Remarks for Sustainability Panel at Public Meeting on Northeast & Mid-Atlantic LCFS, October 27th in Newark New Jersey.

Good afternoon. My name is Jeremy Martin, and I am a Senior Scientist in the Clean Vehicles Group at the Union of Concerned Scientists. The Union of Concerned Scientists is the leading science-based nonprofit organization working for a healthy environment and a safer world.

I have been asked to address the sustainability of low carbon fuels. Since biofuels are important part of this story, that's what I will address.

The first point is that where biofuels sustainability is concerned, the science is clear, and getting clearer everyday. *To avoid perverse incentives and harmful unintended consequences, biofuels programs must account for fossil fuel carbon and carbon emitted from changes in land use.*

Forests and other unmanaged land absorb and sequester a lot of carbon, which gets stored in the plants and soils. Converting carbon rich land types to agriculture releases this carbon into the atmosphere. Expanding biofuels production adds to the footprint of agriculture, which results in accelerate conversion of forest, especially in the tropics. Because plants and soils store fifteen times more carbon than the world's proven oil reserves, accounting for the forest side of the carbon ledger is just as important as the fossil fuel side of ledger.

The references below are part of the large and growing body of peer reviewed scientific work on this issue. The first group of references describes the carbon impact of direct conversion of ecosystems to biofuel production, such as conversion of peat forests to palm oil plantations. The second group looks at this indirectly, using agricultural economics models to relate the expansion of biofuels to changes in the footprint agricultural worldwide. This is called indirect land use change accounting. The final group is recent work looking at the potentially disastrous consequences of broader policy frameworks that miss the linkage between biofuels, bioenergy and emissions from land use changes.

These papers bear on the global carbon accounting of deforestation in the tropics. But we would be naïve to ignore the broad range of sustainability impacts that accompany carbon emissions when tropical forests are destroyed. The depletion of carbon stocks in unmanaged ecosystems is accompanied by a loss of biodiversity, wildlife habitat, land rights of Indigenous Peoples, soil erosion and interference in local water cycles. Addressing tropical deforestation is vitally important to the global climate, but it is also a sustainability issue of the highest order.

It is clear that land use emissions are significant, and no credible analysis of overall carbon impacts can ignore them, but this is not to say that this is an easy task.

I have here and will submit with my comments a statement signed by more than 200 scientists and economists with relevant expertise in support of including emissions from indirect land use changes in the lifecycle accounting of biofuels. The lead signers are below, along with a couple key sentences that are worth quoting.

"There are uncertainties inherent in estimating the magnitude of indirect land use emissions from biofuels, but assigning a value of zero is clearly not supported by the science."

"Grappling with the technical uncertainty and developing a regulation based on the best available science is preferable to ignoring a major source of emissions."

This position is consistent with the approach CARB and EPA have been taking to date, and their work shows there is a workable route forward. Both agencies have clearly recognized the challenges posed by the novelty of the analysis, and the uncertainty in models and data sources. They have both allowed substantial opportunities for stakeholder input, and technical peer review. While EPA's regulations are still being finalized, CARB, has finalized theirs. In the process they created an expert work group to continue to investigate possible refinements in the lifecycle analysis going forward. This is an appropriate response to technical uncertainty, and a good model for the Northeastern and mid-Atlantic states. Ignoring a significant source of emissions is not reasonable or technically defensible.

Before going on to non carbon sustainability impacts, I want to comment on the idea that biofuels are being somehow unfairly singled out by the approach EPA or CARB are taking, and that land use change or other indirect emissions of gasoline are being ignored. Crop based biofuels fundamentally require a great deal of land to produce fuel at anything close to the scale of US fuel consumption. Changes in land use play a fundamental role in the carbon cycle, so this is a factor that simply can not be credibly ignored. Fossil fuels production requires much less land per unit of energy, so when CARB and others have looked into the land use change emissions from fossil fuels, the numbers have not been significant. The peer reviewed scientific literature has so far not produced a credible way to estimate other indirect emissions associated with fossil fuel production. If and when credible analysis demonstrates that there are significant indirect emissions from fossil fuels, these should certainly be included into the fossil fuel lifecycle. But until that happens there is no substance behind demands of symmetry. This is a matter of credible and accurate analysis.

Beyond carbon, water use is a critical and limited resource with implications for the sustainability of our fuel system. An article in this week's Science magazine makes the point that biofuels mandates impact water use and water pollution. Increased use of corn for ethanol is prompting farmers to plant corn in areas of the country that require irrigation. Michael Wang and his group at Argonne national lab have turned their attention to the water impacts of different fuels, and these are their current results. Ethanol produced from irrigated corn can consume staggering amounts of water, which is especially harmful in regions that already have depleted aquifers. Increased scale and

intensity of corn production also causes water quality problems from runoff of fertilizer that is contributing to the expansion of the hypoxic zone in the gulf of Mexico. As with land use accounting, it is not sufficient to look only at the acreage around the corn ethanol facility, as the larger demand for corn affects planting decisions in other aquifers as well.

These are some of the key sustainability concerns about biofuels, but there are also opportunities. Scientists, engineers and entrepreneurs around the region, and across the country are developing a variety of different technologies to make biomass based fuels technically and economically feasible. With these breakthroughs we can make better biofuels, that balance the needs for food, fuel and climate mitigation while protecting the land from degradation. These include:

1. Perennial plants grown on degraded lands abandoned from agricultural use
    - Prarrie grasses or fast growing trees can produce biomass with less fertilizer, pesticides while reducing runoff and improving the land and soil over time.
2. Crop residues
    - With sustainable agricultural practices, crop residues like corncobs, stalks and wheat grass can be used as biofuel feedstock without displacing food production.
3. Sustainably harvested wood and forest residues
    - Wood and forest residues can be productive feedstocks, provided policies are in place to provide for the regeneration of the forest and minimize negative short-term impacts and protect against long-term deterioration of water quality, soil productivity, wildlife habitat, and biodiversity.
4. Double crops and mixed cropping systems
    - Use of winter cover crops and other multi-year rotations can incorporate biomass harvests into a sustainable multi-product mix that diversifies revenue streams while enhancing sustainability.
5. Municipal and industrial wastes
    - Waste materials headed for landfills after recycling are also a significant source of fuel feedstocks that can be exploited while actually minimizing the impact of landfills.

Together with other low carbon fuels that I don't have time to discuss, including electricity, biogas, etc., there are a variety of sustainable low carbon fuels. I commend the NE and Mid Atlantic states for their work. You are on the right track. I would be happy to take any questions.