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Dear Matt:

I was good to see you yesterday. Sitting at Logan for an extra 2½ hours yesterday provided me with enough "quiet" time to realize that I did not fully articulate my major modeling concern that currently runs through most analysis including California's LCFS an and your LCF modeling[1]. My issue is that by choosing the conventional IPCC political reporting data using a 100-year atmospheric lifetime to calculate GHG impact in the 2010-2050 or shorter timeframes (e.g. 2020) will not provide policy makers the best guidance on what the most effective greenhouse gas reduction strategies are.

As you know, a substance's Global Warming Potential "GWP" depends on the timespan over which the potential is calculated. A gas which is quickly removed from the atmosphere may initially have a large effect but for longer time periods as it has been removed becomes less important. Thus methane has a potential of 25 over 100 years but 72 over 20 years; conversely sulfur hexafluoride has a GWP of 22,800 over 100 years but 16,300 over 20 years (IPCC TAR). The GWP value depends on how the gas concentration decays over time in the atmosphere.

The United Nations Intergovernmental Panel on Climate Change (IPCC) developed the concept of GWP as an index to help policymakers evaluate the impacts of greenhouse gases with different atmospheric lifetimes and infrared absorption properties, relative to the chosen baseline of carbon dioxide (CO_2). Scientific advancements have led to corrections in GWP values over the past decade, and now our policy decisions need to reflect this new knowledge. In the mid-90s, policymakers for the Kyoto Protocol chose a 100-year time frame for comparing greenhouse gas impacts using GWPs. The choice of time horizon determines how policymakers weigh the short- and long-term costs and benefits of different strategies for tackling climate change.

According to the IPCC, the decision to evaluate global warming impacts over a specific time frame is strictly a policy decision—it is not a matter of science:

> *"the selection of a time horizon of a radiative forcing index is largely a 'user' choice (i.e. a policy decision)" [and] "if the policy emphasis is to help guard against the possible occurrence of potentially abrupt, non-linear climate responses in the relatively near future, then a choice of a 20-year time horizon would yield an index that is relevant to making such decisions regarding appropriate greenhouse gas abatement strategies."*[2]

[1] My understanding is that your data included the AR4 100-year CO_{2e} numbers for CO_2 (GWP = 1), CH_4 (GWP = 25) and N_20 (GWP = 298)

[2] Intergovernmental Panel on Climate Change, 1994. Radiative Forcing of Climate Change and an Evaluation of the IPCC IS92 Emission Scenarios. Cambridge University Press, p. 229.

Knowledge of climate change and its implications have increased exponentially since the Kyoto Protocol was established. Growing political and scientific consensus points to the urgent need to reduce emissions by 50% by 2050, with reductions up to 80% in developed countries, in order to avoid "the likelihood of massive and irreversible disruptions of the global ecosystem."[3] More than 200 scientists at the U.N. Climate Conference in December 2007 signed the "Bali Climate Declaration by Scientists," calling for policies to reflect the need for global emissions to peak and decline within the next 10-15 years:

> *"Based on current scientific understanding, this requires that global greenhouse gas emissions need to be reduced by at least 50% below their 1990 levels by the year 2050. In the long run, greenhouse gas concentrations need to be stabilized at a level well below 450 ppm (parts per million; measured in CO2-equivalent concentration). In order to stay below 2 ℃, global emissions must peak and decline in the next 10 to 15 years, so there is no time to lose."*[4]

In fact, EPA focused RFS2 on a 30 year atmospheric timeframe as being appropriate for biofuels. "iv. Timeframe of Emission Analysis5: Based on input from the expert peer review and public comments, EPA has chosen to analyze lifecycle GHG emissions using a 30 year time period, over which emissions are not discounted, i.e., a zero discount rate is applied to future emissions." … "Based upon the comments discussed above, EPA has decided to use a 30 year frame for assessing the lifecycle GHG emissions[3].

Examining fossil fuels for internal combustion engines (ICE) and atmospheric combustion in boiler and furnaces from the perspective of carbon equivalent reduction policy in the near-term (e.g. 2020 to 2050 time frame), it is important to use the best science. Considering the critical actors, in transpiration and stationary heating applications, are CO_2 and methane and methane's chemical lifetime in the atmosphere is approximately 12 years, a 12 year atmospheric lifetime would result in the maximum GHG profile for engines, boilers and furnaces. However, since EPA is using 30 years (RFS2) and the IPCC history of 20 year data, I would highly recommend NESCAUM update its scientific baseline and use the 20 year IPCC AR4 data and not the 100 year atmospheric lifetime data it currently is using.

The IPCC Working Group 1 presents GWP values based on the up-to-date science, but does not recommend any rules on application of those values. Note that the latest science presented in the Fourth Assessment Report (AR4) rates the 100-year impact of methane at 25 times CO_2 and the 20-year impact of methane emissions at 72 times the global warming potential of CO_2.

[3] European Union, 2007. Limiting Global Climate Change to 2° Celsius: The way ahead for 2020 and beyond." Accessed at http://ec.europa.eu/environment/climat/future_action.htm on March 17, 2008.
[4] Climate Change Research Centre, 2007. "2007 Bali Declaration by Scientists." Accessed at ttp://www.climate.unsw.edu.au/bali/ on March 17, 2008.
[5] 14780 Federal Register / Vol. 75, No. 58 / Friday, March 26, 2010 / Rules and Regulations: ENVIRONMENTAL PROTECTION AGENCY, 40 CFR Part 80, [EPA–HQ–OAR–2005–0161; FRL–9112–3] RIN 2060–A081
Regulation of Fuels and Fuel, Additives: Changes to Renewable Fuel, Standard Program, AGENCY: Environmental Protection Agency (EPA). ACTION: Final rule.

IPCC Fourth Assessment Report (2007) AR4			
	20 year	**100 year**	**500 year**
Carbon dioxide	1	1	1
Methane	72	25	7.6
Nitrous oxide	289	298	153

Focusing on near-term targets for GHG impacts makes sense in that it will surely buy time for more long-term solutions to be developed. To a degree, the choice of timeframe for modeling will have a substantial impact on how we view the competing fuels, and it would seem wise that the policy makers in the states make an explicit judgment on this subject.

I am sorry we did not get a chance to discuss this further yesterday. I trust you will give this critical assessment metric strong consideration as it forms the basis for real GHG reduction success over the 2010 – 2050 timeframe. I look forward to you thoughts on this matter.

Sincerely yours,

Rich Sweetser

Cc: John Huber – NORA
Jeremy McDiarmid – ENE
Susan Reid – CLF