BTR ENERGY

Policy Primer: Activating the RFS Electric Pathway

Bringing Electric Transportation Into the RFS

Overview

Under the Renewable Fuel Standard (RFS), the U.S. Environmental Protection Agency (EPA) could activate the "Electric Pathway" to allow for the generation of Renewable Identification Numbers (RINs) for renewable electricity used as transportation fuel to power electric vehicles. If activated, the Electric Pathway would create a new and significant incentive for: (1) electric vehicle (EV) adoption and investment in EV technology and charging infrastructure, and (2) investment in renewable electricity generation that will help drive prosperity in rural communities and mitigate methane emissions.[1]

Background

BTR Energy is a credit generator on behalf of EV manufacturers participating in the California Low Carbon Fuel Standard (LCFS). The Company uses EV charging data combined with Renewable Electricity Certificates (RECs) to generate LCFS credits for renewable electricity used to charge EVs. In 2015, BTR Energy submitted an initial registration application to EPA for purposes of generating D3 RINs for biogas-based electricity used as a transportation fuel. The RIN generating protocol proposed by the Company is substantially similar to the process through which it generates LCFS credits.

BTR Energy has contracted with additional biogas facilities and intends to submit registration applications to EPA. However, the Company understands EPA cannot approve such applications to generate RINs for electricity as new regulations are needed and are still in development.

The equivalence value for biogas-based electricity is an essential component for any future annual volume or cellulosic percentage standard requirement under the RFS. EPA may fully account for the increased efficiency of the EV drivetrain as part of the equivalence value or annual standard setting process. Updating the equivalence value – even before other regulations related to the Electric Pathway are finalized – would provide the renewable fuels markets direction as to the potential value, size, and impact of the Electric Pathway.

Policy Benefits of the RFS Electric Pathway

BTR Energy estimates an average EV would consume enough electricity over a five-year period to produce approximately $2,100 in e-RIN revenue[2]. A 2018 analysis by Oak Ridge National Laboratory estimated that if e-RIN revenue were to be used to finance a point-of-purchase discount for EVs, the Electric Pathway could significantly alter the growth curve of the electric vehicle fleet, adding as many as 13.2 million BEVs to the road by 2030 over a baseline, no-policy scenario.[3]

E-RIN revenue would also increase the value of renewable electricity generated by biogas facilities, like anaerobic digesters used on dairy farms. Making manure and food waste-based electricity generation an economically viable business has broad benefits and complements new policies like "organics bans" being adopted in large cities across the U.S.

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[1] "Biogas Opportunities Roadmap," US Department of Agriculture, US Environmental Protection Agency, US Department of Energy. https://www.epa.gov/agstar/biogas-opportunities-roadmap-report

[2] Based on an average daily EV electricity usage of 6.0 kilowatt-hours (kWh), an RFS equivalence value of 5.24 kWh/ RIN, and a category D3 RIN price of $1.00.

[3] "Could a bioenergy program stimulate electric vehicle market penetration? Potential impacts of biogas to electricity annual rebate program," August 2018. https://onlinelibrary.wiley.com/doi/pdf/10.1111/gcbb.12581

This new revenue could catalyze an estimated $40 billion in capital investments in new biogas facilities, and when combined with accelerated EV adoption, the Electric Pathway could reduce emissions equivalent to removing tens of millions of passenger vehicles from the road.

Similar programs, like the LCFS, have already successfully accelerated EV adoption and infrastructure investment and motivated the development of new biogas facilities. Since 2011, California has reduced the carbon intensity of transportation fuels by more than 5%[4].

The potential economic benefits of activating the Electric Pathway include the following:

$2,100	**13.2 million**	**$40 billion**
5-Year Incentive Value Per Vehicle	Additional EVs Sold by 2030	New Capital Investments in Biogas

Addressable EV Market and Equivalence Value

The equivalence value for renewable electricity will have a significant impact on the potential RIN generation volume from biogas-based electricity. To illustrate the potential impact, BTR Energy has used EV charging data it collects for LCFS purposes, combined with publicly available EV sales data, to estimate the total amount of electricity used as a transportation fuel to charge EVs and potential RIN generation volume with different equivalence values.

- BTR Energy-observed average passenger EV charging per day: 6.0 kWh per EV per day[5]
- Total passenger EVs operating in the US: 1.6 million[6]
- Estimated EVs actively reporting charging data: 1.2 million[7]
- Total annual electricity used as a transportation fuel: (1.2 million EVs) X (6.0 kWh per EV per day) X 365 = 2,628,000 megawatt-hours (MWh)
- **Annual RIN generation with current equivalence value (1): (2.6 million MWh) X (44 RINs per MWh) = 116 million RINs**
- **Annual RIN generation with alternative equivalence value (3.4): (2.6 million MWh) X (150 RINs per MWh) = 394 million RINs**

The equivalence value could have a multiplying impact on annual RIN generation volume for renewable electricity. Though BTR Energy does not expect RIN generation to reach these volumes for years after the Electric Pathway is activated, BTR Energy expects the market to mature in a similar way as CNG/LNG produced from biogas (renewable natural gas), in that RIN generation volume under the Electric Pathway would increase incrementally year-over-year. Thus, a resolution on the equivalence value will help the market assess the potential for RIN generation.

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[4] "The Low Carbon Fuel Standard Has Succeeded, But How Does It Work?" January 2020. https://ghginstitute.org.
[5] BTR Energy currently collects charging data from more than 100,000 EVs, including both BEVs and PHEVs, operating in California. Since 2019, BTR Energy has received data on more than 6 million unique charge events, which the Company uses to calculate average electricity used to charge each vehicle each day.
[6] "Federal EV Tax Credit Phase Out Tracker by Automaker." June 2020. https://evadoption.com/ev-sales/federal-ev-tax-credit-phase-out-tracker-by-automaker/
[7] Not all vehicles collect and record charging data that may be required for RIN generation. BTR Energy estimates that approximately 25% of EVs operating today are not collecting and recording charging data.

Questions and Answers Regarding the Equivalence Value for the Electric Pathway

Why is it important to increase the equivalence value for RFS electricity as soon as possible?

The existing equivalence value for RFS electricity (1.0) imposes a significant regulatory bias against the production of one of the lowest-carbon vehicle fuels (electricity generated with captured methane from organic waste-based biogas) and its use in the most fuel-efficient vehicles (EVs).

Given the outlook for growth in EV adoption and the expected activation of the RFS Electric Pathway, the equivalence value for renewable electricity is now one of the most significant uncertainties affecting future growth and participation in the RFS program, and EPA's projections of renewable volume obligations (RVOs).

The earliest opportunity to propose a new equivalence value for RFS electricity in a rulemaking is during the review of EPA's proposed Renewable Volume Obligations (RVOs) for 2021 and 2022, which began undergoing interagency review on August 26, 2021. The next opportunity in a rulemaking will most likely be during the review of the forthcoming "Set Rule" for RVOs for 2023 and Beyond.

What is an RFS equivalence value, and what is the existing value for RFS electricity?

Under the RFS, EPA assigns equivalence values by comparing every renewable fuel to ethanol on an equivalent energy content basis. An equivalence value is assigned to physical gallons of liquid renewable fuels and to ethanol gallon-equivalents of non-liquid (gas or electricity) renewable fuels.

Equivalence values determine how many RINs can be generated for each gallon or ethanol gallon-equivalent of renewable fuel. Because all RIN generation is based on ethanol-equivalence, each RIN or "gallon-RIN" represents an amount of renewable fuel that is equivalent to a gallon of ethanol on an energy content basis.

An equivalence value of 1.0 means that every physical gallon or gallon-equivalent of a renewable fuel counts as one gallon-RIN for RFS compliance purposes. An equivalence value of 1.7 means that every physical gallon or gallon-equivalent of a renewable fuel counts as 1.7 gallon-RINs for RFS compliance purposes. Accordingly, equivalence values directly impact projected and finalized RVOs.

EPA has assigned equivalence values to various renewable fuels, as follows, with electricity shown in item (6) below:

1. Ethanol which is denatured shall have an equivalence value of **1.0**.
2. Biodiesel (mono-alkyl ester) shall have an equivalence value of **1.5**.
3. Butanol shall have an equivalence value of **1.3**.
4. Non-ester renewable diesel with a lower heating value of at least 123,500 Btu/gal shall have an equivalence value of **1.7**.
5. 77,000 Btu (lower heating value) of compressed natural gas (CNG) or liquefied natural gas (LNG) shall represent one gallon of renewable fuel with an equivalence value of **1.0**.
6. 22.6 kW-hr of electricity shall represent one gallon of renewable fuel with an equivalence value of **1.0.**

What goals did EPA seek to achieve in using energy-based equivalence values?

In final rules issued in 2007 and 2010, EPA explained why it uses energy-based equivalence values and the goals it sought to achieve in doing so, as follows:

"The use of energy-based Equivalence Values … provide[s] a level playing field in terms of the RFS program's incentives to produce different types of renewable fuel…"

"By comparing every renewable fuel to ethanol on an equivalent energy content basis, each renewable fuel is assigned an Equivalence Value that precisely accounts for the amount of petroleum in motor vehicle fuel that is reduced or replaced by that renewable fuel in comparison to ethanol."

"[T]he assignment of Equivalence Values other than 1.0 to some renewable fuels is a reasonable way for the RFS program to establish ''appropriate'' credit values while also ensuring that the Act's volume obligations, read together with the Act's directions regarding credit values towards fulfillment of that obligation, are satisfied."

"We do not believe it would be appropriate to treat a renewable fuel with very low volumetric energy content as being equivalent to a renewable fuel with very high volumetric energy content, since the impact on motor vehicle fossil fuel use is very different for these two renewable fuels."

"The market [will] be free to choose the most appropriate renewable fuels without any bias imposed by the RFS regulations, and the costs imposed on different types of renewable fuel through the assignment of RINs would be more evenly aligned with the ability of those fuels to power vehicles and engines and displace fossil fuel-based gasoline or diesel."

What is wrong with the existing equivalence value for RFS electricity?

The existing equivalence value for RFS electricity is too low, as evidenced in these statements by EPA in a 2013 Proposed Rule:

"... 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 Btu of input."

"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 …"

Using the existing equivalence value of 1.0 for both ethanol and electricity, and the miles per gallon (MPG) and miles per gallon-equivalent (MPGe) values used further below, one gallon of ethanol (at 22.6 kWh per gallon of ethanol) would be credited with one gallon-RIN for every 0.67 gallons of gasoline displaced (at 33.7 kWh per gallon of gasoline). However, one ethanol gallon-equivalent of renewable electricity (at 22.6 kWh per gallon-equivalent) would be credited with one gallon-RIN only for every 2.76 gallons of gasoline displaced.

In sum, the existing equivalence value for electricity does not achieve the goals described above: (i) it is not "appropriate" and therefore not compliant with Section 211(o) of the Clean Air Act (CAA), (ii) it treats renewable electricity the same as ethanol even though the impact on fossil fuel use is very different for those renewable fuels, (iii) it fails to accurately account for motor petroleum fuel displacement by renewable electricity in comparison to ethanol, (iv) it does not provide a level playing field for renewable electricity

relative to other renewable fuels, and (v) it imposes a regulatory bias against the production and use of renewable electricity as an RFS-qualified fuel.

What equivalence value would be appropriate for RFS electricity?

A more appropriate equivalence value for electricity could be determined by dividing the most recently determined Average Fuel Economy of New Light-Duty *Electric* Vehicles (expressed in MPGe) by the most recently determined Average Fuel Economy of New Light-Duty Vehicles (expressed in MPG). Data on these fuel economy ratings can be found on the DOE/EPA Fuel Economy website and in the recently released EPA Automotive Trends Report for 2020.

For purposes of illustration only, by using EPA's projected average MPG for all New Light-Duty Vehicles for 2020 (25.7 MPG), and the approximate, unweighted average MPGe of what were reportedly the 10 best-selling EVs in 2020 (106 MPGe), the methodology described above would yield an equivalence value of approximately 4.1.

Alternatively, the Energy Economy Value (EER) of 3.4 used by the California Air Resources Board for the LCFS program could either be adopted or used as an interim equivalence value for electricity. Under the LCFS, EER means "the dimensionless value that represents the efficiency of a fuel as used in a powertrain as compared to a reference fuel used in the same powertrain [and] EERs are often a comparison of miles per gasoline gallon equivalent (MPGe) between two fuels."

The 2018 analysis by Oakridge National Laboratory used an equivalence value of 4.3, which was suggested by the International Council on Clean Transportation (ICCT) as a value that reflects petroleum displacement by electricity due to the higher efficiency of electric vehicles.