CALIFORNIA CLEANER FREIGHT COALITION

VISION FOR A SUSTAINABLE FREIGHT SYSTEM IN CALIFORNIA

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CCFC MEMBERS

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EXECUTIVE SUMMARY

Our current system of moving nearly $1 trillion in goods through California is not sustainable: it is taking a huge toll on the health and quality of life of communities surrounding freight-related operations; it is preventing entire regions from meeting national health-based air quality standards; and it is contributing significantly to greenhouse gases that impact the Earth's climate. The California Cleaner Freight Coalition (CCFC) represents a collaborative partnership of organizations committed to an inclusive membership, honest dialogue, respect for differences, and transparent decision-making. The Coalition includes grassroots environmental justice, environmental, science, and health groups in California. The mission of the CCFC is to create transformational changes to the freight transportation system in California in order to protect the public's health, clean the environment, and promote social justice and equity.

Our members have a huge stake in seeing that the current freight system be transformed, and believe that now is the time to lay out the plan for achieving that transformation. This vision document outlines the need for a sustainable freight plan, a description of the types of technologies and transformation that should be pursued, and specific regulatory and other policy recommendations for achieving that transformation. The following table outlines the key regulatory and policy recommendations of the CCFC vision.

CCFC is pleased to see the increased attention by state and local agencies on the issue of freight. We look forward to continuing to work with agencies and decision makers in formulating the actions that will be necessary to transform our freight system into one that ensures the health and welfare of the surrounding communities, regions and planet are protected.

KEY ELEMENTS OF A SUSTAINABLE FREIGHT PLAN

1

ADOPT ZERO-EMISSION TECHNOLOGY MANDATES AND NEXT GENERATION OF ENGINE STANDARDS

- Adopt zero-emission vehicle mandates that will expand and become more stringent over time for buses and freight related equipment, starting with near-term mandates for forklifts, cargo handling equipment, ground support equipment, drayage trucks, urban vocation (last-mile delivery) trucks, and shuttle buses.
- Petition for more stringent federal heavy-duty truck engine NOx standards.
- Adopt more stringent state heavy-duty truck engine NOx standards if EPA delays.
- Revise emission standards for harbor craft to include more stringent NOx and PM limits and include zero-emission mandates for certain harbor craft.
- Expand shore-side power requirements for ocean-going vessels and require use of emission control systems for other vessels.
- Petition for more stringent federal locomotive standards
- Adopt state locomotive standards on intrastate operations that will encourage use of zero-emission and hybrid technologies.

2

ADOPT NEXT GENERATION OF FLEET PURCHASE REQUIREMENTS

- Revise state and local public fleet rules to require expanding purchase mandates for zero-emission technologies.
- Establish zero-emission mandates for port equipment fleets.

3

ADOPT CLEANER FUELS STANDARDS

- Pursue proposed low-emission diesel requirements to achieve emission reductions in older trucks and non-road diesel equipment.

4

ESTABLISH FRAMEWORK FOR COORDINATING INCENTIVES AND REGULATORY REQUIREMENTS FOR FREIGHT ELECTRIFICATION

- Target incentives to early adoption of mandated zero-emission technologies
- Allow for rate-basing of certain electric charging infrastructure.
- Expand implementation of Zero-Emission Vehicle Action Plan to address freight-related vehicles and equipment.

5 REQUIRE THE NEXT GENERATION OF INFRASTRUCTURE

- Align transportation planning with transformation to zero-emission technologies.
- Use planning to prevent "sprawl" of freight-related development.
- Ensure air and other relevant agencies are engaging in environmental review of transportation and site-specific freight-related projects.
- Use indirect-source review authorities to mandate incorporation of infrastructure to support zero-emission technologies.
- Improve coordination with Public Utilities Commission (PUC) on decisions that will affect charging infrastructure development.
- Design infrastructure to create incentives for the adoption of zero-emission technologies, e.g., by limiting access to zero-emission vehicles and trucks.

6 PROTECT, EMPOWER AND ENGAGE IMPACTED COMMUNITIES

- Target incentives for the demonstration and deployment of advanced technologies in impacted communities.
- Adopt meaningful CEQA siting and mitigation guidelines to promote efficiency while at the same time avoiding compounding environmental injustice by adding to the burdens of already overburdened communities.
- Use indirect source review requirements to lower emissions, prevent idling, and build out zero-emission infrastructure at existing freight hubs.
- Create infrastructure that removes truck traffic from communities and facilitates zero-emission corridors.
- Use zoning and access incentives to remove freight activities from residential areas and promote advanced technologies.
- Provide job training and other support for individuals and small businesses to transition away from unsustainable freight activities.
- Work with impacted communities to ensure that they receive a fair share of the economic benefits that goods movement brings to their region.

THE NEED FOR A SUSTAINABLE FREIGHT STRATEGY

California's freight system is massive – generating $700 billion in revenue in 2013.[1] It also has a profoundly negative impact on the health and environment of surrounding communities and on our global climate. Freight pollution disproportionately impacts low-income communities and communities of color that far too often live in close proximity to freight system elements, including freeways, ports, railyards and facilities that generate significant diesel truck and freight contamination. These same communities also disproportionally experience higher asthma rates and other illnesses related to pollution from freight transport and the cumulative impacts from other sources of pollution often also present in these communities. Moreover, these problems only threaten to get worse.

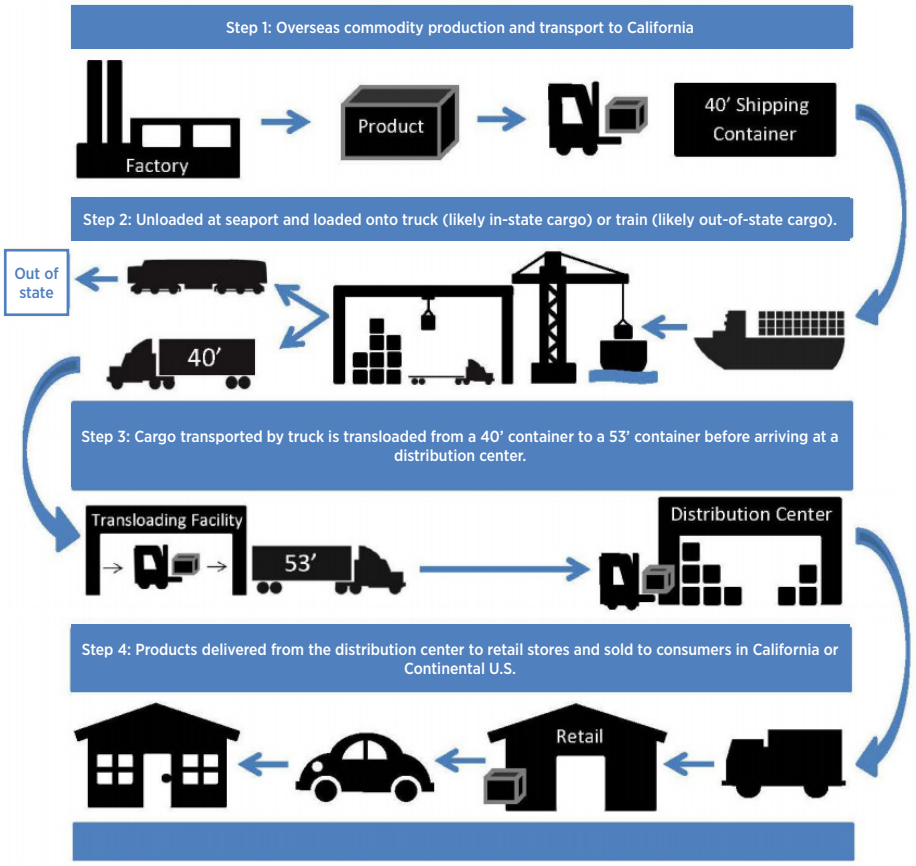
It is beyond time for California to develop a strategy for cleaning up our freight system. California's Air Resources Board (ARB) has released a discussion document outlining possible actions the agency is considering to achieve a clean freight system and draft strategy for regulating mobile sources.[2] But even according to the agency's own assessments of what will be required to meet national health-based standards and greenhouse gas targets, more needs to be done. The California Clean Freight Coalition therefore offers its own vision for creating a clean, modern and sustainable freight system.

WHAT IS THE FREIGHT SYSTEM?

In simple terms, the freight system transports goods from factories to consumers and encompasses many different intermediate sites and modes of transportation. The freight system is comprised of a broad state-wide network of transportation elements involving marine ports, rail yards, airports, warehouses, distribution centers, and refineries. The freight system includes not only international goods movement, but also the movement of local and regional goods throughout California (e.g. the transport of agricultural crops to a processor or the hauling of manufactured products to a warehouse distribution center).

The transport of goods from a domestic or international production factory to consumers may involve various routes within the freight system. ARB has offered a useful graphic for describing the various steps that may be involved in the transport of goods to consumers:[3]

FIGURE 1: Import Supply Chain Example



[1] Air Resources Board, "Sustainable Freight: Pathway to Zero and Near-Zero Emissions" ("Sustainable Freight Strategy") at 10 (April 2015) ("Sustainable Freight Strategy") (available at: http://www.arb.ca.gov/gmp/sfti/sustainable-freight-pathways-to-zero-and-near-zero-emissions-discussion-document.pdf).
[2] Id. at 2; see also, Air Resources Board, "Mobile Source Strategy" (discussion draft Oct. 2015) (available at: http://www.arb.ca.gov/planning/sip/2016sip/2016mobsrc_dd.pdf).
[3] "Sustainable Freight Strategy" at 9.

As this example makes clear, the freight system involves pathways for the transportation of goods by plane, ship, truck, or rail, both domestically or internationally through marine or national border ports of entry. The freight system is a vast network that touches virtually everything we use including food, clothing, and other goods.

PROBLEMS CAUSED BY FREIGHT

Diesel Emissions

Although the freight system is essential for making the movement of goods possible in California, the current emissions produced by the State's freight system have serious health impacts on individuals and entire communities, particularly on those near freight elements, which are disproportionally communities of color and/or low-income residents.[4] The freight system is a major emitter of greenhouse gases (GHGs) and other air pollutants that are known to have a negative effect on the health of communities. The health burdens are particularly carried by communities living near ports, rail yards, highways, airports, and distribution centers. The health impacts on people living near these freight elements is significant considering that in densely populated areas like Southern California, for example, about half of the total population resides less than a mile from a freeway.[5]

Diesel particulate matter (PM) is diesel exhaust emitted by diesel engines. Exposure to significant amounts of diesel PM emissions can lead to premature death and other devastating health impacts including asthma and respiratory impacts,[6] pregnancy complications and adverse reproductive outcomes,[7] cardiac and vascular impairments, and heightened cancer risk.[8] Diesel PM from exhaust is responsible for over two-thirds of the total air toxics health risks in Southern California,[9] and a South Coast Air Quality Management District (SCAQMD) study on air toxics exposure confirms that "diesel particulate continues to be a dominant air toxic pollutant based on cancer risk."[10]

The largest emitters of diesel PM in California are diesel trucks.[11] Diesel PM is also emitted from locomotives, marine vessels, cargo handling equipment and a variety of other diesel equipment used in the freight system. The South Coast air basin and the San Joaquin Valley are the regions with the highest levels of diesel PM emissions in California and in the United States.[12] In the South Coast air basin, which is home to nearly 17 million people, diesel PM emissions averaged 7.40 tons per day in 2012.[13] In the San Joaquin Valley, average daily diesel PM emissions were 4.93 tons per day in 2012.[14] These two regions alone comprised nearly half of total daily diesel PM emissions in California in 2012.[15]

> *"Exposure to significant amounts of diesel PM emissions can lead to premature death and other devastating health impacts including asthma and respiratory impacts, pregnancy complications and adverse reproductive outcomes, cardiac and vascular impairments, and heightened cancer risk."*

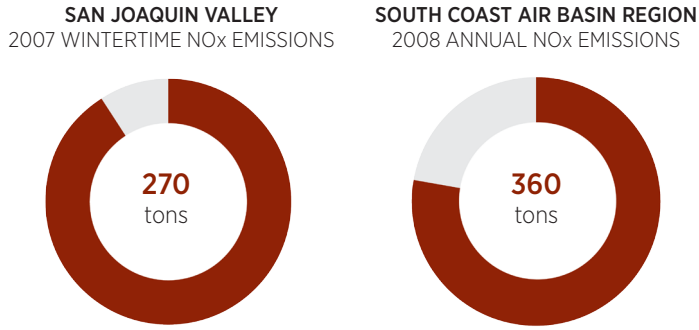
The freight system, particularly the use of diesel trucks for goods movement, is a significant contributor to the high diesel PM emissions in these severely impacted regions. The South Coast air basin is home to the Ports of Los Angeles and Long Beach, as well as rail yards and distribution centers that temporarily house goods shipped into these ports. Likewise, the San Joaquin Valley's highways are important routes for heavy-duty diesel trucks moving goods from farms to processors or from the South Coast ports. ARB estimates that diesel PM from trucks alone contributed to

[4] Arlene Rosenbaum, et al., American Journal of Public Health, "Analysis of Diesel Particulate Matter Health Risk Disparities in Selected US Harbor Areas" at S221 (2011).
[5] UCLA School of Public Health, "Research Highlights" at 2 (Nov. 2012) (available at: http://ph.ucla.edu/sites/default/files/downloads/magazine/fsph.nov2012.research.pdf); Shishan Hu, et al. "A wide area of air pollutant impact downwind of a freeway during pre-sunrise hours," 43 Atmospheric Environment 16 (May 2009).
[6] Jun Wu, et al., "Association between Local Traffic-Generated Air Pollution and Preclampsia and Preterm Delivery in the South Coast Air Basin," 117 Environmental Health Perspectives 11 (Nov. 2009).
[7] Urmila P. Kodavanti, et al., "Vascular and Cardiac Impairments in Rats Inhaling Ozone and Diesel Exhaust Particles," 119 Environmental Health Perspectives 3 (Mar. 2011).
[8] Air Resources Board, "Supplement to the June 2010 Staff Report on Proposed Actions to Further Reduce Diesel Particulate Matter at High-Priority California Railyards" at 18 (July 2011).
[9] South Coast Air Quality Management District, "Final Report: Multiple Air Toxics Exposure Study in the South Coast Air Basin (MATES-IV)" ("MATES-IV") at 6-1 (May 2015).
[10] Id.
[11] See Air Resources Board, "Almanac Emission Projection Data" (2013) (available at: http://www.arb.ca.gov/app/emsinv/2013/emssumcat_query.php?F_YR=2012&F_DIV=-4&F_SEASON=A&SP=2013&F_AREA=CA#6); see also, "Sustainable Freight Strategy" at 58.
[12] "Sustainable Freight Strategy" at 59.
[13] Id.; see also, South Coast Air Quality Management District, "About South Coast AQMD" (available at: http://www.aqmd.gov/home/about).
[14] "Sustainable Freight Strategy" at 59.
[15] Id.

roughly 4,500 premature deaths across California in 2005.[16]

NOx Emissions

Nitrogen oxide (NOx) emissions are produced by the combustion of fuels in various sources, including trucks, cars and other equipment.[17] NOx contributes to the formation of both ozone (i.e. smog) and particulate matter pollution. California's freight system contributes significantly to ozone levels throughout the state, particularly in the San Joaquin Valley and South Coast air basin, which have the worst ozone pollution levels in the U.S. In the San Joaquin Valley, for example, the total 2007 wintertime NOx emissions for on-road motor vehicles was 296.5 tons per day—of this total, 269.5 tons per day came from vehicles used for goods movement, such as heavy and medium duty diesel trucks.[18] In the South Coast air basin region, annual average NOx emissions in 2008 were 462.05 tons per day with 359.91 tons per day coming from equipment related to goods movement.[19] Statewide, ARB estimates that the freight transport system is responsible for 45 percent of NOx emissions.[20]



Unjust Burdens on Communities Closest to Freight Hubs

Communities near freight hubs and along freight corridors bear the disproportionate health burdens of an unsustainable freight system. These are communities largely comprised of low-income residents and people of color.[21] In a study examining communities near four rail yards—BNSF San Bernardino, Union Pacific Commerce, BNSF Hobart, and Union Pacific Intermodal Container Terminal Facility/ Dolores—researchers found maximum individual cancer risks ranging from 180 in one million to 650 in one million.[22] Residential communities closest to the Ports of Los Angeles and Long Beach had increased cancer risks greater than 500 in one million.[23] When the movement of goods slowed during the recent economic recession, studies showed there was a reduction in cancer risks.[24]

In addition to the health impacts caused by diesel PM emissions and related air pollution, the freight system can also have a negative impact on the quality of life for communities near freight hubs. Industrial freight operations create a host of nuisances, including noise, traffic, light and vibrations. The imposition of freight elements in a residential area can also create blight, leading to increased crime and low property values that make it difficult for communities to thrive. It is not uncommon for families living near freight elements to reside next to tall stacks of rusted-out shipping containers, barbed-wire lined chain link fences, and long lines of idling heavy-duty trucks that pose a safety and environmental threat to these communities. In short, the traffic and related toxic operations imposed by freight hubs often change a neighborhood for the worse.

AN UNSUSTAINABLE PATH: PROJECTIONS FOR BIGGER FUTURE PROBLEMS

Although now is the time to develop a clean freight strategy, California is still set on a path toward increased emissions from goods movement. Existing standards and regulations will continue to reduce emissions in the short term, but growth in demand for goods movement will slow and eventually reverse this trend.[25] In fact, Southern California is bracing for an 80 percent increase in truck

[16] Union of Concerned Scientists, "California: Diesel Trucks, Air Pollution and Public Health." Retrieved June 9, 2015, from http://www.ucsusa.org/clean_vehicles/why-clean-cars/air-pollution-and-health/trucks-buses-and-other-commercial-vehicles/diesel-trucks-air-pollution.html#.VXduFPlVhBc.
[17] United States Environmental Protection Agency, "Nitrogen Dioxide." Retrieved October 27, 2015, from http://www.epa.gov/airquality/nitrogenoxides/.
[18] San Joaquin Valley Air Pollution Control District, "Appendix B: Emission Inventory" at B-8 (Dec. 2012) (available at: https://www.valleyair.org/Workshops/postings/2012/12-20-12PM25/FinalVersion/12%20Appendix%20B%20Emission%20Inventory.pdf).
[19] SCAQMD, "2012 AQMP: Appendix III" at Table A-1 (Feb. 2013) (available at: http://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-management-plans/2012-air-quality-management-plan/final-2012-aqmp-(february-2013)/appendix-iii-final-2012.pdf).
[20] "Sustainable Freight Strategy" at 1.
[21] Teagan K. Boehmer, et al., "Residential Proximity to Major Highways — United States," 62 Morbidity and Mortality Weekly Report 46-50 (Nov. 22, 2013) (available at: http://www.cdc.gov/mmwr/preview/mmwrhtml/su6203a8.htm).
[22] Air Resources Board. "Supplement to the June 2010 Staff Report on Proposed Actions to Further Reduce Diesel Particulate Matter at High-Priority California Railyards" at 3 (Table 1) (July 2011) ("Railyard Commitments Report") (available at: http://www.arb.ca.gov/railyard/commitments/suppcomceqa070511.pdf); see also, MATES-IV at 6-2.
[23] Id. at 18.
[24] Id. at 3.
[25] "Sustainable Freight Strategy" at 12.

vehicle-miles traveled (VMT) between 2008 and 2035.[26] By 2035, trucks are expected to make up over 10 percent of the total VMT in Southern California.[27] An increase in the number of shipping containers at the Ports of Los Angeles and Long Beach will accompany this increase in truck VMT. In 2010, container volume at the ports was under 15 million Twenty-Foot Equivalent Units (TEUs), but by 2035, container volume is expected to nearly triple to 43 million TEUs.[28] The increase in goods movement will only further contribute to the toxic air environment many communities are already expected to endure, along with the health implications of this pollution.

Similarly, high levels of growth in goods movement are expected in the San Joaquin Valley. The movement of goods in the San Joaquin Valley is projected to grow by 60 percent from 2007 figures, with roughly 800 million tons of goods projected to be moved in the San Joaquin Valley by 2040.[29] Approximately 93 percent (or 750 million tons) of these goods will be carried on trucks, with just 7 percent being moved via rail.[30] Due to increases in goods moved by truck, the San Joaquin Valley is expecting a substantial increase in truck volume on its main highways, namely Interstate 5 and State Routes 99, 46, and 58: truck volume on Interstate 5 will nearly double by 2040; truck volume on State Routes 46 and 58 will double; and truck volume on State Route 99 will more than double.[31]

Goods movement is expected to grow in other freight hubs within the state. For example, the Port of Stockton will also expand, with an estimated 3.8 percent growth rate and a near tripling in short tons moved between 2011 (2.1 million short tons) and 2040 (6.2 million short tons).[32] With this growth in goods arriving at California ports and being moved on rail and diesel trucks throughout the state, there will also be a demand for more distribution centers and warehouses. The Southern California region expects a 228 million square foot shortfall in warehouse space in the next 20 years.[33] The development of warehouses and distribution centers will continue to occur in areas that are less developed (e.g., the Inland Empire in the South Coast air basin) and that are already grappling with severely

Onyx Bazulto, Westmorland, CA
Comite Civico del Valle

I live in the City of Westmoreland, which lies on State Highway 86 – "the Killer Highway." This large highway serves as a major corridor for the transportation of goods between California and Mexico, in addition to being the main gateway for the Imperial Valley. The loud rumblings, vibration and fumes from the traffic congestion caused by the trucks on this road are a daily experience for me, my family and neighbors. The highway also poses safety threats because it is a major culprit for traffic collisions and pedestrian fatalities. The freight industry creeps into our community and takes over. On a daily basis you'll find long parked rows of idling semis less than ten feet from a low-income housing property.

Since I moved into Westmorland, both my family and I have suffered from terrible allergies and daily asthma symptoms. Apart from living in a rural, desert, and farming community, freight transportation greatly impacts my community's air quality and livelihood. There are solutions to end the suffering from this air pollution. Imperial County already faces some of the highest asthma hospitalization rates in the state and has exceeded standards for air-quality measures. Any reform to help reduce the amount of diesel pollution would relieve the disruption and contamination of my beloved Valley.

[26] Southern California Association of Governments and Freight Works. "On the Move: Southern California Delivers the Goods" at 7 (Dec. 2012) (available at: http://www.camsys.com/pubs/CRGM_OnTheMove_ExecSummary.pdf).
[27] Id. at 14.
[28] Southern California Association of Governments. "Regional Transportation Plan 2012-2035: Sustainable Community Strategy, Towards A Sustainable Future: Goods Movement Appendix" at 7 (April 2012) (available at: http://www.freightworks.org/DocumentLibrary/2012fRTP_GoodsMovement.pdf).
[29] Cambridge Systematics. "San Joaquin Valley Goods Movement Plan: Final Report at 2-20 (Aug. 2013). Retrieved July 16, 2015 from http://www.camsys.com/pubs/2013-07-25%20final%20report.pdf.
[30] Id.
[31] Id. at 2-22.
[32] Id. at 2-24.
[33] Southern California Association of Governments. "Regional Transportation Plan 2012-2035: Sustainable Community Strategy, Towards A Sustainable Future: Goods Movement Appendix" at 12.

polluted air.

Due to this growth in goods movement, current regulations will fall short of emission reduction goals, unless updated to reflect the State's need to transition to zero-emission technology.[34] If California is invested in maintaining a world-class freight system, it must develop regulations and programs that will reduce or entirely eliminate emissions. These regulations and programs will have to spur the transition to zero-emission technology.

THE WAY FORWARD: A VISION FOR ZERO-EMISSION GOODS MOVEMENT

To meet the Clean Air Act's National Ambient Air Quality Standards (NAAQS) for ozone and PM2.5, ARB projects that NOx emissions must be reduced 90 percent below

> *"To meet the Clean Air Act's National Ambient Air Quality Standards (NAAQS) for ozone and PM2.5, ARB projects that NOx emissions must be reduced 90 percent below 2010 levels."*

2010 levels.[35] State and local agencies have recognized that meeting national health-based air quality standards and state greenhouse gas reduction goals under the current status quo is not possible. Instead, ARB has explained "California must take effective, well-coordinated actions to transition to a zero-emission transportation system for both passengers and freight."[36] The remaining portions of the paper look at what such a transition would look like and how it can be achieved.

[34] Id.
[35] Air Resources Board, "Vision for Clean Air: A framework for Air Quality and Climate Planning" at 10 (DRAFT June 27, 2012) ("Vision for Clean Air"); see also "Mobile Source Strategy" at 16 (80 percent below today's levels for attainment of 75 ppb ozone standard in South Coast).
[36] "Sustainable Freight Strategy" at 1.

WHAT A SUSTAINABLE FREIGHT SYSTEM LOOKS LIKE

A sustainable freight system requires a long-term wholesale transformation away from fossil-fueled technologies. Such transformation starts with widespread implementation of zero-emission technologies that are already viable in applications with the potential for significant expansion. Zero-emission technology, such as drivetrains powered by batteries or hydrogen fuel cells, are available for some truck types, as well as forklifts, gantry cranes, and other types of goods movement equipment. As with the early light duty vehicle electrification market, the market faces higher per vehicle costs, vehicle availability, limited manufacturers, and other early market entry barriers including limited fleet experience with the vehicles. These, however, are barriers that can be overcome with the right policies and investments to successfully move the freight system toward zero emission technologies. Increased deployment of these technologies will help create economies of scale. As use of zero-emission technologies grows, prices will fall and the efficiency of those technologies will improve.[37] Growing use of zero-emission technologies will also require greater investment in infrastructure that supports these technologies.

Where short-term adoption of zero-emission technologies is not yet possible, other interim strategies must also be pursued to increase zero-emission miles, and lower emissions from conventional technologies such as through more stringent emission standards and programs mandating cleaner fossil fuels. But these must be viewed as short-term, interim strategies that should be designed to support the longer-term transformation away from fossil fuels altogether.

This section offers a realistic picture of what a sustainable freight system should look like now and in the future, based on technologies that are available now and those that are currently in development.

TRUCKS

Zero-Emission Technologies

Zero-emission truck technology is commercially available for some vehicle applications, including urban delivery trucks.[38] Battery electric engines are particularly well suited to the needs of urban delivery trucks. Urban delivery trucks are driven short ranges on fixed routes, and the limited ranges of battery electric engines are sufficient for that application. They operate at moderate speeds, thereby maximizing battery life. They make frequent stops, allowing for regenerative braking to partially recharge the engine. They are driven during the day and parked at night, allowing for time to recharge batteries. As a result, they can produce cost savings for companies when used efficiently.[39] Companies have already begun adding battery electric delivery trucks to their fleets. Smith Electric's Newton trucks, for example, are currently being used by major corporations such as Staples and Coca Cola. Another Smith Electric customer, Frito Lay, has the largest fleet of all electric trucks, with 176 Smith Newton trucks.[40] UPS

> *"Battery electric engines are particularly well suited to the needs of urban delivery trucks... Companies have already begun adding battery electric delivery trucks to their fleets."*

and FedEx have also added electric trucks to their delivery fleets.[41] A sustainable freight system would require all urban delivery trucks to utilize zero-emission technology powered by increasing amounts of renewable electricity or hydrogen. Converting to zero-emission technology for delivery trucks not only benefits the environment but also saves businesses money.

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[37] Eelco den Boer, et al., CE Delft, "Zero emissions trucks: An overview of state-of-the-art technologies and their potential" at 16-17 (July 2013) ("CE Delft Report") (available at: http://www.theicct.org/sites/default/files/publications/CE_Delft_4841_Zero_emissions_trucks_Def.pdf).
[38] California Hybrid, Efficient and Advanced Truck Center (CalHEAT), "Battery Electric Parcel Delivery Truck Testing and Demonstration" at 17 (August 2013) (available at: http://www.calstart.org/Libraries/CalHEAT_2013_Documents_Presentations/Battery_Electric_Parcel_Delivery_Truck_Testing_and_Demonstration.sflb.ashx).
[39] Id. at 5 ("Data showed that E-Trucks are more efficient than conventional diesel vehicles, with E-Truck efficiency being up to 4 times better than the fuel efficiency of similar diesel vehicles. E-Trucks are also cheaper to operate since they are more efficient and are generally fueled with cheap electricity.")
[40] See Smith Electric's website: http://www.smithelectric.com/.
[41] "Sustainable Freight Strategy" at 25.

A sustainable freight system would also use zero-emission technologies for short haul trucks servicing ports. Ports are currently evaluating zero-emission technology for drayage trucks and yard tractors: the trucks used to move containers from ships to nearby storage lots and the trucks used to move containers within a port. The Port of Los Angeles has been testing battery electric and fuel cell drayage trucks and yard tractors since 2009.[42] These demonstration projects have included trucks manufactured by TransPower and Balqon. Battery life and inverter performance has improved significantly at the Port of Los Angeles over the testing period. Because the Port has found recent data from zero-emission technology demonstration projects to be promising, it is planning for additional rounds of testing to evaluate how battery electric and fuel cell engines perform under a typical operating schedule.[43] Additionally, advanced technologies in the bus market are paving the way for greater use of heavy-duty electrification technologies in the freight sector, providing experience with infrastructure requirements, utility level grid impacts, and electricity pricing.[44]

> *"Fuel cell technology currently provides the most feasible pathway to zero-emission transport. Fuel cell systems are more efficient than diesel systems: they are 50-60% efficient compared to diesel's 37% efficiency rate."*

Experts expect battery life to improve over the next ten to twenty years, with energy densities that are anywhere from 3 times to 10 times greater than current battery energy density.[45] As battery energy densities improve, battery electric drayage trucks will be better able to handle heavy loads and meet the needs of California ports.

For long-haul, heavy-duty trucking, fuel cell technology currently provides the most feasible pathway to zero-emission transport. Fuel cell systems are more efficient than diesel systems: they are 50-60% efficient compared to diesel's 37% efficiency rate.[46] Fuel cells also have shorter refueling times than electric vehicles; electric vehicles need hours to refuel while fuel cells can refuel in minutes.[47] Heavy-duty vehicles with fuel cell engines are still in the development phase. To create a sustainable freight system, California must continue to support demonstration projects to evaluate and refine the technology. In the near-term, fuel cell vehicles should be deployed more widely as challenges associated with hydrogen storage are resolved and heavy-duty fuel cell vehicles become ready for commercialization. Greater investment in hydrogen fuel cell fueling stations and other infrastructure will be necessary in the very near-term to promote greater use of fuel cell vehicles.

Near-Zero-Emission Technologies

Near-zero-emission technologies are important in the short-term, as a means to reduce emissions and commercialize full zero-emission technologies. For example, overhead catenary systems can help provide additional zero-emission miles for diesel or natural gas hybrid electric heavy-duty trucks or full battery-electric heavy-duty trucks.[48] Trucks can connect to catenary systems for part of their route, and travel via electricity instead of diesel. For battery electric vehicles or plug-in hybrid vehicles, the catenary systems help extend range by conserving battery energy. Catenary systems also help reduce the need for energy storage on a

[42] Port of Los Angeles, "Draft Zero Emission White Paper" at 10-11 (July 2015) (available at https://www.portoflosangeles.org/pdf/Zero_Emmissions_White_Paper_DRAFT.pdf).
[43] Id. at 11.
[44] See California Hybrid, Efficient and Advanced Truck Research Center (CalHEAT), "DRAFT CalHEAT Research and Market Transformation Roadmap for Medium- and Heavy-duty Trucks" at 63-64 (February 2013) ("CalHEAT Roadmap") (available at: http://www.calstart.org/Libraries/CalHEAT_2013_Documents_Presentations/CalHEAT_Roadmap_Final_Draft_Rev_7.sflb.ashx).
[45] "CE Delft Report" at 22.
[46] Id. at 49.
[47] Id. at 49-51.
[48] Volvo, for example, is offering a plug-in hybrid heavy-duty truck: http://www.volvotrucks.com/trucks/uk-market/en-gb/trucks/volvo-fe-hybrid/Pages/volvo-fe-hybrid.aspx.

vehicle, allowing for smaller batteries and greater reliance on the catenary.[49] Catenary lines are especially useful on routes that would require a lot of power and potentially drain a battery, such as very hilly routes or routes where vehicles travel with extremely heavy loads.[50] Catenary technology is in use for other applications, such as buses and street cars in some cities, but has not been widely used for goods movement applications yet.[51]

Routes with overhead catenary systems should be viewed as an essential piece of California's sustainable freight system, and development projects and future commercial projects should be focused in areas where communities are overburdened by diesel pollution from heavy-duty trucking. Some examples of high priority areas include the I-710 corridor in Long Beach, the I-880 corridor in Alameda County, and the Grapevine on Interstate 5. Communities along these corridors are exposed to high levels of carcinogenic diesel particulates. In addition, the freight hubs near these high volume goods movement corridors are likely to be at the forefront of adopting new technologies, such as battery electric heavy-duty trucks. Those battery electric heavy-duty trucks will need overhead catenary systems to extend their range. Channeling resources toward greater development of these systems will provide the infrastructure necessary to support greater use of zero-emission equipment in goods movement. Furthermore, regional planning efforts to locate future warehousing and logistics facilities or other freight hubs must be coordinated with zero-emission trucks routes, including catenary roadway systems.

Technologies to extend zero-emission vehicle ranges are under development in the U.S. and Europe now; a sustainable freight system must include additional research and development of these technologies. Siemens is developing catenary systems for goods movement applications in demonstration projects in southern California, Germany, and Sweden.[52] Another manufacturer, Volvo, is developing conductive charging as another technology to provide additional zero-emission miles for trucks with battery electric engines:[53] this method uses either power conducted from metal bars beneath the road or from lines above the

Margaret Gordon, West Oakland, CA
West Oakland Environmental Indicators Project

Margaret Gordon's personal experience with the effects of air pollution led her to become a leader in her community and throughout the region on reducing freight pollution. She noticed her asthma symptoms worsening after her move to West Oakland, and saw her grandchildren being diagnosed with asthma. She connected the dots and realized that pollution from the nearby port and the three freeways that surround the community were harming her family's and her community's health.

In 2002, she co-founded the West Oakland Environmental Indicators Project (WOEIP) to improve air quality and protect the community from pollution. WOEIP has succeeded in working with the Port of Oakland to create an air quality improvement plan, but many more hurdles remain. Emissions from diesel truck traffic and port activities continue to impact the community, particularly as a developer proposes to move coal from Utah through the Port of Oakland. Ms. Gordon is fighting the proposal and raising concerns about the effects of fugitive coal dust on her already overburdened community.

[49] "CE Delft Report" at 45.
[50] Id.
[51] Gladstein, Neandross and Associates on behalf of the California Cleaner Freight Coalition, "Moving California Forward: Zero and Low-Emission Goods Movement Pathways" at 15 (November 2013) (available at: http://www.ucsusa.org/sites/default/files/legacy/assets/documents/clean_vehicles/Moving-California-Forward-Report.PDF).
[52] Siemens, "Siemens builds first eHighway in Sweden." (June 04, 2015)(available at http://www.siemens.com/press/en/pressrelease/?press=/en/pressrelease/2015/mobility/pr2015060246moen.htm&content[]=MO).
[53] Volvo Group, "The road of tomorrow is electric"(May 23, 2013) (available at http://news.volvogroup.com/2013/05/23/the-road-of-tomorrow-is-electric/).

road's surface.[54] Yet another company, Scania, is testing inductive charging (or wireless charging) along roadways, with enough power to charge city buses or heavy-duty trucks.[55] In the near-term, California's sustainable freight system should include zero and near-zero-emission trucks with extended range made possible by catenary systems or inductive/conductive charging systems.

Hybrid trucks are also an essential piece of the sustainable freight system; more widespread use of hybrid heavy-duty trucks will help manufacturers refine technologies so that fully zero-emission trucks are developed and commercialized more quickly for all applications. Hybrids have electric drive systems but receive power from diesel or natural gas engines.[56] Manufacturers are developing hybrid drayage trucks that can operate as zero-emission vehicles for short ranges.[57] These trucks could reduce emissions at and near ports by operating in zero-emission mode within a certain radius of a port. In addition, they can be commercialized quickly and are cost-effective for operators due to fuel savings.[58] Hybrid trucks provide multiple benefits to the freight system and should be prioritized as an integral step toward commercially available zero-emission technologies for heavy-duty trucks.

Finally, efforts to further reduce climate change and criteria emissions from conventionally powered diesel and natural gas trucks, including new standards and stepped up enforcement efforts, must continue. The vast majority of new and in-use freight trucks and equipment are powered by gasoline and diesel engines. Moving towards a more sustainable freight system relying on electrification technologies will take time and further efforts to address emissions from conventional technologies will be critical in the interim. Federal Phase II greenhouse gas standards that are expected to be finalized in 2016 will increase truck efficiency and lower climate emissions over the next 10 to 15 years.[59] Even greater emission reductions are feasible by 2030.[60] In addition, greater reductions in nitrogen oxides (which are necessary to achieve air quality standards in CA) are possible in this timeframe as emission control technologies advance. California and federal standards on climate and criteria emissions are especially critical for freight applications like long-haul heavy-duty trucks and locomotives where zero-emission technologies are likely to take longer to deploy or which may rely more heavily on volume-limited lower carbon biofuels and more conventional emission control systems to achieve very low pollutant levels.

SUPPORT EQUIPMENT

Support equipment includes the equipment that moves cargo at ports, distribution centers, and airports. Some examples are forklifts, gantry cranes, and pallet jacks. Many types of support equipment are prime candidates for a transition to zero-emission technologies, like battery electric engines because they make repetitive short trips during the work day, are centrally fueled, and have time to recharge. Specific examples of zero-emission support equipment that should be part of California's sustainable freight system are discussed below.

Cargo Handling Equipment

Zero-emissions technology is viable for many types of cargo handling equipment but according to a 2012 report by California air agencies, use of these technologies is limited.[61] Electric gantry cranes, for example, have been available commercially for years but are not widely used at California ports.[62] Both battery electric and fuel cell forklifts are viable options, but in many places they are not used. Walmart, for example, has added fuel cell forklifts to its fleets.[63] In fact, the California air agencies' report stated that there were "demonstrations under discussion" even though there are zero-emission forklift options that could be used now.[64] Use of existing zero-emission forklifts and gantry cranes at ports, warehouses, and distribution centers throughout the state must be a near-term priority

[54] Fast CoExist, "Volvo Tests A Road That Can Charge Cars And Trucks" (August 2013) (available at http://www.fastcoexist.com/3016069/futurist-forum/volvo-tests-a-road-that-can-charge-cars-and-trucks).
[55] Scania, "Scania drives development for electrified roads" (March 13, 2014) (available at http://newsroom.scania.com/en-group/2014/03/13/scania-drives-development-for-electrified-roads/).
[56] Air Resources Board, "Heavy-Duty Fuels and Technology Assessment" at 12 (Draft April 2015) ("ARB Tech. Assessment") (available at: http://www.arb.ca.gov/msprog/tech/techreport/ta_overview_v_4_3_2015_final_pdf.pdf).
[57] Port of Los Angeles, "Zero Emission White Paper" at 9.
[58] "ARB Tech. Assessment" at 12.
[59] See 80 Fed. Reg. 40138 (July 13, 2015) (proposed heavy-duty truck rule).
[60] See Ben Sharpe, ICCT, "What is at stake in the U.S. truck efficiency rule" (August 12, 2015) (available at: http://www.theicct.org/blogs/staff/what-stake-us-truck-efficiency-rule).
[61] Air Resources Board, "Vision for Clean Air" at Appendix A, 25-26.
[62] Id. at Appendix A, 25 (The status of battery-electric gantry cranes is listed as "demonstration under discussion."); "ARB Tech. Assessment" at 10 ("Electric cable reel or bus bar [rubber tired gantry cranes] and rail mounted gantry cranes (RMG) are a mature technology used at the automated foreign ports with the first delivered in 2002.")
[63] "Sustainable Freight Strategy" at 25.
[64] "Vision for Clean Air" at 25.

for building out a sustainable freight system.

Ground Support Equipment

Ground support equipment is the equipment used to move cargo at airports, such as tugs, tractors, container loaders, and buses. Zero-emission ground support equipment is commercially available for baggage tugs, tow tractors, lavatory service trucks, water trucks, and belt loaders.[65] The electric belt loaders are manufactured by at least three different companies: TLD, Tug Technologies Corporation, and Charlatte America.[66] The electric baggage tug is manufactured by at least four different companies: Charlatte America, Tug Technologies Corporation, Tronair, and Eagle Tugs.[67]

In March 2015, the Bay Area Air Quality Management District granted $2.5 million to United Airlines to fund the purchase of 87 pieces of zero-emission ground support equipment at San Francisco International Airport.[68] Prior to this announcement, San Francisco International Airport had 300 all-electric pieces of ground support equipment in service.[69] California is not the only state transitioning to zero-emission ground support equipment: fuel cell ground support equipment is already in use at Memphis International Airport.[70]

A sustainable freight system would employ zero-emission ground support equipment wherever possible, especially given the severe air quality and environmental health impacts of airports on nearby communities. Zero-emission ground support equipment provides an opportunity to reduce some of that impact and advance the development of zero-emission technologies more broadly.

Commercial Harbor Craft

Commercial harbor craft includes a wide range of vessels, but tugboats are the equipment type most relevant for the freight system. Because tugboats stay within the confines of the harbor, they are good candidates for battery electric power. Diesel electric hybrid tugboats already have been demonstrated at the Ports of Los Angeles and Long Beach. The first hybrid tugboat was demonstrated at the Ports

> *"Hybrid diesel electric tugboats have seen 50 percent reductions in NOx emissions and 70 percent reductions in diesel PM."*

in 2009, and a second began operating in 2012.[71] Diesel electric tugboats are also operating in Europe.[72] Hybrid diesel electric tugboats have seen 50 percent reductions in NOx emissions and 70 percent reductions in diesel PM.[73] More widespread use of hybrid tugboats is essential for the development of California's sustainable freight system, by providing near-term emission reductions and also as a necessary stepping stone to the development of full electric, zero-emission vessels.

OCEAN-GOING VESSELS

Zero-emission technologies for ocean-going vessels are still under development. In the near-term, however, vessels can reduce emissions while in harbor by using shore-side power. While docked, ships can use shore-side electricity to power support equipment on board, such as lighting, cooling, and ventilation.[74] Shore-side power is commercially available from various manufacturers, and ARB has already adopted regulations requiring its use in some settings.[75] The Middle Harbor terminal at the Port of Long Beach is already incorporating shore-side technology as part of its redevelopment plans, demonstrating the availability of this technology.[76] California's sustainable freight system

[65] "ARB Tech. Assessment" at 9-10; Charlatte America, Products (available at http://www.charlatteamerica.com/products).
[66] "ARB Tech. Assessment" at 9.
[67] Id. at 10.
[68] Bay Area Air Quality Management District, "Air District Awards $2.5 Million to United Airlines for Zero-Emission Equipment at SFO" (March 2015) (available at http://www.baaqmd.gov/~/media/files/communications-and-outreach/publications/news-releases/2015/2015-025-airportequipmentgrant-031815.pdf?la=en).
[69] San Francisco International Airport, "San Francisco International Airport 2011 Environmental Sustainability Report" at 58 (December 2011) (available at: http://flysfo.proofic.net.s3.amazonaws.com/default/download/about/reports/pdf/SFO_2011_Environmental_Sustainability_Report.pdf).
[70] Dept. of Energy, "World's First Fuel Cell Cargo Trucks Deployed at U.S. Airport" (June 10, 2015) (available at http://energy.gov/eere/articles/worlds-first-fuel-cell-cargo-trucks-deployed-us-airport).
[71] David A. Tyler, The Professional Mariner,"Foss's second hybrid tugboat employs new, more-powerful lithium polymer batteries" (August 22, 2012) (available at: http://www.professionalmariner.com/September-2012/Fosss-second-hybrid-tugboat-employs-new-more-powerful-lithium-polymer-batteries/).
[72] EV World, "Europe's First Hybrid-Electric Tugboat Goes Into Service" (June 15, 2012) (available at: http://evworld.com/news.cfm?newsid=28150).
[73] "Vision for Clean Air" at Appendix A, 31.
[74] "ARB Tech. Assessment" at 15.
[75] Id.
[76] Port of Long Beach, Middle Harbor (available at http://www.polb.com/about/projects/middleharbor.asp); Middle Harbor Redevelopment Project (available at: http://www.middleharbor.com/).

should require universal use of shore-side power, especially given that shore-side power is now in the early stages of commercialization. Like overhead catenary systems, shore-side power can provide emission reductions that benefit overburdened communities adjacent to ports.

The Advanced Maritime Emissions Control System (AMECS) is an alternative to shore-side power for ocean-going vessels. AMECS attaches to the exhaust port of a vessel and scrubs the exhaust of 90-99 percent of PM10, PM2.5, NOx, and SO2 emitted.[77] It is a good alternative for vessels that are not retrofitted to be able to access shore-side power. AMECS can be housed on the shore or on a barge and can move from vessel to vessel, even reaching vessels docked off-shore.[78] A sustainable freight system should utilize AMECS in addition to shore-side power, and should actively seek out innovative new technologies to address emissions from ocean-going vessels and all other freight equipment.

Companies are exploring zero-emission technologies for ocean-going vessels, and the sustainable freight system should encourage the development of these technologies through funding for demonstration projects. The first zero-emission ferry was constructed and operated earlier this year, and experts predict that new technology developments such as conversion to liquefied natural gas and hybrid technologies will reduce emissions for other types of ocean-going vessels, with an ultimate goal of developing zero-emission engines for ocean-going vessels.[79] Just as other technologies, such as forklifts and medium-duty trucks, have benefitted from dedicated funding for research and development, funding demonstration projects for ocean-going vessels would accelerate progress toward the development and commercialization of zero-emission technologies.

LOCOMOTIVES

Zero-emission technology developments for locomotives lag behind trucks and support equipment, but there are technologies that can reduce emissions from locomotives in the near-term. The near-term focus should be on increasing the amount of zero-emission miles locomotives travel. This can be accomplished using catenary systems, hybrid diesel-electric locomotives, and battery tender cars.[80] Catenary systems, as with trucks, involve using overhead wires to connect the train to electricity. Hybrid diesel-electric locomotives rely on batteries that store energy released during braking and reuse it when more power is needed. Battery tender cars are similar to the hybrid diesel-electric technology, but a battery tender car is an entire rail car devoted to batteries. Those batteries can power the locomotive without any power from diesel fuel for a short range. Battery tender cars would be a way to increase the amount of zero-emission miles traveled through highly polluted areas.[81]

In addition to technologies to achieve zero-emission miles, technologies are available today to reduce emissions from conventionally-fueled locomotives. LNG has emerged as a promising alternative fuel that produces fewer NOx and PM emissions than diesel fuel. There are also technologies available that can reduce emissions from existing engines. One example is the Advanced Locomotive Emission Control System ("ALECS"). ALECS captures and treats exhaust from locomotives while they idle at the railyard, using scrubbers that remove particulate matter and SOx along with selective catalytic reduction ("SCR") technology to remove NOx.[82] Locomotives do not need any modification to be able to use the ALECS system, so it could be installed in railyards in heavily polluted areas now.

[77] Advanced Cleanup Technologies, AMECS (available at http://www.advancedcleanup.com/index.php?article=31).
[78] Hesse, Danielle, "Port of Long Beach to test promising technology to reduce ship emissions" (March 19, 2014) (available at: http://switchboard.nrdc.org/blogs/mwyenn/port_of_long_beach_to_test_pro.html).
[79] Siemens, "First electrical car ferry in the world in operation in Norway now" (May 19, 2015) (available at: http://www.siemens.com/press/en/feature/2015/corporate/2015-05-e-ferry.php); Wallenius Wilhelmsen Logistics. "Zero Emission Future" (available at http://www.2wglobal.com/sustainability/responsible-logistics/environmental-frontrunner/zero-emission-future/#.VfBhK_lVhBc).
[80] See Gladstein, Neandross and Associates on behalf of the California Cleaner Freight Coalition, "Moving California Forward: Zero and Low-Emission Goods Movement Pathways" at 33-36 (Nov. 2013); Frank Stodolsk, Argonne National Laboratory, "Railroad and Locomotive Technology Roadmap" at 45-48 (December 2002) (available at: http://www.ga.com/websites/ga/docs/transportation/ecco/Railroad%20and%20Locomotive%20Technology%20Roadmap.pdf); BNSF Railway, "Green Technology"(available at http://www.bnsf.com/communities/bnsf-and-the-environment/green-technology/); Air Resources Board, "Freight Locomotive Advanced Technology Assessment" at 26-50 (September 3, 2014) (available at http://www.arb.ca.gov/msprog/tech/presentation/rail.pdf); "ARB Tech. Assessment" at 13 and 28.
[81] Gladstein, Neandross and Associates on behalf of the California Cleaner Freight Coalition, at 34.
[82] Advanced Cleanup Technologies, Inc., "Emissions Control System" http://www.advancedcleanup.com/index.php?article=2.

MAKING THE SUSTAINABLE VISION A REALITY

Achieving a sustainable freight system will require a major effort and poses a number of challenges. The one thing we know, however, is that a sustainable freight system will not be achieved by delaying meaningful action and maintaining the status quo. In developing a sustainable freight plan, agencies must adhere to the following general principles. These will ensure that meaningful action is not delayed and that a plan is put in place that has the greatest likelihood of success.

PRINCIPLES THAT SHOULD GOVERN DEVELOPMENT OF A SUSTAINABLE FREIGHT PLAN

Work Backwards from Zero

ARB has repeatedly acknowledged that to meet both health-based standards and greenhouse gas reduction targets, mobile sources, both on-road and off-road, must transition predominantly to zero-emission technologies. The benefit of needing such transformational change is that we know that we do not have many choices and do not need to "wait to see how things develop." We know where we need to go and can work backwards from that ultimate outcome. Such an analysis needs to look at the technologies that need to be promoted, the barriers that need to be overcome, and the timing for achieving all of these steps.

Various analyses have modeled what this transformation might look like.[83] In general, these analyses show that to achieve federal health-based air quality standards and state greenhouse reduction goals, near-term regulatory measures are needed to rapidly accelerate the adoption of zero-emission technologies. Waiting to require this adoption – either by general inaction or by adopting measures that fail to mandate zero-emission technologies – assures that needed emission reductions will not be achieved.

Preparing an action plan that will achieve widespread adoption of zero-emission technologies in the timeframes necessary to meet applicable standards requires a detailed roadmap of the strategies for overcoming barriers to that ultimate goal, and the near-term and long-term measures that will be adopted to achieve that goal and implement those strategies. Working backwards from that ultimate goal is critical if there is to be any chance of actually achieving it.

Adopt Technology-Forcing Regulations to Provide the Necessary "Clear Market Signal" for Manufacturers and Operators

To achieve the sort of transformation that will be required to create a sustainable freight system, companies need to rapidly develop and commercialize zero-emission technologies. That development will not happen unless companies know that there will be a market for those new technologies. Repeatedly, analyses have concluded that the only way to provide that clear market signal is through the adoption of regulations mandating the sale and/or purchase of these new vehicles.[84] Incentives and limited pilot projects

[83] See, e.g. "Vision For Clean Air"; Lew Fulton and Marshall Miller, National Center for Sustainable Transportation, "Strategies for Transitioning to Low-Carbon emission Trucks in the United States" (June 2015) (available at: http://ncst.ucdavis.edu/wp-content/uploads/2014/08/06-11-2015-06-11-2015-STEPS-NCST-Low-carbon-Trucks-in-US-06-10-2015.pdf); Benjamin Rodriguez Sharpe, "Examining the Costs and Benefits of Technology Pathways for Reducing Fuel Use and Emissions from On-road Heavy-duty Vehicles in California" dissertation thesis, U.C. Davis (2013) (available at: http://www.its.ucdavis.edu/research/publications/publication-detail/?pub_id=1961); "CalHEAT Roadmap."

[84] See, e.g., Port of Los Angeles, "Zero Emission White Paper" at 55 ("The fastest scenario for widespread implementation of zero emission technologies to occur is if a national or statewide regulatory requirement for their use is imposed. At a minimum, a statewide requirement would attract OEM participation by signaling a strong and reliable market, presumably large scale, and thereby (hopefully) drive down costs closer to conventional truck costs, while not imposing a competitive disadvantage to particular region, industry or facility."); "CalHEAT Roadmap" at 16 (assuming "[a]ggressive new state and federal regulations by 2020 that motivate manufacturers to produce, and fleets to purchase, large numbers of advanced technology vehicles"); Eelco den Boer, et al., CE Delft, "Zero emissions trucks: An overview of state-of-the-art technologies and their potential" at 105 (July 2013) ("The widespread uptake of zero emissions vehicles and the distribution of a fuel/charging network therefore requires support by anEU strategy that provides clear long term signals to the trucking industry. Therefore, a roadmap for the introduction of zero emissions trucks needs to be developed and needs to be supported by a full policy package. This policy package should swiftly change from stimulation to regulations in order to reach the European goal of reducing GHG emissions from transport with 60% by 2050 as compared to 1990, a goal set in the European Commission's White Paper on Transport."); Fulton and Miller, "Strategies for Transitioning to Low-Carbon emission Trucks in the United States" at 39 ("Currently at a national and state level, virtually no policies are in place to encourage the uptake of ZEV medium- and heavy-duty trucks. The main CO2e reduction policy in place is fuel economy/GHG standards, and while these will be tightened in 2016, they will not likely promote the adoption of ZEV trucks without additional supporting policies.").

PRINCIPLES THAT SHOULD GOVERN DEVELOPMENT OF A SUSTAINABLE FREIGHT PLAN

1

WORK BACKWARDS FROM ZERO

On-road and off-road mobile sources must transition predominantly to zero-emission technologies. Near-term regulatory measures are needed to rapidly accelerate the adoption of zero-emission technologies.

2

ADOPT TECHNOLOGY-FORCING REGULATIONS TO PROVIDE THE NECESSARY "CLEAR MARKET SIGNAL" FOR MANUFACTURERS AND OPERATORS

Create a market for companies to rapidly develop and commercialize zero-emission technologies by adopting regulations mandating the sale and/or purchase of these new zero-emission vehicles.

3

BUILD MOMENTUM, ECONOMIES OF SCALE, SUPPLY CHAINS, AND TECHNOLOGY DEMONSTRATION BY INCLUDING NEAR-TERM MEASURES THAT REQUIRE ZERO-EMISSION TECHNOLOGIES IN THE MOST FEASIBLE CATEGORIES FIRST

Zero-emission mandate regulations should more aggressively target those advanced technology vehicle types that are closest to commercialization.

4

ADOPT MEASURES NOW TO PROVIDE SUFFICIENT LEAD-TIME

Provide sufficient lead-time between the time the regulation is adopted and the time compliance will be required.

5

USE INCENTIVES TO SUPPLEMENT RATHER THAN REPLACE TECHNOLOGY-FORCING REGULATORY REQUIREMENTS

Incentives should be coupled with regulatory requirements to promote research and development and early compliance.

6

IMPROVE COORDINATION BETWEEN AIR PLANNING, ENERGY, TRANSPORTATION AGENCIES AND UTILITY REGULATORS TO FOCUS ON INFRASTRUCTURE DEVELOPMENT AND POLICY CHANGES NEEDED TO SUPPORT DEPLOYMENT OF ZERO EMISSION VEHICLES

Align agency goals and continue close coordination on investments in technology development and deployment, as well as infrastructure.

7

BUILD AND LEVERAGE PARTNERSHIPS WITH OTHER REGIONS, STATES, OR COUNTRIES TO BUILD DEMAND FOR ZERO-EMISSIONS FREIGHT TECHNOLOGIES

Explore compacts that expand the applicability of California standards on freight-related equipment. Continue to leverage and expand national and international partnerships to support markets for zero-emission passenger vehicles and freight-related equipment.

8

EDUCATE, EMPOWER AND INVOLVE RESIDENTS OF IMPACTED COMMUNITIES AND PROVIDE MEANINGFUL OPPORTUNITIES FOR PUBLIC PARTICIPATION ON THESE ISSUES

Solutions must include targeted subsidies, job training, and smart infrastructure planning to support individuals and small businesses. Education and other capacity building must be part of the effort to ensure that community members are allowed to participate in a meaningful way.

are insufficient to support the industry-wide investment that will be necessary to spur innovation, create necessary supply chains, and enable economies of scale. Even regulations with long lead-times provide better certainty for guiding investments in research and development than the current policies that rely on project-specific subsidies and focus on demonstration projects. While these current policies have aided pre-market prototype development, these policies now need to be supplemented with technology-forcing regulatory mandates to set clear long-term direction, spur commercialization and deployment, and level the playing field for manufacturers and operators.

Build Momentum, Economies of Scale, Supply Chains, and Technology Demonstration by Including Near-Term Measures that Require Zero-Emission Technologies in the Most Feasible Categories First

The type of technological transformation needed to address the pollution problems caused by freight will require the development of new markets for not only the end vehicles, but also for all of the components and technologies that will go into these advanced vehicles. Development of these new manufacturing markets will be key to advancing these technologies and bringing down costs.

To spur these markets, zero-emission mandate regulations should more aggressively target those advanced technology vehicle types that are closest to commercialization (or that are already commercially available). This may mean starting with vehicle types that have limited ranges and therefore represent smaller portions of the overall emissions from the freight system, and vehicle categories outside the freight system such as urban transit buses, where application duty-cycles and vehicle attributes such as weight and power requirements are similar to freight applications. But requiring the deployment of zero-emission technologies for the vehicle types where such technologies are closest to commercialization will help demonstrate the viability of these technologies for those equipment types that are farther behind in the development process and will create the component manufacturing and supply chains that will be needed to support expanding advanced technologies to these other equipment types. Examples of technologies where more rapid deployment of zero-emission technologies is possible include urban buses and shuttles, ground support equipment, forklifts, other on-port equipment, and urban vocational trucks.[85] As outlined below, more aggressive zero-emission technology mandates with shorter lead times should be adopted for these vehicle categories.[86] Such action will enable the technology and market development that will support expansion of these mandates to other categories of freight equipment.

Adopt Measures Now to Provide Sufficient Lead-Time

Another key to developing these advanced technologies is to provide sufficient lead-time between the time the regulation is adopted and the time compliance will be required. Courts have explained that agencies can set standards that are premised on predictions of the technologies that industry will be able to develop over the lead time provided by the rule.[87] Such lead time allows regulations to be technology-forcing (i.e., to force the development of new technologies by setting standards that cannot be met with current technologies) while at the same time providing the necessary clear signal that there will be a market for new advanced technologies. To provide this lead time and still meet the 2023 and 2032 deadlines for meeting national ozone standards in Los Angeles and the San Joaquin Valley, as well as the 2030 and 2050 greenhouse gas reduction targets, will require that agencies adopt measures now. As noted above, agencies must work backwards from the ultimate transformation required to meet these health and greenhouse gas reduction targets and consider when regulations must be adopted in order to provide sufficient lead time.

Use Incentives to Supplement Rather than Replace Technology-Forcing Regulatory Requirements

Incentives can be useful both in the development and early deployment phases of introducing new technologies. These incentives alone, however, will be insufficient to drive the scale of development and deployment that will be necessary to transform our freight system. Instead, incentives should be coupled with regulatory requirements to promote research and development and early compliance. Transformation to zero-emission technologies will require market certainty to support the necessary investment in development and deployment, and incentives alone cannot provide that certainty. Mandatory requirements must be

[85] See "ARB Tech. Assessment."
[86] See, e.g., den Boer, et al., "Zero emissions trucks: An overview of state-of-the-art technologies and their potential" at 101: ("[A]dvanced concepts are already being introduced in many countries for both urban bus transport and for the city distribution of goods. Therefore, policy incentives could first be directed to these urban applications and increasingly expanded to intercity and long haul applications after implementation success is seen in urban applications.").
[87] See, e.g., Natural Res. Def. Council v. EPA, 655 F.2d 318, 331 (D.C. Cir. 1981) (holding an agency "will have demonstrated the reasonableness of its basis for projection if it answers any theoretical objections to the [predicted control technology], identifies the major steps necessary in refinement of the technology, and offers plausible reasons for believing that each of those steps can be completed in the time available").

adopted as well. Adoption of regulations will also help guide the most fruitful investment of limited incentive funds. Providing clear direction on the standards that must be achieved and the categories of vehicles that will be subject to the earliest requirements will provide useful parameters for investment strategies.

Improve Coordination Between Air Planning, Energy, Transportation Agencies and Utility Regulators to Focus on Infrastructure Development and Policy Changes Needed to Support Deployment of Zero Emission Vehicles

The Governor's recent executive order on freight[88] recognizes the need to coordinate actions to not only promote advanced technologies but also ensure the development of the new infrastructure necessary to support those technologies.[89] Zero-emission technologies available now, such as battery electric vehicles and fuel cell vehicles, have been demonstrated and tested at ports and on roads, but without infrastructure, their use cannot expand beyond the pilot/development stage. These technologies require networks of fueling stations or other recharging opportunities along their routes.

This will require a different relationship between air and transportation agencies. In the past, air agencies prepared the plans for meeting the various health and greenhouse gas targets, and transportation agencies assessed how those plans might or might not constrain their own projects. Now, transportation agencies must be active participants in designing affirmative solutions.

Greater electrification in the freight sector also requires close coordination between air and transportation agencies and as well as the Energy Commission (CEC) and Public Utilities Commission (PUC). ARB and CEC have increased coordination over the years on investment decisions on light and heavy-duty vehicles and infrastructure. A fundamental transformation of the freight sector in California will require alignment of agency goals and continued close coordination on investments in technology development and deployment, as well as infrastructure. As with the first recommendation, agencies will benefit from working backwards from zero. A number of analyses have looked at not only the technological steps that will be required for the widespread

> *"This will require a different level of interaction between air planning agencies and transportation agencies, utilities, utility regulators, and energy agencies."*

commercialization of zero-emitting technologies, but also at how infrastructure will need to be changed.[90] But this will require a different level of interaction between air planning agencies and transportation agencies, utilities, utility regulators, and energy agencies. Transportation planning must become more than an assessment of what will be allowed or consistent with air quality plans, and instead must be a strategic component of those plans to demonstrate how transportation projects will support the air plan's assumptions about the feasibility of zero-emitting technologies.

Build and Leverage Partnerships with Other Regions, States, or Countries to Build Demand for Zero-Emissions Freight Technologies

Investment in advanced zero-emission technologies will be driven not only by having the certainty of future markets but also by the size of those markets. National zero-emission mandates for freight-related sources would be ideal to create a strong market for these advanced technologies, but even without national regulations, California has the ability to expand the market for these technologies beyond the borders of the State. Under the Clean Air Act, other states violating national air quality standards have the option of requiring manufacturers to meet California mobile source standards.[91] Relying on this authority, California has entered into agreements with other states to promote the broader deployment of zero-emission passenger vehicles.[92] Similar compacts should be explored for expanding the applicability of California standards on freight-related equipment.

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[88] Executive Order B-32-15 (July 17, 2017)

[89] Fulton and Miller, "Strategies for Transitioning to Low-Carbon emission Trucks in the United States" at 42 ("A critical element for the introduction of ZEV truck technology is refueling infrastructure. While electric trucks will benefit from the well-developed grid system, and to some degree from recharging systems being installed for light-duty vehicles, recharging stations dedicated and suitable for their needs (geared toward high capacity battery systems, fast charging needs) and in suitable locations (e.g. industrial areas, truck stops) will be needed, and should become more of a priority as the light-duty vehicle recharging infrastructure system becomes adequate. . . . Given the High ZEV scenario presented in this report, such infrastructure planning is needed now, with demonstration projects and roll-outs focused on trucks (along with truck models being introduced)— starting within perhaps three to five years.").

[90] See, e.g., Governor's Interagency Working Group on Zero-Emission Vehicles, "2013 ZEV Action Plan" at 8-13 (Feb. 2013) (available at: http://opr.ca.gov/docs/Governors_Office_ZEV_Action_Plan_(02-13).pdf).

[91] 42 U.S.C. §§§ 7507., 7543(e)(2)(B).

[92] See Multi-State ZEV Action Plan (May 2014) (available at: www.nescaum.org/documents/multi-state-zev-action-plan.pdf).

California has also entered into partnerships with China and other countries to share learning on technologies and best policy practices around zero-emission vehicles.[93] California should continue to leverage and expand these partnerships to support not only the markets for zero-emission passenger vehicles but freight-related equipment as well. As an example, the recent creation of the International ZEV Alliance[94] provides an opportunity for greater coordination on heavy-duty freight electrification globally in addition to passenger vehicles and should be used as a forum to explore international cooperation on this issue.

Educate, Empower and Involve Residents of Impacted Communities and Provide Meaningful Opportunities for Public Participation on These Issues

In developing a plan for creating a sustainable freight system, agencies must not lose sight of the communities that are suffering the most under the current unsustainable system. Communities near freight hubs have in-depth knowledge of the risks those facilities pose, and their voices should be heard. Indeed, many of these impacted communities will include residents who work in freight-related industries. Agencies will benefit from the insight of these impacted communities that can speak to the on-the-ground effects of various "solutions" and can offer critical perspective on alternatives that should be considered. For example, solutions that merely target efficiency of the system may leave communities worse off if emissions are not reduced and traffic/throughput levels increase. Solutions might also need to include support for those individuals and small businesses in these communities that will need to transition away from traditional, unsustainable practices and technologies. Such solutions might include targeted subsidies, job training, and smart infrastructure planning to support smaller operators.

In seeking this input, however, agencies must take special efforts to enable participation by residents who are not paid and trained professionals on these issues. Education and other capacity building must be part of the effort to ensure that community members are allowed to participate in a meaningful way.

ELEMENTS OF A SUSTAINABLE FREIGHT PLAN

The scope of the necessary transition to zero-emission technologies may seem daunting, but it is important to remember that these technologies are already commercially available for certain types of trucks and equipment and can be deployed at ports and on roadways today. Demonstrating and further commercializing these technologies in these early categories of equipment will pave the way for broader introduction into other categories of freight equipment. The general strategy should be adoption of a new round of standards for new vehicles and engines, followed by fleet purchase requirements that ensure that these zero-emitting technologies will have a market in the worst-polluted regions, followed by broader replacement requirements that will complete the transformation to these technologies. Staging these requirements will give these technologies time to mature, but adopting these measures now as part of a coordinated plan will provide the necessary market signal for more rapid development. These regulations should be complemented with actions to promote the infrastructure needed to support zero-emission technologies, and to protect impacted communities from new harmful freight projects.

Adopt ZEV Technology Requirements and Next Generation of Engine Standards

Zero-Emission Mandates for New Trucks and Cargo Handling Equipment

The central component of a sustainable freight plan should be regulations mandating the transition of heavy-duty trucks and other freight-related equipment to zero-emission technologies.[95] These mandates may not be immediately feasible for all types of trucks and non-road equipment, but the general approach should include more immediate mandates for those trucks and equipment types where zero-emission technologies are commercially available or will be commercially available in the short-term.[96] These mandates should be coupled with more stringent NOx, PM and GHG emission standards for conventionally-fueled trucks. For those truck and equipment types that will need longer lead-times to deploy zero-emission technologies, the

[93] See, e.g., Yunshi Wang, Dan Sperling and Alberto Ayala, Editorial, "California wins by collaborating with China on electric vehicle market," Sacramento Bee (Mar. 10, 2015) (available at: http://www.sacbee.com/opinion/op-ed/soapbox/article11089439.html)
[94] https://www.iea.org/media/workshops/2015/towardsaglobalevmarket/C.2ZEVAlliance.pdf.
[95] See Fulton and Miller, "Strategies for Transitioning to Low-Carbon emission Trucks in the United States" at 41 ("While fuel economy standards require manufacturers to achieve a target level of fuel use (or CO2e) per mile, a more directed "ZEV standard" would encourage sales of ZEVs by explicitly targeting sales requirements for such vehicles.").
[96] "For trucks, a similar type of standard is imaginable, though there are a range of issues with trucks that do not typically occur with cars. These include the wide range of truck types and small volumes of some truck segments (making the provision of some share that are zero emission burdensome given the small quantities)— and the challenge of meeting truck duty requirements across segments with ZEVs. . . .Ways to deal with such issues include averaging across truck types, a robust system of credit trading that allows some manufactures in some segments to avoid producing ZEVs while others 'over comply,' and long lead times to let manufacturers have enough time to develop models that can compete." Id.

ELEMENTS OF A SUSTAINABLE FREIGHT PLAN

1 ADOPT ZEV TECHNOLOGY REQUIREMENTS AND NEXT GENERATION OF ENGINE STANDARDS

Regulations should mandate the transition of heavy-duty trucks and other freight-related equipment to zero-emission technologies. Regulations should also require harbor craft engines to meet Tier 4 standards when upgrading in the near-term, with an understanding that the zero-emission standard will become effective in the 2025-2030 timeframe. ARB should further adopt standards that mandate zero-emissions technologies for existing engines that operate within railyards or are in local service only.

2 REQUIRE CLEANER FUELS

CCFC supports ARB's efforts to achieve short-term NOx, PM and GHG emission reduction benefits from conventionally-fueled trucks and other equipment by cleaning up the fuels that they use.

3 ADOPT NEXT GENERATION OF FLEET PURCHASE REQUIREMENTS

Once new vehicles with zero-emission technologies are required by emission standards, various fleets should be required to purchase these technologies, which yield emissions benefits, advance the use of cleaner technologies, and create a market for such technologies.

4 ESTABLISH A FRAMEWORK FOR COORDINATING INCENTIVES AND REGULATORY REQUIREMENTS FOR FREIGHT ELECTRIFICATION

Well-crafted incentive programs, and other complementary measures, should be employed to accelerate the transition to freight electrification beyond what could be achieved by regulatory measures alone.

5 REQUIRE THE NEXT GENERATION OF INFRASTRUCTURE

Infrastructure development must include a host of activities to build out the infrastructure to support zero-emission vehicles and equipment and incentivize their adoption. These activities will need to occur at the state, regional, local and project-specific level.

6 PROTECT IMPACTED COMMUNITIES

A sustainable plan must not only include opportunities for impacted communities to participate, but also provide the capacity building that will enable meaningful participation.

sustainable freight strategy should still include mandates but allow longer lead-times in order to provide the market signal necessary to spur the research and development that will move these technologies to become commercially available for these truck and equipment types.

As with passenger vehicle standards, zero-emission mandates should be an independent part of standards that set tighter overall NOx, PM or GHG emission standards.[97] Also like the passenger vehicle standards, these mandates could be tiered to require escalating sales percentage requirements over time depending on the availability of these technologies.

ARB has the authority to adopt standards for new trucks and other mobile sources sold in California, and has done so in the past.[98] The next generation of these standards should include lower NOx and GHG standards to provide interim pollution benefits while the zero-emissions mandates are rolled out and expanded. Ideally these new standards could be coordinated with EPA to provide national benefits and ensure compliance of out of state trucks, but ARB should move forward with or without EPA as necessary to meet emission reduction targets.

The first set of rules should mandate the sale of zero-emission vehicles and equipment before 2020 for those categories where zero-emission technologies are already commercially available or nearly available.[99] These include:

- Urban buses and shuttle buses[100]
- Urban vocational trucks
- Drayage trucks
- Forklifts and port cargo handling equipment[101]
- Airport ground support equipment[102]

[97] Cleaner diesel and natural gas trucks are available now, with more coming soon; ARB should require use of cleaner diesel and natural gas technologies for vehicles that cannot transition to zero-emission technologies now. ARB's lowest mandatory standard for heavy -duty engines allows a maximum of 0.2 grams per horsepower-hour (g/hp-hr) of NOx emissions. ARB has also adopted a three-tiered optional low-NOx standard. The three levels of certification for this standard are 0.1 g/hp-hr, 0.05 g/hp-hr, and 0.02 g/hp-hr. It is expected that there will be at least one heavy -duty engine that will be certified to meet the 0.02 g/hp-hr standards as early as 2016. CCFC supports ARB efforts to petition EPA to adopt a federal NOx standard of 0.02 g/hp-h to ensure CA trucks as well as though coming from out of state are contributing to achieving air quality standards. ARB, however, should not delay in adopting its own state standards to make the optional 0.02 g/hp-hr standard a mandatory standard in the near future.

[98] See, e.g., Cal. Health & Saf. Code §§ 43013, 43101, and 43104 (authorizing ARB to adopt emission standards and test procedures to control air pollution caused by on-road and off-road vehicles); and § 43018(a) (directing ARB to endeavor to achieve the maximum degree of emission reduction possible from vehicular and other mobile sources in order to accomplish the attainment of state ambient air quality standards at the earliest practicable date). See also 13 Cal. Code Regs. § 1956.8 (ARB regulations governing certification of new heavy-duty vehicles); §§ 2421 et seq. (regulations governing certification of new nonroad diesel equipment).

[99] See Eelco den Boer, et al., "Zero emissions trucks: An overview of state-of-the-art technologies and their potential" at 101("[A] dvanced concepts are already being introduced in many countries for both urban bus transport and for the city distribution of goods. Therefore, policy incentives could first be directed to these urban applications and increasingly expanded to intercity and long haul applications after implementation success is seen in urban applications.").

[100] As noted above, while urban and shuttle buses are not necessarily considered part of the freight system, zero-emission mandates on these categories of vehicles will support the development of these technologies for use in other freight-related sources.

[101] In the "Sustainable Freight Strategy," ARB notes that "electric cargo handling for container movement at seaports is already in use in California" and is being used in warehouses and distribution centers. "Sustainable Freight Strategy" at 40. However, the strategy does not suggest that ARB will be adopting regulations to require a move toward zero -emission cargo handling equipment throughout the state. Zero-emission regulations for cargo handling equipment are feasible and should be implemented immediately.

[102] Airport ground support equipment is already undergoing a transition to near-zero and zero-emission equipment, but an ARB regulation can and should accelerate that progress. ARB's Sustainable Freight Discussion Document suggests that ARB will explore opportunities to adopt regulations that will hasten widespread deployment of zero-emission ground support equipment. The strategy includes a firm timeline to update the Large Spark-Ignition Fleet Regulation to standardize reporting and labeling requirements, but does not include a timeline for a regulation that would reduce emissions by promoting the transition to zero-emission technology. "Sustainable Freight Strategy" at 79. ARB could update the Large Spark-Ignition Fleet Regulation to include requirements that will expand the use of zero-emission technology at the same time as it updates reporting and labeling requirements.

The initial mandates should vary depending on the lead-times and assessment of availability. For example, forklifts and ground support equipment can be largely electrified now and do not need significant lead-times to require broad transformation to zero-emissions technologies. Rules for new urban vocational trucks and drayage trucks might start with a more modest zero-emissions vehicle mandate in 2020 but include expansion of those mandates between 2020 and 2030.

The transition to zero-emission technologies can and should be broken down into smaller, achievable steps as described above, but the regulations and other policies governing the overall transition must be adopted now. For example, after urban vocational trucks and urban buses begin transitioning to zero-emission technologies, general bus and truck replacements can follow. But the regulated community must know that the transition is coming and must have enough lead time to prepare. Regulations provide that lead time and offer the regulated community the certainty they need to invest in zero-emission technology.

Regulations for Marine Vessels and Harbor Craft

There are opportunities to use the same transformation process outlined for trucks for other goods movement equipment, such as harbor craft. Specifically, ARB's Airborne Toxic Control Measure for Commercial Harbor Craft should be revised to include a zero-emission standard. The standard should be adopted in the near-term, with compliance required in the 2020 to 2030 timeframe.[103] The regulation should also require harbor craft engines to meet Tier 4 standards when upgrading in the near-term, with an understanding that the zero-emission standard will become effective in the 2025-2030 timeframe.

The immediate focus for larger marine vessels should be on requirements for shore-side power and emissions controls on vessels while at port or hoteling. The Ports of Los Angeles and Long Beach have shown that ports can develop the infrastructure to offer shore-side power for marine vessels.[104] ARB should expand shore-side power requirements by requiring 100 percent use of shore-side power by 2025. In 2007, ARB adopted a regulation that required limited use of shore-side power by vessels at many California ports.[105] By 2014, ARB required fleets to limit use of auxiliary engines for at least 50 percent of their trips to port. By 2020, that requirement will increase to 80 percent.[106] ARB should strengthen the regulation to increase limited use of auxiliary engines to 100 percent of a fleet's trip to port. Lower emission standards should also be applied for vessel operations at the port that are not covered by shore-side power requirements. Technologies such as the Advanced Maritime Emissions Control System (AMECS)[107] can be used to meet these lower limits even in the absence of shore-side power.

Regulations for Locomotive Engines

California's authority for regulating emissions from railroad engines is limited in several ways.[108] California likely retains authority, however, to set standards for certain existing engines that operate within railyards (e.g., switcher engines) or are in local service only. For those engines that can be directly regulated, ARB should adopt standards that will mandate zero-emissions technologies. Even if of limited applicability, these standards will help promote technology development and demonstrate the feasibility of tighter standards at the national level. CCFC also supports ARB efforts to petition for stronger national regulations of locomotives, including changes to federal regulations to allow broader state authority to set standards for non-new locomotive engines.

Require Cleaner Fuels

CCFC supports ARB's efforts to achieve short-term NOx, PM and GHG emission reduction benefits from conventionally-fueled trucks and other equipment by cleaning up the fuels that they use.[109] Such a fuels strategy could provide important near-term benefits in older trucks,

[103] ARB's Sustainable Freight Strategy agrees that this sector can move toward zero- and near-zero emission technologies, but the strategy does not include a blueprint for that transition. ARB may require selective catalytic reduction on harbor craft engines or require hybrid engines. ARB may also require an emissions cap for freight facilities, but does not include an emissions cap for commercial harbor craft in its strategy. "Sustainable Freight: Strategy" at 41. CCFC recommends a more technology-neutral approach that focuses on regulating harbor craft emissions. These limits could take the form of, for example, requiring Category 3 marine engines to comply with an emission standard 80% below Tier 3 levels in 2024 and 100% below Tier 3 levels by 2032. Similar standards can be implemented for Category 1 and 2 engines. See http://www.epa.gov/otaq/standards/nonroad/marineci.htm for exhaust emission standards for marine compression-ignition engines. ARB could also decide to set the most stringent standards for vessels on shorter routes first, because implementation for those vessels is more feasible in the short term.

[104] Port of Los Angeles, "Alternative Maritime Power" http://www.portoflosangeles.org/environment/alt_maritime_power.asp; Port of Long Beach, "Shoreside Power Fact Sheet" http://www.polb.com/civica/filebank/blobdload.asp?BlobID=5878.

[105] The "Airborne Toxic Control Measure for Auxiliary Diesel Engines Operated on Ocean-Going Vessels At-Berth in a California Port" Regulation applies to the following ports: Port of Los Angeles, Port of Long Beach, Port of Oakland, Port of San Diego, Port of San Francisco, and Port of Hueneme. See ARB, "Shore Power for Ocean-going Vessels" (June 24, 2015).

[106] Id.

[107] See, e.g., http://www.advancedcleanup.com/index.php?article=31

[108] See, e.g., 42 U.S.C. § 7543(e)(1)(B) (prohibiting state standards on new locomotives and new engines used in locomotives).

[109] See "Mobile Source Strategy" at 101.

out-of-state trucks operating in California, and in other equipment that will be more challenging to move to zero-emissions technologies such as locomotives and certain marine vessels.

Adopt Next Generation of Fleet Purchase Requirements

Once new vehicles with zero-emission technologies are required by the emission standards described above, various fleets should be required to purchase these technologies. Such rules yield emissions benefits, advance the use of cleaner technologies, and create a market for such technologies. The form of these rules can be based on the stalled zero-emission bus rule and revised versions of the SCAQMD fleet rules with a narrower definition of the technologies that are required. Thus, instead of merely avoiding diesel, which is what the current fleet rules do, the requirements should require the purchase of zero-emitting technologies. The phase-in of these fleet requirements should be based on predictions of where these technologies will be most viable first. Buses are a natural starting point,[110] followed by urban vocational trucks and other vehicles with limited range requirements and centralized re-fueling capabilities. These purchase requirements should begin to be implemented soon after the new emission standards begin to require the production of zero-emitting vehicles (i.e., between 2020 and 2030).

These fleet rules can be adopted at the state level for all vehicles, or at the district or local level for public fleets. California has the authority to establish rules governing purchases for all fleets operating in California, but local governments can also participate by establishing purchase requirements for public fleets such as city owned and operated bus fleets and passenger vehicles.[111] For those districts that, like SCAQMD, have already instituted fleet rules, the rules should be strengthened to encourage the transition of publicly owned fleets to zero-emission vehicles. SJVAPCD's lone fleet rule, for example, governs school bus fleets and simply requires retrofits or replacements of older diesel engines with newer and less polluting diesel engines.[112] SJVAPCD and other local air districts should revise these regulations to require increasingly higher penetration of zero-emission technology into school bus fleets in the near- to medium-term.[113] Similar rules should be developed for transit buses. Like school buses, zero-emission technology for transit buses has been demonstrated and is already in use in some areas.[114] Other vehicle types where fleet rules would help reduce emissions include light-, medium-, and heavy-duty public fleets, waste collection vehicles, airport ground transportation, such as taxis and shuttles, and street sweepers.[115]

The sustainable freight strategy should also explore opportunities for encouraging purchase plans for specific entities such as the ports. The Ports of Los Angeles and Long Beach are exploring ways to advance zero-emission technologies at, and servicing, their ports.[116] The Port of Oakland is in the midst of a large expansion project.[117] A mixture of regulatory requirements, including new engines standards, fleet purchase requirements, and indirect source requirements should be used to expand the use of zero-emission technologies for port trucks and equipment.

Establish a Framework for Coordinating Incentives and Regulatory Requirements for Freight Electrification

Well-crafted incentive programs, and other complementary measures, should be employed to accelerate the transition to freight electrification beyond what could be achieved by regulatory measures alone. Incentives can support business investments in zero-emission vehicles, equipment and infrastructure as the technologies mature, manufacturing capacity grows, and vehicle and equipment sales volumes increase.

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[110] As noted above, advances in technologies in the non-freight sector (e.g., public buses and light duty trucks) can promote technological advances in the freight industry. Accordingly, we strongly support fleet rules that may indirectly advance electric and hybrid vehicles in the freight and non-freight sector.

[111] Engine Mfrs. Ass'n v. South Coast Air Quality Management Dist., 498 F.3d 1031, 1045-49 (2007). (upholding fleet rules against preemption challenge under the Clean Air Act; rules constituted proprietary action versus regulatory action and fell within the market participant doctrine).

[112] San Joaquin Valley Air Pollution Control District, Rule 9310 (School Bus Fleets) § 5.0.

[113] These local strategies are already being pursued in several European cities. See Eelco den Boer, et al., "Zero emissions trucks: An overview of state-of-the-art technologies and their potential" at 104 ("In addition, local governments should lead by example and adopt zero emission technologies to green their own fleets, helping to establish an early market for zero emission vehicles. The city of Rotterdam has replaced several of its conventional vehicles with full electric garbage vehicles since 2009; several other cities, such as The Hague and Breda have followed this example.")

[114] See CALSTART, "Low Carbon Bus Program: About High-Efficiency and Low-Carbon Buses" http://www.calstart.org/projects/Low-Carbon-Buses/high-efficiency-low-carbon-buses.aspx.

[115] See South Coast Air Quality Management, Fleet Rules (available at: http://www.aqmd.gov/home/regulations/fleet-rules).

[116] Port of Long Beach. "2012 Air Emission Inventory" http://www.polb.com/civica/filebank/blobdload.asp?BlobID=11373; http://www.portoflosangeles.org/environment/zero.asp.

[117] Port of Oakland. Projects: Oakland Trade & Logistics Center. http://www.portofoakland.com/maritime/oab.aspx.

Light-duty electric vehicles are currently going through the early stages of technology deployment – driven by regulatory requirements on manufacturers and supported by various complementary policies including direct consumer incentives for vehicles, charging infrastructure incentives, the low carbon fuel standard, and utility EV rate structures. The PUC is also in the process of considering applications for allowing utilities to rate-base infrastructure investments which would unleash hundreds of millions of dollars in charging infrastructure, lowering barriers to EV adoption. These types of measures should also be employed and tailored to the freight sector.

The Governor's Zero Emission Vehicle action plan has helped provide a platform for interagency coordination on light-duty and increasingly heavy-duty vehicle considerations. This plan should continue to expand upon freight-related policies to overcome barriers to electrification. In addition, a commitment to funding the Clean Truck and Bus program and a longer term plan for incentives should be pursued to ensure maximum coordination between regulatory and incentive efforts for freight electrification.

Require the Next Generation of Infrastructure

Investing in infrastructure to support zero-emission vehicles now is critical.[118] Infrastructure development must include a host of activities to build out the infrastructure not only to support zero-emission vehicles and equipment, but also to incentivize their adoption. These activities will need to occur at the state, regional, local and project-specific level.

At the agency planning level, infrastructure planning must be aligned with the technology transformation needs described above. Specifically, agencies must consider how our highway system can be modernized to support zero-emission vehicles or allow for zero-emission miles in certain target areas, such as in and out of ports. Infrastructure to support zero-emission technology could include: electricity supply via catenary devices; in-road power supply; wireless, plugin, or overhead ultra-fast chargers; wireless or plugin fast chargers; or battery swapping.[119] Such planning should also prevent the unsustainable "sprawl" of freight development. Smart planning will support efficient development of freight-related infrastructure and incentivize the adoption of zero-emission technologies. Again, working backwards from the technology transformation that will be needed to meet health-based air quality standards and greenhouse reduction goals will be a necessary component of future infrastructure planning activities.

The Governor's sustainable freight executive order anticipates that state agencies will work together to integrate the technology transformation needs into traditional transportation planning.[120] Agencies, such as ARB and local air districts, should also ensure that transportation planning is consistent with air quality planning by engaging in environmental review under CEQA and NEPA, and by more thoughtfully applying the conformity requirements of the Clean Air Act.[121] Air agencies can no longer treat transportation planning as independent of the directed regulatory activities that are necessary to meet federal and state standards. At a minimum, public transportation funding should only be provided to those projects demonstrated to reduce vehicle emissions.

Regulators must begin to consider the technologies available that can allow trucks to travel without emissions, and require use of those technologies on high-traffic freight corridors. I-710's Community Alternative 7, for example, recommends incorporation of road-connected wayside power, such as a catenary system, to move vehicles along its proposed zero-emission corridor.[122] Similar projects should be considered for other high-traffic corridors, particularly in the regions most impacted by freight emissions, such as the Los Angeles region, the Inland Empire, the Bay Area, and the San Joaquin Valley. Development of these projects ideally would be the product of integrated transportation planning activities, but can also be mandated through air planning activities if necessary.

In addition to transportation planning at the state and

[118] See Fulton and Miller, "Strategies for Transitioning to Low-Carbon emission Trucks in the United States" at 42 ("A critical element for the introduction of ZEV truck technology is refueling infrastructure. While electric trucks will benefit from the well-developed grid system, and to some degree from recharging systems being installed for light-duty vehicles, recharging stations dedicated and suitable for their needs (geared toward high capacity battery systems, fast charging needs) and in suitable locations (e.g. industrial areas, truck stops) will be needed, and should become more of a priority as the light-duty vehicle recharging infrastructure system becomes adequate.").
[119] CALSTART, "I-710 Project Zero-Emission Truck Commercialization Study Final Report" at 3-12 – 3-13 (Nov. 20, 2013) (available at: http://www.calstart.org/Libraries/I-710_Project/I-710_Project_Zero-Emission_Truck_Commercialization_Study_Final_Report.sflb.ashx).
[120] Gov. Exec. Order B-32-14 (July 17, 2015) (requiring integrated action plan and calling for corridor-level pilot projects).
[121] See, e.g., 42 U.S.C. § 7506(c)(2) (requiring federal transportation plans to "implement the transportation provisions of any applicable [state] implementation plan approved under [the Clean Air Act]").
[122] Coalition for Environmental Health and Justice, "I-710 Expansion Comments" at 12 (Sept. 28, 2012) (available at: http://docs.nrdc.org/smartGrowth/files/sma_12100301a.pdf).

regional levels, agencies should ensure that necessary infrastructure is being developed at the site-specific level. For example, infrastructure to support zero-emission technologies should be deployed first at ports and warehouses where vehicles and equipment with limited ranges are centered. These vehicles and equipment should be the first targets of new requirements for zero-emission technologies, so the locations where these fleets are centered should be the first targets for supporting infrastructure. Regulatory agencies could target the build-out of infrastructure at these freight hubs either on a project-by-project basis through the CEQA environmental review process or through new regulatory requirements that set standards for these "indirect sources" where mobile sources congregate.[123]

Regulations governing indirect sources should move facilities to be "zero-emission ready" and to incorporate other technologies that will improve efficiency. Examples of regulatory requirements might include ensuring that warehouses provide electrical infrastructure to support charging stations at loading docks, or the electrification of truck stops and ports of entry to reduce emissions from truck idling. These requirements could complement a facility emissions cap as proposed in ARB's Sustainable Freight Discussion Document[124] but should not be replaced by such a cap. A cap alone will promote incremental solutions rather than ensuring that these sources are being modernized to allow and support the widespread use of zero-emission technologies.

Utilities and the PUC have a significant role to play in infrastructure investments that be fundamental in determining the both the speed and effectiveness of policy efforts toward electrification in the freight sector.[125] Infrastructure upgrades to meet new electricity loads at facilities where equipment will be charged, as well as utility rate structures including demand charges are creating economic barriers to fleet adoption of electric truck and bus technology.[126] As evidence grows regarding the benefit of greater transportation electrification in supporting a cleaner and more reliable freight system, as well as in response to the direction provided in SB350, the PUC should pursue policies that facilitate infrastructure investments needed for freight electrification. To accelerate freight electrification, utilities and regulators must pursue innovative strategies to maximize the benefits of freight electrification to the grid and all utility customers while reducing cost barriers for businesses. This should include the ability of utilities to rate-base some of the necessary infrastructure investments to support freight electrification in a manner similar to proposals for light-duty electrification infrastructure currently before the PUC.[127] Utilities are also uniquely positioned to provide information to customers making decisions about fleet electrification and required infrastructure upgrades. Implementing programs to support freight-related businesses in electrification efforts will be necessary to ensure a smooth technology transition. Finally, in addressing some of the challenges of large energy demands by electrifying freight and to maximize the benefits of electrification, utility policies as well as incentive programs should support the integration of renewable electricity and vehicle and equipment charging, including the development of on-site renewable electricity or hydrogen production.

As noted above, transportation planning should not only ensure that infrastructure projects will be built to support the new technologies, e.g., by providing power directly or considering necessary refueling requirements, but also encourage the adoption and use of such technologies, e.g., by providing dedicated lanes for zero-emission trucks, or applying appropriate access charges. Planning at all levels should look for opportunities to spur the adoption of zero-emission technologies. Several cities in Europe "use a variety of instruments to promote the deployment of less-polluting vehicles, such as easing the inner city access, subsidies, and differentiation of city access charges."[128] These strategies could be extended, for example, to restrict conventional diesel and gasoline combustion trucks from city centers to encourage the use of zero-emitting urban vocational trucks.[129]

Protect Impacted Communities

In pursuing the above elements of a sustainable freight plan, agencies must prioritize protecting impacted communities.

[123] See 42 U.S.C. § 7410(a)(5).
[124] "Sustainable Freight Strategy" at 44-45.
[125] CALSTART, "Electric Truck and Bus Grid Integration: Opportunities, Challenges, and Recommendations" at 19 (Sept. 2015) (available at: http://www.calstart.org/Libraries/Publications/Electric_Truck_Bus_Grid_Integration_Opportunities_Challenges_Recommendations.sflb.ashx).
[126] Id. at 14-18.
[127] For example, many of these issues are currently being considered in the PUC's rulemaking R.13-11-007 (Order Instituting Rulemaking filed Nov. 22, 2013).
[128] Eelco den Boer, "Zero emissions trucks: An overview of state-of-the-art technologies and their potential" at 103.
[129] Id. (noting that highly polluting trucks are already banned in many EU cities).

As noted above, the development of a sustainable plan must not only include opportunities for impacted communities to participate, but also provide the capacity building that will enable meaningful participation. In addition to these process considerations, agencies should include substantive actions to promote needed protections. Examples include:

- Target incentives for the demonstration and deployment of advanced technologies in impacted communities.
- Adopt meaningful CEQA siting and mitigation guidelines to promote efficiency while at the same time avoiding compounding environmental injustice by adding to the burdens of already overburdened communities.
- Use indirect source review requirements to lower emissions, prevent idling, and build out zero-emission infrastructure at existing freight hubs.
- Create infrastructure that removes truck traffic from communities and facilitates zero-emission corridors.
- Use zoning and access incentives to remove freight activities from residential areas and promote advanced technologies.
- Provide job training and other support for individuals and small businesses to transition away from unsustainable freight activities.
- Work with impacted communities to ensure that they receive a fair share of the economic benefits that goods movement brings to their region.

Providing residents of impacted communities meaningful opportunities to participate in planning activities will undoubtedly allow the agencies to identify even more ideas for transforming the overall freight system while at the same time improving day-to-day lives in the communities impacted most by our current unsustainable freight system.

Taylor Thomas, Long Beach, CA

I was born and raised in West Long Beach – a beautifully diverse area terribly impacted by freight pollution. West Long Beach is bordered by freeways, refineries, a rail yard, and the Ports of Long Beach and Los Angeles. Hailed as the "Diesel Death Zone," this area suffers high rates of asthma, cancer, premature births, low birth weights, and lowered life expectancy. This is where I grew up.

As a child, having trucks pass through your streets, the rotten smells, and brown skies was normal to me. This was normal to my neighbors, and these conditions persist today. When I was diagnosed with asthma at age seven, where I lived was never discussed as a factor in my condition. Now, I understand that breathing filthy, diesel-choked air played a role in my asthma. The asthma limited my activities at home and at school. My mother and I made many trips to the doctor over the years, and it wasn't until I moved out the area as an adult that my health improved.

My community is a vibrant one, but has been suffering from the results of bad land use practices, lack of investments, and poor leadership and public policy. We need our decision makers to step up and do the right thing by communities that have never been a part of the planning processes that have shaped our neighborhoods. I can't get the days back as a youth when I had to stay indoors or go to the doctor because of my asthma, but our leaders can make sure this occurs less and less to the point where it is safe for the children of West Long Beach to breathe.

The mission of the California Cleaner Freight Coalition is to create transformational changes to the freight transportation system in California in order to protect the public's health, clean the environment, and promote social justice and equity. We are a collaborative partnership of organizations committed to an inclusive membership, honest dialogue, respect for differences, and transparent decision-making. The Coalition includes grassroots environmental justice, environmental, science, and health groups.