Fresno COG 2022 RTP/SCS changes made via Amendment No. 2

The purpose of this document is to provide supporting information on changes to Fresno COG's 2022 RTP/SCS via Amendment No. 2. The changes to Appendix C Item 5 and Appendix C Item 12 are described below:

A. Electric Vehicle (EV) Charging Infrastructure Program Strategy

Fresno COG completed Regional Electric Vehicle Readiness Plan (EVRP), which identified funding sources for charging infrastructure and EV incentives that can be used to quantify the VMT/GHG reductions. Funding sources include federal, state, regional and local sources (Measure C, local sales tax aimed at improving the overall quality of Fresno County's transportation system). Fresno COG's New Technology Grant Program through the local sales tax measure (Measure C) and FTA's Low or No Emissions Program has funded several grants to deploy electric buses in charging infrastructure.

The targeted population of EVRP plan is the general residents of Fresno County. The plan will be implemented by various public and private entities within Fresno County. Fresno COG will monitor the progress of the plan.

The plan recommended installing 4,983 level 2 public charging ports sited within incorporated Fresno County cities by 2030. PHEV drivers in Fresno County would be able to drive a larger share of miles in electric mode because of accessibility to public chargers, instead of shifting to gasoline-powered mode when battery run out. The Electric Vehicle Charging Infrastructure strategies can reduce GHG emissions as the PHEV cVMT be replaced by eVMT.

Table - Regional EV Charger Program Calculation Parameters

Parameter	Value	Source
PHEV population	21,283	EMFAC 2021, 2035 calendar year, FCOG region
# of new EV chargers	4,983	Fresno COG, Electric Vehicle Readiness Plan
cVMT to eVMT	13 miles/PHEV/day	SCS guidelines Appendix E
PHEV emission rate – gasoline	283.4 grams/mile	EMFAC 2021, 2035 calendar year, FCOG region

Quantification Methodology

The steps are as follows:

Step 1: Identify number of public EV chargers to install in the region as part of strategy based on funding commitment and/or policies.

- The EVRP recommended 4,983 new public chargers by 2030.

Step 2-3: Identify the number of PHEVs in the region that could use EV chargers installed as a result of the strategy.

- Assuming 7 PHEVs per charger installed (SCS guidelines Appendix E), the new public chargers in EVRP would be able to serve 7 * 4,983 = 34,881 PHEV.
- The 2035 Fresno region PHEV population acquired from EMFAC 2021 is 21,283. The reason EVRP has more chargers than region total PHEV needs is that Fresno COG' EVRP considered the charging need for BEVs.
- As the SCS EV charging infrastructure strategy is for PHEV benefits, we only include regional PHEV population from EMFAC 2021 data (21,283 PHEVs) for SCS off-model calculation.

Step 4-5: Estimate the total increased PHEV eVMT in the region resulting from strategy implementation.

- Assume an average of 13 eVMT increased per day per PHEV using a workplace EV charging connector (SCS guidelines Appendix E).
- Estimate the total increased PHEV eVMT: 21,283 * 13 = 276,679 miles

Step 6-7: Determine total regional GHG emission reductions due to the shift in PHEV operating mode from gasoline to electric.

- The average 2035 Fresno County region PHEV emission rate of gasoline operating mode was obtained from EMFAC 2021. Assume 283.4 grams of CO2 is avoided for each PHEV mile transferred from gasoline to electric operation.

- Total reductions in regional CO2 emissions = 276,679 * 283.4 gram/day

Challenges, Constraints, and Strategy Implementation Tracking

The goal of this strategy is to convert PHEV driving from gasoline operating mode to electric operating mode. The potential benefits of BEV accessibility to public chargers, EV travel pattern or boost of EV purchases are not included in this strategy. The effectiveness of EV charging infrastructure strategy may vary depending on adoption of PHEVs and electric range of PHEVs. Fresno COG will monitor the number of public EV charging connectors installed by the strategy and the regional PHEV population.

B. Transportation System Management (TSM)/Intelligent Transportation Systems (ITS) Strategies

In the current SCS there are many TSM/ITS projects or components incorporated in various planned projects, such as ramp metering and signal control management. These improvements are not modeled by Fresno COG's ABM model. To properly account for these improvements, off-model calculation was utilized.

The targeted population of TSM-ITS Strategies is the general residents of Fresno County. The funding source will be combination of Federal, State, and local funds and programs identified in the RTP document. The plan will be implemented by various public agencies within Fresno County. Fresno COG will monitor the progress of the plan.

Fresno COG utilized the methodology employed in the San Joaquin Valley SCS Off-model Strategy Analysis spreadsheet developed by Trinity Consultants for TSM-ITS strategies, which involves the following steps:

1. Identify the amount of funding for the TSM-ITS strategy by summarizing the TSM-ITS project cost in the RTP/SCS preferred scenario (Scenario B).
2. Identify the unit cost of installation and/or maintenance of the specific TSM related system by calculating the average project cost.
3. Calculate the approximate number of TSM-ITS projects the given funding would allow.
4. Fresno COG assumed the average hourly travel speed to be 40 miles/hour and VMT of the affected roadway network to be 10% of the total regional VMT provided by Fresno ABM.
5. Based on the proposed number of and type of TSM-related systems, estimate the impact of the proposed TSM strategy to travel speed from empirical literature. The benefit of implementing Adaptive Signal Control Technologies (ASCT) is quantified in Rural Intelligent Transportation Systems (ITS) Toolkit (https://ruralsafetycenter.org/resources/rural-its-toolkit/) to be improvement of average performance metrics by 10 percent or more. In this case, Fresno COG estimated the average hourly travel speed with TSM to be 45 miles/hour.
6. Estimate the GHG emission factors for travel speeds with without the effects of the TSM strategy using the latest EMFAC model.
7. Estimate the effects of the TSM strategy to GHG emissions. The off-model reductions were then applied to the total SB375 GHG emission reduction calculations for the respective years.

C. Telecommute Strategy

In 2020, telecommute became unplanned reality due to COVID pandemic. Going forward, the influence of this pandemic is still uncertain. To gauge the scope and willingness of employees as well as employers in Fresno County to participate in telecommute programs, Fresno COG conducted a county-wide survey. The survey results provided valuable local data to help quantify the long-term trends in applying such strategies. The surveys are designed separately for employees and employers. Fresno COG has collected data by employment industry to gauge the level of acceptance/feasibility for telecommuting. Fresno COG Telecommute Survey Results can be found online at https://www.fresnocog.org/https-www-fresnocog-org-get-involved-2/. Fresno COG used result from Central California Travel Study to estimate the employment sectors that are eligible to work from home.

The targeted population of the telecommute strategy is the commuters who live and work in Fresno County and able to telecommute. Most workers able to telecommute work in the industry of Professional, Scientific, and Technical Services, Educational Services, Health Care and Social Assistance, and Public Administration, Government. Fresno COG will seek any available Federal, State, and local funds and programs that apply to telecommute. The plan will be implemented by various public and private entities within Fresno County. Fresno COG will monitor the progress of the plan.

Fresno COG used the following steps to calculate the emission reductions from the telecommute strategy:

Step 1: Fresno Activity Based Model is used to calculate average home-based work (HBW) trip length in the region.

Trip Length $_{\text{work trip}}$ = 9.53 miles.

Step2: Identify the number of additional telecommuters.

(1) Based on the latest 2022 Central California Travel Study, 74,703 workers in Fresno County were able to telecommute at least a day per month.

The employment numbers were projected into the future years using employment forecast taken from the updated Fresno COG population & employment forecast for the 2022 RTP/SCS, which is available at: https://www.fresnocog.org/wp-content/uploads/2021/03/Fresno-COG-2019_2050-Projections-Final-Report-102920.pdf

$$2035\ \text{telecommute eligible worker} = \frac{2021\ \text{telecommute eligible worker}}{2035\ \text{employment}} * 2035\ \text{employment}$$

$$= 85{,}178$$

(2) Employment subject to Rule 9410 was subtracted from the total county-wide employment number in the calculation to avoid double-counting.

$$2035 \text{ telecommute eligible worker} - \text{Rule } 9410 = \ 56{,}425$$

(3) Using Employer Survey results, Fresno COG applied the percentages and frequencies of the eligible employment sectors which employers plan to offer telecommuting to their employees (i.e., 31% plan to offer telecommuting 5 days a week and 26% for 2 days a week).

(4) Subsequently based on Employee Survey results, Fresno COG applied the percentages and frequencies of eligible employees to participate in telecommuting (i.e., 29% of eligible employees will telecommute approximately for 5 days, 11% for 4 days, 21% for 3 days, 23% for 2 days, and 5% for 1 day).

(5) $2035 \text{ additional telecommuters} = 56{,}425 * \ 31\% * \left(29\% * \frac{5}{5} + 11\% * \frac{4}{5} + 21\% * \frac{3}{5} + 23\% * \frac{2}{5} + 5\% * \frac{1}{5}\right) + 26\% * \left(23\% * \frac{2}{5} + 5\% * \frac{1}{5}\right) = 12{,}096$

Step3: Estimate the number of reduced HBW trips per commuter due to strategy.

Reduced work trips per commuter = 2

Step 4: A rebound effect was also added to the calculation based on CARB's recommendation. The rebound factor applied was 3.7 miles per day per telecommuter, which was used in the San Joaquin Valley SCS Off-model Strategy Analysis V3.0 spreadsheet developed by Trinity Consultants. The 3.7 miles per day factor was based on a paper published by Reitan in 2014 (https://www.semanticscholar.org/paper/The-Rebound-Effect-%3A-A-Simulation-Model-of-Reitan/fa131cef07341a2eec3faef3017de9ec6dc890e4) and factor used by SCAG in 2016.

$$VMT\ reduction_{telecommute} = \left(Trip\ Length_{work\ trip} * \ Reduced\ work\ trips\ per\ commuter - Rebound\ Effect\right) * Additinoal\ Telecommuters$$
$$= (9.53 * 2 - 3.7) * 12{,}096$$

Step 5: The GHG emission reductions were calculated by multiplying the reduced telecommute VMT by the average light-duty vehicle emission factors for the respective years.

Step 6: The off-model reductions were then applied to the total SB375 GHG emission reduction calculations for the respective years.

D. Car Sharing Strategy

Car share program is a membership-based service that provides access to shared vehicles for shorter-term use, often by the hour where fees are typically prices on per-mile or hourly basis. It is an affordable and convenient alternative to owning a car. Car share program can benefit users by saving money on transportation costs as well as benefit communities and the environment by reducing greenhouse gas emissions and traffic congestion.

Car share program has potential to reduce greenhouse gas emissions by reducing vehicle ownership rates as households often shed one or all their vehicles by becoming car sharing members, reducing single occupancy vehicle trips, and VMT, as mode choices shift to biking, walking and transit use due to lower auto ownership rates. In addition, the car share fleets are often newer and fuel efficient than older privately-owned vehicles which are replaced by car sharing.

Fresno region is fairly newer to car sharing. A Car sharing program with 42 electric vehicles has been in Southwest region of Fresno city, which is highly air polluted area of the city[1]. Fresno Area Express also plans to conduct studies for feasibility and implementation of a car share program worth $25 million which is included in RTP constrained list. Local ½ cent sales tax also plans to apportion funds to new technologies such as car sharing that helps to reduce VMT and GHG emissions.

Fresno COG used the following steps to calculate the emission reductions:

Step 1: Identify TAZs that have sufficient residential densities to support car sharing.

a. Preferred Approach: Use data from regional and/or local car share operators, region-specific study, or other local empirical data sources for local residential density support rate.
b. Alternate Approach: Use conservative local residential density support rate five (5) residential units per acre.

Step 2: Estimate Total Population of regions/County/City/TAZs identified in Step 1 as having sufficient residential densities to support car sharing.

Step 3: Identify regional car share adoption rate.

a. Preferred Approach: Use data from regional and/or local Car share operators, region-specific study, or other local empirical data sources for regional adoption rate.

[1] Ride Share E-Bikes and EVs Are Coming to Southwest Fresno https://gvwire.com/2022/03/08/ride-share-e-bikes-and-evs-are-coming-to-southwest-fresno/

b. Alternate Approach: Use conservative adoption rate of 10% of individuals aged 21 to 45. This number was derived from two car-sharing studies in major metropolitan/urban
c. areas described above.

Step 4: Estimate car share membership population of region/County/City/TAZs identified as having sufficient residential densities to support car sharing using the car sharing adoption rate.

Membership Populationcs = (Total Populationcs x Adoption Ratecs)

Step 5: Estimate VMT reductions from vehicles discarded or shed by car sharing members.

a. Preferred Approach: Use data from regional and/or local Car share operators, region-specific study, or other local empirical data sources to estimate the number of trips or miles per year that are associated with shed vehicles per car sharing member.
b. Alternate Approach: Use conservative estimate that shed VMT is 8,200 miles per year.

Total VMTshed = (Membership Populationcs x VMTMemb Shed)

Step 6: Obtain CO2 emission rates for shed private automobiles from the current version of EMFAC.

Step 7: Estimate CO2 emission reductions from private automobiles shed by car sharing members.

CO2shed = Total VMTshed x EMFACshed

Step 8: Estimate VMT from car share members driving car share vehicles

a. Preferred Approach: Use data from regional and/or local TNC operators, region-specific study, or other local empirical data sources to estimate the average number of trips or miles per year driven per car sharing member.
b. Alternate Approach: Use conservative estimate that each car share member drives 1,200 miles per year in a car share vehicle.

Step 9: Estimate emission rates from car share members driving car share vehicles

a. Preferred Approach: Use average local car sharing mix fleet based on data from regional and/or local TNC operators, region-specific study, or other local empirical data sources to identify average fleet-specific mix and age distribution to estimate car share fleet emission rates from the current version of EMFAC.
b. Alternate Approach: Obtain CO2 emission rates for shed private automobiles from the current version of EMFAC and reduce by 29%.

Step 10: Estimate CO2 emissions from car sharing vehicle operation.

CO_2cs = Total VMTcs x EMFACcs

Step 11: Estimate total CO_2 emissions associated with car sharing in the region/TAZs.

Total CO_2cs = CO_2shed + CO_2cs