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RENEWABLE NATURAL GAS: LEGAL LANDSCAPE, PRIVATE SECTOR INTEREST, AND FUTURE OPPORTUNITIES FOR INVESTMENT

ABSTRACT

In response to scientific research demonstrating the impact of anthropogenic greenhouse gas (GHG) emissions, governments, nonprofits, and corporations have pursued various climate mitigation strategies, which often include ambitious emissions reduction targets. Both the private and public sector have increasingly turned to renewable natural gas (RNG) as one mechanism for effectuating these goals, along with other long-term economic and geopolitical objectives related to reducing costs and dependence on foreign oil. While RNG cannot be the sole solution, proponents suggest it can serve as a "bridge" while other greener technologies are developed--particularly because of its compatibility with existing infrastructure, better net outcomes for the environment, and industry support. Allowing RNG to reach its full potential will require a deeper understanding of overlapping government regulations and incentives, closer collaboration between the public and private sectors, and clear government policies that foster innovation and expansion of this critical renewable energy source.

To that end, this article provides a comprehensive examination of the legal developments in RNG--primarily in the United States but also internationally-- and how they intersect with the rapidly growing private sector interest in RNG. This article explores the background and benefits of RNG, describes relevant legislation and regulation, and summarizes recent private sector investment in RNG. Based on this synthesis of the public and private RNG landscape, this article also provides recommendations for deal structuring, investment, and policy that would foster the growth of RNG both within and outside of the United States.

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*69 I. INTRODUCTION

RNG is an increasingly popular topic in serious discussions about the promotion of cleaner fuel. On a federal level, piecemeal legislation and agency regulation has created a complicated web of incentives and regulations to promote the use and production of RNG in the United States. Individual states have committed to their own interwoven energy policies, each acting in what it deems as the best interest of its constituents. Abroad, Europe has taken the lead in production of RNG, but like the United States, the rules, regulations, and polices are constantly in flux.

Unsurprisingly, as governmental support for RNG grows globally, so does commercial interest. But the dynamic nature of this legal landscape creates challenges for private industry to make a confident entrance into, if not commitment to, the world of RNG. Further, RNG is still an agent in inevitably political discussions surrounding the energy industry as a whole, which leaves private investors uncertain about its future.

This article will first explain RNG, including its benefits and limitations, and the current state of RNG production in the United States. Next, this article will provide a survey of the legal landscape in the United States at both the federal and state level. To illustrate other avenues of policy, this article will then examine the legal landscape of RNG abroad, with a sharp focus on Europe. Following the review of the relevant international marketplace, this article will examine the interest and involvement of the private sector in RNG. Finally, a discussion of project exploration and policy considerations will integrate the legal landscape described earlier and propose a future outlook.

II. OVERVIEW OF RNG

A. Definition, Production Methods, and Technologies

RNG--also known as "biomethane"[2] --is biogas that has been processed and upgraded to be interchangeable with existing infrastructure.[3] A multifaceted energy source, RNG is perhaps most easily defined by what it is not: fossil natural gas. While fossil natural gas is ***70** extracted from the ground through mining or drilling,[4] RNG can be produced through a wide array of available feedstock, production methods, and technologies.[5] Costs and benefits vary considerably between RNG products and feedstock.[6]

RNG can be produced from a myriad of organic waste sources including landfill waste, animal manure, wastewater, food waste, sewage sludge, and other organic feedstocks.[7] Municipal solid waste kept in landfills produces a biogas called "landfill gas" as it decomposes.[8] Anaerobic digestion--the decomposition of organic material in the absence of oxygen[9] --can also be used to create biogas from waste at waste water treatment facilities, livestock farms, food production facilities, and standalone organic waste management operations.[10] The biogas is then upgraded into RNG by removing moisture, carbon dioxide, and contaminants, and by reducing the nitrogen and oxygen content.[11] Once this process is complete, the RNG has a methane

content of at least ninety percent, although RNG injected into natural gas pipelines generally must have a methane content of at least ninety-six percent. [12]

Once processed and upgraded, RNG can be used locally where created or, depending on the final product content, injected into existing natural gas pipelines for distribution elsewhere. [13] RNG can be used in place of, or mixed with, fossil natural gas to produce electricity and heat homes and businesses. [14] It can also be used as vehicle fuels using the same vehicles, pipelines, and fueling stations that currently transmit and utilize fossil natural gas. [15] "RNG is so chemically similar to ***71** fossil natural gas that it is a 'drop-in' substitute," which makes it extremely versatile. [16]

B. Benefits and Limitations of RNG

Although not without its critics, RNG promises environmental, economic, and geopolitical advantages that have heretofore been underleveraged in the United States. Still, legitimate questions remain about the true environmental impact of RNG and its ability to serve as a large-scale climate solution.

1. Environmental Considerations

RNG provides both short- and long-term benefits for air quality, emissions reductions, and climate change mitigation through the reduction of atmospheric methane.

RNG mitigates climate change in the near term by capturing and repurposing methane that may otherwise be released into the air. [17] Methane is an extremely potent greenhouse gas. [18] According to the United Nations, "methane traps more heat in the atmosphere per molecule than carbon dioxide (CO_2), making it 80 times more harmful than CO_2 for 20 years after it is released." [19] The agriculture sector is the largest source of methane emissions in the United States, due largely to methane produced naturally by domestic livestock and by human-made manure management systems. [20] Solid waste is also a significant and growing contributor to methane emissions: landfills currently account for fifteen percent of methane emissions in the United States, [21] and the World Bank has predicted that global annual waste generation will increase by seventy percent by 2050. [22] Livestock and human waste can also pose other health risks, including soil and water contamination and foul odor emissions. [23] RNG can thus promote more climate-friendly agricultural and waste management practices while also ***72** capturing and repurposing methane--one of the most potent greenhouse gases--before it escapes into the atmosphere.

For this reason, people sometimes refer to RNG as having a low net carbon impact. [24] According to the U.S. Department of Energy, "RNG can reduce GHG emissions by 95% as compared to diesel, giving it a nearly net zero carbon impact." [25] When RNG is produced from captured biogas that would otherwise have been emitted into the air, it can have a negative carbon impact. [26] The carbon impact thus can vary depending on the source of the biogas. [27] Regardless of the source, RNG is often "considered among the cleanest fuel options around," [28] although not everyone agrees. [29]

In the longer term, RNG can also provide a cleaner fuel source with capacity for replacing at least some dependence on fossil fuels. According to the Environmental Protection Agency (EPA), "[n]atural gas in any form (fossil or RNG) is less carbon-intensive than the other fossil fuels it typically replaces, including conventional transportation fuels (*e.g.*, gasoline, diesel) in most cases and coal or petroleum for generating electricity." [30] Further, fossil natural gas is extracted from the earth, generally through drilling or mining, and finding new sources "is becoming increasingly expensive and destructive to the environment." [31] In contrast, "RNG comes from renewable sources (*e.g.*, landfills, livestock farms and organic waste facilities) and does not contain heavy hydrocarbons." [32] RNG also provides local air quality benefits when it replaces traditional diesel or gasoline. [33]

Despite these alleged benefits, some resist RNG as a mechanism for achieving climate goals. Some environmentalists claim that investing in RNG deepens reliance on infrastructure that will become obsolete ***73** as society transitions to cleaner power sources such as wind and solar. [34] Other critics claim that the environmental benefits of RNG have been overstated. [35] Just like conventional natural gas, RNG still produces carbon when burned, which harms the environment. [36] Further, if RNG leaks,

it releases methane into the atmosphere--a gas that is much more harmful when released into the atmosphere than Carbon Dioxide.[37] According to one scholar, as demand increases for RNG to displace fossil natural gas in existing infrastructure, producers are more likely to intentionally produce methane as a source for their RNG.[38] In that case, the off-setting emissions benefits are arguably eliminated, and any resulting methane leakage would be "climate additional."[39]

Scalability is another commonly cited impediment to widespread reliance on RNG as a climate solution. Economic analysts, academic scholars, and policymakers have argued that "even under the most optimistic scenario, RNG would meet only a fraction of the demand met with natural gas today."[40] For example, a 2018 report to the Oregon Legislature on "Biogas and Renewable Natural Gas Inventory" found that the "gross potential" for RNG production using anaerobic digestion technology or thermal gasification technology could only supply less than one quarter of Oregon's total yearly use of natural gas.[41]

However, another study estimated methane potential in the United States to be approximately 431 trillion British thermal units, which "could displace about 5% of current natural gas consumption in the electric power sector and 56% of natural gas consumption in the ***74** transportation sector."[42] The National Renewable Energy Laboratory thus suggested that "[w]hile [RNG] potential appears small and easy to overlook given the abundance of relatively inexpensive natural gas, it presents an opportunity for greenhouse gas mitigation (methane is 21 times more potent than carbon dioxide) and production of renewable energy fuel."[43]

Ultimately, despite scalability concerns, RNG offers a cleaner energy source with environmental benefits over fossil natural gas. RNG also promises much quicker adoption than other green energy sources such as solar or wind because it utilizes existing infrastructure and widely available feedstock.[44] Accordingly, some believe RNG could be a "bridge" in the transition from fossil fuels to cleaner energy sources, thus serving as one tool in broader efforts to achieve bold climate goals.[45]

2. Economic and Other Considerations

The environmental and economic benefits of RNG are linked. According to the Henry Hub Natural Gas Spot Price, natural gas prices averaged $2.41 perMMBtu[46] during the first six months of 2023.[47] But RNG sells at a premium to market rates because of its climate offsetting benefits: incentive programs at the state and federal level, described further in the next section, mean that RNG can be priced at more than $100 per MMBtu.[48] Some purchasers will also pay a premium price for RNG because of its status as a renewable natural gas.[49]

***75** On the other hand, it is currently more costly to produce RNG than to extract fossil natural gas.[50] Infrastructure used to process and upgrade biogas into RNG, such as anaerobic digesters, can be extremely expensive, which creates barriers to commercial feasibility.[51] According to the World Resources Institute, production costs for RNG on top of the initial capital investments range from $3 to more than $30 per MMBtu.[52] RNG also incurs the costs associated with fossil natural gas, including testing and verification for pipeline specifications and pipeline interconnection costs.[53] As described further below, some states have implemented targeted subsidies to assist with the upfront costs of RNG.[54] Ultimately, the net economic benefits that an RNG producer does or does not realize will depend on a variety of factors, including upfront infrastructure costs, the scale of the operation, the carbon intensity of the produced RNG, and any applicable financial credits.

Lastly, RNG increases fuel diversity and availability. As detailed further below, this has geopolitical benefits, including decreasing reliance on foreign oil.[55] It also reduces geographic disparity in access to affordable energy sources.[56] "[F]ossil natural gas can only be produced in states that have natural gas reserves to tap into," which can create "a dichotomy of haves and have-nots in the energy market."[57] In contrast, feedstock for RNG production--from landfills to livestock to wastewater--is more widespread across every region of the United States. The specific type of feedstock available will vary state by state,[58] but the lower forty-eight states are connected by more than 300,000 miles of interstate and intrastate natural gas transmission pipelines and almost all of the states have natural gas infrastructure ***76** currently in place for electric generation and residential use that is fully compatible with RNG, regardless of the feedstock used.[59]

C. Current RNG Production in the United States

Despite its potential limitations, RNG production and use in the United States has grown dramatically in just the past few years. Between 2012 and 2022, the number of agriculture and landfill RNG projects in the United States grew nearly five-fold. [60]

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There are currently 270 operational RNG facilities in the United States and 244 projects either planned or under construction. [62] Approximately one-third of the operational RNG facilities are located in California, although thirty-nine states have at least one. [63] Other states with at least ten operational facilities include Texas (twenty-one), Wisconsin (nineteen), New York (thirteen), Ohio (ten), and Pennsylvania (ten). [64] The following graphic shows the geographic distribution of all ***77** RNG projects in the United States that are operational, under construction, or planned:

RNG Projects (Operational, Under Construction, or Planned) in the Continental United States (2023)

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California, New York, and Wisconsin each produce large quantities of dairy, which creates opportunities for farm-based projects. [66] For example, manure from dairy cows produces biogas that can be converted into RNG, which can then be used to fuel heavy tanker trucks transporting milk from the same farms across the country. [67] Similarly, livestock-supported industries in other states--such as the pork industry in Iowa, Missouri, and North Carolina or the poultry industry in Delaware and North Carolina--have spurred concentrations of RNG projects in those states. [68] On the other hand, most of the landfill-based projects are located in central and Appalachian states. [69] And projects using biogas produced at water resource recovery facilities tend to be located near metropolitan areas, [70] and such projects are even utilized to ***78** produce RNG for things like local transportation fuel in cities. [71] The availability of state incentive programs also likely influences where projects are built. [72] The benefits of these programs can transcend state borders, although, as described further below, that could change under potential new regulation in California. [73]

III. UNITED STATES LEGAL LANDSCAPE

The rapid growth in RNG investment and projects is both the cause and effect of an interwoven web of incentive structures and regulation in the United States on both the state and federal levels. The predominant incentive programs are fuel standards promulgated on the federal level and in California, Oregon, and Washington. These mostly target transportation fuel, but similarly modeled programs also exist on the state level to incentivize RNG use in electricity. Tax incentives and other subsidies also exist on both the state and federal levels. In terms of bringing RNG to end-users, developers are generally subject to the terms and conditions of interstate and intrastate natural gas pipeline tariffs that are regulated by federal and state agencies, respectively. At this time, RNG has largely been accepted by pipelines as long as it meets tariff quality standards.

A. Renewable Fuel Standards and Renewable Portfolio Standards

One of the most successful efforts at incentivizing investment in and production of RNG has been the fuel standards programs established on both the state and federal level to incentivize investment in renewable fuels. Renewable portfolio standards programs on the state level operate in a similar manner but incentivize renewable fuel use for electricity. Although these programs promote a broad range of renewable energy sources, investment in RNG is one way to leverage the available economic incentives.

These programs generally work by first setting a climate goal, such as a target for carbon intensity or volume of renewable energy sources. The program then incentivizes progress towards that goal through some form of renewable energy certificate or credit. In addition to ***79** being an economic incentive, these credits help with tracking fulfillment of the requirements and progress towards broader climate goals. [74]

1. Federal Fuel Standards

On the federal level, the Renewable Fuel Standard (RFS) Program requires that a minimum volume of transportation fuel sold in the United States be renewable fuel. [75] Established by the Energy Policy Act of 2005, the RFS Program aimed to "lessen imports of foreign sources of energy and encourage the use of clean-burning renewable fuels." [76] This initial version of the RFS Program, launched in 2005, is sometimes referred to as, "RFS1." [77] RFS1 required that a minimum of 4 billion gallons of renewable fuel be used in the national gasoline supply in 2006, and that the minimum volume usage rise to 7.5 billion gallons in 2012. [78]

Each year, EPA sets a percentage of renewable fuels that should be blended into transportation fuel, which translates into the annual Renewable Volume Obligation (RVO). [79] Obligated parties include "any refiner that produces gasoline or diesel fuel within the 48 contiguous states or Hawaii, or any importer of gasoline or diesel fuel into the 48 contiguous states or Hawaii during a compliance period." [80] A party's annual obligation is calculated as its total gasoline and diesel sales multiplied by the annual RVO. [81]

EPA regulates the RFS Program through renewable identification numbers (RINs), which are a form of credit generated from the production of qualifying renewable resources in transportation fuel. [82] RINs are created when a gallon of renewable fuel is produced, and they can be purchased by obligated parties either on the market or through the purchase of gallons of renewable fuel with RINs attached. [83] Market ***80** participants can trade RINs, and obligated parties obtain and retire RINs as part of their compliance obligations. [84] Obligated parties may carry over unused RINs from one compliance year to the next. [85] Obligated parties may also carry a compliance deficit from one compliance year to the next, although this deficit must be made up in the following year. [86]

Following the passage of the Energy Independence and Security Act of 2007 (EISA), EPA transitioned to a new phase of the program called "RFS2." [87] RFS2 builds on its predecessor, RFS1, in multiple ways. RFS2 guarantees a market for biofuels, including RNG, which reduces the risk of investment in biofuel production. [88] RFS2 also greatly expanded the biofuels mandate and applies to most transportation fuel, including not only gasoline, but also "diesel fuel intended for use in highway motor vehicles, non-road, locomotive, and marine diesel." [89] RFS2 also provided greater specificity regarding RINs oversight. [90]

Under RFS2, the total renewable fuel volume requirement is divided into four categories: total renewable fuels, advanced biofuels, biomass-based diesel, and cellulosic biofuels. [91] Each category has its own volume requirement. [92] To qualify in each category, biofuels are required to achieve certain minimum thresholds of lifecycle greenhouse gas emissions (with certain exceptions). [93] In 2014, EPA clarified that RNG qualified as cellulosic biofuel, which EPA noted had "the potential to provide notable volumes of cellulosic biofuel for use in complying with the RFS program." [94] Depending on the pathway, RNG could be considered cellulosic biofuel *or* advanced biofuel, although cellulosic ***81** is generally considered more valuable than advanced. [95] By 2020, RNG comprised over ninety-nine percent of the cellulosic biofuel program. [96]

Lastly, RFS2 increased the mandatory minimum volumes of biofuels to be used in the national transportation fuel supply and extended the time frame across which those volumes are scheduled to increase through 2022. [97] Notably, this meant that 2023 was the first year in which EPA set biofuel volume targets without the ability to use those outlined in statute. [98]

On June 21, 2023, EPA finalized its rule setting the volume standards for RFS2 through 2025, which will go into effect in September 2023. The following table outlines these volume percentage standards:

TABLE I.A.2-1--PERCENTAGE STANDARDS

	2023 (%)	2024 (%)	2025 (%)
Cellulosic biofuel	0.48	0.63	0.81
Biomass-based diesel	2.58	2.82	3.15
Advanced biofuel	3.39	3.79	4.31
Renewable fuel	11.96	12.50	13.13
Supplemental standard	0.14	n/a	n/a

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The EPA chose to set standards for three years at one time "in order to strike an appropriate balance between improving the program by providing increased uncertainty over a multiple number of years and recognizing the inherent uncertainty in longer-term projections." [100] The 2023 annual volume requirement for cellulosic biofuel represents a thirty-three percent increase from the 2022 requirement, which is the largest increase across the four categories. [101] By 2025, the annual volume requirement for cellulosic biofuel (1.38 billion gallons) will be more than double the 2022 requirement (63 million gallons). [102] Although volume requirements for cellulosic biofuel in recent years have increased faster than any other category, cellulosic biofuel still has the ***82** lowest volume requirements across all categories, as reflected in the figure below: [103]

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The volume requirements promulgated in the new rule were created with consideration of the destabilizing effect of the war in Ukraine on global commodities markets--including the petroleum markets--as well as other policies and programs in the alternative fuel technology space. [105] The higher volumes of cellulosic biofuel are in part intended to address the potential for the "EPA's projections of cellulosic biofuel [to be] significantly and consistently lower than the actual production of cellulosic biofuel" and the "variability and uncertainty in cellulosic RIN prices and future cellulosic biofuel requirements" that currently hinder investment. [106]

As of now, compliance with the biofuel volume requirements continues to be low and lacking in enforcement. [107] According to a congressional report, a "variety of factors, such as infrastructure, technology, and limited federal assistance, have led to challenges in meeting ***83** the total volume requirement established by Congress." [108] Specifically, the report points to implementation and compliance challenges related to determining which biofuels qualify, EPA's difficulty projecting certain volume requirements, lack of timely rulemaking leading to obligated parties' uncertainty regarding compliance, and practical issues such as technology setbacks. [109]

2. State-Level Fuel Standards

A few states have established their own fuel standards, with California leading the way. California sets annual carbon intensity targets for the state through its Low Carbon Fuel Standard (LCFS) program, which was originally adopted in 2009 and first implemented in 2011. [110] Most recently, the California Air Resources Board approved amendments to the program that would extend the carbon intensity benchmarks through 2030 and added "new crediting opportunities to promote zero emission vehicle adoption, alternative jet fuel, carbon capture and sequestration, and advanced technologies to achieve deep decarbonization in the transportation sector." [111]

In contrast to the federal RFS program, which sets volume standards, the LCFS program uses "carbon intensity," or "CI," as the metric for setting standards and determining credits. LCFS standards are "expressed in terms of the 'carbon intensity' (CI) of gasoline and diesel fuel and their respective substitutes." [112] A fuel's CI is "the measure of GHG emissions associated with producing and consuming it." [113] LCFS credits are then determined by comparing the carbon intensity scores assessed for each fuel with the annual carbon intensity benchmark set by the state. [114] Fuels with CIs below the benchmark generate credits, while fuels with CIs above the benchmarks generate deficits. [115] One credit is worth approximately $150 per metric ton of carbon dioxide reduced. [116]

RNG qualifies for credits as long as it is used to replace conventional transportation fuel. [117] Currently, "[a]lthough RNG must be sold in ***84** California to receive LCFS credits, fuel producers can be located anywhere in the country and receive credits via book-and-claim accounting, a chain of custody model that tracks the exchange of environmental attributes without physical traceability." [118] This allows the detachment of the credits from the fuel itself, which allows market participants to trade the attributes and physical fuel separately.

It is worth noting, however, that the California Air Resources Board (CARB) may soon promulgate new regulations limiting this optionality. [119] For example, in one draft of a potential regulation, CARB would impose "deliverability requirements" requiring biomethane injected into common carrier pipelines to "physically flow within California or toward the end user in California for which biomethane was produced." [120] And, under this version of the proposed regulation, "[e]ligible pipelines must flow toward California 50% of a given year." [121] If this regulation passes without some type of grandfather clause, many existing RNG projects--particularly those in the eastern half of the United States--may lose their eligibility for LCFS credits. [122]

Despite the general regulatory uncertainty, clean fuel standards have proved to be resilient against legal challenges. For example, California's LCFS program has withstood multiple legal challenges under federal and state laws, including unsuccessful claims that the standards were preempted by the federal Clean Air Act and EISA and thus violated the dormant Commerce Clause. [123]

California's LCFS program has become a model for other states and countries. On the west coast, Oregon's Clean Fuels Program, [124] Washington's Clean Fuel Standard, [125] and British Columbia's Low Carbon Fuel Requirements Regulation [126] all operate similarly to California's ***85** LCFS, including using carbon intensity to set standards and measure credits. Based on these shared goals and initiatives, California, Oregon, British Columbia, and Washington have formed a regional agreement called the "Pacific Coast Collaborative," with a vision to "[d]ramatically reduce greenhouse gas emissions and create a vibrant, low carbon regional economy by transforming energy systems, buildings, transportation, and food waste management." [127]

On the opposite coast, New York State recently rejected--once again-- similar legislation establishing a low carbon fuel standard. [128] One study attempting to quantify the potential production of biogas and RNG from agricultural and waste sources in New York State found that just ten percent of the state's available resources were being used to generate biogas, and only a small fraction of that biogas was being processed into RNG. [129] The study also found that the state's carbon emissions resulting from fossil natural gas usage could be reduced by twenty percent by incorporating RNG and "green" hydrogen gas into the pipeline system. [130] The researchers concluded that "the value of RNG can be increased 10-fold [in New York State] by applying a similar incentive policy to California's Low Carbon Fuel Standard." [131]

Nevertheless, New York's latest attempt to implement a low carbon fuel standard failed in June 2023. [132] Despite rejecting similar legislation in previous sessions, the New York Senate passed the Clean Fuel Standard in June 2023, which would

have been the "second-largest clean fuel standard in the United States, surpassed only by California's." [133] But the New York Assembly referred the bill to the Standing Committee on Environmental Conservation and never held a vote. [134] Assembly member Deborah Glick (D-Manhattan) was particularly outspoken against the legislation, saying it would allow for continued ***86** combustion of fuels and did not match the goals set out in the state's climate law. [135]

Other states including Colorado, Iowa, Illinois, Minnesota, Pennsylvania, and South Dakota have also begun exploring their own low carbon fuel standards, although none have passed yet. [136]

3. Renewable Portfolio Standards

Renewable Portfolio Standards (RPS) are regulatory policies implemented to promote the use of renewable energy sources in the *electricity* sector. Similar to Renewable Fuel Standards, Renewable Portfolio Standards generally require that a percentage of electric power sales in a state come from renewable energy sources, [137] and they also may require or allow utilities to trade renewable energy credits or certificates (RECs). [138] RECs are "[f]inancial products ... available for sale, purchase, or trade that allow a purchaser to pay for renewable energy production without directly producing or purchasing the renewable energy." [139] RECs are an economic incentive as well as a monitoring tool to track progress towards climate goals. [140] In the electricity sector, one REC represents the environmental benefits of one megawatt-hour of renewable energy generation. [141] "RECs are created when renewable energy is sent out to the grid and are used to verify that utilities are meeting their targets." [142]

There is no federal RPS, but more than half of the states have enacted some form of an RPS program as of 2021. [143] Some of these programs are goals, which are voluntary and defined within limited time frames. [144] On the other hand, prominent states in the renewables field ***87** like California, Oregon, Washington, Maryland, and Colorado have mandatory renewable portfolio standards, which are enforceable. [145] According to the National Conference of State Legislatures, "RPS legislation has seen two opposing trends in recent years": many states with RPS programs have expanded or renewed them in recent years, but others have allowed their RPS targets to expire. [146]

"State RPS programs vary widely in terms of program structure, enforcement mechanisms, size, and application." [147] States can choose whether to focus their RPS requirements on investor-owned utilities or apply them to all utilities in the state. [148] States also define what renewable energy sources and technologies fall under their RPS program. [149] Some states-- but not all-- explicitly include RNG derived from biogas in their RPS programs. [150]

B. Other Incentive Programs

Federal and state governments also provide other incentives to promote investment in, production of, and use of RNG, and this network of incentive programs has expanded significantly in recent years. Generally, incentives on the federal level are provided through tax credits. Tax incentives exist on the state level as well, although they are sometimes supplemented by other subsidies.

On the federal level, the Inflation Reduction Act of 2022 (IRA) provides tax incentives aimed at encouraging investment in clean energy and reducing greenhouse gas emissions. [151] The IRA established the Production Tax Credit (PTC) for facilities producing electricity from renewable energy and the Investment Tax Credit (ITC) for investment in renewable energy projects. [152] The IRA was the first time in American history that these federal tax incentives included "qualified biogas property" as an energy property. [153] However, only properties for which ***88** construction begins on or before December 31, 2024, are eligible for the PTC or the ITC. [154]

State tax incentive programs are not as common, but states are increasingly exploring them. The existing state-level tax incentives have traditionally been narrower and more specifically targeted than the IRA. For example, Washington's House Bill 2580 reinstated and expanded tax incentives for certain digesters to promote investment in production and use of RNG in

2018, [155] and Colorado passed a sales tax exemption for anaerobic digester equipment in 2019. [156] In Washington, RNG used as transportation fuel is also exempt from public utility taxes. [157]

Some states have also embraced creative approaches to subsidizing RNG, particularly focusing on reducing the up-front burdens of infrastructure, production, and transportation costs. The aforementioned tax incentives related to anaerobic digester equipment are one example. However, there are also costs associated with transportation of RNG from its production site to existing pipeline networks, which are another potential area for subsidies. [158] In response to those costs, California adopted its biomethane interconnector monetary incentive program. [159] This program is funded by California utility customers and administered by Southern California Gas Company (SoCalGas) under the auspices of the California Public Utilities Commission. [160] SoCal-Gas has been authorized to provide an incentive towards the cost of an RNG interconnection. [161] This incentive is for fifty percent of the qualifying costs, up to $3 million, or up to $5 million for a dairy cluster of at least three dairy digesters. [162]

California has also taken advantage of its position as the "leading milk producing state in the United States" [163] by providing specific incentive programs targeted at dairy RNG production. The California Department of Food and Agriculture's Dairy Digester Research and ***89** Development Program (DDRDP) invests in digester projects for dairies. [164] Public-private partnerships between the state of California, energy companies, and dairies have made RNG production practical for more dairies through the development of "cluster" projects. [165] For example, one such cluster project included a group of fifteen dairy digesters to start, twelve of which were funded by the DDRDP. [166] The project "generate[s] renewable natural gas to be sent to a centralized conditioning facility for processing and injection into a common carrier natural gas pipeline." [167] Similar incentive programs may not be as useful in every state, but states can assess what feedstocks are widely available within their borders when crafting RNG incentive programs.

C. Regulation of RNG Transportation

In addition to incentive programs, state and federal governments regulate RNG transportation to end-users through intrastate and interstate pipeline tariffs. As noted previously, one of the benefits of RNG is that it is compatible with current infrastructure, meaning it can be placed in existing natural gas pipelines and transported just like fossil natural gas. However, in order to be accepted into existing natural gas pipelines, RNG must meet the gas quality specifications in an interconnecting pipeline's tariff, which may not always be feasible. Pipeline companies have the ability to propose tariff changes to either accommodate or hinder the transportation of RNG on their pipelines.

The Federal Energy Regulatory Commission (FERC) regulates interstate natural gas pipelines through tariffs. Tariffs are a compilation of a natural gas company's effective rate schedules, defined as a "rate or charge for a particular classification of transportation or sale of natural gas," along with "all terms, conditions, classifications, practices, rules, and regulations affecting such rate or charge." [168] FERC generally obligates companies to operate their natural gas pipelines as open-access systems without preferential treatment or unduly discriminatory behavior. [169] However, under the Natural Gas Act, each interstate natural gas pipeline company may propose its own rules and regulations specific to its own pipeline as long as they comply with FERC ***90** policy. [170] This has the effect of creating different standards on different pipelines, adding to the patchwork of laws and regulations an RNG developer needs to understand.

Under general FERC policy, a pipeline *can* deny access to a shipper whose gas does not meet the relevant tariff's gas quality standards. [171] Gas quality standards often specify, among other things, the natural gas's required heat content and permissible percentage of contaminants. [172] Even if RNG has the requisite methane content to be injected into a natural gas pipeline (ninety-six to ninety-eight percent), [173] RNG may not meet the gas quality standards because it tends to have a lower heating value than geologic natural gas and a different composition of contaminants. [174] Most interstate pipelines have discretion to waive gas quality requirements when doing so would not jeopardize pipeline safety. [175] These individual waivers are feasible when, as is generally the case now, RNG makes up a relatively small portion of the transported gas because RNG can be blended without

compromising quality or pipeline operations. [176] However, as RNG volume in pipelines increases, the tenability of individual waivers decreases, thus increasing the need to change gas quality standards to accommodate an increased presence of RNG. [177]

FERC has asserted its jurisdiction under the Natural Gas Act over transportation of RNG on interstate pipelines. [178] But FERC has generally shown a desire to allow industry practice to shape how permissive or restrictive the pipeline system is towards RNG expansion. [179] This is in part because each pipeline has unique operating characteristics, has distinct customer profiles, and serves different markets. Further, under the Natural Gas Act, the pipeline has the right to propose changes to rates, rules, and regulations in its tariff, [180] and those proposed changes ***91** will reflect the operating and business environment of each individual pipeline. Some pipeline companies are increasingly proposing RNG-specific tariff amendments, which continue to have the effect of creating a varied landscape of rules applied to RNG. [181] As RNG attracts more development and the demand for interstate RNG transportation grows, the patchwork of FERC-approved RNG provisions continues to evolve.

Tariffs governing intrastate pipelines are also very common in the state regulatory landscape and operate similarly to FERC tariffs.

IV. INTERNATIONAL LEGAL LANDSCAPE

From a global perspective, Europe is the largest producer of RNG in the world. [182] Like in the United States, legal developments in Europe occur both at the European Union (EU) level and on a country-by-country basis. Examining the European framework is useful for understanding the multitude of options for incentivizing RNG. Not surprisingly, there is little private sector involvement in Europe. Canada provides another comparison point as its private sector is starting to play a more significant role in supporting RNG.

A. European Overview

Europe's dominating status of RNG production on the world stage is no surprise given the European Union's very aggressive climate goals. [183] As part of the *Clean Energy for All Europeans Package* in November 2016, in 2018, the European Commission published the Directive (EU) 2018/2001 of the European Parliament and of the European Council on the promotion of energy from renewable sources. This 2018 Renewable Energy Directive is known as the RED II Directive (RED II). [184] RED II established several goals, including a legally binding EU-wide target of thirty-two percent for renewable energy by 2030. [185] It also set out industry-specific goals, including a fourteen percent share of renewables in the energy sector and a 1.3 percent annual ***92** increase in the heating sector. [186] In July 2021, the European Commission published the "Fit for 55" policy directly affecting renewable natural gas, which has proposed an increase in the EU target of renewables in the energy sector to forty percent by 2030, along with other new, national targets. [187]

In coordination with these objectives, in 2019, the EU funded the REGATRACE (Renewable Gas Trade Centre in Europe) project to create a trade system based on issuing and trading biomethane/renewable gases Guarantees of Origin (GoO). [188] A GoO is a tradable commodity that represents a claim to environmental benefits associated with renewables. [189] GoOs function similarly to RECs offered in the United States. REGATRACE represents a concerted effort to integrate solutions aimed at a common European market for renewable natural gas.

One of the benefits of RNG in the EU is that the cost of biomethane production has been lower than anticipated, especially when compared to volatile natural gas prices, and it is expected to go down by 2050. [190] The promotion of RNG in the EU has the collateral benefit of a wealth of new green jobs. [191]

B. Select Member States

Against this backdrop of EU policy, EU member states are legally entitled to create their own support programs to incentivize renewable energy producers to achieve these lofty targets set by the European Commission. [192] Member states are permitted to interfere in the EU market through Article 107(2) and (3) of the Treaty on the Functioning of Europe. [193]

The most common support schemes in European countries include:

- **Feed-in tariff (FiT)**: A technology-specific support system that provides technology-specific remuneration per unit of renewable energy. Public authorities define and guarantee the ***93** tariff. Some of the advantages include long-term contracts with producers, guaranteed grid access, and payment levels based on renewable energy generation costs.

- **Feed-in premium (FiP)**: A bonus paid above the prevailing benchmark market price. Also technology specific, a FiP is a subsidy per unit of renewable energy at a fixed or floating price.

- **Green certificate schemes (GC)**: Production of renewable energy is supported by an obligatory target with specific share of renewable energy requirements in a mix of producers, consumers, or distributers. Compliance is tracked by renewable energy certificates. Producers benefit by selling their energy to the grid at market price and by selling certificates on the "green certificates market."

- **Fiscal incentives**: Tax exemptions or reductions can be an additional support system.

- **Investment support**: A fixed amount received at some point during or after the building phase of a plant, independent of the amount of renewable energy production. [194]

The figure below indicates that, as of 2020, the most often-applied support system for RNG in Europe is the feed-in tariff. [195] In Austria and Germany, the feed-in tariff applies only if the end-use of the RNG gas is electricity. [196]

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***94** [197]

Broadly speaking, France, the Netherlands, and Denmark are projected to see huge RNG growth. [198] The figure below represents the number of plants and biomethane production across the most productive European countries as of 2020: [199]

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[200]

***95** The transportation sector has been a particular target for RNG interventions in Europe. For example, in Italy, special public incentives exist for the use of RNG in the transportation sector as a biofuel. The United Kingdom (UK) has implemented the Renewable Transport Fuel Obligation (RTFO), which requires suppliers of relevant transport fuel in the UK to show that a percentage of the fuel they supply comes from renewable sources. [201] These transportation-focused policies share similarities to the Renewables Fuel Standard at the federal level in the United States.

1. Germany

Germany is a major player in the RNG market. Within Europe and worldwide, Germany is the biggest producer of biogas and biomethane. [202] However, Germany's biomethane production has waned recently, while other countries' production rates have grown, such as those of the UK, Denmark, and France. [203]

The main legislative tool in Germany for the development of RNG is the Renewable Energy Sources Act (EEG) of 2000, which guaranteed renewable power producers an above-market fixed price, or feed-in tariff. [204] The EEG is revised almost yearly. Biomethane fed into the German gas grid at one point and withdrawn later is still biomethane, and the electricity from that biomethane can benefit from the EEG subsidy. The selling price of biomethane is freely tradable and thus depends on the possible remuneration provided by the EEG. [205]

For twenty years, Germany's main incentive program was the feed-in tariff. [206] But Germany has begun to transition away from the feed-in tariff in favor of an auction model, with the introduction of the auction model in 2017. [207] On January 1, 2022, RNG producers officially stopped receiving the feed-in tariff that had guaranteed them fixed price. [208] For newly built and existing plants, there is now a pay-as-bid ***96** auction model. [209] In this newer model, the government indicates the volume of the tender, and current or potential power plant operators bid on available capacity. Any plant of over 750 kW is encouraged to participate in the bidding process. [210] The bidder with the lowest price wins, and the auction continues until the bid size is reached. This shift to the auction program from the feed-in-tariff marks a shift away from government support for renewable natural gas, and a move toward competition between different generation technologies. [211]

Biomethane production started to decline by 2020 as a result of the new auction approach. [212] The new tender under the EEG 2021, along with a focus for RNG in the transportation sector, is expected to lead to the commissioning of new RNG plants, which had stagnated in previous years as prior EEG revisions had removed the feed-in tariff for domestic producers in favor of the new auction approach. [213] Although Germany is by far the largest player in the RNG sector, RNG is growing, and many European countries have implemented their own incentive policies and/or regulations.

2. France

One of the few countries to have set *specific* RNG targets is France. In France, biomethane was granted access to the gas grid in 2011, and at that time, ambitious targets were set. [214] The number of plants has since grown exponentially, and, currently, over 1,000 registered projects use the pipeline, setting France up to become a leader in the European biomethane sector and potentially to overtake Germany. In August 2015, the Act on the Energy Transition for Green Growth spurred this growth in the biomethane market with an objective of ten percent renewable gas and a feed-in tariff scheme that guarantees a fixed price for fifteen years. [215]

The main support scheme for biomethane in France is still the feed-in tariff, as it provides biomethane producers a guaranteed price for fifteen years. [216] The amount of support is contingent on the plant size, ***97** the type of plant, and the raw material. [217] Additionally, France offers a tender system, wherein biomethane production facilities are also eligible to participate in state-run tenders. France also plans to use Green Certificates, known in France as Biogas Production Certificates, as another mode of financial support starting in 2025, which are similar to RECs in the U.S. [218] In addition, Gaz Réseau Distribution France, France's gas network operators, keeps a register of all GoOs and has run the register since 2012. [219] The GoO registry is a tool that records quantities injected, exchanged, sold, and as such, traces the production of biomethane. [220]

3. Denmark

The Danish Energy Agency is responsible for supporting biomethane in Denmark. In 2019, the Danish government agreed on a new Climate Act with a legally binding target to reduce GHGs by seventy percent by 2030 (compared to 1990) and reach net zero emissions by 2050.

As part of that initiative, the government requires a minimum of 5.75 percent biofuels, including RNG, in fuel sold for transport on land. The Danish transmission system operator (TSO), Energinet, issues RNG certificates for every megawatt-hour (MWh) of RNG injected into the natural gas grid. Certificates are primarily traded to Germany and Austria but can be traded across all EU members. [221]

Denmark used to support its biomethane industry through its subsidy scheme, but that subsidy system closed for new plants as of 2020. [222] Similar to Germany, electricity production is now eligible for subsidies based on tenders.

4. Italy

Italy's support systems for renewable natural gas are hyper-focused on the transport sector. [223] This is not surprising, considering Italy has one of the largest natural gas vehicles (NGV) fleets in the world. [224]

***98** There are two main regulations that incentivize and govern RNG in Italy. In 2018, the Italian government published the Ministerial Biomethane Decree dated March 2, 2018, on "[p]romotion of the use of biomethane and other advanced biofuels in the transport field." [225] The incentive program grants aid only for renewable natural gas produced for the transport sector. The aid is based on allocation of the "Certificates of Release to Consumption of Biofuels" (CICs). [226] CICs are awarded to plants, which may sell them to fuel producers to use in the transport sector. [227] For a long time, public aid was provided only if the biomethane was proven to be used in the transport sector. [228]

That limitation changed with the second major regulation: the new Italian Biomethane Decree of September 2022. [229] The new decree established incentives for biomethane production *outside* the transport sector. Mechanisms include allocating €1.73 billion and combine assets and reforms for additional biomethane production. [230] Moreover, the incentive tariffs have an estimated budget of €2.8 billion over a fifteen-year operational period. [231] The new measures aim to promote the investments in new plants or reconverted plants (from biogas to biomethane) and encourage the development of this renewable gas and its injection into the national gas grid for use in sectors other than transport (*e.g.*, heating for industrial, tertiary, and residential sectors). [232]

C. Cross-Border Implications

Despite the EU's involvement in this area, most RNG produced in an EU country is still consumed within national borders. [233] As of January 2022, notable exceptions include Denmark, which was producing more RNG than it consumed, and Sweden, which consumed two times ***99** what it produced, likely because its incentives focus on *consumption* (tax exemptions), rather than production of RNG. [234]

Currently, biomethane trade among EU countries is limited. In 2020, trade among countries constituted only three terawatt-hours (TWh), or 0.06 percent of all-natural gas consumption in the EU. [235] Since 2021, the cross-border trade of biomethane has been facilitated through the ERGaR CoO scheme operated by the European Renewable Gas Registry (ERGaR), which enables cross-border title transfer of Certificates of Origin (CoO) between participating national biomethane registries. [236] The Netherlands, the United Kingdom, Austria, and Germany all have approved registries. [237] For some countries, the import of biomethane is not possible due to certain restrictive laws. [238]

If this cross-border trade increases, two practical options might arise, including transport using high-pressure pipelines and transport in liquefied form. [239] To the extent that certain countries' import laws limit cross-border trade, those countries could be faced with falling behind the EU member states regarding biomethane trade on the international stage unless and until they amend such policies.

D. Canada

Certain provinces in Canada have recently begun to enjoy the interest and involvement of the private sector in the RNG sphere. RNG first became integrated into pipelines in Canada in 2003 when the Trans Québec & Maritimes (TQM) Pipeline started receiving RNG captured from Quebec. Now that same RNG is mainly exported to the United States. [240]

But more projects across Canada deliver RNG to natural gas distribution networks for local markets within Canada. Like the exponential growth anticipated in certain European countries, the number of projects operating in Canada is expected to more than double between ***100** 2021 and 2025. [241] Policy changes, like provincial mandates, and opt-in programs are contributing to the increase in new projects. [242]

One of the overarching regulations is the Canada Renewable Fuels Regulations (2011). Initially introduced by the federal government in 2011, it applies a renewable content mandate to liquid fossil fuels. [243] A major feature of the federal Renewable Fuels Regulations was to make it complementary to provincial systems, similar to how the European Commission permits member states to regulate their own countries. The renewable content minimums outlined in the Renewable Fuels Regulations serve as a baseline, which five provinces (British Columbia, Alberta, Saskatchewan, Manitoba, and Ontario) are either meeting or exceeding with their own provincial-level renewable liquid fuel mandates.

In British Columbia, for example, the province's CleanBC plan sets out a fifteen percent renewables target by 2030. [244] The province also amended its Greenhouse Gas Reduction Regulation (GGRR) to increase the production and use of renewable gas. Changes to the GGRR enable natural gas utilities to increase the amount of RNG, green and waste hydrogen, and other renewable energy they can acquire and make available to their customers by: (1) increasing the amount of renewable gas utilities can acquire and supply from five to fifteen percent of their total annual supply of natural gas; (2) broadening the methods by which utilities can obtain hydrogen, RNG and other renewable gases to include producing or upgrading it themselves for injection into the pipeline; paying a third party to produce or upgrade it for pipeline injection; or purchasing hydrogen, synthesis gas, or lignin to displace the use of natural gas at customers' facilities; (3) allowing the current price cap of $30 per gigajoule that utilities can pay to acquire any of these fuels to increase with inflation; and (4) enabling utilities to acquire and supply green and waste hydrogen, synthesis gas, and lignin. [245]

Quebec was the first province to require RNG in natural gas distribution via the Québec Renewable Natural Gas Mandate (2019). In ***101** 2019, the Government of Québec introduced a renewable natural gas mandate that built upon existing voluntary industry commitments. The regulation requires natural gas suppliers in the province to blend in a minimum one percent of RNG by 2020-2021 and a minimum five percent of RNG by 2025-2026. [246]

In multiple provinces across Canada, commercial distribution companies have also created their own opt-in programs. Notably, FortisBC in British Columbia and Enbridge Gas in Ontario essentially give customers the choice to pay a little more for their natural gas in order to fund RNG projects. [247] Both companies advertise this program on their websites with testimonials and offer monetary incentives like prizes. [248] This type of commercial sponsorship, with an emphasis on individual autonomy, could prove to be a model to watch for integration into the United States.

V. PRIVATE SECTOR INTEREST AND INVOLVEMENT

A. Notable Deals

As government incentive programs for RNG have expanded, so has private interest. California's LCFS program was implemented in 2011, [249] and EPA clarified that RNG qualified as a cellulosic biofuel for purposes of the RFA standards in 2014. [250] Between 2011 and 2016, RNG production in the United States grew from 1.4 million to nearly 190 million ethanol-equivalent gallons. [251]

The RNG market has become more bullish over the past year as evidenced by a number of acquisitions and large-scale investments. In 2022 alone, RNG transaction volume more than doubled. [252] Notably, three large natural gas companies

expanded their RNG portfolios by acquiring smaller companies that were already producing RNG or had sustainable renewable infrastructure programs in place, each of which ***102** connected its acquisition to its broader goals for transitioning towards renewable energy sources.

First, in February 2022, Chevron Corporation announced that it had acquired Energy Group Inc., at a value of $3.15 billion.[253] In its press release, Chevron stated: "The transaction is expected to accelerate progress toward Chevron's goal to grow renewable fuels production capacity to 100,000 barrels per day by 2030 and brings additional feedstock supplies and pre-treatment facilities."[254]

Second, in October 2022, BP Products North America Inc. announced it had acquired Archaea Energy, Inc., one of the largest RNG producers in the United States.[255] This acquisition aligns with BP's Energy Outlook 2022, in which biogas grows more than twenty-fivefold from 2019 to 2025 in both the Accelerated and Net Zero scenarios.[256] BP's stated goal is to reduce carbon intensity of its energy products by five percent by 2025, and by fifteen to twenty percent by 2030 (against a 2019 baseline).[257]

Third, just one month later, in November 2022, Shell Petroleum announced that it had acquired Nature Energy Biogas A/S--a Danish firm that was the largest producer of RNG in Europe--for nearly $2 billion.[258] According to Shell's press release, "this transaction fits Shell's Powering Progress strategy to accelerate its energy transition and will be absorbed within our 2023 capital range of $23-$27 billion."[259]

There have also been several other notable transactions in the RNG space over the past two years. For example, in October 2022, NextEra ***103** Energy Partners, LP acquired assets from owners of the Energy Power Partners Fund I LP and North American Sustainable Energy Fund LP in a plan to grow its RNG portfolio.[260] "The Florida-based renewables energy powerhouse intends to convert the funds' portfolio of landfill gas-to-electric projects and assets to renewable natural gas (RNG) and build a services company with the existing portfolio."[261] As another example, Opal Fuels LLC--which operates five RNG projects and had seven RNG projects under construction as of May 1, 2022-- went public in December 2021 "by merging with blank-check firm ArcLight Clean Transition Corp II (ACTD.O) in a deal that values the renewable energy production and distribution company at $1.75 billion, including debt."[262] The SPAC was backed by energy infrastructure private equity firm ArcLight Capital Partners LLC.[263]

Private equity involvement has been critical in other deals as well. For example, in February 2023, H.I.G. Capital, "a leading global alternative investment firm with $54 billion of equity capital under management," announced that its portfolio company, Northern Biogas LLC, had "acquired three additional dairy [RNG] projects, significantly expanding its RNG production capacity."[264] Northern Biogas CEO Chris Akers commented: "Since partnering with H.I.G. in September 2022, we have more than doubled the number of RNG projects under construction, and rapidly expanded our RNG project development pipeline across the waste-to-renewable natural gas market."[265]

Demonstrating interest in RNG by both private equity and significant oil and gas players, earlier this year, growth equity firm Cresta Fund Management LLC sold a 49.9 percent stake of its RNG portfolio company, LF Bioenergy LLC, to Marathon Petroleum Corporation at ***104** a valuation of $100 million, with the potential to increase to $200 million based on pre-determined earn-out targets.[266]

B. Best Practices for Deal Structuring

The explosive investment in RNG over the past two years is likely to continue, particularly given the relatively recent tax incentives implemented through the IRA.[267] An understanding of the complex legal and regulatory landscape, along with lessons learned from other deals, can help prepare companies interested in engaging in similar transactions or investments.

The complicated web of state, federal, and international regulations and incentive programs--as described above--necessitates thorough and appropriate diligence, with particular attention to relevant environmental policies.[268] Because the economic

value of many of these projects hinges on credits related to the environmental attributes of the projects, determining which government incentives (and the value thereof), as well as which regulations apply, is a necessary preliminary step. [269]

Diligence should also involve thorough assessment of applicability and compliance with relevant policies. [270] Site inspections can help ensure that projects are in compliance with applicable regulations. [271] Further, since environmental metrics such as carbon intensity calculations can be critical in determining the applicability of financial credits, third-party verification and advice of reporting can be a helpful part of diligence. [272] Environmental consultants are also routinely involved in environmental due diligence and can perform technical environmental reviews. [273]

The broader climate-related legal landscape is also in flux, which necessitates attention to relevant policy changes. For example, in March 2022, the SEC proposed a rule requiring filers to make climate- ***105** related disclosures, including but not limited to disclosure of greenhouse gas emissions. [274] The SEC received an overwhelming number of comments on the rule. [275] Among them were suggestions for an extended phase-in period for new disclosure requirements. [276] As of the time of writing, the SEC has not issued a final rule. Regardless of the outcome, this example highlights how dynamic regulation affecting the RNG world is right now, which necessitates constant vigilance in monitoring relevant changes.

Relatedly, another key consideration for those exploring RNG mergers, acquisitions, investments, or related commercial deals is which party bears the risk and windfall of changing regulations. As demonstrated above, many incentive programs will sunset in the next few years, and others may come online. Furthermore, relevant policies are often left to expire for political or other non-substantive reasons. [277] This rapidly evolving policy space necessitates careful and intentional contractual drafting.

Lastly, the incorporation of RNG into a portfolio might necessitate action. For example, consider whether a tariff for a local utility is versatile enough to cover RNG, or whether the regulatory framework for a particular state or utility would necessitate an amendment, and consider the timing or other challenges that such an amendment would face.

C. Public-Private Partnerships

RNG also presents unique opportunities for partnerships between the public and private sectors, which many municipalities are already leveraging. One particular area of interest has been fuel for local transportation. For example, in 2020, the New York Metropolitan Transportation Authority announced they contracted with Clean Energy Fuels Corporation to provide RNG to power 800 natural gas transit buses in the city. [278] "The organic waste-derived RNG will ... allow ***106** the city to lower their emissions from transportation. The multi-year agreement for an estimated 25 million gallons of Clean Energy Fuels' RNG is expected to reduce emissions by 25,351 metric tons annually." [279] Similarly, San Antonio's VIA Metropolitan Transit announced a fuel supply partnership with CPS Energy in 2021, under which CPS Energy provides RNG to fuel more than 500 of VIA's buses. [280]

Research and technology grants are another example of public-private partnerships spurring investment in RNG. For example, in 2022, the Department of Energy awarded $29.5 million to fifteen projects for "improved bioenergy resource recovery and conversion systems." [281] One of the grants was awarded to a professor at Washington University in St Louis's McKelvey School of Engineering, who plans to develop a "scalable technology" to convert biogas from wastewater plants to RNG and "push basic research toward further technological development." [282]

VI. PROJECT EXPLORATION, POLICY CONSIDERATIONS, AND FUTURE OUTLOOK

By definition, RNG is a multifaceted resource, meaning critical considerations will vary from project to project. Actors in both the public and private sectors who are considering RNG initiatives will need to make a case-by-case determination of environmental, financial, and other costs and benefits of new projects and policies. [283]

A. Project Exploration

Financial considerations for new projects will vary depending on a number of factors, including feedstock sources and geography. State and federal credits--including LCFS credits and RINs--make RNG potentially very profitable, but the monetary value of the credit is linked to the environmental impact of the product. [284] Different feed-stocks thus generate RNG with different prices. For example, in 2020, ***107** dairy RNG projects earned average price realizations of $100 per MMBtu, whereas landfill RNG projects earned $30 per MMBtu on average. [285] Both sources were priced above their average cost of supply, [286] and well above the average Henry Hub Natural Gas Spot Price of $2.035 per MMBtu in the same year. [287] But this price differential can significantly affect the profitability of RNG projects.

On the other hand, variations in up-front costs can quickly offset credit benefits, and up-front costs also vary between feedstock sources. For example, although financial credits for RNG produced from landfills are lower than for other feedstocks, [288] one analysis nevertheless concluded that "landfills [generally] offer the greatest current economic potential, compared to other sources, because they require relatively little buildout and have a customer base readily available in the form of heavy-duty waste management vehicles." [289] In contrast, projects diverting organic waste prior to its arrival at a landfill can earn some of the most profitable credits, but they generally require high upfront costs to cover new infrastructure for production. [290]

Geographic considerations also affect the viability of RNG projects on a case-by-case basis. First, the available feedstock varies significantly between states. For example, California has taken advantage of its thriving dairy industry to incentivize RNG produced from dairy farms, which yields some of the best environmental benefits of any feedstock. [291] Although similar incentive structures would be less effective in other states, one of the advantages of RNG over fossil natural gas is that every state has *some* source it can similarly leverage within the RNG space. [292] Second, strategic placement of RNG projects close to existing pipelines or fueling stations can have a significant impact on profitability. [293] Third, as detailed previously, the applicable regulations and policies--which have critical and sometimes dispositive implications for the viability of RNG projects--change depending on the location of an RNG project.

***108** *B. Policy Considerations*

Policymakers on the state and federal levels have avenues they could pursue to encourage investment in and production of RNG. Costs are the "primary barrier to expanding RNG," and the "capital needs for RNG projects are [often] still prohibitive to the development of the RNG facilities." [294] Accordingly, one scholar has suggested that, "[a]t a minimum, states should begin laying regulatory groundwork to facilitate a market for RNG, if not outright subsidizing capital investments into its procurement." [295] Subsidies could target production infrastructure such as anaerobic digesters, like the tax credits passed in Colorado and Washington, or pipeline interconnection infrastructure, like California's interconnector monetary incentive program. [296] States outside of the west coast could also consider--and some are currently considering--implementing their own low carbon fuel standards programs similar to those in California, Oregon, and Washington. [297] Credit-based incentive programs that take into account carbon externalities would help to ensure RNG is commercially competitive with existing fossil fuel-based transportation fuels. [298]

Even absent additional financial subsidies, transparent and reliable policies would make it easier for new players to enter the market and existing players to expand their RNG capacity. The current web of incentives and regulations is incredibly difficult to navigate, especially given the overlapping municipal, state, federal, and even international considerations. Many have suggested that a more transparent system of incentives would likely encourage more private investment. [299]

The current regulatory framework has also been criticized as lacking long-term certainty. [300] This unpredictability makes it difficult to plan projects and secure financial investments. [301] For example, during a panel on "Food Scrap Recycling" in 2021, Mark McDannel, who is the Manager of Energy Recovery Engineering at the Los Angeles County ***109** Sanitation Districts, has called short-term pricing for RNG a "gold rush": "great prices, but they probably won't last." [302] Julia Levin, the Executive Director of the Bioenergy Association of California, agreed, stating that "[e]ven if credit values are high, it's hard to take those

to investors and to the bank if they're not guaranteed for more than a year or two at a time." [303] The role of politics in shaping applicable incentives and regulations exacerbates this long-term uncertainty. [304]

This uncertainty is especially problematic in the context of low-carbon fuel standards. According to the World Resources Institute, "[a]lthough renewable and low-carbon fuel markets can provide substantial economic incentive for RNG production, they carry risk since their future prices can't be predicted with certainty." [305] In particular, "RIN prices have historically been volatile due to regulatory uncertainty around the policy and the volumes that EPA will set each year, as well as past problems with fraudulent RINs." [306] The political influence may grow after 2023, which was the first year in which EPA promulgated its own annual volume targets without being limited by the statute. [307] The 2024 presidential election thus only adds to the uncertainty.

C. Future Outlook

Investment in RNG is important not only for the environmental benefits and investment opportunities, but also from a geopolitical standpoint. [308] Historically, there has been bipartisan support in the United States for policies that reduce dependency on foreign sources of energy. For example, after President Bush signed the Energy Policy Act of 2005--which first established the federal RFS program--he remarked that "[e]very time we use a home-grown fuel, particularly [RNG], we're going to be helping our farmers and, at the same time, be less dependent on foreign sources of energy." [309] More recently, the Russian invasion of Ukraine caused President Biden to sign an Executive Order banning the import of Russian oil, liquified natural gas, and ***110** coal to the United States, thus furthering his administration's goal of "reduc[ing] our dependence on foreign oil and fossil fuels." [310] RNG can be produced locally, and the United States currently produces an abundance of feedstock--including more than 70 million tons of organic waste each year [311] --that could be leveraged to displace natural gas currently imported from foreign countries. [312]

Governments, corporations, and nonprofits alike have chosen to pursue initiatives that will collectively bring us into a "green future" [313] and one of "energy independence." [314] They now must determine whether and how RNG fits into those plans. Some resist the movement away from fossil fuels, while others criticize RNG for not being "green" enough. Legitimate criticisms have been leveraged against RNG's ability to displace the entirety of the fossil fuel industry, but RNG still holds the promise of significant environmental, economic, and geopolitical benefits even on a more limited scale.

Specifically, many believe RNG holds promise as a "bridge" between fossil fuels and cleaner energy sources. [315] One advantage of RNG over other green energy sources is its potential for much quicker adoption, given that it utilizes existing infrastructure and widely available feedstock. [316] Almost every state already has the infrastructure in place to start using RNG for electric generation and residential use *today*. [317] And the energy industry has taken note, investing billions in ***111** this transitionary fuel. RNG also has benefits that other green technologies currently do not, including that it can be easily stored and produced on demand. [318] As such, RNG has the potential to serve as an energy transition bridge to a future of cleaner fuel, net zero emissions, and energy independence. The research and policy analysis in this article suggests that, with cooperation and engagement with the public and private sectors, RNG can serve as one tool of many in achieving these ambitious goals.

VII. CONCLUSION

The joint forces of the private and public sector increasingly turning to RNG may very well lead to clearer policy surrounding its use and production. But, as it stands in both the United States and elsewhere, RNG policies instead reflect the relatively nascent stages of the innovation: disorganized. In the United States, the combination of economic and geopolitical motivations to reduce cost and dependence on foreign oil, particularly in light of the Russia-Ukraine war, hold promise to usher in a firmer commitment to the increasing use of RNG and, in turn, its profitability.

Footnotes

1 Megan Ridley-Kaye and Niki Roberts are Partners at Hogan Lovells US LLP. Chloe Warnberg is a former Associate at Hogan Lovells US LLP who completed all of her work on this article before leaving the firm. Charlotte Nicholas is an Associate at Hogan Lovells US LLP. Special thanks to Susan McAuliffe, Allison Hellreich, and Stefan Schröder for their comments and contributions. We are also deeply grateful to Blake Comeaux, Hannah Ryu, Melody Shaff, Michael Stallworth, and Daniel Whalen for their invaluable research contributions.

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