October 19, 2020

Oklahoma Corporation Commission
c/o Mr. Michael L. Velez, Deputy General Counsel
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Submitted via electronic mail to the Oklahoma Corporation Commission Court Clerk (OKCfilings@occ.ok.gov), Mr. Michael L. Velez (michael.velez@occ.ok.gov), and the Public Utility Division (PUDsubmissions@occ.ok.gov).

Public Comments of Oklahoma Sierra Club
Cause No. PUD 202000083 – In Re: Inquiry of the Oklahoma Corporation Commission to Examine Issues Related to Energy and Public Utilities

Oklahoma Sierra Club submits the below public comments in response to the Oklahoma Corporation Commission's ("OCC" or "Commission") August 20, 2020, Notice of Inquiry ("Notice") in Cause No. PUD 202000083. In these comments, Oklahoma Sierra Club addresses primarily the issues and questions raised in the NOI concerning battery storage, so-called "renewable" natural gas and related infrastructure, and electric vehicles ("EVs") and Compressed Natural Gas ("CNG") vehicles. We also offer more concise comments on the other issues in the NOI, including rate transparency and the Oklahoma Academy 2019 Town Hall. Oklahoma Sierra Club anticipates attending the technical conference and the public meeting in this cause, and can elaborate as appropriate during those meetings.

America's largest and oldest grassroots environmental group, Sierra Club has more than 3.5 million members and supporters nationwide. More specifically for the purpose of this submission, the Oklahoma Chapter of Sierra Club, organized in the state since 1972, currently has more than 4,200 members, spread across all 77 Oklahoma counties. These members reside, work, or recreate around the various energy facilities in Oklahoma, and are residential customers of our state's various utility companies. Having advocated on behalf of, and engaged legislatively and legally, in all of the matters for which the Commission seeks input, Oklahoma Sierra Club has technical expertise on the issues raised in this cause, as well as perspective on their regulatory treatment. Oklahoma Sierra Club opposes the polluting, uneconomical fossil-

based energy. Instead, we favor affordable, clean, and truly renewable energy resources and infrastructure, which can bring significant cost savings and public health benefits to our state.

I. Battery Storage (*Notice heading A*)

As a general matter, Oklahoma Sierra Club enthusiastically supports widespread promotion and implementation of battery storage, for economic as well as health and environmental reasons. An increasingly sophisticated and widely deployed technology, storage is already cost effective, particularly when paired with the kind of low-cost wind and solar generation that is abundant in Oklahoma. Also, with that coupling, those clean, renewable resources are able to function more like baseload power plants, serving capacity needs reliably and at a lower cost than fossil-burning power plants. Oklahoma should invest aggressively in battery storage in order to take full advantage of our state's exceptional wind and solar potential. This will save money for the whole spectrum of Oklahoma electricity ratepayers—homeowners, businesses, industry, churches, and schools alike—while also improving public health, keeping our air and water clean, and mitigating climate change.

As a supplemental point, Oklahoma Sierra Club has witnessed an aggressive campaign for the past several years to hold back the spread of distributed generation of renewable energy (especially solar) in Oklahoma. This has included legislative choices to favor monopolistic utility-scale solar, as well as how the Commission has to date addressed the issue of distributed generation versus utility-scale renewable generation. We want to be clear that we support laws and policies in favor of battery storage that will not hinder widespread adoption and use of storage by individual entities in an equitable manner, rather than an approach in which we welcome this new and exciting technology with the upfront goal of favoring utility companies.

Oklahoma Sierra Club may offer additional or more specific comments on this subject at later junctures in this proceeding.

II. "Renewable" Natural Gas (*Notice heading B*)

In most contexts, so-called "renewable" natural gas ("RNG") is a bad proposition in economic terms as well as its impact on public health and the environment. Generally speaking, Oklahoma Sierra Club therefore opposes RNG mandates for Oklahoma's regulated utilities, and would oppose most specific potential utility spending in RNG, instead favoring cleaner, cheaper, actually-renewable energy resources and efficiency options. RNG typically is not a cost-effective energy solution, relative to either conventional fracked gas or clean energy options, and as a practical matter cannot replace either in relatively significant quantities. Moreover, reliance on

RNG—being mostly methane, the same as fracked gas, and sometimes containing other harmful substances—usually is not an environmentally friendly option compared to alternatives.

The rare circumstances in which RNG can make good environmental and economic sense are limited to situations when, in a word, both (a) the gas's creation and emission was truly unavoidable in the first place (*e.g.*, existing landfills where waste reduction measures have already been exhausted), and (b) the production and distribution of the gas will not effectively double down on an infrastructure that could be replaced by more affordable clean energy options (*e.g.*, turning to electrification and energy efficiency for buildings). For instance, the limited supply of the methane generated from landfills should only be used for sectors that are hard to electrify and decarbonize, not for buildings or most vehicles.

RNG—sometimes referred to as biogas, biomethane, synthetic gas, or power-to-gas, depending on production method—primarily comes as methane from landfills, concentrated animal feeding operations ("CAFOs"), or wastewater treatment facilities, or is produced as synthetic gas (or syngas) through power-to-gas processes. Some have promoted RNG as a "cleaner" alternative to fracked gas; but whereas RNG may have lower lifecycle emissions depending on the production process, the climate change and public health impacts of its leakage or emissions from burning are the same as fracked gas. Methane is methane, regardless of whether the source is geological or biological. The lack of comprehensive methane leak detection and repair state regulations in the upstream oil/gas industry damages the possible environmental benefits of RNG. RNG can play a very limited role in greenhouse gas abatement, but analysis shows that RNG is limited in supply and scalability very costly, has detrimental environmental and health impacts (especially on frontline communities), and in some cases can ultimately increase greenhouse gas emissions.

For more details on the technological processes, economic/cost comparisons, and environmental and health impacts of RNG, Oklahoma Sierra Club respectfully refers the Commission to two resources attached as Exhibits A & B hereto: (A) *A Pipe Dream or Climate Solution? The Opportunities and Limits of Biogas and Synthetic Gas to Replace Fossil Gas*, a June 2020 report by the Natural Resources Defense Council (NRDC)[1]; and (B) *Rhetoric vs. Reality: The Myth of "Renewable Natural Gas" for Building Decarbonization*, a July 2020 report by Earthjustice and Sierra Club.[2] For discussion of situations in which RNG, given its limited supply and high costs, can be suitably used in harder-to-decarbonize segments of society, see in particular p. 7 of the former report, Exhibit A; and pp. 14-16 of the latter report, Exhibit B.

[1] This report is publicly available at: https://www.nrdc.org/sites/default/files/pipe-dream-climate-solution-bio-synthetic-gas-ib.pdf.
[2] This report is publicly available at: https://earthjustice.org/sites/default/files/feature/2020/report-decarb/Report_Building-Decarbonization-2020.pdf.

These resources are not exhaustive of the illuminating literature on the subject, of course—Oklahoma Sierra Club can cite more upon request—but they provide a good overviews of the technological, economic, health and environmental aspects of RNG that the Commission should be aware of and consider.

In response to some of the Notice's specific questions about RNG, Oklahoma Sierra Club opposes the institution of RNG mandates or goals because RNG generally is not a healthy, environmentally friendly, or economical option, as noted above and expounded in the referenced attachments, among other studies and resources. That said, Oklahoma Sierra Club might not oppose particular projects, provided that there were robust showings of relative cost-effectiveness and relative environmental health and environmental benefits. Such showings would likely be rare: they may be satisfied only in circumstances where gas emissions are unavoidably destined to happen, and also when those emissions can be harnessed and beneficially repurposed without perpetuating an energy infrastructure that should be replaced by a more affordable clean energy options. RNG proposals in these limited potential situations should undergo scrutiny—in a regulatory proceeding with robust stakeholder participation and transparency—and subject to approval on a case-by-case basis only after a showing of relative cost-effectiveness, relative health and environmental benefits, and the public interest otherwise.

As a final note at this juncture, Oklahoma Sierra Club encourages avoiding use of the misleading term "renewable" natural gas (or RNG). In fact, this gas is not renewable; it is captured/created, combusted, and gone, causing pollution. It should not be greenwashed with the same label as truly renewable (and cleaner) energy such as solar, wind, geothermal, and hydro power. Above, Oklahoma Sierra Club has used the term RNG as a matter of convenience for the Commission, given the Notice's use of that term. Going forward, however, Oklahoma Sierra Club urges the Commission, as well as the Legislature and stakeholders, to use the term "fossil gas alternatives" / "FGAs," or a similarly more accurate term, in order to avoid misleading the public by suggesting that this form of methane is actually a renewable, clean resource.

III. Increased Bill information & Statewide Utility Rate Transparency and Reporting (*Notice headings C & D, respectively*)

As a general matter, Oklahoma Sierra Club supports increased transparency and availability of information for the public in ratemaking and regulation. It is fair and beneficial to customers to have clear, thorough presentation of billing components, as well as meaningful access to comparisons of electric and gas utility rates.

Oklahoma Sierra Club may offer additional or more specific comments on this subject at later junctures in this proceeding.

IV. Eminent Domain and Consumer Protections (*Notice heading E*)

Oklahoma Sierra Club does not offer any specific technical comments on this subject at this time, but we do wish to comment on a very real bias in Oklahoma regarding the use of eminent domain for fossil fuel infrastructure (especially pipelines) as compared to eminent domain for renewable energy infrastructure. Legislatively, there have been numerous attempts to categorize and impede the use of eminent domain as "bad for the public" when it concerns utilizing eminent domain for renewable energy infrastructure, without any such characterization when eminent domain is used for fossil fuels, especially pipelines.

The truth of the matter is that there has been a long and consistent opposition from Oklahoma landowners to the use of eminent domain for the installation of pipelines in the state, most recently in southern Oklahoma and the installation of the Midship Pipeline. This project has become a regular Federal Energy Regulatory Commission ("FERC") hotbed, and countless violations have been well documented. FERC has even had to resort to issuing work stoppage orders due to the very real, and very serious, environmental and land owner damages. All of this activity is directly related to the issue of eminent domain, and the Midship Pipeline is currently engaged in continued legal action despite FERC allowing the facility to go into production.

It must be noted that in Oklahoma, there have been no serious accidents that have harmed workers, landowners, or the public reported as stemming from renewable energy infrastructure. The same cannot be said about oil and gas pipelines: In 2019 alone, the Pipeline and Hazardous Materials Safety Administration ("PHMSA") documented 12 people were killed and 35 were injured in pipeline accidents in 2019. But most importantly to the question of eminent domain—well over 120 pipeline leaks were documented by the PHMSA, directly impacting land owners forced into pipeline proximity as a result of eminent domain.

V. Electric and CNG Vehicles (*Notice heading F*)

Sierra Club has significant expertise on transportation electrification and related utility regulatory issues and regularly engages before state utility commissions across the country, including Oklahoma, to provide expert testimony and comments. Sierra Club has intervened and/or provided briefing or comments on a range of similar EV-related issues before utility regulatory bodies in a number of states across the country, including California, Connecticut, Georgia, Illinois, Kentucky, Massachusetts, Michigan, Minnesota, Missouri, Nevada, New Jersey, New York, North Carolina, Ohio, Oregon, Utah, Vermont, Virginia, Washington, and Wisconsin, among others.

But most importantly to this cause, the Oklahoma Chapter of Sierra Club has been deeply engaged on this specific issue here in Oklahoma for several legislative cycles, including a successful 2017 Oklahoma Supreme Court case that struck down HB1449 (56th OK Legislative Session) that brought the issue of how electric vehicles are handled legally and legislatively to the forefront of the Oklahoma EV discussion.

Sierra Club's policy leadership includes developing the Transportation Electrification Accord, a set of guiding principles on EV regulatory issues that has been joined by more than 120 parties representing labor, environmental, consumer, low-income, vehicle manufacturer, and EV technology company interests, among others.[3] In February 2020, Sierra Club released a new accord together with consumer groups and the Edison Electric Institute that explains how utility EV programs can deliver benefits to all customers, particularly those in communities most impacted by air pollution and facing burdensome household energy costs.[4]

Below, Oklahoma Sierra Club responds to the Commission's questions regarding EVs. We have no comment at this time on the questions related to CNG vehicles.

1. *What challenges does any increase of electric vehicles present to utility providers?*

There is often a misconception that widespread EV adoption and related electricity loads from vehicle charging will necessarily strain the electric grid, resulting in costly upgrades. But light-duty EVs (*i.e.*, passenger cars), which are primarily charged at home, typically sit idle for the overwhelming majority of the day; and this flexibility allows for a large share of EV charging to occur at off-peak times when the grid is underutilized and when marginal costs to serve additional load are low. Likewise, EVs that are part of public and private fleets—whether light-, medium- or heavy-duty vehicles—also tend to have regular and predictable use patterns that can facilitate charging that is consistent with grid conditions. When this flexible and manageable charging load is well-integrated with the system using time-variant electricity rates and simple technology tools, EVs can be used to facilitate the integration of variable generation from renewable sources, improve utilization of standing assets, and smooth or shift demand. Through increased system efficiency, EVs can place downward pressure on electricity rates for all utility customers.

Oklahoma Sierra Club therefore encourages the Commission to view transportation electrification and EVs as an opportunity to support electricity grid benefits for all customers, as

[3] The Electric Vehicle Accord is available at: https://www.theevaccord.com/.
[4] This joint statement is available at: https://www.eei.org/resourcesandmedia/newsroom/Pages/Press%20Releases/2.11_Joint%20Statement_TransportationElectrification.pdf.

well as a wide range of societal benefits, including regional economic gains, cost savings for customers, and public health improvements. Recognizing these benefits, utility commissions across the country[5] have determined that transportation electrification is in the public interest, and that utilities have a critical role to play in realizing and maximizing the benefits of EVs.[6] That Commission-led action to understand and support transportation electrification has occurred through investigatory proceedings such as this inquiry, as well as rulemakings and through utility-driven infrastructure programs. Whether in this docket or a separate proceeding, we urge the Commission to continue to take concrete steps to accelerate the electrification of Oklahoma's cars, trucks, and buses, pulling forward the associated benefits so that Oklahomans realize them sooner than later.

2. *What plans are proposed by utility providers to meet the challenges identified above?*

Oklahoma Sierra Club is not aware of any new or proposed programs by utility providers to support grid integration of EV charging at this time. But, to ensure EVs are in fact leveraged for grid benefit as adoption grows, we recommend that the Commission take steps now to assess current electricity rates for compatibility with transportation electrification use cases[7]; and, where rates are not optimized to support EVs, the Commission should direct or lead a process to develop new rates. This review should include the design of current residential rates for home charging of passenger EVs, and commercial and industrial rates for the high-power charging of light-duty vehicles using direct current fast charging stations and the regular charging of medium- and heavy-duty vehicles.

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[5] *See* Georgetown Climate Center and M.J. Bradley, "Utility Investment in Electric Vehicle Charging Infrastructure," at 3-4 (2017) (finding that a well-managed increase in EV charging "has the potential to provide numerous benefits to the electric grid and customers: reducing all customer rates by spreading fixed distribution maintenance costs over more electricity demand; reducing emissions of greenhouse gases and local air pollutants, including around low- and moderate-income communities that are disproportionately burdened by vehicle pollution; lowering the cost of transportation and increasing equitable access to mobility; and providing grid management services that can help integrate renewables and other distributed and customer-located generation resources).

[6] *See, e.g.*, *Order Making Findings and Requiring Filings* at 10, Docket E-999/CI-17-879, Minnesota Public Utilities Commission (filed Feb. 1, 2019) (finding that "electrification is in public interest" because "electrification of Minnesota's transportation sector can further public interest in" affordable, economic electric utility service, renewable energy, and clean energy); *Order Adopting Guiding Principles and Commencing a Second Collaborative Technical Conference* at 12, 34, Case No. U-18368, Michigan Public Service Commission (filed Dec. 20, 2017) (finding that: "(1) transportation electrification is in the public interest, (2) transportation electrification in Michigan is lagging and barriers need to be addressed, and (3) electric companies are uniquely suited to help").

[7] Examples of "use cases" might include (1) at-home charging of passenger EVs; (2) public charging at Level 2 or Direct Current Fast Charging stations; (3) charging of medium- and heavy-duty fleets that are publicly or privately owned, among others.

Time-of-use ("TOU") electricity rates are a foundational tool to manage EV load, particularly for home charging. When properly designed, TOU rates create effective and efficient price signals for energy consumers, minimize long-term grid impacts from increased EV adoption, and maximize fuel cost savings for EV owners. Both "EV-only" TOU rates, which utilize separate or sub-meters, and "whole-home" TOU rates, where all electricity use is billed by time-of-use on a single meter, are viable options. We urge the Commission to evaluate both whole-home and separately metered time-variant rate options with a focus on cost-effectiveness and ease for EV drivers.

As with residential rates, it is critical for the Commission to consider whether existing commercial and industrial rates promote grid integration of fleet vehicle charging (particularly medium- and heavy-duty vehicles) and the extent to which demand charges pose a challenge to the economics of electrifying a fleet of trucks or buses. While the fuel cost savings from electricity fuel versus diesel are substantial in theory, those savings can be frustrated by utility demand charges that do not accurately reflect the costs associated with transportation electrification use cases and frustrate or erase the fuel cost savings upon which the economics of transportation electrification depend.[8] Traditional demand charges are designed for commercial and industrial buildings with much higher load factors that allow for costs to be spread over more kilowatt-hours; they make little sense for near-term low load factor uses in the DCFC context, or the often-flexible nature of charging for medium- and heavy-duty vehicles. Because demand charges often do a poor job of reflecting actual distribution system costs, and because energy costs are better reflected in time-varying volumetric rates[9], we support review and reformation of utility rates to better account for transportation electrification use cases.

3. *On January 1, 2020, the OCC issued a Final Report on Oklahoma's Transmission Capacity. Are additional transmission upgrades needed to meet the increased demand of electric vehicles?*

In the near term, it is unlikely that EV adoption in Oklahoma will grow at a rate that will affect transmission capacity considerations.[10] At the end of 2018, there were only 3,290 all electric vehicles registered in Oklahoma. However, as noted in the response to questions 1 and 2 above, the Commission should take proactive steps to ensure that as EV adoption increases in

[8] *See, e.g.*, ICF, California Transportation Electrification Assessment – Phase 3-Part A: Commerical and Non-Road Grid Impacts – Final Report," at 47 (Jan. 2016) (finding that "[u]tility rate structures are one of several key decision factors for potential [transportation electrification] consumers, and can represent the difference between a consumer accruing a return on their investment or realizing a net loss").
[9] *See Borenstein, Severin, The Economics of Fixed Cost Recovery by Utilities*, Energy Institute at Haas Working Paper 272R (July 2016).
[10] *See* https://afdc.energy.gov/data/10962.

Oklahoma, these new vehicles are well integrated into the grid to maximize their grid benefit and avoid any significant grid impacts.

A 2019 study by Lawrence Berkeley National Laboratory and Pacific Gas & Electric shows that simple smart grid integration policies (such as shifting EV charging to off-peak times) could allow the grid to accommodate high EV penetration without upgrading most parts of the distribution system.[11] This peer-reviewed study used real-world data on the distribution grid and EVs to simulate what would happen if all households were driving an EV in a residential region of Northern California, and found that if even just *30 percent* of EVs shifted charging to off peak times, the required grid upgrades were reduced by a factor of four.[12] This finding is significant, as time-of-use rates have proven to be very effective at incentivizing EV drivers to charge during off-peak periods. For example, in a recent filing with the Minnesota Public Utilities Commission, Xcel Energy reported that for EV drivers on its residential time-of-use rate, *90-95 percent* of EV charging occurred during off-peak hours each month during the previous two-year period.[13]

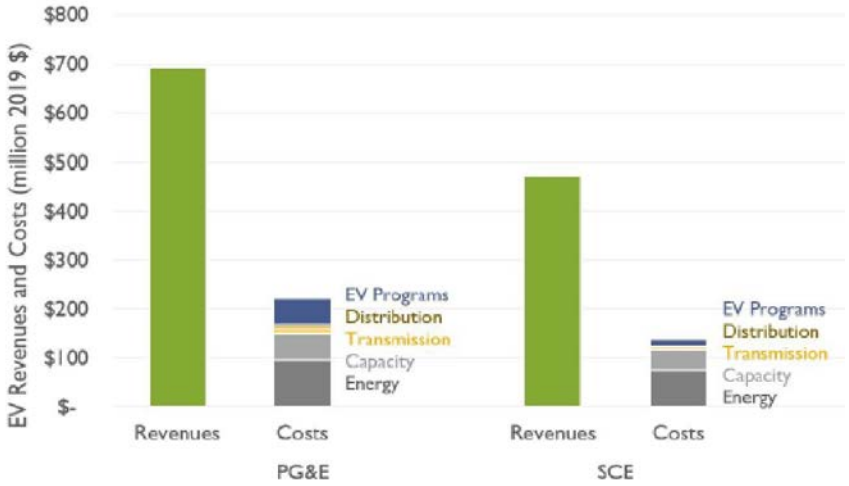
A 2017 analysis of EV grid integration costs in California found that utilities collectively spent less than $610,000 on upgrades out of a collective distribution capital budget greater than $5 billion—one hundredth of one percent of total distribution capital expenditures from 2012 to 2017.[14] Thus, the analysis shows that while the grid costs have been *de minimis*, the revenues that have accrued from EV charging are significant.

Indeed, an analysis of EV-related costs and revenues from the two utility service territories with the highest number of EVs in the country, Pacific Gas & Electric Company (PG&E) and Southern California Edison (SCE), found that EVs put downward pressure on rates for all ratepayers, including those that do not drive an EV. As depicted in Figure 1, below, Synapse compared the revenue the utilities collected from EV drivers with the cost of the energy required to charge those vehicles, along with the costs of the utility EV programs such as any associated upgrades to the distribution and transmission grid. Synapse found that EV drivers in these two utility territories contributed nearly $600 million more than the necessary costs to

[11] Coignard J., MacDougall P., Stadtmueller F. and Vrettos E., "Will Electric Vehicles Drive Distribution Grid Upgrades?: The Case of California," in IEEE Electrification Magazine, vol. 7, no. 2 (June 2019).
[12] *Id.*at 46-56.
[13] Xcel Energy, Minnesota Public Utilities Commission, Compliance Filing Residential Electric Vehicle Charging Tariff Docket No. E002/M-15-111, E002/M-17-817, AND E002/M-19-186, at 6 (June 1, 2020), https://www.edockets.state.mn.us/EFiling/edockets/searchDocuments.do?method=showPoup&documentId={004B7572-0000-C2B4-B383-456C902F125F}&documentTitle=20206-163660-06.
[14] Avi Allison & Melissa Whited, *Electric Vehicles Are Not Crashing the Grid: Lessons from California*, Synapse Energy Economics (Nov. 2017), *available at* http://www.synapse-energy.com/sites/default/files/EVs-Not-Crashing-Grid-17-025_0.pdf.

serve those customers, and thus that "EVs offer a key opportunity to reduce harmful emissions and save customers money at the same time."[15]

Fig. 1. PG&E and SCE Revenues and Costs of EV Charging, 2012-2019 [16]



4. *What plans, if any, do utility providers propose to construct electric vehicle recharging stations? (Including any partnerships or support of 3rd party installers.)*

There are three primary barriers to EV adoption: (1) incremental vehicle cost; (2) the lack of charging infrastructure; and (3) the lack of consumer awareness, particularly around the public health, and lifetime cost advantages of EVs.

Utilities are well- situated to address all three barriers. First, utilities can partially offset the up-front costs of EVs through rebates on vehicles and home charging equipment and can structure rates to ensure EV drivers save on fueling costs over the life of the vehicle.

Second, utilities are a trusted source of information for many consumers and are therefore in a strong position to improve customer awareness about the benefits of EV ownership, including the fuel and maintenance cost savings, and the environmental and public health advantages. For existing EV owners, utilities should provide clear information on available rates, the cost of charging, and any available utility-specific EV programs, including rate designs that incentive charging during off-peak hours, and any available rebates on EVs or EV home charging equipment.

[15] Jason Frost, Melissa Whited, & Avi Allison, *Electric Vehicles are Driving Electric Rates Down*, Synapse Energy Economics (June 2020), *available at* https://www.synapse-energy.com/sites/default/files/EV_Impacts_June_2020_18-122.pdf.
[16] *Id.* at 4.

Third, utilities are well situated to address infrastructure challenges related to EV charging infrastructure, the deployment of which suffers a market coordination problem whereby low penetration of charging stations inhibits the growth of the EV market, and vice versa: customers may be unwilling to purchase an EV if there is not sufficient charging network development, and charging station providers may be unable to build out a network with insufficient demand. Utilities' understanding of distribution system architecture and system constraints, customer connections, expertise in program implementation, and access to capital makes them well-positioned to address this chicken-or-the-egg dilemma by supporting deployment of infrastructure, in turn increasing the value of EVs to potential drivers. As demonstrated in both in scholarly literature[17] and in real-world experiences,[18] building out EV charging infrastructure is a highly effective tactic for increasing EV ownership, and thus implementing policies that encourage EV infrastructure development to the fullest extent possible will help speed EV adoption and associated benefits in Oklahoma.

Such utility programs to deploy charging infrastructure necessarily require cooperation between utility providers and EV charging technology companies. Utilities are entirely reliant on EV service providers and technology companies to supply and support EV charging stations, which are the locus of innovation in the EV infrastructure marketplace. There is a diverse and robust market of companies that work to develop the hardware, software and/or networking services for charging stations. The wide-ranging product types and robust market for EV charging station components can be contrasted with the other links in the EV infrastructure chain—the metering, wiring, conduit, panels on the customer side of the meter—which are common products.

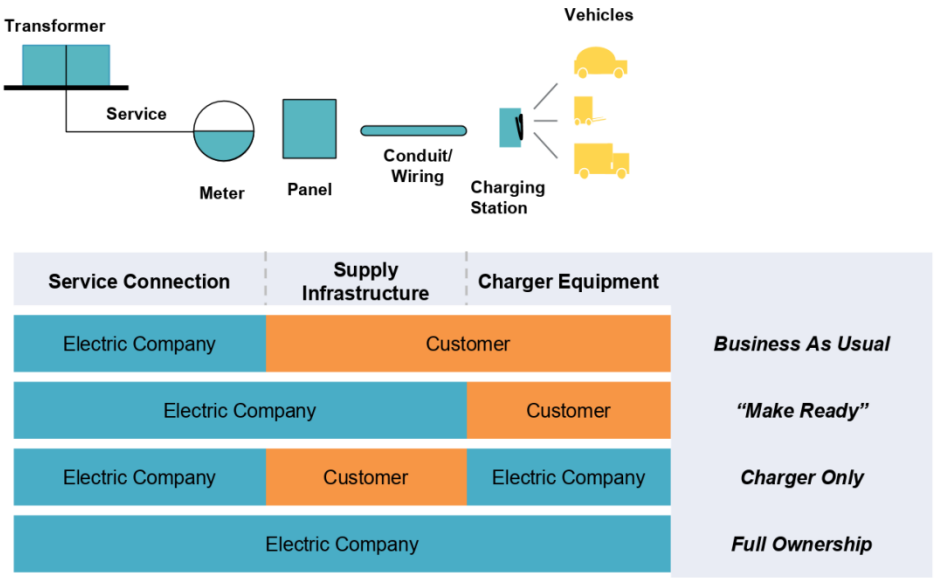
Utility regulators have approved various utility program "models" or "designs" for infrastructure support, ranging from utility operation and ownership of EV charging stations to pure rebate programs, with many program designs in-between (the most common being a "make-ready" program, where the utility owns and operates the site supply infrastructure of panel, conduit and wiring up to, but not including, the EV charging station). See Figure 2, below, illustrating several program design options. Different program models can be better suited to certain needs; for example, when compared side-by-side, turn-key utility ownership programs

[17] *See, e.g.*, Shanjun Li, et al., *The Market for Electric Vehicles: Indirect Network Effects and Policy Design*, Journal of Environmental and Resource Economists (2017) (concluding that in some markets a given subsidy provided to EV infrastructure will increase EV sales by more than twice that of the same subsidy offered toward an EV purchase).

[18] *See* Dory Smith, "KC Metro leads the nation in EV adoption," Kansas City Business Journal (June 7, 2017) available at https://www.bizjournals.com/kansascity/news/2017/06/07/kc-metro-electric-vehicle-adoption.html (last visited October 12, 2018) (noting that utility's rapid EV charging infrastructure build out resolved both consumer awareness and range anxiety barriers leading to rapid growth in EV ownership).

have had much greater success in securing deployment of EV charging stations at multi-unit dwellings than rebates or make-ready programs that rely on private initiative and investment from landlords that may have little direct incentive to install charging stations.

Fig. 2. Models of Utility EV Programs[19]



At this juncture, as the Commission considers the role for utilities, it should provide for flexibility and encourage innovation in utilities' program designs; there is no consensus on what single utility program model works best, as different program solutions will be appropriate for different infrastructure challenges. From Oklahoma Sierra Club's perspective, utility investment in EV charging infrastructure should support an innovative, sustainable market and robust management of new EV load in order to deliver the grid benefits that justify utility investment.

5. *Area there additional challenges or hindrances presented by existing Oklahoma Statutes or rules? If so, which Oklahoma Statutes, or rules, and what changes would you recommend?*

Oklahoma Sierra Club is not aware of specific challenges or hindrances presented by existing law (though please see our initial discussion of our 2017 legal effort, as it would have been a negative impact), however having been deeply engaged on this issue in the Oklahoma Legislature for the past five years, we do believe the Oklahoma Legislature as well as the Oklahoma Department of Transportation, have been viewing electric vehicles as a negative, with

[19] Source: Edison Electric Institute.

almost no formal discussion, nor formal legislation, accounting for the numerous positive benefits electric vehicles will have on our state. In other words, we firmly believe certain stakeholders with a very different set of facts, have largely been ignored or overlooked legislatively when it comes to the debate on electric vehicles.

As a general matter, Oklahoma Sierra Club recommends that utility regulators address two main issues in order to provide regulatory and market certainty: first, to resolve any issues related to Commission jurisdiction over non-utility owners or operators of public EV charging stations; and, second, to develop a framework that clarifies how the Commission will review any utility proposals to develop EV charging infrastructure and related programs, including what information should be included in utilities' applications and the standards the Commission will use to consider them.

This Commission has already addressed the first issue. In 2018, Oklahoma Sierra Club provided comments to the Commission in Cause No. 201800010 regarding potential regulation of the sale of electricity from EV charging service providers to EV drivers.[20] Since that time, Oklahoma appropriately clarified that providing EV charging services to EV drivers does not constitute the resale of electricity subject to the Commission's jurisdiction.[21]

The Commission should now act to address the second issue: clarifying the role for utilities with respect to EVs. In the evolving transportation electrification markets, it is clear that both private industry and public utilities both have roles to play with respect to infrastructure deployment, load management, and education and outreach. A lack of regulatory certainty can hinder fulfillment of those roles. Specifically, the Commission should take action through an inquiry or rulemaking to create a framework specifying how the Commission will evaluate utilities' EV program proposals, including the following:

- high-level areas of focus for utility programs;
- critical information to be included in utilities' proposals;
- standards or criteria by which utilities' proposals will be reviewed for approval and/or cost recovery;

[20] Sierra Club Comments, Oklahoma Corporation Commission Cause No. 201800010, OAC 165:35 Electric Utility Rates (Dec. 3, 2018).

[21] Oklahoma Administrative Code § 165:35-13-1(c), provides: "Sales of charging services from an electric vehicle charging station, not owned by a regulated utility, for the purpose of fueling an electric vehicle, including the ability to sell on a kWh basis, shall not be considered resale of retail electricity, and such sales from the electric vehicle charging station shall not be subject to rate regulation by the Commission. Utility service to an electric vehicle charging station shall be provided subject to the utility's terms and conditions."

As explained above, utilities are uniquely positioned to address EV charging infrastructure and vehicle-grid integration issues, particularly for undeserved but critical market segments, like multi-unit dwellings, where would-be EV drivers face unique challenges. Oklahoma Sierra Club submits that Commission guidance on the scope of the utility role and the process for regulatory review is critical to solving those infrastructure and integration challenges. We describe a few of those processes below.

In December 2017, the Michigan Public Service Commission ("MI PSC") adopted "high-level principles" for utility investment in EV programs.[22] Those principles begin with a finding that: "(1) transportation electrification is in the public interest, (2) transportation electrification in Michigan is lagging and barriers need to be addressed, and (3) electric companies are uniquely suited to help."[23] Consistent with that finding, the MI PSC invited utilities to develop and propose pilot programs focused on four areas: strategic deployment of charging infrastructure; rate design and smart charging; grid impacts, including integration of renewable energy; and customer education and outreach. "[W]hen evaluating … pilot programs for Commission approval," the MI PSC stated that it would consider: data collection and reporting, "load management," and whether the pilot programs include "new technology" and asked utilities to include a cost-benefit analysis of ratepayer benefits.[24]

In February 2019, the Minnesota Public Utilities Commission (MN PUC) took similar action, finding that electrification is in the public interest and setting expectations for utilities to "develop and file EV-related proposals intended to encourage the adoption of EVs" by "expanding the availability of charging, both home and public," "enhancing consumer awareness," "facilitating the electrification of fleet vehicles" and "encourag[ing] environmentally and economically optimal EV integration" through "time-of-use rates" and "smart charging."[25] The Commission then directed utilities to develop and regularly file a "transportation electrification plan identifying what EV-related initiatives the utility is contemplating over the next two years" and to develop specific component program proposals for those plans. For each utility program proposal, the MN PUC specified 14 different topics that should be addressed, including rates, performance goals, ratepayer benefits, budget, public education and outreach, arrangements to ensure interoperability, and program reporting, among others.[26] The MN PUC Order is attached as Exhibit C hereto.

[22] Case No. U-18368, Dec. 20, 2017, Order, p. 34.
[23] *Id.* at 12 (quoting and summarizing the guiding principles adopted by the Commission).
[24] *Id*.
[25] *Order Making Findings and Requiring Filings* at 11, Docket E-999/CI-17-879, Minnesota Public Utilities Commission (filed Feb. 1, 2019)
[26] *Id.*at 13-14.

6. *Do utility providers plan to implement or seek changes to accommodate electric vehicles and, if so, what plans or changes?*

Oklahoma Sierra Club is not aware at this time of any Oklahoma utility plans to submit a proposal to the Commission regarding EV charging. As explained above, Sierra Club recommends that the Commission act to address questions related to the utility role, and, in resolving those questions, the Commission should direct utilities to develop and propose transportation electrification plans for Commission review, a practice consistent with the work of other state utility commissions.

To take one example, the Wisconsin Public Service Commission recently requested public comment on a draft of such an order, which, if issued as proposed, would require large electric utilities in the state to submit proposals to support EV charging to the Commission in 2021. [27] The draft order would require qualifying utilities to include at least one residential EV pilot, which would be required to address EV charging rates, managed charging, and/or rebates to offset the cost of EVs or home EV charging equipment, while also allowing utilities to submit additional proposals addressing other customer classes.[28]

This Commission should similarly request public input on a draft order that resolves basic issues related to the utility role and directs utilities to develop EV plans for review.

VI. Findings and Key Recommendations from the Oklahoma Academy 2019 Town Hall (*Notice heading G*)

With respect to the list of members of the Oklahoma Center for Energy and Environmental Excellence ("OCEEE"), if formed, and/or participants of any future related town halls, Oklahoma Sierra Club submits that any such groups should include as members, or at least consult regarding their interest in membership, representatives of the environmental advocacy community, the indigenous community, and other traditionally disadvantaged or marginalized communities, including low-income folks and other people of color. The inclusion (or at least consultation regarding inclusion) of these stakeholders is essential just and equitable policymaking.

Oklahoma Sierra Club may offer additional or more specific comments on this subject at later junctures in this proceeding.

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[27] Wisconsin Public Service Commission, Investigation of Electric Vehicle Policy and Regulation, Case No. 5-EI-156 (Sept. 3, 2020), https://apps.psc.wi.gov/pages/viewdoc.htm?docid=396191.
[28] *Id.* at 6.

* * * * *

Oklahoma Sierra Club thanks the Commission for soliciting information on these issues, which are important to our thousands of Oklahoma members. We thank the Commission for considering these public comments, and we look forward to contributing further, as needed, at the technical conference as well as the public meeting in this cause. Please do not hesitate to let us know if the Commission has any questions.

Dated: October 19, 2020

Sincerely,

/s/ Johnson Bridgwater

Johnson Bridgwater
Director, Oklahoma Chapter of Sierra Club
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EXHIBIT A
to the Public Comments of Oklahoma Sierra Club in Cause No. PUD 202000083

A Pipe Dream or Climate Solution? The Opportunities and Limits of Biogas and Synthetic Gas to Replace Fossil Gas
Natural Resources Defense Council (NRDC)
June 2020

JUNE 2020
IB: 20-05-A

ISSUE BRIEF

A PIPE DREAM OR CLIMATE SOLUTION?
THE OPPORTUNITIES AND LIMITS OF BIOGAS AND SYNTHETIC GAS TO REPLACE FOSSIL GAS

Reducing the greenhouse gas (GHG) emissions driving the climate crisis will require replacing highly polluting fossil fuels such as natural gas (more accurately described as "fossil gas") with low-carbon or zero-carbon energy sources. As we more fully embrace substitution of fossil fuels with resources like wind and solar energy, some argue that biogas and synthetic gas are "renewable" alternatives that could someday replace fossil gas in America's pipelines. Biogas is primarily methane produced from organic sources such as food scraps or animal waste, and synthetic gas is methane or hydrogen created using electrical power. This Issue Brief examines the opportunities and limitations of biogas and synthetic gas to displace fossil gas as part of the solution to climate change.

Workers inspect an anaerobic digestion solid waste processing facility that converts food and green organic waste into biogas.

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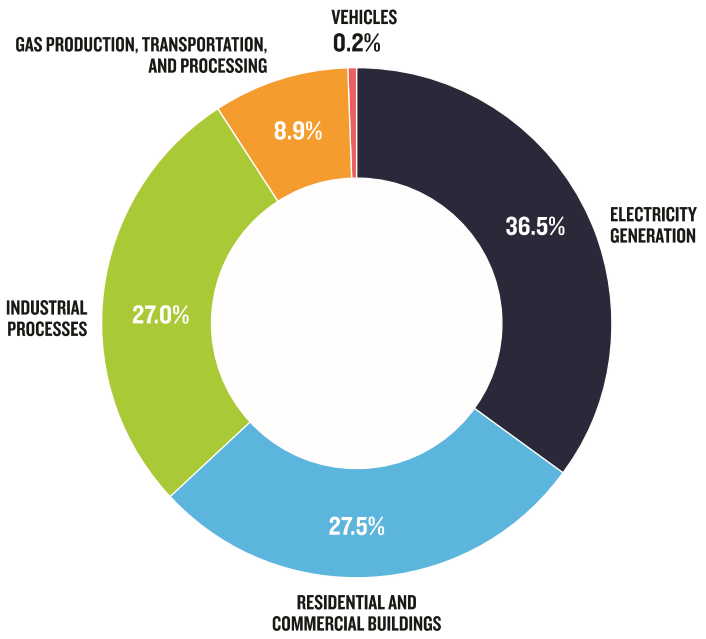
KEY FINDINGS

While biogas and synthetic gas can be a part of the climate solution toolbox, they come with a host of limitations, such as resource availability, cost, and human health and environmental impacts. Most significantly, the potential availability of biogas and synthetic gas is dwarfed by the current level of fossil gas consumption in the United States. NRDC estimates biogas and synthetic gas from ecologically sound sources may be able to replace only roughly 3 to 7 percent of today's gas use, at projected costs that are many times the current price for fossil gas. In addition, biogas and synthetic gas produce the same health-harming pollutants as fossil gas when burned, and leaks will still release methane—an especially harmful greenhouse gas—directly into the atmosphere.

As a result, biogas and synthetic gas should be used sparingly and strategically to meet on-site gas and electricity needs (to avoid transporting methane and building new pipelines), and to reduce emissions from activities that are most difficult to power with renewable electricity, such as industrial processes, aviation, long-distance transportation, and electricity generation to balance seasonal wind and solar resources.

FIGURE I: U.S. GAS CONSUMPTION (EIA 2019)



CURRENT USES AND IMPACTS OF FOSSIL GAS

The United States uses more than 31,000 trillion British thermal units (TBtus) of fossil gas annually.[1] Commonly known as natural gas, fossil gas consists primarily of methane (CH_4) and is used for generating electricity (36.5 percent); heating and cooking in residential and commercial buildings (27.5 percent); industrial processes (27 percent); producing, transporting, and processing gas (8.9 percent); and fueling vehicles (less than 1 percent) (Figure 1). To achieve at least a 40 percent cut in GHG emissions by 2030, and net-zero GHG emissions by 2050, the United States must aim to replace the use of fossil gas in all sectors with clean energy, and emissions from any remaining gas should be permanently captured and sequestered.

Carbon dioxide (CO_2) and other harmful pollutants are emitted when methane burns, contributing to climate and air pollution.[2] Even more troubling, when methane is released directly into the atmosphere, it is a highly potent greenhouse gas. Methane traps about 30 times more heat than carbon dioxide over 100 years, and more than 80 times the amount of heat over a 20-year period.[3] Unfortunately, a significant amount of methane leaks directly into the atmosphere throughout the extraction, processing, distribution, and delivery of fossil gas, resulting in damaging climate disruption.[4] Additionally, the extraction, production, transportation, and combustion of gas does not just increase climate disruption; it poses a myriad of threats to human health, clean air, clean water, wildlife, landscapes and ecosystems, and communities.[5]

WHAT IS BIOGAS?

We use the term *biogas* to refer to methane derived from biogenic (organic) sources such as landfills, sewage treatment facilities, forests, livestock operations, and farms. Biogas is produced through either anaerobic digestion or thermal gasification.

Anaerobic digestion creates biogas when wet, organic material breaks down in environments without oxygen, such as when dairy cow manure is processed in an enclosed container called a digester.[6] If left to decompose in an aerobic environment—an environment with oxygen—these organic sources would primarily release carbon dioxide (CO_2) instead of methane. Anaerobic digestion (AD) is a simple process that has been used to generate gas for many years, although currently only at a very small scale. It can be an effective approach to extracting energy from food and animal waste, but it has potential pitfalls. For instance, it removes organic material that, if left to decompose naturally, can contribute to soil health.[7]

Thermal gasification is a process that breaks down dry biomass—such as waste wood, forestry and agricultural residues, and used paper and cardboard—in a high-heat, low-oxygen, controlled environment to create methane or other gases.[8] In the absence of thermal processing, these dry organic sources would biodegrade over many years and produce mostly CO_2. Thermal gasification is a relatively new technology with limited commercial use thus far. A fundamental issue with gasification is that it can create methane where none or little would have naturally occurred. In addition, instead of gasifying biomass to create methane, there are other more benign and potentially beneficial alternatives that are in development.

For example, thermal gasification processes can produce hydrogen (instead of methane), which has many uses and is not a climate-harming greenhouse gas.[9] Alternatively, dry biomass can be processed into liquid fuels—such as drop-in replacements for fossil gasoline, diesel, and jet fuel—which is likely a higher value use of this material.[10]

For both biogas processes, it is important to carefully consider the range of possible environmental impacts of sourcing the organic material. It is also essential to monitor and limit the methane leaking from the biogas processing itself, as leakage rates from biogas facilities can be even higher than from fossil gas extraction and processing.[11] Figure 2 describes the potential sources of biogas and NRDC's recommendations for each.

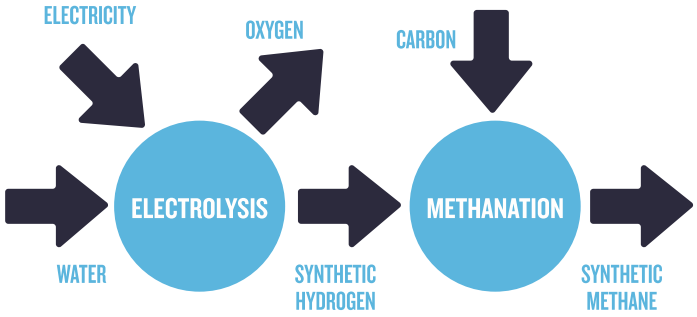
FIGURE 2: BIOGAS SOURCES AND RECOMMENDATIONS

	SOURCE	RECOMMENDATIONS
	**LANDFILL GAS** is generated from residential, industrial, and commercial organic waste—like leftover food, yard clippings, or paper—breaking down in landfills.	**Support in the near term only,** given the organics already in existing landfills. Landfill gas is not a renewable resource. This is a viable source of biogas in the near term, but going forward organic materials should be diverted from landfills to make best use of these materials. When biogas is processed so that it can be injected into a pipeline, leakage occurs in processing and transportation. These accidental methane emissions must be monitored and controlled.
	**ANIMAL MANURE** can generate methane when digesters process it in anaerobic conditions.	**Strong caution.** There are very limited quantities of gas that can be sustainably produced from animal manure. Livestock operations can and should manage manure in ways that protect environmental and human health, but often large livestock operations cause significant human and environmental harm, and using manure to produce methane is economical only for large-scale, concentrated livestock operations.[12] Large concentrated manure sources should be required to reduce their methane emissions and to work with local communities to avoid environmental harms. On-site use of gas should be considered instead of extending pipelines. Small operations with sustainable grazing practices and other sustainable manure management practices that prevent methane creation should be encouraged over large-scale operations.
	**WASTEWATER TREATMENT** plants break down biosolids from wastewater using anaerobic digestion.	**Support.** Methane is already produced through wastewater processing, making such plants a good source of biogas. When biogas is processed so that it can be injected into a pipeline, leakage occurs in the processing and transportation. These accidental methane emissions must be monitored and controlled.
	**ORGANIC COMPONENTS OF MUNICIPAL SOLID WASTE** like leftover food, used paper, and yard waste are generated daily in homes, businesses, and other institutions and can be a source for anaerobic digestion.	**Limited support.** Much of this resource should be diverted from waste streams through food waste prevention, surplus food rescue, composting, and recycling. Anaerobic digestion of food scraps should be done only using source-separated organics, and the leftover organic material from anaerobic digestion should be treated and applied to soil.
	**AGRICULTURAL RESIDUE**—including crop residues from orchards and vineyards, field and seed crops, food processing, and vegetable crops—can be a source for thermal gasification.	**Limited support.** Agricultural residue is largely woody, and biogas would most commonly need to be produced through thermal gasification. Before considering gasification, those who manage agricultural residue should focus on food waste prevention and surplus food rescue; maintaining nutrient cycling in soils; and productively using these sources as animal feedstocks, animal bedding, or fertilizers. Vegetable crops are best used by incorporating them back into soil or using them as animal feed.
	**FORESTRY AND FOREST PRODUCT RESIDUE**, including tree branches, brush, sawmill wastes, and non-merchantable trees from logging and thinning, can be a source for thermal gasification.	**Strong caution.** These resources would be processed through gasification, and access often requires energy-intensive collection and transportation. In cases where the emissions from collection and processing are managed so there is a net decrease in climate and air pollution, only these sources are acceptable: ■ Trees removed for safety reasons from within 200 feet of homes, built infrastructure (such as power lines), and other man-made structures. Outside of removals from these areas to protect people and property, NRDC does not support the use of trees as an energy feedstock. ■ Small-diameter logging slash (e.g., branches and leaves) if these would otherwise be burned on site. However, these sources are limited, logistically challenging, and expensive to collect. ■ Sawmill residues.
	**ENERGY CROPS** are grown specifically to produce energy.	**Strong caution.** Energy crops are often a poor use of land and should not be supported where they compete with food production or biologically diverse landscapes.

WHAT IS SYNTHETIC GAS?

The term *synthetic gas* (sometimes called "power-to-gas") refers to hydrogen or methane created through a series of controlled chemical reactions. The process begins with electrolysis, which splits water into hydrogen and oxygen. When that hydrogen is produced with renewable energy, it is called renewable or "green" hydrogen. Through a process called methanation, this hydrogen can be combined with carbon monoxide or carbon dioxide and converted into synthetic methane, as shown in Figure 3.[13]

FIGURE 3: SYNTHETIC GAS PRODUCTION PROCESS



Electrolysis requires a significant amount of energy. To generate truly "renewable" synthetic gas, that energy would need to be powered entirely by renewable resources such as wind, geothermal, and solar. However, the financial and technical viability of an electrolysis plant that could function economically on renewable energy is an open question because almost all synthetic gas today is produced with fossil gas or coal.[14] Additionally, "renewable" synthetic methane would require renewable sources of carbon dioxide. While synthetic gas can play a role in reducing our global greenhouse gas emissions, it is likely that this role will be played primarily by hydrogen rather than synthetic methane. A forthcoming NRDC publication will explore power-to-gas and the role of hydrogen in greater depth.

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FIGURE 4: RENEWABLE SYNTHETIC METHANE POLICY RECOMMENDATION

	SOURCE	POLICY RECOMMENDATION
CH_4	**RENEWABLE SYNTHETIC METHANE** is generated through methanation of renewable hydrogen using a biogenic or air-captured source of carbon.	**Limited support.** Renewable synthetic methane can directly replace any existing use of fossil gas because it is the same chemical compound (CH_4). However, due to the extra chemical conversion step (methanation) and the need for a source of carbon, synthetic methane is significantly more complex and expensive to produce than hydrogen. Given the many possible uses of renewable hydrogen (e.g., to replace hydrogen currently used by industry, as a transportation fuel, or for the seasonal management of renewable electricity), it may be preferable to use hydrogen directly rather than convert it to methane. Producing synthetic methane also creates the potential for leakage, which could undermine the climate benefits.

The potential supply of biogas and synthetic gas is dwarfed by the United States' current level of fossil gas consumption. Roughly 3 to 7 percent of the country's current gas use could be replaced by ecologically sound biogas and synthetic gas.

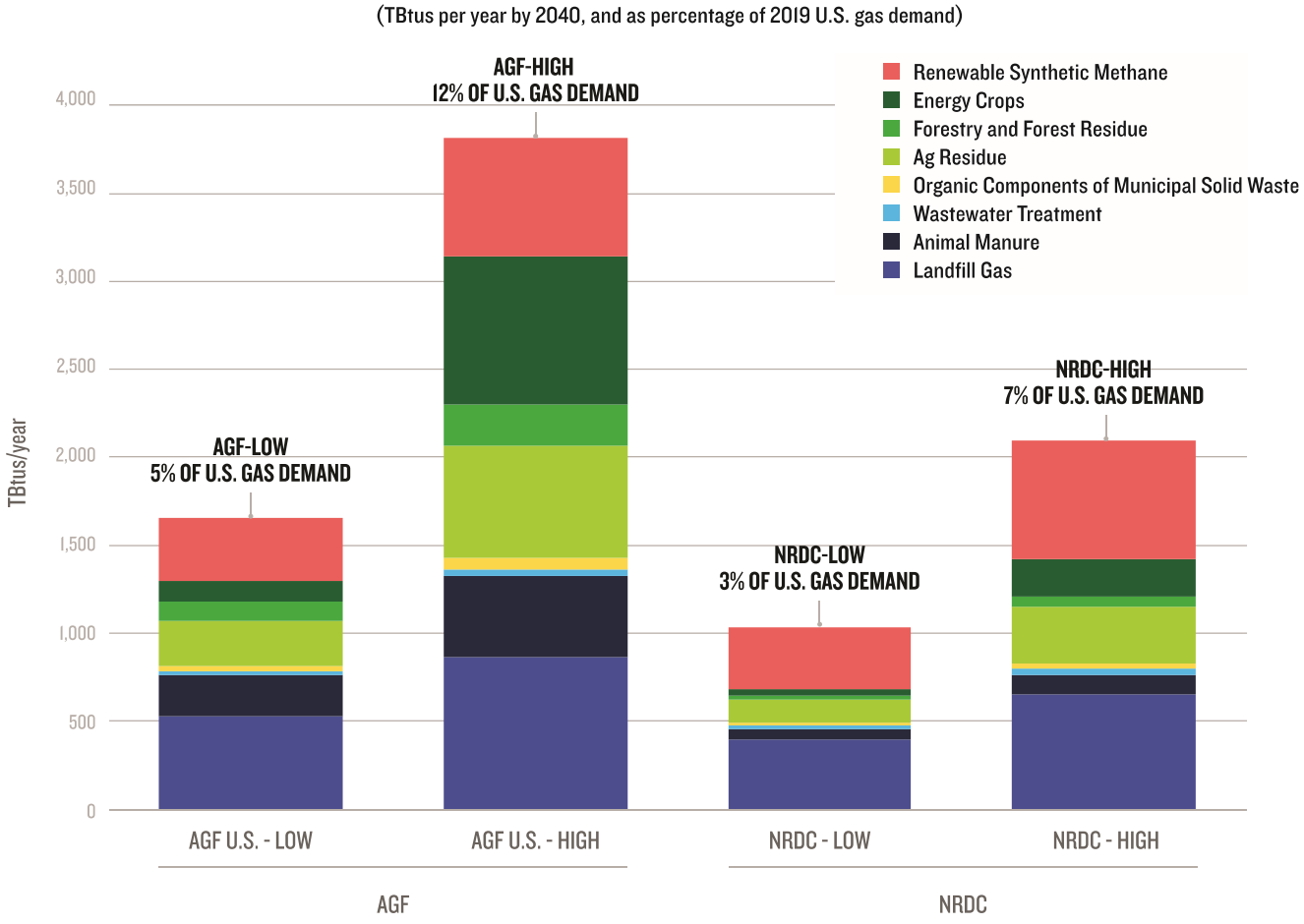
THE POTENTIAL CHALLENGES OF BIOGAS AND SYNTHETIC GAS

Inadequate Supply

The potential supply of biogas and synthetic gas is dwarfed by the United States' current level of fossil gas use. According to a study sponsored by the American Gas Foundation (AGF) and conducted by ICF International, the United States could produce 1,660 to 3,820 TBtus of biogas and synthetic gas annually by 2040.[15] On the basis of these numbers, NRDC applied its own screens to project that ecologically sound biogas and synthetic gas could replace roughly 3 to 7 percent of the country's 2019 gas use, with biogas replacing 2 to 5 percent and synthetic methane replacing 1 to 2 percent.[16] While those contributions would be significant, they do not justify reliance on biogas and synthetic gas as the sole or primary strategy to replace fossil gas use.

Figure 5 shows the AGF study's low and high estimates of potential biogas and synthetic gas supply by 2040, along with NRDC's rough estimates of ecologically sound gas potential. These numbers are an average across the United States; it is worth noting that the availability of biogas will vary significantly by region, depending on the local resources available.

FIGURE 5: AMERICAN GAS FOUNDATION AND NRDC HIGH AND LOW ESTIMATES OF BIOGAS AND SYNTHETIC GAS POTENTIAL*



* NRDC estimates are based on the AGF results, adjusted for our biogas resource policy recommendations given in Figure 2. We use the AGF high and low estimates for synthetic methane produced with renewable electricity.

Workers at the Waste Management facility in North Brooklyn, N.Y., process sewage into bio-slurry for conversion into methane gas.

These estimates rely on projections about current knowledge and technology for an industry that is still very young.[17] We anticipate significant learning over the next decade: It may turn out to be harder or more costly to produce biogas and synthetic gas, or new technologies and scale (especially for synthetic gas) could bring costs down and increase the potential supply.

If total gas demand declines over time, these percentages would increase. However, there may also be competing uses for these resources. For example, long-distance transportation may transition to biogas or hydrogen. And many of these biomass resources could also be converted to liquid fuels to serve other sectors. New demand for this same resource would compete with existing demand for gas for heating and cooking in buildings, industrial processes, and electricity generation.

Affordability

The cost of biogas and synthetic gas is much higher than today's price for fossil gas. The AGF estimates that biogas and synthetic gas will cost $7 to $45 per million British thermal units (MMBtus), which is 3 to 18 times more costly than the current market price for fossil gas, trading around $2.50 per MMBtu.[18] A California Energy Commission study estimates that biogas will cost $8 to $40 per MMBtu and that synthetic methane will cost $37 to almost $90 per MMBtu at scale in 2050.[19]

Environmental Impact

The emissions from biogas and synthetic gas must be carefully examined in determining whether different types of sourcing will have a net positive environmental impact. Biogas is often considered "zero carbon" because its fuel sources—organic material—have absorbed carbon from the atmosphere and would have released that carbon as part of a natural carbon cycle. However, evaluating the climate impacts of both biogas and synthetic gas must take into account the energy required to produce it, whether the source creates new methane where none or little would have existed otherwise, and how much methane leaks during production. All processes that generate methane should require an emissions management plan because without careful monitoring and oversight, these fuels could cause more harm than benefit to the climate.

Human Health

Just like fossil gas, biogas and synthetic methane continue the use of methane, which causes the formation of nitrogen oxides (NO_x) and other harmful air pollutants when burned.[20] NO_x pollution can lead to respiratory problems, from coughing and wheezing to decreased lung function, and can contribute to hospitalizations and even premature death.[21] In other words, biogas and synthetic methane do not avoid the many health harms of fossil gas.

POLICY RECOMMENDATIONS

These policy recommendations are based on our initial findings about the potential and limitations of biogas and synthetic gas:

- **Target on-site use and hard-to-electrify sectors.** Available biogas and synthetic gas resources should be directed to on-site use where possible (to avoid the leakage associated with transportation and the cost of new pipelines), with any excess directed to hard-to-electrify sectors such as industry, long-distance transportation, aviation, and use in electricity generation to balance seasonal wind and solar resources.
- **Transition to clean electricity.** The limited supply of biogas and synthetic gas cannot replace the current use of fossil gas by a long shot. Given the need to substitute clean energy for fossil gas in all sectors to meet climate goals, abundant renewable electricity will be the fuel of choice in most sectors. Gas use and investment in gas infrastructure will need to decline. All states and regions urgently need to begin planning for a smaller gas footprint to avoid the significant costs of under-used pipeline infrastructure.
- **Start small.** Given the nascent state of this market, policies that aim to replace fossil gas with biogas and synthetic gas should start small and grow only if the resource proves to be available, economical, and environmentally sound.
- **Establish and enforce emissions standards, monitoring, and reporting.** Any policy supporting the development of biogas and synthetic gas must include environmental requirements to screen the resources used, and differentiate among them through active monitoring and reporting of life-cycle carbon dioxide and methane emissions, accounting for both short-term and long-term climate impacts.

CONCLUSION

While biogas and synthetic gas have a role to play in avoiding the detrimental use of some fossil gas, it will be limited. These gas sources are often not as climate-friendly as claimed, and burning fuels like methane still creates harmful air pollutants. The limited supply and high cost of these fuels also inherently limit what they can contribute. Across the United States we will need to be strategic about how and where we deploy these resources to ensure they are used to complement, and not detract from, our primary focus on ramping up scalable renewable electricity resources for the sake of our health and the climate.

ENDNOTES

1 U.S. Energy Information Administration (hereinafter EIA), Natural Gas Consumption by End Use (2019), https://www.eia.gov/dnav/ng/ng_cons_sum_dcu_nus_a.htm (accessed May, 12, 2020).

2 Emissions from gas-fired boilers and furnaces include, nitrogen oxides (NO_x), carbon monoxide (CO), carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), volatile organic compounds (VOCs), trace amounts of sulfur dioxide (SO_2), and particulate matter (PM). The NO_x formed when natural gas (which is mostly methane) is combusted comes primarily from nitrogen and oxygen in the air interacting in the high-heat conditions of combustion. International Agency for Research on Cancer (IARC) Scientific Publication No. 161: *Air Pollution and Cancer* (as an e-Book), Edited by Kurt Straif, Aaron Cohen, and Jonathan Samet, 7 October 2013, see Chapter 4: Combustion Emissions, https://publications.iarc.fr/_publications/media/download/3699/eec4c42f3eadb86fd40854bd299756cfe55eca51.pdf (accessed April 28, 2020). Sunil Kumar, "How NOx Is Formed," Energy Solutions Center, last updated September 2002, http://cleanboiler.org/workshop/how-is-nox-formed (accessed April 28, 2020).

3 EPA, "Understanding Global Warming Potentials," last updated February 14, 2017, https://www.epa.gov/ghgemissions/understanding-global-warming-potentials (accessed April 28, 2020).

4 Estimated national average leakage rate of 2.3 percent from Ramón A. Alvarez et al., "Assessment of Methane Emissions From the U.S. Oil and Gas Supply Chain," *Science* 361, no. 6398 (July 13, 2018): 186-188 https://science.sciencemag.org/content/361/6398/186. Behind-the-meter leakage rate of 0.5 percent from: Marc L. Fischer, Wanyu R. Chan, Woody Delp, Seongeun Jeong, Vi Rapp, and Zhimin Zhu, "An Estimate of Natural Gas Methane Emissions from California Homes," *Environmental Science & Technology,* 2018 52 (17), 10205-10213, DOI: 10.1021/acs.est.8b03217, https://pubs.acs.org/doi/10.1021/acs.est.8b03217. Methane leakage estimate of 2.3 to 4.3 percent from Naomi Wentworth, "A Discussion on the Future of Natural Gas in California," Scripps Institution of Oceanography, Capstone Paper, June 2018, https://escholarship.org/content/qt23k2q3jp/qt23k2q3jp.pdf?t=pxewgd.

5 Union of Concerned Scientists, "Environmental Impacts of Natural Gas," June 19, 2014, https://www.ucsusa.org/resources/environmental-impacts-natural-gas. Environmental Defense Fund, "Methane Pollution From the Oil & Gas Industry Harms Public Health," https://www.edf.org/sites/default/files/content/methane_rule_health_fact_sheet_reboot_final_no_citations.pdf (accessed April 12, 2020).

6 EPA, "Basic Information About Anaerobic Digestion," last updated September 2018, https://www.epa.gov/anaerobic-digestion/basic-information-about-anaerobic-digestion-ad.

7 Dana Gunders and Jonathan Bloom, *Wasted: How America Is Losing Up to 40 Percent of Its Food From Farm to Fork to Landfill*, NRDC, August 2017, Appendix C, "Principles for Best Practices in Anaerobic Digestion," 47, https://www.nrdc.org/sites/default/files/wasted-2017-report.pdf.

8 Robert G.Jenkins, *Bioenergy: Biomass to Biofuels*, "Chapter 16 - Thermal Gasification of Biomass – A Primer," (2015), https://www.sciencedirect.com/science/article/pii/B978012407909000016X (accessed April 5, 2020).

9 As found in a recent Lawrence Livermore National Laboratory study, "[g]asifying biomass to make hydrogen fuel and CO_2 has the largest promise for CO_2 removal at the lowest cost and aligns with the State's goals on renewable hydrogen" at 5. Lawrence Livermore National Laboratory (LLNL), "Getting to Neutral, Options for Negative Carbon Emissions in California" (2020), https://www-gs.llnl.gov/content/assets/docs/energy/Getting_to_Neutral.pdf (accessed April 28, 2020).

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11 For other estimates of leakage from biogas facilities, see Rebecca Gasper and Tim Searchinger, "The Production and Use of Renewable Natural Gas as a Climate Strategy in the United States," World Resources Institute, April 2018, https://www.wri.org/publication/renewable-natural-gas (accessed April 28, 2020). Charlotte Scheutz and Anders M. Fredenslund, "Total methane emission rates and losses from 23 biogas plants," *Waste Management*, Volume 97, September 2019, Pages 38-46, https://www.sciencedirect.com/science/article/pii/S0956053X19304842?via%3Dihub (Accessed April 28, 2020). Liebetrau et al., "Analysis of greenhouse gas emissions from 10 biogas plants within the agricultural sector," Water Science &Technology, (2013) 67 (6): 1370–1379, https://doi.org/10.2166/wst.2013.005 (accessed April 28, 2020). Groth et al., "Determination of methane emission rates on a biogas plant using data from laser absorption spectrometry," Bioresource Technology, Volume 178, February 2015, Pages 359-361, https://doi.org/10.1016/j.biortech.2014.09.112, (accessed April 28, 2020).

12 Markus Lauer et al., "Making Money From Waste: The Economic Viability of Producing Biogas and Biomethane in the Idaho Dairy Industry," *Applied Energy* 222 (July 15, 2018): 621-636, https://www.sciencedirect.com/science/article/pii/S0306261918305695.

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15 American Gas Foundation, *Renewable Sources of Natural Gas: Supply and Emissions Reduction Assessment*, prepared by ICF International, December 2019, https://www.gasfoundation.org/wp-content/uploads/2019/12/AGF-2019-RNG-Study-Full-Report-FINAL-12-18-19.pdf. As noted in the report: "ICF made the simplifying assumption that all hydrogen produced via P2G would be methanated for pipeline injection. This assumption should not be viewed as a determination of the best use of hydrogen as an energy carrier in the future; rather, it was a simplifying assumption to compare more easily P2G to other potential RNG resources evaluated in this study.", *Renewable Sources of Natural Gas*, 3-4.

16 NRDC roughly estimated the portion of the AGF potential gas supply that could be considered "ecologically sound" based on our experts' review of each resource. Our estimate includes 100 percent of the AGF's projected 2040 supply of synthetic methane. The estimate for biogas that we use aligns with the policy recommendations in Figure 2. We include 100 percent of the AGF estimate for feedstocks for which we recommend "Support" (wastewater treatment), 75 percent of the feedstocks for which we advocate "Support in the near term" (landfill gas), 50 percent of the feedstocks needing "Limited Support" (organic components of municipal solid waste, agricultural residue), and 25 percent of the feedstocks requiring "Strong Caution" (animal manure, forestry and forest residues, energy crops).

17 The report notes: "ICF estimates that there were about 17.5 tBtu of RNG produced for pipeline injection in 2016 and that there will be about 50 tBtu of RNG produced for pipeline injection in 2020." Ibid., 10.

18 American Gas Foundation, "Executive Summary—Renewable Sources of Natural Gas: Supply and Emissions Reduction Assessment," prepared by ICF International, December 2019, 5, https://www.gasfoundation.org/wp-content/uploads/2019/12/AGF-2019-RNG-Study-Executive-Summary-Final-12-18-2019-AS-1.pdf. EIA, "Henry Hub Natural Gas Spot Price," https://www.eia.gov/dnav/ng/hist/rngwhhdm.htm (accessed March 5, 2020).

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20 See endnote 2.

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EXHIBIT B
to the Public Comments of Oklahoma Sierra Club in Cause No. PUD 202000083

Rhetoric vs. Reality: The Myth of "Renewable Natural Gas" for Building Decarbonization
Earthjustice & Sierra Club
July 2020

RHETORIC VS. REALITY:

The Myth of "Renewable Natural Gas" for Building Decarbonization

EARTHJUSTICE

SIERRA CLUB

JULY 2020

Sasan Saadat, **Earthjustice's Right to Zero campaign**
Matt Vespa, **Earthjustice's Right to Zero campaign**
Mark Kresowik, **Sierra Club**

EXECUTIVE SUMMARY

Policymakers seeking to cut emissions and reduce reliance on fossil fuels are increasingly examining energy use within buildings, which account for nearly 40% of carbon emissions globally. One of the largest drivers of these emissions is the burning of fossil fuels like gas for home heating, hot water, and cooking. In 2018, carbon emissions from U.S. buildings increased 10% due to growth in these uses alone.[1]

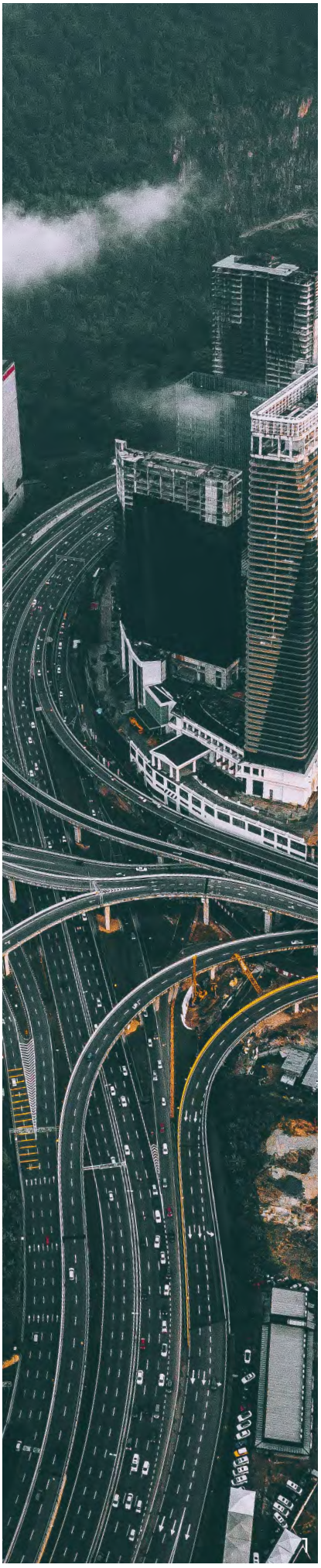
There is growing consensus that electrifying buildings – using electric appliances like heat pumps and induction stoves to replace the need for fuel combustion – is the clearest path to mitigating their pollution. Efficient, all-electric buildings eliminate on-site carbon emissions and methane leakage, and they can eventually achieve net-zero emissions as the grid becomes cleaner. Furthermore, building electrification eliminates the health impacts from burning gas indoors,[2] and reduces the safety hazards from gas leaks and explosions, all while capitalizing on the declining costs of generating electricity from solar and wind power.

Numerous studies indicate that electrification is the lowest-risk and lowest-cost method to reduce greenhouse gas emissions ("GHGs") from buildings, while generating additional societal benefits. And because buildings last for many decades, avoiding gas infrastructure and appliances in new construction is crucial for avoiding lock-in of fossil fuel reliance. As such, many policymakers across the U.S. and globally see electrification as the future of buildings. By early 2020, more than 30 cities and counties in the U.S. passed policies requiring or supporting all-electric new construction.

Gas utilities, which rely on maintaining and expanding fuel delivery infrastructure to buildings to generate revenue, view electrification as an existential crisis. The industry's response has been to pitch fossil gas alternatives ("FGAs") – often marketed as "renewable" natural gas ("RNG") – as an alternative to building electrification.

The argument goes that existing gas infrastructure can continue to operate by replacing today's fuel with a range of biologically and synthetically derived non-fossil gaseous fuels.

This report examines the potential for FGAs to decarbonize buildings and refutes the claim that FGAs are a viable alternative to building electrification.



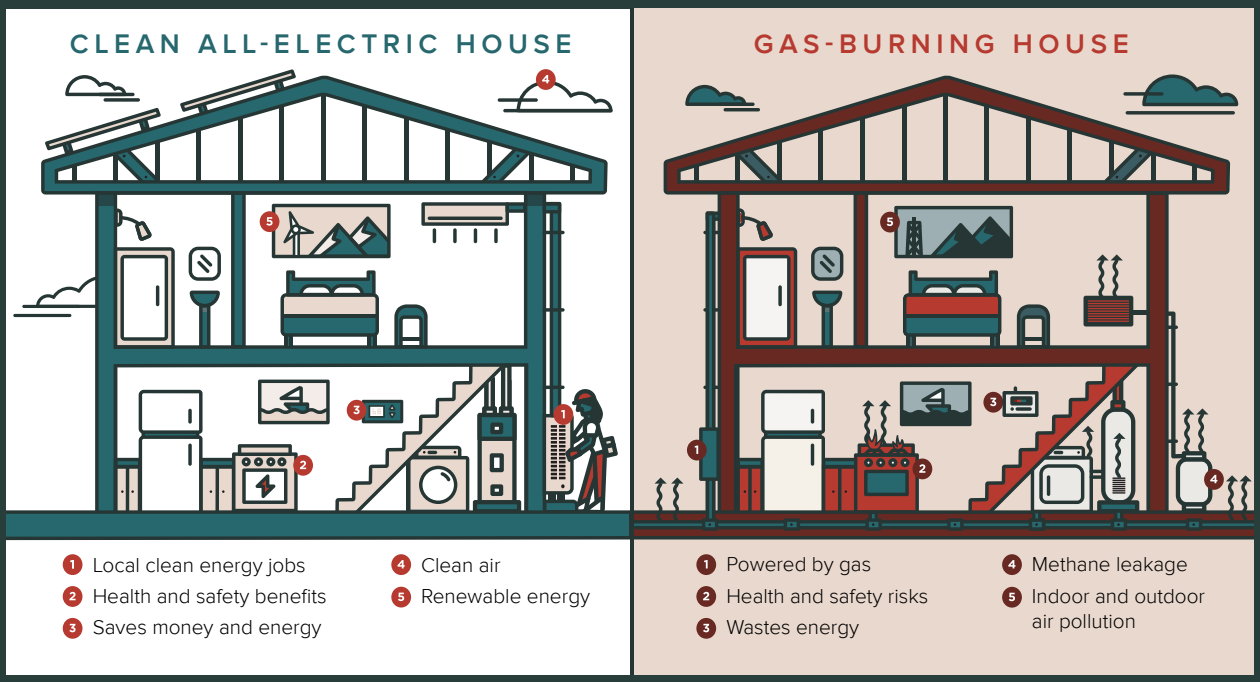
Topline findings include:

- **The potential supply of FGAs is a small fraction of gas demand.** The gas industry's own research found that after two decades of ramping up supply and production, FGAs could only replace 13% of the existing demand for fossil gas. Any strategy to reduce building emissions that relies on FGAs in lieu of electrification would not lead to complete decarbonization and diverts limited FGA supplies from more difficult to electrify sectors.

- **Replacing fossil gas with FGAs is extremely costly.** High production costs mean FGAs range from 4 to 17 times more expensive than fossil gas.

- **FGAs have a mixed environmental record.** Facilities where FGAs are produced can exacerbate air and water pollution impacts in nearby communities. When methane is intentionally produced, leakage throughout the distribution process can result in increased emissions.

- **FGAs perpetuate the health impacts of combustion.** Burning FGAs in homes, offices, and commercial spaces has the same issues inherent to any combustion-based fuels: they produce toxins that harm the health of people living, working, or learning in these buildings and also contribute to local air pollution through continued emissions of NOx and other combustion byproducts.



Through electrification, decarbonizing our buildings is also an opportunity to reduce legacy sources of indoor air pollution.

The report finds that due to the limited supply and high cost of biogas and synthetic gas, and the associated pollution and health impacts, the small and costly amount of FGAs available should be used to decarbonize sectors where there are few or no lower-cost mitigation solutions. Buildings do not meet these criteria.

Nevertheless, gas system incumbents are embarking on a coordinated strategy advocating for the use of FGAs in homes and buildings, irrespective of the fact that low-grade building heat is a poor use case for the limited supply of high-cost, low-carbon FGAs.

The second half of the report looks at both gas industry incumbents' efforts to fight electrification through a well-funded campaign to sway public opinion – often through fake grassroots organizations – and their misleading public rhetoric on the potential use of FGAs as an alternative building electrification.

Claims from utilities like Southern California Gas Company ("SoCalGas") that replacing 20% of fossil gas with FGAs can have the same impact as electrification, or Dominion Energy, that replacing 4% of fossil gas can eliminate the entire carbon footprint of its gas operations, are flawed and misleading given the limited supply of low-carbon FGAs.

These statements positioning FGAs as a clean source of energy make more sense when reviewing internal gas industry documents. The American Gas Association's ("AGA") Clean Energy Task Force developed draft policy principles stating the AGA "supports policies that define the term 'renewable energy' to include RNG on par with other energy sources, such as energy generated from wind or solar resources."[3]

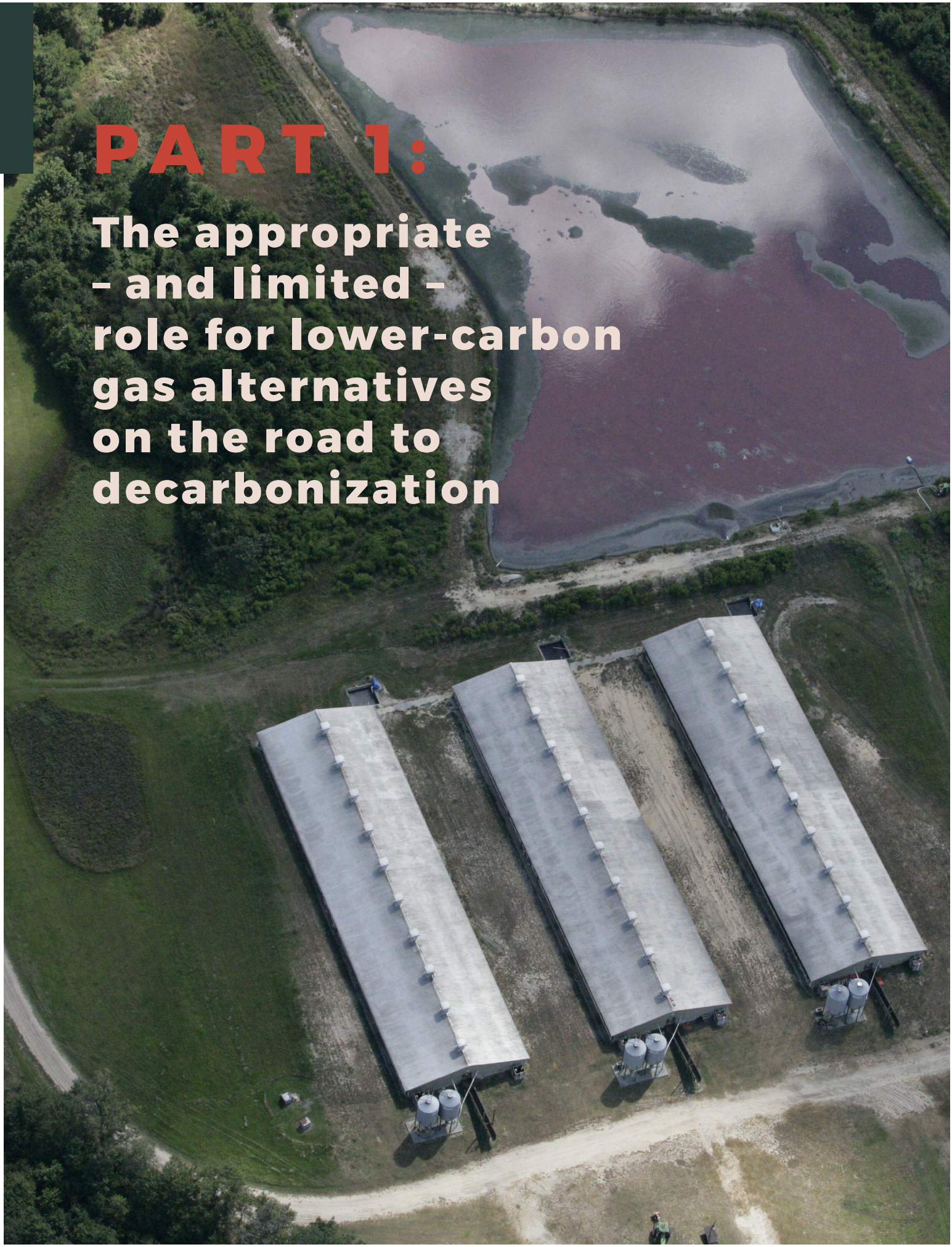
An internal set of AGA meeting notes from March 2018 shows the industry determined FGAs can be used to "mitigate the opposition's fervor" to phase out the burning of gas due to climate concerns.[4]

Another internal document makes clear an awareness of FGAs' limits, coming from an industry source: "[In my opinion], RNG will not sustain our industry at its present size."[5] In another instance, a board member for a gas industry advocacy group told The Guardian on the record: "Dairy biogas is way too expensive" to use in home or businesses – five to 10 times more expensive than fossil gas. "It doesn't pencil out and it doesn't make all that much sense from an environmental standpoint. It's a pipe dream."[6]

We find a pattern of talking points and lobbying efforts that leverage FGAs as a means of maintaining a gas-based heating system and stalling the transition away from fossil fuels.

This is not unfamiliar territory: The tactics come from the same energy industry playbooks that have dismissed and obfuscated the threat of climate change. In this case, the widespread adoption of a proven and cost-effective means of fighting climate change is being attacked and stalled in order to protect fossil fuel financial interests.

Ultimately, FGAs do not provide a path to decarbonizing the gas grid in line with a net-zero emissions energy system. Policymakers must see beyond the gas industry's rhetoric around FGAs and acknowledge the reality of their high costs, limited supply, and environmental risk. ■



PART 1:

The appropriate – and limited – role for lower-carbon gas alternatives on the road to decarbonization

1. Climate goals require a gas phaseout

To keep global average temperature from rising above 1.5°C and avoid the worst impacts of climate destabilization, the world must achieve net-zero emissions of greenhouse gases by mid-century.[7] This requires us to stop burning fossil fuels as rapidly as possible.[8] **Thus, greenhouse gas emissions from unabated gas use are incompatible with achieving net-zero emissions.**[9] Even aiming for the far less safe 2°C warming scenario would mean keeping more than half of the world's existing gas reserves unused and unburned.[10]

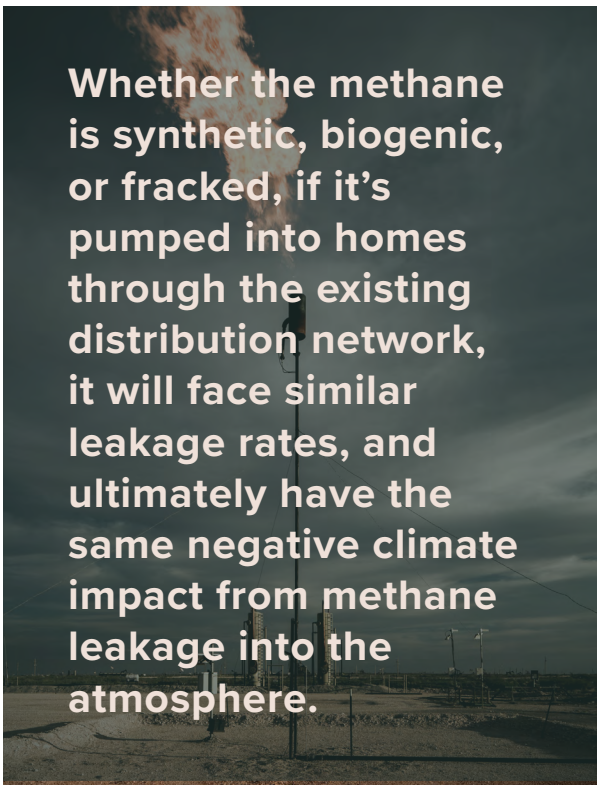
Achieving a net-zero emissions society inevitably means a substantial decline in gas consumption. With gas overtaking coal as the largest source of fossil fuel emissions in the United States, greater focus has been given to its true climate impact.

A growing body of research has highlighted the high global warming potential of methane, the main constituent of gas. Methane's radiative force,[11] which is 36 times more potent than CO2, and its pervasive leakage along the gas supply chain – both of which are proving more severe than previously understood – increase the urgency of its near-term mitigation.

New findings suggest methane leakage throughout the nation's gas delivery system is much more widespread than officials understood just a few years ago. In 2018, research published in the journal Science found the leakage rate in the U.S. gas supply chain equaled 2.3% of U.S. gross gas production, 60% higher than the EPA's official estimate.[12]

A 2019 study expanded the analysis to include leakage in distribution and end-uses, and found observed emissions from local gas distribution to be a factor of two to three times larger than those in the U.S. EPA's inventory.[13] Researchers in California found average home leakage rates to be 0.5%, representing leaks "an order of magnitude larger" than earlier estimates.[14]

Importantly, methane leakage issues are not limited to fossil gas. Whether the methane is synthetic, biogenic, or fracked, if it's pumped into homes through the existing distribution network, it will face similar leakage rates, and ultimately have the same negative climate impact from methane leakage into the atmosphere.



Gas flare at Permian Basin— Eddy County, NM
blake.thornberry, Flickr, CC BY-NC-ND 2.0

2. Different sources of fossil gas alternatives

The term "RNG" is currently used as an umbrella term to describe a range of fossil gas alternatives, most of which fall into two categories: biogas and synthetic gas. Different feedstocks and production methods for either of these alternatives require trade-offs around cost, supply, and social and ecological impact.[15]

BIOGAS

Biogas refers to methane derived from organic sources, such as crops or animal manure. It is produced via two main pathways, anaerobic digestion and thermal gasification. When upgraded and conditioned so it is pipeline-ready, biogas is typically referred to as biomethane.

ANAEROBIC DIGESTION

Anaerobic digestion is the decomposition of wet, organic matter by microorganisms in an oxygen-free environment. Often, anaerobic digestion is used to produce biogas from sources which currently emit methane, including:

- landfill gas;
- animal manure from livestock operations;
- wastewater treatment plants ("WWTP"); and
- organic municipal solid waste ("MSW"), specifically food waste.

THERMAL GASIFICATION

Thermal gasification breaks down dry biomass in a high-heat environment, creating methane from solid matter where none would ordinarily occur. The feedstocks used in this process are mostly lignocellulosic plants – so named because they contain carbon-based polymers – which include:

- agricultural residues, such as the unusable portions of crop stalks, stems, and branches;
- forestry and forest residues, such as sawmill residue and the extraneous wood generated from logging;
- energy crops, grown specifically for the purpose of becoming fuel, such as perennial grasses; and
- inorganic components of MSW, such as construction debris, such as plastic, glass, and textiles.

Lignocellulosic biomass can also be used as a non-gaseous fuel, such as conversion into renewable diesel. While gasification is a well-understood process, thermal gasification of biomass has not yet been proven at scale.

Lima Synthetic Gas Research Center
Ohio Development Services Agency, Flickr, CC BY 2.0

SYNTHETIC GAS

Synthetic gas is produced by converting electricity into a gaseous fuel through a process called power-to-gas, or P2G. It begins with electrolysis – using electricity to split water into hydrogen and oxygen. Hydrogen itself is a gaseous energy carrier, but to match the chemical make-up of fossil gas, it must go through a second step called methanation where carbon dioxide is added to the hydrogen.

When powered by renewable electricity, this process allows power from sources such as wind or solar to be converted into a gaseous fuel that can be carried by traditional pipelines.

But the substantial amounts of energy and conversion loss needed to turn electricity into hydrogen, and then hydrogen into synthetic methane, wastes much of the renewable power. After electrolysis, only about 67% to 81% of the initial energy remains. Not including the energy required to capture the CO_2, the methanation process leaves only about 54% to 67% of the energy.[16] All else being equal, using renewable electricity to power electrolysis and create synthetic methane that is then used to generate heat is far more costly and energy-intensive than the direct use of renewable electricity through heat pumps.

3. Not all fossil gas alternatives are environmentally beneficial

While estimates for the maximum amount of technically producible FGAs vary, these estimates rarely screen for those FGAs which are actually environmentally beneficial to use. Higher potential volumes of FGAs should not be assumed to be more environmentally beneficial. Because of methane's severe radiative force and the high probability of leakage throughout its lifecycle, generating new sources of methane where none would ordinarily occur can lead to an overall increase in GHGs. A new analysis by the Natural Resources Defense Council estimates that screening out ecologically problematic sources of FGAs would exclude roughly half the total amount of FGAs technically producible.[17]

Recent research highlights the potential for intentionally produced methane to create climatically significant levels of leakage.[18] The analysis shows that FGAs "from intentionally produced methane is always GHG positive unless total system leakage is 0."[19] At leakage levels observed

Dairy cattle on a hot summer day in Bakersfield, CA
David McNew/Getty Images

Biogas from CAFOs

Methane generated from the anaerobic decomposition of manure in lagoons at concentrated animal feeding operations ("CAFOs") has been advanced as a promising source of biomethane production. While often marketed as "sustainable," biomethane capture does not abate the significant harms CAFOs have on already overburdened local communities and ecosystems. For example, dairy CAFOs in the Southern San Joaquin Valley of California are the region's largest source of ozone-forming volatile organic compounds ("VOC") and further damage air quality through significant emissions of ammonia and fine particulate matter.[i] These facilities also contribute to nitrate pollution of drinking water and contaminate waterways, with nitrogen runoff leading to the eutrophication of lakes and streams.[ii] Every well monitored near dairies in the Central Valley Dairy Representative Monitoring Program showed nitrate levels above the maximum contamination limit.[iii]

In addition, while proponents assert that methane from CAFOs manure lagoons would otherwise be emitted into the atmosphere, these emissions are not an inevitable or ordinarily occurring consequence of raising livestock. They are the result of industrial livestock management decisions (namely confinement, concentration, and liquid-based manure storage)[iv] and a regulatory environment that permits these practices to continue despite their significant air and water quality impacts. Were herd sizes maintained at more manageable levels, livestock operations could avoid producing waste in excess of agronomic rates for nearby crops, maintain pasture-based livestock operations, or more feasibly employ dry handling storage systems, thereby avoiding these methane emissions in the first instance.[v] Because the high capital costs of anaerobic digesters make economic sense only for the CAFOs that produce and store large quantities of wet manure, markets and subsidies for biomethane capture reward the largest and most polluting CAFOs, reinforcing and intensifying trends of industry consolidation, with corresponding increases to localized pollution.[vi]

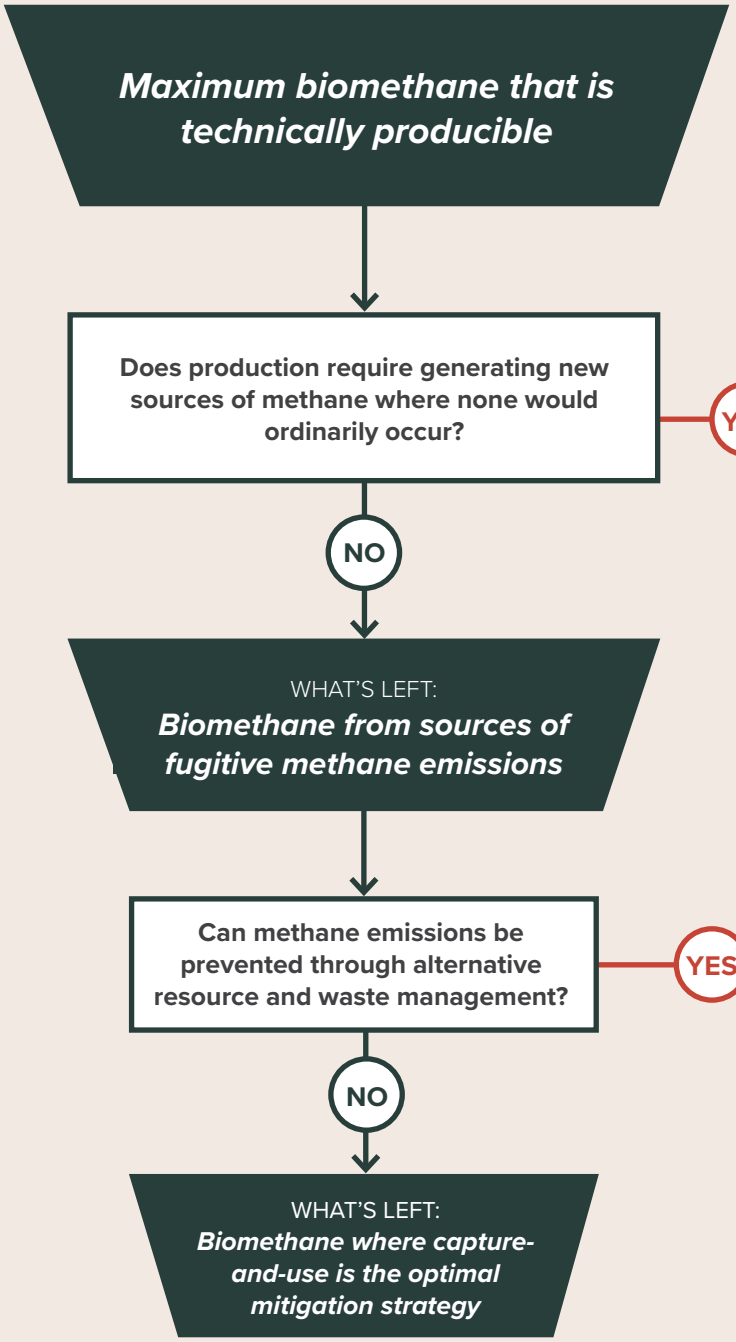
in the existing biogas industry, intentionally produced methane, even from climate-neutral CO_2 sources, has substantial climate impacts.[20] Thus, the climate benefit of FGAs depends on whether they are derived from methane that would otherwise be emitted into the atmosphere. Of the total volume of FGAs technically producible, only a very small portion comes from methane already being emitted to the atmosphere. **The study estimates that capturable waste methane (e.g., from uncontrolled landfills and wastewater treatment plants) is less than 1% of current gas demand.**[21] The rest must be intentionally produced and will pose the risk of additional methane leakage that can offset any potential emission reductions.

Even FGAs that can be produced from methane already emitted into the atmosphere should not automatically be considered environmentally beneficial. As a general rule, proposals to commoditize pollution should be treated with caution. Climate "solutions" that perpetuate or exacerbate local pollution are incompatible with the principles of a just and equitable transition. In fact, creating markets for FGAs that capture methane pollution can perversely incentivize continued reliance on practices that lead to the methane pollution in the first instance. As researchers note, "because biogas and biomethane can generate revenue, it is not only possible but expected to intervene in biological systems to increase methane production beyond what would have happened anyway when there is an incentive to do so."[22] Before considering capturing and using waste methane as an FGA, decision makers should examine whether the methane emissions could be prevented in the first place through better resource or waste management practices. **A premium should be placed on mitigation strategies that permanently avoid the generation of methane emissions through more sustainable practices.**

In particular, mitigation strategies that address the underlying causes of waste methane are important to consider when these practices are associated with multiple social and environmental harms. Markets that value pollution may become obstacles to policies that can reform inefficient and polluting practices or which may appropriately make polluters responsible for addressing their own emissions. In the graphic below, we illustrate a framework for assessing whether FGAs are actually likely to be environmentally beneficial. The supply of FGAs from genuine and unavoidable waste methane is far more limited than the amount that is technically producible.

A premium should be placed on mitigation strategies that permanently avoid the generation of methane emissions through more sustainable practices.

What Biomethane Sources are Environmentally Suitable?



The supply of biomethane that is environmentally beneficial to produce is substantially smaller than the total maximum potential of biomethane.

Genuine waste methane which cannot be readily avoided and has few other social or environmental harms (e.g., wastewater treatment) may be environmentally beneficial to capture and reuse as biomethane.

AVOID

Thermal Gasification of:

- Energy crops
- Forest product residue*
- Usable agricultural residue*

RATIONALE

Due to methane's severe radiative force, and the high probability of leakage throughout its lifecycle, it is preferable to avoid generating new sources of methane where none would ordinarily occur.

AVOID

Anaerobic Digestion of:

- Manure from CAFOs
- Preventable, rescuable or compostable food waste

RATIONALE

A premium should be placed on mitigation strategies that permanently avoid the generation of emissions in the first instance. Biomethane production from these sources can perversely perpetuate poor resource management.

* While they do not ordinarily generate methane, certain types of lignocellulosic biomass from agricultural or municipal solid waste (e.g., sawmill residue) may be unpreventable and difficult to compost or divert toward other uses. If no superior waste prevention or management strategy exists, it may be environmentally advantageous to redirect these waste streams toward fuel production. Nonetheless, it may be practical to exclude these from estimates of biomethane potential since multiple end-uses beyond current gas demand will compete for the limited supply of sustainable lignocellulosic biomass. Potential renewable fuel sources are generally better devoted to liquid fuels that displace more expensive, GHG-intensive petroleum or to hydrogen production which does not pose the risks of GHG increases from methane leakage or emit pollutants when combusted.

4. Fossil gas alternatives have no clear path to fully decarbonizing the gas grid

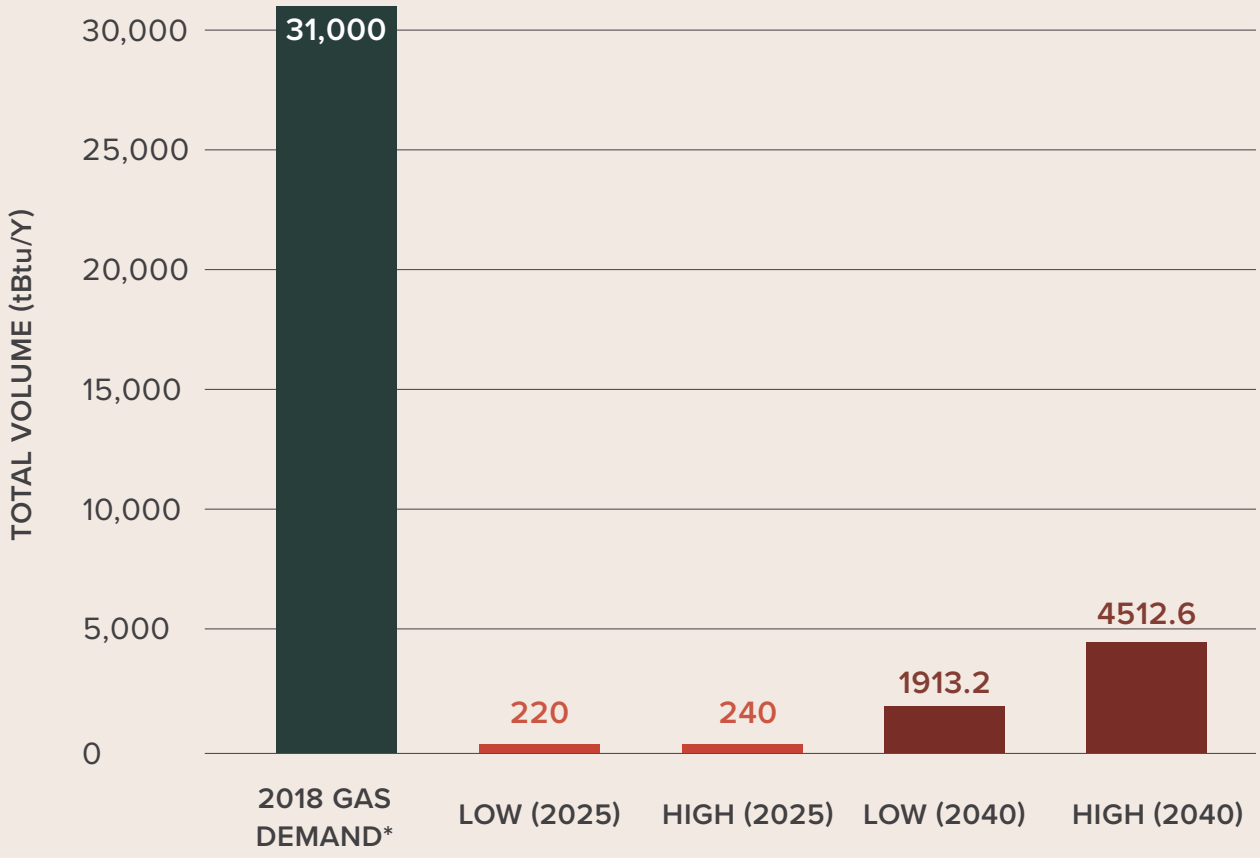
Even the gas industry's own analysis finds there is an insufficient supply of carbon-free gas to meet anything more than a small portion of current gas demand. **According to a study by the American Gas Foundation ("AGF"), even after fully ramping up the production of renewable gas, FGAs could supply between just 6% to 13% of current gas demand,**[23] clearly falling short of the goal of net-zero emissions and requiring fossil gas to make up the difference.

In the AGF study, a proposed high-resource scenario, which would still meet just 13% of U.S. gas demand, relies on significantly increased thermal gasification of energy crops, accelerating production from 123 to 837 tBtu/year (trillion British thermal units a year, a measure of gas production). Expanding reliance on purpose-grown energy crops would introduce serious sustainability risks by diverting arable land from food to energy production. It could drive up the cost of food and drive changes in land-use patterns that would transform forests and grasslands – natural carbon sinks – into agricultural areas for energy crops. According to the U.S. EPA's own assessment, the Renewable Fuel Standard – an existing program that incentivizes biofuel production – has resulted in the conversion of 4 to 8 million acres of land, completely nullifying and overwhelming any climate benefit the program might have had.[24] Thus, additional energy crop incentives are likely to result in a dramatic loss of stored carbon and increased emissions that can make biofuels even more GHG-intensive than fossil fuels.

A limited amount of biogas (363-876 tBtu/year) could come from the residual portions of agricultural and forest products that are not traditionally usable. But some of these forest and crop residues would be more ecologically advantageous to devote to other purposes besides fuel production, such as animal feed or incorporation as a soil amendment into compost. The high-resource scenario also assumes that most or all forest and crop residue would be devoted exclusively to gaseous fuel production as opposed to liquid fuels or power generation, more suitable uses explored later in this report.

Even the most aggressive scenario laid out by the AGF still reflects what would be possible by 2040, after two decades of scaling FGA potential. Mobilizing all these resources toward existing gas demand, which still would only meet 13% of the nation's gas needs, would leave a far smaller amount of biogas and synthetic gas available for more difficult to decarbonize end uses.

FGA RESOURCE POTENTIAL AND CURRENT GAS DEMAND



Source: *American Gas Foundation RNG Report, Dec. 2019*
** U.S. Energy Information Administration*

5. Low-carbon gases are significantly more expensive than fossil gas

Relative to the cost of fossil gas, FGAs are far more expensive to produce. Between 2018 and 2020, fossil gas prices mostly hovered between $2.03-$2.86/MMBtu (one million British Thermal Units).[25] By contrast, the AGF's estimates for landfill gas, typically the cheapest way to produce biogas, range between $10-$20/MMBtu.[26] Dairy manure projects are projected to cost closer to $40/MMBtu. Thermal gasification projects, necessary to achieve higher technical potentials, all begin at even higher production costs.[27]

The AGF concluded that by 2040, half of all low-carbon, non-fossil gas used in their aggressive resource potential scenario could be available at $20/MMBtu. While some low-cost biomethane from landfills and wastewater treatment plants is available, the costs rapidly increase as production is expanded and pushed to more challenging projects.

A report for the California Energy Commission similarly finds: "[e]ven under optimistic cost assumptions, the blended costs of hydrogen and synthetic natural gas are found to be 8 to 17 times more expensive than the expected price trajectory of natural gas."[28] While substantial cost declines are likely to be a decade or more away, synthetic gas from hydrogen (whereby hydrogen is produced from electrolysis and then methanated) is estimated to remain many times more expensive than fossil fuels for decades to come, even assuming aggressive and rapid industry learning. Production costs would be lower if electrolysis is used only to produce hydrogen and avoid the additional step of methanation. But hydrogen can only be injected into existing gas pipelines at minimal volumes before risking dangerous levels of corrosion. Optimistic scenarios estimate that the pipeline system could handle volumes of 7% hydrogen by energy content before requiring costly upgrades.[29]

Thus, each FGAs decarbonization potential for building end uses is limited by supply, cost, or environmental integrity. Synthetic methane is disadvantaged by its conversion inefficiencies and high costs. Biogas, which is limited in supply, could only be made in more substantial amounts by accepting significant environmental risks and higher production costs. While hydrogen production is compatible with net-zero emissions and technically unlimited in supply, its suitability for decarbonizing the existing gas grid are constrained by its effects on the pipeline.[30]

6. Given their limited supply and high costs, fossil gas alternatives are best-suited for use in harder-to-decarbonize segments of society

Injecting FGAs into the gas delivery system hits a dead end well short of complete decarbonization. Even outstanding improvements to the production costs of FGAs are unlikely to alter a fundamental point: **Decarbonized gas is better suited for applications that currently lack a low-cost pathway to direct electrification.**

Even if renewable energy costs decrease and electrolyzer technology improves, lowering the cost of renewable hydrogen and using renewable synthetic gas to decarbonize heating will likely remain far more expensive than running heat pumps on renewable power, an existing and already widely available technology. Changes to this dynamic are limited by basic physics: Using renewable electricity to power electrolysis for the production of gas will result in significant conversion losses. To produce 100% renewable hydrogen, an electrolyzer has to have access to 3 to 3.5 times its installed capacity of solar or wind generation.[31] **Because of this inherent inefficiency, P2G will always be considerably more expensive than directly using electricity.**[32] On top of that, gas-burning appliances such as boilers and furnaces are far less efficient than heat pumps. Direct electrification is therefore far more effective in decarbonizing heat wherever it is possible to use heat pumps. Even for many industrial uses, which require temperatures between 75 to 140°C, heat pumps are the most effective option.[33]

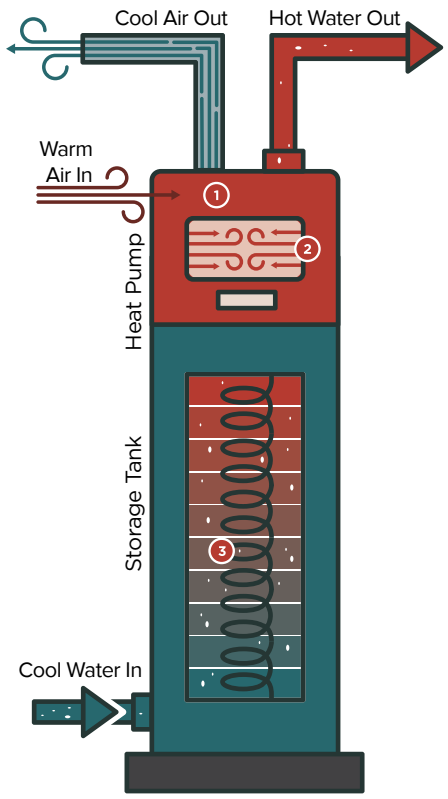
Given the limited availability of economic, sustainable FGAs, their role in a net-zero energy system will necessarily be small. Dedicating FGAs to incrementally lower the carbon intensity of gas heating in buildings is a poor use case, especially given their potential to advance decarbonization in more challenging sectors.

On a cost-effectiveness basis, policymakers should focus on socially optimal use cases for liquid/gaseous renewable fuels, such as delivering high industrial heat for steel production or powering air or marine

HOW DO HEAT PUMPS WORK?

By transferring heat rather than creating it, heat pumps deliver hot water **3-5 times more efficiently** than conventional water heaters.

1. Heat pump pulls warmth from the air.
2. Warm air is compressed, increasing its temperature.
3. Condenser coils transfer heat to the water.



transportation. Biogas and synthetic gas, as well as other renewable liquid fuels, have several advantages over electricity. Though costly, limited, and inefficient to produce, they are energy-dense, can be stored and transported more readily than electricity, and work with existing infrastructure that must rely on combustion. In optimizing their use, the advantages of renewable fuels (e.g., flexible, combustible, dispatchable) should be weighed against their disadvantages (e.g., cost, leakage, limited supply) and the availability of alternatives such as electrification and demand management. Because heat pumps and electric vehicles offer superior efficiency and eliminate end-use air pollution, direct use of electricity should be used to the maximum extent feasible in buildings and transport.

Because heat pumps and electric vehicles offer superior efficiency and eliminate end-use air pollution, direct use of electricity should be used to the maximum extent feasible in buildings and transport.

SOME SUGGESTED USES FOR FGAs:

HIGH-HEAT INDUSTRIAL PRODUCTION

Certain carbon-intensive industrial processes, such as steel production, require sustained temperatures greater than 200°C, which are currently generated by combusting natural gas. While it's possible to use advanced heat pumps to deliver high process heat in some instances, changing industry operations to employ electricity in place of combustion may require expensive logistical changes and facility retrofits.[34] Biogas and synthetic gas could enable decarbonization of these sectors right now, without requiring costly modifications.

DECARBONIZING CHEMICAL PRODUCTION

Hydrogen is required as a feedstock for industrial processes, such as ammonia and iron ore production. Nearly all of the hydrogen currently used to meet these demands is developed through Steam Methane Reformation ("SMR") of fossil gas, an emissions-intensive process. Renewable hydrogen offers a way to provide cleaner feedstocks to these industries.

FUEL FOR HEAVY ROAD, AIR, AND MARITIME TRANSPORTATION

Renewable liquid or gaseous fuels, either from biogenic materials or from power-to-gas/power-to-liquid pathways, may eventually enable decarbonization of the heavier categories of transportation, such as international air and sea transport.

Even with the current, low-commodity costs of fossil gas, electrification proves to be a cost-effective energy solution for many households. The balance would significantly tilt in favor of electrification if FGAs were used given their extremely high costs.

These findings are not limited to warmer climates such as California. A multifaceted analysis by Evolved Energy Research on pathways to reducing the state of New Jersey's emissions and meeting its 2050 climate goals included a "least cost" option. That scenario, along with numerous other options discussed, required buildings to be 90% electric by 2030.[35]

Nevertheless, gas system incumbents are embarking on a coordinated strategy advocating for the use of FGAs in homes and buildings, irrespective of the fact that low-grade building heat is a poor use case for the limited supply of high cost, low-carbon FGAs.

Moreover, FGAs are not an ideal fuel source for buildings because, just like fossil gas, their combustion harms the health of people living, working, or learning in these buildings. They also contribute to local air pollution through continued emissions of NOx and other combustion byproducts – an avoidable outcome, given the availability of electric, zero-emission solutions. In addition, even after treatment for injection into gas pipelines, the potential residual toxicity of biomethane has yet to be fully understood. A recent study by the California Energy Commission found that using biomethane for home appliances causes DNA damage and mutagenicity, with varying results for fossil gas.[36]

The existential financial risks large-scale electrification present to the incumbent fossil fuel industry – largely responsible for the energy and environmental challenges we now face – should not be a reason to waste precious time and resources and on promoting FGAs for use in buildings. ■

A father prepares a meal with his son on an induction stove. Children who grow up in a home with a gas stove are 42% more likely to develop asthma than those who don't.[37]
Tom Werner/Getty Images

PART 2:

How the reality of fossil gas alternatives differs from gas and industry rhetoric

1. Fossil gas alternatives help preserve the gas utility business model in the face of electrification

Despite the inefficiency of FGAs laid out in this report, the fossil fuel industry hopes that by capitalizing on very low public awareness of the respective cost, supply, and sustainability challenges that exist for broad-scale use of FGAs, they can sell them as an alternative to building electrification.

This section lays out how building electrification challenges the gas industry's business model and profits, and how FGAs rose to prominence within their efforts and tactics to fight electrification.

Like electric utilities, gas utilities profit not by selling the gas itself, but by maintaining infrastructure that delivers energy to homes and businesses within an exclusive service territory. Their businesses are regulated by state public utility commissions, which allow them to earn a rate of return on the money they invest in their gas pipeline networks.

On average, gas utilities generate more than 85% of their gross revenues[38] from their residential and commercial customers. In the last 20 years, gas utilities have added 12.4 million new residential customers,[39] and spent more than $22 billion annually[40] replacing old pipes, averaging a 12% per year increase in capital investment from 2010 to 2016.[41] About 30% of the nation's residential and commercial gas demand is delivered by gas-only utilities, as opposed to those who deliver both gas and electricity, making these organizations that much more dependent on maintaining the status quo.

Any large-scale shift that reduces gas usage, such as electrification, poses an existential threat.

As Sempra Energy, the parent company for California utilities SoCalGas and San Diego Gas & Electric Company ("SDG&E") noted in its annual 10-K Report, increased use of renewable energy and electrification "could have a material adverse effect on SDG&E's, SoCalGas' and Sempra Energy's cash flows, financial condition and results of operations."[42]

Indeed, in a 2014 presentation to senior management, SoCalGas already foresaw the risks of electrification to its business, fighting against higher proposed efficiency standards for water heating in new construction to block the pathway toward highly efficient electric heat pump water heating and more widespread building electrification.

While investors have typically prized gas utilities, valuing them higher than their electric counterparts for many years, signs are emerging that investor confidence in the future of gas may be in question.[43] This has also been visible on recent gas utility quarterly earnings calls, where company executives are increasingly being forced to defend the sustainability of their businesses to the financial community.[44]

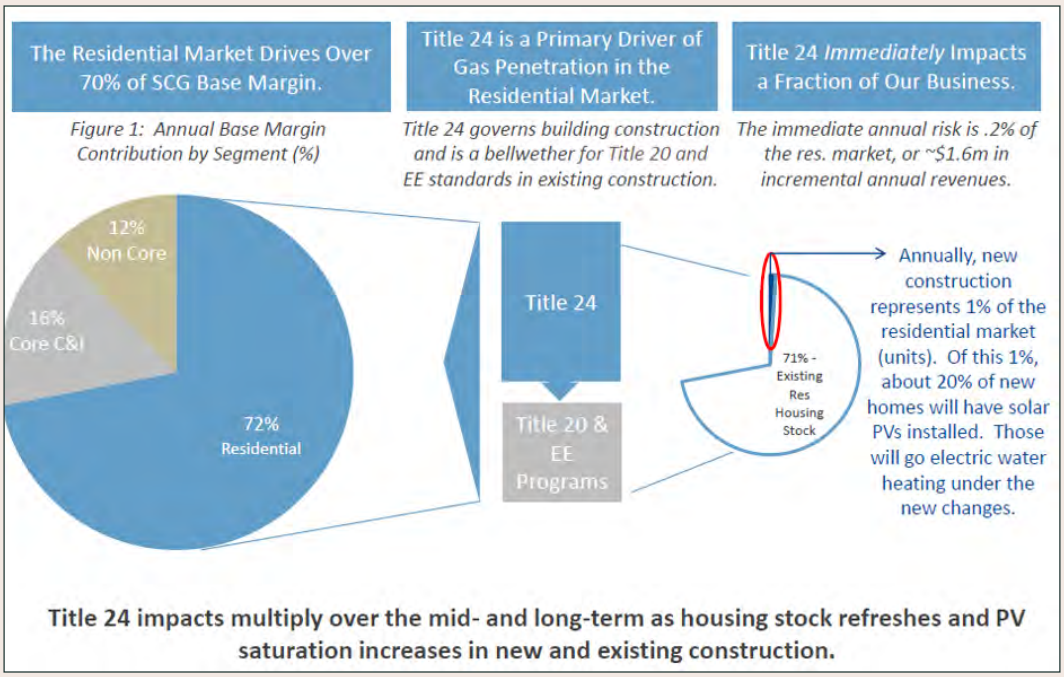
Gas interests are under pressure to both demonstrate they are taking steps to reduce emissions while also illustrating alternative pathways that allow gas infrastructure to continue being "used and useful" and also expanded.

The Longer Term Business Impact Would Be Significant.

» Left unchecked, the proposed changes would have a growing impact on SoCalGas:

- Residential water heating accounts for ~$800m of revenues/year
- **New construction opportunity cost: Up to $12m per year by 2020**
  - Adoption of these proposals would lead to new construction opportunity cost of $1.6m in the first year (2016), as .2% of the market (new construction homes with PV) migrates to electric
  - By 2020, the new construction opportunity cost would be at least $4.8m annually. If PV installations accelerate from 20% to 50% of new construction, the annual opportunity cost would be $12m/year by 2020.
- **Existing construction lost revenues: ~$4.8m per year by 2020**
  - Extrapolated to retrofit standards, the first year replacement rate of gas storage or tankless by electric heat pump would result in an additional $1.6m in lost revenues from current market the first year (2016) (2% of homes have solar PV; of those, 10% will have to replace water heater per year).
  - Assuming average water heater life of 10 years and that homes with solar PV will switch to electric water heating (2% of existing homes are solar), our gas water heating revenues would decline by an incremental $1.6m/year, or up to $4.8m annually by 2020
- Total impact by 2020: Up to $17m in lost revenues and opportunity cost annually
- As gas water heating erodes in new construction, space heating, cooking, clothes drying, etc., are all put at risk due to dominant role of water heating in cost justifying the gas houseline
- The loss of residential water heating revenues will cause rates to rise across other customer segments

In a 2014 presentation to senior management, SoCalGas already foresaw the risks of electrification to its business, fighting against higher proposed efficiency standards for water heating in new construction to block the pathway toward highly efficient electric heat pump water heating and more widespread building electrification.



Title 24 impacts multiply over the mid- and long-term as housing stock refreshes and PV saturation increases in new and existing construction.

2. How the gas industry seeks to short-circuit building electrification

The movement towards all-electric buildings, which emerged in 2019 with a wave of measures seeking to replace gas appliances with increasingly efficient and consumer-friendly electric alternatives, poses a new long-term financial threat to the gas industry.

To date, more than 30 communities in California and Massachusetts have passed policies restricting or eliminating the installation of any new gas infrastructure in new buildings, or promoting all-electric building codes. These communities include San Jose, California, the tenth largest city in the U.S., and Brookline, Massachusetts,[45] which became the first local government on the East Coast to adopt its own electrification policy. Dozens of other cities across the country are considering similar measures.

States, too, are beginning to examine how to wind down investment in existing gas distribution networks. California,[46] New Jersey,[47] and New York[48] in particular are updating and modernizing planning processes, gearing them towards a clean energy future that reduces or eliminates the need for future gas infrastructure investment.

Residents Line Up to Speak in Support of Berkeley's All-Electric Building Code

The gas industry quickly mobilized against pro-electrification legislation,[49] using front groups to wage aggressive misinformation campaigns. Prominent examples include:

- SoCalGas set up and continues to fund Californians for Balanced Energy Solutions ("C4BES"), a front group masquerading as a grassroots organization.[50] A filing to the California Public Utilities Commission shows how SoCalGas hired a PR firm to set up and provide ongoing support to this organization.[51]
- The Seattle Times recently exposed a $1 million effort from Washington and Oregon gas companies to form a new group dubbed the Partners for Energy Progress, which launched in May 2020.[52] It is intended to represent a coalition of unions, businesses, and consumer groups specifically to help "prevent or defeat" local electrification initiatives. They received advice from C4BES.

- Hawaii Gas, facing a Honolulu City Council bill that would limit gas water heaters in newly built homes, hired a Seattle-based political consulting firm to create a new front group called Our Energy Choice and fund additional opposition campaigns.[53]
- Before the town of Brookline passed a measure to prohibit new fossil fuel infrastructure in major construction projects, a group called the Massachusetts Coalition for Sustainable Energy unsuccessfully pressed Brookline officials to reject the policy.[54] Despite its name, however, this organization is actually an Astroturf front group formed to promote gas pipeline expansion projects and funded by in-state gas interests and utilities including Enbridge, Eversource, and National Grid.[55]

Recently, gas interests have also turned to a preemption strategy. Industry allies have begun pushing bills in state legislatures that would preempt or prevent cities and towns from enacting local ordinances that would limit or ban the inclusion of gas infrastructure in new buildings. Arizona legislators, at the behest of the utility Southwest Gas,[56] passed the first such measure, soon followed by Tennessee,[57] the second state to enact such a law. Similar bills forbidding gas bans, using near identical language to the Arizona bill, have been introduced in Kansas,[58] Minnesota,[59] Mississippi,[60] Missouri,[61] and Oklahoma.[62] SoCalGas also advocated for a similar law in California. In an email to C4BES Board Members, the Vice President for External Affairs and Environmental Strategy at SoCalGas stated "Regarding the AZ bill, maybe we at C4BES should be looking at that approach here in CA."

These efforts to stymie building electrification are effectively kneecapping local governments that are serious about meeting their long-term emissions reductions goals, since this sector represents such a significant portion of citywide carbon emissions. Building emissions represent 27% of the greenhouse gas footprint in Berkeley, California,[63] nearly two-thirds in Brookline,[64] and as high as 73% in Washington, D.C.[65]

Community Demonstration at SoCalGas/C4BES Press Conference in Riverside, CA

3. Industry claims about fossil gas alternatives

The gas industry's strategy to prevent electrification by locking in FGAs is framed as a pursuit of a more sustainable future. The pitch consists of oft-repeated statements meant to confuse the public over the value and cost of electric alternatives while promoting FGAs.

At least 10 op-eds from gas industry surrogates, promoting misleading data on the costs related to electrification while pushing FGAs as a better solution, have been published in California and national media between late 2018 and 2020.

Local utilities, eager to continue supplying gas to homes and buildings and provide some justification for their role in a decarbonized future, have been particularly aggressive in pushing and inflating the potential of FGAs.

SOUTHERN CALIFORNIA GAS COMPANY

In March 2019, SoCalGas announced its intent to become the "cleanest natural gas utility in North America." A cornerstone of that strategy is to replace 20% of its fossil gas supply with FGAs by 2030:

> ***"Research shows that replacing about 20% of California's traditional natural gas supply with renewable natural gas would lower emissions equal to retrofitting every building in the state to run on electric-only energy and at a fraction of the cost," a company press release claims. "Using renewable natural gas in buildings can be two to three times less expensive than any all-electric strategy and does not require families or businesses to purchase new appliances or take on costly construction projects."***[66]

As illustrated in Part 1 of this report, the reality is that FGAs can take California only marginally down the path of reducing emissions, and at an extremely high cost, while building electrification can cost-effectively take it to zero. The California Energy Commission, across two reports and three years, has found building electrification is the cheapest and lowest-risk option to decarbonize the state's buildings. SoCalGas's claims and rhetoric run counter to all reputable analyses on the topic, and SoCalGas has been silent on how much replacing 20% of its gas with FGAs would cost its customers.

Emails show that SoCalGas's front group, C4BES, was set up specifically to help spread this inaccurate message. In a welcome letter between Ken Chawkins, a SoCalGas employee, and Matt Rahn, who was recruited by SoCalGas as the chair of the board of C4BES, Chawkins states the purpose of C4BES: "We (C4BES) will tell the public and the media about the importance of natural and renewable natural gas."[67]

DOMINION ENERGY

Dominion Energy, a mixed-fuel utility that supplies gas to seven states, has been actively promoting FGAs as part of its pathway to decarbonization. Dominion announced[68] a goal in February 2020 to reach net-zero emissions by 2050 and plans to meet that goal with FGAs, saying in their statement that capturing the methane from farms will offset "any remaining methane and carbon dioxide emissions from the company's natural gas operations."

Dominion's RNG strategy includes a recently announced $200 million investment[69] with pork conglomerate Smithfield Foods to produce biomethane.

According to their website as of March 26, 2020, "Our goal is to meet 4 percent of our gas utility customers' needs with RNG by 2040. Because RNG captures 25 times more greenhouse gas than it releases, that will offset our customers' carbon footprint by 100 percent!"[70]

The current version of their website makes the following claim:

> ***"[D]id you know renewable energy can also come from our nation's farms? That's right. Thanks to technological innovation, we can capture waste methane from hog and dairy farms and convert it into clean energy that can heat homes and power businesses.***
>
> ***It's called renewable natural gas, or RNG, and it's transforming the future of clean energy. When methane is converted into RNG, it captures 25 times more greenhouse gases from the atmosphere than are released when RNG is used by consumers. That makes RNG better than zero-carbon. It's actually carbon-beneficial!"***[71]

The claim that RNG captures 25 times more greenhouse gases is unsupported, and specious at best. As explained in Part 1, sources of FGAs vary in their carbon intensity. The vast majority of FGAs are not carbon negative, and most, like landfill gas, are not even carbon neutral. Even those FGAs which are sometimes considered "carbon negative," like biomethane from manure, that consideration is based on the presumption these emissions are inevitable, in contradiction to alternative management systems which avoid emissions altogether.

No utility has thus far been forthcoming about the costs of FGAs as an alternative to building electrification, though regulators have been clear. The Minnesota Attorney General's office called the cost of FGAs "unreasonably high"[72] and noted that if a customer used that fuel exclusively, their gas bill would increase by thousands of dollars annually.

4. Despite what it's telling customers, the gas industry knows the shortfalls of fossil gas alternatives

Despite these public statements, many in the gas industry are all too aware of the problems with wide-scale promotion and production of FGAs. Internal documents and communications illustrate how and when the strategy of using FGAs as a defense against building electrification emerged, as well as the cost and feasibility issues around these fuels.

The American Gas Association's Clean Energy Task Force developed draft policy principles for FGAs in January 2018. As stated in the document,[73] the AGA "supports policies that define the term 'renewable energy' to include RNG on par with other energy sources, such as energy generated from wind or solar resources." The principles also discuss FGAs as a way for gas to count towards Zero Net Energy standards for buildings.

An internal set of AGA meeting notes from March 2018 shows the industry's interest in using FGAs to "mitigate the opposition's fervor." After FGAs "piqued the interest of opposition group" Mothers Out Front, a Boston-based nonprofit dedicated to phasing out fossil fuels, the group reached out to National Grid, a gas utility that operates in Massachusetts, to learn more about the fuel. The meeting notes record the following action item in response: "Consider how technologies to decarbonize the pipeline can serve as a conduit to environmental organizations, thereby seeking to mitigate the opposition's fervor against infrastructure expansion."[74]

At the same time as the industry quickly began to outwardly express confidence in the role FGAs can play in "decarbonizing" the gas system, internal documents show there were and are concerns about the costs and supply of these fuels.

In a document obtained by the Climate Investigations Center,[75] Mark Krebs, an energy policy specialist at St. Louis-based Spire Energy, wrote to other gas utility employees, "If CA sees builders use more gas, they will probably clamp down on it; unless it is RNG; hence all the hoopla over RNG. In my opinion, RNG will not sustain our industry at its present size."

Even members of the board of C4BES – the pro-gas industry front group developed and funded by SoCalGas – expressed concerns about the misleading characterization of FGAs. Michael Boccadoro, a lobbyist for California's dairy industry, which stands to benefit from incentives promoting the production of FGAs from large dairies, sat on the board of C4BES at its launch. He told The Guardian, "Dairy biogas is way too expensive" to use in home or businesses – five to 10 times more expensive than fossil gas.

He also stated, "It doesn't pencil out and it doesn't make all that much sense from an environmental standpoint. It's a pipe dream."[76]

Boccadoro raised his concerns about supply and price in emails with the rest of the C4BES board, which were played down by the chairman, Matt Rahn. Boccadoro left the board shortly thereafter. ■

CONCLUSION:

Benefits of building electrification should not be obscured by a fog of gas industry misinformation

The continued evolution of our energy systems and the push towards net-zero emissions require honest accounting of the pros and cons of different energy solutions. State agencies and independent analysis have overwhelmingly concluded that powering the grid with renewable energy and electrifying buildings is one of the quickest, most cost-effective ways to hit emission reduction goals.

Closer scrutiny of the production and distribution challenges of fossil gas alternatives (called “renewable natural gas” by the gas industry) are not, and are unlikely to ever be, a substitute for widespread electrification. Their role, if any, should be specialized and limited to specific industries that can’t easily electrify, specifically heavy industry and air or maritime transport. If focused on those specific functions, these fuels can play a potential role in complementing the society-wide energy transition.

The gas industry’s well-documented campaign of skewing facts, misleading consumers, and branding fossil gas alternatives as a renewable, sustainable energy source must be recognized for what it is: a PR campaign to protect the industry’s financial interests and preserve a business model that is incompatible with achieving a net-zero emissions society. The movement towards building electrification is gaining ground in the United States on a local level because it’s the most viable and affordable option for reducing emissions from the built environment. A straightforward reading of the facts and the adoption of existing technology can steer policymakers, consumers, and utilities alike towards a future of cleaner energy. ■

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EXHIBIT C
to the Public Comments of Oklahoma Sierra Club in Cause No. PUD 202000083

Order Making Findings and Requiring Filings
Minnesota Public Utilities Commission, Docket E-999/CI-17-879
February 1, 2019

BEFORE THE MINNESOTA PUBLIC UTILITIES COMMISSION

Dan Lipschultz	Commissioner
Matthew Schuerger	Commissioner
Katie J. Sieben	Commissioner
John A. Tuma	Commissioner

In the Matter of a Commission Inquiry into Electric Vehicle Charging and Infrastructure

ISSUE DATE: February 1, 2019

DOCKET NO. E-999/CI-17-879

ORDER MAKING FINDINGS AND REQUIRING FILINGS

INTRODUCTION

While still a small share of the market, electric vehicle (EV)[1] sales are growing rapidly and show signs of increasing growth. The Legislature has taken steps to facilitate the adoption of EVs in Minnesota. Minn. Stat. § 216B.1614 requires each public utility to have a tariff specifically designed for EV charging that offers time-of-day or off-peak rates to customers who own EVs. Minn. Stat. § 216B.02, subd. 4, exempts entities that sell electricity for EV charging from regulation as a public utility, which allows non-utilities to develop and operate charging infrastructure.

EVs have the potential to benefit Minnesota in numerous ways, but could also adversely impact the electric system if their integration is not planned. In order to facilitate EV integration in a manner consistent with the interests of the public and of ratepayers, the Commission initiated this investigation into EV charging and infrastructure.

PROCEDURAL HISTORY

On December 28, 2017, the Commission opened the present docket by issuing a Notice. The Notice stated,

> The purpose of this inquiry is to gather information and gain a better understanding of the following:
>
> 1. The possible impacts of EVs on the electric system, utilities, and utility customers, including the potential electric system benefits;

[1] Minn. Stat. § 169.011, subd. 26a, defines "electric vehicle" as "a motor vehicle that is able to be powered by an electric motor drawing current from rechargeable storage batteries, fuel cells, or other portable sources of electrical current, and meets or exceeds applicable regulations in Code of Federal Regulations, title 49, part 571, and successor requirements." The definition includes a neighborhood electric vehicle, a medium-speed electric vehicle, and a plug-in hybrid electric vehicle.

2. The degree to which utilities and utility regulatory policy can impact the extent and pace of EV penetration in Minnesota; and

3. Possible EV tariff options to facilitate wider availability of EV charging infrastructure.

The public interest should benefit from a better understanding of these issues and from more regulatory certainty.

On March 16, 2018, the Commission convened a public workshop featuring national and local EV experts in order to discuss the challenges and opportunities surrounding EV adoption in Minnesota.[2] The workshop included panels on charging infrastructure, cooperative and municipal utility EV initiatives, and investor-owned utility and stakeholder perspectives.

On May 9, 2018, the Commission issued a Notice of Comment Period, requesting comment on a variety of EV issues including barriers to EV adoption, guiding principles for EV adoption, the possible effects of increased electric retail sales for EVs, cost recovery for EV-related investments, EV pilot programs, and cost-benefit analysis of EVs.

By August 8, 2018, the following parties submitted comments in response to the May 9 Notice:

- Alliance for Transportation Electrification
- Center for Energy and the Environment
- Ceres
- ChargePoint, Inc.
- Citizen's Utility Board of Minnesota
- Dakota Electric Association
- Fresh Energy, Natural Resources Defense Council, Sierra Club, & Minnesota Center for Environmental Advocacy (the Clean Energy Organizations, or CEO)
- Greenlots
- Institute for Local Self-Reliance
- Minnesota Department of Commerce, Division of Energy Resources (Department)
- Minnesota Pollution Control Agency & Minnesota Department of Transportation (MPCA/MDOT)
- Minnesota Power
- Office of the Minnesota Attorney General, Residential Utilities and Antitrust Division (OAG)
- Otter Tail Power Company (Otter Tail Power)
- Siemens
- Tesla, Inc.
- Union of Concerned Scientists
- Xcel Energy

[2] The Commission issued notices of the workshop on February 1, 2018 and March 5, 2018.

By August 24, 2018, the following parties filed reply comments:

- Center for Energy and the Environment
- CEO
- ChargePoint, Inc.
- Citizen's Utility Board of Minnesota
- The Department
- Greenlots
- MPCA
- Siemens
- Tesla, Inc.
- Union of Concerned Scientists
- Xcel Energy

On December 13, 2018, the Commission met to consider the matter.

FINDINGS AND CONCLUSIONS

I. Summary of Commission Action

In this order, the Commission will make general and specific findings regarding EVs in Minnesota based on the input received in the course of this investigation, and will direct Xcel Energy, Minnesota Power, and Otter Tail Power to submit plans and proposals for EV-related programs and investments.

The Commission received comments and reply comments from many different stakeholders, each with a unique perspective and expertise regarding EVs and the broader electric system. The Commission has reviewed and considered these comments, and this order discusses below the most prominent issues that emerged from these comments.

II. Key Issues

Issues discussed in this section are not necessarily the views of the Commission, but rather a summary of the issues raised in the course of the investigation. The Commission offers this summary to provide context for the Commission's findings and order, which are informed by these views.

A. Potential Benefits of and Barriers to EVs

1. Benefits of EVs

EVs have the potential to deliver a variety of benefits to Minnesota, especially environmental and public health benefits. Replacing fossil fuel powered vehicles with EVs can reduce greenhouse gas and other harmful emissions, especially as the rise of EVs coincides with the rise of renewable energy and the decline in coal-fired electric generation.

Reducing greenhouse gas emissions is key to stopping climate change, and Minnesota has accordingly established greenhouse gas emissions reduction goals.[3] But according to MPCA, the transportation sector is a leading source of greenhouse gas emissions in Minnesota and has not significantly reduced emissions levels.[4] Increasing the adoption of EVs in Minnesota can help the state meet its emissions reduction goals and fight climate change.

Fossil-fuel powered vehicles also emit harmful pollutants that can cause adverse public health effects.[5] These harmful pollutants tend to disparately impact minority and low-income areas where emissions are higher. Switching to EVs can help reduce emissions of these harmful pollutants and improve health outcomes in these vulnerable communities.

By using more electricity, EVs can benefit all ratepayers. An increase in electricity sales can drive down rates for all ratepayers "by spreading the utilities' fixed costs over a greater amount of kilowatt-hour sales,"[6] especially if EV charging occurs during times of low demand when not as much electricity is consumed by customers. It is estimated that an EV driver uses 4,000–5,000 kilowatt hours annually, but the Department concluded that significant growth in EVs is necessary before it would noticeably impact electric consumption.[7]

Utilities can play a role in advancing these wide-ranging potential benefits by helping facilitate the growth of EVs through education of the public and development of EV charging infrastructure.

2. Barriers to EVs

Widespread EV adoption is not a given due to conditions that can hamper the growth of EVs. The two main barriers to EVs that have been identified in this docket are insufficient charging infrastructure and lack of consumer awareness of EVs and their benefits.

These barriers are intertwined, because a great way to remind consumers about EVs and show that EVs are a viable and convenient option is for consumers to encounter charging infrastructure as they go about their day. Potential EV owners have reported concerns about being able to complete their driving trips on a single charge, a phenomenon that has been labeled "range anxiety." Installing plenty of chargers that potential EV owners encounter regularly can help counteract range anxiety and encourage EV adoption. Developing charging infrastructure is therefore a potential prerequisite to significant growth in EVs. However, third-party charging providers can face difficulties in developing charging infrastructure without robust EV ownership to support it. Utilities can play a role in facilitating and developing charging infrastructure in order to help bridge this gap.

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[3] Minn. Stat. § 216H.02.

[4] MPCA/MDOT comments at 1.

[5] *See, e.g.*, *In the Matter of the Further Investigation into Environmental and Socioeconomic Costs Under Minnesota Statutes Section 216B.2422, Subdivision 3*, Docket No. E-999/CI-14-643, Order Updating Environmental Cost Values at 32–33 (January 3, 2018) (Updating Environmental Costs Order).

[6] CEO comments at 5.

[7] Department comments at 5.

B. Important Components of EV Proposals

1. Designing Efficient and Effective Rates

The electric system is designed to provide safe and reliable service at all times, including times of peak demand, which is the time of day when electricity use by the public is at its highest. In Minnesota, peak demand generally occurs during the evening hours when most people have returned from work, with the lowest demand occurring overnight.[8] The growth of EVs has the potential to significantly impact the electric grid, because scores of EVs charging during times of peak demand could necessitate large investments in generation and distribution infrastructure to handle this new load. Fortunately, rate design can be an efficient and effective tool for avoiding these costly investments.

Time-of-use rates adjust the price of electricity based on the time that it is consumed, with low prices during low-demand periods and high prices during peak demand. A time-of-use rate could therefore encourage charging during times of low demand and impose higher rates for usage when demand is high to reflect the additional costs this usage imposes on the system. Using rate design to encourage charging during times of low demand can help the electric grid absorb and accommodate the new load created by EVs without the need for new generation or distribution infrastructure, thereby enhancing the efficient use of existing infrastructure and potentially driving down electricity rates.

Rate design mechanisms intended to encourage off-peak charging through lower rates at those times can be particularly effective for persuading public and private fleet managers to switch to EVs. Fleet managers "tend to be very sensitive to operations and maintenance costs, and so are more accustomed to thinking in terms of total cost of ownership" and therefore more likely to consider fuel cost savings in choices about vehicle types.[9]

Another benefit of encouraging charging during times of low demand is that overnight electricity consumption also tends to correlate with high generation of Minnesota's most abundant renewable resource: wind power. Matching EV charging with wind generation could allow utilities to make better use of the wind resource and potentially support increased wind generation, which can help Minnesota meet its greenhouse gas and harmful emission reduction goals.

Smart or managed charging takes rate design a step further by enabling the utility to actively manage the charging load. Chargers can be equipped with two-way communication capabilities between the utility and the EV, which allows the utility to remotely control the rate of EV charging in order to meet a local or regional system need. For example, the utility could ramp up EV charging during times of high wind generation, and the utility could curtail charging during peak demand in areas with high EV penetration to defer the need for distribution infrastructure upgrades.

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[8] Department comments at 7.

[9] CEO comments at 21.

2. Educating Ratepayers about EV Options and Benefits

The EV tariff statute allows utilities to recover costs incurred "to inform and educate customers about the financial, energy conservation, and environmental benefits of electric vehicles and to publicly advertise and promote participation in the customer-optional tariff."[10] A plain reading of this provision authorizes cost recovery for education efforts by a utility that go beyond simply encouraging customers to enroll in the utility's EV tariff. The statute contemplates that utilities could disseminate information to customers about the overall benefits of EVs, such as the financial benefits to the individual customer in the form of lower fuel costs and broader environmental benefits of widespread EV adoption.

Utilities are uniquely situated to educate the public about the benefits of EVs because of their existing relationships and frequent contact with their customers. Education efforts could even target public and private fleet managers to encourage the transition of vehicle fleets to EVs—a high-impact opportunity for boosting EV adoption. Since lack of awareness about the benefits of EVs is a major barrier to EV adoption, utility efforts to educate ratepayers about benefits of EVs can be an efficient and effective way to encourage EV growth.

3. Investing in EV Charging Infrastructure

Because EV charging infrastructure must connect to the electric grid, utilities inevitably play a role in the development of that infrastructure. At a minimum, the utility will treat a customer hosting charging infrastructure like any new customer by providing a service connection to the customer, including any necessary distribution upgrades, up to and including the meter. The costs of the service connection are then allocated to the customer hosting the charging infrastructure in the same manner as any new customer.

Utilities can take on a larger role in developing EV charging infrastructure by assuming more of the costs and spreading them across all ratepayers. Under the "make-ready" approach, the utility could cover the cost of connecting the charging infrastructure up to the point where the charger connects to the grid. This approach could reduce the cost of building charging infrastructure, which could increase the economic viability of that infrastructure.

Utilities could build and own EV chargers, which would ensure development of charging infrastructure and strongly support the growth of EVs. A less direct approach could involve the utility offering financial incentives to third-party charging providers to build charging infrastructure.

Another factor to consider regarding EV charging infrastructure is the type of infrastructure that will be installed. For example, direct current fast charging (DCFC) infrastructure allows users to recharge in 10–30 minutes, drastically reducing charging time compared with traditional EV chargers and enhancing the potential for combined charging and parking services.

With any approach to development of EV charging infrastructure, there will be questions about which costs should be recovered from ratepayers and why. There are a number of mechanisms for cost recovery, as explained further below.

[10] Minn. Stat. § 216B.1614, subd. 2(c)(2).

4. Cost Recovery of EV-Related Investments

Any discussion of utility investments raises the issue of how the utility will recover the cost of those investments from ratepayers. Utilities recover costs from ratepayers through a variety of mechanisms, depending on the type of cost being recovered. Different types of cost recovery can incentivize certain investments and behaviors of the utility.

In the course of this investigation, stakeholders suggested a variety of approaches to cost recovery for EV-related costs. A utility's capital investments in EV infrastructure could be added to rate base through a rate case and earn a rate of return on the investment. The Commission has also authorized cost recovery outside of a rate case through riders. Utilities could be allowed to earn a higher rate of return on EV-related investments as an incentive. Attaching performance metrics to EV-related costs could tie cost recovery to the utility's achievement of certain goals, such as customer participation or satisfaction. Allowing the utility to recover EV-related costs as operating expenses would distribute cost recovery across all ratepayers but without the utility earning a rate of return on those costs. To be clear, the Commission generally decides recovery of a utility's cost of service on a case-by-case basis considering factors such as the purpose, nature, magnitude, and potential benefits of the costs incurred.

For investments serving only one customer, such as home charging equipment, it may be appropriate to recover the cost from that customer. These costs could be recovered over time using on-bill financing, which would recover a portion of the cost through the customer's electric bill each month, thereby easing the burden of the cost to that customer.

5. Promoting Connections Through Interoperability

One concern with the buildout of EV charging infrastructure is "interoperability," which broadly refers to the integration between different charging networks, as well as integration between charging infrastructure and different models of EVs. Interoperability is viewed as an important principle in the development of EV charging infrastructure to ensure a smooth user experience for customers and enable different types of chargers to communicate across networks. The Commission has no authority over third-party charging providers and how they choose to build charging infrastructure in Minnesota, but the Commission can encourage and mandate interoperability in utility proposals for development of charging infrastructure.

One aspect of interoperability is the Open Charge Point Protocol (OCPP), an informal standard that enables communication between a charging station and network management system. Another aspect of interoperability is Open Automated Demand Response (OADR), which enables the two-way communication between the EV and the utility that is necessary for smart charging.

C. Commission Consideration of EV Proposals

1. Weighing Effects Through Cost-Benefit Analysis

The Commission generally evaluates a proposal on its own terms based on the record developed in that docket. This approach promotes consideration of the unique context surrounding the proposal. In addition, the Commission frequently weighs the costs and benefits of a particular proposal in order to determine whether the proposal is in the public interest. Parties can submit a

formal cost-benefit analysis that attempts to quantify various costs and benefits to determine whether the benefits outweigh the costs, or vice versa.

Determining the appropriate level of cost-benefit analysis to inform the Commission's decision can depend on the magnitude of the proposal. For example, a large, expensive project may require a more detailed cost-benefit analysis to persuade the Commission that approval is in the public interest, while a smaller pilot project that is intended to experiment with a new idea in a low-risk manner may not require such extensive analysis.

One challenging aspect of conducting a cost-benefit analysis can be in attempting to quantify the costs and benefits that could result from implementing the proposal. Fortunately, the Commission recently conducted an extensive investigation into the societal costs of fossil fuel emissions and established dollar values attributable to carbon emissions and other harmful emissions.[11] These environmental cost values can be used to compare the costs of continued fossil fuel use with the cost of investments in emission-reducing EVs. In addition, MPCA is "beginning to quantify the health and climate costs of vehicle emissions as well as the benefits from policies targeted at reducing these emissions, including the increased adoption of EVs."[12] Some factors that could be considered in a cost-benefit analysis of EVs include better grid management, public health, and other social benefits.

2. Evaluating Infrastructure Investments

In its comments, OAG proposed an "analytical tool" to assist the Commission in evaluating utility proposals to build EV charging infrastructure.[13] OAG explained the analytical tool as follows:

> Step one involves an analysis of the expected number of EVs expected within a state in a certain time period. This step includes analysis of economics and policy factors such as climate or air quality targets or EV adoption targets. Step two uses the information developed in step one to determine how much public charging infrastructure would be needed to support the projected levels of EV penetration including the type of chargers needed. There are existing resources for this task. For example, NREL has developed a tool to determine the level of infrastructure needs based upon population density, EV ownership rates, traffic patterns, and travel data. Step three is an assessment of the competitive market for charging infrastructure, to determine the ownership model for EV charging stations and the extent of utility involvement in the supporting infrastructure.[14]

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[11] *See generally* Updating Environmental Costs Order.

[12] MPCA reply comments at 2.

[13] OAG comments at 13–14.

[14] *Id.*

This approach examines a number of factors to estimate the appropriate amount of infrastructure needed to support EVs, which can help avoid overbuilding infrastructure resulting in stranded assets.

3. Designing Effective Pilot Programs

Utilities occasionally propose pilot programs, which are temporary programs that allow the utility to test new technology or policies on a smaller scale. Pilot programs can be useful in the EV context because they allow utilities to experiment with different approaches to rate design, emerging technologies, infrastructure build-out, and other EV issues.

The purpose of a pilot is to determine whether a proposal is beneficial enough to warrant expansion to a full-scale program. A pilot proposal should articulate clear goals for the pilot and detail the evaluation metrics that will be used to measure and assess whether those goals have been met. Once the pilot has been adequately evaluated, the Commission can turn to the question of whether the approaches that were tested in the pilot should be expanded.

Furthermore, the scope and cost of a pilot will inform the level of scrutiny required before the Commission approves the pilot. For example, a smaller pilot may not require an extensive cost-benefit analysis before approval, because the smaller scale translates into a lower risk of adverse consequences if the expected benefits of the pilot do not materialize.

III. Commission Action

In the ordering paragraphs below, the Commission makes general and specific findings regarding EVs in Minnesota that are intended to shape and guide future EV proposals from utilities. The Commission affirms that EVs hold the potential for significant benefits to all Minnesota ratepayers, and that utilities will play a role in educating ratepayers about the benefits of EVs and helping integrate EVs into the electric system.

The Commission will require Minnesota's three investor-owned utilities—Minnesota Power, Otter Tail Power, and Xcel Energy—to submit the following filings, which are further described in the ordering paragraphs below:

Filing	Due Date
Report of planned 2019 EV proposals	March 31, 2019
Annual EV Reports required under Minn. Stat. § 216B.1614, subd. 3, including promotional cost recovery mechanisms	June 1, 2019
Transportation Electrification Plan	June 30, 2019
Proposals for infrastructure, education, managed charging, etc.	No later than October 31, 2019

The Commission will also request that MPCA file a supplemental report with the Commission in this Docket after it has completed its work quantifying the benefits of vehicle emission reductions related to EVs.

The Commission outlines in the ordering paragraphs below a number of topics that should be discussed in any future EV pilot proposal submitted by a utility, to the extent relevant.

The Commission will authorize the Executive Secretary to sustain an ongoing stakeholder process in this docket, further described below, which should seek to coordinate as much as practicable with the MPCA Volkswagen stakeholder process.

ORDER

The Commission makes the following general findings:

1. *Electrification Is In Public Interest*: The Commission finds that electrification of Minnesota's transportation sector can further the public interest in:

    a. *Affordable, economic electric utility service* by improving utility system utilization/efficiency and placing downward pressure on utility rates through increased utility revenues and better grid utilization;

    b. *Renewable energy use* by increasing electricity demand during hours when renewable energy is most prevalent on the system and developing tariffs that correlate renewable energy resources to electric vehicle charging; and

    c. *Clean energy* by reducing statewide greenhouse gas and other environmentally harmful emissions.

2. *Barriers to EV Adoption*: The Commission finds that barriers to increased EV adoption in Minnesota include but are not limited to: (a) inadequate supply of and access to charging infrastructure, and (b) lack of consumer awareness of EV benefits and charging options.

3. *Optimizing EV Benefits*: The Commission finds that how EVs are integrated with the electric system will be critical to ensuring that transportation electrification advances the public interest. This may include rate design that pairs charging with periods of low demand and high renewable energy generation, encourages advanced technology for enhanced load management, and provides direct benefits to EV owners through lower fuel costs of electricity.

4. *Utility Role Regarding EVs:* The Commission finds that Minnesota's electric utilities have an important role in:

    a. *Facilitating the electrification of Minnesota's transportation sector* through policies and investments that educate customers on the benefits of EVs and enhance the availability of charging infrastructure; and

b. *Optimizing the cost-effective integration of EVs* through appropriate rate designs, policies, and investments that improve system utilization/efficiency and benefit utility ratepayers, including non-EV owners.

The Commission makes the following specific findings:

5. *Expectations Regarding Utility Role:* The Commission finds that Minnesota's investor owned utilities should take steps to encourage the cost-effective adoption and integration of EVs. Among these steps, utilities should:

   a. *Focus specifically on issues related to transportation electrification*, including the cost-effective integration of EVs.

   b. *Develop and file EV-related proposals* intended to encourage the adoption of EVs by:

      i. Expanding the availability of charging infrastructure, both home and public;

      ii. Enhancing consumer awareness of EV benefits and charging options beyond what utilities could otherwise do under Minn. Stat. § 216B.1614, subd. 2(c)(2), without specific Commission approval; and

      iii. Facilitating the electrification of vehicle fleets.

   c. *Encourage environmentally and economically optimal EV integration* through, at a minimum, the adoption of appropriate and effective time-of-use and EV-specific rate designs, and reasonable initiatives or investments that encourage and support smart charging.

   d. *Consider energy bill financing as an option*, at least on a pilot basis, to facilitate the economic availability of residential charging infrastructure.

6. *Content of EV-Related Proposals/Investments:* The Commission finds that the following should be included at a minimum in any EV-related utility proposals:

   a. *Any EV-related proposals that involve significant investments* for which the utility is seeking or will seek cost recovery should include a cost-benefit analysis that shows the expected costs along with the expected ratepayer, system and societal benefits associated with the proposal; and

   b. *In the case of a proposed pilot*, the utility filing should include specific evaluation metrics for the pilot and identify what the utility expects to learn from the pilot. An extensive cost-benefit analysis may not be needed for a pilot, depending on the scope and cost of the pilot.

7. *Cost-Benefit Analysis:* The Commission finds that no specific cost-benefit methodology should be adopted at this time. However, as a starting point, utilities should use the Commission's current environmental externality values for carbon and criteria pollutants in analyzing the societal costs and benefits associated with EV-related proposals. Cost-benefit analyses should consider potential long-term ratepayer and societal benefits,

including better grid management, public health, and other social benefits. These analyses should also consider potential long-term costs, including the risk of stranded investment.

8. *Evaluating Investments in Public Charging Infrastructure:* The Commission finds that the OAG's suggested three-step process for evaluating utility investments in public charging infrastructure is reasonable. This framework should be incorporated into a utility's analysis when seeking Commission approval of any such investments.

9. *Interoperability:* The Commission finds that utility investments and arrangements related to charging infrastructure should be designed to ensure interoperability, using standards such as Open Charge Point Protocol and Open Automated Demand Response.

10. *Utility Cost Recovery*: The Commission finds that no single method of cost recovery should be generally precluded at this time for any EV-related investments. Rather, cost recovery, including the method of recovery, should be determined in each individual case based on factors such as the purpose, nature, magnitude, and potential benefits of the investments.

11. *Promotional Cost Recovery:* The Commission also finds that Minn. Stat. § 216B.1614, subd. 2(c)(2), allows utilities the opportunity to recover costs related to educating customers on the benefits of EVs beyond those costs related specifically to the utility's EV tariffs.

The Commission takes the following actions:

12. Minnesota Power, Otter Tail Power, and Xcel Energy shall file EV promotional cost recovery mechanisms consistent with Minn. Stat. § 216B.1614, subd. 2(c)(2), and the Commission's above Findings in this docket, as part of their annual EV reports filed June 1, 2019.

13. The Commission requests that the MPCA file a supplemental report with the Commission in this Docket after it has completed its work quantifying the benefits of vehicle emission reductions related to EVs.

14. The Commission directs Minnesota Power, Otter Tail Power, and Xcel Energy to file:

    a. By March 31, 2019, a report that identifies and discusses the EV-related proposals the utility plans to file in 2019, including the approximate date the utility anticipates filing those proposals; and

    b. By June 30, 2019, a Transportation Electrification Plan identifying what EV-related initiatives the utility is contemplating over the next two years, including next steps as specific programs to scale up current or currently proposed EV pilots or tariffs. The plan should identify the extent to which the utility's planned or contemplated initiatives would:

i. Facilitate availability and awareness of public charging infrastructure and residential charging options for both single family and multiple unit dwellings, including programs or tariffs in development to address flexible load or reduce metering and data costs;

ii. Educate customers on the benefits of EVs;

iii. Assist in the electrification of vehicle fleets with a focus on medium and heavy duty trucks and buses;

iv. Offer DCFC specific tariffs and which tariffs are currently in use;

v. Optimize EV benefits by, for example, aligning charging with periods of lower customer demand and higher renewable energy production and by improving grid management and overall system utilization/efficiency; and

vi. A discussion of current and planned charging practices/tariffs for public charging stations along with a discussion of any concerns related to those charging practices.

15. Minnesota Power, Otter Tail Power, and Xcel Energy shall file proposals, which can be pilots, intended to enhance the availability of or access to charging infrastructure, increase consumer awareness of EV benefits, and/or facilitate managed charging or other mechanisms that optimize the incorporation of EVs into the electric system. The utilities should consult with stakeholders, including but not limited to the Department, OAG and Fresh Energy, to help with the development of their proposals. The Executive Secretary is authorized to work with the utilities in identifying specific due dates for each filing, which should be sequenced to accommodate workload issues of Commission staff, Department of Commerce and other stakeholders. These proposals must be filed no later than October 31, 2019.

16. In any future pilot proposal, utilities should include a discussion of the following topics to the extent relevant:

a. Environmental justice, with a focus on communities disproportionately disadvantaged by traditional fossil fuel use;

b. Low-income access and equitable access to vehicles and charging infrastructure, which can include all-electric public transit and EV ride-sharing options;

c. Environmental benefits, including but not limited to carbon and other emission reductions;

d. Potential economic development and employment benefits in Minnesota;

e. Interoperability and open charging standards;

f. Load management capabilities, including the use of demand response in charging equipment or vehicles;

g. Energy and capacity requirements;

h. Pilot expansion and/or transition to permanent status at a greater scale;

i. Education and outreach;

j. Market competitiveness/ownership structures;

k. Distribution system impacts;

l. Cost and benefits of the proposal;

m. Customer data privacy and security; and

n. Evaluation metrics and reporting schedule.

17. The Commission authorizes the Executive Secretary to sustain an ongoing stakeholder process in this Docket, led by Commission staff, that involves a broad and diverse range of participants. The Commission specifically authorizes the Executive Secretary, when necessary and at the appropriate time, to solicit written comments and/or establish stakeholder workshops to examine any of the issues raised in this Docket. The Executive Secretary is also authorized to establish a notice and comment process for stakeholder input in response to each utility Transportation Electrification Plan. This stakeholder process should seek to coordinate as must as practicable with the MPCA Volkswagen stakeholder process and their grant program.

18. This order shall become effective immediately.

BY ORDER OF THE COMMISSION

Daniel P. Wolf

Daniel P. Wolf
Executive Secretary

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