SOUTHERN CALIFORNIA CLEAN CITIES COALITION STRATEGIC PLAN

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About SCAG

Founded in 1965, the Southern California Association of Governments (SCAG) is a Joint Powers Authority under California state law, established as an association of local governments and agencies that voluntarily convene as a forum to address regional issues. Under federal law, SCAG is designated as a Metropolitan Planning Organization (MPO) and under state law as a Regional Transportation Planning Agency and a Council of Governments (COGs).[1]

The SCAG region encompasses six counties (Imperial, Los Angeles, Orange, Riverside, San Bernardino, and Ventura) and 191 cities in an area covering more than 38,000 square miles. The agency develops long-range regional transportation plans including sustainable communities' strategy and growth forecast components, regional transportation improvement programs, regional housing needs allocations and a portion of the South Coast Air Quality management plans. SCAG's governing body consists of an 86-member Regional Council to help accommodate new responsibilities mandated by the federal and state governments, as well as to provide more broad-based representation of Southern California's cities and counties.[2]

In addition to the six counties and 191 cities that make up the SCAG region, there are six county transportation commissions with primary responsibility for programming and implementing transportation projects, programs, and services in their respective counties. Additionally, SCAG bylaws provide for representation of Native American tribes and air districts in the region on the Regional Council and policy committees.[3]

[1] About SCAG, SCAG. Available at: https://scag.ca.gov/about-us

[2] About SCAG, SCAG. Available at: https://scag.ca.gov/about-us

[3] About SCAG, SCAG. Available at: https://scag.ca.gov/about-us

Executive Summary

The Southern California Clean Cities Coalition was first designated by the U.S. Department of Energy (DOE) on March 22, 1996. In 2010, SCAG resumed direct administrative responsibility for the coalition, which supports locally based governments and industry partnerships in the expanding use of infrastructure and vehicles operating on alternative fuels. The broader network of clean cities coalitions brings together expertise from federal agencies, national laboratories, and other institutions to create tailored clean transportation solutions for communities across the country. They establish networks with stakeholders, providing hands-on support to address local fleet challenges, and build partnerships. Each coalition is guided by key objectives to offer data-driven tools, empower stakeholders, share best practices, engage in technical assistance, and leverage resources to encourage private-sector investment in advanced transportation and infrastructure projects.

The clean cities coalitions are required by the DOE to establish and maintain a strategic plan, which serves as a multi-year guideline to identify objectives and activities to achieve specific goals, including a 16 percent increase in gasoline gallon equivalent (GGE) displaced and a 20 percent yearly reduction in greenhouse gas (GHG) emissions. This Southern California Clean Cities Strategic Plan addresses the elements requested by DOE and these specific targets but additionally it summarizes the activities of the Southern California Clean Cities Coalition, links to SCAG's Connect SoCal Regional Transportation Plan/Sustainable Community Strategy (RTP/SCS) and synergistically aligns with other regional policies and planning initiatives at SCAG. The Strategic Plan is intended to span a four-year period (2024-2028) alongside the Connect SoCal update cycle.

The targets contained in this Southern California Clean Cities Strategic Plan are visionary goals, to be updated annually and "ad hoc," and help to align SCAG's efforts with DOE requirements. They directly align with Connect SoCal 2024 projections, targets, and strategies. The strategic plan was also drafted to align with SCAG's Clean Transportation Technology Policy, established by Regional Council Resolution No. 23-654-5, which provides a guiding framework for the development of zero or near-zero emission transportation systems. Additionally, the strategic plan supports SCAG's Clean Technology Program, harmonizing the federal, state, and regional objectives. This coordination aims to advance clean transportation technologies within SCAG's region, emphasizing a commitment to environmental sustainability.

The Southern California Clean Cities Strategic Plan details the various actions and strategies that SCAG and the Southern California Clean Cities Coalition can undertake to support the advancement of affordable, efficient, and clean transportation technologies. It lays the foundation to promote the shift to efficient, clean energy sources such as biodiesel, electricity, ethanol, hydrogen, natural gas, propane, and renewable diesel, as well as the innovative technologies and infrastructure needed to support this transition. It also underscores the importance of a comprehensive, multi-dimensional approach to policies and regulations to bolster the widespread adoption of clean transportation technologies and ultimately transform Southern California's transportation ecosystem.

The Southern California Clean Cities Strategic Plan encompasses a range of content, including an overview of the current state, covering air pollution status, fuel types, vehicle types, and the existing clean transportation infrastructure. It also reviews SCAG's recently completed work, including studies like the Electric Vehicle Charging Site Suitability Study and the Plug-in Electric Vehicle Atlas Update, and outlines specific, ongoing efforts, such as the Zero Emission Truck Infrastructure Study, Last Mile Freight Program, and collaborations with entities like the Los Angeles Clean Tech Incubator and the University of California, Irvine. The Strategic Plan Roadmap details the immediate steps for the Southern California Clean Cities Coalition, addressing GGE displacement and GHG reduction targets, and provides a high-level summary of potential future efforts contingent on funding and resources.

This plan was crafted to meet the objectives, visions, and strategies of both SCAG and DOE, functioning simultaneously as a SCAG Clean Technology Plan and a Clean Cities Plan. It adopts a holistic approach aimed at harmonizing federal, state, regional and local policies to address any existing gaps and provide a cohesive framework. This is intended to facilitate the efficient implementation of projects that mitigate air quality and greenhouse gas emissions, thus promoting a more sustainable and environmentally friendly outcome.

As the SCAG Clean Cities Coalition is situated within the larger Clean Technology Program, which encompasses projects that extend beyond the requirements set by the DOE, SCAG is committed to investigating possibilities for broadening the Clean Cities initiative within our current programs wherever feasible and applicable. Additionally, SCAG aims to explore co-branding opportunities that can enhance the visibility and impact of these initiatives. This effort reflects our dedication to integrating the Clean Cities mission more comprehensively within our portfolio, thereby maximizing the environmental benefits and fostering greater synergy among our programs.

In conclusion, the Southern California Clean Cities Strategic Plan not only charts a course for the future of clean transportation activities at SCAG but also serves as a strategic alignment of past, present, and future initiatives with regional, state, and federal requirements. Through this holistic approach, the strategic plan underscores a commitment to environmental sustainability and comprehensive conformity with SCAG's long-term planning objectives and goals.

Southern California Clean Cities Strategic Plan Roadmap

SOUTHERN CALIFORNIA CLEAN CITIES VISION

Our vision for Southern California is to cultivate a sustainable and environmentally conscious transportation ecosystem. Central to this vision is the integration of advanced infrastructure, cutting-edge technologies, and forward-thinking policies, underpinned by a principle of technology neutrality. This approach ensures that all potential solutions are considered on their merits, promoting innovation and adaptability in our pursuit of environmental stewardship. We are committed to building an actively engaged community dedicated to eco-friendly transportation practices. Our strategy involves transparent reporting, effective collaboration, and strategic partnerships, establishing a resilient, innovative, and environmentally compatible transportation network. By embodying these principles, we strive to set a benchmark in Southern California for a balanced and sustainable transportation system, aspiring to inspire and guide local, regional, statewide, and nationwide initiatives.

PRIMARY GOAL

The numerical targets for greenhouse gas (GHG) reduction and gasoline gallon equivalent (GGE) displacement are critical for helping California meet its respective climate goals. Specifically, the main goals of the Clean Cities program are a 16 percent increase in GGE displaced and a 20 percent annual reduction in GHG emissions. The DOE established these metrics by examining coalition performance across the country and then passed them down to each coalition. They are intended for the entire coalition network as well as each individual coalition across the nation.

GGE is defined by the National Institute of Standards and Technology as the amount of alternative fuel equivalent to the energy content of one liquid gallon of gasoline. With GGE, consumers can compare the energy content of alternative fuels in relation to gasoline, a fuel that is widely known.[4] **Exhibit 32, Energy Use Impact and GHG Reduction**, illustrates the reductions in GHG and GGE dependent on the type of technology used.

To achieve this goal, a portfolio of alternate fuel vehicles (AFVs) and supporting infrastructure should be considered.

Alternative fuels include but are not limited to:

- Electric Drive
- Compressed Natural Gas
- Propane
- Renewable Natural Gas/Biomethane
- Ethanol/E85
- Biodiesel/B20
- Hydrogen

Vehicle types include but are not limited to:

- Light-Duty Vehicles
- Commercial Medium- and Heavy-Duty Vehicles
- Buses
- Rail

[4] Price Verification Tops Technical Program At NCWM 79th Annual Meeting, National Institute of Standards and Technology. Available at: https://www.nist.gov/news-events/news/1994/05/price-verification-tops-technical-program-ncwm-79th-annual-meeting

Supporting infrastructure include but are not limited to:

- Electric Vehicle Charging Infrastructure
- Hydrogen Fueling Infrastructure
- Natural Gas Fueling Infrastructure

SCAG has designed a set of strategies and actions to support the displacement of GGE and reduction of GHG, drafted to also address regional barriers referenced in this report. Existing barriers include cost, technology readiness, lack of charging and fueling infrastructure, consumer knowledge, and regulatory support. The strategies and actions outlined in this plan are intended to mitigate and minimize these barriers to improve the clean technology transition. Infrastructure and technology deployment are crucial for supporting the transportation network.

STRATEGIES AND PROPOSED ACTIONS

Each clean cities coalition is responsible for providing technical assistance, targeted outreach, tracking, and reporting. Fostering a greater understanding of alternative fuels and accelerating advanced vehicle technologies are central to the clean cities mission. The following goals, strategies, and actions were carefully developed to align with the clean cities coalition program requirements and simultaneously with the Connect SoCal 2024 implementation strategies. They represent seven core areas and are subject to funding availability.

Connect SoCal 2024 includes the following implementation strategies that focus on clean transportation and align with those contained in this strategic plan:

1. Maintain a robust Clean Technology Program that focuses on planning, research, evaluation, stakeholder support and advocacy.
2. Share information and provide technical assistance to local jurisdictions and operators on opportunities to upgrade their fleets and accelerate deployment of supporting infrastructure.
3. Investigate how zero-emission vehicles can strengthen resilience through vehicle-to-grid technologies or other opportunities where batteries can be used to enhance capacity of renewable energy sources.
4. Investigate opportunities to install charging stations that can be used by multiunit dwellers who don't have the same opportunities for charging as single-family homeowners.
5. Facilitate development of EV charging infrastructure through public-private partnerships.
6. Assist local jurisdictions in developing an incentive program to further adoption of zero-emission passenger vehicles.
7. Support the deployment of clean transit and technologies to reduce greenhouse gas emissions as part of the CARB innovative clean technology (ICT) rule.

System preservation and resilience, particularly for evaluating system performance targets, is emphasized in this roadmap. The complete streets strategy supports the integration of new technologies, including those that mitigate climate change impacts. Within the context of transit and multimodal integration, a special focus is given to the role technology can play when improving the transit network. Actions proposed in this strategic plan also align with Connect SoCal 2024 implementation strategies related to goods movement, as many of SCAG's current projects in this space support the decarbonization of the transportation system and help satisfy short-term GHG and GGE goals. Lastly, the plan directs SCAG to provide technical assistance grants for innovative technology solutions that reduce GHG emissions and test the deployment of clean technologies. These critical strategies that implement Connect SoCal 2024 simultaneously support the goals established by the DOE and will similarly help implement this strategic plan.

Exhibit 1 Southern California Clean Cities Coalition Strategies and Proposed Actions

SMART Goals	Barriers Addressed	Actions	Measure of Success	Tracking Frequency	Alignment with Connect SoCal 2024 Implementation Strategies
Infrastructure Deployment					
Support alternative fuel and advanced technology vehicle infrastructure.	•Lack of Charging and Fueling Infrastructure	•Collaborate with public and private sector partners to obtain funding and support the construction of new infrastructure.	•5% increase in EV charging infrastructure between 2024 and 2028 (see **Exhibit 2, SCAG's Guiding Metrics for the 2024-2025 Plan Cycle**)	Annual	Clean Transportation Implementation Strategy 5
Increase the number and accessibility of fueling and charging stations, especially in key transportation corridors.		• Identify key transportation corridors for the strategic placement of additional alternative fueling and charging stations. • Conduct feasibility studies to determine optimal locations and technology choices for infrastructure expansion as needed, building upon SCAG's Plug-in Electric Vehicle Atlas and EV Site Suitability projects, and Zero Emission Infrastructure Study.		Quarterly	Clean Transportation Implementation Strategy 5
Technology Deployment					
Promote the adoption of clean and sustainable transportation technologies.	•Technology Readiness •Cost	•Seek out opportunities to establish a permanent source of program funding (subject to availability) to support the research and development of local, innovative, clean transportation technologies.	•200+ (226) zero emission (ZE)/near-zero emission (NZE) trucks adopted by 2024 (see **Exhibit 2, SCAG's Guiding Metrics for the 2024-2025 Plan Cycle**)	Annual	Clean Transportation Implementation Strategy 1
Facilitate the deployment of alternative fuel vehicles and advanced technology vehicles.		•Establish new partnerships with automotive manufacturers to promote the availability and affordability of clean vehicles.		Quarterly	Clean Transportation Implementation Strategy 1

SMART Goals	Barriers Addressed	Actions	Measure of Success	Tracking Frequency	Alignment with Connect SoCal 2024 Implementation Strategies
		•Research model incentive programs to encourage businesses and individuals to adopt advanced technology vehicles.			
Policy Advocacy					
Advocate for standardized policies and regulations that support clean transportation.	•Regulatory Support •Cost	•Explore tax credits, grants, and regulatory incentives for clean transportation initiatives. •Advocate for consistent regulations and permitting processes across jurisdictions to address the current lack of standards.	•Adoption of Strategic Plan and associated resolution •Expansion of recently adopted policies	Biannual	Clean Transportation Implementation Strategies 1 and 6
Collaborate with policymakers to incentivize alternative fuels and cleaner technologies through regulations and financial incentives.		•Collaborate with environmental advocacy groups and community-based organizations (CBOs) to strengthen support for policies promoting sustainable transportation. •Participate in public hearings and policy forums to provide expert input and promote the adoption of supportive regulations.		Biannual	Clean Transportation Implementation Strategies 1 and 6
Community Engagement					
Increase public awareness and involvement in clean transportation initiatives.	•Consumer Knowledge	•Support public awareness through various media channels to educate the community on the benefits of clean transportation.	•Increased participation via greater number of public events •Participation in the Inland Empire ZEV Working Group with WRCOG	Biannual	Clean Transportation Implementation Strategy 1
Align outreach efforts to educate the public and foster partnerships with community organizations.		•Attend community events, workshops, and webinars to engage residents and solicit their input on sustainable transportation initiatives. •Bolster partnerships with academic institutions to support clean		Biannual	Clean Transportation Implementation Strategy 1

SMART Goals	Barriers Addressed	Actions	Measure of Success	Tracking Frequency	Alignment with Connect SoCal 2024 Implementation Strategies
		transportation education and collaboration.			
Performance Monitoring and Reporting					
Track and report progress toward established targets.	•Technology Readiness	•Explore new reporting mechanisms and continue with existing, regular reporting mechanisms to share progress updates with stakeholders and the public.	•Performance metric definitions? •Improved monitoring system or options	Annual	Clean Transportation Implementation Strategy 2
Explore the feasibility of a monitoring system for displacement of gasoline equivalents and reduction in greenhouse gas emissions.		•Define performance metrics, such as key performance indicators, to regularly monitor and share real-time or frequently updated data. •Research interactive monitoring systems to track GGE displacement and GHG emission reductions.		Annual	Clean Transportation Implementation Strategy 2
Collaboration and Partnerships					
Foster collaboration, including with other clean cities coalitions, and other entities to build on past and ongoing initiatives.	•Regulatory Support •Consumer Knowledge	•Attend and/or convene regular stakeholder meetings to foster collaboration and share best practices. •Form strategic partnerships with private companies, research institutions, and non-profit organizations to leverage expertise and resources.	•Development of a bimonthly new stakeholder or technical working group •Recurring collaborative calls and efforts with other local Coalitions in the SoCal area •New partnerships with academic institutions	Annual	Clean Transportation Implementation Strategies 2, 3, and 7
Collaborate with government, private sector, and nonprofit organizations to leverage resources and share best practices.		•Explore opportunities for joint initiatives with neighboring regions to share knowledge and coordinate efforts for broader impact. Consider alignment on emissions targets, strategies, etc. •Assess the feasibility of establishing a technical advisory committee for critical clean technology priorities.			
Barrier Mitigation					

SMART Goals	Barriers Addressed	Actions	Measure of Success	Tracking Frequency	Alignment with Connect SoCal 2024 Implementation Strategies
Identify and address barriers hindering clean transportation progress.	•All	•Survey among local partners to identify specific technological, economic, regulatory, and public perception barriers.	•Seek funding for $5M to deploy 50 additional ZE/NZE trucks deployed between 2024 and 2028 (see **Exhibit 2, SCAG's Guiding Metrics for the 2024-2025 Plan Cycle**) •Seek funding for $5M to deploy 40 vehicles across clean transportation and/or AFV pilots between 2024 and 2028 (see **Exhibit 2, SCAG's Guiding Metrics for the 2024-2025 Plan Cycle**)	Annual	Clean Transportation Implementation Strategy 4
Review current barriers and assess strategies to overcome them, including pilot programs and public awareness campaigns.		•Develop a pilot program framework to test innovative solutions and strategies for overcoming identified barriers. •Align public relations efforts among SCAG initiatives to address public perception issues and build support for clean transportation initiatives.			

ACTIONS TO DISPLACE GGE AND REDUCE GHG

The Southern California Clean Cities Coalition targets include an increase in 16 percent GGE displaced and 20 percent GHG reduction. Through a combination of current projects and ongoing strategies, SCAG aims to exceed those figures and developed a set of guiding metrics for the 2024-2025 plan cycle to measure the region's progress. Through SCAG's long-term implementation of Connect SoCal, the agency's efforts coincide with DOE targets and align without duplication or creation of additional efforts.

As stated previously, Connect SoCal 2024 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS) sets forth strategies to achieve SCAG's per capita GHG emission reduction target of 19 percent below 2005 levels by 2035, consistent with SB 375 and other regional goals. However, as part of the strategies outlined in Connect SoCal 2024, the Southern California Clean Cities Coalition and its partners can undertake actions that achieve the DOE goals and Connect SoCal 2024's SB 375 goals concurrently. The primary mechanisms for implementing Connect SoCal 2024 and meeting the agency's long-term GHG goals directly support and align with the GGE displacement and GHG reduction goals prescribed by the DOE. The metrics described herein are intended to be high-level estimates with simple calculations for ease of update and replicability.

Exhibit 2 SCAG's Guiding Metrics for the 2024-2025 Plan Cycle

Project or Program	Metric	Calculation/Impact	GHG Reduction	GGE Displacement	Responsible Agency/Partners
Goods Movement Fleet Conversion (Last Mile Freight Program) Goals Addressed: • Technology Deployment • Collaborations and Partnerships • Barrier Mitigation	Number of medium- and heavy-duty vehicle adoptions implemented in the Last Mile Freight Program (LMFP)	• 200+ (226) zero emission (ZE)/near-zero emission (NZE) trucks adopted by 2024	**53%** **17k tons CO2e total**	**8.3%** **1.8M GGE total**	• SCAG • Mobile Source Air Pollution Reduction Review Committee (MSRC) • Fleet partners
Clean Technology Program Outreach and Collaboration Goals Addressed: • Technology Deployment • Collaborations and Partnerships • Barrier Mitigation	Number of medium- and heavy-duty vehicle adoptions estimated to be implemented in the region during the 2024-2028 RTP/SCS cycle and post-LMFP	• Seek funding for $5M to deploy 50 additional ZE/NZE trucks	**10.2%** **3.4k tons CO2e total**	**1.6%** **342k GGE total**	• SCAG • Fleet partners • Funding agencies
UC Irvine Automated Intersection Monitoring for EVs Pilot Goals Addressed: • Infrastructure Deployment • Collaborations and Partnerships • Performance Monitoring and Reporting	Reduction of idling by passenger vehicles in the pilot study area via traffic sensors at key intersections	• Estimated 50,000 daily drivers in the study area • Optimized sensor systems can save one-fifth of one GGE per car • Could annually save 10,000 GGE per day	n/a	**16%** **3.65M GGE total**	• SCAG • UC Irvine • Technology partners • City of Irvine

Project or Program	Metric	Calculation/Impact	GHG Reduction	GGE Displacement	Responsible Agency/Partners
EV Charging Infrastructure Expansion and Zero Emission Truck Infrastructure (ZETI) Implementation Goals Addressed: • Infrastructure Deployment • Collaborations and Partnerships • Performance Monitoring and Reporting	Number of charging stations or related infrastructure projects, estimated to be implemented over the 2024-2028 RTP/SCS cycle	• Estimated 5% increase in EV charging infrastructure and 3% increase in EV sales • 7,899.2 tons for EV charging infrastructure increase (799 stations) and 3.79M GGE for drivers	**23%** **7.9k tons CO2e total**	**17%** **3.79M GGE total**	• SCAG • Technology partners • Private vendors • Local operators and governments
Smart Cities Vision Plan and AFV Pilot Implementation Goals Addressed: • Technology Deployment • Collaborations and Partnerships • Community Engagement • Performance Monitoring and Reporting	Pilot program for clean transportation technology and AFV deployments, estimated to be implemented over the 2024-2028 RTP/SCS cycle	• Seek funding for $5M to deploy 40 vehicles across clean transportation and/or AFV pilots • Mix of fuel types and vehicle types including compressed natural gas (CNG), EV, and ZE/NZE, and medium- and heavy-duty vehicles	**8.2%** **2.7k tons CO2e total**	**1.3%** **274k GGE total**	• SCAG • Technology partners • Private vendors • Local operators and governments • Funding agencies • Transit Operators

Project or Program	Metric	Calculation/Impact	GHG Reduction	GGE Displacement	Responsible Agency/Partners
California Air Resources Board (CARB) Innovative Clean Transit (ICT) Regulation: Zero Emission Bus (ZEB) Implementation Requirements Goals Addressed: • Technology Deployment • Collaborations and Partnerships • Community Engagement • Performance Monitoring and Reporting	Mandatory upcoming transition to ZEB for all new bus purchases in the region by 2029	• Region averages approximately 75 new bus purchases annually • Using figures provided by the DOE and annual estimates of 13k GGE per bus	**6.1%** **2k tons CO2e total**	**4.6%** **999k GGE total**	• SCAG • CARB • Regional/Local Transit Agencies

DEVELOPMENT OF SCAG'S CLEAN TECHNOLOGY PROGRAM

SCAG is currently developing a detailed Clean Technology Program for potential initiatives with a strong focus on technology neutrality. These initiatives align with and complement the broader objectives and vision of the Clean Cities Program, acknowledging areas of overlap. SCAG plans to coordinate program efforts with other clean cities coalitions in the region to calculate regional benefits and to ensure work efforts and strategies are aligned. In addition, programs will be coordinated to align with the GHG emission reduction targets set by the DOE, Federal Highway Administration, and SCAG. Depending on the availability of resources, SCAG may pursue efforts in the following key areas:

PLUG-IN ELECTRIC VEHICLE INCENTIVE PROGRAM FOR LOW-INCOME HOUSEHOLDS

SCAG is evaluating the potential for developing a plug-in electric vehicle (PEV) incentive program offering incentives for trading in used vehicles for new PEVs, designed to complement, not replace, existing federal, state, or district incentive programs. Such a program could also prioritize the needs of low-income households in communities of concern.

PUBLIC EDUCATION & OUTREACH INITIATIVE

SCAG can help boost the adoption of PEVs by enhancing public knowledge through educational campaigns, workshops, seminars, and stakeholder/public gatherings. This initiative would disseminate information on PEV technologies, available governmental incentives, and the benefits of shifting to cleaner transportation, both environmentally and economically.

PEV-READY BUILDING CODE GUIDELINES

SCAG may consider developing or evaluating guidelines for local building codes to enhance PEV infrastructure within high-density housing zones, with a special emphasis on multi-unit dwellings (MUDs). This initiative would yield a strategic framework that would propose recommendations for PEV-ready parking requirements, PEV-exclusive zones, and the integration of PEV charging amenities into current building standards. The guidelines would not only facilitate the installation of charging infrastructure in both new and retrofitted MUDs but also advocate for environmentally responsible building practices. The overarching goal of the initiative would be to significantly enhance charging accessibility, remove barriers to PEV use in dense living situations, and catalyze a marked increase in PEV uptake, thereby contributing to a cleaner, more sustainable urban future.

PEV SUPPORTIVE ZONING GUIDELINES

SCAG may consider conducting studies that would provide concise guidelines to assist local jurisdictions in revising land use and zoning policies that facilitate PEV infrastructure, focusing on optimizing public land use, updating regulations to accommodate charging stations across zones, streamlining permit processes, and incentivizing developers to include PEV charging options.

PEV TRANSITION GOALS

SCAG will work with local governments to assist in setting regional objectives for transitioning local government fleets to PEVs, exemplifying a commitment to clean technology ahead of state mandates. This action can validate PEV efficacy and stimulate market growth for new technologies. Additionally, integrating these goals into strategic planning and supporting local jurisdictions in establishing and revising their PEV adoption benchmarks could encourage widespread uptake.

EV WEIGHT IMPACT STUDY

SCAG may consider initiating a comprehensive study to examine the impacts of the increased weight of PEVs on road infrastructure, emphasizing potential asset management implications. The study would compare the infrastructure repair costs necessitated by the heavier build of PEVs versus traditional vehicles. It would also explore various strategies to mitigate these impacts, potentially leading to updated infrastructure design standards and policy initiatives to reduce overall vehicle use. The goal of this study would be to provide actionable insights for the development of durable, cost-efficient infrastructure that supports escalating EV adoption.

As SCAG pursues avenues to enhance PEV adoption, SCAG will maintain its commitment to assisting local partners with PEV integration. This includes ongoing provision of resources, strategic planning support, best practices sharing, and policy advocacy assistance.

DOE & CLEAN CITIES TRAININGS

SCAG will provide various DOE-specific and/or Clean Cities trainings through future Toolbox Tuesdays virtual training sessions hosted by SCAG to provide a range of planning knowledge and technical skills to a variety of elected officials, local planners, community organizers, students, and community members. Toolbox Tuesdays include training on various tools and resources on emerging planning topics such as equity, environmental justice, traffic safety, housing, transportation, sustainability, spatial analytics, programming language, and data literacy.[5]

COLLABORATION WITH THE NATIONAL CLEAN FLEETS PARTNERSHIP

SCAG previously focused on public sector fleets, but more recent efforts have included private sector fleets. SCAG will work with contacts from the DOE's National Clean Fleets Partnership Program, which establishes strategic alliances with large fleets to help them explore and adopt alternative fuels and fuel economy measures to cut petroleum use. Collaboration is subject to the status and activity level of the national partnership. The partnership builds on the established success of DOE's Clean Cities Program and provides fleets with top-level support, technical assistance, robust tools and resources, and public acknowledgement to help meet and celebrate fleets' petroleum-use reductions.[6]

IDLE REDUCTION

SCAG may consider pursuing opportunities related to school buses and idle reduction efforts, such as providing technical support. The agency may additionally expand upon the anticipated findings from the Automated Intersection Monitoring for Electric Vehicles Partnership with the University of California, Irvine (UCI). The artificial intelligence pilot offers insight into idle reduction benefits associated with this type of project and provides an opportunity for further exploration. This item is a low priority relative to SCAG's key focus areas and subject to funding availability.

MULTI-UNIT DWELLING (MUD) EV CHARGING PROGRAM

SCAG seeks to implement an MUD EV charging project, like the Greater Washington Clean Cities Coalition, within the region. The Greater Washington Clean Cities Coalition is providing technical assistance to the Vehicle Charging Innovations for a MUD project, which is designed to implement cost-effective options for EV charging at MUDs. The project includes engaging stakeholders across the United States, determining barriers to MUD and curbside residential EV charging, educating stakeholders about charging technologies, and assisting stakeholders with on-site

[5] Toolbox Tuesday, SCAG. Available at: https://scag.ca.gov/toolbox-tuesday

[6] National Clean Fleets Partnership, U.S. DOE. Available at: https://afdc.energy.gov/files/u/publication/ncfp.pdf?44c46ae68b#:~:text=The%20National%20Clean%20Fleets%20Partnership%20is%20open%20to%20fleets%20that,its%20operations%20and%20fuel%20use.

installations. The project is also developing a comprehensive MUD Charging Toolkit for building managers/owners, residents, electric utilities, and local governments to better understand the opportunities and rewards of EV charging.[7]

INNOVATIVE CLEAN TRANSIT

SCAG will support the deployment of clean transit and technologies as part of CARB's Innovative Clean Transit (ICT) Program. The goal of the ICT Program is to continue CARB's partnership with transit agencies to maximize benefits while providing flexibility and sufficient time for transit agencies to address potential challenges and utilize available funds. This regulation strives to maintain as well as enhance transit service through increased mobility options and has built-in technological and financial safeguards to ensure transit service or fares are not adversely impacted by the transition.[8] SCAG intends to calculate program benefits and incorporate them into the next iteration of the Southern California Clean Cities Strategic Plan.

STAKEHOLDER SUPPORT, TRAINING, OUTREACH, AND ENGAGEMENT

SCAG will continue to provide support, training, outreach, and engagement to its stakeholders at various events, including the AltCar Expo, SCAG's ZETI Technical Advisory Committee, Toolbox Tuesday trainings, Money Monday newsletters, and various clean transportation events that occur. Special consideration will be given to ensure critical clean cities updates are incorporated into SCAG's board and policy committee meetings for transparency and engagement.

REGIONAL ACCOMPLISHMENTS

SCAG will continue to showcase regional accomplishments related to clean technology at SCAG's board and policy committee meetings as well as SCAG's General Assembly. The agency will explore additional opportunities to highlight accomplishments in potential online tools such as dashboards and web applications.

Exhibit 3 Summary of Projects

Project	Description	Responsible Agency/Partners
Connect SoCal Plan	SCAG's Connect SoCal RTP/SCS encompasses a comprehensive set of planned transportation investments, policies, and strategies designed to meet the region's goals and performance requirements. The strategies within this plan are aimed at achieving reductions in greenhouse gas emissions, promoting investments in clean technologies, and facilitating the transition to a clean-energy economy.	SCAG
Clean Technology Program	Established after SCAG's Connect SoCal 2020, the Clean Technology Program is dedicated to advancing efforts that underscore the importance of PEVs and other AFVs, along with the necessary infrastructure. These initiatives play a pivotal role in mitigating GHG emissions in the SCAG region, a priority highlighted in SCAG's Connect SoCal 2024 Plan.	SCAG

[7] Multi-Unit Dwelling (M.U.D) EV Charging Program, Greater Washington Region Clean Cities Coalition. Available at: https://gwrccc.org/multi-unit-dwelling-m-u-d-ev-charging-program/

[8] Innovative Clean Transit, CARB. Available at: https://ww2.arb.ca.gov/our-work/programs/innovative-clean-transit/about

Project	Description	Responsible Agency/Partners
Southern California Clean Cities Coalition	SCAG continues to lead with the Southern California Clean Cities Coalition as part of its cooperative agreement with the DOE. These ongoing efforts contribute to the broader objectives of the national Clean Cities Coalition Network.	SCAG, DOE
Electric Vehicle Charging Station Study (EVCSS) and Associated Regional Plug-in Electric Vehicle (PEV) Plan	The EVCSS includes tailored policy guidance to the 18 study partner cities; a regionwide Site Suitability Analysis to target areas for future EV charging infrastructure, with a focus on increasing EV infrastructure in traditionally underserved and hard-to-reach communities including MUDs and DACs; EV site evaluations; and a PEV Infrastructure Plan that informs on the need and tools available for cities to spur development of charging stations and support EV adoption across Southern California.	SCAG
Plug-In Electric Vehicle (PEV) Atlas Update	The PEV Atlas contains 198 pages of maps, charts, and data at the subregional and COG level that illustrate factors that influence demand for charging equipment at specific locations.	SCAG
Clean Transportation Technology Compendium	Required by Resolution No. 23-654-5, the Clean Transportation Technology Compendium supports the development of SCAG's Connect SoCal 2024 and offers an in-depth look at zero- and near-zero emission transportation technologies, including their charging and fueling infrastructure, and other supporting products. The compendium highlights essential features, identifies knowledge gaps, and suggests strategies for the deployment of clean technologies in the region, serving as a key resource for both public and private sector entities during procurement and investment deliberations.	SCAG
Zero Emission Truck Infrastructure (ZETI) Study	SCAG's ZETI Study includes a phased blueprint and action plan toward realizing a regional network of zero emission transportation infrastructure for battery electric and hydrogen fuel cell trucks.	SCAG
Last Mile Freight Program (LMFP)	SCAG has partnered with the MSRC to establish the LMFP. Phase 1 of the program involves focusing on the commercial deployment of zero-emission or near-zero emission (ZE/NZE) heavy- and/or medium-duty on-road trucks (including ZE/NZE equipment and supporting infrastructure).	SCAG, MSRC

Project	Description	Responsible Agency/Partners
Partnership with UCI on Automated Intersection Monitoring for Electric Vehicles	SCAG has partnered with HIMaC at UCI to research artificial intelligence (AI) and transportation energy efficiency in the city of Irvine. Twenty-five traffic intersections in the city are being used to conduct research and create a public road network platform. In addition to the 25 intersections, the project is using three fleets of vehicles operating in distinct modes within the public roadways to demonstrate the benefit of AI-powered sensors.	SCAG, UCI
Partnership with LACI on Testing and Evaluation of Curb Management and Integrated Strategies to Catalyze Market Adoption of Electric Vehicles	SCAG has partnered with the Los Angeles Clean Tech Incubator (LACI) to develop and validate open-source curb management tools and approaches to increase total urban area dedicated to zero emission curb zones by 50% or more in three or more locations. The project aims to accelerate adoption of zero emission transportation, provide health outcomes for communities, and provide more efficient transportation and energy systems that benefit local residents and businesses as well as delivery operations at the curb.	SCAG, LACI

U.S. Department of Energy Clean Cities Program

As part of the U.S. Department of Energy's (DOE) Vehicle Technologies Office (VTO), clean cities coalitions foster the nation's economic, environmental, and energy security by working locally to advance affordable, domestic transportation fuels, energy efficient mobility systems, and other fuel-saving technologies and practices.[9] Coalitions provide the technical expertise local decision-makers and fleets need to understand and implement alternative and renewable fuels, electric vehicles (EVs), idle-reduction measures, fuel economy improvements, new mobility choices, and emerging transportation technologies.[10] Since beginning in 1993, clean cities coalitions have achieved a cumulative impact in energy use equal to nearly 13 billion gasoline gallon equivalents (GGEs) through the implementation of diverse transportation projects,[11] and have eliminated 67 million tons of carbon dioxide emissions through projects that use alternative fuels and fuel-efficient technologies. Together, the coalitions create a compounding impact nationwide that advances United States energy independence and reduces vehicle emissions while supporting regional economic development and job growth.[12]

HISTORY

The Clean Cities Coalition network dates to the Alternative Motor Fuels Act of 1988 and the Clean Air Act Amendments of 1990. These laws, which encouraged the production and use of alternative fuel vehicles (AFVs) and the reduction of vehicle emissions, led to the creation of the Alternative Fuels Data Center (AFDC) in 1991. The AFDC's initial objective was to collect, analyze, and distribute data used to evaluate alternative fuels and vehicles.[13]

The 1992 enactment of the Energy Policy Act of 1992 (EPAct) required certain vehicle fleets to acquire AFVs. Subsequently, DOE created the Clean Cities network in 1993 to provide informational, technical, and financial resources to EPAct-regulated fleets and voluntary adopters of alternative fuels and vehicles.[14] The Clean Cities Coalition Network has built bipartisan support, made deep connections within the transportation industry, and created active partnerships with 20,000 public and private stakeholders.[15]

Since its creation, the Clean Cities Coalition Network, facilitated by support from the National Renewable Energy Laboratory (NREL), has expanded considerably to include over 75 active coalitions that cover nearly every state and 84 percent of the U.S. population.[16] Coalitions are comprised of businesses, fuel providers, vehicle fleets, state and local government agencies, and community organizations. These stakeholders share experiences, information, and resources, educate the public, collaborate on transportation projects, and help identify research needs.[17] Each coalition is led by an on-the-ground coalition director who tailors projects and activities to capitalize on unique regional opportunities. Stakeholders gain access through the coalition to a wide array of resources, including individualized technical assistance, informational publications and tools, networking opportunities with fleets and industry partners, workshops, funding opportunities, and outreach support. Deeply engaged stakeholders also receive

[9] About Clean Cities, U.S. DOE. Available at: https://cleancities.energy.gov/about/

[10] Clean Cities Coalitions Overview, U.S. DOE. Available at: https://cleancities.energy.gov/publications/

[11] About Clean Cities, U.S. DOE. Available at: https://cleancities.energy.gov/about/

[12] Clean Cities Coalitions Overview, U.S. DOE. Available at: https://cleancities.energy.gov/publications/

[13] Why We're Here, U.S. DOE. Available at: https://cleancities.energy.gov/about/

[14] Why We're Here, U.S. DOE. Available at: https://cleancities.energy.gov/about/

[15] Clean Cities Coalitions Overview, U.S. DOE. Available at: https://cleancities.energy.gov/publications/

[16] Clean Cities: A Model of Collaborative Technology Innovation Built Over 30 Years, National Renewable Energy Laboratory (NREL). Available at: https://cleancities.energy.gov/publications/

[17] Clean Cities Coalitions Overview, U.S. DOE. Available at: https://cleancities.energy.gov/publications/

public recognition, highlighting their accomplishments and success. Furthermore, coalitions host events for stakeholders to share information, work with fleets to evaluate their fuel or technology options and collaborate on projects that implement these fuels and technologies.[18]

Exhibit 4 National Clean Cities

Source: U.S. DOE, 2023. Clean Cities Coalitions Overview: https://afdc.energy.gov/files/u/publication/clean_cities_coalitions_overview.pdf?b558c85ca2

[18] Clean Cities Coalitions Overview, U.S. DOE. Available at: https://cleancities.energy.gov/publications/

Exhibit 5 Clean Cities Roadmap

Source: U.S. DOE, 2023. Clean Cities Coalitions Overview: https://afdc.energy.gov/files/u/publication/clean_cities_coalitions_overview.pdf?b558c85ca2

CLEAN CITIES WORK

Clean cities coalitions leverage expertise from federal agencies, national laboratories, and their fellow coalitions. VTO's Technology Integration Program and DOE's national laboratories offer technical assistance, information resources, online training, and an array of data and analysis tools. Coalitions then bring this expertise directly to the communities they serve and develop community-driven solutions based on a unique understanding of local needs, opportunities, and markets. The coalitions build networks of community stakeholders and provide hands-on problem-solving support to fleets.[19]

Clean cities coalition work includes:[20]

- Building partnerships with public- and private-sector transportation stakeholders.
- Dispensing objective information, data-driven online tools, and a suite of resources to fleets and local decision-makers.
- Empowering stakeholders to evaluate and implement the best strategy to achieve their goals;

[19] Clean Cities Coalitions Overview, U.S. DOE. Available at: https://cleancities.energy.gov/publications/

[20] Clean Cities Coalitions Overview, U.S. DOE. Available at: https://cleancities.energy.gov/publications/

- Collecting and sharing best practices, data, and lessons learned to inform local decisions and build a strong national network.
- Engaging technical assistance to help fleets and end users implement alternative fuels, advanced vehicles, and fuel-saving practices.
- Building relationships with industry partners, fleets, and communities to solve problems and identify and address technology barriers.
- Leveraging people and resources to encourage private-sector investment, resulting in successful implementation of advanced transportation, fueling infrastructure, and charging equipment development projects.

To advance affordable, efficient, and clean transportation fuels and technologies, coalitions employ the following strategies: [21]

- **Evaluate transportation needs and energy choices** to determine the most impactful and cost-effective vehicle options, fuels, technologies, and best practices that make sense for their stakeholders.
- **Shift to efficient and clean energy sources** through alternative and renewable fuels such as biodiesel, electricity, ethanol, hydrogen, natural gas, propane, and renewable diesel.
- **Improve fuel efficiency** through state-of-the-art technologies and strategies.
- **Reduce greenhouse gas emissions** and local pollutants through transition to low- and no-emission vehicles, idle reduction, and other fuel-saving technologies and practices.
- **Demonstrate and assess new mobility choices** that maximize the return on investment for mobility systems in terms of time, cost, energy, and opportunity.

Coalition activities, project results, and estimated energy impacts are summarized in an annual report. This gives coalitions the ability to track accomplishments, inform stakeholders of their coalition's progress, and devise strategies for the future. Moreover, access to this data allows coalitions to identify points of mutual interest with other coalitions and jointly develop projects for larger impact. [22]

DOE and the national laboratories require that coalitions are held to the following standards and requirements to ensure minimum levels of engagement: formal designation and redesignation, cooperative agreements with DOE, and annual reports, along with other expectations guiding their participation in clean cities activities.[23]

Formal designation is the process of becoming an official DOE-designated clean cities coalition, whereby a multi-year plan is agreed upon and a regional manager is made available to support a coalition through this multi-year process. To become designated and join the Clean Cities Coalition Network, a coalition must have:[24]

- An active network of public and private stakeholders who meet regularly and have defined roles.
- A clear organizational structure.
- A director to lead the coalition.

[21] Clean Cities Coalitions Overview, U.S. DOE. Available at: https://cleancities.energy.gov/publications/

[22] Clean Cities Coalitions Overview, U.S. DOE. Available at: https://cleancities.energy.gov/publications/

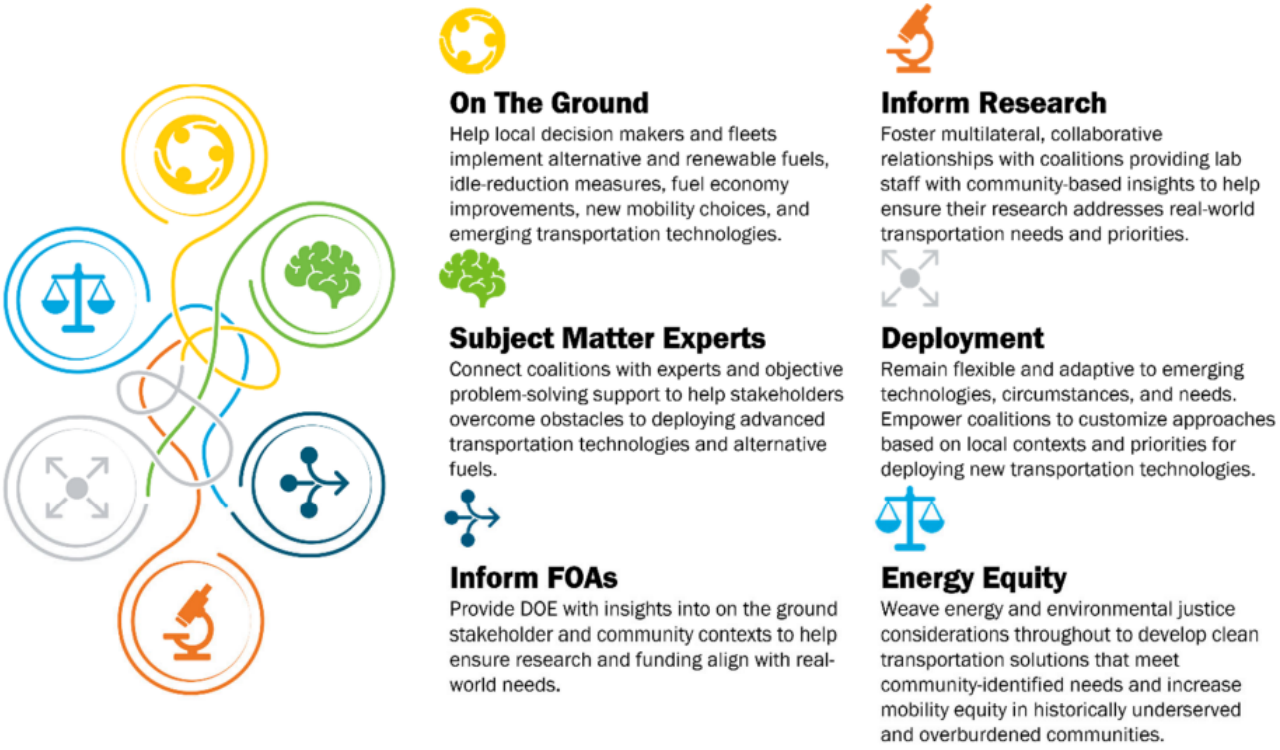
[23] Clean Cities: A Model of Collaborative Technology Innovation Built Over 30 Years, NREL. Available at: https://cleancities.energy.gov/publications/

[24] Clean Cities: A Model of Collaborative Technology Innovation Built Over 30 Years, NREL. Available at: https://cleancities.energy.gov/publications/

- Reliable funding for the director position.
- Specific, attainable goals and a strategic plan for achieving them.
- Strong partnerships with air quality officials, energy officials, and other decision-makers who control resources and help guide policy.

Coalitions must renew their formal designation every four years by showing active stakeholder networks, engagement, and coalition impacts and presenting to VTO staff on their progress, creating a minimum standard for inclusion in the Clean Cities Coalition Network and access to the resources, tools, and support provided by DOE and national labs.[25]

Exhibit 6 Clean Cities Process



Source: NREL, 2023. Clean Cities: A Model of Collaborative Technology Innovation Built Over 30 Years. Available at: https://afdc.energy.gov/files/u/publication/clean_cities_a_model_of_collaborative_technology_innovation_built_over_30_years.pdf?1f77c74cb1

[25] Clean Cities: A Model of Collaborative Technology Innovation Built Over 30 Years, NREL. Available at: https://cleancities.energy.gov/publications/

About Southern California Clean Cities Coalition

The Southern California Clean Cities Coalition, also referred to as the "SCAG Clean Cities Coalition," was formally designated on March 1, 1996. The coalition covers the six counties within the SCAG region: Imperial, Los Angeles, Orange, Riverside, San Bernardino, and Ventura, but excludes areas covered by other independent Clean Cities coalitions. Four independent coalitions are located within the SCAG region:

- Western Riverside County Clean Cities Coalition[26]
- Los Angeles Clean Cities Coalition[27]
- Long Beach Clean Cities Coalition[28]
- Clean Cities Coachella Valley Region.[29]

Coalition activities are reported to the DOE/NREL on a quarterly and annual basis and critical updates are periodically shared with SCAG's policy committees and Regional Council. As a program of SCAG, the governing structure, policies, goals, and resources are the same. Pursuant to DOE program requirements, the coalition received redesignation in August 2023. The Coalition at SCAG aims to strategically align with other Coalitions in Southern California and actively support regional planning initiatives.

One of the primary objectives of the coalition is to align efforts between private and public sector entities supporting AFVs. These entities include the 197 stakeholders of the region's local municipalities (six counties and 191 cities), six county transportation commissions, other regional regulatory agencies, air quality management districts, and various transit operators. Private stakeholders include technology vendors, local businesses, transportation experts, nonprofit agencies, and research institutions.

Aligning these agencies and efforts helps create a platform for stakeholders to identify shared interests, collaborate on public policy initiatives, explore joint project opportunities, optimize resource utilization, and collectively advocate for the advantages of AFVs across the region. The coalition is dedicated to advancing the use of alternative fuels, AFVs, and fuel blends; enhancing fuel efficiency; promoting hybrid vehicles; and advocating for idle reduction practices.

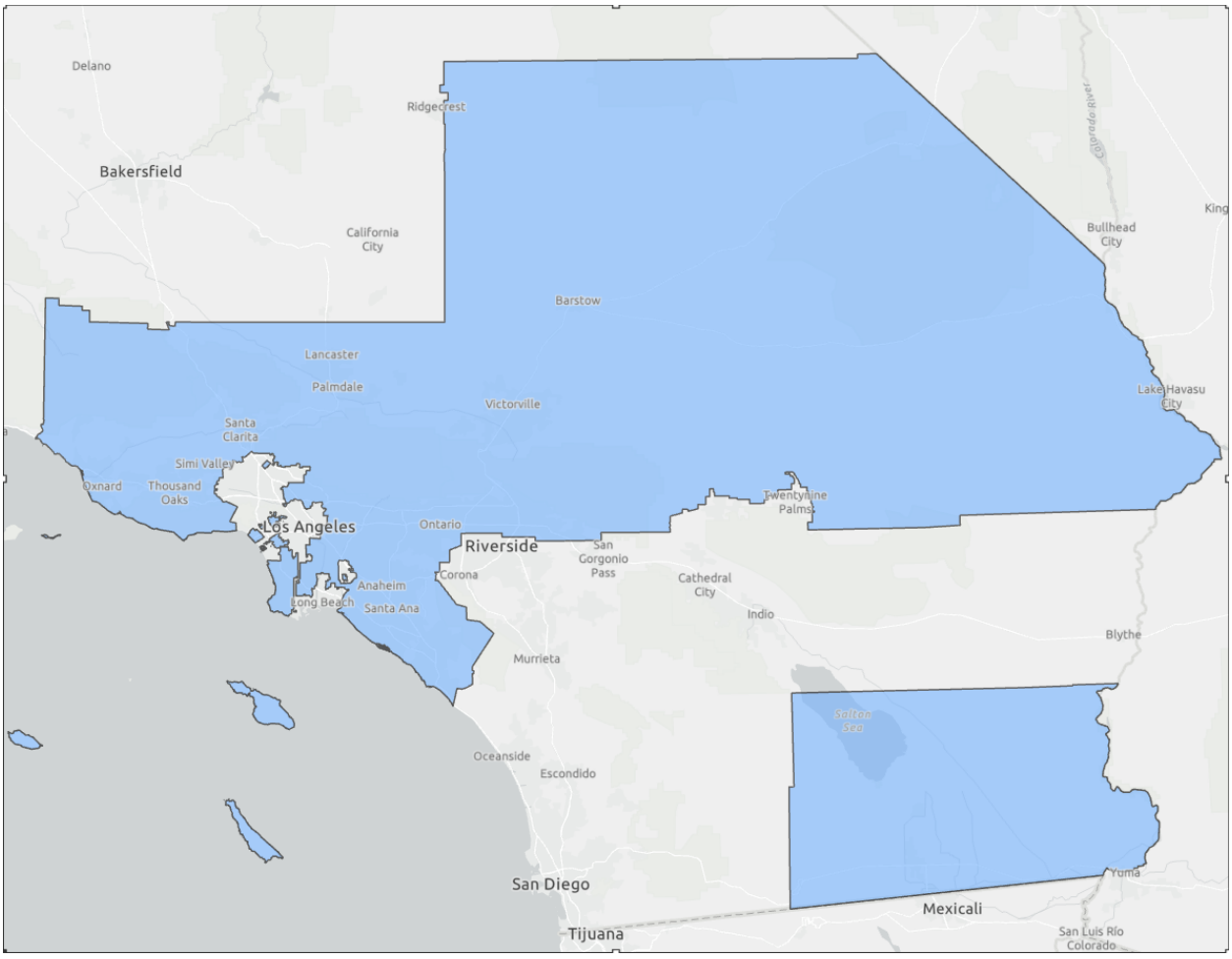
[26] Western Riverside County Clean Cities Coalition, Western Riverside Council of Governments. Available at: https://wrcog.us/175/Clean-Cities-Coalition

[27] Los Angeles Clean Cities Coalition, LA Sanitation & Environment. Available at: https://www.lacitysan.org/san/faces/home/portal/s-lsh-es/s-lsh-es-si/s-lsh-es-si-cc?_afrLoop=210425586265014648_afrWindowMode=0&_afrWindowId=null&_adf.ctrl-state=1a6oh8h1ub_1#!%40%40%3F_afrWindowId%3Dnull%26_afrLoop%3D21042558626501464%26_afrWindowMode%3D0%26_adf.ctrl-state%3D1a6oh8h1ub_5

[28] About Us, Long Beach Clean Cities. Available at: https://cleancitieslongbeach.org/about-us/

[29] About Clean Cities Coachella Valley, Clean Cities Coachella Valley Coalition. Available at: https://cleancitiescv.org/

Exhibit 7 Southern California Clean Cities Coalition Map



Source: U.S. DOE, 2024. Southern California Clean Cities Coalition: https://cleancities.energy.gov/coalitions/southern-california

Southern California Clean Cities Coalition Strategic Plan

The transportation sector in the SCAG region, encompassing cars, trucks, buses, trains, and associated infrastructure, is a major contributor to air pollution and greenhouse gas emissions (GHG). These emissions adversely affect air quality and lead to negative health outcomes in the area. Southern California's unique meteorological conditions further exacerbate these issues, making it one of only two regions in the United States designated as an "extreme" nonattainment area for the 2015 Ozone National Ambient Air Quality Standards (NAAQS). Additionally, the region faces threats from climate change, including heatwaves, droughts, and wildfires, which are potentially intensified by emissions from transportation.

Reducing transportation emissions in Southern California is challenging and complex, due to the region's heavy freight and port activity, large metropolitan population, and a predominantly car-dependent urban layout. SCAG is actively tackling this issue through various strategies, including land use and transportation planning that promotes multiple travel choices like transit and active transportation, advocating policies aimed at reducing vehicle miles traveled (VMT), and transitioning to a zero-emission transportation system through the adoption of clean transportation technologies.

To combat air quality and climate change issues stemming from the transportation sector, the SCAG Regional Council adopted the Clean Transportation Technology Policy via adopted Regional Council Resolution No. 23-654-5 on April 6, 2023. This policy defines clean transportation technology as encompassing alternative fuel vehicles (AFV) along with their supporting infrastructure and other products that diminish environmental impact throughout their lifecycle.

AFVs which include zero-emission vehicles (ZEVs) and near-zero-emission vehicles (NZEVs), including battery-electric vehicles (BEVs), plug-in hybrid electric vehicles (PHEVs), fuel cell electric vehicles (FCEVs), and low NOx natural gas vehicles (NGVs), are seen as key technological solutions for substantial emissions reductions in transportation. Electricity, hydrogen, or renewable natural gas as fuels, particularly in California, have the potential to drastically lower overall vehicle emissions and, in many cases, completely or significantly reduce tailpipe emissions.

Equally important are the supportive products for ZEV and NZEV. These include any systems, hardware, or software solutions, or services that facilitate the efficient deployment, maintenance, and operation of ZEVs and NZEVs and their respective infrastructures. The primary goal of these supportive products is to provide an integrated solution in the deployment and adoption of clean transportation technologies to mitigate or eliminate environmental impacts associated with these technologies while also improving the user experience.

The U.S. Department of Energy (DOE) recently introduced a new mandate for all clean cities coalitions, including the Southern California Clean Cities Coalition, to craft a strategic plan as part of their annual Statement of Project Objectives (SOPO) update. This directive provides a structured, multi-year roadmap for coalition stakeholders, detailing specific objectives and activities that support the transition to AFVs. The ultimate goals outlined by the DOE include a 16 percent increase in gasoline gallon equivalent (GGE) displaced and a 20 percent annual reduction in greenhouse gas (GHG) emissions.

Responding to this requirement, the Southern California Clean Cities Coalition has formulated the Southern California Clean Cities Strategic Plan. This plan is not just a response to the DOE's new requirement but also an essential guide for the coalition's activities over the next five years. It focuses on accelerating the deployment of alternative fuel and advanced technology vehicles and expanding the necessary infrastructure to minimize petroleum use.

This strategic plan is designed to be adaptable and emphasizes technology deployment. It aligns closely with SCAG's Clean Transportation Technology Policy and the strategies set forth in Connect SoCal 2024. Furthermore, it supports the initiatives of SCAG's Clean Technology Program, ensuring a synchronized approach to achieving the coalition's objectives at federal, state, and regional levels.

By aligning with these broader policies and strategies, the Southern California Clean Cities Coalition Strategic Plan demonstrates a robust commitment to addressing environmental challenges. It underlines the importance of innovative and sustainable transportation solutions in creating a cleaner, more efficient transportation future for Southern California. The plan represents a significant stride in fostering collaboration across various levels of government and sectors, crucial for meeting the set targets and advancing towards a more sustainable future.

SOUTHERN CALIFORNIA CLEAN CITIES VISION

Our vision for Southern California is to cultivate a sustainable and environmentally conscious transportation ecosystem. Central to this vision is the integration of advanced infrastructure, cutting-edge technologies, and forward-thinking policies, underpinned by a principle of technology neutrality. This approach ensures that all potential solutions are considered on their merits, promoting innovation and adaptability in our pursuit of environmental stewardship. We are committed to building a community actively engaged in and dedicated to eco-friendly transportation practices. Our strategy involves transparent reporting, effective collaboration, and strategic partnerships, establishing a resilient, innovative, and environmentally compatible transportation network. By embodying these principles, we strive to set a benchmark in Southern California for a balanced and sustainable transportation system, aspiring to inspire and guide local, regional, statewide, and nationwide initiatives.

GOALS AND STRATEGIES

Our primary goal is to work in tandem with stakeholders and the DOE to achieve two critical targets, which are standard requirements for all clean cities coalitions: an annual 16 percent reduction in GGE usage and a 20 percent decrease in GHG emissions. Our approach to these objectives is structured around seven key focus areas, with particular attention on the development and implementation of infrastructure and advanced technologies, such as the installation of EV charging stations.

SCAG's involvement is primarily in supporting the DOE, focusing on advocating for effective policies and legislation, and encouraging active collaborations, partnerships, and research initiatives. This includes enhancing efforts through established Southern California Clean Cities Coalition efforts, the Clean Technology Program, and the Connect SoCal 2024 Regional Transportation Plan/Sustainable Communities Strategy. SCAG's contributions are a critical part of the collective effort, which is directed toward seven key areas. Each of these areas is essential in achieving our broad objectives, which reinforces our commitment to advancing a sustainable and environmentally aware future.

The seven key areas include:

1. Infrastructure Deployment
2. Technology Deployment
3. Policy Advocacy
4. Community Engagement
5. Performance Monitoring and Reporting
6. Collaboration and Partnerships
7. Barrier Mitigation

Strategic Framework of the Southern California Clean Cities Strategic Plan

To fully appreciate the objectives and strategies of the Southern California Clean Cities Strategic Plan, it's essential to grasp the context and foundation upon which it is built. This overview sets the stage for SCAG's strategies aimed at achieving the key annual targets of a 16 percent increase in gasoline gallon equivalent (GGE) displaced and a 20 percent annual reduction in greenhouse gas (GHG) emissions.

The plan begins by outlining the existing conditions, providing a baseline understanding of the current situation in the region, including an assessment of current infrastructure, usage patterns, and the status of alternative fuel and advanced technology vehicle deployment. Then the plan addresses various barriers, including technological challenges, economic factors, regulatory hurdles, or public perception issues that could impede progress toward goals.

Next, the plan highlights work undertaken by other entities as well as SCAG's own contributions, including past and ongoing initiatives, collaborations, and achievements that laid the groundwork for the current strategic plan.

Finally, the plan culminates in a detailed presentation of the proposed work efforts. These efforts align with the overarching objectives of increasing GGE displacement and reducing GHG emissions. This encompasses a range of strategies, from the deployment of new technologies and infrastructure to policy advocacy and community engagement.

By providing this structured and detailed overview, SCAG aims to ensure that stakeholders are well-informed and equipped to engage with and contribute to the strategic plan's successful implementation. This approach reflects SCAG's commitment to transparency, collaboration, and informed decision-making in its pursuit of a more sustainable and environmentally friendly transportation future in Southern California.

The Need to Transition to Clean Transportation

The transition to clean transportation technologies is driven by the urgent need to address environmental and public health challenges posed by traditional transportation methods. Currently, the transportation sector is a significant contributor to global greenhouse gas emissions, air pollution, and reliance on non-renewable energy sources. Transportation not only exacerbates climate change but also leads to detrimental health effects, particularly in densely populated urban areas. AFVs and supporting infrastructure offer a sustainable solution. By reducing emissions, using clean energy, and minimizing pollution, transitioning to clean transportation will promote environmental sustainability, improve public health, and ensure a viable future for coming generations. This shift is not just an environmental imperative but also an opportunity to foster innovation, create green jobs, and lead the global economy toward a more sustainable path.

NATIONAL

Nationally, the United States encompasses a vast transportation network of approximately 4.25 million miles and represents approximately 27 percent of greenhouse gas (GHG) emissions.

Despite ongoing efforts to decarbonize the electricity grid, the United States consumes approximately 20 million barrels of petroleum per day, with approximately three-fourths used for transportation. Transportation also has a significant economic impact on American businesses and families, accounting for nearly one-sixth of the average household's expenses (second only to housing). Improving efficiency and reducing costs in this sector can thereby make a notable impact on our economy.

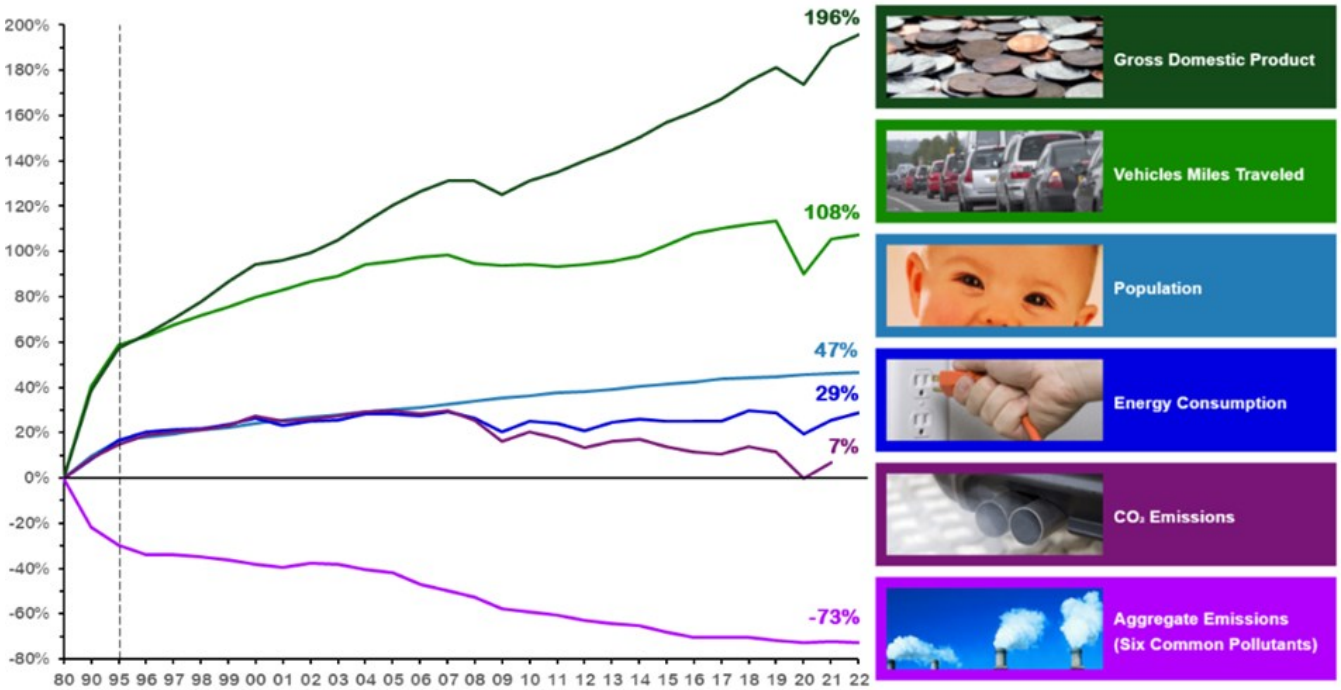
In 2022, approximately 66 million tons of pollution were emitted into the atmosphere in the United States. These emissions mostly contribute to the formation of ozone and particles, the deposition of acids, and the impairment of visibility.[30]

As shown below in **Exhibit 8, Comparison of Growth Areas and Emissions, 1980-2022**, between 1980 and 2022, gross domestic product increased 196 percent, vehicle miles traveled increased 108 percent, energy consumption increased 29 percent, and United States population grew by 47 percent. During the same period, total emissions of the six principal air pollutants dropped by 73 percent. **Exhibit 5** also shows that CO_2 emissions, after having risen gradually for decades, have decreased since 2007, but in 2021 were 7 percent higher than 1980 levels.[31]

[30] Air Quality – National Summary, EPA. Available at: https://www.epa.gov/air-trends/air-quality-national-summary#:~:text=In%202022%2C%20about%2066%20million,of%20acids%2C%20and%20visibility%20impairment.

[31] Air Quality – National Summary, EPA. Available at: https://www.epa.gov/air-trends/air-quality-national-summary#:~:text=In%202022%2C%20about%2066%20million,of%20acids%2C%20and%20visibility%20impairment.

Exhibit 8 Comparison of Growth Areas and Emissions, 1980-2022

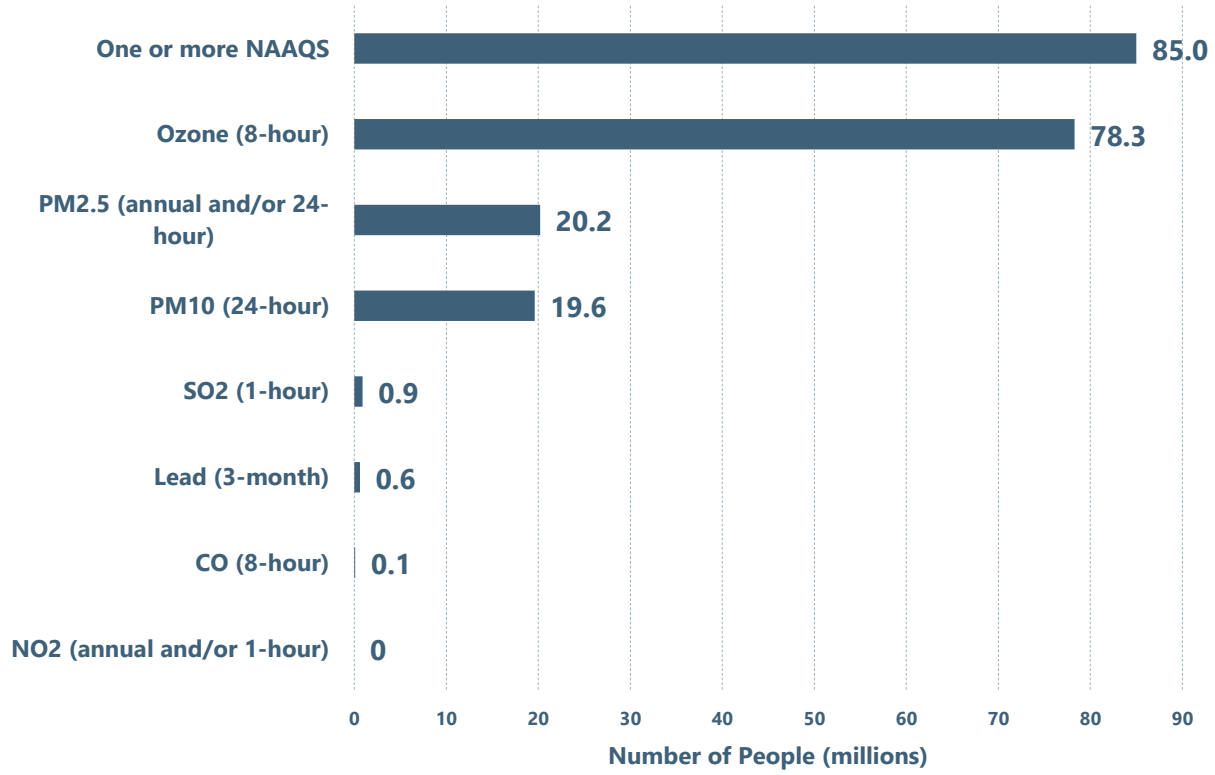


Source: U.S. EPA, 2023. Air Quality – National Summary: https://www.epa.gov/air-trends/air-quality-national-summary#:~:text=In%202022%2C%20about%2066%20million,of%20acids%2C%20and%20visibility%20impairment

Despite great progress in air quality improvement, as shown in **Exhibit 9, Number of People Living in Counties with Air Quality Concentrations Above the Level of the NAAQS in 2022**, approximately 85 million people nationwide lived in counties with pollution levels above the primary NAAQS in 2022. In addition, from 1990 to 2017, emissions of air toxics declined by 74 percent, largely driven by federal and state implementation of stationary and mobile source regulations.[32]

[32] Air Quality – National Summary, EPA. Available at: https://www.epa.gov/air-trends/air-quality-national-summary#:~:text=In%202022%2C%20about%2066%20million,of%20acids%2C%20and%20visibility%20impairment.

Exhibit 9 Number of People Living in Counties with Air Quality Concentrations Above the Level of the NAAQS in 2022



Source: U.S. EPA, 2023. Air Quality – National Summary: https://www.epa.gov/air-trends/air-quality-national-summary#:~:text=In%202022%2C%20about%2066%20million,of%20acids%2C%20and%20visibility%20impairment

The American Lung Association's "State of the Air" 2023 report found that nearly 119.6 million people (36 percent of Americans) still live in places with failing grades for unhealthy levels of ozone or particle pollution. Overall, this is 17.6 million fewer people breathing unhealthy air compared to the 2022 report. Improvements included falling levels of ozone in many places throughout the United States, continuing a positive trend that reflects the success of the Clean Air Act. However, the number of people living in counties with failing grades for daily spikes in deadly particle pollution was 63.7 million, the most ever reported under the current national standard.[33]

More than 64 million Americans live in counties with "F" grades for spikes in daily particle matter (PM) pollution. Among those cities ranked the worst 25, the average number of days residents were exposed to high levels of fine particle pollution increased by almost 2 days, to a weighted average of 18.3 days, up from 16.5 days in the 2022 report. Wildfires in the western United States are a major contributing factor to the increasing number of days and places with unhealthy levels of PM. Additionally, wildfires are increasing the severity of pollution, resulting in a sharp rise in the number of days designated as either purple or maroon, which are the levels on the Air Quality Index that carry the strongest health warnings.

Additionally, nearly 18.8 million Americans live in counties with "F" grades for year-round particle pollution. Cities most affected by high concentrations of year-round PM often experience drought conditions, have high power plant

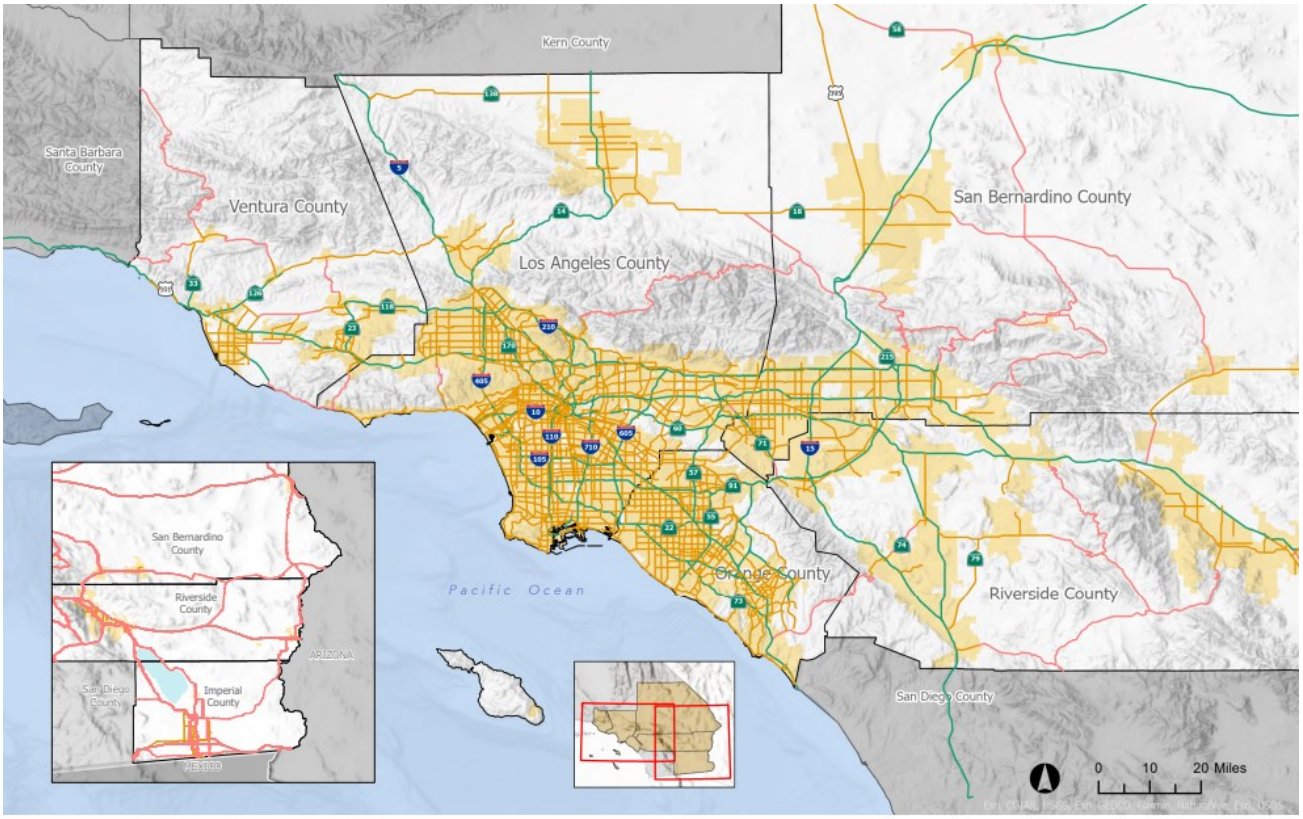
[33] State of the Air – Key Findings, American Lung Association. Available at: https://www.lung.org/research/sota/key-findings

emissions as well as industrial and mobile source pollution. The highest concentration of year-round particle pollution includes eight locations in California, three in Oregon, and three others in Alaska, Arizona, and Washington.[34]

SCAG REGION

The six-county SCAG region encompasses 38,000 square miles of area (almost 25 million acres) and is home to approximately 19 million people. The current transportation network within the SCAG region includes more than 73,000 miles of streets and freeways. The transportation network within the SCAG region supports the largest container complex in the United States, the ports of Los Angeles and Long Beach, and helps people and goods move to and from eight commercial airports, seven government/military airfields, and over 30 reliever and general aviation airports.

Exhibit 10 SCAG Region Existing Highways and Arterials



Source: SCAG, 2023. Connect SoCal 2024. Available at: https://scag.ca.gov/sites/main/files/file-attachments/23-2987-connect-socal-2024-draft-complete-110223.pdf?1698262706

[34] Year-Round Particle Pollution Trends, American Lung Association. Available at: https://www.lung.org/research/sota/key-findings/year-round-particle-pollution

While the state of California is a leader in the national and global reduction in climate pollutants and deployment of clean technologies and fuels, the state represents a sizable portion of the nation's air quality and GHG impacts.

In California, transportation is responsible for 38 percent of total emissions in the state, a plurality of statewide emissions. As estimated for 2022, mobile sources are projected to account for 81 percent of nitrogen oxide (NOx) emissions and 25 percent of fine particulate matter (PM2.5) emissions in the South Coast Air Basin.

PM poses a significant air quality challenge in the SCAG region, with contributions from various sources such as vehicle emissions, power generation, industrial facilities, residential fireplaces, wood stoves, construction activities, agriculture, wildfires, and atmospheric reactions. The SCAG region includes four air basins: the South Coast Air Basin (SCAB), Mojave Desert Air Basin (MDAB), Salton Sea Air Basin (SSAB), and South-Central Coast Air Basin (SCCAB). Each basin's air quality is influenced by its unique topography, climate, population, and land use. Despite improvements since the 1970s, Southern California still ranks among the worst in the nation for air quality. The American Lung Association's "State of the Air" 2023 report lists the Los Angeles-Long Beach metropolitan area as ninth worst for 24-hour PM2.5 exposure, fourth worst for annual PM2.5, and the worst for ozone pollution.[35]

Furthermore, the American Lung Association consistently gives failing grades to counties within the SCAG region for ozone and particulate pollution levels (See **Exhibit 11, American Lung Association Report Card for SCAG Region).** For 2023, all six counties in the region received a failing grade for ozone, indicating a significant number of unhealthy air days relative to the ozone standard. The grading system, based on a weighted average of air quality index levels, also shows stringent criteria for PM2.5, with the association using a more restrictive limit than the national standard to protect public health from short-term pollution spikes.

Exhibit 11 American Lung Association Report Card for SCAG Region

County	Ozone Grade	Particle Pollution Grade
Imperial	F	D
Los Angeles	F	F
Orange	F	F
Riverside	F	F
San Bernardino	F	F
Ventura	F	D

Source: American Lung Association, 2023. State of the Air 2023. Available at: https://www.lung.org/research/sota/city-rankings/msas/los-angeles-long-beach-ca

The California Air Resources Board (CARB) compiles GHG inventories for the State of California. Based on the 2019 GHG inventory data, California emitted 404.5 MMTCO2e including emissions resulting from imported electrical power in 2019.[36] Based on the GHG inventories compiled by the World Resources Institute, California's total statewide GHG emissions rank second in the United States (Texas is the highest emitter of GHG).[37]

The primary contributors to GHG emissions in California are transportation, electric power production from both in-state and out-of-state sources, industry, agriculture and forestry, and commercial and residential activities.[38] **Exhibit**

[35] State of the Air 2023, American Lung Association. Available at: https://www.lung.org/research/sota/city-rankings/msas/los-angeles-long-beach-ca

[36] California Greenhouse Gas Inventory for 2000-2020 — by Category as Defined in the 2008 Scoping Plan, CARB. Available at: https://ww2.arb.ca.gov/sites/default/files/classic/cc/inventory/ghg_inventory_scopingplan_sum_2000-20.pdf

[37] 8 Charts to Understand U.S. State Greenhouse Gas Emissions, World Resources Institute. Available at: https://www.wri.org/insights/8-charts-understand-us-state-greenhouse-gas-emissions

[38] California Greenhouse Gas Inventory for 2000-2020 — by Category as Defined in the 2008 Scoping Plan, CARB. Available at: https://ww2.arb.ca.gov/sites/default/files/classic/cc/inventory/ghg_inventory_scopingplan_sum_2000-20.pdf

12, Greenhouse Gas Emissions in California (1990 and 2019), provides a summary of GHG emissions reported in California in 1990 and 2019 by categories. Similarly, the primary contributors to GHG emissions in the United States are transportation, electric power production from both in-state and out-of-state sources, industry, agriculture and forestry, and commercial and residential activities.[39]

Exhibit 12 Greenhouse Gas Emissions in California (1990 and 2019)

Source Category	Total 1990 Emissions (MMTCO2E)	Percent of Total 1990 Emissions	Total 2019 Emissions (MMTCO2E)	Percent of Total 2019 Emissions
Transportation	150.6	35%	162.4	40%
Electric Power	110.5	26%	60.2	15%
Commercial	14.4	3%	14.5	4%
Residential	29.7	7%	25.9	6%
Industrial	105.3	24%	80.4	20%
Recycling and Waste[a]	–	–	8.8	2%
High-GWP/Non-Specified[b]	1.3	<1%	20.7	5%
Agriculture/Forestry	18.9	6%	31.4	8%
Forestry Sinks[c]	-6.7	–	–	–
Net Total[d]	**431**	**100%**	**404.5**	**100%**

Source: CARB, 2022. California Greenhouse Gas Inventory for 2000-2020 — by category as defined in the 2008 Scoping Plan. Last updated October 26, 2022. Available at: https://ww2.arb.ca.gov/sites/default/files/classic/cc/inventory/ghg_inventory_scopingplan_sum_2000-20.pdf

a. Included in other categories for the 1990 emissions inventory.

b. High-Global Warming Potential (GWP) gases are not specifically called out in the 1990 emissions inventory.

c. Revised methodology under development (not reported for 2019).

d. CARB revised the state's 1990 level GHG emissions using GWPs from the Intergovernmental Panel on Climate Change (IPCC) AR4. (IPCC, 2007. Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Pachauri, R.K and Reisinger, A. (eds.). IPCC, Geneva, Switzerland.)

According to Connect SoCal 2024, Total SCAG emissions in 2020 were estimated to be 216 MMTCO2e (2019 was not a projection year). Transportation emissions are most prevalent relative to all other sectors in California and specifically in the SCAG region. Transportation emissions accounted for approximately 38 percent of total emissions in the SCAG region, compared to 26 percent of total emissions in the United States in 2008.[40] Fossil fuel carbon dioxide emissions (FFCO2) for 2011 were calculated across the Los Angeles metropolitan area, which includes Los Angeles, Orange, Riverside, San Bernardino, and Ventura counties. The total FFCO2 emissions for the Los Angeles metropolitan area, which covers the complete geographic extent of the previously mentioned five counties, were calculated to be approximately 53.4±5.9 MMT CO2e/year, with transportation emissions accounting for approximately 50.4 percent of these emissions.[41] Los Angeles County contributed approximately 55 percent of the total FFCO2 emissions, followed by San Bernardino, Orange, Riverside, and Ventura counties. These results are consistent with SCAG estimates of GHG

[39] Greenhouse Gas Inventory Data Explorer, EPA. Available at: https://cfpub.epa.gov/ghgdata/inventoryexplorer/

[40] Regional Greenhouse Gas Inventory and Reference Case Projections, 1990-2035, SCAG. Available at: https://scag.ca.gov/sites/main/files/file-attachments/05-30-12_scag_revised_if_report_final.pdf

[41] The Hestia fossil fuel CO2 emissions data product for the Los Angeles megacity (Hestia-LA), Earth System Science Data. Available at: https://essd.copernicus.org/articles/11/1309/2019/essd-11-1309-2019.pdf

emissions for 2019 (see **Exhibit 13, Greenhouse Gas Emissions (CO2e) from All On-Road and Other Transportation Sources in the SCAG Region (million metric tons per year)**).

Exhibit 13 Greenhouse Gas Emissions (CO2e) from All On-Road and Other Transportation Sources in the SCAG Region (million metric tons per year)

	2019 Base Year	2030 (Connect SoCal 2024)	2045 (Connect SoCal 2024)	2050 (Connect SoCal 2024)
Total GHG Emissions from On-Road Vehicles in CO2e	64.35	50.87	43.52	44.64
Total GHG Emissions from Other Transportation Sources in CO2e*	2.07	2.51	3.03	3.21
All Transportation Sector (On-Road and Other Sources) in CO2e	66.42	53.38	46.55	47.84
2030, 2045, 2050 Connect SoCal 2024 vs. 2019 Base Year		*-19.6%*	*-29.9%*	*-28.0%*

Source: SCAG Modeling (2023)

Notes: CO2 was converted to CO2e based on the Global Warming Potential (CARB GHG Global Warming Potentials. Available at: https://ww2.arb.ca.gov/ghg-gwps).

** Emission sources include rail, aviation, ground support equipment, and ocean-going vessels. Rail, aviation, and ocean-going vessels are regulated at the federal level. Airport Ground Support sources are regulated at the state level.*

HEALTH EFFECTS

Climate change and pollution in the SCAG region are causing significant health risks. Ozone pollution, a result of reactions between sunlight and emissions such as NOx, VOCs, and CO, leads to various health issues. These include respiratory and cardiovascular harm, early death, and potential impacts on the central nervous system and reproductive health. High ozone levels are associated with increased mortality, stroke, respiratory problems, asthma attacks, and a higher likelihood of hospitalizations and emergency visits for respiratory and cardiovascular conditions. Long-term exposure to ozone can result in chronic respiratory diseases, hospitalization for asthma, asthma development, lower birth weights, and reduced lung function in newborns.

Similarly, fine particulate matter (PM), specifically PM2.5, has been linked to serious health impacts. The EPA's December 2009 finding highlighted the association of PM2.5 with early death, cardiovascular and respiratory harm, cancer, and reproductive and developmental issues. Short-term exposure can impair lung function and increase emergency room visits and hospitalizations for respiratory and cardiovascular diseases, sometimes leading to death on days with high pollution levels. Asthma rates in the SCAG region, an indicator of sensitivity to environmental stressors, vary widely, ranging from 28 to 80 per 10,000 people (See **Exhibit 14, Population-Weighted Asthma Rate per 10,000**).

Exhibit 14 Population-Weighted Asthma Rate per 10,000

County	Asthma Rate per 10,000
Imperial	79.8
Los Angeles	53.4
Orange	27.9

County	Asthma Rate per 10,000
Riverside	49.6
San Bernardino	60.9
Ventura	36.8
SCAG Region	**49.3**

Source: CalEnviroScreen4.0, 2021. Age-adjusted rate of emergency department visits for asthma per 10,000. 2021 Update. Available at: https://oehha.ca.gov/media/downloads/calenviroscreen/report/calenviroscreen40reportf2021.pdf#page=151

Climate change exacerbates these health risks through its effects on temperature, air quality, wildfires, and droughts. Extreme heat days, when temperatures exceed the 98th percentile of the maximum for a location, lead to heat-induced illnesses such as heat stroke, heat exhaustion, dehydration, and premature death due to cardiovascular or respiratory disease. These effects are amplified by the urban heat island effect in densely populated areas. Extreme heat also contributes to longer and more severe droughts, drying of soil and vegetation, and melting of the Sierra Nevada snowpack. Additionally, sea level rise poses a threat, particularly in areas like Orange County, where 3.6 percent of the population is in an inundation zone. In Los Angeles and Ventura counties, 1.6 percent and 0.17 percent of the population, respectively, face similar risks. Flooding from sea level rise can lead to contaminated drinking water and health issues such as respiratory problems from mold in flood-damaged homes.

Alternative Fuels

Over the past few decades there have been great strides made to develop alternative fuels to improve air quality and reduce greenhouse gas emissions.

ELECTRIC DRIVE

There are two types of plug-in electric vehicles (PEVs)—battery electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs). BEVs use electricity stored within batteries and use an electric motor instead of a gasoline engine. PHEVs use a battery pack that is plugged into an electric source (e.g., wall outlet) to recharge and an internal combustion engine that utilizes gasoline.[42]

Hybrid electric vehicles (HEVs) are powered by an internal combustion engine in combination with one or more electric motors that use energy stored in batteries.[43]

COMPRESSED NATURAL GAS

Compressed natural gas (CNG) is an alternative to gasoline and diesel fuel that consists mostly of methane. The gas is extracted from the source then compressed to a high pressure where it can then be stored in a vehicle fuel tank.

Natural gas vehicles (NGVs) were first introduced in the United States in the 1980s with the goal of extending petroleum supply and lowering exhaust emissions. However, for a variety of reasons, NGVs were initially a commercial failure. The absence of a business case for fleets, liberalization of the natural gas market, high cost of infrastructure development, scarcity of public refueling stations, and restricted options available for natural gas engines and cars have all been major obstacles. However, a new generation of NGVs has recently emerged and has enormous growth potential.[44]

PROPANE

The most utilized alternative fuel for vehicles is propane, with more than 13 million vehicles worldwide. Propane is noncarcinogenic, non-toxic, and does not pose risks to groundwater, surface water, or soil. Propane can reduce GHG emissions by 15-20 percent compared to gasoline.[45]

Propane is a byproduct created by natural gas processing and refining crude oil. Propane is not widely used for transportation. It is primarily used for home and water heating, cooking, and refrigerating food, clothes drying, and powering farm and industrial equipment. As an alternative fuel, propane's benefits include its domestic availability, high-energy density, clean-burning condition, and reduced cost. It is the world's third most common transportation fuel, behind gasoline and diesel.

Two classes of propane vehicles exist: dedicated and bi-fuel. Dedicated propane vehicles can only run on propane, while bi-fuel vehicles operate using two separate fueling systems which allow the vehicles to use propane or gasoline. This provides the flexibility of using either fuel, which typically provides bi-fuel vehicles a greater range than dedicated propane or gasoline vehicles. Extra storage tanks can increase range, but the tank size and additional weight affect payload capacity. Propane vehicles tend to require less maintenance, which explains their popularity as

[42] Alternative Fuels & Vehicles, SCAG. Available at: https://scag.ca.gov/alternative-fuels-vehicles

[43] Hybrid Electric Vehicles, AFDC. Available at: https://afdc.energy.gov/vehicles/electric_basics_hev.html

[44] U.S. Department of Energy Clean Cities Five-Year Strategic Plan, U.S. DOE. Available at: https://cleancities.energy.gov/files/pdfs/strategic_plan.pdf

[45] U.S. Department of Energy Clean Cities Five-Year Strategic Plan, U.S. DOE. Available at: https://cleancities.energy.gov/files/pdfs/strategic_plan.pdf

light- and medium-duty vehicles. Moreover, propane's low carbon and low oil contamination can contribute to a longer engine lifespan.[46] Another influential factor in the use of propane vehicles is the fuel's performance in cold weather conditions compared to diesel.

RENEWABLE FUELS

RENEWABLE NATURAL GAS/BIOMETHANE

Renewable natural gas/biomethane is an economical alternative fuel, supplied by large amounts of organic materials, such as landfills, farms, food, and agricultural waste. As of 2014, 525 landfills, 125 dairies, and 115 wastewater treatment plants recoup energy from biogas in the United States. Due to economic and regulatory benefits, most biogas recovered from these sources are turned into electricity. RNG/biomethane are beneficial as a vehicle fuel for reasons similar to CNG, such as increasing energy security and lowering vehicle emissions. Moreover, RNG/biomethane can replace fossil fuel-derived natural gas, gasoline, and diesel, with the added quality of reducing GHG emissions by 75-90 percent over petroleum.

ETHANOL/E85

E85 is a mixture of 85 percent ethanol and 15 percent gasoline that can be used as an alternative fuel for vehicles. The ethanol content of E85 changes depending on the time of year and geographical location. More than 98 percent of United States gasoline contains ethanol to oxygenate the fuel. Typically, gasoline contains E10 (10 percent ethanol, 90 percent gasoline), which reduces air pollution.

Depending on the volume quantity of ethanol in the blend, ethanol yields less energy per gallon than gasoline. Per gallon, denatured ethanol (98 percent ethanol) has roughly 30 percent less energy than gasoline. The amount of ethanol in the fuel and whether an engine is designed to run on gasoline or ethanol determines how much of an influence ethanol has on fuel economy. Vehicles that can use a combination of ethanol and gasoline up to 83 percent are referred to as flexible fuel vehicles (FFV). [47]

When ethanol is used by a vehicle, the carbon dioxide released is balanced by the carbon dioxide that is sequestered throughout the feedstock crop's growth. This is not the same as gasoline or diesel, which come from refined petroleum mined from the earth.

BIODIESEL/B20

Biodiesel is a renewable fuel made from soybeans or restaurant grease. It does not contain any petroleum. However, biodiesel can be mixed with petroleum diesel to form a biodiesel blend that can be incorporated into diesel engines without significant changes.

This alternative fuel's performance in cold weather is dependent on the combination of biodiesel, the feedstock, and the petroleum diesel composition. Typically, blends that contain smaller percentages of biodiesel perform better in cold weather. Additionally, biodiesel in its pure, unblended form is less damaging than petroleum diesel if spilled or released to the environment. It is a safer fuel than petroleum diesel because it is less combustible.

Diesel and biodiesel vehicles are the same. Although, different types (e.g., light-, medium-, and heavy-duty) are not defined as alternative fuel vehicles, they are almost all able to utilize biodiesel blends.

[46] Propane Benefits and Considerations, U.S. DOE. Available at: https://afdc.energy.gov/fuels/propane_benefits.html

[47] Flexible Fuel Vehicle Availability, U.S. DOE. Available at: https://afdc.energy.gov/vehicles/flexible_fuel_availability.html

HYDROGEN

Hydrogen's energy content by volume is low. This makes storing hydrogen a challenge because it requires high pressures, low temperatures, or chemical processes. Overcoming this challenge is important for light-duty vehicles because they often have limited size and weight capacity for fuel storage.

Hydrogen can be derived from domestic resources (e.g., natural gas, coal, solar energy, wind, and biomass) and has the potential for near-zero GHG emissions. When produced, hydrogen creates power in a fuel cell, only emitting water vapor and warm air. This alternative fuel has great promise for the transportation energy sector.

Fuel cell EVs can be powered by hydrogen, and hydrogen technology is advancing with the expectation this alternative fuel will become more prevalent. As of 2023, California is leading the country in building hydrogen fueling stations, with 52 retail hydrogen stations open to the public.[48]

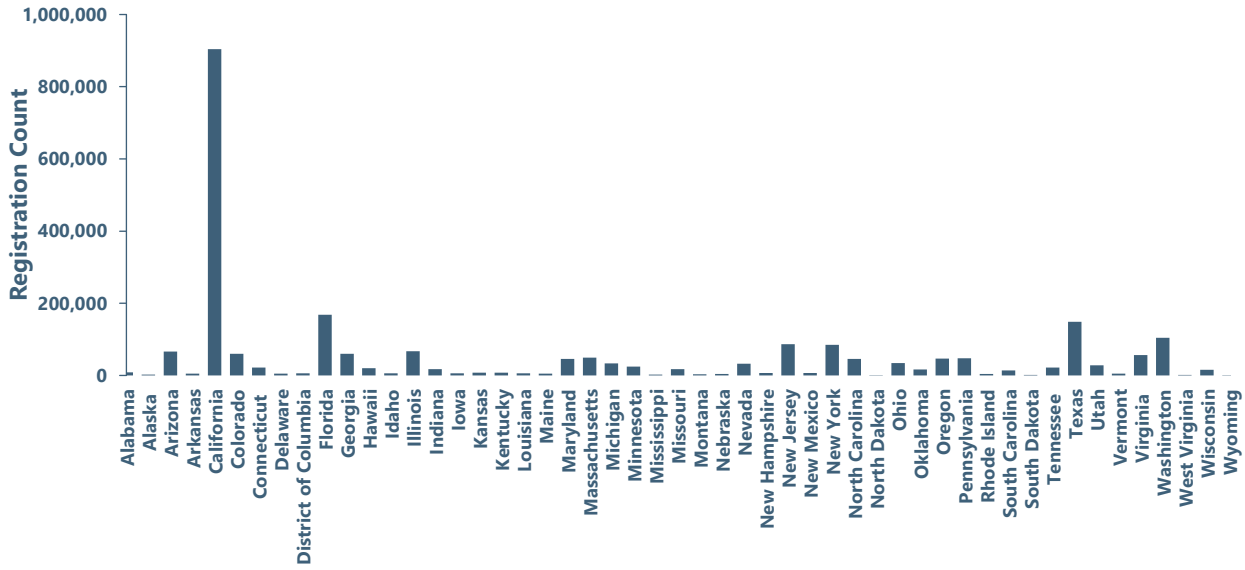
[48] Hydrogen Basics, U.S. DOE. Available at: https://afdc.energy.gov/fuels/hydrogen_basics.html

Types of Alternative Fuel Vehicles, Supporting Infrastructure and Adoption Rates

CALIFORNIA

In 2022, there were a total of 4,327,300 AFVs registered in the United States, including 903,600 BEVs, 361,100 PHEVs, 1,514,000 HEVs, 183,900 biodiesel vehicles, 1,338,000 ethanol/flex (E85) vehicles, 10,300 CNG vehicles, 1,500 propane vehicles, and 14,900 hydrogen vehicles.[49] As shown in **Exhibit 15, Electric Vehicle Registrations by State**, California had the greatest number of EVs in the United States in 2022, representing 37 percent of EVs nationwide.[50] In addition, as shown in **Exhibit 16, Vehicle Registrations in California from 2021-2022**, between 2021 and 2022, EV purchases in the state increased 60.5 percent, much faster than gasoline vehicle purchases (1.8 percent). Other AFV purchases increased from 2021 to 2022, including PHEVs (14.5 percent), HEVs (11.7 percent), biodiesel (12.4 percent), and hydrogen (26.3 percent). Ethanol/ flex (E85) and CNG vehicle purchases decreased by 0.4 percent and 18.3 percent, respectively, while diesel vehicle purchases increased by 2.1 percent. No additional propane vehicles were purchased from 2021 to 2022.

Exhibit 15 Electric Vehicle Registrations by State



Source: AFDC, 2023. Electric Vehicle Registrations by State. Available at: https://afdc.energy.gov/data/10962
Note: Last Updated July 2023

[49] Vehicles Registered in 2022, AFDC. Available at: https://afdc.energy.gov/states/ca

[50] Electric Vehicle Registrations by State, AFDC. Available at: https://afdc.energy.gov/data/10962

Exhibit 16 Vehicle Registrations in California from 2021-2022

Vehicle Type	Number of Registered Vehicles in 2021	Number of Registered Vehicles in 2022	Percent Change
Electric	563,100	903,600	60.5%
Plug-in Hybrid Electric	315,300	361,100	14.5%
Hybrid Electric	1,355,900	1,514,000	11.7%
Biodiesel	163,600	183,900	12.4%
Ethanol/Flex (E85)	1,343,200	1,338,000	-0.4%
Compressed Natural Gas (CNG)	12,600	10,300	-18.3%
Propane	1,500	1,500	0%
Hydrogen	11,800	14,900	26.3%
Gasoline	30,512,600	31,059,000	1.8%
Diesel	710,500	725,300	2.1%

Source: AFDC, 2024. TransAtlas. Available at: https://afdc.energy.gov/transatlas/#/?state=CA&fuel=ELEC

There are a total of 51,541 alternative fuel stations, of which 48 are biodiesel, 291 are CNG, 49,877 are electric, 369 are ethanol (E85), 65 are hydrogen, 39 are liquified natural gas, 255 are propane, and 597 are renewable diesel.[51]

AFV TECHNOLOGY TYPES WITHIN THE SCAG REGION

LIGHT-DUTY VEHICLES

Light-duty vehicles (LDVs) encompass a diverse range of vehicles, including passenger cars, SUVs, minivans, light-duty pickup trucks, and utility vans. They can use various advanced technologies like battery electric vehicles (BEV), hybrid electric vehicles (HEV), plug-in hybrid electric vehicles (PHEV), and fuel cell electric vehicles (FCEV). Currently, BEV and PHEV technologies are predominant due to ongoing improvements in battery technology.

FCEVs, although less varied, offer an alternative for longer trips requiring quick refueling. Many automakers are investing in FCEV technology. As of December 2022, consumers in California had access to 50 BEV models, 51 PHEV models, and 3 FCEV models for purchase.[52]

PHEVs are considered zero emission vehicles (ZEVs) when running solely on battery power but switch to a gasoline engine when the battery is depleted. The electric range of PHEVs has increased from 20.5 miles in 2012 to 38.5 miles by 2021.[53]

ZEV adoption in the SCAG region began around 2010, initially concentrated in densely populated and affluent areas. Most ZEVs in the region are in Los Angeles and Orange counties, with Los Angeles County having over 50 percent and Orange County over 25 percent of the total ZEVs.[54]

Before 2010, there were only 122 ZEVs in the SCAG region. By the end of 2022, this number had surged to approximately 525,000, constituting about 3.9 percent of the total LDV fleet in the region. ZEVs now represent around

[51] Fueling Stations, AFDC. Available at: https://afdc.energy.gov/states/ca

[52] Clean Technology Compendium, SCAG. Available at: https://scag.ca.gov/post/clean-technology-compendium

[53] Evolution of average range of electric vehicles by powertrain, 2010-2021, International Energy Agency. Available at: https://www.iea.org/data-and-statistics/charts/evolution-of-average-range-of-electric-vehicles-by-powertrain-2010-2021

[54] Clean Technology Compendium, SCAG. Available at: https://scag.ca.gov/post/clean-technology-compendium

25 percent of LDV sales as of the second quarter of 2023. BEVs and PHEVs dominate the market, while FCEVs make up a minimal 0.06 percent of ZEVs in the region. [55]

Most BEVs in the region (88 percent) offer an electric range exceeding 200 miles.[56] The region is making significant progress toward the state's goal of having 100 percent ZEV sales in California by 2035.

Despite higher upfront costs, ZEVs, including BEVs and FCEVs, offer cost savings over their lifetime when considering total cost of ownership (TCO). BEVs are particularly cost-effective in terms of TCO, while FCEVs may require additional investment to achieve cost parity with their diesel counterparts. Overall, ZEVs prove to be financially advantageous choices due to reduced operating and maintenance costs in the long term.

Exhibit 17 Light Duty Vehicle Body Styles Descriptions

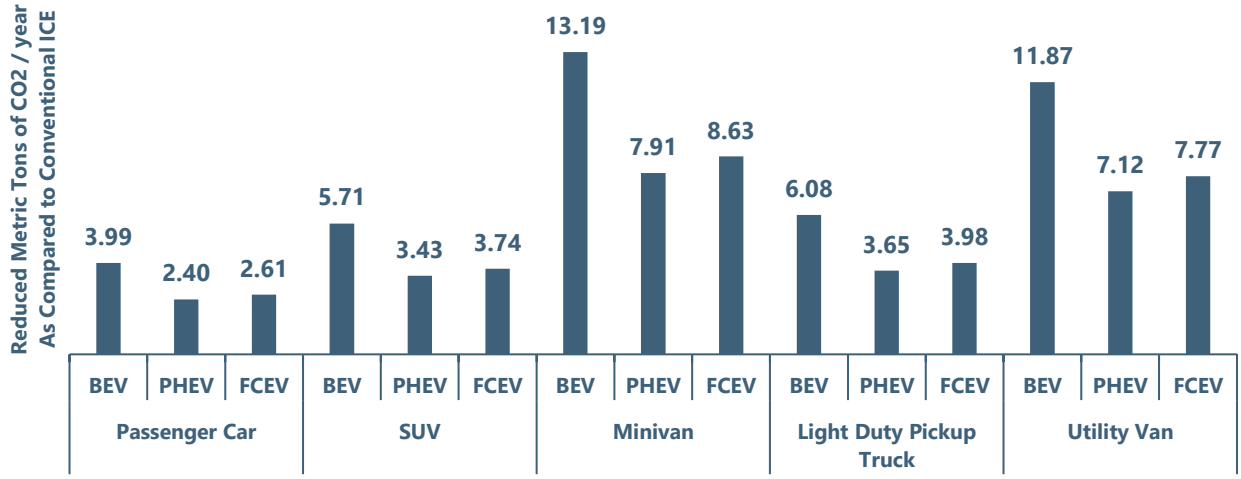
Vehicle Type	Description
Passenger Car	A passenger car, also known as an automobile, is a four-wheeled vehicle primarily designed for the transportation of passengers. It typically seats four to five people, with a separate enclosed area for passengers and a designated trunk space for cargo.
SUV	An SUV combines elements of both a passenger car and an off-road vehicle. It typically features higher ground clearance, a more spacious interior, and the ability to accommodate more passengers. SUVs often offer optional four-wheel drive for improved off-road capability.
Minivan	A minivan, also known as a multi-purpose vehicle (MPV), is a spacious vehicle designed to transport multiple passengers, typically with three or more rows of seating. Minivans provide ample interior space, versatile seating configurations, and often have sliding doors for convenient access to the rear passenger area.
Light-Duty Pickup Truck	A light-duty pickup truck is a type of light-duty vehicle characterized by an open cargo bed at the rear, separate from the passenger compartment. Pickup trucks are designed for both passenger transportation and hauling cargo. They often offer towing capabilities and are available in various sizes, from compact to full-size models
Utility Van	A utility van, also known as a cargo van or commercial van, is a light-duty vehicle primarily designed for carrying goods, equipment, or tools. Utility vans typically have a fully enclosed cargo area without rear passenger seating. They offer ample space and security features for efficient transportation and storage of cargo or supplies

Source: SCAG, 2023. Clean Technology Compendium. Available at: https://scag.ca.gov/post/clean-technology-compendium

[55] Clean Technology Compendium, SCAG. Available at: https://scag.ca.gov/post/clean-technology-compendium

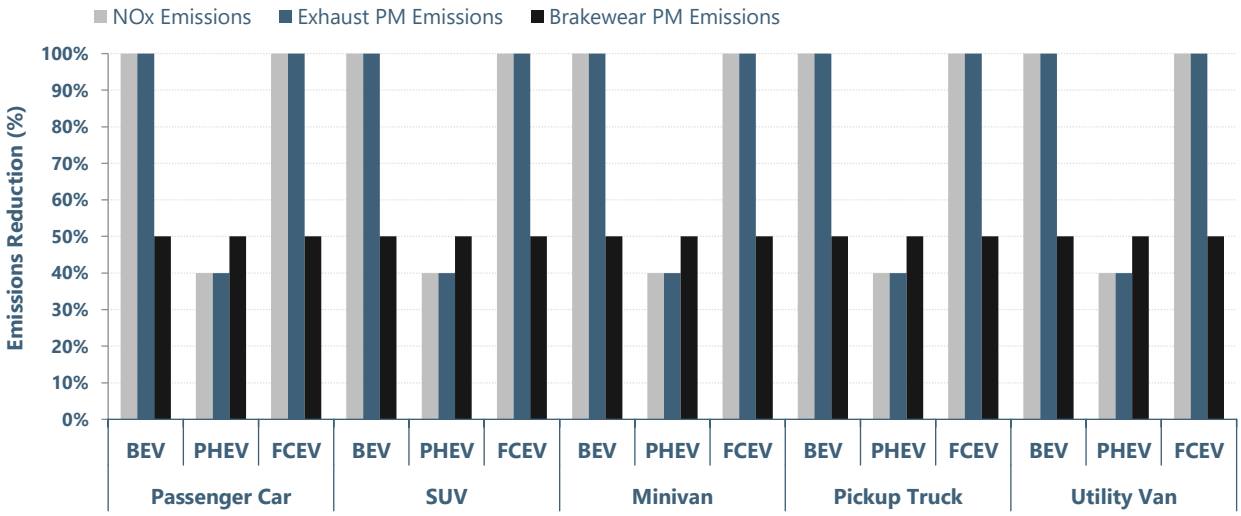
[56] Clean Technology Compendium, SCAG. Available at: https://scag.ca.gov/post/clean-technology-compendium

Exhibit 18 GHG Emissions (Well to Wheel) Reductions of LDV Body Style and Technology Types



Source: SCAG, 2023. Clean Technology Compendium. Available at: https://scag.ca.gov/post/clean-technology-compendium

Exhibit 19 Percentage of NOx Emissions Reductions, Exhaust PM Emissions Reductions, and Brake Wear PM Emissions Reductions by Body Style and Technology Type



Source: SCAG, 2023. Clean Technology Compendium. Available at: https://scag.ca.gov/post/clean-technology-compendium

COMMERCIAL MEDIUM- AND HEAVY-DUTY VEHICLES

Medium-duty vehicles (MDVs) range from Class 2 to 7 with a weight rating of 8,501 to 33,000 lbs. MDVs include pickup trucks, cargo vans, passenger vans, step vans, box trucks, and cab & chassis. They can use different technologies like battery electric vehicles (BEV), plug-in hybrid electric vehicles (PHEV), fuel cell electric vehicles (FCEV), and natural gas vehicles (NGVs).

Heavy-duty vehicles (HDVs) are Class 8 trucks weighing over 33,000 lbs. and include straight trucks, semi-tractors, and refuse trucks. They can also utilize similar technologies.

The commercial medium and heavy-duty vehicle (MHDV) sector is transitioning from fossil fuels to cleaner options like electric and hydrogen fuel cell technologies. These technologies can reduce greenhouse gas emissions and

improve air quality, particularly regarding nitrogen oxides and diesel particulate matter. Leading manufacturers now offer electric and hydrogen-powered MHDVs for applications such as delivery trucks and semi-tractors. According to CALSTART, 134 zero-emission MHDV models are available in North America, including nine FCEVs and 125 BEVs. However, PHEVs are less common in the MHDV sector.[57]

In the SCAG region, the adoption of zero-emission MHDVs is in early stages, with only 178 MHDVs currently in use (58 heavy-duty and 120 medium-duty).[58] This is significantly below the state's target of achieving 100 percent new zero-emission vehicle sales by 2036. Most of these vehicles are concentrated in Los Angeles and Orange counties.

In addition to zero-emission vehicles (ZEVs), the use of natural gas vehicles (NGVs), including compressed or renewable natural gas (CNG/RNG), is growing in the MHDV sector. NGVs are considered cost-effective alternatives to diesel trucks due to lower and more stable natural gas prices. CARB has implemented strict emissions regulations for on-road heavy-duty vehicles, driving the development of low-NOx CNG trucks, which can reduce GHG and NOx emissions. However, continued research and development of cleaner technologies like BEVs and FCEVs is crucial.

Overall, ZEV and NGV MHDVs can provide cost savings compared to traditional diesel vehicles, except for FCEVs.

Exhibit 20 MDV and HDV Descriptions by Body Style

Vehicle Type	Body Type	Description
Medium-Duty Vehicles	Medium-Duty Pickup Truck	A medium-duty pickup truck is a type of medium-duty truck with an open cargo bed at the rear designed to carry both passengers and cargo. It typically has a separate cabin for passengers and a rear bed for hauling goods or materials.
	Cargo Van	A cargo van is a commercial vehicle primarily designed for transporting goods or cargo. It typically features a closed cargo area without rear passenger seating, offering ample space for loading and transporting goods securely.
	Passenger Van	A passenger van, also known as a passenger minivan, is a vehicle designed to transport multiple passengers. It typically has several rows of seating, accommodating a higher number of passengers compared to standard cars, and may include additional features for passenger comfort.
	Step Van	A step van, also referred to as a walk-in delivery van, is a vehicle primarily used for delivery or mobile service purposes. It usually has a tall and boxy body design, allowing drivers to easily step in and out of the vehicle, often without the need to climb up or down.
	Box Truck	A box truck, also known as a cube truck or box van, is a medium-duty commercial truck characterized by a fully enclosed cargo area. It typically has a separate cabin for the driver and a rectangular-shaped cargo area with a rigid and enclosed box structure, providing secure storage and transportation for various goods or materials.
	Cab & Chassis	Cab & chassis refers to a vehicle configuration where the manufacturer provides only the cab and the chassis frame, without any additional cargo area or specialized body. This configuration allows for customization by adding different types of bodies or equipment according to specific needs, such as a flatbed, dump bed, or utility body.

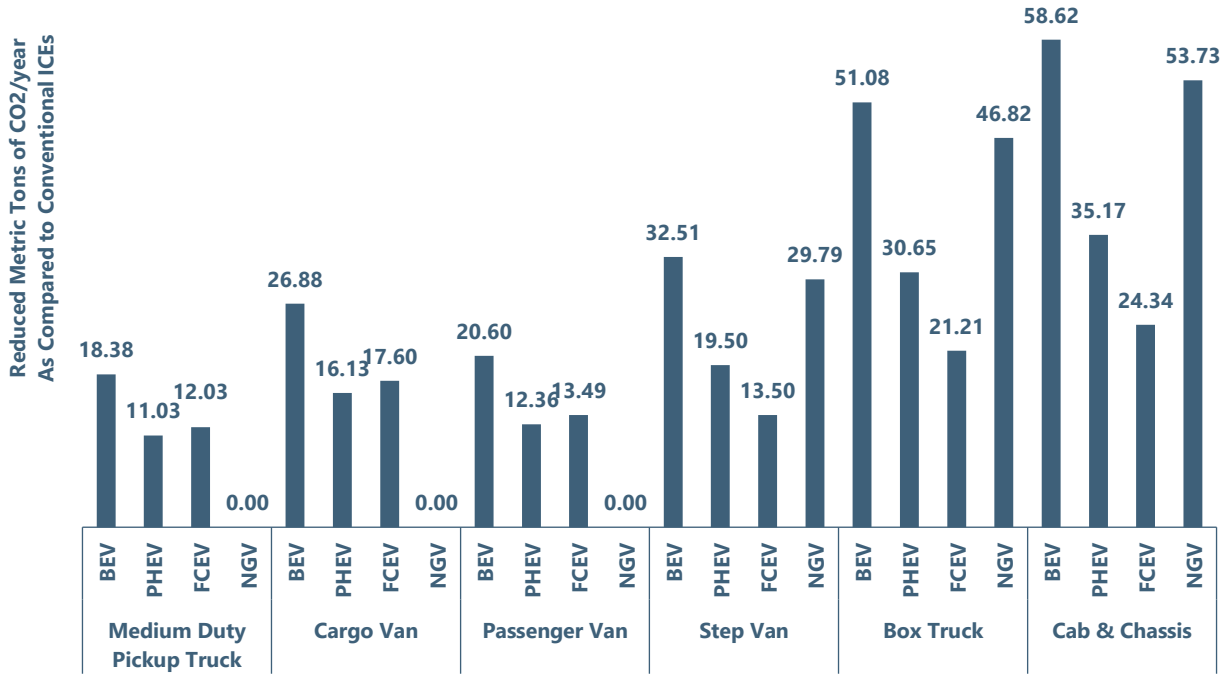
[57] ZETI Data Explorer, CALSTART. Available at: https://globaldrivetozero.org/tools/zeti-data-explorer/

[58] Clean Technology Compendium, SCAG. Available at: https://scag.ca.gov/post/clean-technology-compendium

Vehicle Type	Body Type	Description
Heavy-Duty Vehicles	Straight Truck	A straight truck, also known as a box truck or straight-bodied truck, is a class 8 vehicle consisting of a single rigid frame. It typically has a cab for the driver and a cargo area directly behind it. The cargo area is usually enclosed and designed to transport goods or materials securely. Straight trucks are commonly used for local deliveries or as moving trucks.
	Semi-Tractor	A semi-tractor, also known as a semi-truck or tractor-trailer, is a class 8 truck designed to tow semi-trailers. It consists of a powerful engine, a large cab for the driver, and a fifth-wheel coupling at the rear to attach and tow trailers. Semi-tractors are commonly used for long-haul transportation of goods over significant distances.
	Refuse Trucks	Refuse vehicles, also known as garbage trucks or waste collection vehicles, are class 8 vehicles specifically designed for collecting and transporting solid waste or refuse. They are equipped with mechanisms for loading and compacting garbage, such as front loaders, rear loaders, or side loaders. Refuse vehicles play a crucial role in waste management systems, ensuring the efficient collection and disposal of waste materials.

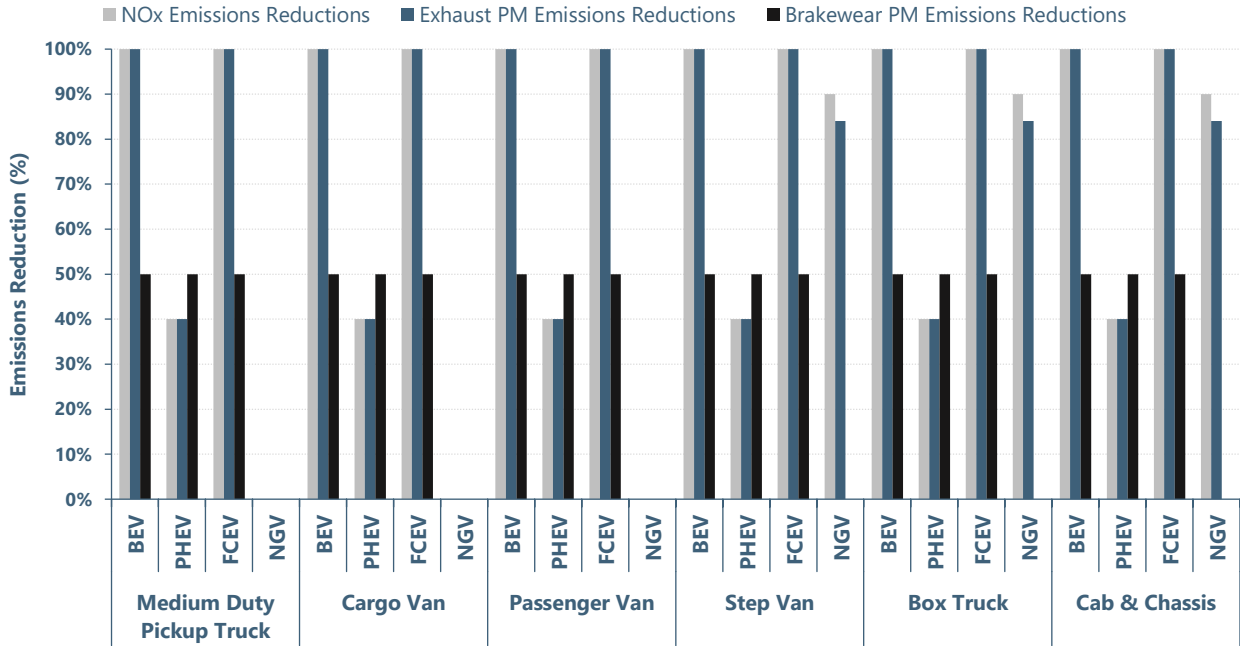
Source: SCAG, 2023. Clean Technology Compendium. Available at: https://scag.ca.gov/post/clean-technology-compendium

Exhibit 21 GHG emissions (Well to Wheel)R (Metric Tons of CO2 per Year) of MDVs by Body Style and Technology Type



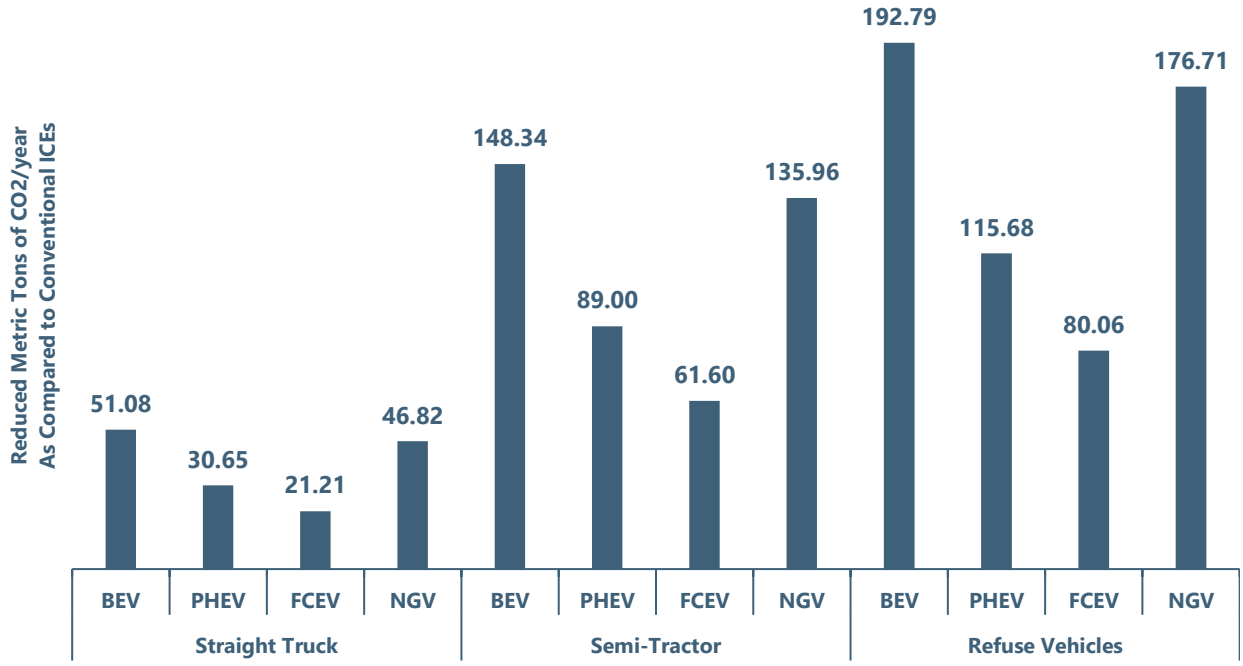
Source: SCAG, 2023. Clean Technology Compendium. Available at: https://scag.ca.gov/post/clean-technology-compendium

Exhibit 22 Percentage of NOx Emissions Reductions, and Exhaust PM Emissions Reductions by Body Style and Technology Type



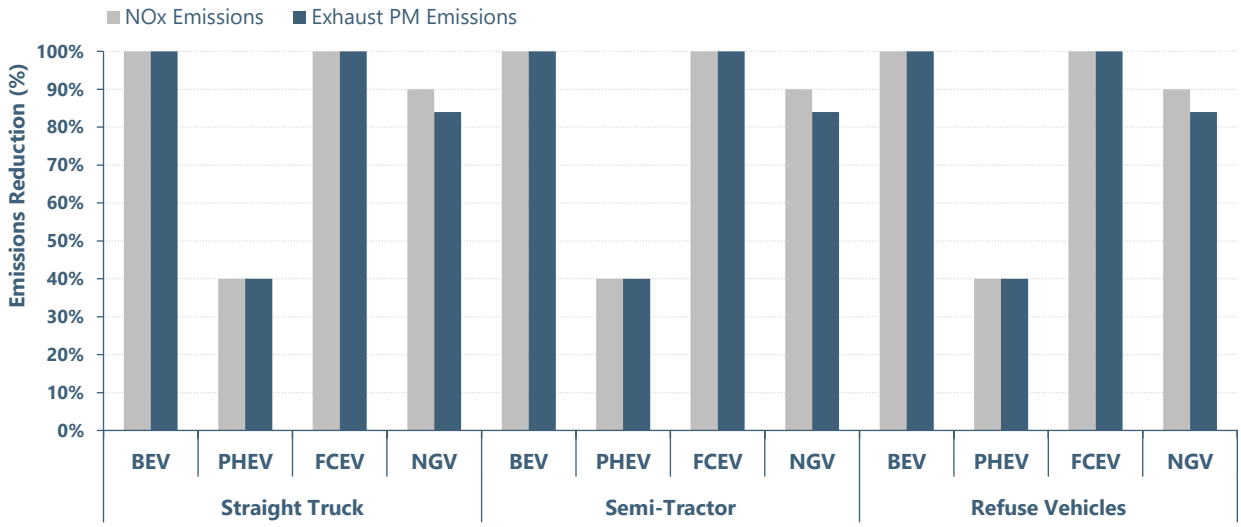
Source: SCAG, 2023. Clean Technology Compendium. Available at: https://scag.ca.gov/post/clean-technology-compendium

Exhibit 23 GHG Emissions (Well to Wheel) Reductions (Metric Tons of CO2 per Year) of HDVs by Body Style and Technology Type



Source: SCAG, 2023. Clean Technology Compendium. Available at: https://scag.ca.gov/post/clean-technology-compendium

Exhibit 24 Percentage of NOx Emissions Reductions, and Exhaust PM Emissions Reductions by Body Style and Technology Type



Source: SCAG, 2023. Clean Technology Compendium. Available at: https://scag.ca.gov/post/clean-technology-compendium

BUSES

Buses classified as Class 4 or heavier vehicles weighing 14,001 lbs. or more, are designed primarily for passenger transportation in public transit systems, school transport, and private charter services. They come in various styles, including single- and double-deck buses, articulated buses, school buses, shuttles, and cutaways. Buses come in various technological classifications, such as battery electric buses (BEBs), plug-in hybrid electric buses (PHEBs), fuel cell electric buses (FCEBs), and natural gas buses (NGBs).

Clean technology for buses has evolved significantly, with BEBs and FCEBs gaining traction. These technologies substantially reduce GHG and pollutant emissions compared to diesel and natural gas-powered buses. BEBs have become more prevalent due to advances in battery technology, while FCEBs offer a clean alternative, especially for long-range routes. Currently, there are over 60 models of zero-emission buses available in North America, with 57 BEBs and three FCEBs, according to CALSTART's Zero Emission Technology Inventory. [59]

In the SCAG region, zero-emission transit buses make up the largest number of heavy-duty zero-emission vehicles, with a total of 476 ZEBs, including 449 BEBs and 27 FCEBs. Transit buses account for the majority, with 378 ZEBs, while 90 are school buses, and eight are coach buses. The Los Angeles County Metropolitan Transportation Authority and the Antelope Valley Transit Authority have the largest fleets in the region, with the latter having the most zero-emission transit buses. Other operators in the region have varying numbers or no zero-emission buses. The current adoption rate of transit ZEBs is approximately 5 percent of the total transit buses in the region,[60] falling short of the state's target of achieving 100 percent ZEBs by 2040 established by the state's Innovative Clean Transit regulation.[61]

Despite higher upfront costs, ZEBs, including BEBs and FCEBs, offer cost savings over their lifetime when considering total cost of ownership (TCO). BEBs are particularly advantageous in terms of TCO, while FCEBs may require additional

[59] ZETI Data Explorer, CALSTART. Available at: https://globaldrivetozero.org/tools/zeti-data-explorer/

[60] Clean Technology Compendium, SCAG. Available at: https://scag.ca.gov/post/clean-technology-compendium

[61] Innovative Clean Transit, CARB. Available at: https://ww2.arb.ca.gov/our-work/programs/innovative-clean-transit

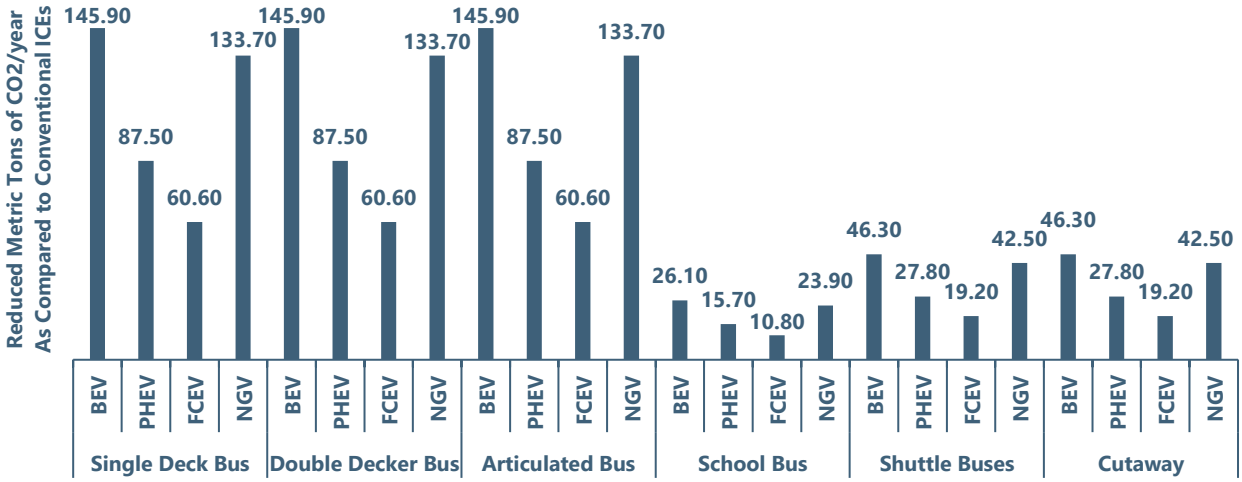
investment to reach cost parity with diesel or NGV counterparts. Overall, ZEBs prove to be cost-effective choices for bus fleets due to reduced operating and maintenance expenses over their lifespan.

Exhibit 25 Bus Product Descriptions by Body Style and Technology Type

Vehicle Type	Description
Single-Deck Bus	A single-deck bus is a type of bus with only one level or floor for passenger seating. It typically has a single entrance and exit, with a uniform seating arrangement on the same level throughout the bus.
Double-Decker Bus	A double-decker bus is a bus with two levels or floors for passenger seating. The upper level is accessed via stairs located at the rear or front of the bus. Double-decker buses provide increased seating capacity and are often used in urban areas or for tourist transportation.
Articulated Bus	An articulated bus, also known as a bendy bus or articulated coach, is a bus with a joint or flexible section that allows the vehicle to bend in the middle. This design enables better maneuverability and increased passenger capacity. Articulated buses are commonly used in urban transit systems
School Bus	A school bus is specifically designed to transport students to and from educational institutions. School buses usually have specific safety features such as high seat backs, flashing lights, and a distinctive yellow color. School buses adhere to specific regulations and guidelines to ensure the safety of students during transportation.
Shuttle Buses	Shuttle buses are small- to mid-sized buses used for short-distance transportation, typically within a specific area or between designated locations. They are often used for airport transfers, hotel shuttles, or corporate transportation services.
Cutaway	A cutaway, also known as a cutaway van chassis, refers to a vehicle configuration where the manufacturer provides a cab and chassis with the rear portion of the vehicle left unfinished. It allows for customization by adding different types of bodies or structures, such as shuttle bus bodies, motorhomes, or delivery vans, according to specific needs.

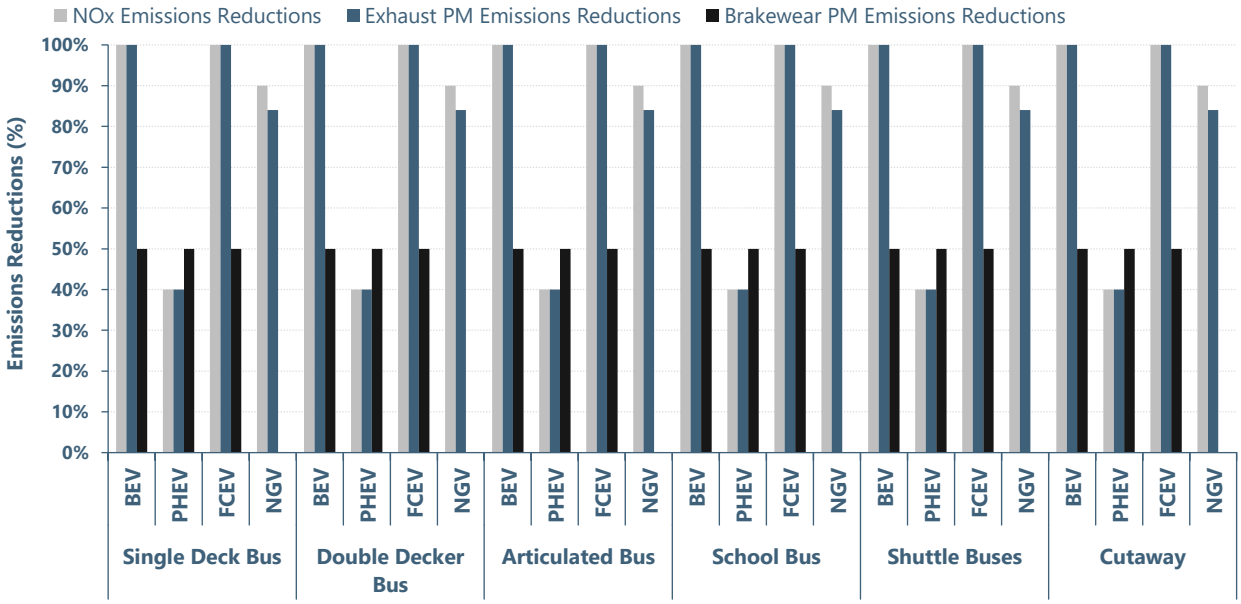
Source: SCAG, 2023. Clean Technology Compendium. Available at: https://scag.ca.gov/post/clean-technology-compendium

Exhibit 26 GHG Emissions (Well to Wheel) Reductions (Metric Tons of CO2 per Year) of Buses by Body Style and Technology Type



Source: SCAG, 2023. Clean Technology Compendium. Available at: https://scag.ca.gov/post/clean-technology-compendium

Exhibit 27 Percentage of NOx Emissions Reductions, and Exhaust PM Emissions Reductions by Body Style and Technology Type



Source: SCAG, 2023. Clean Technology Compendium. Available at: https://scag.ca.gov/post/clean-technology-compendium

RAIL

Rail technology includes battery electric vehicles (BEVs), fuel cell electric vehicles (FCEVs), and natural gas vehicles (NGVs), and it includes passenger locomotives, freight locomotives, and switchers.

The adoption of zero-emission technologies in the rail sector is still in early stages in North America, with Europe and Asia being more advanced. Battery-electric technology suits passenger locomotives with predictable routes and charging options for shorter routes. Fuel cell technology provides flexibility for longer routes with less frequent refueling. Caltrans has identified hydrogen locomotives as suitable for Amtrak intercity operations and aims for 100 percent zero-emission rail fleet by 2035.[62]

Metrolink aims to fully electrify its rail fleet by 2028,[63] and the San Bernardino County Transportation Authority plans to introduce hydrogen locomotives in 2024.[64] CARB's In-Use Locomotive Regulation requires passenger locomotives manufactured after 2030 to operate in a zero-emission configuration in California.[65]

While zero-emission locomotives offer environmental benefits and long-term cost savings, their higher upfront costs compared to diesel locomotives remain a barrier. However, as technology advances and economies of scale are realized, zero-emission locomotives are expected to become more financially viable and contribute to decarbonization in the rail sector.

Exhibit 28 Rail by Body Type

Vehicle Type	Description
Passenger Locomotive	A passenger locomotive, also known as a passenger train engine or passenger train locomotive, is a powerful rail vehicle specifically designed for pulling passenger trains. It provides the necessary traction and power to haul passenger cars, ensuring safe and efficient transportation of passengers over long distances or within urban transit systems.
Freight Locomotive	A freight locomotive, also known as a freight train engine or freight train locomotive, is designed for hauling freight or cargo trains. It is typically optimized for pulling heavy loads and is commonly used in the transportation of goods, materials, or containers over long distances or for industrial purposes.
Switchers	Switchers, also referred to as shunting locomotives or switcher locomotives, are used primarily for maneuvering or shunting railcars within a railway yard or industrial facility. They are designed to handle low-speed operations, including coupling and uncoupling of railcars, sorting, and assembling trains in a rail yard.

Source: SCAG, 2023. Clean Technology Compendium. Available at: https://scag.ca.gov/post/clean-technology-compendium

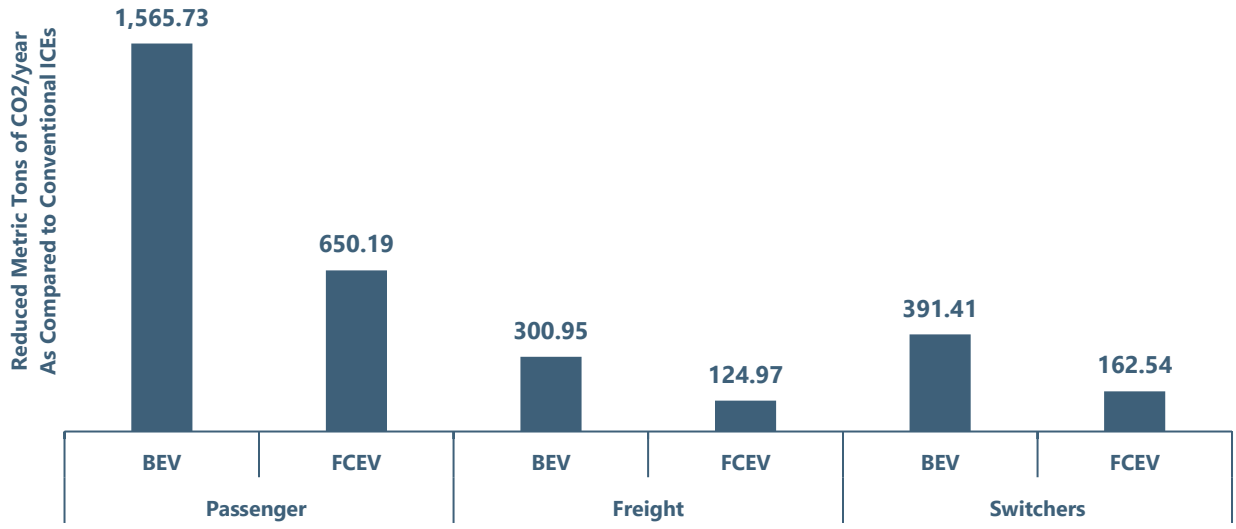
[62] Clean Technology Compendium, SCAG. Available at: https://scag.ca.gov/post/clean-technology-compendium

[63] Clean Technology Compendium, SCAG. Available at: https://scag.ca.gov/post/clean-technology-compendium

[64] Zero Emission Rail Technology, SBCTA. Available at: https://www.gosbcta.com/wp-content/uploads/2022/12/ZEMU-Technology-Fact-Sheet-ENG-120522.pdf

[65] CARB passes a new In-Use Locomotive Regulation estimated to yield over $32 billion in health benefits, CARB. Available at: https://ww2.arb.ca.gov/news/carb-passes-new-use-locomotive-regulation-estimated-yield-over-32-billion-health-benefits-0?ref=frontline-observer.com

Exhibit 29 GHG Emissions (Well to Wheel) Reductions (Metric Tons of CO2 per Year) of Locomotives by Passenger or Freight Use and by Technology Type



Source: SCAG, 2023. Clean Technology Compendium. Available at: https://scag.ca.gov/post/clean-technology-compendium

SUPPORTING INFRASTRUCTURE WITHIN THE SCAG REGION

Within the Southern California Clean Cities Coalition Region, there are a total of 13,160 alternative fuel stations, of which 12,779 are electric, 153 are ethanol, 107 are natural gas, 81 are propane, 23 are hydrogen, and 11 are biodiesel.[66] In addition, the annual energy use impact was a total of 21,929,461 GGEs with savings of the following alternative fuel types: natural gas (CNG) (97.1 percent), propane (LPG) (0.8 percent), electric and plug-in vehicles (0.5 percent), hydrogen (0.7 percent), and hybrid vehicles (0.9 percent).[67]

EV CHARGING INFRASTRUCTURE

Electric vehicle (EV) charging infrastructure encompasses three main components: Level 2 charging, direct current fast charging (DCFC) stations, and innovative charging solutions.

Level 2 charging stations provide moderate charging rates and can operate either as stand-alone units or within a networked system. DCFC stations offer faster charging speeds at various power levels, from low power to ultra-high power. Innovative charging solutions encompass wireless charging systems, pantograph charging systems, and solar charging canopies. Level 2 chargers are the most used, while DCFC stations are better suited for heavy-duty vehicles with higher power demands.

Currently, the region boasts approximately 33,000 Level 2 chargers and 3,700 DCFC chargers. Los Angeles County leads the region with 76 percent of all Level 2 chargers and 50 percent of DC fast chargers. [68] This reflects the county's large population and high EV adoption rates. San Bernardino and Riverside counties also have substantial charger numbers, indicating their commitment to expanding charging infrastructure. In contrast, the more rural Imperial

[66] Southern California Clean Cities Coalition, U.S. DOE. Available at: https://cleancities.energy.gov/coalitions/southern-california

[67] Southern California Clean Cities Coalition, U.S. DOE. Available at: https://cleancities.energy.gov/coalitions/southern-california

[68] Clean Technology Compendium, SCAG. Available at: https://scag.ca.gov/post/clean-technology-compendium

County has the fewest chargers in the region. This disparity underscores the need for a more equitable distribution of resources to support widespread adoption of zero-emission vehicles.

The capital cost of EV charging infrastructure varies depending on the type of charging system. For stand-alone Level 2 charging stations, capital costs typically range from $2,500 to $4,500. Networked Level 2 stations may have additional costs related to central management systems. DCFC stations, owing to their faster charging capabilities, have higher capital costs. Low-power DCFC stations (50 – 100 kW) typically range from $29,500 to $59,500. Medium-power DCFC stations (>100 – 250 kW) have a capital cost of $59,500 to $115,000. High-power DCFC stations (>250 – 350 kW) fall in the range of $115,000 to $139,000. Ultra-high-power DCFC stations (up to 1 MW) come with higher capital costs, usually ranging from $400,000 to $500,000. [69]

HYDROGEN FUELING INFRASTRUCTURE

Hydrogen fueling stations are crucial for clean energy transportation with fuel cell electric vehicles (FCEVs). However, building this infrastructure comes with challenges, including high costs and technical complexities. Despite these hurdles, investing in hydrogen stations has environmental benefits.

FCEVs store hydrogen as compressed gas in high-pressure tanks. There are different ways to transport hydrogen, like trucks and pipelines, and on-site production. Various types of stations, such as slow and fast fill, on-site production, and others, are considered based on costs and availability.

Southern California has one of the world's largest hydrogen station networks. As of January 2023, there are 39 stations, mainly in Los Angeles and Orange counties.[70] San Bernardino, Riverside, and Ventura counties have fewer. Currently, there are 34 light-duty retail stations, with 20 more planned.[71] In the heavy-duty sector, there are five operational stations and one more is on the way.

Setting up hydrogen stations is complex and costly. Hydrogen is typically made from natural gas or water, requiring a lot of energy. Its low energy density and flammability make transport and storage challenging. The initial investment is high, ranging from $400,000 to $8,000,000, with yearly maintenance costs around $142,000.[72] Regulatory hurdles and the 'chicken-and-egg' problem—consumers hesitant due to limited stations and providers unwilling to invest without demand—add to the difficulties.

NATURAL GAS FUELING INFRASTRUCTURE

Natural gas is a cleaner fuel compared to traditional petroleum-based options, emitting fewer GHGs, particulate matter, and smog-forming pollutants. Its availability and existing infrastructure, including pipelines, and refueling stations, make it easy to integrate into transportation systems. Many fleet operators, including transit agencies and delivery companies, have adopted natural gas as a fuel choice.

Renewable natural gas (RNG) is a low-carbon alternative to natural gas, produced by capturing and refining biogas emitted from various sources. RNG undergoes a purification process to remove impurities and increase its methane content, making it a renewable fuel derived from organic waste materials. However, it's not completely carbon-neutral, as methane emissions can occur during production and distribution.

Natural gas can power vehicles as compressed natural gas (CNG) or liquified natural gas (LNG). LNG is created by cooling natural gas to a liquid state, reducing its volume for more efficient storage and transportation. LNG requires specialized equipment for handling cryogenic temperatures. CNG involves compressing natural gas to high pressures and storing it in cylinders or tanks at the fueling station. CNG fueling infrastructure requires compressors and dispensers.

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[69] Clean Technology Compendium, SCAG. Available at: https://scag.ca.gov/post/clean-technology-compendium

[70] Clean Technology Compendium, SCAG. Available at: https://scag.ca.gov/post/clean-technology-compendium

[71] Clean Technology Compendium, SCAG. Available at: https://scag.ca.gov/post/clean-technology-compendium

[72] Clean Technology Compendium, SCAG. Available at: https://scag.ca.gov/post/clean-technology-compendium

There are two types of CNG refueling stations: time-fill and fast-fill. Time-fill stations are for overnight or prolonged refueling, often used in fleet operations. They fill CNG tanks slowly, optimizing infrastructure use. Fast-fill stations are similar to conventional fueling stations, providing quick refueling suitable for vehicles with higher fuel consumption.

In the SCAG region, natural gas fueling infrastructure is evenly distributed across four of the six counties. Los Angeles has 34 stations, followed by Riverside and San Bernardino with 19 each, and Orange County with 13. Ventura County has two stations, and Imperial County has one. [73] Costs vary based on station size, ranging from starter stations at $45,000 to $75,000, small stations at $400,000 to $600,000, medium stations at $700,000 to $900,000, to large stations at $1.2 million to $1.8 million. [74] These costs cover equipment, installation, and construction.

[73] Clean Technology Compendium, SCAG. Available at: https://scag.ca.gov/post/clean-technology-compendium

[74] Clean Technology Compendium, SCAG. Available at: https://scag.ca.gov/post/clean-technology-compendium

Emission Reductions

Overall, within the region, use of AFVs reduced annual emissions by 20,829 tons of carbon dioxide equivalent (CO2e). **Exhibit 30, Annual Emissions Reduced in the Southern California Clean Cities Coalition Region by Source**, provides a breakdown of the percentage of annual emissions reductions by source, and **Exhibit 31, Annual Emissions Reduced in the Southern California Clean Cities Coalition Region by AFV Project Type**, provides a breakdown of the percentage of annual emissions reductions by AFV project type.

Exhibit 30 Annual Emissions Reductions in the Southern California Clean Cities Coalition Region by Source

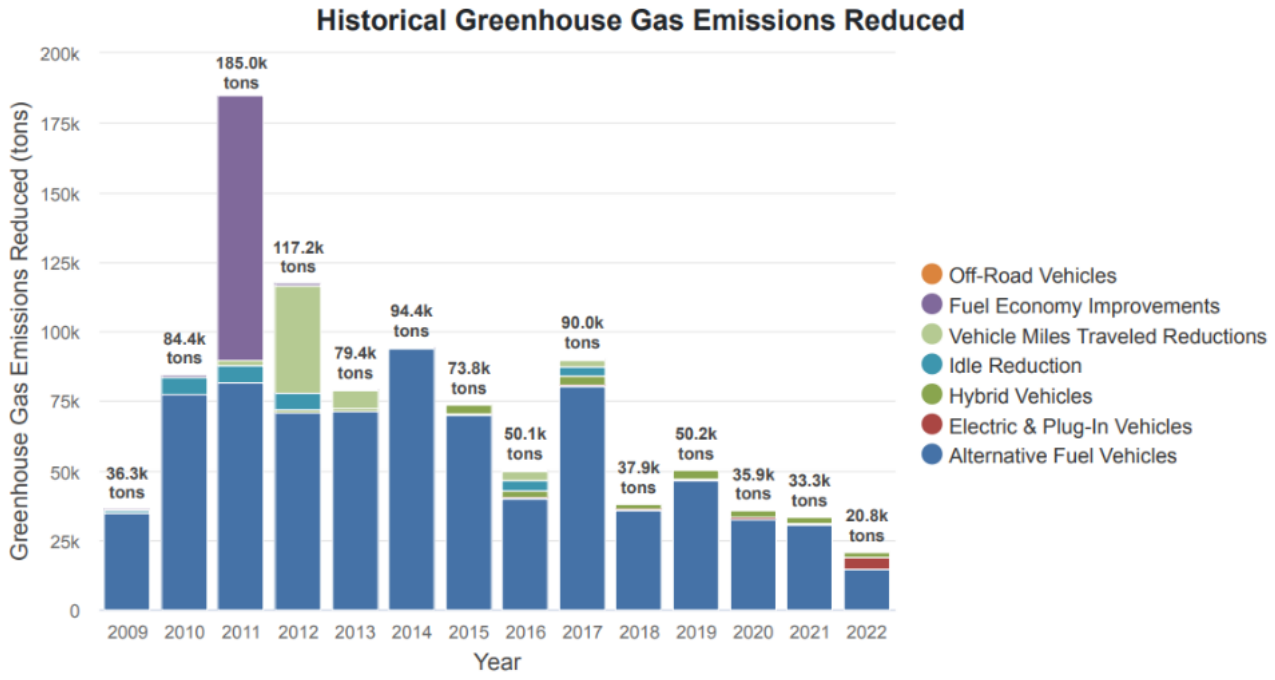
Source	Percent of Emissions Avoided
Natural Gas (CNG), Propane (Liquified Petroleum Gas), Hydrogen, Renewable Natural Gas, and Renewable Diesel Vehicles	70%
Idle Reductions	0%
Battery Electric Vehicles	10.4%
Hybrid Electric and Plug-In Hybrid Electric Vehicles	19.5%
Source: U.S. DOE, 2023. 2022 Transportation Technology Deployment Report: Southern California Clean Cities Coalition.	

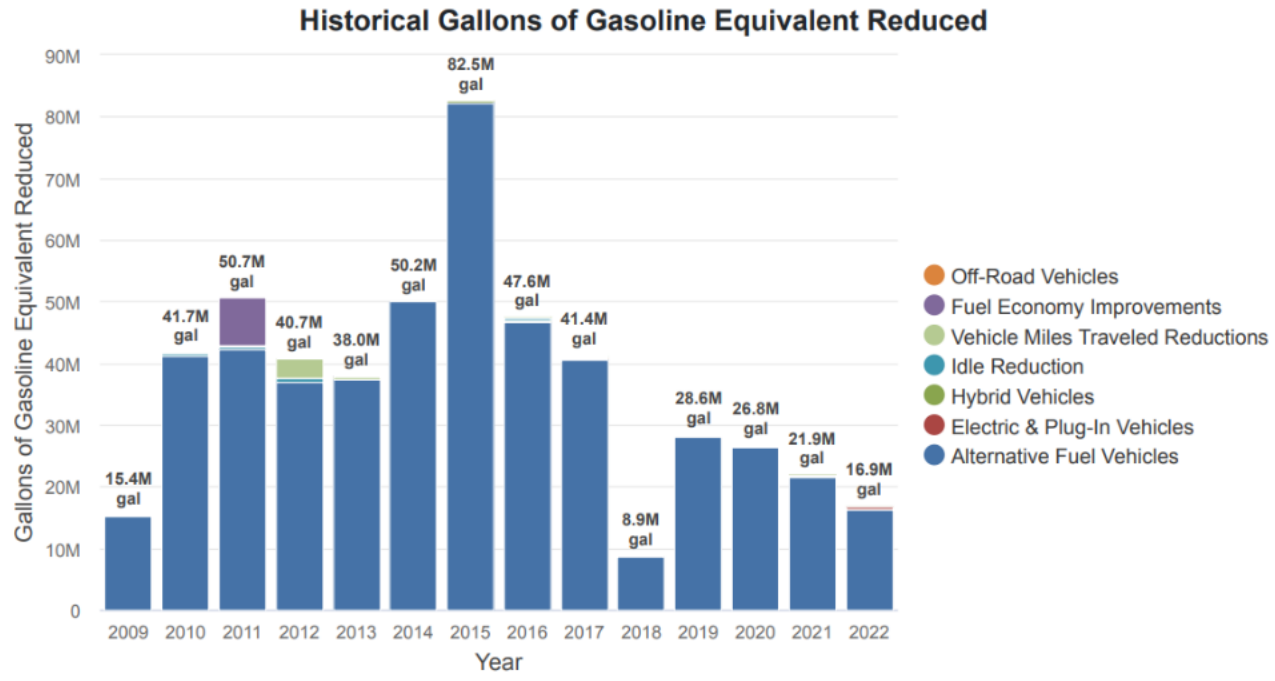
Exhibit 31 Annual Emissions Reduced in the Southern California Clean Cities Coalition Region by AFV Project Type

AFV Project Type	Percent of Emissions Avoided
Natural Gas (CNG)	68.3%
Renewable Natural Gas	0%
Hybrid Electric	10.4%
Battery Electric	19.5%
Hydrogen	0%
Renewable Diesel	0%
Propane (LPG)	1.7%
Plug-In Hybrid Electric	0.1%
Source: U.S. DOE, 2023. 2022 Transportation Technology Deployment Report: Southern California Clean Cities Coalition.	

Exhibit 32, Energy Use Impact and GHG Reduction, depicts the historical GHG emissions and GGE reduced from 2009 to 2022 in the Southern California Clean Cities Coalition region. As shown in the figure, GHG emissions have been decreasing since 2020, with 20,828 tons of GHG emissions avoided in 2022 resulting from hybrid and alternative fuel vehicles. GGE has also been decreasing since 2020, with 16.9 million GGE avoided in 2022 resulting from AFVs.

Exhibit 32 Energy Use Impact and GHG Reduction





One of the primary goals of the Clean Cities Strategic Plan is related to emission reductions, as the DOE sets forth GGE and GHG targets for the Clean Cities Coalition Network, and as each coalition is responsible for quantifying and monitoring on an annual basis. DOE has determined the 16 percent GGE and 20 percent GHG targets by examining coalition performance across the country and passing these targets down to the coalitions. Strategies and actions planned to meet these targets are described in the "Roadmap" section of the Clean Cities Strategic Plan.

In addition to the GHG and GGE reduction strategies outlined in this strategic plan, SCAG's Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS), also known as "Connect SoCal," identifies a variety of strategies designed to reduce GHG emissions over the 20-year plan horizon. Targets identified in this strategic plan align with Connect SoCal to support SCAG's strategies, both in the near- and long-term.

Barriers to Adoption

Despite the rapid adoption of clean transportation technology, the SCAG region faces significant challenges and concerns in implementing these technologies. These barriers can be categorized into five main areas: cost, technology readiness, infrastructure, consumer knowledge, and regulatory support.

- **Cost:** The high initial costs associated with ZEV and NZEV technologies create a significant obstacle, especially for individuals with limited financial resources. According to a recent report from Kelley Blue Book, the average price of a passenger ZEV exceeds that of a typical vehicle with an internal combustion engine vehicle by $18,000. This cost disparity becomes even more pronounced in heavier applications. For example, a conventional passenger locomotive costs around $2.5 million, while its BEV counterparts range from $10 to $12 million. These high costs are attributed to research and development expenses, specialized components, and limited production scale. Additionally, compliance with various performance standards and regulatory requirements adds to the overall expense, potentially limiting accessibility to these technologies.
- **Technology Readiness:** The readiness of clean technologies is a significant hurdle to their widespread adoption. Many of these emerging technologies are still in early development stages and lack the reliability and performance levels seen in conventional vehicles and equipment. The limited availability of dependable and commercially viable clean technology solutions hinders their acceptance in the market and slows the transition toward a cleaner and more sustainable transportation sector.
- **Lack of Charging and Fueling Infrastructure:** The absence of accessible charging and hydrogen refueling infrastructure poses a major barrier to adoption. For instance, approximately 1,700 fueling stations will be required to support the deployment of 1.8 million FCEVs in California. Constructing such infrastructure demands significant investment and coordination among various stakeholders. Without a robust and conveniently located charging and refueling network, consumers may hesitate to adopt clean technologies due to concerns about accessibility and range limitations.
- **Consumer Knowledge:** Limited consumer knowledge and awareness about clean transportation options can impede adoption rates. Many potential buyers are not well-informed about the benefits, availability, and operation of AFVs and associated technologies. Educating consumers about the advantages and practicalities of clean transportation is essential for increasing adoption.
- **Regulatory Support:** The absence of robust regulatory support can hinder the adoption of clean technologies. Clear and consistent regulations, incentives, and policies can motivate consumers and businesses to transition to cleaner transportation options. A lack of supportive measures may discourage investment and innovation in the clean technology sector.

Federal and State Policies and Programs

To boost the adoption of AFVs and associated technologies, the federal and state of California governments have implemented numerous policies and programs.

FEDERAL

Federal and state governments have passed mandates and implemented policies and programs to establish ambitious goals for reducing greenhouse gas (GHG) emissions, transitioning to alternative fuel vehicles (AFVs), and upgrading transportation infrastructure to support these vehicles. These initiatives reflect a concerted effort to address environmental concerns and promote sustainable transportation solutions.

The United States has set comprehensive goals for reducing greenhouse gas (GHG) emissions in the transportation sector, focusing on transitioning to zero emission vehicles (ZEVs). Key targets include a 50 percent goal for ZEVs in new light-duty vehicle sales by 2030,[75] complemented by a target of establishing 500,000 EV charging stations by the same year.[76] Additionally, there's a goal for 100 percent of federal light-duty fleet procurement to be ZEVs by 2027, extending to 30 percent for new medium and heavy-duty vehicles (MHDVs) sales by 2030, and 100 percent by 2040.[77] In the rail sector, the emphasis is on developing technologies for emission reduction.

To support these goals, the United States Departments of Energy, Transportation, Housing and Urban Development, and the Environmental Protection Agency released the "Blueprint to Decarbonize America's Transportation Sector" in January 2023.[78] The blueprint outlines a strategy for nationwide decarbonization, building on significant investments in transportation infrastructure.

Key legislative actions include the Infrastructure Investment and Jobs Act (IIJA) and the Inflation Reduction Act (IRA). The IIJA, signed in November 2021, allocates $660 billion over five years for transportation systems and technologies, focusing on climate crisis mitigation. The IRA, signed in August 2022, is projected to reduce economy-wide emissions by over 40 percent by 2030.[79] These acts facilitate substantial funding for transit, rail, EV charging, and sustainable fuel infrastructure, including tax credits and rebates.

Specifically, the IIJA provides $7.5 billion for EV charging stations, with California's estimated share totaling $384 million over five years. The IRA introduces tax credits and incentives for alternative fuel infrastructure, commercial electric and fuel cell vehicles, and clean heavy-duty vehicle replacements, aiming to boost the ZEV and near-zero

[75] Executive Order on Strengthening American Leadership in Clean Cars and Trucks, The White House. Available at: https://www.whitehouse.gov/briefing-room/presidential-actions/2021/08/05/executive-order-on-strengthening-american-leadership-in-clean-cars-and-trucks/

[76] National Electric Vehicle Infrastructure (NEVI) Program, FHWA. Available at: https://www.fhwa.dot.gov/environment/nevi/

[77] FACT SHEET: President Biden Signs Executive Order Catalyzing America's Clean Energy Economy Through Federal Sustainability, The White House. Available at: https://www.whitehouse.gov/briefing-room/statements-releases/2021/12/08/fact-sheet-president-biden-signs-executive-order-catalyzing-americas-clean-energy-economy-through-federal-sustainability/

[78] The U.S. National Blueprint for Transportation Decarbonization: A Joint Strategy to Transform Transportation; U.S. DOE, U.S. DOT, U.S. EPA, U.S. HUD. Available at: https://www.energy.gov/sites/default/files/2023-01/the-us-national-blueprint-for-transportation-decarbonization.pdf

[79] The U.S. National Blueprint for Transportation Decarbonization: A Joint Strategy to Transform Transportation; U.S. DOE, U.S. DOT, U.S. EPA, U.S. HUD. Available at: https://www.energy.gov/sites/default/files/2023-01/the-us-national-blueprint-for-transportation-decarbonization.pdf

emission vehicle (NZEV) markets. These measures are designed to ease the transition to cleaner transportation for individuals and businesses.[80]

Exhibit 33 Tax Credits and Incentive Programs Offered Through the IIJA and IRA

Incentive Program	Description
National Electric Vehicle Infrastructure Program (NEVI)	The NEVI is a $5 billion federal program to reduce GHG emissions by funding clean transportation and energy programs across the United States. California's Department of Transportation (Caltrans) and the California Energy Commission (CEC) created a deployment plan for NEVI, which will allocate $384 million in federal funds to build a network of modern, high-powered direct current fast chargers along Interstates and National Highways throughout California. The deployment plan was submitted in August 2022. NEVI-funded charging stations will have a minimum of four 150 kW combined charging system (CCS) connectors and total station power of 600 kW, located no more than 50 miles apart and no more than 1 mile from a freeway exit or highway roadway. At least 40 percent of NEVI benefits will go to disadvantaged, low-income, rural, and Tribal communities, and the CEC will manage funding solicitations on behalf of the state.
Electric Vehicle (EV) and Fuel Cell Electric Vehicle (FCEV) Tax Credit	The IRA has updated the Clean Vehicle Credit, formerly known as the Qualified Plug-in Electric Drive Motor Vehicle Credit, effective August 17, 2022, with additional requirements starting January 1, 2023. The Clean Vehicle Credit now includes both EVs and FCEVs, requires a traction battery with at least 7 kWh, and establishes sourcing requirements for critical mineral extraction, processing and recycling and battery component manufacturing and assembly. Vehicles meeting these requirements are eligible for a tax credit of up to $7,500. The percentage of the battery's critical minerals and components that are extracted, processed, recycled, manufactured, or assembled in North America must increase annually to qualify for the tax credit. Eligibility is also subject to a final MSRP limit and modified adjusted gross income threshold.
Alternative Fuel Infrastructure Tax Credit	Alternative fueling equipment for various fuels can receive a tax credit of 30% of the cost up to $30,000 until December 31, 2022. After that date, the credit is 30% or 6% for depreciable property up to $100,000, with specific requirements. Additionally, residential fueling equipment purchased between January 1, 2023, and December 31, 2032, can receive up to a $1,000 tax credit.
Commercial Electric Vehicle (EV) and Fuel Cell Electric Vehicle (FCEV) Tax Credit	Starting January 1, 2023, businesses can receive a tax credit for purchasing new electric or fuel cell vehicles, with amounts based on the vehicle's battery capacity and purchase price, not exceeding $7,500 for vehicles under 14,000 lbs. and $40,000 for vehicles over 14,000 lbs. The tax credit cannot be combined with the Clean Vehicle Tax Credit.
Clean Heavy-Duty Vehicle Program	The IRA allocated $1 billion toward replacing polluting heavy-duty vehicles with clean, zero-emission vehicles, supporting zero-emission vehicle infrastructure, and providing workforce development and training. Additionally, funds will be provided for planning and technical activities to promote the adoption and deployment of zero-emission vehicles. The U.S. Environmental Protection Agency (U.S. EPA) will distribute the funding between now and 2031, with $400 million going to communities in nonattainment areas.

[80] President Biden, USDOT and USDOE Announce $5 Billion over Five Years for National EV Charging Network, Made Possible by Bipartisan Infrastructure Law, FHWA. Available at: https://highways.dot.gov/newsroom/president-biden-usdot-and-usdoe-announce-5-billion-over-five-years-national-ev-charging

Incentive Program	Description
Clean Ports Program	The U.S. EPA has launched a $3 billion program to fund grants and rebates for the purchase or installation of zero-emission port equipment or technology, planning and permitting for such equipment, and the development of qualified climate action plans that reduce emissions of GHGs, criteria air pollutants, and hazardous air pollutants at one or more ports. $750M of total funding will be spent in nonattainment areas, and eligible funding recipients include port authorities, state, regional, local or tribal agencies, air pollution control agencies, and private entities that own or operate port-related facilities. The funding expires on September 30, 2027.

Source: SCAG, 2023. Clean Technology Compendium. Available at: https://scag.ca.gov/sites/main/files/file-attachments/23-3130-clean-technology-compendium-sep-2023.pdf?1698687619

Beyond the incentives offered by the IIJA and IRA, the United States government has implemented key regulations for clean technology adoption. In December 2021, the U.S. EPA set the most stringent federal GHG emissions standards to date for passenger cars and light trucks for model years 2023-2026,[81] aiming for a 5-10 percent annual increase in stringency and an average fuel economy of 40 mpg. Concurrently, the Clean Truck Plan targets GHG and pollutant emissions reductions in medium- and heavy-duty trucks by enhancing fuel efficiency and introducing new standards for diesel, gasoline, electric, and fuel cell-powered trucks for model years 2027-2030.[82]

In December 2022, the U.S. EPA enacted the Heavy-Duty NOx rule, further tightening emission standards for heavy-duty trucks and engines to reduce NOx emissions.[83] Additionally, the U.S. EPA grants California waivers to set its own vehicle emissions standards under the Clean Air Act, allowing the state to implement standards that surpass federal ones, provided they are protective of public health and welfare. Other states can adopt California's standards without EPA approval as long as they are identical to those granted a waiver.

STATE OF CALIFORNIA

To address climate change and enhance air quality, California has taken several steps to boost the adoption of zero-emission vehicles (ZEVs) and near-zero emission vehicles (NZEVs). This includes mandates for automakers to produce a set percentage of ZEVs, financial incentives for purchasing such vehicles, and investments in charging and fueling infrastructure. In September 2020, Governor Newsom signed Executive Order No. N-79-20, requiring all new passenger vehicles to be zero-emission by 2035 and transitioning all medium- and heavy-duty vehicles to ZEVs by 2045. The order also focuses on expanding charging infrastructure, incorporating more ZEVs into public fleets, and promoting EV adoption among consumers.[84] This executive order paves the way for implementing policies to meet these goals, with regulations already in place covering various vehicle types including light-, medium-, heavy-duty, transit, and rail.

[81] Regulations for Greenhouse Gas Emissions from Passenger Cars and Trucks, EPA. Available at: https://www.epa.gov/regulations-emissions-vehicles-and-engines/regulations-greenhouse-gas-emissions-passenger-cars-and

[82] Clean Trucks Plan, EPA. Available at: https://www.epa.gov/regulations-emissions-vehicles-and-engines/clean-trucks-plan

[83] Final Rule and Related Materials for Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards, EPA. Available at: https://www.epa.gov/regulations-emissions-vehicles-and-engines/final-rule-and-related-materials-control-air-pollution

[84] EXECUTIVE ORDER N-79-20, State of California. Available at: https://www.gov.ca.gov/wp-content/uploads/2020/09/9.23.20-EO-N-79-20-Climate.pdf

Exhibit 34 California Regulations Supporting ZEV Deployment

Regulation	Description
Advanced Clean Cars II	The Advanced Clean Cars II regulations will reduce light-duty passenger car, pickup truck, and SUV emissions from the 2026 model year through 2035. The regulations amend the Zero-Emission Vehicle Regulation to require an increasing number of ZEVs, including battery-electric, hydrogen fuel cell electric, and plug-in hybrid electric-vehicles. By 2035, the regulation requires 100% of new passenger vehicles sold in the state to be ZEV. These amendments support California Governor Newsom's executive order that all new passenger vehicles sold in California must have zero emissions by 2035. The Low-Emission Vehicle Regulations were also amended to include increasingly stringent standards for gasoline cars and heavier passenger trucks.
Advanced Clean Trucks (ACT) Regulation	The ACT regulation requires manufacturers of medium- and heavy-duty vehicles to sell increasing percentages of ZEVs in California, culminating in a requirement for 100% ZEV sales by 2045.
Advanced Clean Fleets Regulation	The regulation requires fleets operating in California to transition to zero emission technology with the goal of transitioning all drayage trucks to zero emission by 2035 and the rest of the medium- and heavy-duty vehicles to zero emission by 2045. Starting in 2036, manufacturers can only sell zero-emission medium- and heavy-duty vehicles. From January 1, 2024, trucks participating in drayage activities in California must be registered with the CARB Online System, with only zero-emission trucks allowed to register from 2024 onwards. All drayage trucks must be zero-emission by 2035. High-priority and federal fleets must either follow the Model Year Schedule, buying only ZEVs from 2024 and phasing out internal combustion vehicles that have passed their useful life starting in 2025, or the optional ZEV Milestones Option, meeting phased-in ZEV targets. State and local government fleets must have 50% ZEV purchases from 2024 and 100% by 2027, although small government fleets and certain counties can start their ZEV purchases in 2027.
Low NOx Omnibus Regulation	The HD Omnibus Regulation requires heavy-duty engines of model year 2024-2026 to meet a 0.05 g/bhp-hr NOx standard, with more stringent standards for subsequent model years, aimed at ensuring real-world emissions performance critical for attaining federal health-based air quality standards for ozone in 2031. Despite the regulation being adopted in 2020 and set to be implemented in 2024, as the 2024 model year certification approached, CARB staff became aware through manufacturer product plans that some truck categories in California would not be able to produce Omnibus-compliant diesel engines. To ease the transition, CARB recently proposed amendments offering flexibility, ensuring engine availability while preserving projected emissions reductions. [85]
Innovative Clean Transit (ICT) Regulation	The ICT regulation, adopted in December 2018, requires public transit agencies to transition to a 100% zero-emission bus fleet by 2040. All transit agencies that own, operate, or lease buses with a gross vehicle weight rating (GVWR) greater than 14,000 lbs. must comply with the regulation. The ZEB purchase requirements vary depending on the transit agency's size.

[85] Notice of Public Comment Period on Proposed Amendments to the Heavy-Duty Engine and Vehicle Omnibus Regulation, CARB. Available at: https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2023/hdomnibus2023/notice.pdf

Regulation	Description
In-Use Locomotive Regulation	The proposed in-use locomotive regulation would require locomotive operators in California to fund a spending account based on emissions and use the funds to purchase or upgrade to the cleanest locomotives. Starting in 2030, only locomotives less than 23 years old and those with an original engine build date of 2030 or newer would be allowed to operate in California, and by 2035, all Class I line haul locomotives with an original engine build date of 2035 or newer would need to operate in a zero-emission configuration.
Zero-Emission Truck Measure	This measure, as proposed in the 2022 State SIP Strategy, would seek to accelerate the number of zero-emission (ZE) trucks beyond existing measures (including the proposed Advanced Clean Fleets regulation). The measure seeks to upgrade the remaining heavy-duty combustion trucks to new or used ZE trucks rather than cleaner combustion engines. CARB has committed to implementing regulatory strategies to achieve this goal, such as differentiated registration fees, restrictions and fees for combustion trucks entering low and ZE zones, or indirect source rules (ISR). Alternatively, the measure could require combustion truck fleets to be scrapped and replaced with ZE trucks at the end of their useful lives. The measure would potentially be heard by CARB in 2028 as part of the comprehensive strategy to achieve zero-emissions medium- and heavy-duty vehicles by 2045.

Source: SCAG, 2023. Clean Technology Compendium. Available at: https://scag.ca.gov/sites/main/files/file-attachments/23-3130-clean-technology-compendium-sep-2023.pdf?1698687619

To support the shift on-road and rail transportation toward zero and near-zero emissions, the state has introduced various incentive programs, including rebate schemes, vehicle replacement initiatives, point-of-sale incentives, and infrastructure support measures. **Exhibit 35, California Incentive Program for Clean Technology Adoption**, details the current incentive programs actively promoting the growth of Zero Emission Vehicles (ZEVs) and related infrastructure in the SCAG region.

Exhibit 35 California Incentive Program for Clean Technology Adoption

Regulation	Description
Clean Vehicle Rebate Project (CVRP)	The CVRP provides rebates to California residents who purchase or lease eligible clean vehicles. The amount of the rebates offered by CVRP varies depending on the type of vehicle and its all-electric range, but they generally range from $1,500 to $7,000 for most eligible vehicles. The CVRP rebate can be combined with federal, state, or local agency incentives as well as administrator match funding, if available, to help further buy down an eligible vehicle's cost
Clean Cars 4 All	Clean Cars 4 All provides incentives to low-income individuals to retire their older, high-emitting vehicles and replace them with clean, electric or hybrid vehicles. The funding amount that applicants receive varies depending on the individual's income, the type of vehicle being purchased or leased, and other factors, but it generally ranges from $2,500 to $9,500 per participant.
California Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP)	HVIP is a point-of-sale incentive program that provides a voucher up to $120,000 for zero-emission trucks. At the time of writing this report, the program has supported the purchase of 2,400 natural gas and 1,800 battery-electric trucks since 2010 (redeemed vouchers), and over half of all voucher requests have come from disadvantaged communities seeking diesel particulate matter reductions.

Regulation	Description
California Energy Commission Clean Transportation Program	The program provides funding for a range of projects, including research and development, pilot projects, and infrastructure deployment. The amount of funding each applicant receives from the program varies depending on the specific project and the type of funding requested. Generally, applicants can receive funding for up to 100% of their project costs, although some funding programs require a cost share or matching funds from the applicant. The maximum award amount for some programs can be up to several million dollars, while others may provide smaller grants or loans. The specific funding amount for each project is determined through a competitive application process, with awards granted based on project feasibility, environmental benefits, and other factors.
Low Carbon Fuel Standard (LCFS)	The LCFS is a California regulation that creates a market mechanism that incentivizes low carbon fuels. The regulation requires the carbon intensity of California's transportation fuels to decrease by 20 percent through the 2030 timeframe and maintain the standard afterwards. The number of credits that a fleet generates is based on the amount of electricity used to charge and the carbon intensity of that electricity. Fleets that strategically use renewable electricity for charging, or purchase renewable energy certificates, can further increase their LCFS revenue streams. In addition to generating LCFS credit for dispensed fuel, the eligible hydrogen station or direct current fast charger can generate infrastructure credits based on the capacity of the station or charger minus the quantity of dispensed fuel. Currently stations intended for light duty vehicles (<1,200 kg/day for hydrogen stations and <350 kW per charger for charging stations) are eligible for the capacity credits. As more ZEVs use the station and the station utilization increases, the site will generate more LCFS fuel credits and fewer infrastructure credits.

Source: SCAG, 2023. Clean Technology Compendium. Available at: https://scag.ca.gov/sites/main/files/file-attachments/23-3130-clean-technology-compendium-sep-2023.pdf?1698687619

SCAG's Work Efforts

SCAG has a history of successful initiatives, collaborations, and achievements that align with the goals of the U.S. Department of Energy's Clean Cities Program. These efforts include:

- **Connect SoCal Regional Transportation Plan/Sustainable Communities Strategy:** Adopted by SCAG every four years, Connect SoCal encompasses a comprehensive set of planned transportation investments, policies, and strategies designed to meet Southern California's goals and performance requirements. Connect SoCal strategies aim to reduce greenhouse gas emissions, invest in clean technologies, and transition to a clean-energy economy.
- **Clean Technology Program:** Established after Connect SoCal 2020, the Clean Technology Program is dedicated to advancing efforts that underscore the importance of plug-in electric vehicles (PEVs) and other alternative fuel vehicles, along with the necessary infrastructure. These initiatives play a pivotal role in mitigating greenhouse gas emissions in the SCAG region, a priority highlighted in Connect SoCal 2024.
- **Southern California Clean Cities Coalition:** SCAG continues to lead with the Southern California Clean Cities Coalition as part of its cooperative agreement with the U.S. Department of Energy. These ongoing efforts contribute to the broader objectives of the national Clean Cities Coalition network.

SCAG's commitment to these initiatives underscores its dedication to promoting sustainable transportation, reducing emissions, and fostering clean technology adoption in the Southern California region. The descriptions of activities related to work efforts outlined in **Exhibit 2, SCAG's Guiding Metrics for the 2024-2025 Plan Cycle**, are provided below.

CONNECT SOCAL

Connect SoCal is a crucial long-range plan designed to shape the multi-modal transportation system in the SCAG region. SCAG is mandated by both federal and state law to prepare this regional transportation plan (RTP), which involves long-term forecasting (at least 20 years ahead) for the region's transportation needs. To secure federal and state funding for various transportation projects, including public transit, road infrastructure, and cycling and pedestrian enhancements, SCAG must adopt and regularly update its RTP every four years.

In 2008, California enacted the Sustainable Communities and Climate Protection Act, commonly known as Senate Bill 375 (SB 375). This legislation mandates metropolitan planning organizations (MPOs), such as SCAG, to incorporate a sustainable communities strategy (SCS) into their RTP updates. The SCS identifies policies and strategies for reducing per capita greenhouse gas (GHG) emissions from automobiles and light-duty trucks. Key elements of the SCS include specifying land use patterns, residential densities, transportation networks, housing, and farmland considerations, along with a forecasted development plan for the region. The goal is to align these elements with the Clean Air Act of 1970 to achieve GHG emission reduction targets set by the California Air Resources Board (CARB).

Connect SoCal 2020 was approved and adopted by SCAG's Regional Council on September 3, 2020. Connect SoCal 2020 provided a combination of transportation and land use strategies that outlined how the SCAG region would achieve the State's GHG reduction goals and federal Clean Air Act requirements. Connect SoCal 2020[86] acknowledged the integral role that technology will play in the solutions to the region's problems and included the following strategies related to leveraging technology innovations:

- Promote low emission technologies such as neighborhood electric vehicles, shared rides hailing, car sharing, bike sharing and scooters by providing supportive and safe infrastructure such as dedicated lanes, charging and parking/drop-off space.

[86] Connect SoCal 2020, SCAG. Available at: https://scag.ca.gov/read-plan-adopted-final-connect-socal-2020

- Improve access to services through technology—such as telework and telemedicine as well as other incentives such as a "mobility wallet," an app-based system for storing transit and other multi-modal payments.
- Identify ways to incorporate "micro-power grids" in communities, for example, solar energy, hydrogen fuel cell power storage and power generation.

Connect SoCal 2024 builds on the forward-thinking strategies of Connect SoCal 2020, acknowledging the transformative potential of emerging technologies and mobility innovations, particularly clean technology. These innovations enhance mobility, reduce emissions, generate new revenue streams for regional development, influence land use for improved quality of life, and support economic development, recovery, resilience planning, and equity goals.

Connect SoCal 2024[87] includes various strategies related to clean technology and transportation:

- Maintaining a robust Clean Technology Program that focuses on planning, research, evaluation, stakeholder support, and advocacy.
- Sharing information and offering technical assistance to local jurisdictions and operators for fleet upgrades and infrastructure deployment.
- Exploring the role of zero-emission vehicles in strengthening resilience through vehicle-to-grid technologies and other applications.
- Investigating opportunities for charging stations to serve multiunit dwellers without the same access as single-family homeowners.
- Facilitating the development of EV charging infrastructure through public-private partnerships.
- Assisting local jurisdictions in creating incentive programs to promote zero-emission passenger vehicles.
- Supporting the deployment of clean transit and technologies to reduce greenhouse gas emissions in line with the CARB Innovative Clean Technology (ICT) rule.

These strategies collectively advance the region's commitment to sustainable transportation and emissions reduction while fostering innovation and resilience.

Beyond the goals set forth by the U.S. Department of Energy for clean cities coalitions, SCAG has established distinct goals and strategies within Connect SoCal to reach state-mandated requirements to reduce regional vehicle miles traveled (VMT) and greenhouse gas (GHG) emissions. With the passage of SB 375, CARB set regional targets for GHG reductions for the years 2020 and 2035. By the year 2035 the SCAG region will have reduced emissions by 19.96 percent. Achieving the reduction in emissions is dependent on multiple actions, such as land use strategies, pricing/user fees, transit and shared mobility, active transportation, and other incentives.

In Connect SoCal 2024, SCAG outlines each goal that drives the strategies used to achieve the GHG emissions reduction target:[88]

- **Goal #1: Build and maintain a robust transportation network.** Beyond supporting the investments for maintenance and operation, achieving this goal will improve air quality and minimize GHG emissions. Additionally, promoting investments in complete streets allows for the implementation of curb space management strategies that increase new technologies, such as micro-mobility devices and optimize first/last mile connections to transit and last-mile connections for deliveries. Encouraging the development

[87] Draft Connect SoCal 2024 Plan, SCAG. Available at: https://scag.ca.gov/connect-socal-2024-read-draft-plan

[88] Draft Connect SoCal 2024 Plan, SCAG. Available at: https://scag.ca.gov/connect-socal-2024-read-draft-plan

of transportation projects that can provide affordable and safe alternatives to single-occupancy vehicle travel, such as by traveling via transit, will add to this strategy.

- **Goal #2: Develop, connect and sustain livable and thriving communities.** This goal sets out to communities centered around humans in all settings to increase mobility options and reduce travel distances. Strategies used to enact this goal are developing priority areas with existing urban infrastructure that will allow for multiple mobility options.
- **Goal #3: Create a healthy region for the people of today and tomorrow.** Developing resilient communities will allow for mitigation and adaptation of chronic and acute stresses, such as climate change. The focus on creating a healthier region by integrating the development pattern and transportation network allows for an improvement in air quality, reduction in GHG emissions and better conservation of the region's resources.
- **Goal #4: Support a sustainable, efficient and productive regional economic environment that provides opportunities for all people in the region.** Advance a resilient and efficient goods movement system that supports the economic vitality of the region, attainment of clean air and quality of life for our communities.

CLEAN TECHNOLOGY PROGRAM

SCAG's Clean Technology Program has been instrumental in promoting the significance of plug-in electric vehicles, other alternative fuel vehicles, and their necessary infrastructure. This effort is a critical strategy for reducing GHGs in the SCAG region, a key focus outlined in SCAG's Connect SoCal 2020 and Connect SoCal 2024. Although currently operating independently from the Southern California Clean Cities Coalition, SCAG aims to integrate these initiatives in its strategic plan, ensuring cohesive progress in both programs.

CLEAN TRANSPORTATION TECHNOLOGY POLICY

On April 6, 2023, SCAG's Regional Council passed Resolution No. 23-654-5, establishing SCAG's Clean Transportation Technology Policy. This policy creates a structured approach for SCAG to foster the growth, commercialization, and implementation of a transportation system that is either zero or near zero emission. Clean transportation technology encompasses vehicles with zero or near zero emissions, their necessary infrastructure, and other related products that minimize environmental impacts throughout their lifecycle, including production and disposal. The objective of this policy is to improve air quality, decrease GHG emissions, and fulfill sustainability objectives while maintaining a technology-neutral approach. SCAG's definition of technology neutrality refers to an impartial attitude toward specific technologies, focusing instead on any technology that contributes to achieving a zero-emission transportation system in line with federal and state standards.

ELECTRIC VEHICLE CHARGING STATION STUDY AND ASSOCIATED REGIONAL PLUG-IN ELECTRIC VEHICLE PLAN

SCAG's Electric Vehicle Charging Station Study (EVCSS) was completed in February 2023. For the study, SCAG partnered with 18 cities within the SCAG region to assist with promoting the development and deployment of electric vehicle (EV) charging infrastructure to accelerate transportation electrification. The study included tailored policy guidance to study partner cities; a regionwide Site Suitability Analysis to target areas for future EV charging infrastructure, focusing on increasing EV infrastructure in traditionally underserved and hard-to-reach communities including multi-unit dwellings and disadvantaged communities; EV site evaluations; and a Plug-In Electric Vehicle Infrastructure Plan that explains the need and tools available for cities to spur development of charging stations and support EV adoption across Southern California.[89]

[89] Southern California Electric Vehicle Charging Station Study, SCAG. Available at: https://scag.ca.gov/alternative-fuels-vehicles

PLUG-IN ELECTRIC VEHICLE READINESS ATLAS UPDATE

SCAG developed the "Southern California Plug-in Electric Vehicle Readiness Atlas" Atlas 2012, and most recently adopted the atlas in 2023. The atlas contains 198 pages of maps, charts, and data at the subregional and council of governments level that illustrate factors that influence demand for charging equipment at specific locations.[90] Information in the atlas assists planners with municipal reform by identifying where plug-in electric vehicles (PEVs) are currently owned and operated and where PEV adoption is likely to occur.[91]

CLEAN TECHNOLOGY COMPENDIUM

Resolution No. 23-654-5, which established SCAG's Clean Transportation Technology Policy, also mandated the creation of a "Clean Technology Compendium." This compendium supports the development of SCAG's Connect SoCal 2024 and offers an in-depth look at zero- and near-zero emission transportation technologies, including charging and fueling infrastructure and other supporting products. It covers a range of sectors such as passenger, medium- and heavy-duty vehicles, transit, and rail. The document highlights essential features, identifies knowledge gaps, and suggests strategies for the deployment of clean technologies in the region, serving as a key resource for both public and private sector entities during procurement and investment deliberations.

The compendium assists public agencies and local governments in formulating policies that encourage the adoption of these technologies. It provides stakeholders with information necessary for making decisions that align with sustainability objectives. While the compendium is comprehensive in terms of the overall technology landscape, it does not delve into the specifics of individual vendor technologies. Due to the diverse range of options available in the market, stakeholders are advised to conduct their own research on each vendor's unique offerings to ensure they meet their specific operational and logistical requirements.

ZERO EMISSION TRUCK INFRASTRUCTURE STUDY

In January 2023, SCAG began preparing a study to help envision a regional network of zero emission transportation infrastructure for battery electric and hydrogen fuel cell trucks. The resulting "Southern California Zero-Emission Truck Infrastructure Study" includes a phased blueprint and action plan toward realizing this goal and answering key questions about how stations in the region can operate to serve different truck markets and business functions. The study includes engagement with various stakeholders, including truck drivers, fleet operators and warehouse operators, developers, operators of terminals and intermodal facilities, and community organizations, and is guided by a technical advisory committee of key stakeholders instrumental in implementing zero-emission truck infrastructure.[92]

The study considers existing public and private sector plans from around the region and includes a truck market study to calculate the expected energy demand for charging and fueling stations. The study also details, to the extent possible, the quantity, distribution and characteristics of charging and fueling stations to help visualize and plan for infrastructure needs and investments. Study findings and products will also feed into the Electric Truck Research and Utilization Center (eTRUC) Project, funded by the California Energy Commission (CEC) Research Hub for Electric Technologies in Truck Applications Program and led by the Electric Power Research Institute.[93]

The study investigates where and how charging stations may be deployed to facilitate charging and fueling for different markets, to estimate market share and demand for different technologies, and to show how a combination

[90] Southern California Plug-In Electric Vehicle Atlas, SCAG. Available at: https://scag.ca.gov/southern-california-pev-readiness-atlas

[91] Southern California Plug-in Electric Vehicle Readiness Atlas: 2017 Update, SCAG. Available at: https://scag.ca.gov/sites/main/files/file-attachments/pev_atlas_2017_2.pdf?1620074492

[92] Southern California Zero Emission Truck Infrastructure Study, SCAG. Available at: https://scag.ca.gov/socalzeti

[93] Southern California Zero Emission Truck Infrastructure Study, SCAG. Available at: https://scag.ca.gov/socalzeti

of technologies can work together to support regional zero emission goals. Ten to 12 sites will be selected to provide a closer look at the needs of deploying an individual station and create high-level plans.[94]

LAST MILE FREIGHT PROGRAM

SCAG has partnered with the Mobile Source Air Pollution Reduction Review Committee (MSRC) to establish the Last Mile Freight Program (LFMP). The LMFP is a component of a larger goods movement emission reduction effort established by MSRC. Last mile freight activity is a critical component of supply chains for both consumers and intermediary businesses dealing with physical goods. E-commerce has had a profound impact on last mile delivery growth, and in 2020, the COVID-19 pandemic increased the frequency of deliveries, adding further stress to global supply chains, while air quality challenges continue to impact the public health of the region.[95] The LMFP serves as an initial step toward implementing freight-related clean vehicles/equipment and infrastructure to support cleaner air goals.[96]

SCAG has developed a two-phased approach for the LMFP:

- Phase 1: (Projects have been selected and are currently in implementation phase) Focusing on the commercial deployment of zero-emission or near-zero emission (ZE/NZE) heavy- and/or medium-duty on-road trucks (including ZE/NZE equipment and supporting infrastructure).
- Phase 2: Further expanding Phase 1 projects through coordination with both public and private sector stakeholders to deploy broader innovative technologies currently being demonstrated by leading last mile delivery companies, particularly in e-commerce use cases.

The LMFP aims to:

- Achieve immediate GHG emission and criteria air pollutant (for NOx and $PM_{2.5}$) reductions from commercially deployed vehicles/equipment and facilitate supporting infrastructure.
- Inform both industry and the public regarding ZE/NZE vehicle/equipment and supporting infrastructure performance, and how this information can be used to scale emission reductions to contribute to regional air quality goals;
- Provide private operators and the public with information on return on investment (ROI) and cost-effectiveness insights into ZE/NZE vehicle/equipment and infrastructure operations, maintenance, and reliability;
- Create greater transparency regarding the need for public versus private ZE/NZE supporting infrastructure;
- Inform the needs and/or help address the challenges to significantly scale ZE/NZE vehicles/equipment and infrastructure in the region; and
- Achieve geographic funding diversity and ensure that the LFMP provides economic and environmental benefits across the entire region.

Additionally, the LMFP is guided by the following core principles:[97]

- Creating transparency as to critical barriers impeding the transformation of the last mile freight market;

[94] Southern California Zero Emission Truck Infrastructure Study, SCAG. Available at: https://scag.ca.gov/socalzeti

[95] Last Mile Freight Program, SCAG. Available at: https://scag.ca.gov/last-mile-freight-program

[96] Last Mile Freight Program Fact Sheet, SCAG, Available at: https://scag.ca.gov/sites/main/files/file-attachments/2822_lastmilefreightprogram_2022_r1.pdf

[97] Last Mile Freight Program, SCAG. Available at: https://scag.ca.gov/last-mile-freight-program

- Measuring success for both public and private entities;
- Optimizing where investments can generate the strongest benefits for further growth; and
- Achieving air quality reduction targets.

PARTNERSHIP WITH THE UNIVERSITY OF CALIFORNIA, IRVINE (UCI) ON AUTOMATED INTERSECTION MONITORING FOR ELECTRIC VEHICLES

SCAG has partnered with The HORIBA Institute for Mobility and Connectivity (HIMaC) at UCI to research artificial intelligence (AI) and transportation energy efficiency in the city of Irvine. 25 traffic intersections in the city are being used to conduct research and create a public road network platform. At the Twenty-five intersections, researchers have installed light detection and ranging (LiDAR) sensors to better understand how AI can positively affect air quality, traffic, and safety.[98]

In addition to the 25 intersections, the project is using three fleets of vehicles operating in distinct modes (independent, driving, and shared-use driving) on public roadways to demonstrate the benefit of AI-powered sensors. Each vehicle receives messages from the infrastructure to act in a cooperative manner. The data collected will then be scaled up in simulation to evaluate how these tools and systems can perform at a county level.[99]

Through this research and piloting this technology, the team aims to develop a research testbed for cooperative driving automation through new AI transportation infrastructure tools, revealing important information to help the U.S. Department of Energy meet their goals related to mobility energy productivity and estimating how AI tools would work at different scales, demonstrating at least a 15 percent improvement in energy efficiency.[100]

PARTNERSHIP WITH THE LOS ANGELES CLEANTECH INCUBATOR ON TESTING AND EVALUATION OF CURB MANAGEMENT AND INTEGRATED STRATEGIES TO CATALYZE MARKET ADOPTION OF ELECTRIC VEHICLES

SCAG has partnered with Los Angeles Cleantech Incubator (LACI) to develop and validate open source curb management tools and approaches to increase total urban area dedicated to zero emission curb zones by 50 percent or more in three or more locations, with 25 percent or more located in disadvantaged communities and environmental justice areas, while increasing electric vehicle (EV) adoption by 5 percent or more, increasing mobility energy productivity by 10 percent or more, and increasing curb utilization by 5 percent or more when compared to the baseline as well as a blueprint of recommended technical, policy, behavioral incentive, and data-driven curb management strategies for cities and governments.

The project aims to accelerate adoption of zero-emission transportation, improve public health outcomes for communities, and provide more efficient transportation and energy systems that benefit residents and businesses as well as delivery operations at the curb by:

[98] AI-Based Intersection Monitoring Listening Session Hosted By SCAG And University Of California – Irvine, SCAG. Available at: https://scag.ca.gov/alternative-fuels-vehicles

[99] AI-Based Intersection Monitoring Listening Session Hosted By SCAG And University Of California – Irvine, SCAG. Available at: https://scag.ca.gov/alternative-fuels-vehicles

[100] AI-Based Intersection Monitoring Listening Session Hosted By SCAG And University Of California – Irvine, SCAG. Available at: https://scag.ca.gov/alternative-fuels-vehicles

- Increasing EV utilization of the curb;
- Increasing mobility energy productivity from curb use efficiency (number of people and goods per unit of consumption);
- Reducing GHG emissions and air pollutants; and
- Supporting socio-economic outcomes, including more equitable access to the curb and EVs and deployments in underserved communities.

SCAG's specific roles in this project include supporting the project's equity goals and engaging public interest groups, environmental justice advocates, and community-based organizations to participate in the project's equity and communications committee; leveraging connections made through related SCAG projects and engaging relevant delivery companies, transportation network companies, and other key business stakeholders; and utilizing the Southern California Clean Cities Coalition as a forum to share highlights and exchange learnings throughout the project.

Ongoing Work Efforts for the Southern California Clean Cities Coalition

Clean cities coalitions sign annual cooperative agreements, referred to as the Statement of Project Objectives (SOPO). The SOPO outlines tasks that coalition members will be responsible for over the following year that will contribute to the objectives of the national Clean Cities Coalition network. Below is a summary of key project objectives and some notable achievements:

KEY PROJECT OBJECTIVES

ANNUAL PROGRESS REPORT

The Southern California Clean Cities Coalition's activities and accomplishments from the previous year are described in detail in an annual progress report. This information is submitted online through a reporting tool managed by the National Renewable Energy Laboratory (NREL). The coalition provides organizational data, such as membership, funding, projects, activities (outreach events and trainings), and the number of individuals reached, particularly underserved groups. Voluntary data about the volume of alternative fuels used, the number of alternative fuel vehicles including EVs and hybrid EVs, idle reduction initiatives, fuel economy improvements, and programs to reduce vehicle miles traveled is also collected from stakeholders for inclusion in the annual report. [101]

The report acts as an important indicator of the coalition's impact and allows the coalition and its stakeholders to track progress over time. NREL compiles this annual report with those of the other clean cities coalitions to analyze national impacts and determine how energy use in the United States has shifted because of the activities of the Clean Cities network. *[102]*

ALTERNATIVE FUEL PRICE TRACKING AND REPORTING

The Southern California Clean Cities Coalition assists the U.S. Department of Energy (U.S. DOE) with tracking retail alternative fuel pricing information fuel in the coalition's region every quarter. This process includes contacting stations within the region via phone call or email to verify the current price of fuels offered. The U.S. DOE requires that at least five prices are submitted for each alternative fuel. Once complete, the report prices are updated within the online reporting system specified by the U.S. DOE.

ALTERNATIVE FUELING STATION REPORT

The Southern California Clean Cities Coalition assists the U.S. DOE annually with updating the list of alternative fueling stations in the Alternative Fuels Data Center (AFDC) fueling stations database. The coalition focuses on existing stations within its region. Stations are verified via phone call, email, or online research and submitted to the online reporting system specified by the U.S. DOE.

VEHICLE AND STATION COST TRACKING AND REPORTING

The Southern California Clean Cities Coalition assists the DOE annually with collecting cost information for alternative fuel vehicles (propane, compressed natural gas, electric vehicle, plug-in hybrid electric vehicle, hydrogen) and stations

[101] Clean Cities: A Model of Collaborative Technology Innovation Built Over 30 Years, NREL. Available at: https://cleancities.energy.gov/publications/

[102] Clean Cities: A Model of Collaborative Technology Innovation Built Over 30 Years, NREL. Available at: https://cleancities.energy.gov/publications/

(propane, compressed natural gas, electric, and hydrogen) to include in the vehicle and station cost reporting tool. The U.S. DOE requires that a minimum of one data point is provided.

PEER-TO-PEER INFORMATION SHARING

The Southern California Clean Cities Coalition participates in peer-to-peer sharing at monthly California Clean Cities Coalition regional calls, national clean cities meetings, and at other official clean cities workshops and trainings.

COALITION BUILDING AND STAKEHOLDER ENGAGEMENT

The Southern California Clean Cities Coalition continues to strengthen and grow by retaining and engaging stakeholders, attracting new stakeholders, and establishing strategic partnerships. Coalition activities include holding stakeholder meetings; maintaining a coalition website; conducting targeted outreach; providing services to stakeholders, potential stakeholders, end-users, and potential end-users; and providing services to entities in undesignated areas outside of the coalition's current territory.

ACHIEVEMENTS

The Southern California Clean Cities Coalition, a dynamic collaboration of cities, consumers, vendors, public agencies, transit providers, and universities, is a champion of eco-friendly transportation initiatives. This coalition has not only fostered partnerships with local transportation agencies and private sector projects, but has also played a pivotal role in securing funding for alternative fuel vehicle and electric vehicle infrastructure programs in the region. Key accomplishments are as follows:

- Foothill Transit was granted $7,942,200 to facilitate the acquisition of zero-emission buses, aimed at replacing older models that were no longer efficient. This significant investment has led to enhanced air quality for the residents of the San Gabriel and Pomona valleys in Los Angeles County. Additionally, this initiative has ensured continued service reliability and maintained the transit system in good operational condition. [103]
- The Riverside Transit Agency (RTA) received a grant of $8,787,846 to establish hydrogen filling stations at its Riverside and Hemet divisions, along with funding for training its maintenance personnel. This strategic investment supports the RTA's transition to an electric bus fleet powered by hydrogen fuel cells, significantly contributing to its climate objectives and enhancing air quality in the region. [104]
- The city of Norwalk, through its Norwalk Transit System, was awarded $3,530,822 to acquire zero-emission, battery electric buses. This grant also supports the replacement of older buses that have surpassed their service life, along with the development of the necessary charging infrastructure. This initiative plays a crucial role in enhancing air quality, ensuring service reliability, and keeping the transit system well-maintained and in excellent operational condition. [105]
- The city of Cerritos received a substantial grant of $4,378,140, allocated for the procurement of electric buses. This funding enables the city to phase out older, inefficient buses, thereby bolstering its commitment to environmental sustainability. The project significantly enhances air quality, particularly through the city's fixed-route transit program, "Cerritos on Wheels." This nine-mile network connects residential neighborhoods with important regional destinations such as workplaces, schools, and healthcare facilities.

[103] Fiscal Year 2021 Buses and Bus Facilities Projects, FTA. Available at: https://www.transit.dot.gov/funding/grants/fiscal-year-2021-buses-and-bus-facilities-projects

[104] Fiscal Year 2021 Buses and Bus Facilities Projects, FTA. Available at: https://www.transit.dot.gov/funding/grants/fiscal-year-2021-buses-and-bus-facilities-projects

[105] Fiscal Year 2021 Buses and Bus Facilities Projects, FTA. Available at: https://www.transit.dot.gov/funding/grants/fiscal-year-2021-buses-and-bus-facilities-projects

The introduction of electric buses into this network marks a progressive step in promoting cleaner, greener urban transportation.[106]

- SCAG successfully assisted Zeco Systems Inc, operating as Greenlots, in securing a $2,000,000 grant from the California Energy Commission. This funding was for a collaborative project focused on expanding charging access to support reliable, on-demand transportation services. A key aspect of this project was the installation of direct current fast-charging stations at various strategic points throughout the Los Angeles area. The primary objective is to encourage the adoption of electric vehicles (EVs) within the transportation network company industry, while also benefiting disadvantaged communities through the provision of essential charging infrastructure and reducing reliance on gasoline vehicles. The implementation of this initiative plays a crucial role in aiding California's efforts to meet its emission reduction targets and enhances the availability of EV charging facilities in the Los Angeles region. [107]

[106] Fiscal Year 2021 Buses and Bus Facilities Projects, FTA. Available at: https://www.transit.dot.gov/funding/grants/fiscal-year-2021-buses-and-bus-facilities-projects

[107] Notice of Proposed Awards- Clean Transportation Program, CEC. Available at: https://www.energy.ca.gov/sites/default/files/2022-02/GFO-21-601_NOPA_Cover_Letter_2022-02-14_ADA.pdf

Conclusion

SCAG's efforts to transform Southern California's transportation system are holistic and multi-dimensional. The organization focuses on enhancing infrastructure to accommodate alternative fuel and advanced technology vehicles, driving widespread adoption of clean transportation technologies and advocating for supportive policies and regulations. Integral to this strategy is community engagement, aimed at increasing awareness and fostering partnerships for a collective movement towards sustainable practices.

SCAG's commitment to transparency and innovation is highlighted by collaboration with a diverse range of stakeholders and strategic efforts to identify and address barriers. These initiatives are pivotal in shaping a sustainable and environmentally friendly transportation future for the region.

As part of the regular maintenance of the Strategic Plan, SCAG will continue to coordinate with the other Clean Cities Coalitions within the six-county SCAG region to help ensure the Plan strategies are complementary and mutually supportive of their efforts. SCAG will also continue to refine its methodology for calculating the performance metrics. Additionally, SCAG will continue to advance its Connect SoCal implementation strategies and Clean Technology Program in alignment with both state and federal requirements pertaining to GHG reduction. In addition to the SB 375 per capita GHG reduction targets established for the SCAG region by the California Air Resources Board, and the DOE GHG targets established for the Clean Cities Coalition, the FHWA has issued a GHG performance measure final rule, effective January 8, 2024, that requires MPOs such as SCAG to establish four-year GHG emissions reductions targets and report on progress toward the achievement of those targets.[108]

Looking forward, SCAG's alignment with the U.S. Department of Energy's Clean Cities Program helps shape its future clean transportation initiatives. SCAG plans to pursue initiatives that advance AFV adoption and infrastructure development within the region, with a strong focus on technology neutrality. These initiatives will assist SCAG with meeting the Clean Cities Coalition targets of a 16 percent increase in gasoline gallon equivalent (GGE) displaced and a 20 percent yearly reduction in greenhouse gas (GHG) emissions.

SCAG's dedication to innovation, inclusivity, and environmental stewardship positions it as a key regional leader in promoting sustainable transportation solutions. The commitment to cleaner technologies, evident in both current projects and proactive future endeavors, signals a move toward a more sustainable future for Southern California.

[108] GHG Performance Measure, FHWA. Available at: https://www.fhwa.dot.gov/environment/ghg_measure/

GLOSSARY

AB 32 – Assembly Bill 32 – Signed into law on September 26, 2006, it requires the state's global warming emissions be reduced to 1990 levels by 2020. This reduction will be accomplished through an enforceable, statewide cap on global warming emissions that will be phased in starting in 2012, in addition to other measures. To effectively implement the cap, AB 32 directs the California Air Resources Board (CARB) to develop appropriate regulations and establish a mandatory reporting system to track and monitor global warming–emissions levels. Please also see "CARB – California Air Resource Board."

AB 617 – Assembly Bill 617 – In 2017, California Governor Jerry Brown signed Assembly Bill 617 (C. Garcia, Chapter 136, Statutes of 2017) to develop a new, community-focused program that could more effectively reduce exposure to air pollution and preserve public health. AB 617 is a companion bill to AB 398, which extends California's Cap-and-Trade program for greenhouse gas emissions. The most significant criteria and toxic air-quality legislation passed in California in the last three decades, AB 617 directs the California Air Resources Board (CARB) and all local air districts throughout California to take measures to protect communities disproportionally impacted by air pollution.

- There are five central components to the AB 617 mandate:
- Community-level air monitoring
- A state strategy and community-specific emission-reduction plans
- Accelerated review of retrofit pollution control technologies on industrial facilities subject to cap-and-trade
- Enhanced emission-reporting requirements
- Increased penalty provisions for polluters CARB may also direct additional grant funding to communities determined to have the highest air-pollution burden.

Active Transportation – A mode of transportation that includes human-powered transportation and low-speed electronic assist devices. Examples include, but are not limited to, walking (includes any person walking, skateboarding and using a wheelchair or other personal mobility device) or use of a bicycle, electric bicycle (e-bike), tricycle, scooter, skates, push scooter, trailer or hand cart.

AFV – Alternative Fuel Vehicles – A dedicated, flexible fuel, or dual-fuel vehicle designed to operate on at least one alternative fuel.

AQMP – Air Quality Management Plan – Regional plan for air-quality improvement in compliance with federal and state air-quality-planning requirements, including attaining applicable federal and state ambient air-quality standards.

Automated Vehicle – The U.S. Department of Transportation's National Highway Traffic Safety Administration (NHTSA) has defined five increasing levels of vehicle automation:

- Level 0 – No-Automation: The driver is in complete and sole control and performs all driving tasks.
- Level 1 – Driver Assistance: The vehicle is controlled by the driver, but some driving assist features may be included in the vehicle design.
- Level 2 – Partial Automation: The vehicle has combined automated functions, such as acceleration and steering, but the driver must remain engaged with the driving task and monitor the operating environment at all times.
- Level 3 – Conditional Automation: The driver is a necessity but is able to cede the performance of driving tasks to the vehicle. However, the driver must be ready to take control of the vehicle at all times.
- Level 4 – High Automation: The vehicle is capable of performing all driving functions under certain conditions and within certain operating environments. The driver may or may not have the ability to control the vehicle.

- Level 5 – Full Automation: The vehicle is capable of performing all driving functions under all conditions. The driver may or may not have the ability to control the vehicle.

Base Year – The year that is used in the RTP/SCS performance analysis as a reference point for current conditions. For Connect SoCal 2024, the base year is 2019.

Baseline – Defined in the U.S. Environmental Protection Agency's Transportation Conformity Regulations, the Baseline is the future transportation system that will result from current programs, including the following (except that exempt projects listed in Section 93.126 and projects exempt from regional emissions analysis as listed in Section 93.127 need not be explicitly considered):

- All in-place regionally significant highway and transit facilities, services and activities
- All ongoing travel demand management or transportation system management activities
- Completion of all regionally significant projects, regardless of funding source, which are currently under construction or are undergoing right-of-way acquisition (except for hardship acquisition and protective buying); come from the first year of the previously conforming transportation plan and/or TIP; or have completed the NEPA process

For Connect SoCal 2024, the baseline represents the projected future (2050) regional transportation system that will result from the continuation of current programs, including projects currently under construction or undergoing right-of-way acquisition, those transportation plans and projects programmed and committed to in the 2023 Federal Transportation Improvement Program (FTIP), and/ or transportation projects that have already received environmental clearance.

BEV – Battery Electric Vehicle – An electric-drive vehicle powertrain that is powered by an onboard battery. A BEV is a sub-class of a Plug-in Electric Vehicle (PEV).

Bus – A transit mode comprised of rubber-tired passenger vehicles operating on fixed routes and schedules over roadways.

CAA – Federal Clean Air Act – The federal law that authorized the U.S. EPA to establish national ambient air quality standards (NAAQS) to limit levels of pollutants in the air. The EPA has promulgated NAAQS for six criteria pollutants: sulfur dioxide (SO2), nitrogen dioxide (NO2), carbon monoxide (CO), ozone, lead and particulate matter (PM10). All areas of the United States must maintain ambient levels of these pollutants below the ceilings established by the NAAQS. Any area that does not meet these standards is a "nonattainment" area. States must develop State Implementation Plans (SIPs) to explain how they will comply with the CAA.

The last major change in the law, the Clean Air Act Amendments of 1990, was enacted by Congress in 1990. Legislation passed since then has made several minor changes. The Clean Air Act, like other laws enacted by Congress, was incorporated into the United States Code as Title 42, Chapter 85. The House of Representatives maintains a current version of the U.S. Code, which includes Clean Air Act changes enacted since 1990.

Caltrans – California Department of Transportation – State agency responsible for the design, construction, maintenance and operation of the California State Highway System, as well as portions of the Interstate Highway System within the state's boundaries.

Cap-and-Trade – A market-based regulation that is designed to reduce greenhouse gases (GHGs) from multiple sources. Cap-and-Trade sets a firm limit, or cap, on GHGs and minimizes the compliance costs of achieving California's AB 32 goals. The cap will decline approximately 3 percent each year beginning in 2013. Trading creates incentives to reduce GHGs below allowable levels through investments in clean technologies. With a carbon market, a price on carbon is established for GHGs. Market forces spur technological innovation and investments in clean energy.

CARB – California Air Resources Board – California state agency responsible for attaining and maintaining healthy air quality through setting and enforcing emissions standards, conducting research, monitoring air quality, providing education and outreach, and overseeing/assisting local air-quality districts within California. The CARB is also

responsible for implementing AB 32 and establishing regional greenhouse gas emission reduction targets for automobile and light trucks under SB 375. CARB is a part of the California Environmental Protection Agency, an organization that reports directly to the Governor's Office in the executive branch of the State of California.

Carbon Sequestration – The ability of natural elements, such as forests, soils and oceans to store carbon instead of releasing it into the atmosphere, preventing GHG emissions.

CBO – Community-Based Organization – Public or private nonprofit group that works at a local level to address community needs.

Clean Transportation Technologies – These include zero- and near-zero-emission vehicles, their supporting infrastructure and other facilitating products that reduce environmental impacts over their full life cycle, including upstream production and end-of-life.

Climate Change Mitigation – Consists of actions to limit the magnitude of climate change and its related effects. Mitigation addresses the cause of climate change.

CO – Carbon Monoxide – A colorless, odorless, poisonous gas formed when carbon in fuels is not burned completely and can be harmful when inhaled in large amounts. The greatest sources of CO to outdoor air are cars, trucks and other vehicles or machinery that burn fossil fuels. A variety of items in your home, such as unvented kerosene and gas space heaters, leaking chimneys and furnaces, and gas stoves also release CO and can affect air quality indoors. CO is one of six "criteria air pollutants" for which the U.S. EPA sets national standards pursuant to CAA.

COG – Council of Governments – Under state law, a single or multicounty council created by a joint powers agreement.

Complete Streets – Streets designed and operated to support the safety, comfort and mobility of all road users. They provide for people of all ages and abilities, regardless of whether they are driving, walking, bicycling, rolling or riding transit/rail. Complete Streets approaches vary based on community context, but elements often include comfortable sidewalks, bicycle lanes, transit priority lanes and signals, high-quality transit stops, frequent and safe crosswalks, median islands, accessible signals, curb extensions, modified vehicle travel lanes, and streetscape and landscape treatments.

Connected/Automated Vehicles – Refers to the interrelated nature of connectivity and automation in new vehicle technology. Connected vehicles may use any number of different communication technologies to communicate with the driver, other cars on the road (vehicle-to-vehicle [V2V]), roadside infrastructure (vehicle-to-infrastructure [V2I]) and the "cloud" to improve safety, user experience and collision avoidance. Please also see "automated vehicles."

Corridor – In planning, a broad geographical band that follows a general directional flow or connects major sources of trips. It may contain a number of streets and highways, as well as transit lines and routes.

EPA or U.S. EPA – The United States Environmental Protection Agency – Federal agency established to develop and enforce regulations that implement environmental laws enacted by Congress to protect human health and safeguard the natural environment.

EV – Electric Vehicle – A vehicle fully or partially powered by an electric engine. In common use, it is synonymous with Plug-In Electric Vehicle (PEV); however, hydrogen-fuel-cell vehicles are also electric vehicles.

EV Charging Station – A location where a vehicle can be parked and the electric storage or battery can be recharged. EV charging stations can be private or publicly accessible and can be free to the user or used for a fee.

FCV – Fuel Cell Vehicle – Electric vehicles that are powered by hydrogen fuel cells.

FHWA – Federal Highway Administration – Federal agency responsible for administering the Federal-Aid Highway Program, which provides federal financial assistance to the states to construct and improve the National Highway System, urban and rural roads, and bridges.

First-Last Mile – Strategies designed to increase transit/rail usage by making it more convenient and safer to walk, bicycle or roll to and from transit/rail stations. Strategies include wayfinding, bikeways, station amenities, new crosswalks, sidewalk improvements, shared mobility services and bike sharing.

FTA – Federal Transit Administration – The federal agency responsible for administering federal transit funds and assisting in the planning and establishment of area-wide urban mass-transportation systems. As opposed to FHWA funding, most FTA funds are allocated directly to local agencies rather than to Caltrans.

FY – Fiscal Year – The 12-month period on which the budget is based and planned. The state fiscal year begins July 1 and ends June 30 of the following year. The federal fiscal year begins October 1 and ends September 30 of the following year.

GHG – Greenhouse Gas – Components of the atmosphere that contribute to the greenhouse effect. The principal greenhouse gases that enter the atmosphere because of human activities are carbon dioxide, methane, nitrous oxide and fluorinated gases.

HDT – Heavy-Duty Truck – Truck with a gross vehicle weight of 8,500 pounds or more.

HEV – Hybrid Electric Vehicle – Vehicles that are powered by an internal combustion engine in combination with one or more electric motors that use energy stored in batteries.

HUD – U.S. Department of Housing and Urban Development – Federal agency charged with increasing homeownership, supporting community development, and increasing access to affordable housing free from discrimination.

ICE – Internal Combustion Engine – Refers to traditional vehicle engines that are powered by the burning of fuel sources, including gasoline, diesel and natural gas.

IIJA – The Infrastructure Investment and Jobs Act – Also referred to as the Bipartisan Infrastructure Law, is a federal transportation authorization package, signed into law in November 2021, that provides $550 billion over fiscal years 2022 through 2026 in new federal investment in infrastructure, including roads, bridges, transit, water infrastructure, resilience and broadband.

Infrastructure – The basic facilities, equipment, services and installations needed for the growth and functioning of a community. This may refer to transportation infrastructure, such as rail stations or roadways, as well as other civic infrastructure, such as electrical and water systems.

JPA – Joint Powers Authority – Two or more agencies that enter into a cooperative agreement to jointly wield powers that are common to them. JPAs are a vehicle for the cooperative use of existing governmental powers to finance and provide infrastructure and/or services in a cost-efficient manner.

LACMTA – Los Angeles County Metropolitan Transportation Authority, also referred to as "Metro" – Agency responsible for planning and funding countywide transportation improvements, administering the county's transportation sales-tax revenues, and operating bus and rail transit service.

MDAB – Mojave Desert Air Basin – Area defined by state law as comprising the desert portions of Los Angeles, Kern, Riverside and San Bernardino Counties.

Metrolink – Regional commuter rail system connecting Los Angeles, Orange, Riverside, San Bernardino and Ventura Counties and operated by the Southern California Regional Rail Authority (SCRRA).

Micromobility – Personal vehicles that typically are designed to carry one passenger. Devices include, but are not limited to, bicycles, electronic bicycles (e-bikes) and electronic scooters (e-scooters). Micromobility is often linked to bike and scooter sharing.

Mode – A particular form of travel (e.g., walking, traveling by automobile, traveling by bus, or traveling by train).

MPO – Metropolitan Planning Organization – A federally required planning body responsible for transportation planning and project selection in a region.

Multimodal – A mixture of several modes of transportation, such as transit, highways, non-motorized, etc.

NAAQS – National Ambient Air Quality Standards – The federal Clean Air Act requires the U.S. EPA sets National Ambient Air Quality Standards (NAAQS) for six criteria air pollutants. These common air pollutants can harm human health and the environment and cause property damage. Please see "CAA-Federal Clean Air Act" for more information on NAAQS.

NGV – Natural Gas Vehicle – Vehicles that are powered by internal combustion engines that burn compressed or liquid natural gas.

NOx – Nitrogen oxides – A group of highly reactive gases, all of which contain nitrogen and oxygen in varying amounts. NOx is a major component of ozone and smog. NOx also can be a major component of particle air pollution.

PEV – Plug-in Electric Vehicle – Refers to all vehicles that can be plugged into an external source of electricity in order to recharge an onboard battery that provides some or all power to an electric engine.

PHEV – Plug-in Hybrid Electric Vehicle – A vehicle powertrain that combines an electric engine with a traditional, internal combustion engine. The two engines can operate in parallel with the electric engine operating at certain speeds, or the engines can operate sequentially, with all power being provided by the electric engine until the battery power is exhausted.

PM10 – Particulate matter with diameters that are generally 10 micrometers and smaller – A mixture of inhalable solid particles and liquid droplets found in the air that are 10 micrometers or less in size. (A micrometer is one-millionth of a meter. The average human hair is about 70 micrometers in diameter.) These coarse particles are generally emitted from sources such as vehicles traveling on unpaved roads, materials handling, crushing and grinding operations, and windblown dust.

PM2.5 – Particulate matter with diameters that are generally 2.5 micrometers and smaller – A mixture of fine, inhalable solid particles and liquid droplets found in the air that are 2.5 micrometers or less in size. (A micrometer is one-millionth of a meter. The average human hair is about 70 micrometers in diameter.) These fine particles result from fuel combustion in motor vehicles, power generation and industrial facilities, as well as from residential fireplaces and wood stoves.

RC – Regional Council – Conducts the affairs of SCAG; implements the General Assembly's policy decisions; acts upon policy recommendations from SCAG policy committees and external agencies; appoints committees to study specific problems; and amends, decreases or increases the proposed budget to be reported to the General Assembly.

Resilience – The capacity of the SCAG region's built, social, economic and natural systems to anticipate and effectively respond to changing conditions, acute shocks and chronic stressors by creating multiple opportunities for a sustainable, thriving and equitable future.

RTP – Regional Transportation Plan – A federally required, 20-year plan prepared by metropolitan planning organizations and updated every four years. Includes projections of population growth and travel demand, along with a specific list of proposed projects to be funded.

SB 375 – Senate Bill 375 (Chapter 728, Steinberg) – Established to implement the state's greenhouse gas (GHG) emission-reduction goals, as set forth by AB 32, in the sector of cars and light trucks. This mandate requires the

California Air Resources Board to determine per-capita, GHG emission-reduction targets for each metropolitan planning organization (MPO) in the state at two points: 2020 and 2035. In turn, each MPO must prepare a Sustainable Communities Strategy (SCS) that demonstrates how the region will meet its GHG emission-reduction target through integrated land use, housing and transportation planning.

SBCTA – San Bernardino County Transportation Authority – The council of governments and transportation planning agency for San Bernardino County. SBCTA is responsible for cooperative regional planning and developing an efficient, countrywide multimodal transportation system.

SCAB – South Coast Air Basin – Comprises the non–Antelope Valley portion of Los Angeles County, Orange County, western Riverside County and the non-desert portion of San Bernardino County.

SCAG – Southern California Association of Governments – The metropolitan planning organization (MPO) for six counties including Imperial, Los Angeles, Orange, Riverside, San Bernardino and Ventura.

SCAQMD – South Coast Air Management District – The air-pollution control agency for all of Orange County and the urbanized portions of Los Angeles, Riverside and San Bernardino Counties in Southern California. This area of 10,743 square miles is home to more than 17 million people—about half the population of the whole state of California. It is the second-most populated urban area in the United States and one of the smoggiest. South Coast AQMD is responsible for controlling emissions, primarily from stationary sources of air pollution within its jurisdiction. These can include anything from large power plants and refineries to the corner gas station.

SCCAB – South Central Coast Air Basin – Comprises San Luis Obispo, Santa Barbara and Ventura counties.

SCS – Sustainability Communities Strategy – As part of SB 375, which was established to implement the state's greenhouse gas (GHG) emission reduction goals as set forth by AB 32, each California metropolitan planning organization (MPO) is required to prepare a SCS as part of their regional transportation plan. The mandate requires the California Air Resources Board to determine per capita GHG emission-reduction targets for each MPO in the state at two points: 2020 and 2035. In turn, each MPO must prepare an SCS that demonstrates how the region will meet its GHG through integrated land use, housing and transportation planning.

SIP – State Implementation Plan – Comprehensive state plan that describes how an area will attain national, ambient air-quality standards. The federal Clean Air Act requires that transportation activities, including regional transportation plans, programs and projects conform to, or are consistent with the purpose of the applicable SIP.

SOV – Single-Occupant Vehicle – Privately operated vehicle that contains only one driver or occupant.

SOx – Sulfur oxide – Any of several compounds of sulfur and oxygen formed from burning fuels, such as coal and oil.

SSAB – Salton Sea Air Basin – Comprises the Coachella Valley portion of Riverside County and all of Imperial County.

Sustainability – The practice of analyzing and accounting for the impact of decisions, policies, strategies and development projects on the Economy, the Environment and Social Equity (commonly referred to as the three E's). In the 2017 SCAG Strategic Plan, SCAG adopted the following objective: "Cultivate dynamic knowledge of the major challenges and opportunities relevant to sustainability and quality of life in the region."

Technology Neutrality – A stance that does not give preference to a particular technology, as long as it furthers the desired outcome of a zero-emission transportation system that meets or exceeds federal and state targets.

Urban Areas – Urban Areas in the SCAG region represent densely developed territory and encompass residential, commercial and other nonresidential urban land uses where population is concentrated over 2,500 people in a given locale.

U.S. DOT – U.S. Department of Transportation – Federal agency responsible for the development of transportation policies and programs that contribute to providing fast, safe, efficient and convenient transportation at the lowest cost consistent with those and other national objectives—including the efficient use and conservation of the resources of the United States. US DOT is comprised of 10 operating administrations, including FHWA, FTA, FAA and FRA.

VMT – Vehicle Miles Traveled – On roadways, a measurement of the total miles traveled by all vehicles in the area for a specified time period. It is calculated by the number of vehicles times the miles traveled in a given area or on a given roadway during the time period. In transit, it is the number of vehicle miles operated on a given route or line or network during a specified time period.

ZEV – Zero Emissions Vehicles – Vehicles that produce no tailpipe emissions of criteria pollutants. Generally, ZEVs feature electric powertrains. Technically, ZEVs are still responsible for some greenhouse gas emissions, as the GHG content from the electricity generation must be accounted for. ZEVs include battery electric vehicles (BEV), plugin electric hybrids (PHEV) when powered by the electric engine and hydrogen fuel cell vehicles (FCV).

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