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Northeast States for Coordinated Air Use Management (NESCAUM)
89 South Street, Suite 602
Boston, MA 02111

RE: Clean Fuel Standard Coalition Comments on NESCAUM's Final Report "Economic Analysis of a Program to Promote Clean Transportation Fuels in the Northeast/Mid-Atlantic Region"

This letter provides the Clean Fuel Standard Coalition's[1] (CFS Coalition) comments on NESCAUM's Economic Analysis of implementing a CFS in the Northeast and Mid-Atlantic States (CFS States).

The CFS Coalition is a collection of utilities that are stakeholders to the development of a regional CFS. Members of the CFS Coalition have been active in state, regional and federal greenhouse gas policy discussions for a number of years and are interested in working with the CFS States to develop a regional program that achieves cost-effective emission reductions and drives investment in innovative technologies and low carbon fuels in a responsible manner. Members of the CFS Coalition have been active in promoting electricity and natural gas as transportation fuel options for consumers in their respective service territories as well as participating in leading industry vehicle deployment pilots and research programs.

The CFS Coalition members can play a role to reduce the carbon intensity (CI) of transportation fuels in our respective service territories and we are ready and willing to do so. The CFS Coalition believes:

- Penetration of electric and natural gas vehicles are a desirable and viable path to reduce dependence on foreign petroleum, greenhouse gas emissions, and total energy consumption in the region;
- The penetration of these technologies is hampered by higher capital costs which can be offset with reduced energy/fueling costs;
- Electricity and natural gas delivery infrastructure are already prevalent in the region and represent an ideal distributed domestic method for the delivery of transportation fuel;
- Domestic electricity and natural gas utilities are regulated, providing significant oversight, price stability, and control; and
- Electricity and natural gas prices are expected to be more stable than gasoline prices in the short and long term.

The key challenge for a regional CFS is to place a monetary value on the environmental benefit of lower carbon fuels and to convert that benefit into a price signal that is passed on to consumers of

[1] The LCFS Coalition members are: National Grid, New York Power Authority, and Northeast Utilities.

the lower carbon fuel. The CFS Coalition is supportive of the development of a policy framework to accomplish that objective. While the economic analysis is not a prediction of what will happen, it presents a perspective of what could happen and provides sufficient confidence to move forward with the next program step of the development of a policy framework.

As stated in the final report, the three most important variables in the economic analysis are:

- Price of petroleum;
- Price of low carbon alternatives (fuel, infrastructure and vehicles); and
- The CI of petroleum and low carbon fuels.

Assumptions relative to these three variables (and others) are overly conservative and if modified appropriately would result in economic analysis conclusions that would be even more supportive of achieving stated CFS program goals as outlined in the December 2009 Memorandum of Understanding. Assumptions of particular note are:

- Petroleum price projections;
- CI of electricity;
- Required charging levels;
- Electric vehicle (EV) efficiency assumptions;
- Energy Efficiency Ratio (EER) variation;
- Compressed Natural Gas (CNG) vehicle mix; and
- CI of Biogas.

Petroleum Price Projections

Petroleum price assumptions in the Economic Analysis should be updated with more current projections. For example, the Low Oil Price gasoline price assumption for 2022 is lower than the current gasoline price, as is the High Oil Price for 2013. Underestimating the projected price of petroleum reduces the overall net savings on transportation costs in the various CFS scenarios.

It is important to note that greater diversity in the transportation fuel mix would help to mitigate the negative economic impact of petroleum price volatility. The NESCAUM economic analysis clearly shows that in any CFS future scenario higher oil prices will result in an increased market penetration of alternative transportation fuels. Please refer to Figures ES-1 and ES-2 which show the petroleum portion of Regional Transportation Fuel Diversity at 94% irrespective of price in the Business-as-Usual scenario. The percentage of petroleum in the fuel mix drops in all CFS future scenarios, particularly as petroleum price increases and goes as low as 73% in a high oil price, electric future scenario. In addition to achieving the program goal of reducing CI of transportation fuels, all CFS scenarios provide alternatives that could help to mitigate the negative economic impact of transportation price volatility.

Carbon Intensity of Electricity

The CFS Coalition appreciates the simplifying benefit of using an average grid CI when calculating the impact of charging vehicles; however we continue to encourage the use of separate grid averages for each region to provide a more accurate view of the impacts. Separate values for each electricity control region (ISO New England, New York ISO, and the appropriate portion of the PJM Interconnection) would provide a more meaningful basis for evaluation.

Additionally, it should be noted that the “optimal” charging pattern may result in a CI that is somewhat different from the grid average. Given the weighting toward off-peak charging, the CI is likely to be closer to the CI of the baseload fuel mix. Additional modeling may be appropriate to determine emissions profiles based on anticipated charging patterns.

The CFS Coalition disagrees with the assumption for the high end CI value for electricity of 35-40 percent increase. The assumption is unreasonably high for this analysis. The error is magnified and effects key outcomes of the economic analysis as a higher CI value requires a greater number of EVs to achieve 10% CI reduction goal. Overestimating the number of vehicles leads to overestimates of the costs of electric charging infrastructure, the quantity of electricity consumed, and the total cost of low carbon fuel.

This number may be more realistically estimated by using the high end charging assumptions and applying an increase in CI that reflects the difference between on-peak and off-peak charging. As a point of reference, the increase from average (828 pounds CO_2/MWh) to marginal (930 pounds CO_2/MWh) emission rates for ISO-New England is only 12%.[2]

Required Charging Levels

As stated in the report, electricity infrastructure investments constitute the single largest component of low carbon fuel infrastructure needs under all of the CFS policy scenarios evaluated. While the CFS Coalition believes that the cost estimates for individual components of the charging infrastructure are reasonable, assumptions regarding the extent of infrastructure needs are overstated.

As stated in the report and endorsed by the CFS Coalition, electric vehicle charging should and likely will predominately take place at home during off peak hours. The CFS Coalition agrees that every EV will need a dedicated modest charger (Level 1, or modest Level 2) at home. Level 1 charging is the most economical solution and is the predominate option chosen by Chevy Volt customers today. While current data point to most PHEV owners utilizing Level 1 charging at their homes, it is possible that a portion of EV owners would upgrade their in-home charging systems to modest Level 2 (3.3 kW). Virtually all suburban and rural households have enough spare capacity in their home electrical system to accommodate Level 1 or modest Level 2 EV charging at zero to minimal additional infrastructure cost. It would be useful to see modeling results using the anticipated, lower level and lower cost charging infrastructure.

We disagree with the assumption that electric vehicle charging will rely on Level 2 and Level 3 chargers. The CFS Coalition questions why the analysis assumes that 100% of BEVs and 25% of PHEVs on the low end and 33% of PHEVs on the high end have Level 2 charging. Please provide a clarifying statement that the balance of the charging infrastructure (75% of PHEVs on the low end and 67% on the high end) will rely on Level 1 charging. We also strongly encourage NESCAUM to adjust the economic analysis to include a greater use of Level 1 charging.

The report notes that given the lack of empirical data for electricity fueling needs, estimates of charging stations used in this analysis were derived from the typical number of stations required to support internal combustion engine (ICE) vehicles. The CFS Coalition disagrees with this centralized station approach for EVs given that charging will likely occur at home and at work and believes that the number of public transient charging stations will be far less than for ICE vehicles. The conventional gasoline "filling station" model and ratio of station/vehicle (S/V) does not match the usage patterns for EV deployments. Electric vehicles will always start the day full and will seldom be fully discharged when approaching a public charging station. Most owners will charge opportunistically, and they may, for instance, just plug in at a destination to pre-condition the

[2] *2009 ISO New England Electric Generator Air Emissions Report*, System Planning Department ISO New England Inc., March 2011.

vehicle on hot or cold days. We believe that EVs require about 1/10th the ratio of public refueling infrastructure as ICE vehicles.

The faster you charge an electric vehicle the more expensive the "fuel" will be, and charging during the day will be more expensive than charging at night. Faster charging rates required to reduce fill times (i.e. Level 3) will always result in higher demand charges and higher average delivered energy cost ($/kWh). Current generation vehicles can achieve 100 mi/charge, making daily fueling at home practical. Improvements in battery technology and driveline efficiency could easily extend practical range to 200 mi/charge in the future, mitigating much of the perceived need for public charging infrastructure.

Electric Vehicle Efficiency Assumptions

The CFS Coalition contends that NESCAUM was too conservative with the electric vehicle efficiency assumptions. The analysis assumes 2.4 mi/kWh across the modeling horizon without any improvement over time. EPA tests show the Nissan Leaf gets 0.34 kWh/mi or 2.94 mi/kWh plug to wheels, including charging losses. The GM Volt gets 0.36 kWh/mi, or 2.78 mi/kWh in EV mode. Given these data, the EV efficiency assumption in the economic analysis is 16–23% below current, actual efficiency and does not include technology improvements.

Energy Economy Ratio for Electric Vehicles

The CFS Coalition sees the potential for PEV EERs higher than 3.0 and would like to see NESCAUM model the effects of alternative EER on projected program costs. Using 3.0 as a conservative value for this economic analysis is acceptable, but we urge NESCAUM to conduct a sensitivity analysis with higher EER for EV Future scenario. Varying electricity CI as a proxy is unlikely to capture the full impact of higher EERs within the realistic range of electricity CI.

Compressed Natural Gas Vehicle Mix

As we've commented before, CNG is better suited for commercial fleets and the vehicle mix should reflect this. Commercial vehicles use substantially more fuel than non-commercial vehicles and, "Ideal target fleets for a NGV program are those that are centrally-fueled and domiciled or have routes near existing natural gas filling station infrastructure, to meet fueling requirements and to ensure access to either a fleet controlled fueling source or a public natural gas fueling station."[3] However, based on the economic analysis, the number of light duty CNG vehicles is far greater than medium and heavy duty CNG vehicles. This results in an overestimation of the number of vehicles and infrastructure investment necessary. The CFS Coalition recommends that NESCAUM model a lower penetration level of light duty CNG vehicles and a higher number of medium and heavy-duty vehicles. This would result in fewer private and public CNG refueling stations and provide a more accurate assessment of the costs and benefits of natural gas vehicles in a CFS.

Carbon Intensity of Bio-methane

The current analysis is based on a CI of between 11 and 18 gCO_2e/MJ for renewable gas. We recommend a review of these values and a weighted average spectrum of local northeast feedstocks be considered and prioritized in order of production cost. For example, the value of 11 gCO_2e/MJ is similar to the CA GREET value for landfill gas. It is often assumed that "upgraded biogas is virtually pollution-free and carbon-neutral".[4] We believe that there are sources of bio-methane that can be produced locally in the northeast that have a lower CI value and would likely be

[3] *Natural Gas Vehicle Incentive Program - Report Prepared For: Natural Gas Vehicles for America* Prepared by Emisstar, January 15, 2009 http://www.emisstar.com/docs_and_pdfs/070709_NGV_fullreport

[4] *Summary of Waste to Wheels Building For Success,* U.S. Department of Energy, Clean Cities Program, December 1, 2010 http://www1.eere.energy.gov/cleancities/pdfs/waste_to_wheels_summary.pdf

prioritized due to lower cost. One example would be the recovery of methane from wastewater treatment operations were such bio-gas is currently flared. In such cases, pipeline gas is fully displaced thus leading to a near elimination of carbon generation. For a new review of carbon benefits, refer to the recent American Gas Foundation potential study of renewable gas.[5]

REMI Results

The REMI outputs identify the utility sector as the main financial beneficiary of a regional CFS program. While we agree that utilities in the region could deliver more electricity and natural gas and will likely be required to make distribution system investments, it is unlikely that utilities will own charging and/or refueling stations. As such, the REMI results are misleading and inaccurate from the perspective of regulated electric and natural gas utilities. The CFS Coalition requests revisions to the analysis or a better explanation of the how the REMI model works as well as the results in the final report.

Conclusion

The CFS Coalition encourages the Northeast and Mid-Atlantic states to continue the process of developing a regional CFS with the release of a policy framework. As shown by the economic analysis, a CFS has the potential to not only reduce carbon intensity of the transportation fuel sector but to also provide multiple economic benefits for the region. If NESCAUM adjusts the specific assumptions as outlined in this letter, we believe it would result in an economic analysis that would be even more supportive of achieving stated CFS program goals. However, further analysis should not prevent the states from moving forward with the policy framework discussion.

Thank you for your consideration of these comments. We look forward to continued participation in the regional Clean Fuel Standard development process. If you have any questions on these comments please contact me directly at 978-405-1269.

Sincerely,

Brian Jones
MJB&A
on behalf of:

National Grid • New York Power Authority • Northeast Utilities

[5] *The Potential for Renewable Gas: Biogas Derived from Biomass Feedstocks and Upgraded to Pipeline Quality,* American Gas Foundation, September 2011, http://www.gasfoundation.org/ResearchStudies/agf-renewable-gas-assessment-report-110901.pdf