Biogas Researchers, Inc.
1440 G Street, N.W.
Washington, D.C. 20005

White paper/timeline concerning the Equivalence Value for RFS electricity

2006

At the outset of the RFS program, EPA confirmed that the statutory definition of renewable fuel included in Section 211(o) of the Clean Air Act (CAA), as amended by the Energy Policy Act of 2005 (the Act), includes all motor vehicle fuels whether directly used with gasoline or not, that are produced from biomass material, including those produced with natural gas from a biogas source such as a landfill, sewage waste treatment plant, feedlot, or other place where decaying organic material is found.

EPA also confirmed the Act requires it to determine the appropriate value for credits (i.e., "Equivalence Values") for different types of renewable fuel, and determined that it was appropriate to base the Equivalence Value assigned to a particular renewable fuel on the degree to which the renewable fuel supplants the petroleum content of fuel used in a motor vehicle, because this was consistent with the Act's definition of renewable fuel.

2007

EPA acknowledged that gasoline and diesel are only replaced or reduced to the degree that the energy they contain is replaced or reduced. At that time, virtually all RFS renewable fuels were volumetric and chemical (i.e. liquid fuels such as ethanol, biodiesel and butanol), and virtually all vehicles were powered by internal combustion engines that burned those fuels. EPA therefore determined it could appropriately account for the extent to which a renewable fuel would replace or reduce petroleum transportation fuel - and thereby comply with the Act's requirement to assign "appropriate" credit values to renewable fuels - by assigning an Equivalence Value to each renewable fuel based on its energy content in comparison to that of ethanol, the most prevalent RFS fuel.

EPA posited that basing Equivalence Values of renewable fuels on their energy content in comparison to that of ethanol could be used to determine the appropriate Equivalence Value for any other potential renewable fuel as well. In other words, EPA determined that by basing the Equivalence Value of a renewable fuel on its energy content, the Agency would also be basing the Equivalence Value on the degree to which the renewable fuel would replace or reduce petroleum transportation fuels. EPA further stated it believed the use of Equivalence Values based on volumetric energy content helps achieve [the] goal of differentiating between renewable fuels that have different impacts on motor vehicle gasoline and diesel consumption,

and that it did not believe it would be appropriate to assign the same Equivalence Value to renewable fuels with materially different impacts on such consumption.

From that point on, the number of credits (RINs) generated for a given RFS fuel has essentially been calculated strictly on the energy content of that renewable fuel - as embodied in its Equivalence Value - when it enters a vehicle. This practice was based on EPA's largely correct belief that by comparing every renewable fuel to ethanol on an equivalent energy content basis, each would automatically be assigned an Equivalence Value that accurately accounts for the amount of petroleum transportation fuel that is reduced or replaced by that renewable fuel in comparison to ethanol.

2010

In a final rule issued in 2010, EPA confirmed that its inclusion of electricity and CNG/LNG made from renewable biomass in the RFS program was consistent with the requirement of the Energy Independence and Security Act of 2007 (EISA) that all transportation fuels be included in the RFS program. Both fuels are non-volumetric, so EPA decided to measure those fuels in "gallon equivalents," and designated gallon equivalents of both fuels to have an energy content identical to that of one gallon of ethanol (i.e., 22.6 kilowatt hours for each gallon equivalent of biomass-based electricity, and 77,000 Btu for each gallon equivalent of biogas-based CNG/LNG).

After having designated the energy content to gallon equivalents for both of these non-volumetric fuels, EPA assigned both fuels an Equivalence Value also identical to that of one gallon of ethanol, i.e., 1.0. In doing so, EPA clearly assumed that use of Equivalence Values based on the volumetric energy content of one gallon of ethanol for both of these two non-volumetric fuels was an appropriate measure of the extent to which each would replace or reduce petroleum transportation fuels. As shown below, this later appeared not to be true for biogas-based electricity.

2013-2014-2015

In 2013, EPA acknowledged it would take roughly three times the amount of energy from liquid fuel to drive a conventional vehicle a given distance compared to an EV powered by electricity, and stated that the drivetrains of electric vehicles are roughly three times as efficient as those of conventional gasoline-powered vehicles, meaning that any given EV would be able to travel about three times as far per unit of energy input. Nonetheless, in 2014, EPA reconfirmed that one gallon-equivalent of biogas-based electricity would continue to have both an energy content and Equivalence Value equal to that of one gallon of ethanol (i.e., 22.6 kWh and 1.0, respectively).

In 2015, Biogas Researchers formally petitioned EPA to increase the Equivalence Value for RFS electricity from 1.0 to 4.3. That request is still pending at EPA.

2016

In a November 16, 2016 proposed rule ("REGS rule"), EPA asked for public comment concerning whether it should deviate from its current system for determining Equivalence Values, where (i) the number of RINs generated is calculated strictly on the energy content of the fuel entering the vehicle, and (ii) the corresponding Equivalence Value is assumed - but not confirmed - to be an appropriate measure of the extent to which each RFS fuel would replace or reduce petroleum transportation fuels.

In a December 12, 2016 final rule, EPA confirmed that due to the difference in energy content between ethanol and gasoline, one gallon of ethanol is energy-equivalent to approximately 67% of a gallon of gasoline, and more ethanol gallons must be consumed to go the same distance as gasoline due to ethanol's lower energy content. EPA did not address the contradiction inherent in the fact that a gallon equivalent of biogas-based electricity is also energy-equivalent to approximately 67% of a gallon of gasoline, but much less than a gallon equivalent of electricity must be consumed in a vehicle to go the same distance as a gallon of gasoline.

2017

In a July 12, 2017 proposed rule, EPA advised that, when estimating per gallon costs of RFS fuels, it considered the costs of ethanol on an energy equivalent basis to gasoline (i.e., per energy equivalent gallon), since more ethanol gallons must be consumed to go the same distance as gasoline due to the ethanol's lower energy content. EPA did not address how it would estimate the costs of a gallon-equivalent of biogas-based electricity, or the fact that a gallon equivalent of electricity has less energy content than a gallon of gasoline, but nonetheless, much less than a gallon equivalent of electricity must be consumed to go the same distance as a gallon of gasoline.

Final comments:

EPA interprets section 211(o) of the Act as allowing it to develop Equivalence Values representing the number of gallons (i.e. RINs) that can be claimed for compliance purposes for every gallon or gallon equivalent of renewable fuel. At the current Equivalence Value of 1.0, only one gallon/RIN can be claimed for compliance purposes for every gallon-equivalent of biogas-based electricity. Three of the other five RFS fuels with EPA-assigned Equivalence Values have values that exceed that of ethanol (i.e., 1.0), precisely because of their greater ability to displace fossil-based gasoline or diesel. Numerous stakeholders have notified EPA that electricity also has a significantly greater ability than ethanol to displace gasoline and diesel, and that the current Equivalence Value assigned to biogas-based electricity is much too low, potentially by a factor of four or more.

Because the current Equivalence Value for biogas-based electricity is not an appropriate measure of the extent to which that biofuel reduces or replaces petroleum-based transportation fuels, it undercounts the number of available gallons of RFS fuel that could be claimed for

compliance purposes. It also imposes a bias affecting the market's ability to choose the most appropriate renewable fuels, and results in costs imposed on biogas-based electricity that are not evenly aligned with the ability of that biofuel to power vehicles and displace fossil-based gasoline or diesel. Furthermore, it creates an unlevel playing field in terms of the RFS program's incentives to produce different types of renewable fuel from the available feedstocks.

In order to determine the appropriate Equivalence Value for RFS electricity, EPA, which has a tremendous amount of fuel efficiency data on virtually all models and years of vehicles powered by both combustion engines and electric motors, should work with DOE, which has studied how many kilowatt hours of electricity used must be consumed in electric vehicles in order to displace a gallon of gasoline used in conventional vehicles. These two agencies have all the data needed to compare average miles per gallon for conventional vehicles and average watts per mile for electric vehicles, and calculate an appropriate Equivalence Value for RFS electricity.

To ensure the Equivalence Value assigned to biogas-based electricity is an appropriate measure of the degree to which that RFS fuel reduces or replaces fossil-based gasoline and diesel, EPA must confirm -- not assume -- that the resulting number of RINs generated per gallon-equivalent of electricity is calculated strictly on the extent to which the energy in electricity used in electric vehicles displaces fossil-based gasoline and diesel used in conventional vehicles.

Contact: *jim.lemon@biogasresearchers.org*