Dear members of the House Committee on Energy and Environment:

Thank you for this opportunity to comment on Oregon SB 334 A.

1. Opportunities: I believe renewable natural gas (RNG) should be developed as an important fuel for heavy trucking and shipping, and potentially for seasonal energy storage.

Decarbonizing Oregon's energy will require energy sources to be restricted to clean electricity or carbon-neutral biofuels[1]. Within transportation fuels, the cost trajectories of batteries will likely enable electric vehicles to globally dominate new light vehicle and medium-duty truck and bus models within a decade. But long-haul freight trucks and shipping need higher energy capacities, and both already have some natural gas infrastructure and usage. Compressed natural gas (CNG) fueling stations for long-haul trucking exist across the US, and the North American Emission Control Area emission standards imply natural gas engines within 200 nautical miles of US ports. Replacing fossil natural gas with RNG would eliminate both the particulate emissions and GHG emissions of these two transportation categories.

Rearranging the sources and users of natural gas is a huge project, so SB 334 is necessary governance to track existing and potential sources of RNG.

Another large potential source of RNG is synthesis through various processes that use excess power from wind farms or solar farms to electrolyze water into hydrogen and oxygen and then create methane from the hydrogen. Whether generating hydrogen or methane, such technologies are called power-to-gas[2] or P2G. We already curtail excess power generation from wind farms, and increasing our wind and solar generation will create even more excess generation periods. RNG from excess renewable generation could be stored and transported in existing natural gas infrastructure, as opposed to separate and more problematic storage and distribution of hydrogen. How much RNG would be used for electricity generation vs. transportation fuels will depend upon the relative economics of other technologies for firming up the intermittency of renewable electricity generation, including energy efficiencies, other types of storage, more transmission, better demand response (control of loads), etc.

In some regions, the cost trajectories of wind and solar power generation are already crossing over the costs of generation by natural gas, which are far lower than coal or nuclear generation. A decade or two from now Oregon will be primarily powered by wind, solar, and hydro, because those will be the cheapest. The deployment of wind and solar is increasingly being paced by the ability of grid resources to firm up the intermittent generation. Daily energy storage will probably be dominated by batteries, whether utility-scale or distributed. But anyone with a solar array who calculates the battery necessary to get through months of an overcast winter quickly realizes that some other seasonal energy storage is necessary. Ergo the interest in P2G, although of course other nascent technologies for season storage may evolve more rapidly.

Mark Jacobson's pathfinding studies on decarbonization[3] highlight the need for seasonal storage and recommend P2G technologies. Development and deployment of P2G in Europe is far ahead of the US, but Oregon could lead the US in this important technology. An obvious location for a large P2G plant, and potential business cluster, is near The Dalles, tied into wind farms, Bonneville Power, and the Pacific Interties.

2. This bill: I strongly support SB 334 A as is, but feel it should be improved by expanding the potential sources of RNG to include power-to-gas (P2G) processes under development.

As described above, an important and potentially much larger source of RNG is P2G plants, whether utility-scale or distributed. Instead of limiting the sources of RNG to "processed gas derived from biogas that is generated from organic waste or other organic materials", the definition of RNG should perhaps include derivation from any carbon-neutral or carbon-negative process. P2G may not be the only process we figure out, but perhaps generating methane from excess electric power covers enough of the options we can foresee now.

3. Future: RNG should fit into a comprehensive, long-term energy plan. Emissions planning for Oregon clearly indicates that we must eliminate fossil natural gas usage and replace it with RNG or clean electricity. Given that Portland, Multnomah county, and many other cities and countries are appropriately targeting 100% renewable energy by 2050, examples of necessary state policies for natural gas would include:

- Renewable portfolio standard (RPS) targets for natural gas: 50% by 2030 and 100% by 2050.
- Fines for methane infrastructure leaks. Preliminary measurements of methane leakage from natural gas wells, pumping stations, and pipelines indicate fugitive methane emissions averaging as high as 5 to 10% of the transported methane, which makes electricity generation from methane as bad for greenhouse heating as burning coal. This effect is independent of the source of the methane, whether from fracked wells or from RNG. It appears that the EPA will not be allowed to do any more of such monitoring, so states need to require objective measurements and elimination.
- Fines for large waste streams that don't capture methane or don't capture enough of the emitted methane.
- Efficiently encourage or fund P2G development and deployments in Oregon.

As with other developments that replace fossil-fuel usage in Oregon, the economic benefits of keeping energy expenditures within the state are huge. $11 billion a year flowing out of the state to fossil-fuel companies is a giant, job-killing tax.

We are at a historic tipping point, both for global ecosystems and also for the global energy transition to renewables. Those states that act wisely now will be more competitive in the future.

Again, thank you for this opportunity to affect the future of Oregon.

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References

1. *Planning Oregon Emissions,* an informal white paper by Eric Strid, written in frustration that no one in the Northwest has tried to write a comprehensive energy/emissions plan. http://cgcan.org/wp-content/uploads/2017/04/Planning-Oregon-Emissions-170331-1.pdf This explorative work considers top-down planning for emissions goals for Oregon, deployment implications, economic options, policy examples, and governance gaps.

2. Power to gas summary in Wikipedia https://en.wikipedia.org/wiki/Power_to_gas

3. Jacobson, et al, *100% Clean and Renewable Wind, Water, and Sunlight (WWS) All-Sector Energy Roadmaps for 139 Countries of the World*, April 2017. https://web.stanford.edu/group/efmh/jacobson/Articles/I/CountriesWWS.pdf