissions train and bus fleet.

Future GHG Reduction Actions

- As recently as the last Transit and Intercity Rail Capital Program (TIRCP) cycle, SJJPA applied for funding for research and development and pilot testing of new vehicle technologies that will help achieve the state's GHG reduction targets.
- The agency is considering a wide range of technology options for achieving zero emissions, including more visionary solutions such as a transition to zero-emissions multiple-unit (ZEMU) trains. In partnership with the State, SJJPA will work toward transitioning to a full zero-emissions fleet by 2035.

Other Sustainability Actions

- The agency also has a history of taking action that will improve general sustainability outcomes, some of which fall outside a CAP's traditional GHG focus, and/or fall outside the scope of this initial CAP Framework, including:
  - Incorporating Tier 4 locomotives into the fleet
    - These provide a minor increase in GHG emissions but substantial improvement to air quality emissions.
    - These locomotives also allow an increase in coaches per train (from 7 to 10), which improves per passenger fuel efficiency metrics.
  - In the process of developing on-site solar programs at stations, with an initial focus on new station construction projects. This reduces operational energy demand that might otherwise be provided from non-renewable sources.
  - Planning for service expansions, including operating the future HSR service, which helps avoid GHG emissions within the SJJPA service territory by facilitating a switch toward low-carbon travel options.

Stakeholder Engagement

Stakeholder Engagement

- Following development of this initial CAP Framework, the agency's steps for stakeholder engagement are to consider working with groups like the Central Valley Working Group and Valley Directors Committee, and then take the draft CAP Framework to the Board for approval.
- Following approval, the agency will publish the CAP Framework to its website.

Monitoring Approach

GHG Reduction Monitoring

- The agency will approach GHG target progress monitoring in two ways, including tracking overall GHG reductions and tracking individual action implementation.
- **Top-down monitoring** – The agency will regularly track fuel use (and fuel type) for its trains and buses, along with other transit service metrics that help contextualize fuel consumption, such as:
  - Gallons of fuel use by each service compared to annual service miles provided to express changes in operational efficiency
- **Bottom-up monitoring** – The agency will also track implementation of specific GHG reduction actions to monitor their individual progress over time. This more granular level of monitoring will support course corrections, as needed, if specific actions are not achieving their estimated potential.
  - For example, as part of bottom-up monitoring the agency can confirm continued use of renewable diesel in locomotives and buses as planned, until zero-emissions vehicles are fully incorporated.
  - Similarly, when the agency expands the GHG inventory to include stationary energy use (for example) and develops new GHG reduction actions, implementation of those actions can be monitored on a regular timeline to confirm progress occurs as estimated.

Anticipated Future Steps in Climate Action Planning

Note: opportunities presented in this section are contingent upon the agency identifying additional funding sources to complete further GHG analysis.

GHG Inventory Expansion

- As described earlier, this CAP Framework is based on a partial GHG inventory that considers the agency's largest operational emissions sources. Future phases of CAP analysis can expand that scope to consider a fuller range of operational emissions sources, as guided by the GHG inventory protocols referenced in this CAP Framework. The following slide suggests a potential phased approach to expanding GHG emissions analysis based on the likely scale of additional emissions sources and data availability.

GHG Inventory Expansion

- The agency can include additional emissions sources based on Corporate Standard requirements, as prioritized below:
  - Priority #1
    - Purchased electricity for total agency operations
    - Stationary combustion – natural gas, propane, diesel, etc.
  - Priority #2
    - Mobile combustion – fuel use in other agency on-road vehicles
    - Mobile combustion – fuel use in agency off-road vehicles & equipment
  - Priority #3
    - Fugitive sources – refrigerant use
    - Fugitive sources – natural gas distribution leaks
    - Optional 'other sources' as deemed relevant by the agency

GHG Inventory Expansion

- As part of future GHG emissions analysis, the agency can also determine its ability to report 'optional' emissions sources, such as:
  - Employee commute
  - Employee business travel
  - Waste disposal
- The agency can also work to refine the data collection process for current inventory sources:
  - San Joaquins Thruway buses – the agency can work with its providers to track and report annual fuel consumption from bus services AND/OR report annual vehicle miles traveled (See Appendix for a sample Amtrak data request table)

New Action Identification

- As additional emissions sources are included in the agency's operational GHG inventory, new actions can be developed, implemented, and monitored to reduce those corresponding emissions. Additional GHG reduction opportunities could include:
  - Decarbonizing buildings/facilities to transition away from fossil fuel appliances/equipment
  - Renewable energy generation/purchases
  - Decarbonizing agency on-road fleet (e.g., passenger vehicles, light-duty trucks) and construction equipment/off-road vehicles

Avoided Emissions Analysis

- SJJPA plays an important role in decarbonizing travel in California. Beyond reducing operational GHG emissions, the agency's core service is a primary GHG reduction strategy for long-term State and national GHG goals. Agency service expansion helps to remove vehicles from roadways (and passengers from airplanes) and replaces them with a zero-carbon transit alternative. As the agency achieves its goals for a zero-emissions fleet, its future service expansion is a net positive solution to global climate change.

Avoided Emissions Analysis

- The most significant GHG reductions resulting from the agency's low- (and soon-to-be zero) carbon transit service likely accrue outside of this CAP Framework. These are the GHG reductions from avoided emissions – on-road community transportation emissions that can be avoided through use of SJJPA trains and Thruway buses. Within a CAP perspective, these emissions reductions would appear in the various community CAPs for jurisdictions served by SJJPA.

Avoided Emissions Analysis

- The agency has begun estimating the avoided GHG emissions as part of its most recent TIRCP application. Future expansion of this CAP Framework can refine these initial estimates and put them in the context of the agency's operational GHG emissions.
- Future CAP efforts might also include quantified estimates for reductions in air pollutants, beyond GHG emissions, to contextualize other public health benefits of the agency's decarbonization actions, including benefits to environmental justice communities.

Long-term GHG Target

- The agency can set a long-term GHG reduction target beyond the initial 2030 target analyzed in this CAP Framework.
- Based on trends in climate planning from industry leaders, public agencies, local governments and others, an appropriate long-term target could be set as zero carbon or carbon neutrality by some future target year (e.g., 2045, 2050).
- The process for establishing a long-term target should consider all emissions sources within the complete GHG inventory and corresponding reduction strategies.