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ATTACHMENT A

Sustainable Systems Research, LLC

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May 30, 2016

Adrian Martinez

Staff Attorney

Earthjustice California Office

800 Wilshire Blvd, Suite 1000

Los Angeles, California 90017

Re: Comments on Freight Electrification

Dear Adrian,

I have prepared the attached final comments in response to your request for evidence of electrification needs for goods movement. If there is anything additional you need, please do not hesitate to contact me.

Regards,



Deb Niemeier, Ph.D.

Principal

Sustainable Systems Research (SSR), LLC was retained by Earthjustice to review and reply to comments submitted to the CPUC on May 18, 2016 related to transportation electrification and the implementation of SB 350. Dr. Niemeier was the lead author of this review.

Dr. Niemeier has more than 20 years of experience in transportation-air quality and has published more than 150 papers on topics related to air quality, goods movement, environmental justice, and climate change. She is currently a professor at the University of California, Davis in the Department of Civil and Environmental Engineering. She is also a member of the National Academy of Engineering Board on Energy Systems and the Environment.

In the review that follows, we focus specifically on the South Coast region due to the levels of air pollutants and concern over air quality attainment. The region has also experienced enormous growth in port activity, which is a key generator of goods movement. As this discussion clearly demonstrates, there are policy levers that can be pulled to influence both the rate of technology development and the rate of technology adoption. In addition, the environmental benefits of medium and heavy duty transportation electrification, particularly for the South Coast, are significant. Finally, from a technology standpoint, consideration of fuel-celled vehicles as an integral strategy for achieving near-term emissions reductions for medium and heavy-duty is premature.

CONSISTENCY WITH THE LONG RANGE TRANSPORTATION PLAN ENSURES RAPID DEPLOYMENT

*Southern California Edison (SCE) submitted comments emphasizing the need for rapid action to accelerate electrification of all vehicles.*¹ To place these comments in context, it is important to understand that the identification and prioritization of transportation projects does not occur in a vacuum. Long range transportation plans, which identify key regional projects, are the product of a significant public vetting process that is managed by California's 18 metropolitan planning organizations (MPOs). MPOs are the heart of regional transportation governance; they are responsible for transportation planning and have the authority to allocate federal and state transportation funds. MPOs are responsible for developing long range transportation plans (LRTPs), which identify the necessary infrastructure to support a region's future growth, and for prioritizing projects using two- to four-year fiscally constrained transportation improvement plans (TIPs). The LRTP projects are selected to be consistent with regional goals and policies, which typically encompass not just transportation, but also air quality, housing, equity, and economic growth and development. The TIPs prioritize and schedule the implementation of the projects listed in the LRTP. A region's LRTP and subsequent TIPs characterize not only how a transportation system will manifest, but also how the system will connect to the region's unique and often diverse population centers. Because MPOs play the central role in regional transportation planning and implementation, the priorities identified through these processes must be integrated into any effort aimed at developing zero-emissions transportation infrastructure.²

Four metropolitan regions in California are currently poised to produce immediate and potentially significant transportation demand for electrification: San Diego, Sacramento, the Bay Area, and Los Angeles; however, each of these regions differs in terms of its unique needs. For example, one of the key strategies in San Diego's 2015 Draft Sustainable Communities Strategy (SCS) for reducing

¹ Southern California Edison Company. May 18, 2016. Southern California Edison Company's (U 338-E) Comments in Response to Amended Scoping Memo and Ruling of the Assigned Commissioner and Administrative Law Judge, pp. 4-9.

² U.S. Department of Transportation. 2010. Transportation's Role in Reducing U.S. Greenhouse Gas Emissions. Volume 1: Synthesis Report. Report to Congress. U.S. DOT.

greenhouse gas emissions (GHG) is greater penetration of electric vehicles (EV) and deployment of a regional EV charging program.³ Planning for greater penetration of EV's began in early 2014 with the development and vetting of the San Diego Regional Plug-In Electric Vehicle (PEV) Readiness Plan.⁴ The development of both the Readiness Plan and the SCS included input from major stakeholders throughout the region. Thus, CPUC's recent approval of the installation of thousands of electric vehicle charging stations throughout San Diego and south Orange Counties took advantage of and was consistent with the priorities articulated in the 2015 Draft SCS.

Alternatively, the South Coast region is constrained in terms of its ability to both accommodate the level of growth in goods movement while simultaneously attaining air quality standards. Both the previous (2012) and the current (2016) long range regional transportation plans (RTP) emphasize the need for "aggressive programs"⁵ that achieve zero emissions goods movement solutions, particularly for trucks. The 2012 long range transportation plan laid out a coherent, fully integrated regional goods movement system to address predicted growth in goods movement. Daily port-related truck traffic alone is currently on track to grow by roughly 60%, increasing from 55,000 trips per day in 2012 to 87,000 regional trips per day 2040. Strategies identified in the 2016 RTP/SCS for accommodating growth in freight while minimizing impacts to air quality include prioritizing a system of truck-only lanes that extend from the San Pedro Bay Ports to downtown Los Angeles along I-710, with connections to the SR-60 and I-15 corridors. In addition, an east-west freight corridor is also envisioned. Projects in both of these corridors have been established via extensive public vetting processes that took place initially prior to the adoption of the 2012 long range plan and again, prior to the adoption of the 2016 long range plan. Implementation has been hindered by potential air quality and environmental justice concerns. Accelerating electrification strategies in either corridor is consistent with regional infrastructure priorities, allows for leveraging of existing planning efforts and funding streams and will result in very significant regional air quality effects.

KEY POLICY LEVERS THAT CAN BE APPLIED BY CPUC

*The Utility Reform Network (TURN) recommends that the Commission and utilities focus on light duty vehicle promotion and argues that medium and heavy duty vehicles are outside of the Commission's core competencies.*⁶ In point of fact, the CPUC has identified several key policy levers for incentivizing transportation electrification that fall within its core competencies.⁷ Each of these can significantly influence and/or accelerate electrification for medium and heavy-duty trucks:

- Infrastructure investments

Investing in infrastructure that has been publicly vetted and prioritized allows each region to uniquely determine its potential electrification portfolio. In the South Coast region, the need for investment in electric infrastructure provides a significant technology push for the

³ <http://www.arb.ca.gov/board/books/2015/062515/15-5-4pres.pdf>

⁴ A. Lowe, S. Freedman, and A. King Wood *et al.* "San Diego Regional Plug-In Electric Vehicle (PEV) Readiness Plan." San Diego: SANDAG; Center for Sustainable Energy, 2014.

http://www.sandag.org/uploads/publicationid/publicationid_1817_17061.pdf.

⁵ SCAG. "Looking Ahead." 2016 Regional Transportation Plan, Chapter 9. South Coast Council of Governments, 2016. http://scagtrpocs.net/Documents/2016/proposed/pf2016RTPSCS_09_LookingAhead.pdf: 4

⁶ The Utility Reform Network. May 18, 2016. Comments of The Utility Reform Network on the Amended Scoping Memo and Ruling of the Assigned Commissioner and Administrative Law Judge (TURN Comments), p. 3.

⁷ Crisostomo, N, and A Mesrobian. "Transport Electrification: Market Assessment, Policy Overview, and Utility Guidance Pursuant to Senate Bill 350" presented at the R.13-11-007 Workshop, San Francisco, April 29, 2016.

development of lower cost medium and heavy duty vehicles. If this technology push is simultaneously accompanied by investment in truck-only routes, two critical outcomes can emerge: 1) the region increases its ability to grow economically and 2) the long-term issues with regional air quality attainment can be mitigated. But beyond these direct consequences, there are other important outcomes. Investment in electrification of truck-only corridors will also significantly improve safety, decrease regional goods movement delay, and reduce GHGs. Because the truck-only I-710 and east-west corridors are already part of a larger regional transportation plan, *any* investments in electrification of the routes will be consistent with regional goals, become an integral part of the larger transportation system, and continue to produce benefits long into the future.

- Rates and incentives

Current rate schedules may present challenges for electrification and medium and heavy duty vehicles. Medium and heavy duty trucks that have no choice but to operate on electrified facilities during peak load conditions may see limited fuel cost benefits. Rate design structures will have to be carefully implemented.⁸ The combined dedicated, electrified truck-only corridors and incentives for individual truck owners will be necessary to stimulate 3rd party investments in truck technology, which will help to lower initial capital investment. Currently, the differences between capital costs for conventional and electric trucks are significant. Available funding mechanisms will need to be closely coordinated and leveraged wherever possible to ensure that medium and heavy-duty truck owners are incentivized to invest in newer truck technologies.

- Reliability

The reliability of goods movement could be significantly improved with the provision of truck-only corridors. Both the I-710 proposal and east-west truck-only corridors offer the potential for significantly reducing vehicle delay and improving general traffic safety. However, neither corridor can be developed without also addressing the issue of air quality. For example, the I-710 expansion process is considering a number of proposals for additional lanes: as currently proposed, several alternatives allow for lanes with electrical infrastructure, including catenary electrification wires over the lanes. Selecting an alternative that requires electrified truck lanes would enable dual-mode trucks to run electric on this segment of the freeway. Coupling the electrified system with dedicated truck lanes would increase the reliability of freight movement into and out of the Ports of Los Angeles and Long Beach.

Effectively pulling any of these policy levers requires that investments be consistent with longer regional goals and clear the hurdle of cost-effectiveness. The Standard Practice Manual (SPM) outlines the calculations to be used to determine cost effectiveness for investments undertaken by the CPUC.⁹ There are four tests that can be applied, each with a different perspective.¹⁰ The first is the total resource cost

⁸ ICF Intl. "California Transportation Electrification Assessment." San Francisco, January 2016. <http://www.caletc.com/wp-content/uploads/2016/01/California-Transportation-Electrification-Assessment-Phase-3-Part-A.pdf>.

⁹ California Public Utilities Commission (CPUC). "California Standard Practice Manual Economic Analysis of Demand-Side Programs and Projects." Sacramento, CA: Governor's Office of Planning and Research, State of California, 2001. <http://www.cpuc.ca.gov/WorkArea/DownloadAsset.aspx?id=11290>.

¹⁰ Morgenstern, J. (2013) California's experience in incorporating non-energy benefits into the cost-effectiveness tests, IEA Workshop, Sessions 3:4, October 16.

test (TRC), which examines the efficiency of a decision from the viewpoint of the service territory. The test compares the benefits accrued from avoided energy costs to the costs of administering a program, including any equipment upgrades. When a program passes the TRC, this means that total resource costs are expected to drop, and the total cost of energy services for an average customer will fall. The ratepayer impact test (RIM) examines the investment from the viewpoint of the utility customers, including any distributional effects. The test evaluates changes in average price levels due to changes in utility revenues and operating costs caused by a program. A benefit/cost ratio less than 1.0 indicates the program will influence prices upward for all customers. The remaining two tests, the utility cost test (UCT) and the participant test (PCT), measure cost-effectiveness from the perspective of the utility for the former, and benefits and costs to the customers participating in a program for the latter.

The vast majority of states rely on the TRC, or a variant of it, the societal cost test (SCT), for making cost-effectiveness decisions.¹¹ The SCT expands the point-of-view from the service territory to society. The TRC and the SCT also differ in two other important ways: 1) the TRC uses an average cost of capital discount rate while the SCT uses a societal discount rate; and 2) the SCT includes all quantifiable benefits attributable to a program, such as avoided pollutants and other non-energy benefits.¹² ICF International recently calculated the present value of the medium duty and heavy duty vehicles' TRC and SCT benefits as \$3.5 billion and \$4.4 billion (2015-2030), with a per vehicle present value benefit of \$13,474 for medium duty vehicles.¹³ The heavy duty truck per vehicle benefits were not calculated.

ENVIRONMENTAL BENEFITS ARE SIGNIFICANT

*The Consumer Federation of California (CFC) suggests that the environmental and health benefits of transportation electrification projects may be "nebulous" and "unmeasurable."*¹⁴ This is not the case for projects that seek to electrify important freight sectors. As I noted in my previous memo, container volume handled through the Ports of LA/Long Beach is expected to grow 3% annually through 2035. Converted to twenty-foot equivalent units (TEU's), this reflects an increase of approximately 13 million TEUs by 2035 (15 million in 2015 to 28 million in 2035). Using these estimates, a recent UC Davis study found that electrification of drayage trucks¹⁵ had the potential to *significantly* reduce local pollutants as well as greenhouse gases (GHG).¹⁶ Assuming that 50% of both near-dock and off-dock drayage VMT is met with electric trucks by 2035, the study estimates about a 28% reduction in NOx emissions.

A recent extension to the UC Davis research also shows that these estimated reductions are robust regardless of the potential grid mix. Emissions of GHGs, NOx, and PM2.5 from medium and heavy duty electric trucks are a function of the electricity utility generation portfolio. The study relied on average emissions rates for estimating pollutant reductions. Average emissions factors represent an average of all the energy produced by each generating technology. However, marginal rates, which represent the additional loads that would need to be met by the marginal electricity supplier, will also play a role in

¹¹ Elizabeth Daykin, Jessica Aiona, and Brian Hedman. "Whose Perspective? The Impact of the Utility Cost Test." Portland, OR, 2012. http://www.cadmusgroup.com/wp-content/uploads/2012/11/TRC_UCT-Paper_12DEC11.pdf.

¹² California uses the TRC, but recognizes the importance of minimizing utility administration costs by adopting a one-third UTC weight and two-thirds TRC weight for any cost-effectiveness test.

¹³ ICF Intl. "California Transportation Electrification Assessment." presented at the CPUC Workshop on SB 350, San Francisco, April 29, 2016. <http://www.cpuc.ca.gov/WorkArea/DownloadAsset.aspx?id=11290>.

¹⁴ Consumer Federation of California. May 18, 2016. Comments of Consumer Federation of California to the Peterman Wong Scoping Ruling [sic] (CFC Comments), p. 2.

¹⁵ In California, drayage trucks are class 7 or 8 trucks (GVWR greater than 26,000 lbs) and move cargo between the port and near and off-dock intermodal facilities.

¹⁶ Ambrose, Hanjiro, and Miguel Jaller. "ELECTRIFICATION OF DRAYAGE TRUCKS: ON TRACK FOR A SUSTAINABLE 1 FREIGHT PATH 2." *Transportation Research Board 95th Annual Meeting*. No. 16-5924. 2016.

grid supply. Marginal emissions factors tend to be higher than base-load or average emissions rates due to must-take renewables and other low marginal cost generators. By simulating different energy mix scenarios, the sensitivity of the emissions reductions to the utility grid mix can be estimated.

In Figure 1, the reduction percentage on the horizontal axis represents the reduction in each emissions species per truck mile traveled. Under a variety of different energy mix scenarios, NOx emissions showed reductions of 30 to 45% per truck mile, while PM2.5 emissions decreased by 35 to 52% per truck mile. This analysis suggests that the estimated operational emissions reductions are robust to utility grid generation portfolio.¹⁷

The robustness of results to grid generation portfolio means that sketchplan level of analyses for investment can be conducted. Using the expected per mile reduction in air pollutants due to electrification of medium and heavy duty trucks, it is possible to calculate the regional health benefits accruing as a result of any given project. These regional health benefits are likely to far exceed any project level implementation costs in the South Coast, although they should be calculated for each project specifically.

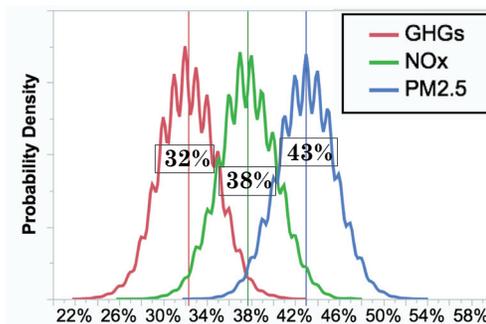


Figure 1. Range of potential emissions reductions per truck VMT

CONSIDERING OTHER FUELS UNDER SB 530

Southern California Gas Company (SoCalGas) recommends inclusion of “near zero” natural gas technologies within the straw proposal¹⁸ and Pacific Gas & Electric Company (PG&E) urges an expansive interpretation of “transportation electrification” that would include hydrogen fuel cells.¹⁹

Some have referred to hydrogen fuel-celled vehicles as electric vehicles. Hydrogen fuel-celled vehicles differ from electric vehicles in that instead of a battery, a fuel cell generates electricity using hydrogen. Hydrogen fuel cell vehicles and natural gas vehicles would not normally be users of vehicle or transportation system electrification strategies.

Specific to fuel cell trucks, it is important to recognize that these vehicles are not yet ready for deployment. Because fuel-cell vehicle technologies are expected to scale across different vehicle types, ongoing and planned pilot programs will provide important information for development pathways. For example, fuel cell technology development for urban transit buses is expected to accelerate the demonstration and deployment of Class 7 and 8 heavy-duty trucks since they can share the same power train design, and basic components. But other design features will take time to flesh out, including the additional weight and space requirements of hydrogen tanks, which can affect payload or may result in reduced vehicle range between fueling. ARB has indicated that “early transition for buses is a first step, and is expected to lead a broader transition to zero emissions technologies for other medium and

¹⁷ Emissions rates for conventional vehicles were taken from the forecast in CA EMFAC. Emissions factors are taken from the California GREET model and energy mix is scenarios are taken from the EIA. Email: mjaller@ucdavis.edu, May 30, 2016

¹⁸ Southern California Gas Company. May 18, 2016. Opening Workshop Comments of Southern California Gas Company (U 904 G), p. 3.

¹⁹ Pacific Gas & Electric Company. May 18, 2016. Opening Comments of Pacific Gas and Electric Company (U 39E) in response to Questions in Appendix B of Amended Scoping Memo and Ruling of the Assigned Commissioner and Administrative Law Judge, p. 4

heavy-duty applications,”²⁰ and that as fuel-celled trucks become available, ARB will consider approaches to accelerating the market. In contrast, electric vehicle technology is well understood and the main constraints to greater deployment for medium and heavy duty trucks have been capital costs and “refueling” limitations, both of which can be greatly mitigated by CPUC funding efforts.

In short, the consideration of fuel-celled medium and heavy-duty trucks is both beyond the statutory authority granted in SB 530 and premature from a technology perspective. The need for and barriers to electrification in the South Coast have been well established. Infrastructure investments that accelerate the penetration of medium and heavy-duty electric trucks are clearly articulated and have been well-vetted in the public processes associated with long range transportation plans. This proceeding’s focus should remain on near-term electrification infrastructure investments that are consistent with the region’s goals.

²⁰ ARB. “Technology Assessment: Medium and Heavy-Duty Fuel Cell Electric Vehicles.” Sacramento, CA: California Air Resources Board, 2015. http://www.arb.ca.gov/msprog/tech/techreport/fc_tech_report.pdf: VIII-2.