ANALYSIS OF UNITED STATES SUPPLIES OF RNG AND THEIR IMPACT ON THE CALIFORNIA LOW CARBON FUEL STANDARD THROUGH 2030

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Overview

California is one of a handful of regions that adopted a low-carbon fuel standard (LCFS) with a goal of enabling long-term, deep reductions in greenhouse gas emissions from the transportation sector. The LCFS requires decarbonization of transportation fuel – a 10% reduction in carbon intensity from 2010 levels by 2020, with proposed reductions of 18% by 2030. The LCFS is structured to create an incentive that works to bring less carbon-intensive fuels into California. Through use of a credit market and credit trading, the LCFS encourages the production of low carbon fuels (i.e. renewable natural gas, bioethanol, biodiesel) by subsidizing fuels based on the degree to which their carbon intensity falls below some regulatory-determined target. The funds for these subsidies are generated by taxing high carbon fuels (i.e. gasoline, diesel) based on the degree to which their carbon intensity exceeds the target. Up to this point, LCFS compliance has largely been met through the use of low-carbon liquid biofuel, both domestically and internationally sourced. As the LCFS compliance schedule becomes stricter through 2020 and beyond, and as CA continues targeting GHG emission reductions past 2030 LCFS, compliance becomes less certain.

Renewable natural gas supplies (RNG) are produced primarily from collecting emissions at landfills and from the deliberate anaerobic digestion of dairy manure, municipal solid waste, and waste water. The potential for Californian supplies of RNG to contribute to LCFS compliance have been assessed (Parker et al, 2017; Scheitrum et al, 2017). Out-of-state supplies of RNG will impact both the quantity available to California and the economic competitiveness of Californian sources of RNG. A national supply assessment is needed to evaluate the impact of RNG on California's energy markets and climate policy compliance as well as the compliance of the national RFS. Existing estimates of national RNG supply curves (Murray et al, 2017, Milbrandt et al, 2016) use single techno-economic models to represent cost of production across the United States. Those cost models are not appropriate for California and potentially other regions. Accounting for spatial heterogeneity of cost and carbon intensities will provide greater insight into the potential RNG market development. In addition, analysis of the economic competition between resources with the additional value of policy credits is needed to evaluate the impact of out-of-state RNG on both the LCFS compliance markets and the economic viability of in-state sources, which are a potential source of in-state methane reductions.

Methods

This paper conducts a national assessment of RNG resources from livestock production, landfills, municipal solid waste, and wastewater treatment and estimates the cost of production as well as carbon intensity at each possible production site. Estimated supply curves are then generated to inform a model of the California LCFS including interactions with other state-level fuel policies and the national RFS.

Given the availability of organic wastes and the costs of their safe disposal, the potential to derive renewable and clean substitutes to fossil fuels is worth understanding and there is also relatively little economic analysis of this particular biological resource in contrast to crop-derived biofuels, and we already have massive policies in the form SB1383 in California as well as the LCFS implementations in California and Oregon.

Results

Preliminary results indicate there is a potential for approximately 600 bcf of RNG supplies to be developed in the United States, of which about 15% is within California. The RNG production protential in California is slightly cheaper than out-of-state options for the Landfill and Dairy pathways and is considerably cheaper for the wastewater treatment plant production pathway. Interactions with national and out-of-state fuel policies are still being examined.

Conclusions

Reducing methane emissions has been a top priority for environmental groups and the agricultural sector has long been identified as a prime target for policy. We anticipate this research will be of interest to the dairy and beef industries, waste management, energy and public utilities, as well as environmental groups. Further, as more states are looking to adopt state-level fuel policies to mitigate pollution and greenhouse gas emissions, we believe the results of our work will inform the policymaking process for subsequent implementations.

Additionally, this paper will address the issue of policy interaction between the California LCFS implementation with both the national RFS and the Oregon LCFS. An extension of this work will address the possibility of further adoption of state-level LCFS policies.

References

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