December 15, 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 additional comments regarding CARB's proposed reauthorization of the Low Carbon Fuel Standard (LCFS) regulation and proposed update to the CA-GREET model (CA-GREET 2.0). As detailed in our October 24, 2014 comments, we support CARB's re-authorization of the LCFS regulation. We also appreciate the ongoing dialogue with CARB staff regarding the concerns detailed in our previous comments and the efforts that staff have made to address those concerns. However, the latest release of the CA-GREET model is still far from ready, exhibiting several critical calculation errors and data quality issues.

Therefore, we continue to strongly urge you to delay adoption of any proposed revisions to CA-GREET until our concerns have been thoroughly addressed, and until important new data from various ongoing studies has been incorporated. We also request that CARB staff implement a robust public workshop process and convene a natural gas industry working group during the period between the February 19-20th and July 23-24th board meetings. Our organizations stand ready to engage in the workshops and working group, supporting CARB staff in the development of a CA-GREET model that relies on the best available data.

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. Some of our previous technical concerns have been addressed by CARB staff over the last two months and we appreciate the ongoing dialogue and efforts by staff in this regard. However, a number of technical concerns remain. Additionally, the new draft of the CA-GREET model (referred to here at CA-GREET 2.0b for clarity) provided to us on December 2nd, has raised additional concerns. These technical concerns are summarized below, and detailed in the attached ICF International report that was commissioned by our organizations in regard to the latest release of the CA-GREET model. It is clear that no updates to the CA-GREET model can reliably be completed apace with the reauthorization of the LCFS, and that more work and time is needed to satisfactorily complete the updates to the model.

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 2.0b update, and 2) incorporate significant new peer-reviewed data that CARB staff has acknowledged will emerge over the next six to twelve months. We also recommend that CARB staff pursue a more robust workshop process around the CA-GREET model updates with stakeholders in 2015 that will allow all sides to engage in a process of comment and review guided by the technical needs of the program rather than the reauthorization timeline of the LCFS regulation.

Details

<u>Why our organizations strongly support the reauthorization of the LCFS regulation</u>

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 have been 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. Staff then released an initial draft of the CA-GREET model for public review on October 10th (CA-GREET 2.0a) and allowed for a nine business day period to review the model and submit comments. During that brief comment period, we identified numerous issues with the CA-GREET 2.0a model that we believe arose due to the speed at which the proposal was being developed.

On December 2nd, staff released the proposed CA-GREET 2.0b update, which superseded the proposed CA-GREET 2.0a model. Again, we were provided with nine business days to review and comment on the revised model. While some of the issues that we identified in our October 24th comments have been addressed, several issues remain and new errors have been identified in the CA-GREET 2.0b proposal. We strongly believe that this push for expediency is happening at the expense of accuracy and completeness.

As noted in our previous comments, and reiterated here: 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 valuable information becomes available.

Highlighted concerns from the attached ICF International report

Attached to this letter, we are providing a technical report prepared by ICF on behalf of CNGVC, NGVA and RNGC. The ICF report is based on a review of the proposed CA-GREET 2.0b model and addresses specific issues and problems that ICF and our team have identified regarding CARB's proposed changes to CA-GREET.

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

a. Tailpipe Emissions of Methane and Nitrous Oxide – The previous draft of the CA-GREET 2.0 model relied on outdated emissions factors based on 18-year-old NGV technologies. Staff have taken the commendable step to pursue other data sources, recognizing that the outdated data employed in the previous model should not be relied upon. In the current draft CA-GREET 2.0b model, staff have relied upon emissions factors from EPA's MOBILE 6.0 emissions model. Unfortunately, this appears to be a case of replacing one bad dataset with another. The referenced MOBILE 6.0 data are 12 years old and still do not reflect the best currently available data. Further, the MOBILE 6.0 model is no longer used by regulatory bodies, having long been replaced by EPA's MOVES model.

b. The Need to Include Compression-Ignition Natural Gas Engines – The (national) GREET model developed by Argonne National Laboratory, 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. It is critical that any updated CA-GREET model 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, any updated CA-GREET should account for efficiency and emissions differences across vehicle classes and duty cycles.

c. Fugitive Methane Emissions – CA-GREET2.0b has incorporated the latest U.S. EPA methane leakage rate estimates, as provided in the 2014 version of the national GREET model. While these leakage rates are lower than the 2013 version of the national GREET model 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 2.0b 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 CA-GREET 20.b model. An internal engineering analysis by SoCalGas indicates that leak rates could be 80 percent lower than the CA-GREET 2.0b 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.

Note that this issue remains unaddressed from our October 24th comments. We continue to recommend that CARB 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 previous CA-GREET 2.0a model draft, LFG-based natural gas pathways included an assumed two percent methane 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. Staff have since revised this leakage rate down to one percent, which we believe moves in the right direction and we appreciate the degree of interaction and consideration by CARB staff on this point. Unfortunately, no detail on the basis of the one percent figure has been given, and we continue to support the position that the leakage rate is effectively zero at LFG facilities. Any assumption of methane leakage from LFG facilities must be documented and justified, because such leakage would likely conflict with state and federal regulations limiting methane emissions from U.S. landfills. Specifically, California regulation 17 CCR 95464 (b)(1) sets very stringent leakage limits of 500 ppmv[1] and would translate into less than 0.1% leakage. Under Federal law, 40 CFR 60.753 prohibits any leakage of collected gas from landfill collection and processing systems.

   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. Additionally, we would encourage CARB to engage with industry to support a study conducted by the Gas Technology Institute (GTI) to assess methane leakage of landfill facilities, similar to ongoing work that GTI is conducting on transmission and distribution pipeline leakage rates.

   In lieu of data demonstrating and quantifying methane leakage at LFG facilities, CARB should not assume that methane leakage occurs. Additionally, we request that CARB make the leakage rate a user-modifiable input in the CA-GREET model so that fuel producers able to provide supporting documentation may submit site-specific values for methane leakage.

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 any updated CA-GREET model properly allocates energy and emissions from associated gas recovery to oil production pathways rather than natural gas pathways, where appropriate. To date, there is no indication in the CA-GREET 2.0b model or accompanying documentation that this is the case. Notably, in the near future Argonne National Laboratory is expected to update the national GREET model on this specific issue.

[1] Parts per million, by volume

f. LCNG Pathway – The LCNG pathway in the CA-GREET model double counts the electrical energy needed for regasification and compression. As detailed in the attached report, default values in the Tier 1 calculator for energy use in regasification and compression are each given as five kilowatt-hours. Engineering estimates provided to CARB staff by LCNG design firms indicate that the combined energy consumption for liquefaction and compression should be five kilowatt-hours. Hence, the default values in the calculator should be adjusted to reflect real-world energy consumption based on engineering estimates.

g. Hydrogen and Electricity Pathways – In the currently proposed CA-GREET 2.0b model, there is an apparent coding error in the calculation of power plant efficiency. The coding error occurs in the 'Electricity' spreadsheet and results from the transition from using NERC regions to eGRID regions. This coding error leads to a carbon intensity of electricity that is about 30 g/MJ too high. This error propagates through the model and increases the carbon intensity of various aspects of the natural gas pathway (e.g., compression).

Many of the concerns identified above can be addressed by further stakeholder engagement and public vetting of the CA-GREET 2.0b model and could be realized through a robust public workshop process conducted in 2015. Additionally, 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. 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.

Summary of Conclusions and Recommendations

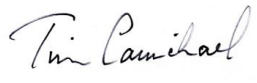
Our organizations want to work closely with CARB and all stakeholders to ensure that the LCFS program can continue without interruption. We also believe it's critical for CARB to take additional time to ensure the program is based on the strongest-possible scientific foundation. Updating CA-GREET involves 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 the transportation sector's contributions to 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. We also request that CARB staff implement a robust public workshop process and convene a natural gas industry working group over the next several months as CARB moves toward the July Board meeting, where a new proposed version of the CA-GREET model will be considered. Please refer to our attached report from ICF International, for a more 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 do not hesitate contact any of us.

Sincerely yours,



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Attachment: "Technical Review of CA-GREET 2.0 Model (Updated)" ICF International Report, December 2014.