Off-Model Strategies Adopted by California MPOs
In Sustainable Communities Strategies as of April 29, 2016

Off-model adjustments are commonly used to estimate greenhouse gas (GHG) emissions reductions from strategies to which regional travel demand models and land use models are not sensitive. These off-model adjustments are based on evidence from empirical research that demonstrate the potential for GHG emissions reductions from particular strategies found in Sustainable Communities Strategies (SCS). Common off-model strategies include Transportation Demand Management (TDM) such as employer-based trip reduction, ridesharing, and car sharing programs; Transportation System Management (TSM) such as ramp metering, variable message signs, and incident management; Intelligent Transportation Systems (ITS) such as providing travel information; and incentive programs to encourage electric vehicle (EV) use. This memorandum summarizes common off-model strategies that have been adopted by California Metropolitan Planning Organizations (MPOs) as part of their SCSs and for which GHG emissions reduction credit was taken towards meeting Senate Bill (SB) 375 targets.

The attached tables summarize the off-model strategies used by all 18 MPOs, and the total GHG emissions reduction benefit claimed by the MPO as part of its quantification of GHG emissions reductions to meet SB 375 targets. The tables reflect the first SCSs for most MPOs, but reflect the second SCSs for SANDAG, SCAG, and SACOG.

Car Sharing

Car sharing is a short-term auto use program in which people rent cars for short periods of time, often by the hour. MPOs estimated the GHG emissions reduction benefit from car sharing based on the currently enrolled car sharing members in the region, the suggested GHG emissions reduction potential from studies such as *Moving Cooler*,[1] CAPCOA's *Quantifying Greenhouse Gas Mitigation Measures*,[2] and the California Air Resources Board's (ARB) land use and transportation policy briefs.[3]

Ridesharing

Ridesharing is a commute alternative to driving alone, which can be in the form of carpooling (i.e., High Occupancy Vehicle 2+ (HOV 2+)) or vanpooling (HOV 6 to 15). MPO(s) estimated GHG emissions reductions from ridesharing based on existing

[1] Cambridge Systematics, *Moving Cooler: An Analysis of Transportation Strategies for Reducing Greenhouse Gas Emissions*, Urban Land Institute, publisher, 1 Sept. 2009, <http://www.issuelab.org/resource/moving_cooler_an_analysis_of_transportation_strategies_for_reducing_greenhouse_gas_emissions>.
[2] California Air Pollution Control Officers Association, *Quantifying Greenhouse Gas Mitigation Measures*, Aug. 2010, <http://www.capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf>
[3] Handy, S., M. Boarnet, et al., Transportation and Land Use Policy Briefs, <http://arb.ca.gov/cc/sb375/policies/policies.htm>.

ridesharing programs in the region, or ridesharing statistics provided by ridesharing programs such as the 511 Rideshare and California Vanpool Authority (CalVans).

Employer-Based Commute Strategies

Employer-based commute strategies encourage employers in the region to establish a plan to encourage employees to reduce single occupancy vehicle (SOV) trips. For example, the San Joaquin Valley Air Pollution Control District's (SJVAPCD) e-TRIP Rule (Rule 9410) is an employer-based commute strategy that applies to worksites in the SJV that have 100 or more employees.

Bicycle and Pedestrian Facility Enhancement

This strategy enhances the existing system of bike lanes and walking paths to encourage non-motorized (active) modes of transportation. MPOs estimated potential GHG emissions reductions associated with the improvement of bicycle and pedestrian facilities based on the applicable level of deployment summarized in *Moving Cooler* such as *expanded current practice*, *aggressive*, and *maximum effort* of deployment, or local studies.

Work-At-Home Policies

Instead of commuting to a central workplace, work-at-home policies allow employees to work at home by using a computer and/or phone. MPO(s) estimated the GHG reduction benefit from the work-at-home policies based on the existing telecommuter participation rate and average commute trip length in the region.

Transportation System Management (TSM) and Intelligent Transportation System (ITS)

TSM refers to strategies that aim to reduce GHG emissions by reducing congestion through improving transportation system efficiency and traffic flow. ITS strategies involve the use of electronics, communications, or information processing to improve the efficiency of a transportation system. MPOs estimated potential GHG emissions reductions associated with the deployment of TSM and ITS strategies based on the applicable level of deployment of GHG emissions reductions summarized in the *Moving Cooler* report.

Electric Vehicle Programs

Strategies such as regional EV chargers, vehicle buy-back and plug-in electric vehicle (PEV) purchase incentives, and increased EV market penetration increase the proportion of clean vehicle miles driven in the region. MPOs estimated the GHG emissions reductions based on their current knowledge of the fleet mix in their regions, and the projected penetration of EVs in the market.

Attachment: Off-Model Strategies Adopted by California MPOs as of April 29, 2016

The following tables summarize the off-model strategies used by California MPOs (Table 1) and the total GHG reduction benefit claimed by the MPO as part of its quantification of GHG reductions to meet SB375 targets (Table 2). The tables reflect the first SCSs for most MPOs, but reflect the second SCS for SANDAG, SCAG and SACOG.

Table 1: Off-Model Strategies Used by California MPOs

Strategy Type	MPO								
	AMBAG	FresnoCOG	MTC	SACOG	SANDAG	SCAG	StanCOG	TMPO/TRPA	TulareCAG
Active Transportation	✓	✓				✓		✓	
Electric Vehicle Related Program			✓	✓	✓				
Intelligent Transportation System (ITS)				✓					
Transit System Enhancement	✓							✓	
Transportation Demand Management (TDM)	✓	✓	✓	✓	✓	✓	✓	✓	
Transportation System Management (TSM)	✓			✓					
Employer Based Trip Reduction	✓								✓

Table 2: Total Per Capita GHG Emissions Reduction from All Off-Model Strategies Combined

MPO	Strategy	GHG Reduction[1]		Reference[2]
		2020[3]	2035	
AMBAG	**Transportation System Management**	--		*Moving Cooler: An Analysis of Transportation Strategies for Reducing Greenhouse Gas Emissions*[4]
	Transportation Demand Management			ARB policy briefs on impacts of transportation and land use related policies[5]
	Travel Reduction Programs			CAPCOA: *Quantifying Greenhouse Gas Mitigation Measures*[6]
	Active Transportation			SACOG (2012). *Final Environmental Impact Report for the MTP/SCS for 2035*[7]
	Transit System Enhancement			ABAG/MTC (2013) *Bay Area Plan: Strategy for a Sustainable Region*[8]
FresnoCOG	**Ridesharing**	2.70%	2.70%	2012 vanpool study by CalVans[9]
	Employer-Based Trip Reduction	3.94%		SJVAPCD's e-TRIP Rule (or Rule 9410)[10]
	Bike/Walk Facility Enhancement and ITS Deployment			*Moving Cooler: An Analysis of Transportation Strategies for Reducing Greenhouse Gas Emissions*
MTC	**Regional Electric Vehicle Charger Program**	4.60%	6.30%	EV-related strategies baseline calculation tool created by ICF International (May 2013)
	Vehicle Buyback and Plug-in Electric Vehicle Purchase Incentive			
	Clean Vehicles Feebate Program			
	Smart Driving			Smart driving public outreach campaign benefit spreadsheet tool by MTC
	Car Sharing			Car sharing studies[11]
				City of San Francisco car share study
				Car share participation study by Zipcar
	Commuter Benefit Ordinance			MTC Commuter Benefits Ordinance Calculator (2011) by ICF
	Vanpools			Historical vanpool participation study by MTC
SACOG	**Transportation Demand Management and Car Sharing**	1.62%	3.17%	*Moving Cooler: an Analysis of Transportation Strategies for Reducing Greenhouse Gas Emissions*
				SACOG (2015). Preliminary Modifications for the Draft Preferred Scenario[12]
	Transportation System Management and Intelligent Transportation Systems			ARB policy briefs on impacts of transportation and land use related policies
	Work-At-Home Policies			CAPCOA: *Quantifying Greenhouse Gas Mitigation Measures*
	EV Local Programs			SACOG's TakeCharge[13] EV infrastructure support program
				ARB's EMFAC2014 vehicle population forecasts
SANDAG	**Incentivized Carpool Program**	1.46%	3.15%	Carpool off-model tool by SANDAG
	Car sharing			Vanpool program participation study by SANDAG
				Car sharing studies[14]
				Participation studies by Car2go and Zipcar programs
	Plug-in Electric Vehicle Readiness Plan			SANDAG Regional charger program off model
SCAG	**Alternative Fuel Vehicles**	--	2.10%	MTC (2013) Bay Area Plan: Strategy for a Sustainable Region
				CAPCOA: Quantifying Greenhouse Gas Mitigation Measures
	Neighborhood Electric Vehicles			Regional mobility studies
	Shared Mobility Services: Car Sharing, and Ridesourcing			See MTC's car sharing reference
				CAPCOA: *Quantifying Greenhouse Gas Mitigation Measures*
				Local car sharing studies
StanCOG	**Employer-Based Trip Reduction**	2.10%	1.80%	SJVAPCD trip reduction worksheet developed by Sierra Research

MPO	Strategy	GHG Reduction		Reference
		2020	2035	
TahoeMPO /TRPA	**Parking Management for Trip Reduction**	3.00%	4.00%	TMPO regional parking studies on turnover rate and occupancy
				ACS 2009, ACS 2005-09, and the 2000 US Census data
				South Lake Tahoe Strategies Study Report prepared by LSC Inc. in 1998
	Transportation Demand Management: Improving Existing Employer Vehicle Trip Reduction			Code of Ordinances by TRPA[15]
	Transit Service and Facilities			
	Intra-Regional Transit Capital Projects			TRIA LSC Working Version 8
	Transit Operational Changes			Tahoe interregional/intraregional Transit Study
	Transit Coordination Improvement: Trip Planning			Transit studies [16]
	Real-time Arrival Information			Existing studies on transit user real-time travel information[17]
	Transit Coordination Improvement: Wait time and Ticketing Structure			Casello, Jeffrey & Bruce Hellinga (2008) *Impacts of Express Bus Service on Passenger Demand*[18]
				Balcombe et. al. (2004) *The Demand for Public Transport: A Practical Guide* [19]
				Tahoe Regional Transit Systems Plan Study, LSC, 2005 [20]
				Mobility 2030 Monitoring Program by TRPA (2010)
	Bike and Pedestrian Facilities Improvement			The 2009 Bicycle Trail User Model by TMPO/TRPA
	Complete Region-Wide Bike and Pedestrian's Network			
	Snow Removal on Important Bike and Pedestrians Routes			
TulareCAG	**TxD Factors[21] for trip reduction**	2.16%	1.56%	Tulare TxD Review (August 4, 2015) by Fehr & Peers prepared for TulareCAG

[1] Some GHG emissions reductions from off-model adjustment were in terms of VMT reductions. A one-to-one ratio is assumed from percent VMT reduction to GHG emissions reductions here.
[2] More description of individual strategy, the methodology MPOs follow, and MPOs' planning assumptions may be found in cited documents in this reference column .
[3] Some MPOs only claim GHG emissions reductions from off-model adjustment for the target year 2035.
[4] Cambridge Systematics, *Moving Cooler: An Analysis of Transportation Strategies for Reducing Greenhouse Gas Emissions*, Urban Land Institute, publisher, 1 Sept. 2009, <http://www.issuelab.org/resource/moving_cooler_an_analysis_of_transportation_strategies_for_reducing_greenhouse_gas_emissions>.
[5] California Air Resources Board, *Senate Bill 375 – Research on Impacts of Transportation and Land Use-Related Policies*, <http://arb.ca.gov/cc/sb375/policies/policies.htm> (accessed 26 May 2016).
[6] California Air Pollution Control Officers Association, *Quantifying Greenhouse Gas Mitigation Measures*, Aug. 2010, <http://www.capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf>
[7] SACOG, *Final Environmental Impact Report for the Metropolitan Transportation Plan/Sustainable Communities Strategy 2035 Update*, 2012, <http://www.sacog.org/sites/main/files/file-attachments/feir_complete.pdf>
[8] Association of Bay Area Governments and Metropolitan Transportation Commission, *Plan Bay Area: Strategy for a Sustainable Region*, 18 July 2013, < http://mtc.ca.gov/our-work/plans-projects/plan-bay-area-2040/plan-bay-area> (accessed 26 May 2013).
[9] California Vanpool Authority (CalVans). http://www.calvans.org/about-us/history-of-calvans

[10] San Joaquin Valley Air Pollution Control District, *The eTRIP Rule – Rule 9410: Employer Based Trip Reduction*, <http://www.valleyair.org/Programs/Rule9410TripReduction/eTRIP_main.htm>

[11] Shaheen, S.A., Cohen, A, and Chung, M., 2009, *North American Carsharing: 10-Year Retrospectie*, Transportation Research Record: Journal of the Transportation Research Board, No. 2110, Transpotation Research Board of the National Academies, Washington, DC, pp. 35-44.
Zhou, B., Kockelman, K, and Gao, R., 2009, *Opportunities for and Impacts of Carsharing: A Survey of the Austin, Texas Market*, TRB.
Cervero, Golub, and Nee, 2006, *City CarShare: Longer-Term Travel-Demand and Car Ownership Impacts*, TRB 2007 Annual Meeting Paper.

[12] Sacramento Area Council of Governments (SACOG) , 2015, *Preliminary Modifications for the Draft Preferred Scenario*, < http://www.sacog.org/sites/main/files/file-attachments/6-dps_supplemental_v4_0.pdf>.

[13] More information about SACOG's TakeCharge EV infrastructure support program can visit http://www.takechargesac.org/.

[14] See footnote 11. And Zhou, B., Kockelman, K, and Gao, R., 2009, *Opportunities for and Impacts of Carsharing: A Survey of the Austin, Texas Market*, TRB.

[15] Tahoe Regional Planning Agency (TRPA), *Code of Ordinances*, <http://www.trpa.org/wp-content/uploads/TRPA-Final-Code-Adopted.pdf>

[16] Trillium, 2009, *Two years after: Google Transit for Humboldt County,* <http://www.trilliumtransit.com/blog/2009/04/09/two-years-after-google-transit-for-_humboldt-county/>
Google Transit: Some numbers from Missoula, Montana, < http://www.trilliumtransit.com/blog/2009/04/27/google-transit-some-numbers-from-missoula-montana/>,
Trillium, 2009.
Bus ridership study in Brussels, Belgium.

[17] Victoria Transport Policy Institute, 2015, Transit ridership study in Brussels, Belgium*. Valuing Transit Service Quality Improvements: Considering Comfort and Convenience In Transport Project Evaluation*, < http://www.vtpi.org/traveltime.pdf>

[18] Casello, Jeffrey & Bruce Hellinga, 2008, *Impacts of Express Bus Service on Passenger Demand*, University of Waterloo. Journal of Public Transportation, Vol 11, No.4, 2008., <http://www.nctr.usf.edu/jpt/pdf/JPT11-4Casello.pdf>

[19] Balcombe, R., R. Mackett, N. Paully, J. Preston, J. Shires, H. Titheridge, M. Wardman, and P. White, 2004, *The Demand for Public Transport: a Practical Guide*, TRL report, TRL593. <www.DemandForPublicTransport.co.uk, or http://eprints.ucl.ac.uk/1349/1/2004_42.pdf, accessed 9/9/2011>

[20] TRPA, 2005, *Tahoe Regional Transit Systems Plan Study*, < http://www.trpa.org/documents/docdwnlds/tart_execsumm.pdf>

[21] The smart growth post-processor (TxD) was funded by the California Department of Transportation to evaluate and adjust travel model sensitivity based on empirical research.