STATE OF MINNESOTA
PUBLIC UTILITIES COMMISSION

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In the Matter of CenterPoint Energy's Natural Gas Innovation Plan **Docket No. G008 /M-23-215**

INITIAL COMMENTS OF THE CLEAN ENERGY ORGANIZATIONS

January 16, 2024

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INTRODUCTION

The Clean Energy Organizations (CEOs) consist of Minnesota Center for Environmental Advocacy, Fresh Energy, and Sierra Club.[1] The CEOs appreciate the opportunity to provide these initial comments in response to the Commission's July 17, 2023 Notice of Comment Period[2] for the Natural Gas Innovation Plan submitted by CenterPoint Energy (the Company).

The Natural Gas Innovation Act (NGIA),[3] passed on June 26, 2021, states that natural gas utilities may file innovation plans with the Commission describing innovative resources the utility plans to implement to help meet the state's greenhouse gas (GHG) emission reduction and renewable energy goals. For the initial NGIA plan submitted by any utility, the NGIA dictates that:

- At least 50% of the utility's costs approved for recovery must be for the procurement and distribution of alternative fuels (renewable natural gas, biogas, hydrogen produced via power-to-hydrogen, and ammonia produced via power-to-ammonia);[4]
- No more than 20% of the utility costs approved for recovery can be for district energy system pilots;[5]
- No more than 10% of total incremental costs can be spent annually on research and development (R&D);[6] and
- The size, scope and scale of the plan must produce net benefits under the cost-benefit framework established by the Commission as required by Minnesota Statute section 216B.2428.

Additionally, the NGIA stipulates that the Company's first NGIA plan must include:

- A thermal energy audit pilot program for small- and medium-sized businesses that identifies opportunities to reduce or avoid GHG emissions from natural gas use and provides incentives for businesses to implement recommendations made by the audit;[7]
- A pilot program for hard-to-electrify industrial manufacturing processes;[8]
- A pilot program that facilitates deep energy retrofits and the installation of cold climate electric air-source heat pumps in existing residential homes that have natural gas heating systems;[9] and

[1] Strategen Consulting assisted the CEOs in the drafting of comments on Pilots C-E, P & Q.

[2] *In the Matter of CenterPoint Energy's Natural Gas Innovation Plan, Notice of Comment Period*, Minn. Pub. Util. Comm'n Docket No. G-008/M-23-215 (July 17, 2023).

[3] Minn. Stat. § 216B.2427.

[4] Minn. Stat. § 216B.2427, subd. 2(d)(1).

[5] Minn. Stat. § 216B.2427, subd. 2(d)(2).

[6] Minn. Stat. § 216B.2427, subd. 3(g).

[7] Minn. Stat. § 216B.2427, subd. 6.

[8] Minn. Stat. § 216B.2427, subd. 7.

[9] Minn. Stat. § 216B.2427, subd. 8.

- A pilot program to facilitate the development, expansion, or modification of district energy systems.[10]

Overlaying these specific requirements for initial NGIA plan filings is the broad intent of the legislation to reduce the overall amount of natural gas produced from conventional geologic sources delivered to customers.[11]

The urgency to reduce the use of natural gas for powering buildings and industry cannot be overstated. The adverse impacts of climate change are accumulating more rapidly than originally predicted by scientists[12] and are already impacting Minnesotans in the form of record-breaking heat, more frequent and intense storms, and more severe flooding.[13] Because combustion of fossil fuels is the largest contributor to the GHG emissions causing climate change,[14] we can't achieve the deep reductions in GHG emissions needed to avoid the worst impacts of climate change without phasing out use of these fuels.

Phasing out the use of natural gas[15] is a critical part of this transition for several reasons. First, natural gas is largely made up of methane, a powerful GHG that heats the atmosphere more than 80 times faster than carbon dioxide over 20 years.[16] Climate-damaging methane can leak along the entire natural gas lifecycle, from gas-extraction sites to transmission and distribution pipelines, storage tanks, electricity-generation plants, and end uses in buildings and industry. Second, natural gas combustion contributes significantly to GHG emissions in Minnesota. Combusting natural gas in buildings and industry in Minnesota contributed 22 million tons of GHG emissions in 2020,[17] which is equivalent to the emissions produced by 5 coal plants in one year.[18] What's more, emissions from industry and residential buildings have both increased by

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[10] Minn. Stat. § 216B.2427, subd. 9.

[11] Minn. Stat. § 216B.2427, subd. 10.

[12] IPCC, Climate Change 2022 – Impacts, Adaptation and Vulnerability: Working Group II Contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (Cambridge Univ. Press, 1st ed. 2023), https://doi.org/10.1017/9781009325844.

[13] *Climate Change Impacts*, Minn. Pollution Control Agency, https://www.pca.state.mn.us/air-water-land-climate/climate-change-impacts (last visited Jan. 10, 2024).

[14] *Causes and Effects of Climate Change*, U.N. Climate Action, https://www.un.org/en/climatechange/science/causes-effects-climate-change (last visited Jan. 10, 2024).

[15] We use the term "natural gas" in our comments to avoid confusion but generally prefer the term "methane gas." Both natural gas and renewable natural gas are primarily methane and have the same climate and health-damaging effects.

[16] IPCC, Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II, and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (R.K. Pachauri & L.A. Meyer eds., 2014), https://www.ipcc.ch/report/ar5/syr/.

[17] *Greenhouse Gas Emissions Data*, Minn. Pollution Control Agency (Sept. 29, 2023), https://public.tableau.com/app/profile/mpca.data.services/viz/GHGemissioninventory/GHGsummarystory.

[18] *Greenhouse Gas Equivalencies Calculator*, U.S. Env't Prot. Agency (July 21, 2023), https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator#results.

14% since 2005[19]—a trend we need to reverse to meet state GHG reduction goals. Third, transporting natural gas to and combusting it in buildings and industry poses significant health and safety risks. Minnesotans experience several natural gas pipeline explosions a year,[20] and combusting natural gas in buildings to power our heating and cooking appliances is known to increase the risk of childhood asthma[21] and to exacerbate the symptoms of respiratory and cardiovascular disease.[22] Recent studies suggest that natural-gas-powered stoves and ovens can even leak health-harming pollutants when not in use.[23] Fourth, continued reliance on natural gas poses increasing financial risks for customers as natural gas prices are highly volatile and prone to spiking,[24] and natural gas rates could increase over time as residents switch from gas to electric heating and cooking appliances if the phase-out isn't well planned. Finally, shifting from natural gas to an alternative fuel such as renewable natural gas (RNG) won't fully alleviate these risks because RNG, which is also primarily methane, poses the same climate, health, and safety risks as natural gas when transported and combusted, and is limited in scale[25] and much more expensive than natural gas to produce.[26]

Natural gas currently powers about 72% of end uses in residential buildings, 57% in commercial buildings, and 39% in industry in Minnesota.[27] The state must significantly reduce the use of natural gas for building end uses and industrial processes to meet GHG reduction goals. Indeed, all the scenarios for achieving net zero emissions by 2050 modeled in national and local studies assume either dramatic declines or a complete

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[19] *Greenhouse Gas Emissions Data*, Minn. Pollution Control Agency (Sept. 29, 2023), https://public.tableau.com/app/profile/mpca.data.services/viz/GHGemissioninventory/GHGsummarystory.

[20] *Pipeline Incident 20 Year Trends*, U.S. Dep't of Transp. (Nov. 15, 2022), https://www.phmsa.dot.gov/data-and-statistics/pipeline/pipeline-incident-20-year-trends.

[21] Taylor Gruenwald et al., *Population Attributable Fraction of Gas Stoves and Childhood Asthma in the United States*, 20 Int'l J. Env't Rsch. Pub. Health 1, 1-4 (2023), https://doi.org/10.3390/ijerph20010075.

[22] Brady Anne Seals & Andee Krasner, Health Effects from Gas Stove Pollution (Rocky Mountain Institute, Physicians for Social Responsibility, Mothers Out Front, Sierra Club, 2020), https://rmi.org/insight/gas-stoves-pollution-health/.

[23] Eric. D. Lebel et al., *Composition, Emissions, and Air Quality Impacts of Hazardous Air Pollutants in Unburned Natural Gas from Residential Stoves in California*, 56 Env't Sci. & Tech. 15828–38, https://doi.org/10.1021/acs.est.2c02581.

[24] *Natural Gas*, U.S. Energy Info. Admin. (Jan. 4, 2024), https://www.eia.gov/dnav/ng/hist/rngwhhdm.htm.

[25] Sasan Saadat et al., Rhetoric vs Reality: The Myth of Renewable Natural Gas for Building Decarbonization (Earth Justice & Sierra Club, 2020), https://earthjustice.org/feature/report-building-decarbonization.

[26] Merrian Borgeson, A Pipe Dream of Climate Solution? The Opportunities and Limits of Biogas and Synthetic Gas to Replace Fossil Gas (NRDC, 2022), https://www.nrdc.org/sites/default/files/pipe-dream-climate-solution-bio-synthetic-gas-ib.pdf.

[27] Jessica Burdette, Minnesota Energy Overview (Minn. Dep't Com., 2021), https://www.revenue.state.mn.us/sites/default/files/2021-11/Energy%20Landscape%202021_Burdette_Commerce.pdf.

elimination of natural gas use in buildings and industry.[28] To that end, protection of the public interest and the intent of NGIA demands as rapid a transition as possible to the lowest-carbon, most scalable resources that will deliver the greatest health and economic benefits to customers. This perspective underpins the comments to follow.

In Section I of our comments, we articulate what we believe to be the most important criteria for evaluating NGIA plans, present our ideal NGIA portfolio, and contrast it to what the Company has proposed. We argue that the ideal portfolio articulates an overarching goal and strategy; achieves GHG gas reductions commensurate with the Company's fair share of Minnesota's economy-wide emissions reduction targets; directs the statutorily required investments in limited and expensive alternative fuels to their best and highest uses; maximizes the statutorily allowed investments in resources that will bring the greatest health and economic benefits to customers; works to advance Energy Conservation and Optimization (ECO) programs; does not fund gas-fired appliances that have more cost-effective electric alternatives or offsets that do not directly reduce emissions originating from local distribution systems; prioritizes the most beneficial projects for low-income and disadvantaged communities; and minimizes bill increases for all. In Section II we critique specific pilots proposed in the Company's plan. We argue that pilots should be evaluated based on the clarity of their objectives, their scalability, likelihood of delivering health and economic benefits to customers, and the reasonableness of their costs. We evaluate pilots based on whether they meet these criteria and suggest modifications to the Company's proposed plan to better align the plan with these criteria and the intent of the NGIA. We finish our comments with recommendations to the Commission and responses to the specific questions posed in the notice for comment.

ANALYSIS

I. Overall Portfolio Review

A. The Commission should ensure that NGIA plan resources are deployed to their best and highest uses

The purpose and goal of NGIA is to reduce GHG emissions from the distribution and combustion of natural gas in the retail gas system to meet the state's GHG and renewable energy goals. An NGIA plan must therefore demonstrate how the utility will achieve a reduction of GHG emissions from the distribution and end-use combustion of

[28] Trevor Drake & Audrey Partridge, Decarbonizing Minnesota's Natural Gas End Uses (Ctr. for Energy & Env't & Great Plains Inst., 2021), https://e21initiative.org/wp-content/uploads/2021/07/Decarbonizing-NG-End-Uses-Stakeholder-Process-Summary.pdf; Eric Larson et al., Net-Zero America: Potential Pathways, Infrastructure, and Impacts [Interim report] (Princeton Univ. 2020), https://netzeroamerica.princeton.edu/img/Princeton_NZA_Interim_Report_15_Dec_2020_FINAL.pdf; James H. Williams et al., *Carbon-Neutral Pathways for the United States*, 2 AGU Advances 1, https://doi.org/10.1029/2020AV000284.

gas. Reviewing utility plans with an eye toward best and highest use and scalability will ensure that the goals of NGIA are fulfilled and ratepayer benefits are maximized.

Gas utilities' pathways to decarbonization run through their customers—residential, commercial, and industrial—each with its own specific use characteristics. A single-family home uses gas very differently than a large industrial customer, and, as the Company notes, "Minnesota has no silver bullet, no single technology that can be relied upon to decarbonize all natural gas end uses."[29] Therefore, a variety of resources and end-use technologies must be deployed to optimize and maximize the decarbonization potential of each customer class. But not every resource should be considered equally. To that end, NGIA is a powerful tool to test decarbonization solutions that have significant, i.e., scalable, decarbonization potential when deployed to their best and highest uses. Similarly, scrutiny of NGIA plans can also uncover the resources that will not aid the state in decarbonizing the gas system. Gas utilities thus have an opportunity to make significant inroads towards reducing GHG emissions through NGIA, but the only way to ensure that ratepayer dollars are responsibly spent and that resources are allocated effectively is to carefully scrutinize utilities' proposed investments.

We recommend that the Commission review utilities' NGIA plans with an eye to ensuring that NGIA resources are deployed to their best and highest uses and that they are scalable. In the NGIA frameworks docket, Fresh Energy urged a deeper investigation into the identification of best and highest uses (and scalability) and the Commission indicated that, "[a]s utilities begin implementing innovation plans and testing innovative resources . . . the Commission may be in a better position to explore nuances such as the best and highest uses of certain types of resources."[30] The Commission now has the opportunity to start exploring these nuances in the review of the Company's initial NGIA plan. The plan will establish five years of decarbonization efforts, and we know enough now to determine how broad categories of resources should be deployed in this effort.

Using a best-and-highest-use lens for reviewing NGIA plans entails identifying the uses of each resource that would deliver the greatest benefit for that resource.[31] The Commission should approach all NGIA resources with this particular lens as it can shape the composition of a portfolio and can be used to guide the Commission towards pathways with the highest impact for a particular sector while still enabling utilities to test innovative resources and learn from the experience.

This approach necessarily orients an NGIA portfolio to maximize ratepayer benefits and should be used when developing a portfolio to screen pilots. Scalability is a

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[29] *Petition by CenterPoint Energy for Approval of its First Natural Gas Innovation Plan*, Minn. Pub. Util. Comm'n Docket No. G-008/M-23-215 at 5 (June 28, 2023) [hereinafter CenterPoint Initial Petition].

[30] *In the Matter of Establishing Frameworks to Compare Lifecycle Greenhouse Gas Emission Intensities of Various Resources, and to Measure Cost Effectiveness of Individual Resources and of Overall Innovation Plans*, Minn. Pub. Util. Comm'n Docket. No. G-999/CI-21-566, Order Establishing Framework for Implementing Minnesota's Natural Gas Innovation Act at 16 (June 1, 2022) [hereinafter NGIA Framework Order].

[31] *See* Fresh Energy Initial Comments, *In the Matter of Establishing Frameworks to Compare Lifecycle Greenhouse Gas Emission Intensities of Various Resources, and to Measure Cost Effectiveness of Individual Resources and of Overall Innovation Plans*, Minn. Pub. Util. Comm'n Docket. No. G-999/CI-21-566 at 24 (Feb. 25, 2022).

component of this approach, and the Company should be looking toward resources that have the potential to both reduce natural gas throughput overall (as required by NGIA[32]) and to achieve the climate goals embodied in state law[33] and in the state Climate Action Framework.[34] Without a scalable resource, achievement of these goals becomes even more difficult. Because each resource has best and highest uses, even if a resource is not scalable for one particular sector, it may have a deployable use in another sector that should be considered in NGIA.[35] The American Gas Foundation and gas utilities agree that resources must be scalable and deployed to their best and highest use.[36] Additionally, the NGIA statute requires the Commission to consider "the size, scope, and scale" of an NGIA plan to ensure that it produces net benefits under the framework established by the Commission in this docket.[37]

B. The CEOs' evaluative framework for NGIA pilots

In addition to adopting a best and highest use perspective, the Commission should also evaluate each proposed pilot using a consistent framework to ensure that the pilots are designed to deliver benefits to ratepayers and to generate useful learnings that can be applied to future decarbonization efforts. Each pilot should thus answer four questions:

a. Scalability: Can the technology or program scale to achieve substantial emissions reductions for the applicable use case/customer class?
b. Cost reasonableness: Is the cost of the program reasonable?
c. Customer impact: Will the program deliver health and economic benefits to customers?
d. Clarity of objectives: What does the Company intend to learn from this pilot and how will that advance its objective to reduce emissions?

Using these questions as an analytical guide or rubric, as a compliment to the cost-effectiveness and evaluative principles contained in the Commission's June 1, 2022 Order,[38] can help to add important context to the consideration of each proposed pilot.

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[32] Minn. Stat. § 216B.2427.

[33] Minn. Stat. § 216H.02, subd.1.

[34] Minnesota's Climate Action Framework (2022), https://climate.state.mn.us/sites/climate-action/files/Climate%20Action%20Framework.pdf.

[35] For example, alternative gaseous fuels may not be scalable for widespread use by residential customers via the distribution system, but may be viable for industrial users in hard-to-electrify use cases. Therefore, the best and highest use case for these fuels would be in hard-to-electrify sectors of the economy, but not for heating buildings.

[36] Am. Gas Foundation, Regulatory Pathways for Advancing Low-Carbon Gas Resources for Gas Distribution Companies (Concentric Energy Advisors, 2023); https://gasfoundation.org/2023/01/24/regulatory-pathways-for-advancing-low-carbon-gas-resources/.

[37] Minn. Stat. § 216B.2427, subd. 2(b)(1).

[38] NGIA Framework Order at 16-22.

C. An overview of the CEOs' concerns with the Company's proposed portfolio

Working within the constraints of the NGIA statute, the CEOs have evaluated the Company's proposed pilots using the criteria above. We have identified a number of pilots that fall short when evaluated using these criteria and have recommended modifications to those pilots. The CEOs provide an overview of our concerns with the Company's proposed NGIA plan in this section, followed by in-depth reviews of the proposed pilots using our evaluative framework. The CEOs appreciated the lengthy stakeholder process hosted by the Company as its plan was being developed and the additional meetings held with CEOs to answer specific questions.

1. The Company's portfolio lacks an overarching goal and strategy for reaching state GHG reduction goals

NGIA plans should have a clear overall strategy with well-defined metrics for reaching state GHG reduction goals. There is a general lack of discussion in the Company's proposed NGIA plan regarding what the objective of the plan is, why the selected pilots were included, and how the proposed pilots can be scaled to reach short- and long-term GHG emission reduction goals. The strategies that the Company states that it employed in selecting among possible portfolios emphasize "including a wide variety of pilots" and "covering different innovative resource types,"[39] with not enough focus on GHG emissions reduction potential and scalability of the resources deployed in the pilots.

We recommend that the Company's plan be modified in Reply Comments to articulate clear GHG reduction goals for the overall portfolio. In our response to the Commission's Question 4 below we recommend the goals we think the Company should use, which are commensurate with the Company's fair share of Minnesota's economy-wide emissions reduction targets.

2. The portfolio does not direct the statutorily required investments in RNG, biogas, and hydrogen to their best and highest uses

Working within the constraints of the statutory 50% floor for alternative fuels, the Company should focus the low-carbon fuels aspect of the portfolio on hard-to-decarbonize customers, specifically large industrial customers. This approach is in line with the U.S. Department of Energy's clean hydrogen strategy and roadmap.[40] The amount of ratepayer money spent on NGIA pilots that blend RNG and hydrogen into the gas distribution system should be minimal, given the well-documented limitations to this

[39] CenterPoint Initial Petition at 13-14.

[40] U.S. Dep't of Energy, U.S. National Clean Hydrogen Strategy and Roadmap 2 (2023), https://www.hydrogen.energy.gov/docs/hydrogenprogramlibraries/pdfs/us-national-clean-hydrogen-strategy-roadmap.pdf.

approach.[41] Much of the research on the limitations to scaling hydrogen for use in the gas distribution system has occurred since NGIA was passed in 2021. While this information may not have been available to legislators, it should not be ignored by the Commission.

Green hydrogen should be deployed in scenarios where electrification is difficult or impossible or there is a need to use hydrogen in a chemical process, such as in industrial applications like fertilizer production or steelmaking. Blending hydrogen into the existing natural gas system would delay electrification, preventing ratepayers and Minnesotans from enjoying the health, economic, and safety benefits of residential and commercial building electrification. Further, the blending of hydrogen into existing natural gas transmission and distribution networks has an upper limit of approximately 20% hydrogen by volume.[42] Above this upper limit there is a significant potential for negative impacts on pipeline safety. Additionally, the Company's filing states that it has determined that the maximum amount of hydrogen that can be safely blended into the existing natural gas distribution system is even lower at 5%.[43] These thresholds significantly limit the climate benefits from blending hydrogen into natural gas for use in buildings because of the lower energy density by volume of hydrogen compared to natural gas. Ultimately, building out a network of electrolyzers to generate a supply with a low 5% blend ceiling would be prohibitively expensive and would run counter to the best and highest use approach, and thus counter to ratepayer interests.

As a combustible gas, hydrogen has a number of potential uses, but not all uses will deliver the same breadth of benefits. The U.S. Department of Energy's National Clean Hydrogen Strategy and Roadmap contains an assessment of the opportunity for hydrogen to contribute to decarbonization targets. The first strategy is to "target strategic,

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[41]Merrian Borgeson, A Pipe Dream of Climate Solution? The Opportunities and Limits of Biogas and Synthetic Gas to Replace Fossil Gas 5-7 (NRDC, 2022), https://www.nrdc.org/sites/default/files/pipe-dream-climate-solution-bio-synthetic-gas-ib.pdf;
Emily Grubert, *At Scale, Renewable Natural Gas Systems Could be Climate Intensive: The Influence of Methane Feedstock and Leakage Rates* 15 Env't Rsch. Letters 1-2, 7 (2020), https://doi.org/10.1088/1748-9326/ab9335; Sasan Saadat et al., Rhetoric vs Reality: The Myth of Renewable Natural Gas for Building Decarbonization (Earth Justice & Sierra Club, 2020), https://earthjustice.org/feature/report-building-decarbonization; Andee Krasner & Barbara Gottlieb, Hydrogen Pipe Dreams: Why Burning Hydrogen in Building is Bad for Climate and Health (Physicians for Social Responsibility, 2022), https://gbpsr.org/resources/hydrogen-pipe-dreams-why-burning-hydrogen-in-buildings-is-bad-for-climate-and-health/; Jan Rosenow, *Is Heating Homes with Hydrogen All but a Pipe Dream? An Evidence Review*, 6 Joule 2225-28 (2022), https://doi.org/10.1016/j.joule.2022.08.015; Sarah Baldwin et al., Assessing the Viability of Hydrogen Proposals: Considerations for State Utility Regulators and Policymakers (Energy Innovation, 2022), https://energyinnovation.org/wp-content/uploads/2022/03/Assessing-the-Viability-of-Hydrogen-Proposals.pdf.

[42] Sarah Baldwin et al., Assessing the Viability of Hydrogen Proposals: Considerations for State Utility Regulators and Policymakers 7-11 (Energy Innovation, 2022), https://energyinnovation.org/wp-content/uploads/2022/03/Assessing-the-Viability-of-Hydrogen-Proposals.pdf.

[43] CenterPoint Initial Petition, Exhibit D at 14. The Company was asked for more information regarding this estimate in an information request including whether the maximum amount is 5% by energy or by volume, but it is currently unclear how the Company would be able to scale hydrogen blending past 5% on the distribution system without requiring significant infrastructure and customer appliance upgrades, resulting in additional costs for customers.

high impact uses for clean hydrogen," which involves prioritizing the use of clean hydrogen for applications that are hard to decarbonize.[44] The Roadmap identified three difficult-to-decarbonize markets to target: "the industrial sector (e.g., chemicals, steel and refining), heavy-duty transportation, and long-duration energy storage to enable a clean grid."[45] The Commission should follow this guidance in reviewing hydrogen pilots to ensure that the resource is deployed to address hard-to-decarbonize sectors of the economy rather than blending it into the distribution system.

Additionally, hydrogen poses health and safety risks when combusted as fuel in buildings. Hydrogen emits more health-harming nitrous oxides than methane when combusted,[46] which would increase indoor air pollution when blended with natural gas. Hydrogen is also more flammable than methane because it requires less energy to ignite and has a wider flammable range.[47] Because hydrogen is so flammable, emits so much nitrous oxides when burned, and has a nearly invisible flame, additional leak detection and flame detectors are needed to ensure safety, which add to the costs of using it in buildings.

We are also concerned with proposals to blend RNG into the distribution system for several reasons. First, RNG has limited availability. It cannot be a 1:1 replacement for current natural gas demand and should not be used, i.e., blended into the distribution system, as if it were. The total RNG supply is limited for use across sectors – natural gas utilities are not the only entities seeking to use RNG, which has uses in industry and transportation. In addition, these competing markets may also affect the price of RNG. Even under an optimistic scenario projected by the American Gas Foundation and ICF International, potential RNG supply would meet only 12% of current U.S. gas demand by 2040.[48] The Natural Resources Defense Council's assessment of the ecologically sound supply is about half of the American Gas Foundation's estimates – just 3 to 7% of current U.S. gas demand, at projected costs that are many times the current price for natural gas.[49] Given the limited availability of RNG even under the most optimistic assumptions and its significant incremental cost, simply blending it into the gas distribution system misses the opportunity to utilize the resource in hard-to-decarbonize sectors.

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[44] U.S. Dep't of Energy, U.S. National Clean Hydrogen Strategy and Roadmap 2 (2023), https://www.hydrogen.energy.gov/docs/hydrogenprogramlibraries/pdfs/us-national-clean-hydrogen-strategy-roadmap.pdf.

[45] *Id*.

[46] Mehmet Salih Cellek & Ali Pınarbaşı, *Investigations on Performance and Emission Characteristics of an Industrial Low Swirl Burner While Burning Natural Gas, Methane, Hydrogen-Enriched Natural Gas and Hydrogen as Fuels*, 43 Int'l J. Hydrogen Energy 1194-1207 (2018), https://linkinghub.elsevier.com/retrieve/pii/S0360319917319791.

[47] *WHA's Hydrogen Fire Risk Management Philosophy*, WHA Int'l, Inc. (Sept. 20, 2023), https://wha-international.com/hydrogen-fire-risk-management/.

[48] Am. Gas Foundation, Renewable Sources of Natural Gas: Supply and Emissions Reduction Assessment 41 (ICF, 2019), https://www.gasfoundation.org/wp-content/uploads/2019/12/AGF-2019-RNG-Study-Full-Report-FINAL-12-18-19.pdf.

[49] Merrian Borgeson, A Pipe Dream of Climate Solution? The Opportunities and Limits of Biogas and Synthetic Gas to Replace Fossil Gas 5 (NRDC, 2022), https://www.nrdc.org/sites/default/files/pipe-dream-climate-solution-bio-synthetic-gas-ib.pdf.

Second, RNG is much more expensive than today's price for natural gas. The American Gas Foundation recently estimated that in 2040, biogas and synthetic gas will cost $7 to $45 per million British thermal units (MMBtus); prices that are roughly 3 to 18 times more, respectively, than the current market price for natural gas at $2.50 per MMBtu.[50] A California Energy Commission study estimated even higher price ranges for biogas and synthetic methane in 2050 ($8 to $40 per MMBtu and $37 to almost $90 per MMBtu, respectively).[51]

Third, there are health and environmental concerns with RNG. Just like natural gas, RNG continues the use of methane, which causes the formation of nitrogen oxides and other harmful air pollutants when burned. RNG does not avoid the many health harms of natural gas, whereas resources like electrification and geothermal provide opportunities to avoid these health harms.

Finally, although RNG is commonly perceived to be carbon neutral because it is produced from organic material, evidence is mounting that the climate benefits of some RNG feedstocks have been grossly exaggerated in the Greenhouse gases, Regulated Emissions, and Energy use in Technologies (GREET) carbon intensity estimation model that utilities are currently required to use in their NGIA plans. This is because the GREET model does not account for the energy used and emissions released during the manufacture of some RNG feedstocks and assumes no current or future policies regulating methane emissions. For example, the carbon intensity of dairy manure RNG is typically estimated to be deeply negative in part because none of the emissions associated with housing, feeding or transporting cattle, and none of the staggeringly-high levels of methane cattle release during enteric fermentation are currently included in GREET carbon intensity estimates for dairy manure RNG. Experts have recently criticized this approach[52] and the Food and Agriculture Organization of the United Nations guidelines for conducting life cycle assessment for large ruminants recommend including upstream sources of emissions for any livestock co-products (e.g., meat, milk, and manure).[53] Including emissions for co-products based on their economic value is the most commonly used approach.[54] Additionally, the GREET model assumes that manure

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[50] *Id.* at 6.

[51] *Id.*

[52] Petion by Ruthie Lanzeby & Brent Newell of Env't Justice Clinic at Vt. L. School to Petition the California Air Resources Board to Exclude All Fuels Derived from Biomethane from Dairy and Swine Manure from the Low Carbon Fuel Standard Program (Oct. 7, 2021), https://ww2.arb.ca.gov/sites/default/files/2022-01/2021.10.27%20Petition%20for%20Rulemaking%20AIR%20et%20al_.pdf; Ruthie Lazenby. Rethinking Manure Biogas: Policy Considerations to Promote Equity and Protect the Climate and Environment, Vt. L. & Graduate Sch. Ctr. for Agric. & Food Sys. (2022), https://www.vermontlaw.edu/sites/default/files/2022-08/Rethinking_Manure_Biogas.pdf.

[53] Food & Agric. Org. of the U.N., Environmental Performance of Large Ruminant Supply Chains: Guidelines for Assessment (Version 1, 2016), https://www.fao.org/3/i6494e/i6494e.pdf.

[54] Stephen G. Mackenzie et al, *The Need for Co-Product Allocation in the Life Cycle Assessment of Agricultural Systems – Is "Biophysical" Allocation Progress?*, 22 Int'l J. Life Cycle Assessment 128, 135-36 (2017), https://link.springer.com/content/pdf/10.1007/s11367-016-1161-2.pdf.

is currently stored in lagoons that release massive amounts of methane into the atmosphere, and that capturing that methane to produce RNG avoids those emissions. While this assumption may hold today, methane emissions are likely to be regulated in the future, as they now are in California.[55] In a context where methane emissions are regulated, the assumption that business as usual involves managing manure with uncapped, methane-leaking lagoons, and that RNG from manure results in net emission reductions, is unreasonable and will lead to inflated estimates of the climate benefits of manure RNG.[56] This is important to note since the Company is proposing RNG pilots that involve longer-term contracts that could lock in these unreasonable assumptions well into the future.

Commissions across the country are coming to the conclusion that RNG and hydrogen are not the best resources to deploy to decarbonize the gas distribution system. In the Massachusetts Department of Public Utilities' recent landmark order, it found "that RNG and hydrogen blending are new, unproven, and uncertain technologies. [Local Distribution Companies] may research and assess these technologies, but until they prove to be a viable alternative to the business-as-usual model and support the Commonwealth's climate targets, any infrastructure costs associated with RNG and hydrogen will be the sole responsibility of the utility shareholders and not their customers."[57] Colorado's clean heat statute puts a cap on the amount of recovered methane that can be deployed by utilities in clean heat plans.[58]

3. The Company's portfolio fails to maximize statutorily allowed investments in the innovative resources that will bring the greatest health and economic benefits to customers (i.e., electrification, energy efficiency and networked geothermal)

The NGIA states the Commission must not approve an innovation plan unless the Commission finds the plan promotes the use of renewable energy resources and reduces or avoids GHG emissions within a certain cost level.[59] The best way to cost-effectively

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[55] Short-Lived Climate Pollutants: Methane Emissions: Dairy and Livestock: Organic Waste: Landfills, S.B. 1383, Reg. Sess. (Cal. 2016), https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201520160SB1383.

[56] Given these emergent critiques of the GREET model for calculating the carbon intensity of some RNG feedstocks, the Commission might want to reconsider the guidance for calculating the carbon intensity of RNG specified in Docket No. G-999/CI-21-566.

[57] *Investigation by the Department of Public Utilities on its own Motion into the role of gas local distribution companies as the Commonwealth achieves its target 2050 climate goals*, Mass. Dep't of Pub. Util. Docket No. 20-80-B, Order on Regulatory Principles and Framework at 71-72 (Dec. 6, 2023).

[58] Colorado gas utilities' clean heat plans must meet clean heat targets of a four percent reduction in greenhouse gas emissions in 2025 as compared to a 2015 baseline, of which not more than one percent can be from recovered methane; and a twenty-two percent reduction in greenhouse gas emissions in 2030, of which not more than five percent can be from recovered methane. Concerning the Implementation of Measures to Advance Thermal Energy Service, H.B. 23-1252, Reg. Sess. (Colo. 2023), https://www.statebillinfo.com/bills/bills/23/2023a_1252_signed.pdf.

[59] Minn. Stat. § 216B.2427, subd. 2(b)(2).

avoid GHG emissions—especially for the buildings sector—is to prioritize electrification, energy efficiency, and networked geothermal resources to take advantage of the increasingly decarbonized electricity grid in Minnesota, and the Company's plan should therefore reflect that.

Strategic electrification and energy efficiency are central components of all the scenarios for achieving net zero emissions by 2050 modeled in national and local studies.[60] Minnesota's 2022 Climate Action Framework emphasizes the importance of strategic electrification and improved energy efficiency in buildings and industry for meeting state GHG reduction goals, calling to weatherize 25% of dwellings where occupants earn 50% or less of the state median income, reduce thermal emissions by at least 20%, and reduce energy use by 10%, all by 2030 and relative to 2005 levels.[61] Finally, the Intergovernmental Panel on Climate Change emphasizes that industrial energy efficiency improvements and electrification of low- and medium-heat industrial processes are critical to limiting global warming to 1.5 degrees Celsius, the level essential for avoiding the worst impacts of climate change.[62]

The Company acknowledges the "widespread agreement that electrification will be an important strategy for reducing emissions from industry and buildings," while also asserting that a fully electrified scenario would require 16 GW of additional electricity generation.[63] Care and coordination regarding impacts to the electric system will become even more critical as the heating sector electrifies, but this statistic does not appear to build in realistic assumptions about future technological developments, electric and gas rate design, demand response, or improvements to new and existing building stock. In addition, maintaining the full gas distribution system as a backup system would present serious affordability concerns depending upon the evolution of gas utility rate design.[64]

Networked geothermal system pilots are another best and highest use for the

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[60] Trevor Drake & Audrey Partridge, Decarbonizing Minnesota's Natural Gas End Uses (Ctr. for Energy & Env't & Great Plains Inst., 2021), https://e21initiative.org/wp-content/uploads/2021/07/Decarbonizing-NG-End-Uses-Stakeholder-Process-Summary.pdf; Eric Larson et al., Net-Zero America: Potential Pathways, Infrastructure, and Impacts [Interim report] (Princeton Univ. 2020), https://netzeroamerica.princeton.edu/img/Princeton_NZA_Interim_Report_15_Dec_2020_FINAL.pdf; James H. Williams et al., *Carbon-Neutral Pathways for the United States*, 2 AGU Advances 1, https://doi.org/10.1029/2020AV000284.

[61] Minnesota's Climate Action Framework 50 (2022), https://climate.state.mn.us/sites/climate-action/files/Climate%20Action%20Framework.pdf.

[62] IPCC, Climate Change 2022 – Mitigation of Climate Change: Working Group III Contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (Cambridge Univ. Press, 2022), http://dx.doi.org/10.1017/9781009157926.

[63] CenterPoint Initial Petition, Exhibit B at 20.

[64] For additional context, the Massachusetts Department of Public Utilities (DPU) recently found that, "In the long term . . . it will be impractical to maintain the gas distribution solely for backup furnaces in cold weather." The DPU determined that it will not approve the use of additional ratepayer dollars for hybrid heating pilots. *Investigation by the Department of Public Utilities on its own Motion into the role of gas local distribution companies as the Commonwealth achieves its target 2050 climate goals*, Mass. Dep't of Pub. Util. Docket No. 20-80-B, Order on Regulatory Principles and Framework at 81 (Dec. 6, 2023).

Company's NGIA Plan. These systems are highly efficient, can repurpose existing gas infrastructure, apply the same skilled labor for laying pipes, and could align well with the traditional utility business model. Additionally, because these systems can be installed in a modular, block-by-block fashion, they are highly scalable. Importantly, these projects provide opportunities to directly benefit low- and moderate-income populations by targeting initial installations for leak-prone pipes in environmental justice communities. Finally, there are several well-documented networked geothermal system pilots and demonstration projects completed and underway across the U.S.[65] These projects will provide rich data on the emission reduction potential, costs, energy savings and air quality benefits afforded by these systems.

4. The Company's portfolio can and should do more to advance Energy Conservation and Optimization (ECO) programs

There is an opportunity for the Company to use NGIA pilots to bolster work on electrification, energy efficiency, and weatherization in ECO. ECO, previously the Conservation Improvement Program (CIP), is the bedrock program for these measures in Minnesota, but its goal is not necessarily to achieve market transformation. NGIA, on the other hand, is intended to complement ECO by unlocking efficiency and electrification investments that could not be reasonably included in a utility's ECO plan.[66] In other words, the Company's NGIA proposal should work to achieve energy savings and GHG reductions that go beyond ECO, even if the measures or programs included in both have overlap. To that end, the Commission adopted recommendations proposed in joint comments led by the Department of Commerce related to the interplay between CIP/ECO and NGIA and, in particular, the phrase "investments" in NGIA.[67] In the joint comments, which included Fresh Energy as a signatory, the joint commenters noted the importance of "facilitating development of a broad array of energy efficiency and strategic electrification investments under NGIA and preserving the integrity of both the

[65] Hyunjun Oh & Koenraad Beckers, Cost and Performance Analysis for Five Existing Geothermal Heat Pump-Based District Energy Systems in the United States, Nat'l Renewable Energy Lab'y (2023), https://www.nrel.gov/docs/fy23osti/86678.pdf; *Networked Geothermal: National Picture*, HEET, https://heet.org/2023/04/17/networked-geothermal-the-national-picture/(last visited Jan. 11, 2024); *Geothermal Pilot Reference Guide*, Eversource, https://www.eversource.com/content/residential/save-money-energy/clean-energy-options/geothermal-energy/geothermal-pilot-reference-guide#framingham-pilot (last visited Jan. 11, 2024); Press Release, N.Y. State Pub. Serv. Comm'n, PSC Moves Development of Utility Thermal Energy Networks Forward (Sept. 24, 2023), https://dps.ny.gov/system/files/documents/2023/09/pr23094.pdf.

[66] Minn. Stat. § 216B.2427, subd. 1(f).

[67] *In the Matter of Establishing Frameworks to Compare Lifecycle Greenhouse Gas Emission Intensities of Various Resources, and to Measure Cost Effectiveness of Individual Resources and of Overall Innovation Plans*, Minn. Pub. Util. Docket. No. G-999/CI-21-566, Order Establishing Framework for Implementing Minnesota's Natural Gas Innovation Act (June 1, 2022).

CIP and NGIA frameworks."[68] The joint comments went on to "conclude that relying on the term 'investments' used in the statutory definition of energy efficiency and strategic electrification creates flexibility regarding what type of efficiency and electrification programs, measures, or approaches might qualify in the future."[69]

The Company's NGIA plan should thus capitalize on the opportunity to work with ECO to advance programs. The Company's proposed R&D pilot for weatherization blitzes, which will test intensive, novel, and community-based marketing and outreach approaches to increase participation in the Company's CIP/ECO weatherization offerings, is a good example of how to do this. We also see additional opportunities for NGIA pilots/projects to assist in implementation of efficient fuel-switching in ECO, especially given that the Company is not planning to include electric cold-climate air source heat pumps (ccASHPs), ground source heat pumps (GSHPs), or heat pump water heaters (HPWHs) in its 2024-2026 ECO Triennial.[70] In the Company's Reply Comments regarding its ECO 2024-2026 Triennial plan, the Company stated, regarding GSHPs, that it "is willing to consider new information about capital costs in retrofit situations or as part of a Natural Gas Innovation Plan (NGIA)."[71] Similarly, the Company stated that it "is willing to reconsider a ccASHP rebate tier and a HP WH rebate based on advancements of the technology, market transformation work through the MN ETA, and/or the Company's NGIA plan."[72] Since the Company filed its NGIA plan in June, it has finalized its 2024-2026 ECO Triennial plan without including electric ccASHPs, GSHPs, or HPWHs as measures. Therefore, these appliances should be included as pilots in the Company's first NGIA plan.[73] These electric appliances have the potential to reduce GHG emissions from the gas system at scale and they should be deployed as soon as possible.

5. NGIA pilots should not fund gas-fired appliances when more cost-effective electric alternatives are available

We are concerned with pilots that would fund gas-fired appliances (i.e., Pilots P and Q). Other pilot ideas that focus on improvements to the building envelope or other aspects of energy efficiency technologies, especially pilots that would address

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[68] *In the Matter of Establishing Frameworks to Compare Lifecycle Greenhouse Gas Emission Intensities of Various Resources, and to Measure Cost Effectiveness of Individual Resources and of Overall Innovation Plans*, Minn. Pub. Util. Docket. No. G-999/CI-21-566, Joint Comments at 4 (July 1, 2022).

[69] *Id.*

[70] *CenterPoint Energy's 2024-2026 Natural Gas Energy Conservation and Optimization Triennial Plan*, Minn. Pub. Util. Docket No. G-008/CIP-23-95, Compliance Filing Proposal (June 30, 2023); *In the Matter of CenterPoint Energy's 2024-2026 Energy Conservation and Optimization Triennial Plan*, Minn. Pub. Util. Docket No. G-008/CIP-23-95, Decision of Deputy Comm'r of Minn. Dep't of Com. (December 1, 2023).

[71] *In the Matter of CenterPoint Energy's 2024-2026 Energy Conservation and Optimization Triennial Plan*, Minn. Pub. Util. Docket No. G-008/CIP-23-95, CenterPoint Reply Comments at 10 (September 1, 2023).

[72] *Id.*

[73] We recognize that proposed Pilot N (residential deep energy retrofits and electric air source heat pumps) includes ccASHPs.

environmental justice concerns, should be prioritized in the NGIA plan over pilots that would fund gas-fired appliances. While failing traditional cost-effectiveness screening tests in ECO is not necessarily a prohibition on a pilot's inclusion in an NGIA plan, funding new gas-fired appliance rebates in NGIA when much more efficient and affordable electric technologies are available runs counter to the spirit of the law.

6. NGIA pilots should not fund offsets that do not directly reduce emissions originating from local distribution systems

Carbon or GHG offsets do not directly reduce GHG emissions from the distribution and combustion of gas in the retail gas system and therefore should not be included in NGIA plans. Counting indirect emission reductions from offsets toward NGIA would implicitly allow gas utilities to meet the targets without reducing their baseline emissions, which runs counter to the spirit of the NGIA. Additionally, we posit that while rigorously vetted and verified offsets *may* have a role once a utility nears state GHG reduction goals, relying on offsets for the very first NGIA plan (or even plans) would be unreasonable given the number of ways the utility can prioritize GHG reductions without resorting to purchasing offsets.[74]

7. The portfolio can and should do more to prioritize the most beneficial projects for low-income and disadvantaged communities and to minimize bill increases for all

Low-income and disadvantaged communities are disproportionately exposed to poor air quality inside and outside their homes, and experience higher energy cost burden. A 2018 Environmental Protection Agency (EPA) study found that communities living below the poverty line have a 35% higher burden from particulate matter emissions than the overall population. Non-whites had a 28% higher health burden and Blacks, specifically, had a 54% higher burden than the overall population.[75] Asthma rates among Black individuals are 42% higher compared to their White counterparts, and the mortality rate due to asthma for Black people is 2.8 times greater than that of White individuals, as reported by the American Lung Association.[76] Black Americans are 75% more likely to

[74] We note too that Public Service Company of Colorado (Xcel) recently amended its Clean Heat Plan to remove both offsets and certified natural gas. *In the Matter of the Application of Public Service Company of Colorado for Approval of its 2024-2028 Clean Heat Plan*, Colo. Pub. Util. Comm'n Proceeding No. 23A-0392EG, Verified Amendment at 1 (Nov. 6, 2023).

[75] Ihab Mikati et al., *Disparities in Distribution of Particulate Matter Emission Sources by Race and Poverty Status*, 108 Am. J. Pub. Health, 480, 480–85 (2018), https://doi.org/10.2105/AJPH.2017.304297.

[76] *Current Asthma Demographics*, Am. Lung Ass'n (July 6, 2020), https://www.lung.org/research/trends-in-lung-disease/asthma-trends-brief/current-demographics; *Asthma Trends and Burdens*, Am. Lung Ass'n, https://www.lung.org/research/trends-in-lung-disease/asthma-trends-brief/trends-and-burden (last visited Jan. 11, 2024).

live near gas production sites than White Americans,[77] and Black children are five times as likely to be hospitalized for chronic lung conditions.[78]

These racial health disparities are especially concerning given recent studies finding gas burning stoves are responsible for 12.7% of childhood asthma cases in the United States,[79] and children living in homes with gas stoves have a 42% increased risk of experiencing asthma symptoms.[80]

Energy burden refers to the share of a family's income allocated to covering annual energy expenses, an often overlooked indicator of racial and economic disparities. Low-income households typically bear an average national energy burden of 8.6%, whereas non-low-income households bear just 3%. Generally, an energy cost of 6% of income is considered the highest sustainable threshold.[81] The primary drivers of energy burden are inefficient homes and appliances, stemming from insufficient investments and resources for housing maintenance and upgrades. High energy costs can jeopardize a family's ability to meet both energy bills and the basic necessities like food, medicine, and more. Energy burden disproportionately affects Black and Brown communities, creating a direct connection to other issues such as substandard or unsafe housing, elevated eviction rates, and adverse health outcomes, which can all be traced back to historical redlining practices that exacerbate challenges in communities of color. Addressing these disparities can significantly enhance energy efficiency, making it one of the most powerful means to combat climate change, another crisis that disproportionately impacts Black and Brown populations.

The ideal NGIA portfolio would direct benefits to low-income disadvantaged communities that are most vulnerable to high utility bills and that tend to suffer the most health-related harms from burning fossil fuels in buildings. The Commission should therefore evaluate portfolios with this in mind in two ways.

First, the Commission should evaluate proposals based on their public health harms, with a focus on customers. To the extent permitted by the NGIA statute, the Commission should de-emphasize pathways that rely on alternative fuels in buildings, as existing analyses have shown these fuels to be higher-cost and to pose greater health and safety risks than electrification. Additionally, de-emphasizing pathways that rely on alternative fuels in buildings will help address the historic disproportionate air-pollution

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[77] Lesley Fleischman & Marcus Franklin, Fumes Across the Fence-Line: The Health Impacts of Air Pollution from Oil & Gas Facilities on African American Communities 8 (NAACP & Clean Air Task Force, 2017), https://naacp.org/resources/fumes-across-fence-line-health-impacts-air-pollution-oil-gas-facilities-african-american.

[78] *Asthma and African Americans*, U.S. Dep't of Health & Human Services, https://minorityhealth.hhs.gov/asthma-and-african-americans (last visited Jan. 11, 2024).

[79] Taylor Gruenwald et al., *Population Attributable Fraction of Gas Stoves and Childhood Asthma in the United States*, 20 Int'l J. Env't Rsch. Pub. Health 1, 3-4 (2023), https://doi.org/10.3390/ijerph20010075.

[80] Weiwei Lin et al., *Meta-Analysis of the Effects of Indoor Nitrogen Dioxide and Gas Cooking on Asthma and Wheeze in Children*, 42 Int'l J. Epidemiology 1724, 1729 (2013), https://doi.org/10.1093/ije/dyt150.

[81] *Low-income Community Energy Solutions*, U.S. Dep't of Energy, https://www.energy.gov/scep/slsc/low-income-community-energy-solutions#:~:text=Energy%20burden%20is,estimated%20at%203%25 (last visited Jan. 11, 2024).

and energy burden-related harms that have been imposed on low-income communities and Black, Indigenous and People of Color (BIPOC) residents. Portfolios that involve continued reliance on burning fuel in dwellings will always disproportionately harm low-income and BIPOC communities who are less likely to have efficient appliances and effective ventilation systems. According to Harvard public health researchers, the emissions from fossil-fuel-fired heating equipment were responsible for causing approximately 6,000 premature deaths across the United States in 2017.[82] Rocky Mountain Institute's analysis, employing the EPA's Benefits Mapping and Analysis Program, revealed that the annual health consequences of pollution from fossil-fuel appliances encompassed a range of significant impacts, including as many as 5,400 premature deaths, 2,300 heart attacks, 55,000 asthma attacks, 2,600 asthma-related emergency room visits, 1,140 hospital admissions, and 355,000 days of work loss. To assure these harms are accounted for, the Commission should evaluate portfolios based on the total amount of fuel burned in dwellings, preferring those that burn less health-harming fuels.

Second, because low-income and BIPOC customers are disproportionately impacted by high utility bills, the ideal portfolio would prioritize spending on cost-effective electrification and efficiency efforts in low-income and BIPOC communities. The ideal portfolio would direct a disproportionate share of spending on these programs to low-income and BIPOC communities.

II. Detailed Comments on Specific Pilots

In this section we review specific pilots for which we have concerns and recommendations. We do not systematically review every pilot proposed in the Company's plan and therefore lack of comment on a pilot should not necessarily be interpreted as recommendation for approval of it. The intent of the CEOs' proposed modifications to the Company's proposed NGIA plan is to ensure that each pilot in the plan is scalable, reasonable in cost, beneficial to customers, and clear in its objectives.

Before getting into the details for specific pilots, we would like to note that most fail to specify learning objectives or metrics of success. This is an important weakness of the overall plan, as the purpose of a pilot is to create a pathway for a utility to test, learn, and answer technical questions of a new program or activity prior to developing a business case for wider deployment. By not specifying objectives for each pilot, the Company risks not delivering value to customers and wasting ratepayer dollars. Further, the absence of well-designed objectives will inhibit the Company from translating learnings into cost-effective scaling of the resources evaluated in its plan. Because objectives and metrics are missing from most pilots, we raise this point in some but not all of our pilot critiques, and present an overarching recommendation that the Company

[82] Jonathan J. Buonocore et al., *A Decade of the U.S. Energy Mix Transitioning Away from Coal: Historical Reconstruction of the Reductions in the Public Health Burden of Energy*, 16 Env't Rsch. Letters 1, 1-13 (2021), https://iopscience.iop.org/article/10.1088/1748-9326/abe74c.

revise its plan in Reply Comments to specify clear learning objectives and metrics of success for each proposed pilot.

Finally, our comments on specific pilots reflect only our initial review of the plan. We may raise additional concerns after reviewing comments from other parties.

A. RNG produced from Hennepin, Ramsey, and Washington County organic waste (Pilots A and B)

Pilots A and B involve using RNG produced from organic waste in Hennepin County and Ramsey and Washington Counties, respectively. The total estimated costs are $2.86 million and $10.16 million, respectively, over the five-year budget period. The estimated net lifetime costs of the pilots are $7.68 million and $27.36 million, respectively.[83] The estimated lifecycle GHG reductions are 28,221 and 147,863 metric tons, respectively,[84] and the lifetime emission reduction costs are $272 and $185 per ton.[85] By proposing RNG from organic/food waste programs, the Company qualified for a 0.25 percentage point increase to its annual cap, or about $3 million in additional allowed spending per year.[86]

1. The Company has not demonstrated the scalability of blending RNG into the gas distribution system

Both Pilots A and B state that, "it is anticipated that the facility will be directly interconnected to the Company's distribution system."[87] The Company has not demonstrated the scalability of blending RNG into the gas distribution system. As described thoroughly earlier in our comments, inadequate supply is a well-documented limitation to the proposed approach of blending RNG into the natural gas distribution system. As we note, the availability of RNG across sectors is limited even under the most optimistic assumptions.

2. The benefit of including both organic waste pilots is unclear

Pilots A and B appear to share many of the same characteristics. The design and objectives of these pilots should be described such that stakeholders can assess whether ratepayer funding enables significant learnings that support the inclusion of both Pilots A and B. Pilots A and B make up approximately 3% and 10% of the overall proposed budget, respectively, and Pilot C, which also contains a food waste archetype, makes up approximately 31% of the proposed portfolio budget. That is a significant portion of the total budget going to organic/food waste pilots and it's not clear why. We ask that the

[83] CenterPoint Initial Petition at 9.
[84] *Id.*
[85] CenterPoint Initial Petition, Exhibit P at 2.
[86] CenterPoint Initial Petition at 18.
[87] *Id.* at Exhibit D at 2, 5.

Company provide justification as to why the inclusion of both Pilots A and B will provide additional learning and unique findings.

3. The pilots will not deliver health and economic benefits to customers

As described thoroughly earlier in our comments, there are well-documented limitations and concerns regarding the proposed approach of blending RNG into the natural gas distribution system, including lack of affordability, negative environmental impacts, and harms to human health.

The CEOs are also concerned that Pilot A's proposed anaerobic digestion facility will be located in an Area of Concern for Environmental Justice in Hennepin County. Additionally, it is not ideal to burn RNG in urban areas because of the potential harm to human health. Electrification and geothermal resources should be prioritized for urban areas to reduce air pollution and improve health.

4. Recommendation

The Company should consider nearby industrial off-takers or other innovative ways to utilize this RNG rather than blending it into the distribution system, and incorporate Inflation Reduction Act (IRA) funding and tax credits for alternative fuels. Additionally, we ask that the Company describe why the inclusion of both Pilots A and B will provide additional learning and how it will address environmental justice concerns related to these pilots.

B. Renewable natural gas request for proposal purchase (Pilot C)

The Company proposes Pilot C, a renewable natural gas (RNG) request for proposal (RFP) with estimated costs totaling $32.37 million over the five-year budget period, including portfolio administrative costs.[88] The estimated net lifetime cost of the pilot is $66.97 million.[89] The Company estimates the pilot will generate lifetime GHG savings of 359,884 metric tons[90] at a cost of $185 per ton of emissions reduced.[91] Through this RFP, the Company proposes to acquire four types of RNG sources: wastewater resource recovery facilities, dairy manure, food waste, and landfill gas.[92] Across the five-year plan period for Pilot C, the Company proposes to spend $19.34 million on the food waste archetype, $6.78 million on the landfill gas archetype, $4.01 million on the wastewater resource recovery facility archetype, and $2.24 million on the dairy manure archetype.[93]

[88] CenterPoint Initial Petition at 9.
[89] *Id.*
[90] *Id.*
[91] *Id.* at Exhibit P at 2.
[92] *Id.* at 1.
[93] *Id.*

The Company's draft RFP identifies three potential services: (1) an RNG purchase agreement between the proposer and the Company, (2) the proposer sells renewable thermal credits (RTCs) to the Company and finds a different buyer for the RNG,[94] and (3) the Company provides capital investment to a proposer in exchange for a reduced RNG price.[95] In all three cases, the Company proposed to retire any acquired RTCs. The Company provides a list of criteria to guide the assessment of the proposals including RNG volume, price, feedstock type, carbon intensity, contract terms, proposer experience, location of project, and cost-effectiveness.[96]

As articulated below, Pilot C is flawed because the objectives and scalability of the RFP are unclear, the costs of the pilot are an unreasonable use of ratepayer money, and the pilot will not deliver health benefits to customers.

1. Objectives and scalability of Pilot C are unclear

The Company has not provided any specific goals for its RNG RFP, nor has it provided any evaluation metrics. By not specifying Pilot C's objectives, the Company risks not delivering value to customers and wasting ratepayer dollars. The absence of well-designed objectives would inhibit the Company from applying learnings into cost-effectively scaling future RNG acquisition.

The first service the RFP seeks, an agreement to purchase RNG, does not identify any objectives or expected learnings. Is the goal to assess the infrastructure interconnection cost to the distribution system? Is it to assess the fuel cost of locally sourced RNG? Or is it to assess the potential availability of RNG? Clarifying the Company's objectives for Pilot C is especially important considering that the Company proposes two other RNG pilots projects. It is possible, for example, that the learnings from Pilots A and B may render Pilot C superfluous. The design and targets of Pilot C should be evident and transparent such that stakeholders can assess whether ratepayer funding enables significant learnings, including insights on scalability, that are distinct from Pilots A and B.

The objectives of the second potential RFP service, the purchase of RTCs without the purchase of fuel, are even more opaque. There are no obvious learnings from the purchase of a tradable environmental attribute. Environmental attribute trading markets are well developed and straightforward. Moreover, since the Company would not be acquiring the associated energy, the Company is not answering technical questions related to interconnection, technological readiness, or any other information relevant to the deployment of RNG in its distribution system. It is unclear if the Company's customers would incur any benefits from the second RFP service type.

Furthermore, we are concerned that the Company does not specify any geographic restrictions for the purchase of RTCs or RNG in its RFP. The Company makes no

[94] When the environmental attribute, in this case called a Renewable Thermal Credit, is separate from the physical gas it is referred to as an unbundled RTC.

[95] CenterPoint Initial Petition, Exhibit Q at 7.

[96] *Id.* at 10.

commitment that the fuel it purchases through the Pilot C RFP will interconnect directly to its system, or even within Minnesota.[97] Investing in the interconnection of RNG into a different utility's system, and especially interconnection in a different state, would hamper the Company's understanding of how to scale RNG adoption in its own system. As it pertains to RTCs, the Company could purchase credits from across the U.S. using Minnesota ratepayer funds. The potential knowledge gained from purchasing RTCs in Oregon or Massachusetts is not relevant to Minnesota customers. The Company does not need a pilot project to assess the market price of RNG RTCs in other regions.

2. The Company has not demonstrated that the costs of Pilot C are reasonable

Pilot C would commit ratepayers to long-term costs beyond the scope of the five-year NGIA budget. The five-year budget totaling $32.37 million is roughly half of the Company's estimated total lifetime pilot cost of $66.97 million.[98] The significant lifetime costs are due to ongoing operational and maintenance costs as well as the incremental fuel cost of RNG.[99] Commission approval of Pilot C would likely lock in the lifetime cost of the project – not just the five-year costs - including incremental Operation and Maintenance (O&M) and fuel costs beyond the cost cap. If the entire cost of Pilot C were to be factored under the cost cap, the RNG RFP alone would account for 63% of the allowable total over the five-year plan.

It may be appropriate for the Commission to approve a pilot that locks customers into costs longer than the five-year pilot, but there needs to be sufficient justification that there will be long-term benefits, that the Company is using the project to learn about a new technology or program, and that the technology holds promise that it can effectively scale. The only identifiable benefit of Pilot C costs beyond the five-year plan period are continued emissions reductions, but it is one of the more expensive pilots on a dollar-per-GHG-emission-reduction basis. Thus, the utility would lock in customers to one of the least cost-effective decarbonization measures.

Second, Pilot C provides few incremental opportunities for learning and is largely redundant with Pilots A and B. RNG can be produced from several feedstocks, each presenting different distribution system interconnection costs and net GHG impacts. Both Pilots A and B seek to procure RNG through anaerobic digestion from food waste and "a smaller quantity of yard waste."[100] The Company proposes to spend $13.0 million in the next five years ($35.0 million lifetime cost) on Pilots A and B.[101] Despite already devoting resources to food waste through Pilots A and B, the Company is seeking

[97] The Company notes a preference for supply interconnecting in its system as well as "in or near Minnesota." *See Id*.
[98] CenterPoint Initial Petition at 9.
[99] *Id.*
[100] *Id*. at Exhibit D at 2, 5.
[101] CenterPoint Initial Petition at 9.

additional food waste feedstock RNG projects through Pilot C.[102] Of the proposed $32.37 million in Pilot C spending, the Company estimates $19.34 million, or 60% of costs, will be allocated to food waste RNG projects.[103] Over the lifetime of the proposed contract, the total cost of the food waste archetype is $40 million.[104] Incremental O&M and fuel costs lead to $20.66 million in additional costs outside the five-year plan.[105] Including RNG Pilots A and B, the Company proposes to dedicate 71% of all RNG investments to the food waste archetype. It is unclear how ratepayers will benefit or what incremental information – about scaling, costs, or other attributes - the Company will learn from a third pilot of the same feedstock. Nor is it evident that the Company is acting reasonably in allocating so much more investment to the food waste archetype rather than to other feedstocks. Given the potential benefits of other feedstocks, it is unreasonable for the Company to pursue additional food waste pilots so heavily (and disproportionately).

3. Pilot C will not deliver benefits to customers

As noted earlier in our comments, blending RNG into the gas distribution system does not avoid the many health and environmental harms of natural gas. RNG continues the use of methane, which causes the formation of nitrogen oxides and other harmful air pollutants when burned.

RNG production poses significant health and environmental risks for customers, especially RNG produced from animal manure. Using manure to produce methane is economical only for large-scale, concentrated livestock operations,[106] but large livestock operations often cause significant harm to human health and the environment. These harms include air pollution,[107] drinking water contamination,[108] increased mortality,[109] and unpleasant odors, all of which disproportionately harm low-income communities.[110]

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[102] *Id.* at Exhibit P at 1.

[103] *Id.*

[104] *Id.*

[105] CenterPoint Initial Petition at 9.

[106] Markus Lauer et al., *Making Money From Waste: The Economic Viability of Producing Biogas and Biomethane in the Idaho Dairy Industry*, 222 Applied Energy 621, 621-36 (2018), https://www.sciencedirect.com/science/article/pii/S0306261918305695.

[107] Georgina Gustin, *Air Pollution from Raising Livestock Accounts for Most of the 16,000 US Deaths Each Year Tied to Food Production, Study Finds*, Inside Climate News (May 11, 2021), https://insideclimatenews.org/news/11052021/air-pollution-from-raising-livestock-accounts-for-most-of-the-16000-us-deaths-each-year-tied-to-food-production-study-finds/.

[108] Sarah Porter & Craig Cox, *Manure Overload: Manure Plus Fertilizer Overwhelms Minnesota's Land and Water*, Env't Working Group (May 28, 2020), https://www.ewg.org/interactive-maps/2020-manure-overload/.

[109] Ji-Young Son et al., *Exposure to Concentrated Animal Feeding Operations (CAFOs) and Risk of Mortality in North Carolina, USA*, 799 Sci. Total Env't 149407 (2021), https://linkinghub.elsevier.com/retrieve/pii/S0048969721044806.

[110] Anne Schechinger, *In Midwest Farm States, Nitrate Pollution of Tap Water Is More Likely in Lower-Income Communities*, Env't Working Group (June 23, 2021), https://www.ewg.org/news-insights/news/2021/06/midwest-farm-states-nitrate-pollution-tap-water-more-likely-lower-income.

Additionally, methane can leak into the atmosphere during RNG processing and transportation, which contributes to climate change. Concerns about adverse health and environmental impacts of dairy manure RNG are so great that several environmental groups recently petitioned the California Air Resources Board to exclude all fuels derived from biomethane from dairy and swine manure from the California Low Carbon Fuel Standard Program.[111]

To minimize these harms, RNG should not be blended into the gas distribution system; large, concentrated manure sources should be required to reduce their methane emissions and minimize environmental damages resulting from their operations; on-site use of RNG should be prioritized over extending pipelines; and small operations with sustainable grazing practices and other sustainable manure management practices that prevent methane creation should be encouraged over large-scale operations.[112]

4. Recommendation

We recommend the Company modify its NGIA plan in Reply Comments to eliminate investments specific to the food waste and dairy manure archetypes, define clear objectives for its RFPs, and eliminate the option to purchase RNG RTCs without procuring the fuel.

C. Green hydrogen blending into the natural gas distribution system (Pilot D)

Pilot D is a proposed 1 MW green hydrogen plant that will produce and blend hydrogen into the gas distribution system in Mankato, Minnesota. The total incremental cost to the utility for the pilot over the five-year budget period is approximately $5.07 million and the project has an estimated net lifetime cost of $22.96 million.[113] The Company estimates that the project will reduce 28,000 metric tons of CO_2 over the life of the project.[114] To power the hydrogen plant, the Company plans to co-locate a solar array on site and purchase electricity from Xcel Energy's green tariff program anytime it is unable to utilize its on-site dedicated solar array. The Company estimates that it will need to purchase approximately 6,658 MWh of electricity from Xcel's green tariff program to operate the electrolyzer at 95% efficiency.[115] The Company estimates that the resulting

[111] Petion by Ruthie Lanzeby & Brent Newell of Env't Justice Clinic at Vt. L. School to Petition the California Air Resources Board to Exclude All Fuels Derived from Biomethane from Dairy and Swine Manure from the Low Carbon Fuel Standard Program (Oct. 7, 2021), https://ww2.arb.ca.gov/sites/default/files/2022-01/2021.10.27%20Petition%20for%20Rulemaking%20AIR%20et%20al_.pdf.

[112] Merrian Borgeson, A Pipe Dream of Climate Solution? The Opportunities and Limits of Biogas and Synthetic Gas to Replace Fossil Gas (NRDC, 2022), https://www.nrdc.org/sites/default/files/pipe-dream-climate-solution-bio-synthetic-gas-ib.pdf.

[113] CenterPoint Initial Petition at 9.

[114] *Id.*

[115] CenterPoint Initial Petition, Document ID 20236-196995-11.

blend of hydrogen in its distribution system will range from 0.5% to 5%,[116] an amount that the Company states has been proven safe for infrastructure and customer appliances.[117]

We are skeptical of the Company's pilot proposal to blend hydrogen into its system. While the Company clearly identifies its intended learning objectives and metrics for Pilot D as required by the NGIA framework,[118] the pilot contains the following deficiencies:

- The company has not demonstrated the scalability of blending hydrogen into the distribution system.
- The high cost of the project relative to the reduction in GHG emissions does not appear to be the best use of customer funds.
- The Company has not sufficiently demonstrated that the incremental learnings that may be gained through Pilot D are worth the cost of the project.
- Blending hydrogen into the gas system is a low value use of an expensive, highly valuable resource.
- Hydrogen poses health and safety risks to customers when combusted as fuel in buildings.

1. The Company has not demonstrated the scalability of hydrogen blending

There is a technical limitation to the amount of hydrogen that a gas utility can blend into the natural gas distribution system without requiring additional infrastructure and equipment upgrades.[119] The Company's filing states that it has worked with the Minnesota Office of Pipeline Safety to ensure that industry standard practices are being followed to determine that the maximum amount of hydrogen that can be safely blended into the existing natural gas distribution system is 5% by volume – or approximately 2% by energy content.[120] Consequently, the potential for blending hydrogen into the distribution system as an emissions-reduction effort is limited. It is unclear how this pilot will aid the utility in scaling hydrogen blending to achieve substantial emissions reductions. If the percentage of hydrogen in the distribution system exceeds 5% there can be integrity issues, including hydrogen embrittlement which can lead to stress fractures in the affected piping.[121] An increased prevalence in stress fractures on pipelines would

[116] The Company was asked during round one of discovery to clarify whether the 5% blending limit for hydrogen into the natural gas system is by energy content or by volume, but the company has not responded to that request at this time.

[117] CenterPoint Initial Petition, Exhibit D at 14-15.

[118] NGIA Framework Order.

[119] Burcin Cakir Erdener et al., *A Review of Technical and Regulatory Limits for Hydrogen Blending in Natural Gas Pipelines*, 48 Int'l J. Hydrogen Energy 5595–5617 (2023), https://doi.org/10.1016/j.ijhydene.2022.10.254.

[120] CenterPoint Initial Petition, Exhibit D at 14.

[121] Guanwei Jia et al., *Hydrogen Embrittlement in Hydrogen-Blended Natural Gas Transportation Systems: A Review*, 48 Int'l J. Hydrogen Energy 32137-57 (2023), https://doi.org/10.1016/j.ijhydene.2023.04.266.

result in the Company needing to invest in expensive pipeline repairs and replacements, may pose an immediate safety risk to customers on the distribution system, and would likely cause increased emissions through pipeline leakage.

In Minnesota, initiatives have recently begun for the production of green hydrogen for use in the creation of green ammonia for fertilizers,[122] and the 45V hydrogen production tax credit is expected to benefit Midwest producers as currently defined by the U.S. Treasury.[123] The Department of Energy recently announced its new Regional Clean Hydrogen Hubs program, which is seeking to create seven regional clean hydrogen hubs to produce upwards of three million metric tons of clean hydrogen per year.[124] These hubs each have different learning goals ranging from decarbonization of public transport and trucking operations to production of clean fertilizer, and can help to provide a blueprint on the efficacy of scaling up hydrogen production for offtake from a large variety of industrial customers. Among the approved hydrogen hubs is the Heartland Hydrogen Hub located in Minnesota, North Dakota, and South Dakota, which will focus on using hydrogen to decarbonize agricultural fertilizer production and will decrease the area's average costs for clean hydrogen.[125] The approved hydrogen hubs will provide valuable insights into the ways that utilities can most efficiently utilize green hydrogen on their system for the end-use of certain large industrial customers. The insights are likely to be more valuable than those that are gained from a hydrogen blending pilot such as Pilot D regarding scaling up hydrogen use within energy distribution systems and for decarbonizing hard-to-electrify customers.

2. The pilot is expensive relative to its GHG-reduction benefits

The Company and its customers will receive minimal incremental GHG-reduction benefits from Pilot D, which come at a steep cost. The Company's stated learning objectives are to gain experience with generating hydrogen using dedicated renewable energy, to gain experience with building and operating a hydrogen storage facility with variable power input, and to understand operational and economic considerations of

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[122] Craig McDonnell, *What's Up With Hydrogen?*, Fresh Energy (Feb. 22, 2023), https://fresh-energy.org/whats-up-with-hydrogen.

[123] Press Release, U.S. Dep't of Treasury, IRS Release Guidance on Hydrogen Production Credit to Drive American Innovation and Strengthen Energy Security (Dec. 22, 2023), https://home.treasury.gov/news/press-releases/jy2010; Jeff. St. John, *New 'Clean' Hydrogen Rules Will Favor Some Regions More Than Others*, Canary Media (Jan. 4, 2024), https://www.canarymedia.com/articles/hydrogen/new-clean-hydrogen-rules-will-favor-some-regions-more-than-others.

[124] Press Release, The White House, Biden-Harris Administration Announces Regional Clean Hydrogen Hubs to Drive Clean Manufacturing and Jobs (Oct. 13, 2023), https://www.whitehouse.gov/briefing-room/statements-releases/2023/10/13/biden-harris-administration-announces-regional-clean-hydrogen-hubs-to-drive-clean-manufacturing-and-jobs/.

[125] *Regional Clean Hydrogen Hugs Selections for Award Negotiations*, U.S. Dep't of Energy, https://www.energy.gov/oced/regional-clean-hydrogen-hubs-selections-award-negotiations (last visited Jan. 11, 2024).

hydrogen storage for use during periods of limited renewable generation capability.[126] Each of those learning outcomes may be valuable, but not so valuable as to justify the cost of creating and operating a new long-term blending pilot such as Pilot D. The proposed green hydrogen blending pilot will subject ratepayers to significant annual costs for 15 years past the provided 5-year budget required under the NGIA. The 5-year budget estimates a total cost of $5.07 million, while the total cost of the pilot through its 20-year lifespan is quadruple that at $22.96 million.[127] The estimated lifecycle GHG emissions total for this pilot is only 27,993 metric tons, making the total cost per ton of emissions reduced $820, a significantly higher amount than most of the other proposed pilots presented by the Company.[128]

In addition to the co-located solar array at the production facility. The Company plans to rely on green tariffs from Xcel Energy for additional power, and assumes that the cost of these tariffs will remain the same over the pilots 20-year lifespan.[129] While some of the costs of running the electrolyzer via the dedicated solar array could be recouped if the Company is eligible for the IRA's production tax credit, the average cost to produce hydrogen in similar facilities is approximately $44/MMBtu.[130] In 2022, the average residential cost of natural gas in Minnesota was $12/MMBtu, which is significantly lower than the projected cost of hydrogen.[131]

3. The Company has not demonstrated the benefit of this additional hydrogen pilot

The proposed green hydrogen plant is similar to a 1 MW green hydrogen plant that the Company placed into service in downtown Minneapolis in 2022.[132] The Company has not sufficiently explained nor justified the incremental benefits that can be gained from creating this second green hydrogen pilot. The existing hydrogen plant is already blending hydrogen into the Company's natural gas distribution system.[133] This brings into question the value of using this pilot as a learning experience that can provide

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[126] CenterPoint Initial Petition, Exhibit D at 13.

[127] CenterPoint Initial Petition at 9.

[128] CenterPoint Initial Petition, Exhibit P at 1.

[129] Minnesota Docket 23-215 Document ID 20236-196995-11.

[130] *Hydrogen Shot*, U.S. Dep't of Energy, https://www.energy.gov/eere/fuelcells/hydrogen-shot (last visited Jan. 16, 2024). We converted the $5/kg value cited in this reference to MMBtu using the conversion factors here: https://www.nrel.gov/docs/gen/fy08/43061.pdf and this equation: ($5/1kg)*(1kg/2.2lbs)*(1lb/52,217Btu)*(1,000,000Btu/1MMBtu).

[131] *Natural Gas*, U.S. Energy Info. Admin., https://www.eia.gov/dnav/ng/NG_PRI_SUM_DCU_SMN_A.htm (last visited Jan. 16, 2024).

[132] Press Release, CenterPoint Energy, CenterPoint Energy Launches Green Hydrogen Project in Minnesota (June 3, 2022), https://investors.centerpointenergy.com/news-releases/news-release-details/centerpoint-energy-launches-green-hydrogen-project-minnesota.

[133] With one pilot already contributing hydrogen to the distribution system, the pilot project is limited to contributing only enough hydrogen to reach the maximum 5% by volume threshold previously identified by CenterPoint.

insights into how to blend hydrogen into the distribution system at a larger scale. The Company states that it is seeking to collect metrics through Pilot D in areas including the hourly electricity generation of a dedicated solar array, the hourly electricity consumption of an electrolyzer, the capacity utilization of renewable energy vs. grid energy, the levelized cost of hydrogen energy, and the operational cost and performance of the hydrogen facility and storage system.[134] While these are all valuable metrics that would assist the Company in more effectively incorporating hydrogen onto its system in the future, the Company has not yet stated why it needs a new facility, or could not add a co-located solar array to the existing hydrogen facility, to achieve these desired learnings.

There are more beneficial ways that the Company could gain experience with hydrogen storage and operating hydrogen facilities using dedicated renewable energy sources than through a blending pilot. Dedicated hydrogen facilities for large industrial customers that cannot electrify, or cannot do so economically, is one method that the Company should pursue to incorporate hydrogen into its energy profile. The use of hydrogen for industrial customers would likely require retrofitting of the industrial customer's equipment, which would require significant buy-in from the participating customer and may require incentives from the Company. However, this use would allow for more scalability than is possible currently with the 5% blending limit the Company has set for its natural gas distribution system. Such a pilot would provide insights into hydrogen storage, transportation, and end-use technologies in a way that maximizes the Company's ability to enable further decarbonization of other hard-to-decarbonize customers.[135] Additionally, costs for an industrial hydrogen pilot could be mostly borne by the industrial customers and not the average natural gas customer, resulting in lower residential bills over the long term.

4. The pilot will not deliver health and economic benefits to customers

As described thoroughly earlier in our comments, blending hydrogen into the gas distribution system poses an increased risk of harm to customers. Compared to methane, hydrogen is more flammable[136] and emits more nitrous oxides as natural gas when combusted,[137] increasing safety risks and indoor air pollution when blended with natural gas. Hydrogen also has a nearly invisible flame and is a very small molecule prone to leakage. These unique properties of hydrogen mean additional leak detection and flame

[134] CenterPoint Initial Petition, Exhibit D at 14.

[135] Craig McDonnell, *What's Up With Hydrogen?*, Fresh Energy (Feb. 22, 2023), https://fresh-energy.org/whats-up-with-hydrogen.

[136] *WHA's Hydrogen Fire Risk Management Philosophy*, WHA Int'l, Inc. (Sept. 20, 2023), https://wha-international.com/hydrogen-fire-risk-management/.

[137] Mehmet Salih Cellek & Ali Pınarbaşı, *Investigations on Performance and Emission Characteristics of an Industrial Low Swirl Burner While Burning Natural Gas, Methane, Hydrogen-Enriched Natural Gas and Hydrogen as Fuels*, 43 Int'l J. Hydrogen Energy 1194-1207 (2018), https://linkinghub.elsevier.com/retrieve/pii/S0360319917319791.

detectors would be needed to ensure safety if significant amounts of hydrogen are blended into the gas distribution system, which add to the costs of using it in buildings.

5. Recommendation

The Company should pursue alternative options for incorporating green hydrogen into its energy profile. Today, electrolysis is expensive – in part because the production of hydrogen results in a nearly 30% energy loss. An additional limitation to green hydrogen scalability will be demand for carbon-free electricity at a time when the grid is simultaneously decarbonizing and expanding to meet new demand associated with economy-wide electrification efforts. It is generally more efficient and cost-effective to electrify customers when practical. A more beneficial pilot is a hydrogen facility that is dedicated only to hard-to-electrify customers. For example, a hydrogen pilot project that is dedicated to industrial customers would allow for faster and more efficient scalability and would provide insights that are different from those that can already be found with the Company's existing hydrogen blending pilot. Utilizing green hydrogen as a tool to decarbonize traditionally hard-to-decarbonize customers is imperative for reaching the Company's and state climate goals in a timely and cost-effective manner.

D. Industrial or large commercial hydrogen and carbon capture incentives (Pilot E)

The Company proposes Pilot E, a $3.79 million investment in power-to-hydrogen and carbon capture for industrial customers.[138] The Company estimates the pilot will reduce emissions by 107,196 metric tons,[139] at a lifetime utility emission reduction cost of -$12 per ton.[140] The Company proposes to identify interested customers, pay up to 20% of feasibility study costs (up to $30,000), and then provide additional funding "for customers who move forward."[141] For the power-to-hydrogen pilot archetype, the Company proposed to cover all equipment and installation costs of electrolyzers, up to $1.5 million, and the customer would own and operate the systems.[142] The Company has not yet identified customers for this archetype.[143] For the second archetype, carbon capture, the utility proposed to cover "a portion of the equipment and installation cost of carbon capture systems."[144] The Company did not indicate whether it has identified potential participants for the second archetype.

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[138] CenterPoint Initial Petition, Exhibit D at 15-16.
[139] CenterPoint Initial Petition at 9.
[140] *Id*. at Exhibit P at 2.
[141] CenterPoint does not provide criteria for assessing which customers can "move forward." CenterPoint Initial Petition, Exhibit D at 15.
[142] CenterPoint Initial Petition, Exhibit N.
[143] *Id*.
[144] *Id*.

Pilot E was proposed to address the NGIA requirement that the Company provide a pilot program for "industrial facilities whose manufacturing processes, for technical reasons, are not amenable to electrification."[145] While the Company's Pilot E proposal appears to satisfy the statutory requirement to propose a pilot program for a harder-to-decarbonize customer, the proposal is not well developed, and the Company has not made a convincing case that approving this skeletal pilot is a reasonable use of customer funds. The Company has not identified customers, does not provide cost containment guardrails, provides no criteria as to how it would assess potential opportunities, does not identify objectives or project metrics, and does not detail how the pilot could be scaled to incremental customer and decarbonization benefits. Through its proposal, the Company appears to have met its legislative requirement to propose a pilot for industrial customers not amenable to electrification, but that does not mean the Commission must approve the proposal if it is not in the public interest. The Commission should not approve Pilot E at this time for the reasons detailed below.

1. The Company has not established reasonable cost controls for Pilot E

We are concerned that we do not know the actual costs of Pilot E and that the Company has not developed sufficient customer protection to ensure efficient spending on the pilot. Although the Company proposes a budget of $3.79 million, that is only a budget and not a cap on Pilot E costs. The Company's proposal states that it will fund only up to $1.5 million for electrolyzers, but that only covers equipment and installation costs. Furthermore, the proposal does not identify total costs allowed for a carbon capture program.

Until the Company identifies a specific customer, the Commission will not have a reasonable estimate of Pilot E costs. Decarbonizing hard-to-electrify industrial manufacturing is a considerable challenge and requires significant, site-specific investments, perhaps including a redesign of a company's manufacturing process. It simply is not possible to identify a reasonable cost estimate without knowing how the specific customer would incorporate the hydrogen or carbon capture technology. The Company's proposal states that it "anticipates considerable effort to identify viable projects for this pilot."[146] The Company provided an indication of what participant acquisition may cost; the Company estimates expenditures of at least $500,000 prior to providing direct customer incentives.[147] Given the challenge in procuring innovative solutions, it is possible that the Company would spend substantial customer funds in pursuit of a viable project and still not manage to advance a project past a feasibility study.

Furthermore, the Company provides no criteria, such as minimum dekatherms of natural gas savings, for customers to qualify for this funding. In the absence of criteria, it

[145] Minn. Stat. § 216B.2427, subd. 7.
[146] CenterPoint Initial Petition, Exhibit D at 17.
[147] *Id*. at 16.

is possible that, if Pilot E were to be approved, the pilot could result in the highest cost per ton of GHG reduction of any project in the NGIA.[148] The lack of project assessment criteria, such as a ceiling cost per CO_2 equivalent reduction, increases the risk that customer funds are misused.

2. The Company has not identified metrics that enable Pilot E to scale

Since the Company has not developed customer or project assessment criteria, including objectives and success metrics, the Company risks selecting a project that cannot scale. One of the fundamental purposes of a pilot is to test whether a project can be replicated and scaled. For example, a pilot project that tests carbon capture and utilization technology with the sole petrochemicals company that can feasibly use the technology in the Company's service area is unlikely to provide scalable benefits. If there are other learnings that would be applicable in other situations, it is the Company's responsibility to identify those learning opportunities. The Company should ensure that a pilot project demonstrates the viability of the technology such that other industrial customers are incentivized to adopt the technology. The fact that the Company has not established assessment criteria and expects that it would be difficult to find a partner customer raises the risk that the utility will select a pilot primarily to comply with Minnesota statute and not because of the project's potential to scale. Establishing a set of metrics that ensures that a pilot project provides wider benefits beyond the project is essential to ensuring customers' funds are spent effectively.

3. Recommendation

The Company should provide more information about Pilot E. As we suggested in our comments on Pilot D, we encourage the Company to continue working with its customers to identify an opportunity to work on a hydrogen project for a dedicated harder-to-decarbonize customer, which is aligned with the legislative intent to which Pilot E is responsive. The CEOs are generally supportive of the intent of this pilot, but without this additional information, the Commission should reject Pilot E.

E. Urban tree carbon offsets (Pilot G)

The Company proposes Pilot G, an Urban Tree Carbon Offset project with estimated costs totaling $329,301 over the five-year budget period. The Company estimates the pilot will reduce emissions by 4,500 metric tons over the lifetime of the

[148] The Company estimates that the Pilot E hydrogen archetype will be cost-effective and the carbon capture archetype will reduce emissions at a cost of $66/ton of CO_2 equivalent (Exhibit P) However, the Company's estimated GHG reductions are largely meaningless since CenterPoint has no viable projects from which to base its estimates.

project,[149] at a cost of $67 per metric ton.[150] Through this pilot the Company proposes to purchase Forest Carbon+ Credits[151] for trees planted in the community. The retired credits will be used for additional tree planting and maintenance by local organizations including Minneapolis Parks and Recreation Board and Hennepin County.[152] Our primary concern with this pilot is that the Company has not demonstrated that it is consistent with the intent of the NGIA as explained below.

1. The Company has not demonstrated that Pilot G is consistent with the intent of the NGIA

The throughput goal in the NGIA states that "[i]t is the goal of the state of Minnesota that through the Natural Gas Innovation Act and Conservation Improvement Program, utilities reduce the overall amount of natural gas produced from conventional geologic sources delivered to customers."[153] Hence, to be consistent with the intent of NGIA, pilots should not only reduce GHG emissions originating from local gas distribution systems, but also reduce the amount of natural gas delivered to customers. Offsets, which represent credits generated from verified GHG reductions achieved in one location to be used to "offset" emissions produced in another location,[154] generally will accomplish neither of these goals. Further, the Company has characterized its offset pilot as a carbon capture project, but this project does not meet the definition of carbon capture in the NGIA. The NGIA defines carbon capture as "the capture of [GHG] emissions that would otherwise be released into the atmosphere,"[155] which we take to mean capturing CO_2 directly from an emissions stream, not drawing down CO_2 that has already been released from the atmosphere as offset projects do.

We do not dispute the Company's claim that planting trees in urban neighborhoods can benefit residents by reducing urban heat effects.[156] However, there are other sources of funding to support the benefits of urban tree planting, including the $1.5 billion allotted for urban forests in the IRA.[157] Therefore, the reasonableness of charging the Company's customers for the cost of this pilot is questionable.

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[149] CenterPoint Initial Petition at 9.
[150] *Id.* at Exhibit P at 2.
[151] *Local Carbon Offsets: Verified City Forest Carbon+ Credits from City Trees*, City Forest Credits, https://www.cityforestcredits.org/carbon-credits/(last visited Jan. 11, 2024).
[152] CenterPoint Initial Petition, Exhibit D at 20-21.
[153] Minn. Stat. § 216B.2427, subd. 10.
[154] Env't Prot. Agency, & Green Power Partnership, Offsets and RECS: What's the Difference? 3 (2018), https://www.epa.gov/sites/default/files/2018-03/documents/gpp_guide_recs_offsets.pdf.
[155] Minn. Stat. § 216B.2427, subd. 1(c).
[156] CenterPoint Initial Petition, Exhibit M.
[157] U.S. Dep't of Agric., Urban and Community Forest Grants https://www.fs.usda.gov/sites/default/files/urban-communit-forestry-2023-factsheet.pdf

2. Recommendation

Given that offsets violate the NGIA throughput goal, will not reduce GHG emissions originating from the Company's gas distribution system and do not satisfy the definition of carbon capture, we recommend that the Company modifies its NGIA plan in Reply Comments to exclude Pilot G.

F. Carbon capture rebates for commercial buildings (Pilot H)

The Company proposes Pilot H to provide rebates to commercial customers that install CarbinX carbon capture systems manufactured by Canadian company CleanO2. These units connect to existing natural gas heating equipment, capture CO_2, and convert it into chemicals that are resold for commercial uses. The Company has estimated costs totaling $1.30 million over the five-year budget period and $23,256 over the lifetime of the pilot.[158] The Company estimates that the pilot would reduce lifetime emissions by 55,150 metric tons and would create 195 jobs.[159]

1. The Company has not demonstrated opportunities for additional learning from the pilot

The Company has already deployed and tested this technology for commercial customers.[160] The Company reports in Exhibit I that, "CenterPoint Energy has installed four CarbinX units through CIP but savings information is not yet available to report."[161] It is not appropriate for the Company's customers to fund rebates for additional commercial customers to install CarbinX carbon capture systems without detailed results from the current pilot projects and clear justification for the inclusion of additional pilots in the NGIA plan.

2. Recommendation

The Company should provide results from the existing CarbinX carbon capture system pilot projects and articulate learnings to be gained from the inclusion of additional pilots in the NGIA plan. Unless the Company provides sufficient supplemental information and results that justify the inclusion of these additional pilots in the NGIA plan, Pilot H should not be approved.

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[158] CenterPoint Initial Petition at 10.

[159] *Id.*

[160] Mike Hughlett, *In CenterPoint Pilot Project, CO2 Waste Will Be Used for Soap-Making,* StarTribune (Mar. 7, 2023), https://www.startribune.com/in-centerpoint-pilot-project-co2-waste-will-be-used-for-soap-making/600262392/.

[161] CenterPoint Initial Petition, Exhibit I at 1.

G. New networked geothermal systems (Pilot I)

The Company proposes Pilot I, a new networked geothermal system to provide building heating and cooling for a neighborhood currently served by the Company. The pilot will involve the installation of a new distributed geothermal system where individual customers would have a new heat pump installed that is connected to a common geothermal network loop. The pilot has estimated costs totaling $11.63 million over the five-year budget period and $42.22 million over the lifetime of the pilot. The Company estimates that the pilot would reduce lifetime emissions by 107,355 metric tons[162] at a cost of $393 per metric ton[163] and would create 430 jobs.[164] The pilot would begin with a feasibility study that includes planning, modeling and site selection, followed by an implementation phase that would entail the design and construction of the actual system.[165] The Company notes that it plans to file the feasibility study with the Commission and provide updated cost and estimated lifecycle GHG reduction information in an annual status report before proceeding to project construction.[166]

We responded to the Company's request for information about district energy, specifically advocating for the inclusion of a networked geothermal pilot in its first NGIA plan (see Attachment 1, "CEO District Energy RFI response"). We therefore are generally supportive of this proposed pilot and find that it will deliver significant benefits, as articulated below. However, we recognize there may be concerns about whether the costs of this pilot are reasonable and would therefore like to present our arguments for why we believe they are and why the phased approach proposed by the Company for this pilot is appropriate. Additionally, we would like to ensure this highly beneficial project is prioritized for the customers who stand to benefit the most from it, and that the Company adequately plans for ample stakeholder engagement opportunities at every phase of the project.

1. Pilot I can deliver significant customer and utility benefits

Networked geothermal energy systems connect distributed ground source heat pumps (GSHPs) to a network of pipes that exchange thermal energy with the ground to provide heating and cooling services to buildings. These systems are an innovative technology that can deliver significant benefits to customers and utilities, for the reasons articulated below.

First, GSHPs are a safer and healthier option for customers than gas-powered heating and cooling systems because they pose no explosion risk, don't produce the indoor air contaminants caused by combusting methane and hydrogen, and generate significantly fewer GHG emissions than other heating technologies. A recent study from

[162] CenterPoint Initial Petition at 10.
[163] *Id.* at Exhibit P at 2.
[164] CenterPoint Initial Petition at 10.
[165] *Id.* at Exhibit D at 27.
[166] *Id.* at 29.

the Oak Ridge National Laboratory examining the potential benefits of national-scale mass GSHP deployment found that wide deployment of GSHPs could reduce CO2-equivalent emissions by 7,351 million metric tons between 2022 and 2050.[167]

Second, GSHPs can lower energy costs for customers who install them by delivering improved energy efficiency and other advantages. Because the ground maintains a relatively stable temperature and these systems are not exposed to the highly variable temperature of outside air, GSHPs are significantly more efficient than both gas-powered furnaces and ASHPs. Analyses of networked GSHPs in five different jurisdictions found an average efficiency level of 470% (COP of 4.7),[168] which is about five times more efficient than the typical gas furnace.[169] A recent study conducted by the Rocky Mountain Institute also suggests GSHPs use 59% less energy than the typical ASHP, 78% less than the typical natural gas furnace, and 82% less the typical propane furnace.[170] This same study also found that GSHPs installed in Minnesota could produce 62% fewer emissions than ASHPs, 85% fewer emissions than gas furnaces, and 90% fewer emissions than propane furnaces through 2050.[171] The efficiency gains from GSHPs can meaningfully reduce energy costs for customers over time. GSHPs can also lower energy costs for customers by reducing fuel-related costs because there are no fuel-requirements for these systems other than the electricity used to power the pumps and controls. Case studies from other states suggest that networked GSHPs can generate annual savings ranging from $48,000 (56,000 sq ft served) to greater than $2 million (5.5 million sq ft), depending on the characteristics of the project.[172] Additionally, a 2021 analysis compared the cost of heating with heat pumps with gas over time and found that the cost of heating with GSHPs will continue to decrease over time, with networked GSHPs predicted to lower heating bills for households even more.[173] Networked GSHPs have the additional benefit of providing cooling in the summer as well as heating in the winter, which will help reduce electric load and electric utility bills for the customers.

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[167] Xiaobing Lui et al., Grid Cost and Total Emissions Reductions Through Mass Deployment of Geothermal Heat Pumps for Building Heating and Cooling Electrification in the United States xiii (Oak Ridge Nat'l Lab'y & U.S. Dep't of Energy, 2023), https://www.osti.gov/biblio/2224191.

[168] Hyunjun Oh & Koenraad Beckers, Cost and Performance Analysis for Five Existing Geothermal Heat Pump-Based District Energy Systems in the United States 12 (Nat'l Renewable Energy Lab'y, 2023), https://www.nrel.gov/docs/fy23osti/86678.pdf.

[169] Steven Nadel & Lyla Fadali, Analysis of Electric and Gas Decarbonization Options for Homes and Apartments (Am. Council for an Energy-Efficient Economy, 2022), http://www.aceee.org/research-report/b2205.

[170] Lauren Reeg et al., *Clean Energy 101: Geothermal Heat Pumps*, Rocky Mountain Inst. (Mar. 29, 2023), https://rmi.org/clean-energy-101-geothermal-heat-pumps/.

[171] *Id.*

[172] Geo Micro District: Feasibility Study at Appendix B: Case Studies (Buro Happhold Engineering & HEET, 2019), https://heet.org/wp-content/uploads/2019/11/HEET-BH-GeoMicroDistrict-Final-Report-v2.pdf.

[173] Joshua R. Castigliego et al., *Inflection Point: When Heating with Gas Costs More*, Applied Economics Clinic (2021), https://aeclinic.org/publicationpages/2021/01/13/inflection-point-when-heating-with-gas-costs-more.

Third, GSHPs can reduce energy costs for all through grid load management and other benefits. For example, a system including residences and businesses could deliver load management benefits by transferring waste heat from one part of the system (e.g., refrigeration units in grocery stores) for space and water heating needs on other parts of the system (e.g., residences). Additionally, the stable temperature of the ground acts as a thermal battery for the system, providing further load management benefits. These grid benefits can translate into reduced transmission requirements and significant savings over time. The Oak Ridge National Laboratory found that wide deployment of GSHPs could reduce transmission requirements by up to 38% and reduce the wholesale price of electricity between now and 2050 by up to 12%.[174] Further, because less grid infrastructure, capacity and transmission investment is needed when GSHPs are broadly deployed, expanding the use of this technology can reduce the cost of power for all customers, not just those who have installed GSHPs.[175]

In addition to the significant health and financial benefits to customers, networked GSHPs can benefit gas utilities in two ways. First, these systems can benefit utilities by providing a new business model that would allow gas utilities to maintain relationships with existing customers and apply the same skilled labor for laying pipes. The piping and boreholes for networked GSHP systems can be installed in the existing utility right-of-way. A model where utilities owned this infrastructure would not only align with gas utilities' traditional business model, but also would benefit building owners in the form of reduced upfront costs for system installation. Second, because new networked GSHPs don't need to be proximal to existing gas distribution and transmission lines, they can provide opportunities for utilities to expand service to currently unserved areas of the state. Utilities in Massachusetts have embraced the promise of networked GHSP systems and are actively piloting them in multiple communities.[176]

2. The costs of Pilot I are reasonable given its substantial potential benefits

In exchange for a substantial capital investment that needs to be recovered over a long period of time, the Company has a unique learning opportunity on a new type of project that will provide customers with healthy and affordable clean heat. Customers will likely spend a fraction of what they are currently spending to heat their homes and will avoid the health risks associated with combusting natural gas in their home.

IRA incentives could reduce the overall costs of this project. The Company notes "that the project could be eligible for a credit of between 6 and 50% of costs depending

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[174] Xiaobing Lui et al., Grid Cost and Total Emissions Reductions Through Mass Deployment of Geothermal Heat Pumps for Building Heating and Cooling Electrification in the United States xii-xiii (Oak Ridge Nat'l Lab'y & U.S. Dep't of Energy, 2023), https://www.osti.gov/biblio/2224191.

[175] *Id*.

[176] Jeff St. John, *A Net-Zero Future for Gas Utilities? Switching to Underground Thermal Networks*, Canary Media (Mar. 1, 2022), https://www.canarymedia.com/articles/utilities/a-net-zero-future-for-gas-utilities-switching-to-underground-thermal-networks.

on whether the project satisfies labor and domestic content requirements and whether the project is in an energy community."[177] The Company "assumed it would achieve a 30% credit by satisfying applicable labor requirements and has reduced estimated project costs accordingly."[178] Therefore, there are additional cost savings to be gained if the project is in an energy community and/or satisfies applicable domestic content requirements, which the Company plans to investigate as part of the initial feasibility study. The participating customers could also be eligible for IRA tax incentives or rebates, further cutting the expected costs of the pilot. IRA tax credits can reduce upfront costs of GSHPs by 30-50%, and GSHPs have operation costs that are more than 58% lower than ASHPs, 66% lower than gas furnaces, and 88% lower than propane furnaces in Minnesota.[179] The Company has not currently included those potential savings in its calculation of participant cost.[180]

The phased approach proposed by the Company for this pilot is a prudent approach that is well-supported by examples from other jurisdictions. In Massachusetts, for example, utility pilots that are constructing and evaluating geothermal networks like that proposed by the Company[181] were preceded and informed by a feasibility study to identify the networked geothermal technologies and system characteristics that would produce the greatest GHG emission reductions and load management benefits at the lowest cost in the unique Massachusetts climate.[182] Conducting a similar feasibility study to identify the optimal geothermal technologies and system characteristics that will produce the greatest benefits in the unique Minnesota climate is likely to be equally valuable and a prudent first step for piloting a new geothermal network in the Company's territory. The feasibility study results will help the Company refine the implementation phase of the pilot proposal, the budget for which could be more fully described and considered for approval during annual status report reviews.

3. Recommendation

As mentioned above, we are generally supportive of this pilot but recommend that the Company modify its plan for this pilot in Reply Comments in the following ways. First, given the significant potential for customer benefits from this pilot, we recommend the installation be prioritized for low-income and environmental justice areas within the Company's service territory, with special attention to neighborhoods with segments due

[177] CenterPoint Initial Petition, Exhibit D at 28.
[178] *Id*.
[179] *Id.*
[180] *Id.*
[181] *See* Eversource's geothermal network project description at *Networked Geothermal Pilot*, Eversource, https://www.eversource.com/content/residential/save-money-energy/clean-energy-options/geothermal-energy (last visited Jan. 11, 2024); *see also* National Grid's project description at *Introducing Our Geothermal Energy Program,* National Grid, https://www.nationalgridus.com/Geothermal-Energy-MA (last visited Jan. 11, 2024).
[182] Geo Micro District: Feasibility Study (Buro Happhold Engineering & HEET, 2019), https://heet.org/wp-content/uploads/2019/11/HEET-BH-GeoMicroDistrict-Final-Report-v2.pdf.

for pipe replacements or upgrades. Second, we recommend the Company provide more information on how it will provide stakeholders with ample opportunities to weigh in on the phases of this pilot (i.e., the feasibility study, planning and modeling, and site selection).

H. Decarbonizing existing district energy systems and new district energy system (Pilots J & K)

The Company proposes Pilots J and K to decarbonize existing district energy systems that use natural gas and develop new district energy systems, respectively. The Company estimated that costs will total to $597,909 and $215,644, respectively, over the five-year budget period. The estimated net lifetime utility costs of the pilots are negative, resulting in savings of $3.42 million and $784,412, respectively.[183] The Company's estimated lifecycle GHG reductions are 124,030 and 40,882 metric tons, respectively.[184]

1. The Company states that these pilots may not meet that statutory definition of district energy

The Company acknowledges that Pilot J does not meet that statutory definition of district energy: "Participating systems will not satisfy the statutory definition prior to implementation of decarbonization measures and may not satisfy it after completing projects, depending on what measures they undertake."[185] Pilot J is essentially an energy efficiency and strategic electrification pilot since it is decarbonizing existing district energy systems that currently use natural gas. The pilot should therefore not count toward the statutory 20 percent budget cap on district energy.

Additionally, the feasibility study that the Company proposed to fund in Pilot J should include a full electrification/decarbonization scenario. If a district energy system that meets the statutory definition is selected as the best alternative to the existing district energy system, only then should the implementation of that system count towards the district energy budget cap.

In Pilot K the Company states that, "while the statutory definition requires the system to include multiple buildings, CenterPoint Energy would allow participation by customers that intend to use systems in a single building that would otherwise qualify as district energy systems. In these cases, the project could qualify for inclusion in the NGIA plan as a strategic electrification measure. CenterPoint Energy would work with customers to ensure the project would satisfy the statutory requirements of strategic electrification by maintaining some gas use and by improving the electric utility load factor."[186] Similarly, Pilot K should not count towards the 20 percent cap on district energy unless the new system meets the statutory definition.

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[183] CenterPoint Initial Petition at 10.

[184] *Id.*

[185] *Id.* at Exhibit D at 32-33.

[186] *Id.* at 36.

2. Recommendation

We are generally supportive of deploying electrification and energy efficiency in Pilots J and K, but the pilots should not count toward the statutory 20 percent district energy floor unless the resulting system meets the statutory definition. If a pilot does not meet the statutory definition, then it should be classified under a different applicable category.

In addition, feasibility studies that the Company funds in these pilots should include full electrification/decarbonization scenarios. Once the feasibility studies are prepared, the studies should be presented to the Commission for review with an opportunity for comment from stakeholders. The Company and the Commission should prioritize projects that meet the criteria of the statutory definition of district energy.

I. Residential deep energy retrofits and electric ASHPs (Pilot N)

The Company proposes Pilot N, a three-phase pilot program to test a combination of deep energy retrofits and air-source heat pumps with gas back-up in a variety of residential building types. This project is a required element of the Company's first NGIA plan, as stipulated in Minn. Stat. §216B.2427, subd. 8. The Company estimates the pilot will reduce GHG emissions by 66,760 metric tons and generate 171 jobs.[187]

We find that the strategic electrification and energy efficiency measures to be implemented in Pilot N are highly beneficial and scalable, and that the costs of the pilot are reasonable, for the reasons articulated below. However, Pilot N could be improved by enhancing learning opportunities regarding the level of weatherization needed to avoid reliance on backup heat, and by doing more to ensure low-income residents benefit from this pilot. Accordingly, we propose that the Company modify Pilot N in Reply Comments in the ways articulated in section 3 below.

1. Pilot N is highly scalable and will deliver significant benefits to customers

Strategic electrification is a safe, effective, and highly scalable option for reducing natural gas throughput and GHG emissions from buildings and industry. Because space heating accounts for most of the energy consumption in buildings, highly efficient electric space heating equipment like ASHPs are central to strategic electrification efforts. Electric ASHPs are 2-4.5 times more efficient than the most efficient gas furnace, even in cold climates like Minnesota,[188] and reduce carbon emissions by 38-53% compared to gas

[187] CenterPoint Initial Petition at 10.

[188] Claire McKenna et al., *It's Time to Incentivize Residential Heat Pumps*, Rocky Mountain Inst. (June 8, 2020), https://rmi.org/its-time-to-incentivize-residential-heat-pumps.

furnaces,[189] even on electric grids currently powered by coal and natural gas.[190] Like GSHPs, electric ASHPs also protect customers from the health and safety risks associated with the combustion of gaseous fuels in buildings. Additionally, recent studies estimate that electrifying heating, cooling, and cooking equipment would create 4,200 installation jobs in Minnesota, and an additional 80,000 manufacturing jobs nationally that Minnesota could compete for.[191] Finally, strategic electrification is more scalable than alternative fuels because it is a less expensive resource with comparatively fewer supply constraints.

When combined with energy efficiency measures such as appliance upgrades, weatherization, insulation, air sealing and other building shell improvements, electrification can produce even greater natural gas throughput and GHG reductions, and significant additional health benefits and bill savings for customers. The American Council for an Energy-Efficient Economy estimated that, in cold climates like Minnesota, deep retrofits (i.e., whole-home projects that involve extensive envelope and equipment upgrades) can produce carbon emission reductions of 41-49%, natural gas throughput reductions as high as 98%, customer bill savings of $500-$1,750 per year, and energy savings of 44-52%.[192] Studies of energy savings potential from retrofits in Minneapolis suggest that energy reductions as high as 70% are possible in the city's older, poorly insulated building stock.[193] Energy efficiency measures involving building envelope improvements can also improve customer comfort and health by reducing mold growth, pest infiltration, drafts, cold surfaces, noise and air pollution.[194] These benefits can also improve respiratory health, sleep quality and cognitive functioning.[195] Retrofits can also

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[189] Theresa Pistochini et al., *Greenhouse Gas Emission Forecasts for Electrification of Space Heating in Residential Homes in the US*, 163 Energy Pol'y 112813, 112813 (2020), https://doi.org/10.1016/j.enpol.2022.112813.

[190] Claire McKenna et al., *It's Time to Incentivize Residential Heat Pumps*, Rocky Mountain Inst. (June 8, 2020), https://rmi.org/its-time-to-incentivize-residential-heat-pumps.

[191] Rewiring America, Bringing Infrastructure Home: A 50-State Report on U.S. Home Electrification 61 (2021), https://www.rewiringamerica.org/policy/bringing-infrastructure-home-report.

[192] Jennifer Amann et al., Pathways for Deep Energy Use Reductions and Decarbonization in Homes 13, 23 (Am. Council for an Energy-Efficient Economy 2021), https://www.aceee.org/research-report/b2103.

[193] Katie Jones et al., Minneapolis 1–4 Unit Residential Weatherization and Electrification Roadmap 3 (Ctr. for Energy & Env't, 2023), https://www.mncee.org/sites/default/files/report-files/Minneapolis%201-4%20Unit%20Residential%20Weatherization%20and%20Electrification%20Roadmap_Final%20%281%29.pdf.

[194] Am. Council for an Energy-Efficient Economy, Empowering Electrification through Building Envelope Improvements at Topic Brief (2023), https://www.aceee.org/sites/default/files/pdfs/empowering_electrification_through_building_envelope_improvements_-_encrypt.pdf.

[195] Piers MacNaughton et al., *The Impact of Working in a Green Certified Building on Cognitive Function and Health*, 114 Building & Env't 178–186 (2017), https://doi.org/10.1016/j.buildenv.2016.11.041; Guy Newsham et al., Do Green Buildings Outperform Conventional Buildings? Indoor Environment and Energy Performance in North American Offices 3 (Nat'l Rsch. Council of Canada, 2012), https://doi.org/10.4224/20857897.

decrease electric peak load by up to 10%, reducing future need for additional power plants, transmission lines and distribution system upgrades.[196]

2. The costs of Pilot N are reasonable relative to its benefits

The pilot has estimated costs totaling $13.6 million over the five-year budget period and $10.6 million over the lifetime of the pilot. With an estimated cost of $382 per lifetime tCO2e reduction, Pilot N is one of the most expensive pilots proposed. However, the pilot will deliver substantial benefits to customers, as articulated above. We therefore find that the costs are reasonable relative to the pilot's expected benefits.

3. Pilot N as proposed fails to take advantage of unique opportunities for valuable learning

The Company argues that the level of retrofit specified in subdivision 8(b) of the NGIA may be infeasible or cost-prohibitive in many homes and therefore proposes a three-phased pilot that would involve studying and implementing levels of retrofit that do and do not meet the statutory definition.[197] Phase 1 would study which homes may meet the statutory definition of a deep energy retrofit, what level of retrofit is reasonable for homes that can't feasibly reach the statutorily defined level, and what measures would be required to reach various levels of design load in different kinds of homes. Phase 2 would conduct feasibility testing of four different tiers of retrofit (including tiers that do and do not meet the statutory definition),[198] and Phase 3 would launch a larger incentive program, informed by results in Phases 1 and 2, and not necessarily restricted to the statutory definition of a deep energy retrofit.

In addition to studying what measures would be required to meet statutorily consistent and other levels of design in different kinds of homes, Pilot N could provide valuable learning by studying how varying levels of retrofit impact the need for natural gas backup power for heating during the winter months. Accordingly, we recommend the Company modify its plan in Reply Comments to describe how Pilot N will examine the impact of different retrofit levels on gas backup demand in different types of homes.

4. Pilot N field testing should be prioritized for low-income residences

Phase 2 of Pilot N involves field testing different levels of retrofits. The Company proposes to fully fund projects in field tested homes with no required participant

[196] Am. Council for an Energy-Efficient Economy, Empowering Electrification through Building Envelope Improvements at Topic Brief (2023), https://www.aceee.org/sites/default/files/pdfs/empowering_electrification_through_building_envelope_improvements_-_encrypt.pdf.

[197] CenterPoint Initial Petition, Exhibit D at 46-47.

[198] CenterPoint Initial Petition, Exhibit N at tab "CNP19", lines 245-249.

contribution.[199] The Company specifies that it plans to ensure that 40% of residential units served by the pilot qualify as low-income, as defined by CIP/ECO, or are in a disadvantaged community, as defined in the IRA.[200]

As the Company points out, deep energy retrofits can be very costly.[201] Given their high costs, these valuable measures are unlikely to be financially accessible to low-income residents without significant assistance. However, low-income residents are the most likely to benefit from them because they are more likely to live in less energy efficient housing,[202] which can lead to a high energy burden (paying more than 6% of gross household income on energy costs). In the Midwest, 25% of all households experience high energy burden, but 66% of low-income households do.[203] Further, low-income households in the Midwest spend 2.5 times more of their income on energy costs than do other households.[204] Weatherization and other energy efficiency improvements can reduce energy burden by up to 25%.[205]

The Company's plan to fully fund the projects in field tested homes is a significant benefit for residents and a unique opportunity to provide meaningful health and safety improvements and deep energy savings for the low-income residents that have the most to gain from these benefits. Accordingly, we recommend the Company do more to ensure that low-income residents are prioritized for participation in the fully funded field testing.

5. Recommendations

Given the many benefits of strategic electrification and energy efficiency, we are generally supportive of this project but recommend the Company modify it in Reply Comments in the following ways. First, to further enhance the valuable learning gleaned from this important pilot, we recommend the Company modify its plan for Pilot N in Reply Comments to examine the impact of different retrofit levels on gas backup demand in different types of homes.

Second, we recommend the pilot be modified to pursue the goal that up to 100% of residences participating in the Phase 2 field testing portion of this project, where the Company proposes to fund projects with no required participant contribution, are low-income residences.

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[199] CenterPoint Initial Petition, Exhibit D at 47.

[200] *Id*. at 46

[201] *Id.*

[202] Dominic J. Bednar et al., *The Intersection of Energy and Justice: Modeling the Spatial, Racial/Ethnic and Socioeconomic Patterns of Urban Residential Heating Consumption and Efficiency in Detroit, Michigan*, 143 Energy & Buildings 25, 30–33 (2017), https://doi.org/10.1016/j.enbuild.2017.03.028.

[203] Ariel Drehobl et al., How High are Household Energy Burdens? An Assessment of National and Metropolitan Energy Burden Across the United States 52 (Am. Council for an Energy-Efficient Economy, 2020), https://www.aceee.org/sites/default/files/pdfs/u2006.pdf.

[204] *Id.* at iii-vi.

[205] *Id.* at vi.

J. Residential gas heat pumps and gas heat pumps for commercial buildings (Pilots P and Q)

The Company proposes two pilots funding gas heat pumps: Pilot P targets residential customers and Pilot Q targets commercial and industrial customers. The Company proposes similar procedural elements for both pilots, including the deployment and testing of gas heat pumps. For Pilot P, the residential pilot, the Company proposes to conduct market research and analysis, enlist participants, engage and train contractors, meter the installations, and analyze the data.[206] The Company forecasts Pilot P to cost approximately $380,000[207] with a lifetime cost per GHG reduction ranging between $1,035 and $1,299 per metric ton of CO_2 equivalent,[208] the second most expensive pilot on a dollars per emissions reductions basis. For Pilot Q, the commercial pilot, the Company proposes to identify sites and participants and submit an RFP to select an implementation provider.[209] The Company proposed to meter and analyze data from the gas heat pump installations. The Company forecasts Pilot Q to cost approximately $749,000[210] with a lifetime cost per GHG reduction ranging between $200 and $259 per metric ton of CO_2 equivalent,[211] which makes it one of the more expensive pilots on a dollars per emissions reductions basis.

These gas heat pumps would be used to replace existing gas-fired appliances used for heating buildings (and water, for the residential program). As stated throughout these comments, weatherization and electrification are the most promising, scalable resources to deploy in the buildings sector, not the replacement of gas-fired appliances for early-stage technologies that promise only marginal energy efficiency gains over existing gas appliances at significant cost. Below, we explain why pilots P and Q should be denied to ensure that ratepayer NGIA funds go toward resources better suited to decarbonize the buildings sector.

1. Electric heat pumps are a more scalable, mature, and cost-effective technology to decarbonize the buildings sector compared to gas heat pumps

Compared to the gas heat pumps proposed in Pilots P and Q, existing electric heat pump technology is more scalable, mature, and cost-effective. Gas and electric heat pumps are deployed in the same sector—buildings—yet electric heat pumps enable a greater potential reduction in emissions for this sector.

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[206] CenterPoint Initial Petition, Exhibit D at 50.
[207] *Id*. at 51.
[208] CenterPoint Initial Petition, Exhibit B at 12.
[209] CenterPoint Initial Petition, Exhibit D at 53-54.
[210] *Id*. at 53.
[211] CenterPoint Initial Petition, Exhibit B at 11.

In 2022, electric heat pumps accounted for 53% of new building heating sales in the United States[212] and are rapidly gaining market share. Federal and state policies, such as the IRA, are expected to further bolster electric heat pump adoption rates. Meanwhile, the performance and cost-effectiveness of heat pumps are expected to increase due to significant R&D investment by manufacturers and governments. In 2021, the DOE launched a Residential Cold Climate Heat Pump Challenge seeking to push the performance of efficient cold climate heat pumps.[213] By November 2022, Trane, a heat pump manufacturer, had announced that its newest cold climate heat pump prototype could perform effectively at temperatures as low as -23 degrees Fahrenheit, exceeding DOE targets.[214] Other manufacturers are also investing in electric heat pumps; for example, Carrier, a significant heat pump manufacturer, announced a $16-million R&D center in April 2020 that focused on sustainable heating solutions.[215] The European Union also invested public funds into electric heat pumps through an accelerator program, financing programs, workforce development, and legislative work, such as phasing out sales of boilers.[216] Between 2022 and 2025, the European Commission projects that EU investment in heat pumps will total €3.3 billion.[217] These investments are likely to result in two customer benefits: increases in electric heat pump COP (the measure of equipment efficiency) and cheaper, commercially-available electric heat pumps.

In comparison, there has been less investment in gas heat pump technology. A November 2019 Gas Technology Institute (GTI) white paper, which was funded by natural gas distribution companies, stated that gas heat pumps were "3-5 years from commercialization."[218] Four years later, it is not clear that gas heat pumps are any closer to commercial viability, as evidenced by the Company's proposal to conduct market research first to identify viable gas heat pump candidates, to train contractors, and to identify interested customers.

Compared to electric alternatives, gas heat pumps are not a cost-effective technology for reducing building emissions. Gas heat pumps are more expensive, less

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[212] Yannick Monschauer et al., *Global Heat Pump Sales Continue Double-Digit Rrowth*, IEA (Mar. 31, 2023), https://www.iea.org/commentaries/global-heat-pump-sales-continue-double-digit-growth.

[213] U.S. Dep't of Energy, Residential Cold Climate Heat Pump Technology Challenge Fact Sheet (2022), https://www.energy.gov/eere/buildings/articles/residential-cold-climate-heat-pump-technology-challenge-fact-sheet.

[214] *Trane Passes Heat Pump Challenge*, Cooling Post (Nov. 4, 2022), https://www.coolingpost.com/world-news/trane-passes-heat-pump-challenge/.

[215] *Carrier to Invest $16 Million in Research & Development Center of Excellence in Italy*, Carrier (Apr. 4, 2022), https://www.carrier.com/commercial/en/eu/news/news-article/carrier-to-invest--16-million-in-research---development-center-of-excellence-in-italy.html.

[216] European Commission Heat Pumps in the European Union: Status Report on Technology Development, Trends, Value Chains and Markets, E.U. Clean Energy Technology Observatory EUR31268 EN (2022), https://data.europa.eu/doi/10.2760/372872.

[217] *Id*.

[218] GTI Brio, The Gas Heat Pump Technology and Market Roadmap 2 (2019), https://www.gti.energy/wp-content/uploads/2020/09/Gas-Heat-Pump-Roadmap-Industry-White-Paper_Nov2019.pdf.

efficient, and enable fewer emissions reductions. The COP of cold-climate electric heat pumps is over 3.0 on a seasonal basis,[219] meaning that electric heat pumps are more than three times more efficient than the most efficient gas furnaces, which are typically 95% efficient (.95 COP). Gas heat pumps are only marginally more efficient than furnaces, about 140% efficient (1.4 COP),[220] falling well short of electric heat pumps. And while electric heat pumps provide air conditioning more efficiently than traditional units, gas heat pumps are far less efficient and may not be able to displace electric air conditioning, rendering gas heat pumps significantly less cost-effective.[221]

Finally, electric heat pumps provide a pathway to full decarbonization, gas heat pumps do not. Minnesota requires the electric grid to be carbon-free by 2040,[222] meaning that the energy used to power electric heat pumps would not produce emissions in 2040. Comparatively, there is no clear pathway to replace existing natural gas throughput with a zero-carbon gas alternative by 2040. In other words, an electric heat pump is not only more efficient, it could also be run using entirely carbon-free electricity by 2040; the same cannot be claimed for gas heat pumps. In the absence of evidence that gas heat pumps are commercially viable and that a market for gas heat pumps has developed, customer funds would be more effectively spent assessing the deployment of cold climate electric heat pumps.

2. The objectives of Pilots P and Q are unclear

The Company's specific objectives for Pilots P and Q are unclear. The Company's stated objective is to "better inform opportunities for gas heat pumps to be part of future CIP/ECO or NGIA programs."[223] But the Company does not describe how installing the nine proposed gas heat pumps in Pilots P and Q will actually achieve this understanding. Without identifying target goals and success metrics, the Company risks wasting customer funds. For a pilot to provide customer benefits, it must have clear and measurable objectives rather than unspecified learnings. Moreover, in its proposal the Company makes no commitment to the transparent release of gas heat pump pilot findings with the public.

The Company's objectives may also be misguided; in Exhibit O, the Company's qualitative considerations for its pilots, the Company states that the "advantage" of gas heat pumps is that they "would avoid shifting electric load to a potential future winter peak. This may help reduce the costs of electric build-out necessary for

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[219] Steven Nadel & Lyla Fadali, Analysis of Electric and Gas Decarbonization Options for Homes and Apartments 68 (Am. Council for an Energy-Efficient Economy, 2022), http://www.aceee.org/research-report/b2205.

[220] *Id*. at 13, 68.

[221] *Id*. at 70.

[222] Madeline Dawson, *Minnesota Joins 20 Other States in Pursuit of 100 Percent Clean Energy*, Env't & Energy Study Inst. (Apr. 21, 2023), https://www.eesi.org/articles/view/minnesota-joins-20-other-states-in-pursuit-of-100-percent-clean-energy.

[223] CenterPoint Initial Petition, Exhibit D at 50-51.

decarbonization."[224] We agree that gas and electric utilities should work collaboratively to assess statewide energy needs, but it is not the role of a gas utility to speculate on the electric system impacts of fuel switching. The Company's NGIA pilot consideration should be focused on providing the greatest benefits for its gas customers and should not be devoted to solving potential electric system concerns.

3. The pilots will not deliver health benefits to customers

Electric heat pumps are healthier and safer than gas heat pumps because they avoid the risks associated with combusting gas in buildings. Installing gas heat pumps would prevent customers from enjoying the health and safety benefits of their electric, more efficient, counterparts.

4. Recommendation

The Commission should not approve the Company's proposed gas heat pump pilots. Gas heat pumps should not be deployed to decarbonize the buildings sector as there are more scalable, mature, and cost-effective technologies with which to accomplish this. In addition, Pilots P and Q lack a specific objective or objectives that would help to inform the Company and the Commission about viable decarbonization pathways for the buildings sector. As proposed, then, Pilots P and Q represent an unreasonable use of ratepayer funds. In the alternative, if the Commission wishes to approve these pilots, it should only approve the market research aspect of the pilots and should require the Company to re-file the pilots with the results of its market research and with a summary of its initial outreach efforts to contractors and customers.

K. Research & development

In addition to the eighteen proposed pilots, the Company's Plan includes seven R&D pilots. The estimated costs of the R&D pilots total $10.57 million over the five-year budget period.[225] We have concerns that a large portion of this budget appears to be reserved for future, unspecified R&D projects.[226] Some of the R&D pilots lack clear objectives, without which the Commission cannot ensure that ratepayer money is being well spent.

While the NGIA does not define the term R&D, we argue it isn't appropriate to fund business ventures through NGIA pilots. NGIA pilots should look at how a utility can reduce its natural gas throughput in novel ways, not provide funding for companies to test new technologies that don't directly affect the Company's customers. These types of projects are not appropriate for inclusion in a ratepayer-funded utility program.

[224] CenterPoint Initial Petition, Exhibit O at 2.
[225] CenterPoint Initial Petition, Exhibit E at 1.
[226] CenterPoint Initial Petition at 10.

Federal funding sources would be more appropriate for the projects that aim to fund commercial business ventures.

1. CenterPoint energy Minnesota net zero study

The CEOs request a stakeholder process for stakeholder input on the study and assumptions. The study should include a full decarbonization scenario.

2. Weatherization blitzes

The CEOs are generally supportive of this R&D pilot. We support this pilot's intent to promote IRA tax credits and rebates that complement CIP offerings in order to braid federal and utility funding for maximum effect. The Company should also consider promotion of a bonus rebate when customers pair incentives for installation of electric ASHPs with incentives for building shell improvements, as Xcel Energy is planning to do in its upcoming ECO Triennial. The Company has stated that it "opposes adding this to its Triennial Plan for 2024 but will consider a bonus rebate for sequencing weatherization with an ASHP as a program modification by no later than January 1, 2026."[227] The Weatherization Blitzes pilot presents an opportunity for the Company to test this bonus rebate prior to incorporating it into ECO.

3. High performance commercial new construction building envelope initiative

The CEOs are generally supportive of this R&D pilot.

4. Assessing next-generation micro-carbon capture for commercial buildings

Ratepayer money shouldn't be used for investment in capital funding to test new technologies that don't directly affect the Company's customers or reduce natural gas throughput. This pilot should not be included in the Company's NGIA plan.

5. Green ammonia novel technology

The CEOs are generally supportive of this R&D pilot. U.S. fertilizer production is enormously carbon intensive, produced primarily using fossil fuels like natural gas, coal, or oil. However, innovative strategies that utilize hydrogen from wind energy to produce vastly less carbon intensive green fertilizer are emerging. Minnesota is a leader in this space, having established a first-in-the-world Wind-to-Ammonia Pilot Plant at the University of Minnesota West Central Research and Outreach Center in Morris in 2013. We see significant opportunities in establishing Minnesota as a regional and federal model for producing green fertilizer locally, reducing our dependence on imported fossil

[227] *In the Matter of CenterPoint Energy's 2024-2026 Energy Conservation and Optimization Triennial Plan*, Minn. Pub. Util. Docket No. G-008/CIP-23-95, Decision of Deputy Comm'r of Minn. Dep't of Com. 127 (December 1, 2023).

fertilizer. Beyond achieving crucial reductions in greenhouse gas emissions from the industrial sector, leveraging a Minnesota model for local green fertilizer production also stands to grow rural economic opportunities, jobs, and tax revenue.

6. Renewable Natural Gas ("RNG") potential study

The CEOs request a stakeholder process for stakeholder input on the study and assumptions.

7. Utilization of green ammonia for thermal applications

The CEOs are generally supportive of this R&D pilot. The pilot would fund research into how green ammonia may be used in industrial-scale burner applications. Co-locating ammonia production with consumption should be prioritized to limit the reliance on long-distance ammonia transportation, which increases environmental and public health risks from leaks and spills.

L. The Company should consider additional pilots or R&D to advance ECO programs

NGIA is an opportunity to work with ECO to advance programs that the Company must capitalize on. As described earlier in our comments, since the Company filed its NGIA in June, it has finalized its 2024-2026 ECO Triennial plan without including electric ccASHPs, GSHPs, or HPWHs as measures, and has expressed willingness to consider these measures in its NGIA plan.[228] Therefore these appliances should be included as pilots in the Company's first NGIA plan. These electric appliances have the potential to reduce GHG emissions from the gas system at scale and they should be deployed as soon as possible.

The Company's NGIA plan should be modified in Reply Comments to include pilots to promote these electrification measures and evaluate what pilot strategies are effective and could be included in ECO or future NGIA efforts, similar to what has been proposed for the Weatherization Blitzes pilot. There is an opportunity to test incentives for these measures in NGIA where the cost-effectiveness test is less stringent. The CEOs request that the Company consider additional overlap with ECO and be sure to involve stakeholders in these discussions.

[228] *CenterPoint Energy's 2024-2026 Natural Gas Energy Conservation and Optimization Triennial Plan*, Minn. Pub. Util. Docket No. G-008/CIP-23-95, Compliance Filing Proposal (June 30, 2023); *In the Matter of CenterPoint Energy's 2024-2026 Energy Conservation and Optimization Triennial Plan*, Minn. Pub. Util. Docket No. G-008/CIP-23-95, Decision of Deputy Comm'r of Minn. Dep't of Com. (December 1, 2023); *In the Matter of CenterPoint Energy's 2024-2026 Energy Conservation and Optimization Triennial Plan*, Minn. Pub. Util. Docket No. G-008/CIP-23-95, CenterPoint Reply Comments at 10 (September 1, 2023).

CONCLUSION

Considering the points raised in our comments and responses to questions posed in the notice for comment, the CEOs respectfully request that the Commission take the following actions in this NGIA plan:

1. Modify the Company's NGIA plan to:

    a. Clearly articulate how it will help the Company meet its fair share of state GHG emission reductions. In our response to Question 4 below we provide two alternatives for estimating the Company's fair share of state GHG emissions reductions.
    b. Incorporate changes to the Company's proposed cost-effectiveness objectives described in our response to the Commission's Question 4 below.
    c. Define clear learning objectives and metrics of success for all proposed pilots.
    d. Consider nearby industrial off-takers or other innovative ways, including incorporation of federal funding or tax credits, to utilize the RNG resource in Pilot A (RNG Produced from Hennepin County Organic Waste) and Pilot B (RNG Produced from Ramsey & Washington Counties Organic Waste) rather than injecting the RNG into the distribution system.
    e. Describe why the inclusion of both Pilots A and B will provide additional learning and unique findings and how it will address environmental justice concerns related to these pilots.
    f. Eliminate investments specific to the food waste and dairy manure archetypes in Pilot C (Renewable Natural Gas Request for Proposal Purchase).
    g. Define clear objectives for the RFPs in Pilot C.
    h. Eliminate the option in Pilot C for the Company to purchase RNG RTCs without procuring fuel.
    i. Pursue an alternative to Pilot D (Green Hydrogen Blending into the Natural Gas Distribution System) that consists of a hydrogen facility that is dedicated only to hard-to-electrify customers.
    j. Provide more information about Pilot E (Industrial or Large Commercial Hydrogen and Carbon Capture Incentives). We encourage the Company to continue working with its customers to identify the opportunity to work on a hydrogen project for a dedicated harder-to-decarbonize customer, which is aligned with the legislative intent to which Pilot E is responsive.
2. Find that offset projects of any type do not directly reduce the amount of natural gas delivered to customers and therefore are inconsistent with the intent of the NGIA.

3. Find that offset projects of any type do not meet the statutory definition of carbon capture in the NGIA.
4. Further modify the Company's NGIA plan to:
    a. Remove Pilot G (Urban Tree Carbon Offsets).
    b. Remove Pilot H unless the Company provides sufficient results from the existing CarbinX carbon capture system pilot projects and articulates learnings to be gained from the inclusion of additional pilots in the NGIA plan.
    c. Prioritize installation of the networked geothermal system in Pilot I for low-income and environmental justice areas within the Company's service territory, with special attention to segments due for pipe replacements or upgrades.
    d. Supply more information on how the Company will provide stakeholders with ample opportunities to weigh in on the phases of Pilot I (New Networked Geothermal Systems).
5. Find that Pilots J and K should not count toward the statutory 20 percent district energy floor unless the resulting district energy system meets the statutory definition.
6. Further modify the Company's NGIA plan to:
    a. Prioritize district energy pilots that meet the statutory definition of this resource.
    b. Ensure that the feasibility studies in Pilots J and K include full electrification/decarbonization scenarios.
    c. Examine the impact of different retrofit levels on gas backup demand in different types of homes in Pilot N (Residential Deep Energy Retrofits and Electric ASHPs).
    d. Pursue the goal that up to 100% of residences participating in phase 2 field testing portion of Pilot N, where the Company proposes to fund the retrofit projects with no required participant contribution, are low-income residences.
    e. Remove Pilot P (Residential Gas Heat Pumps) and Pilot Q (Gas Heat Pumps for Commercial Buildings).
    f. Add and fully describe a process for including stakeholder input on the design and assumptions of the R&D study entitled "CenterPoint Energy Minnesota Net Zero R&D study".
    g. Include a full decarbonization scenario in the CenterPoint Energy Minnesota Net Zero R&D study.
    h. Include promotion of a bonus rebate when customers pair incentives for installation of electric ASHPs with incentives for building shell improvements in the R&D pilot entitled "Weatherization Blitzes".
    i. Remove the R&D pilot entitled "Assessing Next-Generation Micro-Carbon Capture for Commercial Buildings".

j. Add a process for including stakeholder input on the design and assumptions for the R&D study entitled "Renewable Natural Gas (RNG) Potential Study".
k. Include an R&D pilot to promote HPWHs and GSHPs and evaluate what pilot strategies are effective and could be included in ECO or future NGIA efforts.
l. Consider additional overlap with ECO and be sure to involve stakeholders in these discussions.

RESPONSES TO COMMISSION QUESTIONS

Below we provide responses to questions for which we have an opinion. Note that we do not respond to all questions posed by the Commission in the notice for comment for this filing.

Question 1. Should the Commission approve, reject, or modify CenterPoint Energy's 2023 Natural Gas Innovation Plan (2023 NGIA Plan)?

The CEOs recommend that the Commission modify the Company's 2023 NGIA plan, as specified in our Conclusions above.

Question 2. Should the Commission grant CenterPoint Energy's request to spend up to 25 percent more than budgeted for pilots with higher-than-expected expenditures without seeking additional approval from the Commission, provided the increase does not cause the plan, as a whole, to exceed its statutory cost cap or fail to satisfy any other statutory requirements?

The CEOs understand that there are often unexpected project increases for these resources, but we expect the Company to act prudently in avoiding those costs. The Commission shouldn't prohibit the Company from going over budget but should ensure that it acts prudently in its spending on approved NGIA pilots.

Question 4. Should the Commission approve CenterPoint Energy's proposed cost-effectiveness objectives?

The Company proposes specific objectives for each of the four categories identified in the Frameworks Order[229] (Perspectives, Environment, Socioeconomic and Innovation). We recommend that the Company modify its proposed Perspectives and Environment Objectives in Reply Comments in the ways described below.

[229] CenterPoint Initial Petition at 29.

The Company proposes three objectives under Perspectives:

- Overall GHG savings achieved by all approved pilots is achieved at a cost of no more than $200/MTCO$_2$e.
- 40% of residential units served by the Residential Deep Energy Retrofit and Electric Air Source Heat Pump pilots and the Weatherization Blitzes R&D pilot qualify as low-income, as that term is defined in CIP/ECO or are in a disadvantaged community, as that term is defined for the Inflation Reduction Act programs.
- Over the course of the five-year Plan, the Company supports the development of four new sources of low-carbon fuels produced in Minnesota. This may include one or more anaerobic digesters that produce RNG, projects that produce hydrogen via power-to-hydrogen, biogas projects, or projects that create ammonia via power-to-ammonia.

We recommend the Company modify the proposed Perspectives objectives in Reply Comments as follows:

- We appreciate the Company's effort to tie the second objective to the Justice40 goals. However, we see no reason to cap the percentage of residential units served by the Residential Deep Energy Retrofit and Electric Air Source Heat Pump project and Weatherization Blitzes at 40% and hope the Company would consider exceeding that percentage. Accordingly, we recommend the second objective under Perspectives should be modified to read "*At least* 40 percent of residential units served by the Residential Deep Energy Retrofit and Electric Air Source Heat Pump pilots and the Weatherization Blitzes R&D pilot qualify as low-income, as that term is defined in CIP/ECO or are located in a disadvantaged community, as that term is defined for the Inflation Reduction Act programs."
- The third objective under Perspectives should be removed. NGIA plans should not be evaluated based on the diversity or types of innovative resources they develop but rather the extent to which the innovative resources piloted succeed in meeting the GHG reduction objectives specified under Environment. The innovative resources that are the most scalable and effective at reaching GHG reduction targets are the ones that should be more broadly implemented.
- We recommend adding an objective specifying that all alternative fuel project(s) for commercial/industrial customers utilize the fuels on-site or nearby and that none of the alternative fuel projects involve blending alternative fuels into the distribution system.

The Company proposes five objectives under Environment:

- The Plan achieves overall lifetime GHG emissions reductions equivalent to 14% of emissions from the Company's 2020 sales.
- Over the five-year term of the plan, the Plan achieves annual, first-year GHG emissions reductions equal to 1% of emissions from the Company's 2020 sales.

- In year five of the Plan, the Company has reduced annual emissions from sales of natural gas by 53,000 metric tons as a result of low-carbon fuels included in the NGIA plan.
- To support the state's renewable energy goal, the Company procures 602,000 Dth of sales gas from renewable resources.
- To support the state's economy-wide net zero GHG emissions goal, the Company completes an analysis of pathways that would allow it to achieve net zero emissions by 2050. The Company anticipates satisfying this goal through the proposed R&D pilot, The CenterPoint Energy Minnesota Net Zero Study.

We recommend the Company modify the proposed Environment objectives in Reply Comments as follows:

The Company states it derived the 14% reduction in overall lifetime emissions figure from the weighted average cost per ton, using the utility cost test, of the RNG Produced from Hennepin County Organic Waste and the RNG Produced from Ramsey & Washington Counties Organic Waste Pilots. The Company argues it is appropriate to look towards these two pilots to develop this metric because the NGIA requires them to make significant investments in low-carbon fuels and provides additional budget for food-waste-derived RNG.[230] We disagree.

The percentage of GHG reductions specified in the first two objectives under Environment should consider the entire portfolio of pilots and should be tied to state GHG reduction goals rather than estimates from proposed RNG pilots. Minnesota statute now calls for a reduction of at least 50% in economy-wide emissions by 2030 and 100% by 2050, relative to a 2005 baseline of CO2-equivalent emissions.[231] The Company should be proposing an NGIA plan that would help them achieve these goals.

We recognize that the state goals are economy-wide and do not identify specific reduction targets for gas utilities. However, to the extent that any leeway is given to a particular sector for meeting the state GHG reduction targets, it should be reserved for end uses that are hard to decarbonize. Most gas end uses are amenable to electrification. The only gas end uses that are hard to decarbonize are industries requiring high process heat (cement, steel and chemicals). Therefore, any relaxation of the economy-wide emissions reduction targets for the Company should be proportional to the fraction of its sales that go to these industries. There is no compelling rationale for specifying a less aggressive reduction standard for other gas end uses because cost-effective technologies (i.e. electrification and energy efficiency) have already been identified for buildings and low-heat industries. We already know how to deploy these resources and should be rapidly and broadly implementing them to meet state GHG reduction targets. Indeed, it would not be unreasonable to argue that sectors such as buildings and low-heat industry that are not hard to decarbonize should strive for *steeper* reductions than identified in

[230] *Id.* at 30, note 56.

[231] Minn. Stat. § 216H.02, subd. 1.

statute in order to *make up for* the additional time that hard to decarbonize end uses will need to identify scalable and cost-effective decarbonization technologies.

The Company reports that its total emissions from natural gas supplied to sales-service customers, not including NGIA exempt customers, was 8.32 million metric tons CO2 equivalent emissions in 2020.[232] The Company's NGIA portfolio as currently proposed will reduce emissions by an estimated 0.30 metric tons CO2e over five years,[233] which corresponds to a 4% reduction relative to its 2020 emissions.[234]

Figure 1 below shows how the emission reductions that the Company estimates it will achieve over the course of its five-year plan (orange line) compare to what its emissions would need to be if it: (1) strictly adhered to state short- and long-term emission reduction targets (green line), or (2) followed an alternative, more moderate emission-reduction trajectory based on linear average annual reductions between its 2020 baseline and the net-zero-by-2050 state goal (blue line). To align with the state target of a 50% reduction by 2030 relative to our estimate of the Company's 2005 baseline,[235] the Company would need to aim for emission levels in 2030 of roughly 3.5 million metric tons, and levels in 2028 (the presumed end of the five-year plan) of 4.5 million metric tons. The moderate trajectory based on a simple linear trend for achieving the long-term net-zero-by-2050 goal would require the Company to achieve emission levels of no more than 6.1 million metric tons by 2028 (a 27% reduction in the Company's reported 2020 emissions), and levels of no more than 5.5 by 2030 (a 33% reduction in the Company's 2020 emissions).[236]

We recognize that the purpose of the NGIA is to produce learning that will inform broader implementation of emission reduction projects, and that the NGIA spending caps limit what the Company can accomplish over five years in terms of emission reductions. However, the limitations of what can be accomplished within NGIA do not obviate the

[232] CenterPoint Initial Petition at 8, note 15.

[233] CenterPoint Initial Petition, Exhibit D, GHG and Natural Gas Savings During Five-Year Plan provided for each Pilot.

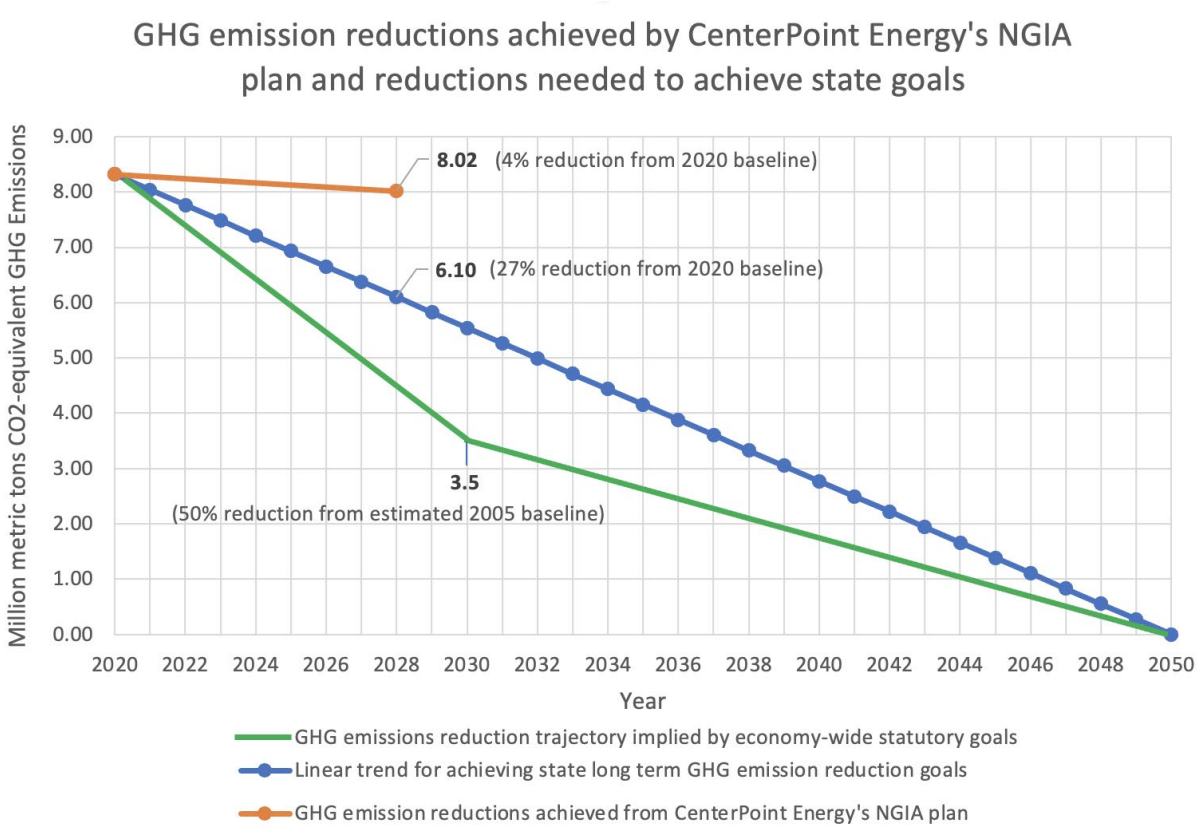
[234] Another way to approach these calculations would be to use estimated reductions in gas throughput. The Company's retail sales in the most recent year of available data (2022) were 140 million mcf (roughly equivalent to dth). The Company estimates combined gas savings across all pilots in its plan of 3 million dth over the 5-year plan, which is roughly 2% of its 2022 sales. To be on track to meet the net-zero-by-2050 goal, the Company will need to reduce its throughput to 100 dth by 2030, which corresponds to a 29% reduction relative to its 2022 baseline. The source for the Company's sales data is its 2022 Minnesota Natural Gas Annual Utility Information Report filed in Docket No. G999/M-23-19.

[235] We have requested the Company's 2005 baseline, but have not yet received it. We estimate it here as 7 million metric tons of CO2-equivalents emission, or 16% lower than the Company's 2020 emissions. We used a decrease of 16% to estimate the Company's 2005 emissions because this percentage corresponds to the change in natural gas emissions from buildings and industry between 2005 and 2020 (across all utilities), expressed as a percentage of 2020 emissions. We obtained the data needed to estimate this percentage from the Minnesota Pollution Control Agency at *Greenhouse Gas Emissions Data,* Minn. Pollution Control Agency, https://public.tableau.com/app/profile/mpca.data.services/viz/GHGemissioninventory/GHGsummarystory (last visited Jan. 12, 2024).

[236] See Attachment 2 - Moderate GHG Emission Reduction Goal Calculations.

need for the Company to align its investments and activities with state emission-reduction targets. Figure 1 illustrates how sizable the gap is between the Company's current emissions and where they need to be to achieve reductions commensurate with its fair share of the state emission-reduction goals. This strongly suggests that the Company's proposed Environmental objectives should be more ambitious, and underscores how critical it is for the Commission to evaluate the scalability and emission-reduction potential of each pilot in the Company's NGIA portfolio.

We recommend the Company replace the first and second objectives under Environment with a single objective that specifies the plan achieves or makes meaningful progress toward achieving Company-wide emission reductions of at least 27% by 2028, relative to the Company's 2020 baseline. The Company should modify its proposal to include pilots that will allow it to cost-effectively achieve this objective. Expensive pilots that will deliver only modest emissions reductions will not help the Company meet this objective.



NGIA plans should be evaluated with respect to whether they help Minnesota meet state GHG emission-reduction goals rather than the volumes of innovative low-carbon fuels consumed. Accordingly, we recommend the Company remove the third and fourth objectives under Environment.

The Company proposes that the test for an increase in funding in future years be the achievement of the majority of approved objectives. We recommend that this test be replaced with a test that assesses whether the plan achieves or makes meaningful

progress toward achieving Company-wide emission reductions of at least 27% by 2028, relative to the Company's 2020 baseline. If the Company is not able to achieve this objective through its NGIA pilots, it should be required to explain why. Whether the Company achieves most other objectives could be an additional consideration.

Question 5. Should the Commission grant CenterPoint Energy's request to increase the statutory budget cap for CenterPoint Energy's next NGIA plan, as permitted by Minn. Stat. § 216B.2427, subd. 3(c) & (d), under the condition that "a majority" of the approved cost-effectiveness objectives are achieved?

As mentioned in our comments on the Company's proposed cost-effectiveness objectives, we think whether most approved cost-effectiveness objectives are achieved could be an additional consideration for continued or expanded funding, but the main criterion for approving continued or expanded funding should be whether the plan achieves GHG reductions that align with state goals, as specified in the Environment objectives. As noted in our response to Question 4 above, we recommend that the Environment objectives proposed by the Company be modified to read that the Company achieves or makes meaningful progress toward achieving Company-wide emission reductions of at least 27% by 2028, relative to the Company's 2020 baseline.

Question 6. Should the Commission approve CenterPoint Energy's proposed plan for filing its annual status reports?

The CEOs support the Company's plan for filing annual status reports.

Question 7. Are there other issues or concerns related to this matter?

The CEOs have presented our primary concerns in these comments.

1. *Submission category:* **District Energy: Networked Geothermal**
2. *Respondent contact information* (alphabetical by organization)

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3. *Detailed description of proposed idea, project, or program*

RFI Respondents Fresh Energy, the Minnesota Center for Environmental Advocacy, Grid Catalyst, Darcy Solutions, and RMI (Respondents) request that CenterPoint pursue a district energy pilot(s) featuring a networked geothermal system, sometimes called a geo-grid or micro geo-district. Such a pilot would utilize a network of ground source heat pumps (GSHPs) to provide heating and cooling services to a diverse range of customers. Because a networked geothermal system utilizes thermal energy stored in the ground or shallow groundwater aquifers, such a system has the potential to operate at levels of efficiency, or coefficient of performance (COP), in the range of 5.0 and 6.0 for a street-level system.[1] This represents upwards of an 8x improvement over a typical gas-powered end use such as a furnace.

[1] Buro Happhold Engineering, prepared for HEET, Geo Micro District: Feasibility Study at 28–29, *available at* https://heet.org/wp-content/uploads/2019/11/HEET-BH-GeoMicroDistrict-Final-Report-v2.pdf.

Networked geothermal systems use the stable subsurface temperature of the ground and groundwater to provide space conditioning (heating and cooling) or other thermal processes.[2][3] There are a wide variety of possible configurations for geothermal ground/groundwater loops as well as a number of technology providers, including a number in Minnesota such as Darcy Solutions. A shared loop system involves a network of multiple buildings which may be able to exchange heat. For example, a shared loop could serve multiple single-family homes, a multi-unit dwelling, a commercial property with multiple businesses, a university campus, or mixed-used properties. Within these loops, energy in the form of heat can be exchanged to meet the needs of other buildings on the network. Waste heat from a refrigeration unit of a grocery store or from an ice rink, for example, could be transported to end-users that require heating of spaces or water. In addition, transferring heat from a medium with a much narrower temperature range found in the ground or groundwater (compared to the outside air) can provide operational and efficiency benefits. Together, a system with a diverse, managed load could reduce the thermal capacity and size needed compared to a stand-alone system or a conventional thermal system that is not networked.

The piping network, including boreholes, required for such a system could be installed in the existing utility right-of-way and may be suitable for a diverse range of host sites/neighborhoods. The network of pipes would be owned by the utility. This ownership model would not only align with the utility's traditional business model, it would reduce upfront costs to the building owner(s), which would in turn reduce a barrier to participation. In a Massachusetts regulatory filing, a representative of the utility National Grid stated that, [s]hared geothermal loops allow customers to heat their homes and businesses, which is the core service provided by the Company."[4] The representative went on to list the similarities between the traditional gas distribution system and a networked geothermal system: "significant upfront capital investments; the installation of underground piping and other infrastructure; and the monitoring and management of system conditions to ensure safety, performance, and reliability for the Company's customers and communities."[5]

CenterPoint, like other gas utilities across the country, is currently in the midst of an infrastructure replacement capital cycle that has driven rate cases over the past decade. As part of this integrity management work, CenterPoint has stated that it prioritizes replacement of the riskiest pipe material on its system, including the systematic replacement of bare steel mains, legacy steel mains, and legacy plastic mains. In Massachusetts, areas that contain "Leak Prone Pipe" (LPP) are under consideration for a networked geothermal project "as an alternative to replacement of the LPP."[6] Such an objective should be a consideration for CenterPoint as its integrity management work is set to continue into the future. Foregoing replacement of existing, leak-prone pipe by installing a networked geothermal system in its place could result in cost

[2] Boston Gas Company d/b/a National Grid, Geothermal District Energy Demonstration Program Filing Vol. I, Mass. D.P.U. Docket No. D.P.U. 21-24 at 12–13 (Feb. 18, 2021).
[3] Note that these are not true geothermal systems, as they rely upon heat in the ground/ground water that is generated via thermal radiation from the sun rather than geothermal radiation from the Earth's core, which require much deeper boreholes to access.
[4] *Id.* at 8.
[5] *Id.*
[6] *Id.* at 11.

efficiencies in addition to the greenhouse gas emissions (GHG) benefits that are the focus of the Natural Gas Innovation Act (NGIA).

"District Energy" is defined in NGIA as "a heating or cooling system that is solar thermal powered or that uses the constant temperature of the earth or underground aquifers as a thermal exchange medium to heat or cool multiple buildings connected through a piping network."[7] Under NGIA, CenterPoint is required to "include a pilot program to facilitate the development, expansion, or modification of district energy systems in Minnesota. This subdivision does not require the utility to propose, construct, maintain, or own district energy infrastructure."[8] Finally, a utility's annual costs related to district energy systems in NGIA may "represent no more than 20 percent of the total costs approved by the commission for recovery under the plan."[9] Capital costs in NGIA include "return of and on capital investments for . . . storage and distribution of innovative resources."[10] Considered together, the district energy-related provisions in NGIA clearly contemplate the sort of networked geothermal system advocated for here.

Respondents would like to highlight a recent pilot project put forward by National Grid in Massachusetts called the "Geothermal Project."[11] The National Grid pilot received support from advocates as well as the Massachusetts Attorney General's Office and the Massachusetts Department of Energy Resources. Under the proposal, which was approved by the Massachusetts DPU in December 2021, the Company would "install approximately four geothermal shared-loop systems serving 20-40 residential and/or commercial customers . . . ."[12] The National Grid pilot is projected to cost $15.6 million over five years, with $6.4 million in capital costs and $9.2 million in O&M expenses.[13] The Geothermal Project is directed at achievement of four goals:

1. Reducing emissions resulting from customer energy use;
2. Promoting non-pipe alternatives;
3. Encouraging the development of sustainable heating options; and
4. Developing new technologies to advance low-carbon heating solutions.[14]

These goals align with energy and climate goals in Minnesota broadly and with the goals of NGIA more specifically. In addition, National Grid's pilot will prioritize those sites that enable the evaluation of one or more of the following concepts:

1. Assessing the thermal performance and economics of shared loops serving a larger number of customers with more diverse load profiles that a project completed by its affiliate in New York (the KEDLI project);
2. Switching gas customers to geothermal energy as an alternative to LPP replacement;
3. Installing shared loops to manage local gas system constraints and peaks; and

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[7] MINN. STAT. § 216B.2427, subd. 1e (2021)
[8] MINN. STAT. § 216B.2427, subd. 9 (2021).
[9] MINN. STAT. § 216B.2427, subd. 2(d)(2) (2021).
[10] MINN. STAT. § 216B.2427, subd. 1(r) (2021).
[11] The Commonwealth of Massachusetts Department of Public Utilities, Order, *Petition of Boston Gas Company d/b/a National Grid for Approval of a Geothermal District Energy Demonstration Program*, Mass. D.P.U. Docket No. 21-24 (Dec. 15, 2021).
[12] *Id.* at 18.
[13] *Id.* at 4.
[14] *Id.* at 3.

4. Installing shared loops to lower operating costs and GHG emissions for low-income customers and environmental justice communities.[15]

The broader goals and the project-specific evaluation metrics directly relate to two important programmatic priorities for Minnesota: NGIA and in addressing the impact of increased spending on the distribution system due to integrity management programs. At scale, district geothermal systems could displace spending on the legacy distribution system while also maintaining or even increasing level of capital spending by a legacy gas utility. The tradeoff for ratepayers will be more reliable rates and the elimination of the fuel component of bills from legacy gas utilities.[16]

In addition, Respondents request that the Company prioritize under-resourced/environmental justice areas within its service territory with input from community members and representatives. Improvement of both indoor and outdoor air quality in these communities—in addition to the GHG emissions benefits and potential energy bill savings—would represent a win-win-win for communities across CenterPoint's service territory. Another Massachusetts gas utility, Eversource Gas, recently received approval for a $10.2 million, three-year project in a lower-income neighborhood in Framingham, Massachusetts.[17]

Networked geothermal systems have the potential to fundamentally alter the path towards decarbonization of the legacy gas system in a way that maintains and even strengthens gas utilities' relationships with customers. In addition, since the installation of a system is not tied to its proximity to an existing gas distribution and transmission infrastructure, it presents an opportunity for legacy gas utilities to expand into unserved areas of the state. This would be one form of infrastructure expansion that advocates like Fresh Energy and MCEA can support if potential future pilots demonstrate the kinds of and scale of benefits that are possible using this technology. At this early stage, however, respondents request that CenterPoint work with stakeholders to develop potential pilots that can work towards identifying the best and highest use case or cases for a networked geothermal system in Minnesota.

4. Estimated project timeline

The design, construction, and operation of a district geothermal could occur within the five-year timeline of an NGIA plan, including time to collect and analyze data from operation of the pilot or pilots. For reference, National Grid estimated that it is reasonable that a 100-ton system that could serve about 20 homes could be installed in less than 18 months "including customer

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[15] *Id*. at 3–4.

[16] Rate design will be an important aspect of such a program. National Grid's pilot includes a fixed, monthly, per-GSHP unit "participant fee" for residential ($150), low-income residential customers ($112.50), and C&I customers ($225). *Id.* at 5. These fees are based on approximately five percent of the costs of the geothermal system recovered over 24 months. The Company also supported an extension of that recovery period to 60 months, with corresponding reductions to these charges. In addition, National Grid pilot participants will be assessed a monthly fixed charge between three and four dollars to cover the existing gas fixed charges, which would approximate the customer charge under a wider-scale deployment scenario.

[17] Jeff. St. John, *A Net-Zero Future for Gas Utilities? Switching to Underground Thermal Networks*, Canary Media (Mar. 1, 2022), https://www.canarymedia.com/articles/utilities/a-net-zero-future-for-gas-utilities-switching-to-underground-thermal-networks.

recruitment, permitting, system design, installation, testing, and commissioning."[18] For larger systems of greater than 100 tons, National Grid extended the estimate to 24 months. It is also noted that some customers could be connected in less than 12 months. From a regulatory perspective, the Company committed to filing for review of an implementation plan within one year of regulatory approval, which occurred in December 2021. The Company received approval for a five-year study of its geothermal pilots.

5. *Organizations involved or suggested implementation partners*

Below is an incomplete list of potential partners, both in the regulatory phase and in the project implementation phase (with RFI respondents in **bold**).

<u>Advocacy/Policy</u>

- **Fresh Energy, MCEA, RMI**
- Labor unions

<u>Technology Experts</u>

- **Darcy Solutions**
- **Grid Catalyst**
- Ever-Green Energy
- Midwest Mechanical Solutions
- Salas O'Brien

<u>Potential Sites/Partners</u>

- Sabathani Community Center[19]

6. *Description of GHG reduction potential*
    a. Estimate of annual lifecycle GHG emissions reductions

Lifecycle GHG emissions from a district geothermal system would be primarily if not entirely related to the electricity used to power the heat pumps. Given the significant efficiencies that such a system could generate compared to a typical heating/cooling system, a reduction in total energy use (and thus GHG emission reductions) is expected, but further modeling is warranted to ensure that a pilot or pilots are designed to maximize GHG emissions reductions from the baseline. In addition, concurrent energy efficiency improvements/retrofits would further increase system efficiency/GHG reductions. Even though ground-source heat pump systems are more efficient than air-source heat pump systems, energy efficiency is still an important resource to pursue—the pursuit of energy-efficiency measures in conjunction with a ground-source system will help to ensure that backup heating sources do not need to be relied upon.

Below, we present a summary of feasibility and pilot studies conducted in other states and regions that have documented the potential for significant GHG emission reductions from networked geothermal systems.

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[18] Boston Gas Company d/b/a National Grid, Geothermal District Energy Demonstration Program Filing Vol. I, Mass. D.P.U. Docket No. D.P.U. 21-24 at 15 (Feb. 18, 2021).

[19] Fresh Energy and others have been involved in initial discussions with representatives from the Sabathani Community Center and understand that the group may be filing a more specific response to CenterPoint's RFI.

- BuroHappold Engineering Feasibility study conducted for HEET, Mass. This study sought to: (1) Identify GSHP systems suitable for street-scale heating and cooling in Massachusetts, (2) Determine the engineering feasibility and capacity of certain street-scale GSHP systems, and (3) Evaluate the economic viability of implementing a district- or street-scale GSHP systems as an alternative to natural gas. It pursued these objectives by evaluating the performance of GSHP systems in a range of building and site conditions. The study findings suggest that low-density residential and medium-density mixed-use neighborhoods could reduce GHG emissions from heating, cooling, and hot water use for a typical street segment by nearly 60 percent initially by switching geologic gas-powered furnaces and boilers to a GeoMicroDistrict system. Further, GeoMicroDistricts systems could reduce GHG emissions by more than 90 percent by 2050 (relative to gas systems) if the state implemented their utility-scale renewable energy targets.
- The New York State 2019 Geothermal Clean Energy Challenge, jointly developed by NYSERDA and NYPA, conducted a study to assess GHG reductions and savings of GSHP systems in 91 participating buildings and facilities across several industries (universities, schools, healthcare facilities and government organizations). The findings suggest that the GSHP systems generated GHG emission reductions of up to 9,800 metric tons annually (mean 790, range 48-9,800).
- A study of geothermal heating and cooling networks in Geneva, Switzerland, which examined the life-cycle environmental impacts of shallow to medium-depth systems, found that environmental impacts are lower when decentralized connected heat pumps are used, rather than traditional, centralized systems. Astu Sam Pratiwi , Evelina Trutnevyte. Life cycle assessment of shallow to medium-depth geothermal heating and cooling networks in the State of Geneva. Geothermics Volume 90, February 2021, 101988. https:s//doi.org/10.1016/j.geothermics.2020.101988.
- A study comparing the performance of GSHP systems to other heating and cooling systems in New Jersey used life-cycle assessment methods with system boundaries including drilling and installation of the borehole heat exchanger, the manufacturing and installation of the heat pump, the operation and maintenance of the system over the course of a 25-year lifetime, and the disposal of the system components. The findings suggest that GSHP systems produced fewer emissions over the course of one year than electric and oil systems (2.63E3 kg CO2 eq vs 9.57E3 and 3.46E4, respectively), but more than gas systems (1.17E4). The finding that GSHP systems produced more emissions than gas systems in New Jersey can be explained by the fact that GSHP require more electricity than gas systems and New Jersey's electricity generation mix is currently only 40% carbon-free. GSHP emissions will be lower in regions like Minnesota with electricity generation mixes more heavily weighted to carbon-free fuels. Minnesota's generation mix was 55% carbon-free in 2020.

7. *Description of estimated applicable costs and benefits*
    a. Total project cost; estimate separate capital and O&M costs as possible
        i. From BuroHappold Engineering Feasibility study conducted for HEET: "According to Massachusetts Clean Energy Center (MassCEC) data, the average cost of installing a vertical GCHP system in Massachusetts is approximately $13,000 per ton of heating capacity, about 45 percent higher

than the $9,000 per ton cost for a horizontal GCHP." (see Tables IV-1 and IV-2 in the report for installation, Table IV-3 for operation costs)

ii. A study comparing the performance of GSHP systems to other heating and cooling systems in New Jersey found that GSHP systems are expected to have significantly lower costs per year than electric, oil, and gas heating and cooling systems.

b. Expected cost to CenterPoint Energy

CenterPoint could design a pilot program in a similar manner to other utility pilots, it would incur both capital and expenses. For example, the National Grid pilots projects to spend approximately $15 million in both capital and operating expenses over the five-year period for four pilots.[20] This includes approximately $6.1 million in capital expenses and $8.8 million in operating expenses. Operating expenses include hiring two FTEs and the purchase of GSHPs for participating customers. The Company also projects to recover approximately $600,000 in participant fees over the pilot period. Additional budgetary detail can be found in the filing. Overall, these costs could be recovered via the cost recovery mechanisms provided in NGIA.

In addition to the regulatory cost recovery options, the Company could also seek to partner with private partners and/or seek federal, state, or local sources of funding. Respondents look forward to working with CenterPoint to identify potential partnerships and funding opportunities to supplement costs that could be incurred (and recovered) within NGIA.

c. Other available funding sources, if any

As stated above, there may be opportunities to receive an incentive from the electric utility; federal support in the form of an incentive of $0.60/sq ft that can typically be used or assigned to a service partner; and a 10 percent investment tax credit for commercial installations with taxable owners.

d. Energy and cost savings, other benefits

i. Energy and cost savings: Rates for GSHP systems can be lower and less variable than for geologic gas systems because they are highly efficient and only need to reflect the cost of installation and maintenance; there are no fuel-related costs (other than the electricity used to power the pumps and controls). Case studies from other states suggest GSHPs can generate annual savings ranging from $48,000 to greater than $2 million, depending on the characteristics of the project (see summary table below based on data included in BuroHappold Engineering Feasibility study conducted for HEET). A study conducted by the New York state Clean Energy Challenge, which assessed savings of GSHP systems in 91 participating buildings and facilities across several industries, found average annual energy bill savings of $0.445 per square foot and average annual operation and maintenance savings of up to $0.423 per square foot.

[20] Boston Gas Co., d/b/a National Grid, Exhibit FOH-5 Geothermal Program Budget, *Petition of Boston Gas Company d/b/a National Grid for Approval of a Geothermal District Energy Demonstration Program*, Mass. D.P.U. Docket No. 21-24 (Feb. 18, 2021).

ii. Improved public health and safety: GSHPs pose fewer safety risks because they rely on low-pressure, room temperature water rather than a combustible fuel to heat and cool buildings, and eliminate exposure to carbon monoxide leaks that can occur from faulty or improperly installed gas appliances.
iii. Potential for swifter and more just transition to carbon-free energy, especially if under-resourced communities' needs are prioritized in the development and implementation process.
iv. Smooth workforce transition with minimal retraining if as GSHP grids use similar permits, installation methods and materials to those used to install and repair geologic gas pipes.
v. Reduced electricity demand during seasonal peaks, which can in turn reduce power outages and costs. Demand smoothing benefits increase with the size and diversity of the grid.
vi. Balancing and optimization potential.
vii. Improved reliability in gas-constrained areas

e. *Impact for CenterPoint Energy and State of Minnesota* (including opportunities to scale up and reproduce the proposed solution and the overall potential impact in terms of economic, environmental, and social benefits)

As noted throughout the response, networked geothermal systems have tremendous potential in Minnesota across a variety of use cases and for a diverse set of stakeholders, including the utility, under-resourced communities, residential and commercial customers, local geothermal providers, labor unions, the state and local governments, and those interested in decarbonizing the gas system.

For the utility, networked geothermal systems would enable a legacy gas utility to continue its business model of installing and managing a complex network of pipes that deliver thermal and other services to end-use customers. Networked geothermal unlocks the potential to transform the gas utility business model and opportunities to expand to areas that are too uneconomic to provide service to today, since service would be untethered from close proximity to an interstate pipeline and the legacy gas distribution system. CenterPoint's longstanding relationship with its customers would be maintained and enhanced with the provision of a new way to provide safe, reliable energy services to homes and businesses.

For under-resourced communities, networked geothermal systems would improve local air quality and thus health outcomes for residents. A more stable source of heating and cooling should reduce the energy burden and keep buildings more comfortable. Networked geothermal systems would also empower communities to make energy decisions that suit the community and its needs while strengthening the relationship with CenterPoint. Similar benefits would accrue to all customers who participate in a pilot or future larger-scale rollout.

Local networked geothermal providers would have the opportunity to partner with legacy gas utilities to implement their systems and evolve the technology and service in partnership with he utility. These local companies would provide an economic boost to the state, including jobs and tax revenue, and could make Minnesota a national hub for network geothermal systems. In a similar manner, local labor unions could see a boost via the expansion into construction of networked

geothermal systems. There could be funding opportunities to re-tool the workforce as well in a way that builds upon the traditional skills and methods that are employed by laborers today.

Finally, units of government at the state, local, and county level will benefit by achieving GHG reduction goals, empowering their communities, building a local labor force, and strengthening the relationship to the legacy gas utilities. Networked geothermal systems could be deployed throughout the state and respondents encourage additional research into the feasibility and scope of this deployment. As an initial estimate, Darcy Solutions, which utilizes the thermal properties of groundwater in a closed-loop system, estimates that there is a 90 percent availability of potential groundwater sources in two-thirds of groundwater provinces (as defined by DNR) throughout the state.[21]

f. Commercialization strategy, if applicable

In addition to the potential scaling of networked geothermal discussed throughout, the pilot or pilots could also enable CenterPoint to explore and establish models for management and operation of these systems. For example, the pilots could be deployed to generate learnings regarding customer service agreements and the relationship to the traditional utility service obligation. The pilots could also explore different third-party ownership and/or management models. Exploration of these variables now could help CenterPoint determine how best to expand the services it provides in the future (and which services may be better served by a third party). This will put the utility at an advantage as the regulatory and technological marketplace evolves over time.

8. *Supplemental category-specific information*
    a. *Specific projects developing district energy (consistent with the description above) in place of geologic gas heating, in CenterPoint Energy's Minnesota service territory, or studies evaluating the feasibility of specific projects.*

- Towerside project, project, and the Hillcrest/Heights project in MN.
- Winneshiek Energy District was commissioned to do a study on the West Union system which informs most of this websites content: Green Up West Union – Community Energy Opportunities!
- Ball State University Geothermal: Case Studies: ERIT: Environmental Resilience Institute Part of the Prepared for Environmental Change Grand Challenge: Indiana University (iu.edu), Geothermal Energy System | Ball State University (bsu.edu)
- Carleton College Utility Master Plan
- Eversource pilot in MA (Geothermal Pilot Program (eversource.com)).
- NY: Community Heat Pump Systems Projects - NYSERDA
- National Grid pilot in MA (five-year geothermal energy demonstration project)

b. Programs, systems, services, research & development efforts, or other ideas that would encourage district energy (consistent with the description above) in place of geologic gas heating, in CenterPoint Energy's Minnesota service territory.
c. Supplemental information to include in your submission document, if available:

[21] MN Dept. of Natural Resources, Minnesota groundwater provinces 2021, https://www.dnr.state.mn.us/groundwater/provinces/index.html.

i. For submissions proposing development of specific district energy projects, please provide the following information, if possible:
    1. System capacity
    2. Detailed description of proposed district energy system design
    3. Project location
    4. Estimated energy savings and GHG emissions reductions

See the detailed estimates/feasibility studies cited throughout.

A table summarizing the characteristics and outcomes of the 6 case studies summarized in BuroHappold Engineering Feasibility study conducted for HEET

Massachusetts GCHP case study characteristics and outcomes						
	Stockton University	West Union District System	Furman University	Ball State University	South Caribou Recreation Centre	Alexandria District Energy Utility
Project type	Retrofit	Retrofit	Retrofit	Retrofit	New construction and Retrofit	New construction and Retrofit
System type	Vertical	Vertical	Vertical	Vertical	Horizontal	Vertical
System capacity	1,741 tons	264 tons		152 MBtu per hour heating (~12,600 heating tons); 10,000 cooling tons	88 tons, refrigeration heat pumps (hockey and curling arena); 24 tons, heating and cooling (offices, change rooms, lobby, etc.)	5.8 MW heating, 7.6 MW cooling
Size	480,000 square feet (classrooms, offices, labs)	330,000 square feet	10 student housing buildings	5.5 million square feet	56,400 square feet	1.7 million square feet
Installation cost	$5.1 million (without rebates and incentives); $2,929 per ton	$8.7 million ($2.3 million for GCHP system), $32,955 per ton	$4.9 million	$82.9 million, $6,579 per heating ton	$868,000 (including incentive), $7,750 per ton; $105,000 (horizontal GCHP	

					only), $4,375 per ton	
O&M cost			$17,000 per year			
Estimated Savings	$400,000 per year (O&M savings)		$55,000 per year	$2.2 million per year	$48,000 per year	
Estimated Payback	6 years		20 years		2 years; 3 years without incentives	20 years (8.27 percent IRR)
GHG reductions	17 percent reduction since installation		600 metric tons of CO2e annually	85,000 tons of carbon dioxide emissions annually		2,482 tons of CO2e by the end of 2017
Source: BuroHappold Engineering Feasibility study conducted for HEET						

Moderate GHG Emission Reduction Goal Calculations		
Calendar year	Metric tons CO2e	% Reduction from 2021 baseline
2020	8,317,369*	0%
2021	8,040,123	3%
2022	7,762,878	7%
2023	7,485,632	10%
2024	7,208,386	13%
2025	6,931,141	17%
2026	6,653,895	20%
2027	6,376,650	23%
2028	**6,099,404**	**27%**
2029	5,822,158	30%
2030	5,544,913	33%
2031	5,267,667	37%
2032	4,990,421	40%
2033	4,713,176	43%
2034	4,435,930	47%
2035	4,158,684	50%
2036	3,881,439	53%
2037	3,604,193	57%
2038	3,326,948	60%
2039	3,049,702	63%
2040	2,772,456	67%
2041	2,495,211	70%
2042	2,217,965	73%
2043	1,940,719	77%
2044	1,663,474	80%
2045	1,386,228	83%
2046	1,108,983	87%
2047	831,737	90%
2048	554,491	93%
2049	277,246	97%
2050	0	100%

***** Source: CenterPoint Energy 2020 emissions reported in Initial Petition at note 15.