

Appendix C - Focus Group Working Papers

Transportation Working Paper (Vehicles/Equipment, Fuels, Land Use and Housing, and Infrastructure)

The transportation system—which includes vehicles/equipment, transportation fuels, infrastructure, housing and other land use location decisions—is the largest contributor to GHG emissions, with transportation sector tailpipe emissions accounting for about 38 percent of emissions, and is the primary source of smog forming and toxic air pollution in the State. The Global Warming Solutions Act (Assembly Bill (AB) 32, Nunez, Chapter 488, Statutes of 2006) requires California to reduce GHG emissions to 1990 levels by 2020, and to maintain and continue reductions beyond 2020. Governor Brown reaffirmed California’s commitment to reduce GHG emissions 80 percent from 1990 levels by 2050 (Executive Order S-03-05) in Executive Order B-16-2012 by establishing a parallel transportation sector target.

This document aims to define the steps toward meeting the 2050 goal, focusing on concrete actions and the subsequent policy priorities for State agencies to take over the next five-year period and is organized into the following sections: Vision (a view to where we need to go), Progress to Date (today’s policy portfolio); System Outlook (in three strategic areas); and Recommended Priorities (explicit policy actions for the next five years).

I. **A Vision for the Future Landscape**

Achieving the 2050 goal will require a fundamental, holistic transformation of the transportation system—in how communities develop and expand, how people travel, how freight is moved, and what fuels are used—requiring significant innovation and, of all the GHG emission sources, will most directly affect the daily lives of Californians.

- For California communities and passenger transportation, this means: development of sustainable communities with a range of mobility choices including easy and equitable access to public transit, active transportation (including walking and biking), and other alternative modes of transportation; improved public transit and rail service utilizing zero and near-zero emission technologies; transportation connectivity among vehicles and between vehicles and infrastructure; optimized operating performance of existing infrastructure; a shift in new investments from road expansion towards “fix it first”; and a vehicle fleet composed of mainly zero emission vehicles powered by clean electricity and hydrogen. The priority of sustainable communities means a focus on integrated, comprehensive outcomes (including public health, economic, environmental, and social equity) beyond consideration of just GHG emissions. ARB’s Advanced Clean Cars Program and the Sustainable Communities and Climate Protection Act of 2008 (Senate Bill (SB) 375) chart the course for starting this transformation in vehicle technology and land use. Major investments, such as high-speed rail beginning in the Central Valley, serve not only as a new, zero-emission means of interregional travel where none currently exists, but also as a catalyst for the type

Appendix C - Focus Group Working Papers

of land use and development where transit connectivity, walking, and bicycling thrive.

- For freight transportation, this means: moving goods more efficiently and with zero or near-zero emissions; providing acceptable velocity and expanded system capacity; and optimizing movement of freight between modes, while integrating with the national and international freight transportation system. This will include lower-carbon fuels during the transition to a zero emissions freight network. The transformation will have important benefits for keeping California's ports, railroads, airports, and logistics industry competitive; improving the delivery of California's products to other states and countries; creating jobs in California and training local workers to support the new freight transport system; and improving air quality and health in California's impacted communities.
- These changes in passenger and freight transportation will require a corresponding transformation of the energy supply sectors (fuels and electricity). In order to transition to sustainable energy for transportation, the most recent Global Energy Assessment states that "without question a radical transformation of the present energy system will be required."¹ Ultimately, achieving our goals will require widespread use of low-carbon electricity and hydrogen as transportation fuels for battery electric and fuel cell vehicles, and low-carbon, renewable fuels where internal combustion engines cannot feasibly be replaced.

Designing and implementing measures to support sustainable communities and a transition to a sustainable transportation sector will require significant public and private investment, sustained financial and non-financial incentives, and strong partnerships and coordination at the local, regional, State, and national levels.

Co-Benefits of Change

The need to reduce GHG emissions is only one of the factors driving this transition. Considerable emission reductions are also needed to achieve the health-based federal ozone standard by 2032. ARB's 2012 *Vision for Clean Air: A Framework for Air Quality and Climate Planning*² study showed that meeting the air quality standards and climate change goals require similar and complementary strategies focusing on many of the same emission sources particularly within the transportation sector. The air quality standard attainment deadline for ozone will be a principle driver for the timing of these emission reductions.

¹ GEA, 2012: *Global Energy Assessment - Toward a Sustainable Future*, Cambridge University Press, Cambridge, UK and New York, NY, USA and the International Institute for Applied Systems Analysis, Laxenburg, Austria.

² ARB's 2012 *Vision for Clean Air: A Framework for Air Quality and Climate Planning* can be found at <http://www.arb.ca.gov/planning/vision/vision.htm> .

Appendix C - Focus Group Working Papers

Connections Between Vehicles, Fuels, Housing and Land Use, and Infrastructure

There is a strong link between land use, housing location decisions, and strategies to reduce emissions from the transportation sector. This document aims to chart a holistic approach to reducing transportation related GHG emissions, including:

- Community-based strategies that reduce dependency on single-occupancy vehicle travel thereby reducing vehicle miles travelled (VMT) and correspondingly reducing emissions. For the purposes of this document, “community-based strategies” focus on those that reduce transportation related emissions.
- Technology-based vehicle and fuels strategies—cleaner and more efficient engines, vehicles (include exploring potential benefits of new mobility innovations of connected and autonomous cars), and equipment and lower-carbon fuels.
- Transportation system construction and operational efficiency improvements, such as highway ramp metering, transit system signal prioritization, and greener pavement technologies.

Sustainable communities are designed to provide housing for all income groups and when combined with cleaner, more sustainable passenger and freight transportation can provide additional benefits such as:

- increased mobility and transportation choices;
- reduced congestion; greater housing choices;
- housing at all price points with access to public transit;
- improved public health as a result of better air and water quality and the use of active transportation;
- natural resource conservation, including preservation of agricultural lands and sensitive habitats;
- economic benefits such as opportunities for neighborhood economic development and lower costs for community infrastructure;
- energy security; and
- greater equity through improved access to jobs, housing, and everyday needs.

The strategies associated with achieving sustainable communities have the added benefit of providing an opportunity to address the health inequities that exist in California communities. These strategies not only improve the health of everyone, but they narrow the existing gaps in health inequalities and increase the ability of vulnerable communities to adapt to climate change. In addition, low-carbon freight strategies are particularly beneficial to vulnerable communities located near ports, rail yards, freeways, and distribution centers by lowering the localized health risk associated with diesel soot but also cutting black carbon that acts as a powerful, short-lived climate forcing pollutant.

Appendix C - Focus Group Working Papers

Housing Role

Within urbanized areas, residential development accounts for the largest share of land area, constituting a major influence on regional development footprints and travel patterns. As such, integrating transportation and residential land use is one of the most impactful strategies for reducing GHG emissions, as well as other forms of air pollution, for the transportation system. Housing development is the largest, single subsector of the construction industry. Pre-1980 construction is responsible for nearly three quarters of all GHG emissions generated by the building industry. Building new housing and preserving the existing housing stock affords the greatest potential for maximizing the benefits of green technology.

Housing also plays a pivotal role in supporting economic vitality, energy efficiency, public health and safety, and insuring access to education and job opportunities. Governmental actions supporting the location, variety and availability of housing at all price points are critical to implementing GHG emissions reduction policies, along with addressing other public policy objectives. Infill development patterns, including transit oriented development (TOD), which focus on the proximity and connectivity of higher density mixed use and residential development to employment and service centers and amenities can increase the effectiveness of these relationships. This development pattern is also referred to as “Equitable TOD.”

Denser, compact forms of development can reduce travel time, trips, and travel costs. Studies indicate public transit ridership drops off dramatically beyond four miles from transit stations, particularly for those commuting to and from places of employment, because ridership generally depends on variables including quality, frequency of stops and travel time. For example, over half (57 percent) of 1,200 workers in a 2007 Harris poll indicated that they would consider moving closer to work if they could find affordable housing near their workplace. Another survey of 300 companies reported that one in three find that the lack of affordable housing nearby impacts the ability to attract or retain qualified entry- and mid-level workers.³ Employers and regional economies are at a competitive disadvantage without a sufficient supply of affordable housing.

Collaborative Approach

Climate change touches every part of society and as a result requires an unprecedented level of collaboration, which is especially true for the transportation system. The State of California is actively working with federal and international partners to collectively reduce GHG emissions, regional organizations such as council of governments or metropolitan planning organizations to assist with implementation of SB 375, non-governmental organizations and universities to support regional collaboratives, and groups such as the Alliance of Regional Collaboratives for Climate

³ Urban Land Institute. 2007, June 4. “Lack of Affordable Housing Near Jobs: A Problem for Employers and Employees.” Press Release. Retrieved August 13, 2010
<http://www.housingcolorado.org/images/uploads/47ab69762a6aa>

Appendix C - Focus Group Working Papers

Adaptation, through whom resources and information are shared. The trend towards regionalization in the discussions of climate change is a needed but complicated process. This is also true at the transportation corridor level for all modes and jurisdictions. Many individual jurisdictions understand the value of coordinating at a regional and corridor level and are participating in joint procurement, grant applications, technology strategies, and policy implementation. These efforts collectively are helping the State to achieve statewide GHG reduction goals and are being supported through collaboration with State agencies and departments through funding, technical support, and assistance with convening and coordination. The State recognizes the need to support and build on these efforts to ensure long term GHG emission reduction targets are met while also achieving the State's planning priorities. Furthermore, outreach and collaboration with businesses will be a necessary component of strategies moving forward to understand the challenges with respect to logistics, fleet operations, location, and economic development.

Energy Sector Coordination

Ongoing coordination between all GHG emission sectors will be necessary to reflect the interconnections between the sectors and possible changes in statewide priorities. However, there is a direct relationship between the evolution of the transportation sector and future energy needs. The vision described herein includes significant electrification of the transportation fleet and growing reliance on hydrogen that will impact the energy sector. For example, as electricity, specifically renewably-generated electricity, fuels more of the transportation sector, there is opportunity for fleets to manage energy consumption or store excess energy to provide benefits to the grid through vehicle-grid integration. Accordingly, transportation and energy planning efforts need to be closely coordinated to ensure both sectors evolve compatibly.

II. Progress to Date – Today's Portfolio of Policies and Programs

There are numerous efforts taking place at the local/regional, State, federal, and international level to achieve GHG emission reductions focused on the transportation sector and the development of sustainable communities. While not exhaustive, this section describes the key laws, executive orders, policies, programs and regulations - especially at the State level - that are driving these efforts.

State Laws and Executive Orders

- AB 1493: Vehicular greenhouse gas emissions – AB 1493 (Pavley, Chapter 200, Statutes of 2002) required ARB to adopt regulations that achieve the maximum feasible and cost effective reduction in GHG emissions from new motor vehicles. ARB approved regulations in 2004, which were amended in 2009 and again in 2012, wherein the control of smog-causing pollutants and GHG emissions were combined into a single coordinated package of standards (commonly known as Advanced Clean Cars).

Appendix C - Focus Group Working Papers

- SBX1 2: California Renewable Energy Resources Act – Established in 2002 under SB 1078, accelerated in 2006 under SB 107 and expanded in 2011 under SBX1 2 (Simitian, Chapter 1, Statutes of 2011), California's Renewables Portfolio Standard (RPS) applies to all electricity retailers in the State (including publicly owned utilities, investor-owned utilities, electricity service providers, and community choice aggregators) and requires these entities to adopt RPS goals of 20 percent of retail sales from renewables by the end of 2013, 25 percent by the end of 2016, and the 33 percent requirement being met by the end of 2020.
- Executive Order S-03-05 – Established the following GHG emission reduction targets: by 2010, reduce GHG emissions to 2000 levels; by 2020, reduce GHG emissions to 1990 levels; by 2050, reduce GHG emissions to 80 percent below 1990 levels. The Executive Order also creates the Climate Action Team and directs the Secretary of Cal/EPA to coordinate efforts with meeting the targets with the heads of other State agencies.
- Executive Order S-01-07 – Established the statewide goal to reduce the carbon intensity of California's transportation fuels by at least ten percent by 2020. This Executive Order also gave ARB the authority to determine if the Low Carbon Fuel Standard could be considered a discreet early action.
- SB 375: Sustainable Communities and Climate Protection Act of 2008 – SB 375 (Steinberg, Chapter 728, Statutes of 2008) reduces GHG emissions from passenger vehicles through an integrated approach to regional transportation and land-use planning.

SB 226: Environmental quality – SB 226 (Simitian, Chapter 369, Statutes of 2011) required an infill streamlining update to the CEQA Guidelines which set forth a streamlined review process for infill projects. The update also contains the performance standards that will be used to determine an infill project's eligibility for that streamlined review⁴.

- Executive Order B-16-12 – Established long-term targets of reaching 1.5 million zero emission vehicles on California's roadways by 2025 and reducing transportation-related GHG emissions by 80 percent below 1990 levels by 2050 (Executive Order S-03-05 is an economy-wide target). The Executive Order also set zero emission vehicles purchasing requirements for State government fleets. In February 2013, an interagency working group developed the *ZEV Action Plan*⁵ which identifies specific strategies and actions that State agencies will take to meet milestones of the executive order.
- Executive Order B-18-12 – Requires State agencies identify and pursue opportunities to provide electric vehicle charging stations, and accommodate

⁴ http://opr.ca.gov/s_sb226.php

⁵ The light-duty focused ZEV Action Plan can be found at http://opr.ca.gov/docs/Governor%27s_Office_ZEV_Action_Plan_%2802-13%29.pdf.

Appendix C - Focus Group Working Papers

future charging infrastructure demand, at employee parking facilities in new and existing buildings.

Implementation of these key laws and Executive Orders is ongoing through activities at the local, regional, and State level. These efforts are occurring through a combination of approaches—regulatory, voluntary actions, incentives, and research/development/deployment—allowing for flexibility and a customized approach to maximize emission reductions.

Local and Regional Efforts

- SB 375 Sustainable Communities Strategies (SCS) – SB 375 requires the 18 federally-designated Metropolitan Planning Organizations (MPO) in the State to adopt and submit to ARB for evaluation a SCS that uses land-use and transportation strategies to reduce the region's passenger vehicle GHG emissions. To date, ARB's Executive Officer has accepted five SCSs from the following agencies: the San Diego Association of Governments, the Southern California Association of Governments, the Sacramento Area Council of Governments, the Butte County Association of Governments and the Tahoe Metropolitan Planning Organization/Tahoe Regional Planning Agency. Each of the submitted SCSs either met or exceeded their ARB-established per capita passenger vehicle GHG emission reduction target. The remaining MPOs are now in the process of developing and adopting their first round of SCSs as part of their next Regional Transportation Plan updates and will all be completed by the close of 2015. Local governments and other stakeholders play a large role in helping to develop the transportation and land-use scenarios used in the SCS development process. In addition, local governments are crucial partners for the implementation of the SCSs because land use authority remains squarely within the purview of the local governments. Builders and a host of cross-sector organizations implement the SCSs.
- General Plans and Local Climate Action Plans – Local governments have an important role to play in reducing GHG emissions to achieve the State's 2050 target. The Governor's Office of Planning and Research maintains detailed recommendations for establishing targets, developing a Climate Action Plan or Greenhouse Gas Reduction Plan in the *Climate Action Plan Technical Advisory* (under development) and in the *General Plan Guidelines* (draft release in early 2014)⁶. Local governments also maintain comprehensive general plans that guide growth and development throughout their jurisdiction, and may choose to incorporate additional GHG emission reduction strategies or a climate action plan as part of a general plan (or another community plan) or as a separate document. Cities and counties are required to update the housing elements of their general plans to implement their share of their Regional Housing Need Allocation, which, in areas with MPOs, must be consistent with the SCS of the

⁶ These documents and related supporting documentation and can be found on OPR's website at www.opr.ca.gov.

Appendix C - Focus Group Working Papers

regional transportation plans. In addition, other entities, such as universities and special districts, also may prepare long-term development plans that address climate change. There are benefits to aligning the GHG emission reduction strategies in these various plans to take advantage of a wider range of mitigation strategies, streamlining environmental review, and establishing a consistent set of baseline conditions and growth assumptions. These local planning products often result in complete streets policies, bicycle and pedestrian master plans, Safe Routes to School programs, and much more.

Many of these local and regional efforts will not only benefit climate and air quality outcomes, but will also positively impact resource conservation, quality of life, public health measures, economic indicators, and social equity. The frameworks established in adopted SCSs call for strategies that will deliver these co-benefits, thus full implementation of the first round of SCSs and other local plans should bring about a suite of improvements to California regions.

State Efforts

The **California Alternative Energy and Advanced Transportation Financing Authority (CAEATFA)** has taken the following actions to reduce GHG emissions from transportation sources and support sustainable communities:

- Sales and Use Tax Exclusion Program – The Sales and Use Tax Exclusion (STE) Program provides a sales and use tax exclusion for advanced manufacturers and manufacturers of alternative source and advanced transportation products, components or systems. The STE Program was originally authorized by Senate Bill 71 (Padilla, Chapter 10, Statutes of 2010), which allowed CAEATFA to provide a sales tax exclusion for manufactures of alternative source and advanced transportation products. The STE Program was recently expanded by Senate Bill 1128 (Padilla, Chapter 667, Statutes of 2012) to include advanced manufacturing projects.

ARB has taken the following actions to reduce GHG emissions from transportation sources and support sustainable communities:

- Low Carbon Fuel Standard – The Low Carbon Fuel Standard requires a minimum of 10 percent reduction in carbon intensity of transportation fuels by 2020. This accounts for about 19 percent of the goal set forth by AB 32. An additional benefit of this regulation is that it will diversify the fuel pool, which in turn leads to less susceptibility to gasoline and diesel price spikes due to the cost of oil.
- Advanced Clean Cars – The Advanced Clean Cars Program includes more stringent GHG emission standards, tighter criteria pollutant standards, and increased zero emission vehicle (ZEV) production requirements from 2017-2025 in passenger cars and trucks, including both battery electric and fuel cell

Appendix C - Focus Group Working Papers

vehicles. These regulations will result in light-duty vehicles sold in 2025 emitting 75 percent less smog-forming pollution and 34 percent less GHG emissions.

- Cap-and-Trade Regulation – The Cap-and-Trade Regulation is a market-based regulatory program that reduces GHG emissions through a declining cap on 85 percent of California’s GHG emissions. Beginning on January 1, 2015, GHG emissions from transportation fuels will be included in the cap.
- SB 375 Sustainable Communities Strategies – SB 375 requires ARB to set regional GHG emissions reduction targets. These targets were set in 2010. ARB also evaluates the SCSs to ensure, if implemented, they would achieve the GHG emission reduction targets.
- Ships-at-Berth (Shore Power) – The Ships-at-Berth Regulation reduces emissions from diesel auxiliary engines on ships while berthing at California ports by requiring them to plug into grid-based shore power while at berth and turn off the on-board auxiliary engines, or use equally effective alternatives. In addition, four ports (Los Angeles, Long Beach, Oakland, and Hueneme) have received contracts to provide about \$80 million in State grants for early or extra emission reductions at 25 berths upon project completion.
- Heavy-Duty Truck GHG Regulations – The Heavy-Duty (Tractor-Trailer) Greenhouse Gas Regulation, adopted by ARB in 2008, reduces GHG emissions by improving the fuel efficiency of heavy-duty tractors through improvements in tractor and trailer aerodynamics and the use of low-rolling-resistance tires. In 2013, ARB adopted a regulation establishing GHG emission reduction requirements for all medium- and heavy-duty vehicles and engines manufactured for use in California, harmonizing with the GHG emission reduction rule finalized by U.S. EPA and the National Highway Traffic Safety Administration (NHTSA) in 2011. For Class 8 heavy-duty vehicles, this “Phase I” GHG standard will reduce new vehicle emissions by four to five percent per year from 2014-2018.
- Diesel Vehicle and Equipment Fleet Rules – ARB has adopted a number of fleet rules in recent years to reduce emissions from diesel trucks, buses, and off-road equipment. These regulations were adopted primarily to reduce diesel particulate matter and NOx emissions; however, they provide ancillary climate change benefits by reducing black carbon emissions.
- Tire Pressure Regulation – The Tire Pressure Regulation reduces GHG emissions from vehicles operating with under inflated tires by requiring automotive service providers to inflate them to the recommended tire pressure.
- Automotive Refrigerant Regulation – This regulation reduces GHG emissions associated with the use of small containers of automotive refrigerant.

Appendix C - Focus Group Working Papers

- Advanced Technology Incentive Funding – ARB provides funding for advanced technologies that reduce criteria pollutant and air toxic emissions, often with concurrent climate change benefits. To date about \$283 million has been dedicated to these technologies which include: rebates for light-duty plug-in electric and fuel cell vehicles, vouchers for hybrid and zero emission heavy-duty trucks, grants for installation of shore-based electrical power for ships, and technology demonstrations such as hybrid tugboat retrofits. In 2013, the State extended fees for the Air Quality Improvement Program until 2024 which is expected to provide about \$25 million annually for advanced technologies.

The **California Department of Transportation (Caltrans)** has taken the following actions to reduce GHG emissions from transportation sources and support sustainable communities:

- Published report in April 2013 titled: “*Caltrans Activities to Address Climate Change*” which quantifies recent activities undertaken to reduce GHG emissions resulting from our statewide operation. It identified that in 2011, these activities resulted in a reduction of approximately 161,500 tons of GHGs, which is the equivalent of removing approximately 31,000 vehicles off the road for one year.
- Concrete Specifications – Caltrans has adopted concrete specifications to allow contractors to use greater amounts of less-GHG-intensive alternatives to Portland cement when building roads and bridges. Use of these alternatives is reducing the GHG emissions associated with road projects.
- Alternative Asphalt Pavements – Caltrans supports the use of alternative asphalt pavements that contain recycled rubber, recycled pavements, or binding agents, allowing pavement to be mixed and laid at lower temperatures, which reduces GHG emissions associated with manufacturing materials and construction fuel use.
- Mass Transportation – Caltrans supports three of the top five Amtrak passenger lines in the country and has taken measures to encourage multi-modal bicycle and train trips. Caltrans financially supports California’s local transit operators, which operate over 20,000 buses, rail cars, and other mass transportation vehicles.
- Promoting Biking and Walking – Using State and federal funds, Caltrans supports active transportation with over \$1 billion spent on facility projects since 1992. The recently created Active Transportation Program (Senate Bill 99, 2013) increases funding of bicycle and pedestrian infrastructure.
- Blueprint Planning Grants – Prior to adoption of SB 375, Caltrans provided \$20 million in grants to help regional transportation agencies create long-term integrated transportation and land use plans.

Appendix C - Focus Group Working Papers

- Complete Streets Implementation Action Plan – The Complete Streets Implementation Action Plan spurred a series of comprehensive edits to the Highway Design Manual that have the potential to reduce GHG emissions by creating streets conducive to all modes of travel.
- Environment Justice Support – Caltrans administers the Community-Based Transportation Planning and Environmental Justice grant programs that include the goal of integrating land-use and transportation planning through the public engagement process.
- Alternative Fueled Vehicles – Caltrans operates approximately 3,000 alternative fuel vehicles as well as other advanced technology vehicles and equipment that reduce fuel consumption.
- High Occupancy Vehicle (HOV)/High Occupancy Toll (HOT) – New HOV lanes allow cars with at least two (or in some cases, three) occupants to bypass congestion, as well as HOT lanes that are open to carpools or to single-occupant vehicles that pay a fee. These lanes have the potential to reduce GHG emissions by encouraging drivers to carpool.
- Recycled Materials – Caltrans uses recycled materials such as tires to reduce hill side erosion, and the use of agricultural green waste as mulch for roadway landscaping.

The **California High Speed Rail Authority (Authority)** has taken the following actions to reduce GHG emissions from transportation sources and support sustainable communities:

- Initial High-Speed Rail Segment – Construction of the high-speed rail system is underway with the award of the first construction contract in August 2013. As soon as the initial operating segment opens it will reduce GHG emissions through shifting trips from air and driving.
- Clean Construction – The Authority is committed to net-zero emissions during construction through new, clean construction vehicles, materials recycling, and an urban forestry emissions offset programs in the Central Valley that will provide direct GHG reduction and compound air quality and energy savings benefits. All major contracts include the green construction requirements, and the RFP for urban forestry is scheduled for release in Spring 2014.
- Renewable Energy – The Authority has committed to using 100 percent renewable energy for the high-speed rail system and in April 2013 released a formal *Call to Industry: Sourcing Renewable Power Supplies* to solicit guidance and insight about purchasing renewable power sources.

Appendix C - Focus Group Working Papers

- Transit Oriented Development – The Authority has engaged seven cities that are anticipated to have high-speed rail stations. This planning funding partnership, administered by the Authority, provides local jurisdictions planning funds to develop market analyses, zoning revisions, general plan updates, or other planning activities to develop TODs that support local sustainable community goals and high-speed rail ridership. This program includes up to \$9,000,000 from federal, State, and local sources.
- Rail Modernization – As part of the investments to support the high-speed rail system, regional commuter and urban rail systems are being upgraded and expanded to provide connectivity to the future high-speed rail system, as well as shared-use investments that high-speed rail will ultimately access, such as the electrification of the Caltrain corridor between San Francisco and San Jose. The direct GHG reductions of Caltrain electrification will be realized in 2019, while the investment in other systems will see GHG reductions from increased ridership and mode shift.
- Agricultural Conservation – As part of mitigation for the high-speed rail system, the Authority, through an agreement with the department of Conservation, is seeking permanent agricultural easements from willing sellers. Ideally, these easements support local jurisdictions land use priorities to protect at-risk land from development, reinforcing compact land use.

The **Department of Motor Vehicles (DMV)** has taken the following actions to reduce GHG emissions from transportation sources:

- Alternative Service Delivery Channels – The DMV continues to expand alternative service delivery channels to reduce the need for customers to have to visit a field office. On-line transactions offer the ability to make appointments, obtain handbooks, access training videos and take sample tests.
- "Clean Air" Vehicles – The DMV administers a program to promote the purchase and use of plug-in and other low emission vehicles. A vehicle that meets specified emissions standards (plug in hybrids, compressed natural gas, battery electric and fuel cell electric vehicles) may be issued Clean Air Vehicle decals that allow the vehicle to be operated by a single occupant in the HOV (carpool or diamond) lanes of California's freeways. Green clean air vehicle stickers have been available since January 1, 2012 to the first 40,000 applicants that purchase or lease vehicles meeting California's enhanced advanced technology partial zero emission vehicle requirements (plug in hybrids). The law also extended the sunset date for the white stickers issued to battery electric, fuel cell electric and compressed natural gas vehicles until January 1, 2019.

Appendix C - Focus Group Working Papers

The **California Highway Patrol (CHP)** has taken the following actions to reduce GHG emissions from transportation sources:

- Active Transportation Grants – As biking and walking become more available commute options, CHP is engaged in active bike and pedestrian safety grants. These focus on those areas where bike and pedestrian collisions are most frequent.
- Active Transportation Roadway Signage – Through its membership on the California Traffic Control Devices Committee, CHP is working with cities that are experimenting with various roadway markings, configurations and signage to promote and enhance the safety of cleaner modes of transportation.
- Polluters Enforcement – CHP works in partnership with ARB and Bureau of Automotive Repair regarding: enforcement of gross polluters and/or racing vehicles; modified exhaust, catalytic converters removed, engine modifications, etc., resulting in reduced polluters; assists ARB inspectors at roadside smog inspections throughout the state; commercial enforcement personnel routinely inspect and enforce California Vehicle Code statutes related to exhaust system requirements/maintenance on commercial motor vehicles. CHP's commercial vehicle enforcement program is incorporating proper tire inflation into the commercial vehicle inspection protocol.
- Electric School Buses – Along with ARB, Energy Commission, and industry, CHP works to increase the use of electric school buses.

The **California Energy Commission (Energy Commission)** has taken the following actions to reduce GHG emissions from transportation sources:

- Advanced Technology Incentive Funding – The Alternative and Renewable Fuel and Vehicle Technology Program (ARFVTP) invests \$100 million annually to develop and deploy advanced technology fuels, hydrogen and other fueling infrastructure, vehicles (including zero emission buses), and workforce skills necessary to operate and maintain these new technologies. Over \$400 million has been invested to date for more than 250 projects through ARFVTP, with about 30 percent of the funding going to advanced technology truck projects. This Energy Commission program has also been extended until 2024, at which time over \$1.5 billion will have been invested in advanced technologies, low-carbon fuels, fueling infrastructure and vehicle projects.
- Vehicles and Fuels Research – Research and development efforts for GHG emission reductions have focused on improving the performance, efficiency and economics of natural gas and electric vehicles. These efforts include support to develop optimized natural gas engines with little or no performance or efficiency penalties. Planning is underway to demonstrate used medium-duty electric vehicle repower projects, hybridization designs that use battery power to minimize emissions, idling, and low-load engine operation. Research will also demonstrate the viability of in-state manufacturing and performance of on-board

Appendix C - Focus Group Working Papers

advanced natural gas fuel tanks, as well as production of renewable natural gas from waste feedstocks.

- Battery Technology Research – Vehicle-grid integration research and demonstrations evaluate technical and economic feasibility for both consumers and utilities. It includes advanced bench-scale recycling processes with potential for commercial scale-up. Battery standardization research will capture lessons learned from previous efforts, life-cycle costs, and pathways to implement. The Energy Commission has proposed further research under the Electric Program Investment Charge (EPIC) on vehicle-grid integration, smart or managed charging, and battery second use.

The **Strategic Growth Council (SGC)** has taken the following actions to reduce GHG emissions from transportation sources and support sustainable communities:

- Sustainable Communities Planning Grant and Incentives Program – The SGC manages this local assistance grant program to fund cities, counties, and regions that conduct sustainable community planning, including transit-oriented development, with the requirement that the funded activities will lead to reduced GHG emissions. More than \$50 million of grants have been awarded to date, with approximately \$16 million allocated in the recent Round 3 solicitation. The Governor's Proposed Fiscal Year 2014-15 Budget allocates up to \$100 million to support SB 375 implementation.
- Modeling Incentive Awards – In 2009, the SGC awarded more than \$10 million to fund data gathering and model development projects necessary for regional agencies to comply with SB 375 (2008). The majority of these awards went to the State's 18 Metropolitan Planning Organizations, every one of which received funding from this program to improve the modeling available for their SCSs.
- UrbanFootprint – The SGC funded the UrbanFootprint land use scenario planning tool, which is available to State agencies, regional agencies, and local governments to identify the sustainability impacts of user-provided land use scenarios.
- Barriers to Infill Development – In 2013, the SGC adopted an infill action plan to mitigate the barriers to sustainable infill development. These actions will facilitate transit-oriented development and other low-VMT development strategies.
- Health in All Policies Task Force – The interagency Health in All Policies Task Force (facilitated by the Department of Public Health and operating under the auspices of the SGC) has conducted internal and external outreach to support local entities in the implementation of complete streets and active transportation.
- Local Government Outreach – The SGC pursues a many-faceted outreach and education program to support its grantees and other local governments by

Appendix C - Focus Group Working Papers

connecting them to state resources and to one another. These efforts ultimately result in increased local capacity and increased adoption of sustainability practices among these local entities.

- Sustainability in State Infrastructure Spending – In 2013, the SGC initiated a project to integrate the State’s Planning Priorities and the Environmental Goals and Policy Report into State agencies’ infrastructure investment decision-making processes. The Council is developing a guidance document that assists with the incorporation of these priorities into future State infrastructure investment decisions within normal activities and coordination efforts.

The **California Public Utilities Commission (CPUC)** has taken the following actions to reduce GHG emissions from transportation sources:

- Alternative Fuel Vehicles Policy – CPUC is developing utility policy on alternative fuel vehicles to make sure the electric utilities that the CPUC regulates are prepared for the projected statewide market growth of plug-in electric vehicles (Rulemaking 09-08-009).
- Electric Vehicle Charging Infrastructure – In 2012, as a result of a settlement to resolve energy crisis litigation, NRG agreed with the CPUC to invest more than \$100 million in charging infrastructure including 200 DC fast chargers and 10,000 “make ready” plug-in units at 1,000 locations.
- Energy Rates for Vehicle Charging – In 2012, the CPUC approved a temporary discounted energy rate for government agencies in Southern California Edison’s territory to demonstrate and develop the market for zero emission electric bus technologies.
- Electric Vehicle Pilots – The CPUC approved several pilot projects each underway in three investor-owned electric utility service territories. The objectives of these pilots include understanding consumer charging behaviors, evaluating the impacts of time of use energy rates and metering technology, and testing the use of electric vehicles as demand response and limited energy storage resources.
- Battery Second Life Grid Applications – In 2013, CPUC approved a PG&E pilot to test how it can procure grid value from vehicle batteries both during and after their useful life in the vehicle. This pilot will help develop contracting methods that can be scaled up to commercial scale in the future, helping to improve the value proposition for PEV owners and PEV fleet operators.
- Support for Electric Vehicle Customers – In Rulemaking 11-03-012 (2011-present), CPUC is developing the utility mechanism for returning revenue from the sale of Low Carbon Fuel Standard credits to benefit electric vehicle customers.

Appendix C - Focus Group Working Papers

The **California Department of Housing and Community Development (HCD)** has taken the following actions supporting reduction of GHG emissions from transportation sources and sustainable communities:

- Synchronized Regional Housing and Transportation Planning – Pursuant to SB 375, HCD has coordinated the Regional Housing Need Allocation process and housing element review with development of regional transportation plans and their SCSs.
- Housing Element Review and Certification – HCD reviews and certifies the housing elements of the general plans of local governments, which include identification of infill and TOD sites with appropriate zoning, development standards, and programs supporting development of RHNA implementing their respective RTP/SCS.
- Funding of Infill and Transit Oriented Development Projects – HCD awards competitive low interest loans and grants to finance infill infrastructure grants, affordable housing, and TOD. These include higher density mixed use and mixed income housing developments and infrastructure supporting transit use, e.g. bike and pedestrian improvements.
- Housing Related Park Funding – HCD awards incentive grants for the creation or improvement of local parks to local governments which have constructed and/or preserved affordable housing. Bonus points are awarded for applications serving disadvantaged communities, those in park-deficient areas and when consistent with a regional blueprint plan.
- Technical Assistance and Regulatory Relief – HCD assists local governments and stakeholders in using provisions of State housing and land use law and best practices to implement housing and land use policies and programs supporting sustainable development patterns and practices. HCD works with other agencies to identify and resolve regulatory barriers to higher density and affordable housing development, including for example, housing sited proximate to high volume roadways.
- Electric Vehicle Charging Building Code Changes – HCD is developing recommendations for inclusion of plug-in stations for electric vehicle charging in the residential building code.

Federal Efforts

- Vehicle Emission Standards – The U.S. Environmental Protection Agency (U.S. EPA) and the National Highway Traffic Safety Administration (NHTSA) are taking coordinated steps—through setting GHG emission standards and improved fuel economy—to enable the production of a new generation of clean

Appendix C - Focus Group Working Papers

vehicles. The agencies have finalized standards to extend the light-duty vehicle GHG National Program for model years 2017-2025 and have adopted GHG regulations for heavy-duty engines and vehicles. These efforts are coordinated and aligned with California standards.

- Tax Credits for Advanced Technology Vehicles – The federal government provides tax credits of varying amounts for the purchase of qualifying plug-in and fuel cell light-duty vehicles and the installation of alternative fuel infrastructure.
- Federal Renewable Fuel Standard (RFS) – The RFS program was expanded by the Energy Independence and Security Act (EISA) of 2007 to include diesel in addition to gasoline, and increased the volume of renewable fuel required to be blended into transportation fuel from 9 billion gallons in 2008 to 36 billion gallons by 2022.
- Partnership for Sustainable Communities – The U.S. Department of Housing and Urban Development (HUD), U.S. Department of Transportation (U.S. DOT), and U.S. EPA have joined together to help communities nationwide improve access to affordable housing, increase transportation options, and lower transportation costs, while protecting the environment through coordinated federal housing, transportation, water, and other infrastructure investments. Several of the first rounds of HUD Sustainable Communities grants were awarded to regions in California.
- Transportation Funding – U.S. DOT issues grants, in accordance with federal transportation authorization (current legislation: MAP-21, the Moving Ahead for Progress in the 21st Century Act), to eligible recipients for planning, vehicle purchases, facility construction, operations, and other purposes. These include funding for surface transportation improvements and planning, fixed guideway systems, rail, and bike/pedestrian projects.
- Air Quality and Energy Efficiency Transportation Incentive Funding – U.S. EPA has provided funding for SmartWay financing and periodically issues smart growth grants to support activities that improve the quality of development. The U.S. Department of Energy has several funding programs and initiatives to support energy efficiency, reducing petroleum consumption through transportation projects, and advanced vehicle technologies including, but not limited to: Energy Efficiency and Conservation Block Grant (EECBG) Program, Clean Cities initiative, and research and development funding through the Vehicle Technologies Office.
- Vehicle to Grid Projects – Pursuant to Executive Order 13423 (Strengthening Federal Environmental, Energy, and Transportation Management), the U.S. Department of Defense is converting its non-tactical fleets at Los Angeles Air Force Base and China Lake Naval Air Warfare Station to provide vehicle-grid

Appendix C - Focus Group Working Papers

integration demand response and battery storage to the California Independent System Operator's wholesale energy and ancillary services markets.

III. System Outlook – Coordinated Policy and Planning

This section provides an overview of the necessary transition for the transportation sector in the 2035 and 2050 time-frames to meet California's climate change and air quality goals, and the initial steps over the next five years for how to get there. The section is organized into three strategy areas: (1) sustainable community and passenger transportation strategies; (2) freight transportation strategies; and (3) low carbon fuels and energy for transportation. However, we acknowledge significant crossover between these categories, and strategies for one category may affect the others. For example, future fuel and energy needs are directly related to the evolution of passenger and freight transportation. In each of these strategy areas, coordinated policy and planning will be required to strategically leverage public funding, align State-level regulations towards common strategies, and conduct local planning for inter-regional corridor and community development.

Achieving the long-term emission goals will require a new approach in policy development and implementation. A new coordinated policy and planning approach should utilize all available means, including, but not limited to, regulations, regional planning, enforceable agreements, project mitigation, and a sustained commitment to incentives (e.g., grants, vouchers, rebates, parking or transit benefits, high occupancy vehicle lane access, etc.). Each of these can play a strategic role in implementation of the vision for transportation. For example, alignment of statewide energy and emissions regulations and coordinated regional planning will be important to strategically encourage common strategies and maximize environmental benefits. Where commercialization barriers exist for new technologies, strategic use of public funding should catalyze new solutions or consumer acceptance. Existing consumer rebates for light-duty plug-in electric and fuel cell vehicles are expected to play a significant role in the full-scale commercialization of these technologies for years to come.

Fundamental to successful coordinated planning efforts is the framing of a consistent vision for California's transportation system that is reflected across the plans produced within and across different agencies. For example, over the next several years, ARB is undertaking significant efforts that all address transportation in some way: (1) the First Update to the Climate Change Scoping Plan; (2) the 2014 Sustainable Freight Strategy; (3) SB 375 target review; (4) the next major set of Ozone State Implementation Plans in 2016, and (5) the next phase of standard setting for vehicle and engine smog, toxics, and GHG emissions. During the same time period, Caltrans will produce the 2014 California Freight Mobility Plan and the 2040 California Transportation Plan in 2015. High Speed Rail is investing in local transit systems and will break ground in the central valley, providing an alternative to air and auto travel. In addition, the Energy Commission prepares a biennial integrated energy policy report that provides an overview of major energy issues and trends facing California and makes energy policy recommendations based on energy assessments and forecasts. Coordination across

Appendix C - Focus Group Working Papers

State agencies is essential, just as it is equally imperative for the statewide efforts to incorporate the planning and implementation activities of the regional and local agencies. Tools developed to support these planning efforts should emphasize the needs of vulnerable communities including, but not limited to, access to affordable public transit, electric vehicle charging or other low-carbon fueling infrastructure; accessible low-cost housing; protections against housing displacement, and localized public health benefits.

Many of the strategies discussed in this section will require a long lead time to realize the benefits. Various strategies rely on infrastructure improvements that can take years to execute from planning to construction or advanced technologies to be developed and commercially available. Because of these practical hurdles, as well as the inevitable fleet and land-use transformation time delays, it is critical to start the planning and implementation of these strategies in the very near future in order to meet the 2032 and 2050 air quality and GHG emission reduction goals. This will require strong collaboration and partnerships, especially at the regional level, to ensure successful roll-out of the described strategies.

1) Sustainable Communities and Passenger Transportation – Beyond SB375 and Advanced Clean Cars

Sustainable Communities and Other Vehicle Miles Traveled Reduction Strategies

In many ways, SB 375 provided a gust of wind to planning coordination efforts that had already begun prior to the law's passage in 2008. In combination with the goals and procedures outlined in SB 375, that change represents a paradigm shift in how traditional transportation, land use, and housing planning is conducted and continuing those efforts will be crucial to meeting future GHG reduction goals. Each of the MPOs' SCSs completed thus far demonstrate a comprehensive shift away from business-as-usual planning, resulting in per capita VMT reductions along with a host of additional benefits that improve the quality of life for Californians. By 2035, residents in the San Diego region will make nearly one third of their trips using a transportation mode other than driving alone. Changes in the Southern California housing stock, where two thirds of new housing will be multi-family by 2035, will provide residents with greater choice in the type of place to live. The Bay Area will experience a 20 percent increase in the region's share of car-free trips by the year 2040. In the Sacramento region, jobs located within high-frequency transit areas will more than double by 2035, making it easier for commuters to get to work. These are just a few examples of the ways that improved regional planning in coordination with local governments will reduce per-capita VMT and support vibrant, livable communities.

SB 375 has provided a new planning framework wherein regional and local governments integrate efforts to improve land use and transportation decisions in support of the State's GHG emission reductions by lowering vehicle miles traveled. As often as every four years, but at least every eight years, ARB is tasked with revisiting the 2020 and 2035 GHG emission reduction targets that it first set in 2010. ARB is

Appendix C - Focus Group Working Papers

currently limited to setting GHG emission reduction targets for the years 2020 and 2035. Beyond 2035, additional legislation will be needed to set targets that specifically link GHG emission reductions to sustainable community planning or VMT reduction. As SCSs are developed, agencies should ensure strong equity and environmental justice metrics are included, jobs-fit-housing modeling is incorporated, and policies mitigate and protect low-income residents from displacement.

Continuing the progress in reducing per capita VMT is critical but maintaining and improving upon this trend is necessary and will require more effort. Because of the long-term nature of transportation planning and implementation, decisions being made now affect future transportation and land use decisions. For example, Regional Transportation Plans consider at least a 20-year planning horizon, and over the next 10 years all MPOs will need to address planning for years 2035 to 2050. It is reasonable to expect MPOs to continue embedding SCS strategies into future planning efforts. To further the progress being made, a number of strategies already shown to lower VMT will need to continue to be implemented and expanded; additional work on refining the understanding of the relationships of these strategies to VMT reductions will need to be completed; and new strategies will need to be developed. These strategies include, but are not limited to: promoting equitable transit-oriented and infill developments; ensuring equity-improving mobility options; and increasing transit connectivity, active transportation options, public education, and travel demand measures.

As agencies implement these strategies they should develop ways to reduce health disparities within vulnerable communities and consider the unintended consequences associated with increased housing demand and the risk of displacement of lower-income households. In many high-demand metropolitan areas, repurposing existing buildings and redeveloping abandoned or underdeveloped sites at higher densities, often in economically disadvantaged areas, is fueling strong competition for varied housing types and availability, inflating land values and ultimately impacting housing affordability. Increasing land values in response to new transit-oriented development without policies in place to manage displacement risk impacts lower income households to a greater degree and increases the risk of community destabilization. Research reveals that increasing land values around a new transit station can trigger unintended consequences, such as higher increased rents and housing prices and reduced transit ridership compared to surrounding metro areas with lower income households located proximate to transit⁷. Thus, preserving existing affordable housing and services in transit-rich locations is important.

Additionally, lower income households displaced to transit-poor locations farther from employment and services may incur additional costs associated with vehicle ownership. Displaced transit-user households acquiring a car to access employment and services add to overall emissions while reducing resources available for necessities. Land use and housing strategies that encourage owner/renter ratios and equitable sales/rents that

⁷ Dukakis Center for Urban and Regional Policy, p. 23 & 25, 2010, *Maintaining Diversity in America's Transit-Rich Neighborhoods: Tools for Equitable Neighborhood Change*

Appendix C - Focus Group Working Papers

mirror the existing or developing employment sector can preserve and expand the goods and services, employment, amenities, and tax base for existing communities.

Strategies for reducing per capita VMT include the following:

- Equitable Transit Oriented Development and Infill
Equitable transit-oriented and infill developments represent the types of land use and transportation decisions that will be needed to accommodate population and economic growth in a manner consistent with GHG emission reduction goals, consumer preferences, and open space conservation. Transit-oriented developments capitalize on transit investments by developing retail, employment, and affordable residential uses accessible to good quality transit stops/stations. By locating destinations near transit, consumers and residents are provided with the choice to take transit, bike and /or walk to these easily accessible destinations. As TODs are developed it is important to maintain and enhance affordable housing that provides access to transit and jobs. Infill developments commonly face local resistance, including costly lawsuits. In order to expedite the proliferation of equitable TODs and other infill, it will be necessary to break through common barriers created by federal, State, regional, local, and private sector policies and practices on financing, environmental review, parking, and other issues. SB 743 (Steinberg, 2013) directs the Governor's Office of Planning and Research to craft a replacement methodology for "Level of Service" traffic mitigation, an important first step in moving to multi-modal solutions for infill development.

Many policies and development conditions continue to incentivize detached single-family housing over higher-density, mixed-use developments. SB 375 added provisions intended to streamline the CEQA permitting process for areas that meet certain requirements, but it remains to be seen if those provisions alone will allow for the style of development necessary to meet the 2050 climate goals.

Transit hubs record highest levels of ridership within a quarter to half mile radius. Increasing housing availability, especially affordable housing, within these areas could create zones where owning and maintaining a personal vehicle is not a necessity. Carless households represent lower transportation-related emissions in transit-oriented areas. Increased ridership is the foundation of new and expanded transit development. Location-efficient affordable housing has been estimated to minimize vehicle use, evidencing a 20-40 percent reduction in vehicle miles traveled⁸. As lower income households account for nearly one-third of all transit riders, and three quarters rely solely on public transportation the preservation and development of affordable housing is critical.

⁸ U.S. Environmental Protection Agency, Smart Growth Program, p. 90, 2013, [Our Built and Natural Environments \[2nd ed.\]](#)

Appendix C - Focus Group Working Papers

- Increased Mobility

Transportation beyond 2035 will need to be defined not by the single occupant automobile but rather by a range of mobility choices. Strategies will need to include incentives for people to ride transit, car-share, carpool, walk, bicycle and rideshare. Many programs already exist to promote a shift away from solo automobile use, but reducing VMT beyond the 2020 and 2035 targets will require even more aggressive strategies to further reduce GHG emissions. In addition, California's demographic makeup is shifting in a way that will call for increased mobility options as the population grows more ethnically diverse and ages. Improving both transportation mobility and accessibility will benefit an aging population that requires access to services and desires to "age in place". Generation Y has shown a preference for driving fewer miles and there is an expectation that that trend will hold true as Generation Y transitions to childrearing years and beyond. The combination of those two demographic forces suggests that improved mobility will not just be a strategy to reduce GHGs, but also a response to changing lifestyles.
- Improved Transit Connectivity

Many of the SCSs outline an increased role for transit in their regions' future. Regions are building new rail lines, developing bus rapid transit systems, and increasing local bus frequency. But, transit operators often narrowly define the transit experience as boarding and exiting a bus or rail car, while users consider their trips in terms of origin, destination, and everything in between. Current and potential transit riders can face inconveniences and even unsafe conditions during the door-to-door travel to their destination. Improving the entire transit experience while minimizing transfers, co-location of first/last-mile electric vehicle car share programs, and increasing availability of safe routes to transit would help increase transit ridership and better serve transit-dependent populations.
- Increased Active and Public Transportation

A major expansion of active transport (such as biking and walking) and public transit are key to achieving California's GHG emission reduction goals. Walking, bicycling, as well as using public transit will need to be the modes of choice for a large share of short, urban trips currently taken in personal passenger vehicles. Strategies will need to be implemented so that active transport and public transit will be as convenient, affordable, safe, and time-efficient as driving. These include the construction of "complete streets", incentives for people to ride transit, and funding for transit operations that increase ridership. As part of the Governor's 2013-14 Budget, the Administration proposed creation of an Active Transportation Program to increase the number of trips achieved through biking and walking. The Active Transportation Program was enacted by Senate Bill 99 in September 2013.
- Public Education and Travel Demand Measures

There are a number of personal choices Californians can take to help reduce commute related VMT. Innovative technology and communications solutions to

Appendix C - Focus Group Working Papers

help facilitate improved telecommuting and teleconferencing options will provide employers and employees with the ability to cut down on VMT. Continuing to promote employer-based transportation solutions such as facilitated carpooling and parking cash out would allow employees more options to reduce commute-related VMT. Commuter benefit ordinances provide employees with reduced commute costs by requiring employers to offer incentives for biking, transit, ridesharing and walking.

Implementation of the strategies identified in the adopted SCSs and other local plans provides an opportunity to conduct research to ensure the strategies are effective in reducing GHG emissions and implemented in an equitable manner. The most effective strategies will be used as the foundation for future planning efforts.

Passenger Vehicle Technology Improvements

To achieve the long-term emission targets in California, passenger travel will require a nearly complete shift to vehicle electrification (electricity and hydrogen), along with continued advances in the efficiency and performance of conventional vehicles. This shift is particularly important in personal light-duty vehicles given the sector's large share of the emissions inventory. For light-duty vehicles specifically, the market will need to include a mix of alternatives, including a growing share of full battery and fuel cell electric vehicles, plug-in hybrid electric vehicles driven primarily in electric mode, and conventional hybrid vehicles for the heavier vehicles in this category. All of these alternatives are in the market today but at scales smaller than what will be needed in the future. This market transformation will need to go well beyond the existing Zero Emission Vehicle Regulation for 2025, and will need strong consumer demand and industry innovation. To support consumer acceptance, the State currently provides vehicle purchase incentives for many of these technologies and most recently the Governor's Proposed Fiscal Year 2014-15 Budget identified up to \$200 million in funding for low-carbon transportation specifically including these technologies. Public investment in some form will need to continue until these vehicles reach full commercialization. In addition, a campaign to push for higher vehicle efficiencies and advancements in a wide range of policies and technologies should include engines and transmissions, batteries, vehicle weight reduction, lower-rolling resistance tires, vehicle aerodynamics, and more efficient vehicle accessories. New California policies targeting lower GHG emissions and more fuel efficient vehicles can also result in significant co-benefits for achieving upcoming ozone standards. As these policies and public investments are being implemented, agencies should ensure access to the vehicle alternatives for low-income households and small businesses.

The battery and fuel cell technologies are evolving rapidly and will result in improved electric vehicles for consumers. In combination, the two technologies can be the no compromise solution for replacing internal combustion engines while fully meeting all consumer expectations of convenience and range. With a few exceptions, today's battery technology limits the electric driving range of battery electric vehicles to below 100 miles per charge and plug-in hybrid electric vehicles to below 40 electric-only miles.

Appendix C - Focus Group Working Papers

Within a few years, this will improve as the next generation batteries enter the market, appealing to a wider range of consumers. Fuel cell vehicle technology will be mature enough for commercial introduction as early as 2015, with fuel cell electric vehicles on the market today in limited volumes through leases. However, current infrastructure availability hampers their market potential. Additional public and private investment is essential to address the remaining barriers to get to 100 hydrogen refueling stations in California – the target number of stations needed to take the early market to a tipping point where normal investment will sustain infrastructure deployment that matches vehicle sales.

To a large extent, the transformation of the transportation sector will depend on consumer demand and choice in the market, so comprehensive public outreach and education on how individual choices impact the transportation system will be a key component of the strategy. The economically efficient transition to zero emission and other advanced technology vehicles will occur as consumers see increasing value in those vehicles. Consumer willingness to embrace the new vehicle technologies will grow as technology costs decline, vehicle choice becomes more prolific and attractive, and “total cost of ownership” factors favor clean vehicles (e.g., fuel savings). Given the urgency of the necessary transition, policy measures will be needed to increase incentives in varying forms and decrease operating costs. In addition to financial incentives, other equally effective incentives can take the form HOV lane access, preferential parking, among other approaches. Operating cost factors include the cost savings in switching to electricity or hydrogen, as well as potential future revenue streams from providing energy services to the grid.

The future will also include greater integration of grid energy services with vehicles, used for transportation. “Vehicle-grid Integration” will provide benefits to utility grid management as more of the transportation system transitions to electricity. Emerging electric grid policies include vehicle electrification, time-of-day pricing, and load demand management. In the future, transportation electricity will be an integral part of the grid management, creating new opportunities for smart grid flexibility. The supply of electricity and hydrogen will need to become largely decarbonized, moving well beyond the existing policies set for 2020. This topic is discussed further in following sections.

In the short-term, improvements can be made to the efficiency of in-use vehicles including deployment of fuel efficient passenger vehicle replacement tires. Deployment could include limited incentives, followed by ratings and then standard setting to permanently shift the market.

Passenger Rail Technology Improvements

Providing viable, quality interregional rail transportation through rail modernization in California will increase benefits for existing passengers, including improved mobility and safety, with a reduced carbon footprint and attract new riders. High-Speed rail, which serves as a spine for improved statewide rail service, will reduce GHG emissions by providing a cleaner alternative to air and private car travel and is projected to show a

Appendix C - Focus Group Working Papers

reduction in emissions its first year in operation, with annual increases in emission reductions as the system continues to expand⁹. In advance of and as preparation for high-speed rail, regional and urban rail providers will be better integrated through schedule and fair integration with each other and with high-speed rail. Increased service, speed, and amenities will grow this mode of travel and—due to station locations—encourage TOD and infill. In addition, activities such as positive train control enable safer, more efficient rail transport.

Passenger rail vehicles, such as those requested recently through a joint bid between the Authority and Amtrak, will be modern, electric, state-of-the art high-speed trainsets. These highly efficient trainsets include regenerative braking technology, which returns braking energy to the trainset or the propulsion system, reducing overall energy loads. By procuring renewable energy for the high-speed rail system, the Authority can provide zero emissions passenger rail service.

Existing Roadway Network Improvements

Making the existing transportation system more efficient will achieve a tangible benefit to GHG emission reductions over the next 20 years make more efficient use of the state-owned 50,000 miles, while reducing the pressure on new highway expansion.

- Operational
Some of the possible operational improvement strategies that could be employed or expanded to reduce transportation related GHG emissions on the existing transportation system include the following:
 - Active Transportation – Increasing dedicated local road space for active transportation (separated bikeways, wider sidewalks, etc.)
 - Traffic Control – includes activities such as arterial signal control and optimizing traffic flow through traffic light synchronization.
 - Transportation Management Systems (TMS) / Intelligent Transportation Systems (ITS) – includes detection, incident management, arterial signal coordination, ramp metering, and traveler information.
 - New Vehicle Technologies – includes autonomous vehicle systems and the use of adaptive cruise control, GPS, and camera technologies to enable truck platooning.
 - Other – includes non-capacity increasing projects, auxiliary lanes, turn lanes, truck lanes (climbing or separated flow), and HOV and HOT lanes.

- Pavement
The condition of the actual roadway surface affects vehicle fuel consumption and the amount of GHG emissions. Research shows that smoother roadway surfaces play a role in GHG emission reductions.

⁹ Contribution of the High-Speed Rail Program to Reducing California's Greenhouse Gas Emission Levels http://www.hsr.ca.gov/docs/programs/green_practices/HSR_Reducing_CA_GHG_Emissions_2013.pdf

Appendix C - Focus Group Working Papers

In addition to the actual condition of the pavement surface, the type of pavement also plays a role in GHG emissions. There are two primary types of pavement materials: concrete and asphalt. Both materials have their own qualities and applications. Concrete is lighter in color and thus absorbs less heat, and depending on conditions, has a longer service life. Asphalt is the most commonly used paving material and less expensive.

The manufacturing process of concrete can produce significant levels of GHG emissions due to the cement used as a binding agent. Concrete manufacturers can produce less GHG intensive concrete by substituting other binding materials such as fly ash or blast furnace slag. Caltrans is developing specifications for “cool pavements” that can help to minimize urban heat island effect¹⁰. There are also methods to reduce the GHG emissions from asphalt. On average, the use of cold-in-place recycling and full depth reclamation reduces GHG emissions associated with the installation of an asphalt pavement surface by up to 90 percent when compared with conventional methods.

2) Freight Transportation – California Freight Mobility Plan and Sustainable Freight Initiative

To meet an 80 percent GHG emission reduction target by 2050, freight will need to be moved more efficiently and with zero or near-zero emissions wherever possible. The solution will require technology innovation including: development and deployment of zero and near-zero emission engines for trucks, locomotives, cargo handling equipment and ships; lower-emission aircraft; parallel development of the necessary supporting infrastructure; and logistical/operational efficiency improvements to reduce VMT. These same strategies have an equally important role in reducing diesel soot and nitrogen oxides that form regional ozone and fine particles. Recognizing that freight transport plays a key role in California’s economy, the strategies must be implemented in a way that improves California’s competitiveness, providing reliable velocity and expanded system capacity, while integrating with the national and international freight transportation system. However, implementation of the strategies should consider accessibility and affordability to small businesses, independent owner-operators, and rural communities when applicable.

A major focus for ARB over the next several years is the development of a Sustainable Freight Initiative (Initiative) which is a broad, multi-decade effort to develop, fund, and implement the changes necessary to achieve a sustainable freight system. The 2014 Sustainable Freight Strategy (Strategy) is a concentrated, one-year effort to produce a document developed in the context of the broader Initiative and represents the next milestone in defining what is necessary to move California toward a sustainable freight system, building on the vision presented below. Fostering a coalition of freight stakeholders is a primary focus of the Strategy, and will ultimately be a significant driving force behind affecting change in areas outside of ARB’s sphere of influence,

¹⁰ The term “heat island” refers to warmer urban air and surface temperatures that result when natural landscape is replaced with hardscape surfaces such as pavement, buildings and other infrastructure.

Appendix C - Focus Group Working Papers

including advocating at the federal level and acquiring public and private funding for implementation. Complementary efforts to identify a future vision for California's freight system are being carried out by regional transportation planning agencies through their Regional Transportation Plans and Caltrans through the California Freight Mobility Plan development process. ARB's Strategy will integrate closely with these efforts.

Vehicles and Equipment

By 2050, freight transport fleet will need to be zero-emitting wherever feasible. In cases where it will not be possible to replace internal combustion engines, engines will need to be significantly lower-emitting and fueled with low carbon renewable fuel. In some cases, these engines may be able to operate in zero emission mode for part of their duty cycles. The vision includes:

- Zero emission trucks in local and high use freight corridors
Zero emission technologies for trucks include battery-powered electric motors, wayside powered electric motors (e.g., catenary or in-road power), or hydrogen fuel cell powered trucks. Each of these technologies has progressed at least to the demonstration phase, and in the case of smaller trucks, battery-powered vehicles are available commercially in small volumes. However, near-term challenges exist either in terms of cost, vehicle range, payload, and the need for associated infrastructure. Continued investment through demonstration and deployment projects will determine which technology or combination of technologies holds the most promise for long-term deployment for different truck categories and duty cycles. Over time, the proven technologies will be well suited for initial large-scale introduction to local routes and high-use freight corridors such as the routes emanating from the ports.
- Zero and near-zero emission trucks statewide
Practical zero emission technology for longer-haul trucks (such as hydrogen fuel cells) is less developed and presents additional challenges integrating into a nationwide fueling infrastructure. Investment in research and demonstrations will help determine the viability of the technology and identify appropriate uses. However, it may not be feasible for longer-haul trucks to be fully zero emission. In these cases, we envision lower-emitting advanced technology vehicles such as dual-mode trucks capable of operating in zero-emitting mode during part of their duty cycle. Dual-mode trucks could have sufficient battery power to operate in electric-only mode, but would also have an internal combustion engine that provides flexibility for longer routes. Another approach for dual-mode trucks would be the use of wayside power when available, or an internal combustion engine when operating away from wayside power.

In any case, new standard-setting efforts for further efficiency improvements and reduction of GHG emissions from the heavy-duty sector will help catalyze renewed efforts towards a statewide zero and near-zero emission target. ARB is working with U.S. EPA and NHTSA on Phase 2 heavy-duty vehicle standards

Appendix C - Focus Group Working Papers

with a goal of federal promulgation in 2015 and ARB consideration by 2016. These regulations would build on Phase 1 regulations to achieve additional GHG emission reductions

- Zero and near-zero emission freight locomotives
As with the truck sector, a future rail sector operating with zero emissions in high-use freight corridors and operating with near-zero emissions statewide is envisioned for 2050 with significant penetration of advanced technology locomotives by 2035. Several technology categories that could be applied toward freight locomotives to achieve zero emission track miles include overhead catenary (with electric or dual-mode locomotives), battery-hybrid systems (capable of operating in zero emission mode during part of their duty cycle), and linear synchronous motor (LSM) technology. Catenary systems are the most extensively used today, although commonly in passenger train and light-rail applications. Electric freight locomotives are used in other countries, but electric locomotives would need to be engineered for use with trains of the size and length operated in the United States. A significant issue that would have to be addressed with catenary systems is how the transition would be made to non-electrified portions of the rail network given the interstate nature of the rail sector. In addition, because of the high cost and long life span of locomotive engines (up to 30 years), achieving rapid turnover to technologies not yet developed will be a challenge.
- Zero and near-zero emission cargo handling equipment
Cargo handling equipment (such as yard tractors, forklifts, gantry cranes) will need to emit zero emissions wherever feasible by 2050. Technologies under development for on-road applications (battery-electric, fuel cell, hybrid electric) may be transferable to cargo handling equipment, with demonstrations of some of these technologies underway or under consideration. In some cases, grid-based electric powered equipment such as gantry cranes or automated cargo moving systems may be viable zero emission options.
- Cleaner marine vessels
Marine vessels do not hold the promise for full electrification that land-based equipment do; however, there is potential for cleaner, more efficient engines, cleaner, lower-carbon fuel, and use of shore-side electricity (instead of ships' auxiliary engines) to power ships while in berth for loading and unloading of cargo. ARB already has a regulation in place requiring use of shore side power for frequently visiting ships as noted in the *Progress to Date* section, and hybrid tug boats are already being demonstrated. The Ports of Los Angeles and Long Beach have programs in place to incentivize shippers to send their cleanest vessels to California ports via lower docking fees for the cleanest vessels. Mechanisms to attract cleaner, more efficient ships to California should be part of the longer-term control strategy. Ultimately, cleaning up the cargo ship fleet will be dependent on international efforts and the penetration of cleaner, more efficient ships into the fleet.

Appendix C - Focus Group Working Papers

Improved Logistics and Operational Efficiencies

Improved logistics and improved technology and operational efficiencies reduce emissions by reducing VMT, fuel consumption, vehicle and equipment idling times, and cargo handling emissions. The cargo industry has a natural economic incentive to continually improve the efficiency of its operations in order to save money and transport goods to market more quickly. However, government has a role to play in infrastructure improvements and strategy demonstrations to make the system more efficient. In addition, collaboration across the California-Mexico border needs to encourage the reduced idling of trucks making those trips.

Community-Based Strategies

Community-based strategies have the potential to also reduce freight transport emissions. One example is the use of centralized package drop-off and pick-up. Another example is localized production of food and the manufacturing of other goods, which has the co-benefit of reducing VMT—and therefore emissions—related to the transport of those goods to market. California is the leading manufacturing state in the nation, and maintaining and increasing in-state manufacturing will be critical for meeting future emission reduction goals as well as maintaining a strong economy.

3) Low Carbon Fuels and Energy for Transportation – *Beyond 2020*

Low Carbon Fuel Standard

Transformation of the transportation sector will require significant changes to how California moves—from people to goods. Fuel policies complement the vehicle policy drivers mentioned above. The question then becomes, how do we make sure that we are providing rigorous enough fuels policies to help drive the demand for near-zero or zero emission fuels? Agile, performance-based policies—such as a Low Carbon Fuel Standard (LCFS)—have the potential to keep up with the fleet transitions while giving fuel providers ability to develop innovative, lower-emission production technologies to deliver the fuels.

The transition to low carbon fuels began in 2011, with the implementation of LCFS. As we move toward the goal of a ten percent carbon intensity reduction from transportation fuels by 2020, we are seeing a mix of liquid biofuels, natural gas, and a small amount of electricity being used in the marketplace. The use of these fuels and others will continue to grow as long as there are vehicles in the marketplace, progressive policies in place, regulatory certainty, and incentive programs that support research, development, and deployment.

While the LCFS has GHG emission reduction targets set only to 2020, the performance-based regulation provides an agile framework that can be extended beyond 2020 to meet the changing needs and goals of the transportation sector. The LCFS, which

Appendix C - Focus Group Working Papers

depends on both the carbon intensity of the fuel and the efficiency of the vehicle using said fuel, can accommodate the lower-carbon fuels that are coming to market (which is, of course, dependent on the vehicles that are on the road). So while the LCFS may need to be extended beyond 2020 to better suit the regulated parties of the future, conceptually a performance-based program that rewards fuels based on their ability to reduce GHG and criteria pollutant emissions has promise to encourage and continue the necessary transitions needed to fuel transportation.

Fueling Infrastructure

The fueling infrastructure and community integration needs to be convenient and widespread. Alternative fueling infrastructure will need to expand along major travel corridors, accommodating varying travel profiles, including commuting trips and longer distance recreational trips. Careful planning for electricity and hydrogen infrastructure has and will involve State agencies, as well as local planners where corridors traverse between regions and states. An initial infrastructure is in place, including home charging for the majority of electric miles on plug-in vehicles, but a more robust infrastructure will need to evolve in the future. This will include widespread charging at workplace locations, charging in strategic public locations (e.g., shopping centers, hotels, multi-unit housing, etc.), multi-unit dwellings, and a modest network of fast chargers for long-distance trips. State and local policies can encourage the growth of this infrastructure through grants, performance standards, and streamlined local permitting and siting. In addition, the California Green Building Standards Code can provide options for new construction to include wiring necessary to accommodate electric vehicle charging stations. Hydrogen infrastructure, particularly, requires focused State policy support given the large commercial barriers that surround that fuel.

Vehicle-Grid Integration

The transformation of transportation to zero- or near-zero emission technologies will rely on varying amounts of electricity as a fuel, which may require capacity expansion. While it is expected that the necessary infrastructure expansion would come at some cost, data indicated that currently most vehicles charge at night, off-peak. In this way, daily load can be leveled and use of additional renewable resources (wind) can be achieved. The ability to forecast and schedule the charging or discharging of many PEVs could allow the vehicles to serve as flexible resources to help integrate intermittent sources of renewable energy, manage costs of grid operations, and moderate costs of any infrastructure expansions. Real-time energy pricing can play a role in encouraging charging at the most appropriate times. Vehicle-grid integration could offer a range of benefits to grid users, vehicle owners, utilities and system operators. For example, if an electric vehicle supply equipment host site (e.g., employer) controls charging, it may use vehicle-grid integration to control demand charges, system upgrades, etc. Separately, there may be opportunities for a limited number of sites to make use of vehicles' load and storage capabilities. Vehicle-grid integration will require development of supporting policies and regulatory mechanisms as well as a scalable demonstration involving a variety of plug-in vehicles and

Appendix C - Focus Group Working Papers

customers. The California Independent System Operator in coordination with the Energy Commission released a Vehicle-Grid Integration Roadmap in February 2014¹¹.

Wayside Power for Freight

Significant infrastructure investments, both public and private, will be needed to support electrification of the freight transport fleet. This may include electrified truck lanes providing wayside power (e.g. catenary or in-road power) on major freight routes. The I-710 corridor in Southern California has been identified as high priority for introduction of zero emission technology. Wayside power will also be needed to support some of the locomotive and cargo handling strategies contemplated. Given the long timeframes for infrastructure development, infrastructure planning decisions will need to be made before some of the advanced technology vehicles and equipment are ready for mass commercialization. It will be a challenge to coordinate infrastructure development with advanced technology rollout.

IV. Recommended 5-Year Policy Priorities

The section builds upon the *System Outlook* section by identifying the key policy priorities and actions for State agencies to pursue over the next five years. With the long timeframes necessary to realize the full benefits from many of the strategies presented above, it is critical to start planning and implementing as soon as possible in order to put the State on the trajectory for reaching the 2032 air quality and 2050 climate change goals. As these actions and policies are implemented, they will need to be consistent with principles/criteria that ensure access, equity, and benefits to vulnerable communities.

We recommend prioritizing the following activities over the next five years:

- ARB, with local agencies, will coordinate with the development of the 2016 State Implementation Plans that focus on criteria pollutant emission requirements—ensuring State Implementation Plan strategies maximize reductions in GHG emissions as well as criteria pollutant emissions.
- Caltrans and ARB will coordinate on the development of the 2014 California Freight Mobility Plan and the 2040 California Transportation Plan to achieve GHG emission reductions.

Sustainable Communities and Passenger Transportation

- ARB will complete a technical review that will inform the need for an appropriate timing of revisions to the SB 375 regional targets established in 2010.

¹¹ <http://www.caiso.com/Documents/Vehicle-GridIntegrationRoadmap.pdf>

Appendix C - Focus Group Working Papers

- Support regional and local implementation of SCSs by providing access to financial resources and incentives that are necessary to achieve the GHG reduction targets.
- SGC will support MPOs' development of SCSs that reduce GHG emissions:
 - Provide data and tools to increase MPO planning and modeling capacity.
 - Facilitate the sharing of best practices and lessons learned among MPOs.
- SGC will support local leadership to implement the strategies described herein:
 - Identify ongoing resources to incentivize local government planning activities that realize the State's climate change and sustainable community goals.
 - Compile, develop, and disseminate guidance and educational materials regarding local strategies to reduce GHG emissions in the transportation sector.
- SGC will develop guidance for State agencies to help ensure that State infrastructure spending is consistent with the State's Planning Priorities¹² and that these investments promote low-VMT development, where appropriate.
- HCD, through administration of the Regional Housing Needs Allocation (RHNA) and updated housing element certification, will support integrated transportation and housing development, offering more varied and efficient consumer choices.
- HCD will support implementation of SCSs and local plans for affordable infill and TOD, including provisions for active transportation, through administration of low interest loans and grants.
- Governor's Office of Planning and Research will develop new CEQA guidelines for infrastructure projects to increase transit use and active transportation.
- Caltrans will work with local agencies to implement SB 375 SCSs that reduce the emphasis on highway expansion and place new emphasis on maintenance of existing systems, expanded transit and active transportation.
- Caltrans and local agencies will invest in clean passenger transportation from public funding sources including cleaner transit with improved connectivity and active transportation.
- The Authority will complete construction of the initial operating segment of the high-speed rail system in the Central Valley and continue with construction

¹² The State's Planning Priorities can be found in California Government Code Section 65041.1

Appendix C - Focus Group Working Papers

toward the Los Angeles basin to link the northern and southern parts of the State with electrified high-speed rail service.

- The Authority will implement the adopted net-zero greenhouse gas emission construction plan, urban forestry, and open-space and agricultural preservation.
- The Authority will procure renewable energy to test, commission, and operate the high-speed rail system.
- The Authority will provide tools and planning funding resources to local jurisdictions to best capitalize on high-speed rail stations as a catalyst for community economic development, including sustainable infill development.
- The Authority and Caltrans will support regional and urban rail providers in modernizing rail, such as the electrification of Caltrain, and other infrastructure improvements that will result in growing rail ridership on clean, energy-efficient trains.
- The Authority and Caltrans will support the integration of rail and transit operators, through better-coordinated scheduling, ticketing, and navigation so that ridership will grow through faster and more convenient service.
- Caltrans will implement operational efficiency improvements within existing transportation system including, traffic control measures, transportation management and intelligent transportation systems.
- Caltrans will finalize and implement use of “cool pavement” specifications.
- ARB, with local agencies, will provide incentives for zero emission transit buses in strategically-located “Transit Centers of Excellence.” The purpose of the “Transit Centers of Excellence” is to enable large-scale demonstrations of zero emission buses with a deployment goal of 40 buses per center. These efforts will be complementary to ARB’s Zero Emission Bus regulation.
- ARB and the Energy Commission will support expanding markets for zero emission passenger vehicles by continuing State incentives and further implementation of the *ZEV Action Plan*.
- ARB will explore additional vehicle fleet efficiency improvements and further GHG reductions beyond 2025 informed by the 2017 mid-term review of the Advanced Clean Cars program.
- CEC supports research to help make electric vehicles more cost competitive with conventional vehicles such as battery recycling, battery standardization, and second use.

Appendix C - Focus Group Working Papers

- ARB will pursue the following research:
 - Research and review of light-duty zero emission vehicle market for the U.S. GHG/CAFE mid-term review of the 2017-2025 standards in the Advanced Clean Cars program.
 - Data analysis that support emissions inventory improvements to better evaluate the efficacy of emission reduction strategies.
 - Research on the efficacy of SCS strategies and how they can be implemented more equitably.
- CPUC, the Energy Commission, and ARB will pursue the following research:
 - Research to understand the charging/fueling behavior of fleet and residential ZEV drivers. This research will help us understand the evolving infrastructure needs of different ZEV applications.

Freight Transportation

- ARB will develop the 2014 *Sustainable Freight Strategy* that will identify a clear vision and broad-based coalition to develop, fund, and implement a sustainable freight system. The *Strategy* will provide further detail to the vision presented in this document. ARB will work closely with air quality, transportation, and energy agencies at the State, local, and federal levels; cargo owners, including key importers and exporters; the freight transportation industry (ports/marine, rail, trucking, air cargo, warehousing and distribution); business and economic development leaders; environmental and community organizations; academics/researchers; and labor and workforce development interests.
- ARB, with local agencies, should provide funding for advanced technology demonstration projects and pilot deployments of freight transport and other vehicles and equipment. Focus areas for these projects include, but are not limited to: zero emission port trucks for near-dock rail pilot projects; pilot projects to deploy zero emission and hybrid vehicles and equipment at distribution centers located in areas most impacted by air pollution; development and demonstration of advanced technology locomotive, marine vessels, port yard trucks, and other cargo handling equipment.
- ARB will engage the Governor's Office of Planning and Research to expand upon the *ZEV Action Plan* for medium and heavy-duty trucks.
- ARB, with the Energy Commission and Caltrans, will identify infrastructure needs to support full scale deployment of the advanced technologies that show the most promise in the demonstration and pilot phase. These will be coordinated with transportation planning agencies to incorporate into future State and regional plans.
- ARB, with local agencies, will support demonstration programs and evaluate funding and regulatory options for full deployment of zero emission trucks

Appendix C - Focus Group Working Papers

transporting containers between the ports and near-dock rail yards in South Coast Air Basin by 2020.

- Caltrans, ARB, and local agencies will provide resources and funding to ensure zero emission truck-only lanes along the I-710 corridor expansion in Southern California.
- ARB will identify funding for a fleet of advanced technology hybrid demonstration vehicles in the San Joaquin Valley to demonstrate viability of technology in non-dense urban environments where vehicle routes and duty cycles may not be conducive to full electrification.
- ARB and the Energy Commission will support expanding markets for high-efficiency trucks and equipment by continuing State incentives, refining certification procedures, establishing performance standards, and conducting technology demonstrations of the next generation high-efficiency trucks that incorporate greater chassis integration and system design optimization.
- ARB, along with U.S. EPA and NHTSA, will expand upon the existing “Phase I” GHG heavy-duty truck emission standards with a proposed “Phase 2” standard to achieve additional GHG emission reductions for trucks.
- ARB will support development through data collection and sharing of a data/information clearinghouse to provide fleets with better hybrid and zero emission truck performance data in real world usage to validate the reliability and business case of the vehicles, including guidance regarding best usage profiles.
- CEC will continue to support research that advances medium- and heavy-duty natural gas engine and storage technologies, as well as hybridization technologies that will reduce emissions and improve performance.
- ARB will pursue the following research:
 - Data analysis that support emissions inventory improvements to better evaluate the efficacy of targeted regional, corridor or vocation-specific strategies.
 - Evaluate potential for near-term GHG emission reductions through enhanced driver training, real-time vehicle feedback mechanisms, and other in-use approaches.
 - Evaluate the operational challenges associated with integration of the zero and near-zero emission rail technologies with the national rail network, and begin infrastructure planning.

Appendix C - Focus Group Working Papers

Low Carbon Fuels and Energy for Transportation

- ARB will continue to implement and enforce the Low Carbon Fuel Standard.
- ARB will consider extending the Low Carbon Fuel Standard beyond 2020.
- CPUC, the Energy Commission, and ARB will support commercial markets for low-carbon transportation fuels and energy through policy considerations, such as setting reasonable rates for electricity service that encourage electrification.
- ARB and the Energy Commission will continue to evaluate the benefits and availability of renewable transportation fuels.
- CPUC and the Energy Commission will provide support for vehicle-grid integration through policy development and technology demonstrations. Greater vehicle-grid integration will require regulations defining the market roles for customers, service providers, and utilities; research into customer participation; and pilot programs that evaluate technological and economic viability.
- ARB, the Energy Commission, California Department of Food and Agriculture, and CPUC will provide support for low-carbon fuels through: 1) continued funding, if available, for infrastructure; 2) development and adoption of performance and quality standards; and 3) streamlined local permitting, siting, and utility interconnection.
- ARB and CPUC will support plug-in vehicle charging rates that strongly encourage off-peak charging both at home and at public chargers or are responsible to grid operational needs.
- ARB and the Energy Commission will evaluate funding options, regulatory options and policy needs to support development of large-scale and low-carbon production facilities.
- ARB will support CPUC efforts to finalize rules allowing bio methane injection into natural gas pipelines.
- ARB will assess the role of natural gas in the low-carbon transportation fuel future.
- ARB will pursue the following research:
 - Evaluate reactivity of and leak rates from CNG and LNG heavy-duty vehicles.
 - Evaluate the capability of the existing and planned natural gas fueling infrastructure to be utilized for hydrogen distribution.