October 24, 2014

Mary D. Nichols
Board Chair
California Air Resources Board
1001 "I" Street
Sacramento, CA 95814

Richard Corey
Executive Officer
California Air Resources Board
1001 "I" Street
Sacramento, CA 95814

Re: Reauthorization of Low-Carbon Fuel Standard and Revisions to the CA-GREET model

Dear Chairwoman Nichols and Executive Officer Corey:

The California Natural Gas Vehicle Coalition (CNGVC), NGVAmerica (NGVA), and the Coalition for Renewable Natural Gas (RNGC) are pleased to provide these comments – and the attached detailed report by ICF International – regarding CARB's proposed reauthorization of the Low Carbon Fuel Standard (LCFS) regulation and update to the CA-GREET model. As detailed below, we support CARB's re-authorization of the LCFS regulation. However, we have very significant concerns with the proposed modifications to the CA-GREET model that underpins full-fuel-cycle pathways under the LCFS. Therefore, we strongly urge you to delay adoption of the proposed revisions to CA-GREET until our concerns have been thoroughly addressed, and important new data from various ongoing studies can be incorporated.

Overview of Our Organizations and Membership

CNGVC is an association of natural gas vehicle (NGV) and engine manufacturers, utilities, fuel providers and fleet operators serving the state. CNGVC and its members are united in the belief that wider adoption of low-emitting NGVs is a long-term, key part of California's world-leading efforts to reduce greenhouse gas emissions, air pollution and petroleum dependence.

NGVAmerica is a national trade association dedicated to creating a profitable, sustainable and growing market for vehicles powered by compressed natural gas and liquefied natural gas. NGVAmerica represents more than 230 companies, including vehicle manufacturers; natural gas vehicle component manufacturers; natural gas distribution, transmission, and production companies; natural gas development organizations; non-profit advocacy organizations; state and local government agencies; and fleet operators.

RNGC is a member-led non-profit organization dedicated to the advancement of renewable natural gas (RNG) as a clean, green, alternative and domestic energy resource. Our diverse membership includes each sector of the RNG industry: waste collection, waste management & recycling companies, renewable energy developers,

engineers, financiers, gas marketers, gas transporters, technology manufacturers & providers, environmental advocates, research organizations, organized labor, law firms, utilities and ratepayers.

Summary of Comments, Concerns and Recommendations

We strongly support CARB's reauthorization of California's LCFS regulation at its February 2015 meeting, for the reasons described below. However, our organizations and respective members have many substantive concerns regarding the changes that are being proposed for the CA-GREET model. These technical concerns are summarized below, and detailed in the attached ICF International report that was commissioned by our organizations.

Given our technical concerns, we urge you to decouple staff's proposed revisions to the CA-GREET model from the more time-sensitive process to reauthorize the LCFS regulation. Extending the time for modifying CA-GREET will allow CARB staff to 1) revisit and revise incomplete or uncertain assumptions and inputs that are embedded in the proposed CA-GREET update, and 2) incorporate significant new peer-reviewed data that CARB staff have acknowledged will emerge over the next six to twelve months.

Details

Why our organizations strongly support the reauthorization of the LCFS regulation

In 2009, CARB adopted the LCFS as a key strategy to reduce the carbon intensity (CI) of fuels used in California's massive transportation sector, which is responsible for more than 40 percent of the state's greenhouse gas (GHG) emissions. More specifically, the LCFS regulation requires the state to achieve at least a 10 percent reduction in the CI values of California's transportation fuels by 2020. Achieving this reduction will be a critical component of meeting the state's broader goals to mitigate climate change under A.B. 32, which seeks to reduce GHG emissions to 1990 levels by 2020. It will also help reduce petroleum dependency and diversify the state's pool of transportation fuels, by increasing deployments of vehicles powered by alternative fuels that include natural gas, electricity and hydrogen.

Already, we are seeing the LCFS play a key role in driving increased production and use of these beneficial alternatives. Consider, for example, that 100 percent of natural gas dispensed at Clean Energy's California public stations in 2014 will be renewable natural gas. Such investments in and growth of renewable fuels are a direct result of the LCFS.

Our organizations believe that the state should continue on this successful path, by reauthorizing the LCFS regulation at its upcoming February 2015 meeting. This will provide regulatory certainty to help continue investments in a full spectrum of alternative transportation fuels and advanced technologies that will be needed to meet the state's GHG-reduction goals for 2050, and beyond. Equally important are the near- and mid-term benefits: reauthorizing the LCFS will ensure continued development and use of low-emissions alternative transportation fuels and advanced vehicle technologies *that are already in use* in California. These fuels and technologies are making major contributions towards restoring healthful air quality to critically impacted areas like the South Coast Air Basin and San Joaquin Valley. In sum, reauthorizing LCFS will drive GHG reductions that are necessary to meet California's goals, keep the state's carbon market operating smoothly, and help attain National Ambient Air Quality Standards.

Why our organizations strongly urge CARB to take more time to update the CA-GREET model

In August of this year, CARB announced it would be updating the CA-GREET model used to estimate "full fuel-cycle" GHG emissions from transportation fuels. However, CARB did not provide essential details for public review until October 10th. Staff has requested comments by October 24, apparently so the Board can vote on and finalize these proposed changes at its February 2015 meeting. We strongly believe that CARB is moving too fast to vet its proposed new carbon intensity (CI) values for natural gas, and other changes to the current model. This push for expediency is happening at the expense of accuracy and completeness for the proposed update to the CA-GREET model.

Providing just nine business days for stakeholders to review and comment on the proposed changes seems unnecessary, arbitrary and capricious for several reasons. First, revising the CA-GREET model is not necessary to reauthorize the LCFS regulation. Indeed, neither A.B. 32 nor the 2009 LCFS regulation require an updating of CA-GREET as part of the LCFS reauthorization. Second, while we welcome the opportunity to participate in a dialogue with CARB to update CA-GREET, insufficient time and information have been provided to fully assess the proposed changes, and engage in such a dialogue. (See the discussion below for the issues and problems that we have had time to identify.) Third, given the likely publication within the next several months of significant new data on methane leakage and other related issues (including studies that CARB has funded and/or sanctioned), *it is clearly premature to change the CI values for natural gas before that information becomes available*.

It is also important to note that the LCFS program relies on a credit trading market defined largely by the CI values for fuels that CARB staff is proposing to modify. Significant changes made hastily to any regulatory or incentive program will create uncertainty and reduce confidence in that program. By rushing to adopt new CI values before significant new natural gas data can be evaluated, CARB risks relying on inaccurate, incomplete or outdated data. The consequence will be to destabilize the LCFS credit trading market, and delay or halt investment plans developed to comply with the LCFS.

To be clear, our organizations do not oppose revisions to the CA-GREET model that are based on the best information. Unfortunately, the current proposal does not take into account new independent, peer-reviewed information about methane leakage that will emerge in the next few months. Instead, CARB is proposing a schedule that guarantees that it will have already adopted a revised CA-GREET model before that information becomes available.

Highlighted concerns from the attached ICF International report

We have attached a technical report prepared by ICF on behalf of CNGVC, NGVA and RNGC. The ICF report addresses specific issues and problems that ICF and our team have identified regarding CARB's proposed changes to CA-GREET; these significantly impact fuel pathways associated with natural gas vehicles.

For your convenience, the following highlights some key concerns further detailed in the ICF report.

a. Tailpipe Emissions of Methane and Nitrous Oxide – CA-GREET currently relies on outdated emissions factors based on 18-year-old NGV technologies. Further, these factors are applied incorrectly within the CA-GREET model by failing to account for differences in the fuel economy of the actual test vehicles and the default light-duty truck in the model. This leads to a significant overestimation of tailpipe emissions. Recent studies and EPA certification data indicate that tailpipe emissions of methane and nitrous oxide are 33 to 91 percent lower than the estimates employed in the proposed CA-GREET model update.

b. The Need to Include Compression-Ignition Natural Gas Engines – The ANL-developed (national) GREET model, on which the CA-GREET model is based, is not ideally suited to calculate the CI of fuels used in medium- and heavy-duty vehicles. As detailed in the attached ICF report (Table 7), it is critical that updated CA-GREET model (2.0) recognizes the differences in fuel efficiency and emissions from compression- and spark-ignition engines. This should include more-advanced engine technologies like Westport's High Pressure Direct Injection (HPDI), which may be incorporated into commercial NGV platforms within the lifetime of CA-GREET 2.0. Also, the updated CA-GREET should account for efficiency and emissions differences across vehicle classes and duty cycles.

c. Fugitive Methane Emissions – CA-GREET has incorporated the latest U.S. EPA methane leakage rate estimates, as provided in GREET 1 2014. While these leakage rates are lower than GREET 1 2013 and reflect the downward trend in methane emissions from the natural gas supply chain over the last 24 years (even as natural gas production has increased), the emissions rates used in the proposed CA-GREET model reflect national averages. We believe CARB should incorporate unique attributes of the California natural gas system. For example:

- SoCalGas reports that modernization efforts over the last 20 years have eliminated cast iron pipes from its massive system. The result is a system now composed of steel and plastic pipes that exhibit much lower leakage rates. Preliminary data from a pending study by the Gas Technology Institute suggests that leakage rates in the SoCalGas territory are 20 percent lower than the leakage rates assumed in the proposed new CA-GREET model. An internal engineering analysis by SoCalGas indicates that leak rates could be 80 percent lower than the CA-GREET model assumption.

- Other utilities and natural gas producers indicate that actual leakage rates attributable to California gas supply are significantly lower than assumed in the proposed CA-GREET update.

We have a specific recommendation on this: CARB should consider developing a California-centric assessment of natural gas systems and supplies, similar in concept to the OPGEE model used to calculate CI values for petroleum fuels. Our organizations and members can assist, by providing inputs for this model.

d. Methane Leakage for Landfill Gas Facilities – Renewable natural gas (RNG) is an important source of low carbon transportation fuel for California. RNG derived from landfill gas (LFG) currently provides an estimated 80 to 90 percent reduction in GHG emissions relative to petroleum fuels. Under the proposed CA-GREET 2.0 model, LFG-based fuel pathways incur a very significant CI increase; this is largely based on an assumed two percent leakage rate during gas clean up. This assumption is carried over from the national GREET 1_2013 model and is based on an analysis of RNG produced from biomass in anaerobic digesters, many of which are not located in the United States. This assumption neglects significant differences in gas clean-up for LFG versus anaerobic digester gas systems, and it ignores federal regulations limiting methane emissions from U.S. landfills. In practice, LFG systems employ thermal oxidizers or flares to destroy unused waste gas, mitigating fugitive methane emissions. Before adopting updates to RNG-based pathways, we strongly encourage CARB staff to engage the producers of LFG used in pipeline and transportation fuel applications, and seek more-representative emissions rates. For example, SCS Engineers, in conjunction with several facility owners/operators, will be conducting an analysis of landfill gas to LNG, CNG and pipeline quality processing operations in order to definitively evaluate the methane leakage rate (if any). This analysis should be complete and available for review within the next four to six months.

e. Proper Allocation of Methane from Associated Gas – This important issue was raised by the South Coast AQMD (and other organizations) during CARB's recent Technology and Fuels Assessment workshops. As noted by CARB at the September 3rd workshop, "approximately 75% of NG production occurs with petroleum production (Associated Gas)." Consequently, it is imperative that the updated CA-GREET model properly allocates energy and emissions from associated gas recovery to oil production pathways rather than natural gas pathways. To date, there is no indication in the CA-GREET model or accompanying documentation that this is the case. We ask that CARB takes the proper time to review this important issue, and make sure that the model is correctly allocating GHG emissions from associated gas. Notably, in the near future Argonne National Laboratory is expected to update the national GREET model on this specific issue.

f. LCNG Pathway – The LCNG pathway in the CA-GREET model reflects a lack of understanding as to the actual operation of LCNG fueling facilities. This is manifested in improper modeling of LCNG storage, regasification, and compression that result in increased CI values for the LCNG pathway.

g. Model Calculation Errors – ICF has identified at least twelve areas in the model where formulas are incorrect or internally inconsistent. These are only the errors that have been identified for natural gas pathways, within the very short timeframe allotted for public review and comment. The number and types of errors suggest that the model would benefit from a more-thorough CARB review followed by a longer period for the vetting process.

h. Hydrogen and Electricity Pathways – The CA-GREET 2.0 model does not currently allow the modeling of CI values for hydrogen and electricity-based pathways in the "T1 Calculator" worksheet. Hence, it is unclear as to whether or not CARB staff intend to update CI values for these fuels at the same time that CI values for natural gas, petroleum, and other bio-derived liquid fuels are updated. Natural gas is currently the dominant feedstock for electricity generation in California and for the production of hydrogen via steam-methane reformation. Any changes to the assumed upstream CI value of natural gas will also impact those for hydrogen and electricity-based pathways. Given the interconnected nature of these fuels, it is imperative that all fuel pathways be updated at the same time. This is necessary to avoid biasing LCFS outputs in favor of some fuels over others.

Many of the concerns identified above can be addressed by further stakeholder engagement and public vetting of the CA-GREET 2.0 model. As noted above, several peer-reviewed studies are pending that are closely assessing the natural gas supply chain, and will bring much-needed new information for CARB's consideration. These studies include:

- Four studies by the Environmental Defense fund covering natural gas gathering, processing, transmission, storage, distribution, fueling station, and vehicle methane emissions;
- A Gas Technology Institute study updating 20-year old methane leakage factors for transmission and distribution pipeline infrastructure;
- A joint California Energy Commission and UC-Davis study of methane leakage; and
- A joint study between CARB and the Gas Technology Institute

All of these studies are nearing completion and have projected publication dates in 2015; some will be published shortly after CARB's February 2015 Board meeting, which is currently scheduled to include review

of the updated CA-GREET model. Clearly, there is much to be gained and little to be lost by decoupling the timeline for LCFS reauthorization from that of the CA-GREET model update, which requires more work by staff and vetting of the proposed changes.

Summary of Conclusions and Recommendations

Our organizations want to work closely with CARB and all stakeholders to ensure that the LCFS program can continue without interruption. We also believe it's critical for CARB to take additional time to ensure the program is based on the strongest-possible scientific foundation. Updating CA-GREET involves very complex and evolving parameters that require proven, fully vetted data and inputs. The modifications that are adopted will likely have profound impacts on development of much-needed alternative fuels and advanced vehicle technologies in California. Given that California frequently leads on energy and environmental issues, these changes will have also have important national and international ramifications regarding the best approaches to address climate change.

For all these reasons, we strongly 1) support the reauthorization of the LCFS regulation in February 2015, and 2) urge you to adopt a more reasonable schedule for the updating of the CA-GREET model, to enable CARB staff to fully integrate critical new information that is likely to emerge in the coming months. Please refer to our attached report from ICF International, for a very detailed technical analysis on the CA-GREET modifications that have been proposed by CARB staff.

Thank you for the opportunity to comment. We look forward to working with CARB staff on this important issue. If we can provide additional information, please contact any of us (the numbers are provided below).

Sincerely yours,

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Attachment: "Technical Review of GREET 2.0," ICF International Report, October 2014.