March 18, 2022

Mark D. Marini, Secretary
Department of Public Utilities
One South Station, 5th Floor
Boston, MA 02110

Re: Investigation by the Department on its own Motion into the role of LDCs as the Commonwealth achieves its target 2050 climate goals, D.P.U. 20-80
Fitchburg Gas & Electric Company d/b/a Unitil – *Net Zero Enablement Plan*

Dear Secretary Marini,

Fitchburg Gas and Electric Light Company d/b/a Unitil's (the "Company") is pleased to present its Net Zero Enablement Plan to the Massachusetts Department of Public Utilities (the "Department") in support of the Commonwealth's 2050 climate goals. As discussed throughout the Company's plan, the Company, and its parent (Unitil Corporation) fully embrace the imperative to achieve net-zero emissions by 2050.

This proceeding is an important first step in establishing the regulatory framework necessary to support and advance the Commonwealth's policies and objectives. The Company appreciates the valuable input from stakeholders that have informed its plan and looks forward to continued efforts with the Department and other interested stakeholders to create a workable regulatory framework that appropriately balances the interests of multiple constituent groups, maintains just and reasonable rates, and serves the public interest.

Please do not hesitate to contact me should you have any questions regarding the enclosed materials.

Thank you for your attention to this matter.

Sincerely,

Matthew C. Campbell

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The Role of Gas Distribution Companies in Achieving the Commonwealth's Climate Goals:

Net Zero Enablement Plan

D.P.U. 20-80

March 18, 2022

Unitil

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I. Introduction and Executive Summary

Fitchburg Gas and Electric Light Company d/b/a Unitil ("FG&E" or the "Company")[1] is pleased to present its Initial Transition Plan ("Transition Plan") to the Massachusetts Department of Public Utilities (the "D.P.U.", or the "Department") in support of the Commonwealth's 2050 climate goals. As discussed throughout this report, the Company, and its parent (Unitil Corporation), fully embrace the imperative to achieve net-zero emissions by 2050. To that end, in June 2021, Unitil Corporation announced its intention to do so. That objective, and Unitil's strategic approach to achieving it, are fully discussed in Unitil Corporation's *2021 Corporate Sustainability and Responsibility Report*.[2]

FG&E recognizes that the transition required to realize the Commonwealth's environmental objectives will be complex and long-lived, and appreciates that in enabling that transition the Department must address multiple stakeholders' interests. The proposals contained in the Company's Transition Plan are intended to provide a portfolio of approaches that support the Department's difficult task: they focus on realizing the Commonwealth's goals; acknowledge the uncertainties inherent in long-term energy transition pathways; respect customers' interest in energy reliability, affordability, and equity; and recognize FG&E's unique operating circumstances. FG&E looks forward to working with the Department and interested stakeholder groups as we collectively work through the energy transition.

A. Overview

On October 29, 2020, the Department issued an order opening an investigation ("D.P.U. 20-80") to "examine the role of Massachusetts gas Local Distribution Companies ("LDCs") in helping the Commonwealth achieve its 2050 climate goals"[3] of net-zero greenhouse gas ("GHG") emissions[4] and to "explore strategies to enable the Commonwealth to move into its net zero GHG emissions energy future while simultaneously safeguarding ratepayer interests; ensuring safe, reliable and cost-effective natural gas service; and potentially recasting the role of LDCs in the Commonwealth."[5] In support of this investigation, the Department directed the LDCs[6] to issue a joint Request for Proposals ("RFP") for an independent consultant to: (i) review the 2050 Decarbonization Roadmap work product ("Roadmap") developed by the Executive Office of Energy and Environmental Affairs ("EEA"); (ii) identify additional strategies or pathways not included in the Roadmap; and (iii) perform a study of each LDC that analyzes the feasibility of all pathways.[7] As a result of the RFP process, the LDCs retained Energy and Environmental

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1 Please note, certain figures and tables throughout this report refer to FG&E as Unitil.

2 See https://unitil.com/reports/2021-Sustainability-Report/

3 Vote and Order Opening Investigation, D.P.U. 20-80, at 1 (October 29, 2020).

4 The Commonwealth's climate goals of net-zero GHG emissions by 2050, with interim goals of GHG emissions reductions of 50% by 2030 and 75% by 2040 compared to 1990 levels, were signed into law in March 2021 by Governor Charlie Baker in Senate Bill 9: An Act Creating a Next Generation Roadmap for Massachusetts Climate Policy.

5 Vote and Order Opening Investigation, D.P.U. 20-80, at 1 (October 29, 2020).

6 The term LDCs refers collectively to the five Massachusetts LDCs: The Berkshire Gas Company ("Berkshire"); NSTAR Gas Company and Eversource Gas Company of Massachusetts, each d/b/a Eversource Energy ("Eversource"); Liberty Utilities (New England Gas Company) Corp. d/b/a Liberty (which, as of January 1, 2021, includes the gas distribution assets of the former Blackstone Gas Company); Boston Gas Company (and the former Colonial Gas Company) d/b/a National Grid ("National Grid"); and Fitchburg Gas and Electric Light Company d/b/a Unitil.

7 Vote and Order Opening Investigation, D.P.U. 20-80, at 4-5 (October 29, 2020).

Economics, Inc. ("E3") and ScottMadden, Inc. ("ScottMadden") (collectively "the Consultants") to perform the requested study and to prepare a report (the "Consultant Report")[8] on or before March 18, 2022.[9]

As explained in the Consultant Report, the study's objective is to provide an independent analysis of various economy-wide pathways to achieve the Commonwealth's climate goals, and includes:

- Identifying decarbonization pathways in support of Massachusetts' net zero commitment;
- Identifying and quantifying implications of these pathways for the Commonwealth, the LDCs, and their customers; and
- Identifying potential policies and regulatory strategies to support the transition within the pathways.

In addition to the Consultant Report, the Department directed each LDC to submit individual reports with recommendations and plans supporting the Commonwealth's 2050 climate goals.[10]

Consistent with the Department's direction, the Consultant Report presents eight decarbonization pathways, all of which achieve 90% gross GHG reductions and net zero GHGs by 2050 compared to 1990 levels, and meet the interim statutory GHG reduction goals of 50% by 2030 and 75% by 2040 (see Figure 1, below). The Company's Transition Plan provides a series of proposals to meet those goals in the context of the decarbonization pathways.

[8] The term Consultant Report refers collectively to the two reports prepared by the Consultants. The Consultant Report includes a Technical Analysis of Decarbonization Pathways Report ("Decarbonization Pathways Report") and Considerations and Alternatives for Regulatory Design to Support Transition Plans ("Regulatory Designs Report").

[9] Joint Motion for Extension of Time, D.P.U. 20-80, February 10, 2022, at 3.

[10] The Department stated: "On or before March 1, 2022, we direct each LDC to submit a proposal to the Department that includes the LDC's recommendations and plans for helping the Commonwealth achieve its 2050 climate goals, supported by the [Consultant] Report. With their proposals, the LDCs must submit the Report, analysis, and supporting data to the Department for review." Vote and Order Opening Investigation, D.P.U. 20-80, at 6 (October 29, 2020).

Figure 1: Summary of Decarbonization Pathways in Consultant Report[11]

DECARBONIZATION PATHWAY	DESCRIPTION
High Electrification *Inspired by Roadmap "All Options" Scenario*	Building sector electrifies >90% of buildings, primarily through the adoption of Air Source Heat Pumps.
Low Electrification *Inspired by Roadmap "Pipeline Gas" Scenario*	Building sector electrifies 65% of buildings through the adoption of ASHPs; gas customer count declines by 40% compared to today.
Interim 2030 CECP *Inspired by 2020 version of Interim 2030 CECP*	Building sector electrifies in an accelerated pace following goals outlined in the Interim 2030 CECP.
100% Gas Decommissioning *Stakeholder proposed*	Building & Industrial sectors fully electrify by 2050. +/- 25% of the building sector converts to networked geothermal systems.
Targeted Electrification *Stakeholder & LDC proposed*	>90% of buildings are electrified through a combination of technologies. LDC customers converting to ASHPs do so in a "targeted" approach.
Networked Geothermal *Stakeholder & LDC proposed*	LDCs evolve their business model and convert +/- 25% of the building sector to networked geothermal systems. Remaining gas customers use renewable gas as their main source of heating by 2050.
Hybrid Electrification *Stakeholder & LDC proposed*	>90% of buildings electrify through ASHPs paired with renewable gas back-up (hybrid heat pumps) that supply heating in cold hours of the year.
Efficient Gas Equipment *Stakeholder & LDC proposed*	Building sector largely adopts high efficiency gas appliances, supplied by a combination of renewable gases by 2050. The industrial sector converts to dedicated hydrogen pipelines.

The Consultant Report emphasizes that the pathways are not mutually exclusive and "[a] portfolio of measures that achieves the Commonwealth's decarbonization goals may include aspects of *multiple pathways*, as well as other strategies that may emerge in the coming decades."[12] FG&E therefore developed a combination of decarbonization strategies by evaluating the pathways identified in the Consultant Report, and applying an analytical framework addressing two fundamental components: (1) FG&E's core objectives and guiding principles; and (2) FG&E's unique situation and characteristics. As show in Figure 2 below (and as discussed more fully later in this report), each component includes several factors that the Company weighed in developing its proposals and recommendations.

[11] Decarbonization Pathways Report at 31.
[12] Decarbonization Pathways Report at 27.

Figure 2: Summary Analytical Framework

CORE OBJECTIVES AND GUIDING PRINCIPLES	FG&E UNIQUE SITUATION AND CIRCUMSTANCES
Objectives: • Safe, Reliable, and Cost-Effective Service • Affordability and Equity • Financial Integrity **Principles:** • No/Low-Regret Strategies • Customer Choice • Optionality; and Reliable Measurement to Track Progress	• Small combination utility with overlapping service territories (provides electricity to 90% of gas customers) • 59% of homes with fuel oil, propane, or electric resistance space heating • Older housing stock with high proportion of low-income and EJ populations • Customer average energy burden greater than state-wide average • Low population growth, high proportion of pipeline-based supply resources, and high share of gas supply by retail marketers • Available electric system capacity

Applying the above framework, the Company identified a portfolio of decarbonization strategies intended to produce meaningful reductions to GHG emissions, both in the near-term and in the long-run. As shown in Figure 3 below, those strategies may be grouped into five general categories: (1) Enhancing Energy Efficiency; (2) Decarbonizing the Gas Supply; (3) Developing and Deploying Programs to Support Electrification; (4) Managing Embedded Infrastructure Costs; and (5) Addressing Affordability and Rate Equity.

Figure 3: Summary of FG&E's Decarbonization Strategies

FG&E also has proposed several regulatory initiatives supporting its decarbonization strategies, including those outlined in the Net Zero Enablement Plan Model Tariff ("Model Tariff") developed in collaboration with the other LDCs. The Model Tariff has been provided along with the concurrently filed LDC Common Regulatory Framework and Overview of Net Zero Enablement Plans (the "Regulatory Framework").

B. Unitil Corporation's Commitment to Sustainability

Unitil Corporation's mission is to safely and reliably deliver energy services to its customers and provide the communities it serves with affordable and sustainable energy solutions. Because Unitil Corporation has embedded sustainability into its strategic decision-making process, lowering GHGs is central to its vision and operating philosophy. The sustainability priorities arising from those strategies include carbon reduction; electrification opportunities; advancing the electric grid; proactive energy resource planning, including utility-scale renewable energy and low carbon sources of renewable natural gas; and environmental stewardship:

- The transportation sector represents about half the GHG emissions in the region served by Unitil, and accordingly, reducing emissions in this sector is a key focus for Unitil Corporation. In both New Hampshire and Massachusetts, Unitil Corporation's wholly owned electric utility operating subsidiaries have filed proposed Time of Use rate schedules and plans to accelerate the adoption of electric vehicles ("EVs") through investment in both public and in-home EV charging infrastructure.

- In Massachusetts, FG&E is piloting utility-scale battery storage, which is designed to support overall system efficiency, reduce peak loading on substation equipment, and provide voltage and frequency regulation to the market.
- FG&E has entered into long-term renewable energy contracts pursuant to the Massachusetts Green Communities Act, and once the projects for approved contracts are constructed, the energy purchased through these contracts will exceed the Company's Massachusetts electric load obligation. In 2021, the three Massachusetts Electric Distribution Companies, including FG&E, issued a third solicitation for offshore wind and negotiations are underway for additional long-term contracts.
- Between 2010 and 2021, FG&E replaced or retired over 50 miles of leak-prone pipe on its natural gas distribution system in Massachusetts. And in Maine, Unitil piloted a technique to capture and recompress the methane in 1.14 miles of eight-inch, depressurized pipeline—methane that, in the past, would have been released into the atmosphere.
- In 2021, Unitil purchased two hybrid line bucket trucks that eliminate the need for idling during hydraulic operations. Unitil Corporation also purchased 13 hybrid pickup trucks and is assessing the feasibility of retrofitting existing vehicles for hybrid and electric vehicle technology, replacing existing gasoline-powered vehicles, and transitioning to alternative fuels, including compressed natural gas.
- Over the past decade, FG&E, along with its fellow Massachusetts utilities, has implemented nation-leading energy efficiency programs designed to lower energy consumption and empower customers to manage their gas and electric energy use. In 2020, Unitil received an EnergyStar Partner of the Year Award for Sustained Excellence in Energy Efficiency Program Delivery in Massachusetts and New Hampshire. The most recently approved three-year energy efficiency plan in Massachusetts (the 2022-2024 Three-Year Plan) builds upon a legacy of demonstrated success and continues to deliver innovative, affordable programs that help customers lower their energy use and energy bills. Importantly, the 2022-2024 Plan will reduce an unprecedented amount of GHG emissions, helping the Commonwealth meet its long-term climate commitments.

C. Regulatory Context and Standards of Review

Although FG&E is a distinctly small contributor to overall GHG emissions levels in the Commonwealth and in the U.S.,[13] the Company understands that a statewide transition is necessary to deliver meaningful reductions in the use of fossil fuels to achieve the mandated GHG limit. A just and reasonable energy transition that serves the public interest can be achieved if the regulatory environment remains supportive, is based on sound economic principles, and provides a high degree of clarity as to the manner in which utilities will be regulated during the transition and beyond. Planning for this transition is a complex, long-term, and evolving undertaking and this proceeding is an important first step in establishing the regulatory framework necessary to support and advance the Commonwealth's policies and objectives. As noted earlier, the Company looks forward to continued efforts with the Department and other interested stakeholders to create a workable regulatory framework that appropriately balances the interests of multiple constituent groups, maintains just and reasonable rates, and serves the public interest.

The historically constructive regulatory environment in Massachusetts, including the stability and predictability associated with the rate structures approved by the Department, have supported the

[13] See Section III.E.

Company's ability to invest in the long-lived assets needed to provide customers with safe and reliable energy service for over a century.[14] The capital-intensive nature of utility operations, the regulatory obligation to serve, and the commitment to provide safe and reliable service have required FG&E's continuing investment in long-lived infrastructure assets.[15] Because they provide essential services, utilities do not have the option to defer critical investments as other companies might. In large measure, that lack of options forms the basis of the regulatory compact in which utilities, including FG&E, accept the obligation to serve in exchange for the opportunity to earn a reasonable return on, and the return of, their prudent investments.[16]

Now, the energy sector in the Commonwealth is poised to undergo a profound transition, driven largely by policy changes designed to combat climate change, but also by new and evolving energy technologies. The nature of utility assets and operations in general, together with the Company's unique circumstances, the uncertain ability of FG&E's customers to adopt electrification and efficiency measures absent high levels of support,[17] and the uncertainties inherent in long-term energy transition pathways emphasize the need for supportive, efficient, and constructive regulatory solutions throughout the transition process.

The Department has not stated the standards it will apply to its review of the regulatory strategies proposed by the LDCs in this proceeding. In the near term, many regulatory proposals may fit into existing ratemaking structures with well-established standards of review. As the transition unfolds, however, it will be necessary to track progress toward decarbonization through new reporting standards, and to explore and develop new ratemaking structures, such as the Model Tariff jointly proposed by the LDCs in this proceeding. Throughout that transition, there are fundamental regulatory principles that should

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[14] Fitchburg Gas Company was chartered in 1852 and changed its name to Fitchburg Gas and Electric Light Company in 1895; and in 1989, a shell organization was organized to transform Fitchburg Gas and Electric Light Company into a wholly owned subsidiary of Unitil Corporation. See Department of Public Utilities, Corporate History of Gas and Electric Utilities in Commonwealth of Massachusetts, at 10 (November 2021).

[15] See Vote and Order Opening Investigation, D.P.U. 20-80, at 4 (October 29, 2020) ("For all identified pathways, the Department will endeavor to determine whether and how the LDCs can implement each pathway in a cost-effective way with a continued focus on safe and reliable service to their ratepayers."); NSTAR Gas Company d/b/a Eversource Energy, D.P.U. 19-120, at 59 (2020) (highlighting the Department's traditional goals of safe, reliable, and least-cost energy); Report to the Legislature Re: Maintenance and Repair Standards for Distribution Systems of Investor-Owned Gas and Electric Distribution Companies, D.P.U. 08-78, at 4 (2009) (The Department's comprehensive oversight powers are to ensure reliable and safe services by gas and electric distribution companies to the public).

[16] See, Bonbright, James C., Albert L. Danielsen, and David R. Kamerschen, *Principles of Public Utility Rates* 198-209 (1988) (2nd Ed.); Phillips, Charles F. Jr., The Regulation of Public Utilities 21 (1993) (3rd Ed.); See also Boston Edison Company, D.P.U. 906 (1982), 1982 MASS. PUC LEXIS 7, *58 (Mass. D.P.U. April 30, 1982) ("[T]he service obligation, regulatory price control, and the support obligation are the essential components that underlie the regulatory compact which public law and policy have created between consumers and utility investors.").

[17] See Decarbonization Pathways Report at 15-16. "Consumers are at the center of Massachusetts' decarbonization goals because their decisions about when and how to adopt electrification and efficiency measures affects the nature, scale, and magnitude of electric and gas system transformations. Pathways that achieve rapid electrification in particular imply high levels of customer support, including financial incentives to reduce upfront capital costs…"

weigh heavily in the Department's review of proposed structures, chief among them that the proposals are in the public interest,[18] and the resulting rates are just and reasonable.[19]

To be sure, the public has an interest in just and reasonable rates, those that are neither excessive nor confiscatory. At the same time, the public has an interest in financially stable utilities, with earnings and cash flows sufficient to maintain and support their financial integrity, and to attract the capital needed to finance their service obligations. Absent regulatory support and stability, uncertainty grows and investors become increasingly reluctant to commit capital, at least not without increasing the returns they require. If the Department were to deviate from the long-standing just and reasonable, and public interest standards, it would increase regulatory uncertainty and diminish utilities' credit profile. In that case, the ability to efficiently fund both existing obligations and those required by the transition strategies will be undermined.

That concern is particularly acute in this proceeding, where all identified decarbonization pathways depend on utilities' ability to enter into long-term contracts required to cost-effectively finance the renewable energy projects enabling broad electrification.[20] A utility's rates are just and reasonable when those rates afford the company the opportunity to meet its cost of service, including a fair and reasonable return on prudently invested capital, but no more.[21] In that important respect, supportive and constructive regulation is essential to the Commonwealth's decarbonization objectives – absent that support, the ability to efficiently finance the projects enabling the decarbonization pathways becomes increasingly strained.[22] In short, regulatory policies or structures that would impair creditworthiness would frustrate the Commonwealth's environmental policy objectives.

The public interest also requires that all customers have access to reasonably affordable energy at just and reasonable rates. The principle of just and reasonable rates insists that lower-income customers are not unduly burdened with transition costs.[23] The Department has long held that rate structure changes should be made in a predictable and gradual manner, allowing ratepayers reasonable time to adjust their consumption patterns, and avoiding rate shock.[24] These important principles, which should continue to be applied in the evaluation of proposed regulatory frameworks, are highly relevant in FG&E's service

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18 Attorney General v. Dep't of Telecomm. & Energy, 438 Mass. 256, 268 (2002).

19 Attorney General v. Dep't of Telecomm. & Energy, 438 Mass. 256, 264 n.13 (2002); Attorney General v. Dep't of Pub. Utils., 392 Mass. 262, 265 (1984); New England Gas Co., D.P.U. 10-114, at 22 (2011).

20 See Decarbonization Pathways Report at 11-16, 60-63, 83-87. See also Section 83C of Chapter 188 of the Acts of 2016.

21 Town of Hingham v. Dep't of Telecomm. & Energy, 433 Mass. 198, 203 (2001); New England Telephone and Telegraph Co. v. Dep't of Pub. Utils., 371 Mass. 67, 73 (1976).

22 See Berkshire Gas Company, D.T.E. 03-89, at 31 (2004) ("[a] weaker financial condition may result in a higher cost of capital required to fulfill the Company's financial obligations."); Order on (1) Motion for Reconsideration File by Bay State Gas Company, d/b/a Columbia Gas of Massachusetts and (2) Refund of Tax Savings Accrued from January 1, 2008 through June 20, 2018, D.P.U. 18-15-F (2019)(noting that a credit downgrade could ultimately harm ratepayers).

23 As discussed in Section III, FG&E's customers already have the highest energy burden in the Commonwealth.

24 NSTAR Electric Company and Western Massachusetts Electric Company, each d/b/a Eversource Energy, D.P.U. 17-05-B, at 5-6 (2018).

territory, which has a high proportion of low income households, and the highest concentration of Environmental Justice ("EJ") populations and communities[25] of the Massachusetts LDCs.[26]

The Department also has held that under the just and reasonable standard, one class should not suffer while another gains.[27] In this proceeding, FG&E believes "classes" reach beyond rate classes to the constituent groups that will benefit from strategies intended to "enable the Commonwealth to move into its net zero GHG emissions energy future." That is, the Commonwealth's environmental policies and the Department's regulatory initiatives are aimed at benefiting the Commonwealth in general, not LDC customers in particular. To the extent burdens should follow benefits, the allocation of costs incurred to meet the Commonwealth's policy objectives may go beyond traditional cost of service ratemaking. FG&E submits that such untraditional approaches may be the most equitable way to "[safeguard] ratepayer interests".

The Department therefore must balance the interests of multiple constituent groups when it determines whether rates are just and reasonable—customers' interests in being charged reasonable rates for safe and reliable service, the interests of utility investors in being fairly compensated for the use of their capital, the interest of the Commonwealth in achieving its environmental objectives, the interests of employees in safe, stable work environments, and the interest of communities in economic development opportunities.[28] As discussed throughout this report, those policy considerations factor into and support FG&E's decarbonization strategy recommendations.

The Company's recommendations also are supported by the analytical framework and conclusions set forth in the Consultant Report:

> Balancing across many considerations, decarbonization pathways that strategically use the state's gas infrastructure alongside and in support of electrification are likely to carry lower levels of challenge. A coordinated gas and electric decarbonization strategy, utilizing a diverse set of technologies and strategies, is likely to be better able to manage the costs and feasibility risks of decarbonization than scenarios that rely more heavily on single technologies or strategies.[29]
>
> The regulatory designs in this [Regulatory Designs Report] are meant to support the achievement of a coordinated decarbonization strategy, as discussed in the D.P.U. 20-80 . . . Decarbonization Pathways [report]. This approach is in recognition that there are substantial uncertainties with respect to the course of decarbonization at this

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25 EEA established an EJ Policy to "help address the disproportionate share of environmental burdens experienced by lower-income people and communities of color who, at the same time, often lack environmental assets in their neighborhoods." EJ populations are "those segments of the population that EEA has determined to be most at risk of being unaware of or unable to participate in environmental decision-making or to gain access to state environmental resources, or are especially vulnerable." EEA, EJ Policy at 6 (June 24, 2021). See, also, https://www.mass.gov/environmental-justice.

26 Decarbonization Pathways Report at 42, Table 9.

27 See NSTAR Elec. Co., D.P.U. 17-05-B, (Jan. 5, 2018) (determining that the goals of designing utility rate structures include, among other things, ensuring fairness between rate classes).

28 In Re New England Tel. & Tel. Co., D.P.U. 94-50, at 188 (May 12, 1995).

29 Decarbonization Pathways Report at 19.

> stage and that the Department and LDCs will need to maintain flexibility and optionality in the face of that uncertainty.[30]

To summarize, during this transition, with its inherent uncertainty and significant implications for multiple stakeholder groups, the Department should evaluate strategies and regulatory proposals through the lens of the public interest standard, and the principle of just and reasonable rates. Doing so will help ensure the Commonwealth's climate objectives are achieved in a cost-effective, equitable manner for all stakeholders.

D. Approach and Analytical Framework

The Company appreciates that throughout the transition, it will have a continuing obligation to provide safe, reliable, and cost-effective service,[31] while supporting the Department's obligation to advance the Commonwealth's climate goals. Recognizing the importance of the regulatory framework and considerations discussed above, the Company's decarbonization strategies and regulatory proposals are informed by three objectives and three guiding principles (shown in Table 1 below):

[30] Regulatory Designs Report at 8.

[31] Notably, the Department has recently reiterated that the "Company's duty to provide service to customers should not jeopardize reliability by focusing exclusively on least-cost supplies" and further concluded that "Unitil should continue its current practice of balancing both reliability and financial benefits for its customers." See Fitchburg Gas and Electric Light Company d/b/a Unitil, D.P.U. 21-10, at 35 (2022).

Table 1: FG&E Objectives and Guiding Principles

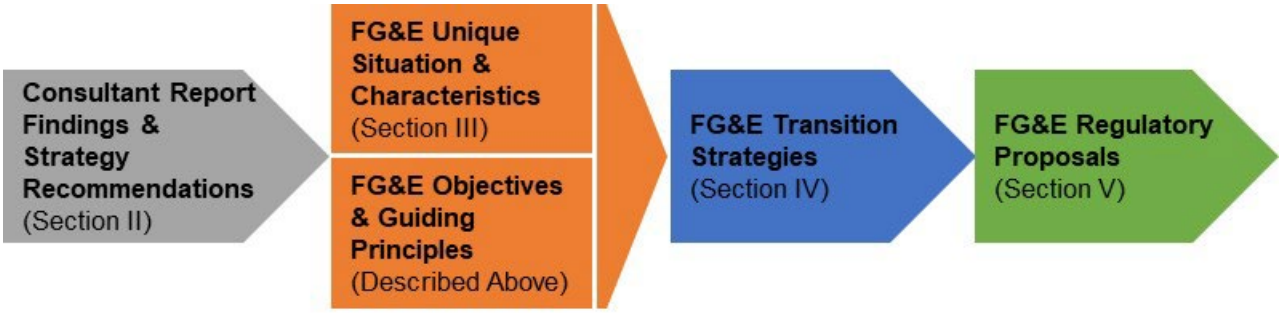
CORE OBJECTIVES	
Safe, Reliable, and Cost-effective Service	The Massachusetts regulatory framework in place for decades is designed to ensure that customers receive safe, reliable, and cost-effective service from their utility provider. These considerations have been and continue to be paramount to FG&E. Accordingly, the Company's strategies must ensure that customers continue to receive safe, reliable, and cost-effective energy service.
Affordability and Equity	Energy is a basic necessity and there are significant practical consequences of high energy burdens for income-limited residents. This is highly relevant in FG&E's service territory, which has a high proportion of low income and EJ populations. The Company's strategies must be in the public interest, result in just and reasonable rates, ensure customers have access to affordable energy service, and lower-income customers are not unduly burdened with transition costs.
Financial Integrity	Decarbonization pathways depend heavily on utilities' ability to cost-effectively finance energy projects. Supportive and constructive regulation therefore is essential to achieve the Commonwealth's decarbonization objectives—absent that support, the ability to efficiently finance ongoing utility service and the projects enabling the decarbonization pathways becomes increasingly strained.
GUIDING PRINCIPLES TO SUPPORT CLIMATE GOALS	
No/Low-regret Strategies	Pursue no/low regrets approaches that contribute to reductions in GHG emissions and preserve the ability/option to modify strategies in the future as the pathway scenarios unfold and technological innovation and markets evolve
Customer Choice and Optionality	Offer customers multiple options to enhance choice and diversify reliance on any single strategy
Reliable Measurement to Track Progress	Reliable measurement of GHG emissions is essential to inform planning and to assess progress

Consistent with those objectives and guiding principles, the Company's strategies include certain immediate and actionable steps it will undertake to support the Commonwealth's climate objectives. As the Company moves through that process, new information will come available that may affect future decisions. Implementing the strategy therefore involves a sequence of decisions, some in the near-term, and some that may be deferred, based on the level of forward-looking uncertainty. The regulatory approach should be developed based on the same principles - there are some actions that may be taken in the near-term, and others that may be deferred until further information becomes available and

uncertainty is resolved.[32] The Company's strategies provide the strategic and operating flexibility to modify regulatory proposals in response to changing circumstances and new information throughout the the transition. That flexibility is to the benefit of all stakeholders.

The remaining sections of the Report are organized based on the framework the Company applied to develop its decarbonization strategies and regulatory proposals to help the Commonwealth achieve its 2050 climate goals. Figure 4 is a summary of the Company's approach, with more detail provided below.

Figure 4: FG&E's Framework for Developing Transition Proposals



- Consultant Report Findings and Strategy Recommendations: Section II provides a review of the commonalities and "no/low-regret" strategies across the decarbonization pathways, as well as the recommendations for near-term actions outlined in the Consultant Report.
- FG&E's Unique Situation and Characteristics: Section III provides a situational analysis of the attributes and metrics that distinguish the Company from other LDCs in the Commonwealth, and summarizes the opportunities and challenges associated with those attributes.
- FG&E Transition Strategies: Based on the Company's objectives and guiding principles, and supported by the Consultant Report Findings and Strategy Recommendations (Section II) and the FG&E situational analysis (Section III), Section IV identifies and outlines the Company's proposed strategies supporting the Commonwealth's climate goals.
- FG&E Regulatory Proposals: Section V summarizes the regulatory proposals supporting the Company's strategies identified in Section IV, and outlines the regulatory framework supporting the transition to the Commonwealth's net-zero GHG emissions energy future.

E. Summary of FG&E's Transition Strategies and Recommendations

Based on the analyses and recommendations outlined in the Consultant Report, and considering its unique service territory, customer attributes, objectives, and guiding principles, the Company provides

[32] See Massachusetts Electric Company and Nantucket Electric Company, d/b/a National Grid, Fitchburg Gas and Electric Light Company d/b/a Unitil, and NSTAR Electric Company and Western Massachusetts Electric Company, each d/b/a Eversource Energy, D.P.U. 15-120; D.P.U. 15-121; D.P.U. 15-122, at 107-108 (2018) ("With preauthorization of investments in a multi-year grid modernization investment plan, it is important to provide the Companies with a certain level of flexibility to deviate from their projections to respond to changes that inevitably will take place over the term of the plan. In the early stages of grid modernization, it is reasonable to expect that significant changes will take place associated with, among the things, the introduction of new technologies and the costs of new and existing technologies. In addition, it is reasonable to expect that the Companies' understanding of how best to deploy grid modernization technologies to optimize their performance will evolve considerably over a five-year period.") (citations omitted).

the following proposed strategies and regulatory structures supporting the transition to the Commonwealth's net-zero GHG emissions energy future.

1. **Enhance Energy Efficiency (i.e., Reduce Demand for Energy)**

    a. Building Shell Efficiency: Expand energy efficiency programs to reduce heat lost to the environment and thus reduce fuel demands for space heating.
    b. Expand Building Electrification Opportunities: Promote adoption of high efficiency electrification equipment, such as air source heat pumps, among customers.
    c. Customer Education: Customer decisions will drive the pace and scope of transition. Therefore, customer education, awareness and marketing campaigns, as well as participant incentives will be critical components of this effort.

2. **Decrease the Carbon Content of the Gas Supply Portfolio**

    a. Procure and Distribute Renewable Gas, which consists of two proposals:

        i. Incorporate Portfolio Standards for Certified Natural Gas ("Certified Gas")[33] and biomethane (or renewable natural gas ("RNG")): In its next Forecast and Supply Plan ("F&SP"), the Company will outline volumetric targets for purchasing Certified Gas and biomethane supplies. The Company anticipates these volumetric targets will increase over time and will be capped at a certain cost threshold.

        ii. Establish a Voluntary Renewable Gas Tariff: The Company will file a new tariff that provides customers the choice of purchasing renewable gas supplies and related products, such as carbon offsets and Certified Gas. This will be designed as an opt-in program requiring customers to make an affirmative election to participate.

3. **Develop and Deploy Programs to Support Electrification and Decarbonization**

    a. Develop Hybrid Heating System Programs: Develop a hybrid heating program with a strategic focus on managing winter peak demand. The proposed program would include:

        i. Customer incentives enabling electric utilities to manage winter peak demands by switching customer heating systems from electric to gas during peak periods.

        ii. Processes for coordinated planning, operations and investment by gas LDCs and electric utilities, including inter-company payments by electric utilities to gas LDCs for peaking capacity, similar to payments under electric demand response programs.

        iii. Electric and gas rate structures that establish price signals associated with the demand and cost characteristics of hybrid heating systems.

    b. Monitor Networked Geothermal Pilot Programs and Other Opportunities: Research and evaluate the feasibility of a pilot project in portions of the Company's service area that may support conditions for a networked geothermal system. The Company's evaluation will include:

[33] Regulatory Designs Report at 25-26. "[C]ertified [N]atural [G]as . . . reduces upstream emissions from the production of natural gas. Importantly, upstream natural gas emissions are not included in the Massachusetts GHG inventory, but Certified Gas measures can nonetheless reduce the overall environmental impact of natural gas use, even as its use declines." Id. at 28-29.

i. Reviewing and monitoring the networked geothermal pilot programs undertaken by Eversource and National Grid to evaluate the benefits and costs of networked geothermal systems; and

ii. Monitoring community and customer interest and soliciting stakeholder feedback. In addition, the Company proposes to monitor opportunities related to other innovative electrification and decarbonized gas technologies, such as carbon capture technology, hydrogen blending into the gas stream, and gas heat pumps.

4. Manage Embedded Infrastructure Costs

a. Manage Embedded Gas Infrastructure Costs: Establish a systematic process to review and pre-approve plans for certain capital investments; review and revise the standards for investments to serve new customers. The Company also proposes to review cost recovery and rate structures that optimize benefits and costs across gas and electric systems. Recognizing the overarching concern of customer affordability, the Company proposes to evaluate an accelerated depreciation method to better align cost recovery of its embedded gas infrastructure costs and gas system utilization during the transition period.

5. Address Customer Affordability and Rate Equity Implications of the Transition

a. Manage Customer Affordability and Rate Equity Implications: Evaluate strategies that look beyond the remaining LDC customers for cost recovery of the transition costs, because: (i) the benefits of the Commonwealth's decarbonization policies should inform the allocation of costs incurred to achieve those benefits; and (ii) customer affordability challenges in the Company's service area is a critical element of determining just and reasonable rates. Consistent with those points, the Company further proposes to re-evaluate the discounts provided to low-income customers, which would require funding through alternative sources and mechanisms.[34]

In addition to the five strategies described above, the Company proposes (in conjunction with the other LDCs) to establish a schedule for periodic filings to the Department as outlined in the Regulatory Framework. Specifically, on a triennial basis the Company will file a forward-looking plan using five- and ten-year planning horizons to allow for review, evaluation of progress, plan updates and proposed modifications to the LDCs' plans, as warranted or appropriate. The Company anticipates its forward-looking plans will include multiple elements, including customer data, emissions calculations, infrastructure details, rates and bill impacts, and effects on EJ communities. In this regard, the Company plans to expand its data collection capabilities to allow for more accurate estimation of customer-specific emissions. The Company also proposes to provide emissions tracking tools to its customers. These initiatives will provide a meaningful baseline for future emissions reductions plans and reporting.

[34] See Regulatory Designs Report at 22-23, "Periodic monitoring and evaluation of key metrics is needed to ensure that required regulatory changes can be implemented in a timely fashion to mitigate these affordability and equity concerns with a particular focus on low-income and EJ communities." Id. at 47.

II. Consultant Report Findings and Strategy Recommendations

As directed by the Department, FG&E's Transition Plan builds on the recommendations and findings from the Consultant Report. This section (i) summarizes the various decarbonization pathways analyzed by the Consultants and the associated results; (ii) highlights the implications of the decarbonization pathways on the LDCs; (iii) reviews the commonalities and "no/low-regret" strategies[35] across the decarbonization pathways; and (iv) summarizes the recommendations for near-term actions outlined in the Consultant Report.

A. Decarbonization Pathways and Results

The Consultant Report identifies and analyzes eight decarbonization pathways, and a Reference (or business as usual) case. All modeled pathways (except the Reference case) achieve the Commonwealth's climate target of net zero GHG emissions by 2050, and interim emissions reduction goals of 50% by 2030 and 75% by 2040 (compared to 1990 levels). Figure 3 below provides a summary of key gas sector effects and implications across the pathways.

[35] The Company uses the term "no/low regrets" to describe those strategies that are likely to be common to all pathways, regardless of the outcome. Because they are expected to persist across all pathways, there are "no/low regrets" to applying them early in the transition process.

Figure 5: Summary of Changes in Gas System across Decarbonization Scenarios[36]

[1]Expressed as gas plus geothermal system rate base assuming optimistic cost reductions & optimistic geothermal costs.
[2]Scenarios with lowest gas system utilization bear the risk of ending up with embedded system costs that can no longer be recovered.
[3]100% Decommissioning pathway shows Revenue Requirement if costs are shared over all geothermal customers (bottom), versus if costs are shared over gas customers only (top).

As shown in Figure 5 (above), there are wide ranges of outcomes across the pathways, including significant differences in natural gas throughput, the number of gas customers served, embedded system costs, revenue requirements, and use of decarbonized fuels. Those factors combine to affect the projected level of system utilization. Pathways with lower levels of gas system utilization (i.e., the High Electrification, 2030 CECP, and 100% Gas Decommissioning pathways) require greater degrees of change relative to the Reference case; those with higher gas system utilization (i.e., the Efficient Gas, and Hybrid Electrification pathways) require less.

Each pathway reflects assumptions regarding fundamental factors (e.g., pace and magnitude of renewable generation and associated electric transmission and distribution construction, and the availability of renewable gas) that are beyond the LDCs' control. Many of those assumptions are foundational requirements for electrification strategies and as such, any delay, modification, or change to

[36] Decarbonization Pathways Report at 15, Figure 3.

them will affect the modelled results. That inherent uncertainty requires an approach that maintains and preserves the option to modify strategies as conditions evolve, and leverages multiple strategies.

B. Utility Metrics and Strategy Observations

In addition to modeling and analyzing the various pathways across numerous quantitative and qualitative factors, the Consultant Report compares the LDCs across characteristics and metrics organized into the following four categories: service area, demographics, LDC statistics, and LDC system. Table 2 below provides a summary of those metrics and their implications for transition strategy development.

Table 2: Summary of LDC Metrics and Strategy Implications from Consultant Report[37]

CATEGORY	METRIC	IMPLICATIONS FOR STRATEGY DEVELOPMENT
Service Area	Number of natural gas customers	National Grid and Eversource are the largest LDCs in terms of effect on the Commonwealth's climate goals
	Gas and electric utility service area overlap	Inter-fuel planning (i.e., across electricity and natural gas) likely will require the participation of multiple utilities, increasing the complexity and time required for planning (including regulatory submissions and benefit/cost sharing)
Demographics	Home heating fuels used by the residential sector for space heating	Building sector decarbonization and space heating electrification programs must address the significant market share of natural gas and fuel oil, and consumer fuel preferences
	Population growth	LDCs with limited population growth should develop decarbonization programs that focus primarily on existing customers
	Age and type of housing	The diversity of housing stock will inform decarbonization programs offered by each LDC, and the implementation approaches for those programs
	Income distribution	Income distribution may indicate the extent to which LDCs should develop low-income decarbonization programs whose costs are socialized across a broad base
	EJ population	Each LDC will need to develop and craft decarbonization strategies that are tailored to its specific EJ population
LDC Statistics	Gas revenues and volumes by customer segment	Utilities with a higher share of harder-to-electrify customer segments, including certain industrial and large commercial customers may need to emphasize hybrid and renewable gas strategies. LDCs with a significant level of transportation volume may need to implement programs that encourage, or set metrics for, renewable gas deliveries by third-party marketers
LDC System	Utility gas plant and system density	Should the utilization of LDC distribution infrastructure decline as a result of electrification programs, the remaining natural gas customers, absent any regulatory policy changes, will see higher volumetric rates and customer bill impacts associated with the cost recovery of the LDCs' investments LDC service areas with higher density may be harder to cost-effectively electrify given the challenges associated with neighborhood-scale/group adoption dynamics and siting electric network infrastructure

C. Consultant Report Strategies and Regulatory Proposals

As summarized in Figure 1, the Consultant Report describes multiple pathways to achieve the Commonwealth's climate goals. Although each pathway is distinct, there are several decarbonization strategies common among them:

[37] Decarbonization Pathways Report at 38-46.

1. Energy efficiency: Most pathways assume an expansion of energy efficiency programs, such as building retrofits, envelope efficiency, and energy efficient equipment, especially for all-electric buildings or buildings using large amounts of decarbonized fuels. These measures reduce demands on the electric system, and the need to purchase renewable gas for harder-to-electrify equipment.

2. Deployment of technologies for electrification and decarbonization: Most pathways assume existing fuel-based heating customers will adopt electrification, including heat pumps, hybrid heat systems, and networked geothermal systems. LDC strategies to achieve the assumed adoption levels include promoting, piloting, and deploying electrification and decarbonized technologies and evaluating emerging technologies, such as hydrogen-ready equipment and customer-site carbon capture.

3. Supply and procurement of renewable gas: Most pathways assume an increasing level of blending of renewable gas in the gas system. Pathways generally assume that by 2030, 5% to 10% of the LDCs' fuel supply will be renewable gas and that by 2050, renewable gas will be a large portion of system deliveries. LDC strategies to achieve the assumed blending levels include developing renewable gas procurement strategies, investigating hydrogen blending, and participating in research and development ("R&D") opportunities to develop and commercialize synthetic natural gas ("SNG").

Beyond those common strategies, the Consultant Report recommends deploying a broad range of decarbonization solutions to balance the costs and risks of meeting the Commonwealth's climate goals, noting that customer costs and energy bills must be managed to ensure affordability and equity. The report states that under all scenarios, regulatory support will be required:

> The regulatory designs in this [Regulatory Designs Report] are meant to support the achievement of a coordinated decarbonization strategy, as discussed in the D.P.U. 20-80 Decarbonization Pathways Report. This approach is in recognition that there are substantial uncertainties with respect to the course of decarbonization at this stage and that the Department and LDCs will need to maintain flexibility and optionality in the face of that uncertainty.[38]

Lastly, the Consultant Report finds decarbonization pathways that strategically use the Commonwealth's gas infrastructure alongside, and in support of, electrification are likely to face lower levels of both feasibility risk, and cost risk.[39]

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[38] Regulatory Designs Report at 8.

[39] As the Consultant Report states: "Balancing across many considerations, decarbonization pathways that strategically use the state's gas infrastructure alongside and in support of electrification are likely to carry lower levels of challenge. A coordinated gas and electric decarbonization strategy, utilizing a diverse set of technologies and strategies, is likely to be better able to manage the costs and feasibility risks of decarbonization than scenarios that rely more heavily on single technologies or strategies." Decarbonization Pathways Report at 19.

III. FG&E's Unique Situation and Characteristics

The Company's transition strategies are informed by its unique service territory and customer attributes.[40] To assess those factors, FG&E applied a framework consistent with the Consultant Report, which analyzed (by municipality, where available) four sets of fundamental operating characteristics, including the nature of its service area; customer demographics; demand and supply-related metrics; and system operating characteristics.[41] Beyond those measures, FG&E considered its emissions contributions, its electric system capacity (as it is a combination gas/electric utility), and its financial profile, including its ability to fund the financial obligations required by the pathways and transition strategies. As discussed throughout the balance of this report, those factors, including customers' economic circumstances and their ability to absorb additional costs introduced by the pathways, create considerations and constraints that the transition and regulatory strategies must address.

A. Service Area Characteristics

To assess its Service Area characteristics, FG&E considered the following information:

- Gas and electric utilities: The Company's natural gas service area, and the primary electricity service provider in that area;
- Gas and electric customers: The number and nature of gas and electric customers by municipality; and
- Home heating fuel: The market share of fuels (e.g., natural gas, fuel oil, electricity) used by the residential sector for space heating across the Company's service area by total occupied housing units, owner-occupied units, and tenant-occupied units.

FG&E provides service to approximately 16,000 natural gas customers and 30,000 electricity customers in north central Massachusetts,[42] representing only 1% of the Commonwealth's electric and gas utility customers.[43] The Company provides serves the cities of Fitchburg and Gardner, and the towns of Townsend, Ashby, Lunenburg,[44] and Westminster (see Figure 6, below).

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40 As recognized by the Department, "Each LDC is distinct and has different capabilities and limitations within its own service territory." Vote and Order Opening Investigation, D.P.U. 20-80, at 4 (October 29, 2020).

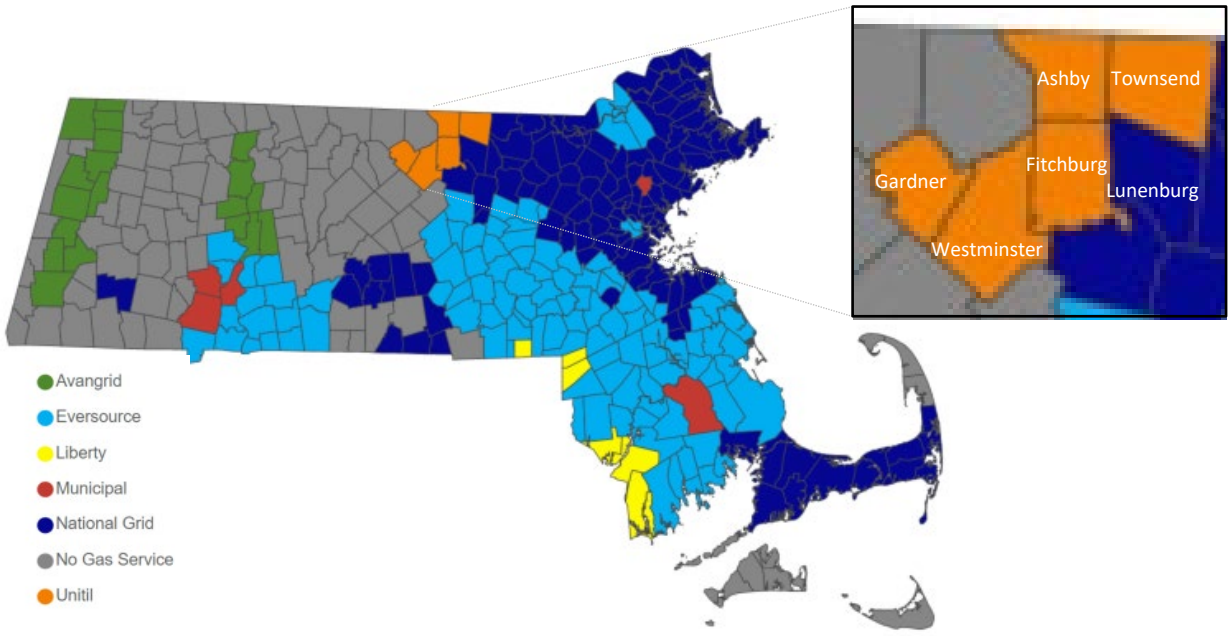
41 Decarbonization Pathways Report at 38-46.

42 In total, Unitil Corporation provides electricity and natural gas distribution service to over 194,000 customers in Massachusetts, New Hampshire, and Maine through its three wholly owned subsidiaries: FG&E; Unitil Energy Systems, Inc., which provides electric service to approximately 78,000 customers in New Hampshire; and Northern Utilities, Inc., which provides natural gas service to approximately 70,000 customers in New Hampshire and Maine. See Unitil Corporation, U.S. SEC Form 10-K for the fiscal year ended December 31, 2021, at 3.

43 Source: U.S. Energy Information Administration ("EIA"), annual company level data from Form EIA-176 (2020) and annual electric utility data from EIA-861 (2020). Customer totals include gas and electric customers for investor-owned utilities and municipally-owned companies. Combined, the two largest utilities in Massachusetts, National Grid and Eversource serve approximately 90% of the state customer totals.

44 While FG&E has over 300 gas customers in Lunenburg, National Grid serves over 800 gas customers in Lunenburg and is considered the primary gas utility in that municipality (as shown in Figure 6). Thus, the values for FG&E/Unitil, which are asterisked (*) in the figures and tables throughout Section III of this report, indicate that values for Lunenburg (which have two asterisks (**) in the figures and tables) were excluded from the Company total.

Figure 6: FG&E Natural Gas Service Area[45]



Of the six municipalities in its natural gas service area, FG&E is the primary electric utility in four (Fitchburg, Townsend, Ashby, and Lunenburg), and National Grid is the primary electric utility in the remaining two (Gardner and Westminster). Consequently (and as shown in Table 3), nearly 90% of FG&E's gas customers also are FG&E electric customers.[46] That high degree of overlap provides significant opportunities to identify and deliver integrated decarbonization strategies, optimizing the use of the Company's gas and electric systems during the transition.

45 Source: Consultant Report, at 22 modified to illustrate FG&E's service area.

46 Notably, as discussed in the Consultant Report, the Company has the highest shared gas/electric services compared to the other combination utilities in Massachusetts (i.e., approximately 48% for Eversource and 39% for National Grid). See Decarbonization Pathways Report at 40, Table 7.

Table 3: FG&E Gas and Electricity Customers by Municipality[47]

MUNICIPALITY	PRIMARY GAS (G)/ ELEC. (E)	2020 GAS CUSTOMERS BY ELECTRICITY PROVIDER		% OF TOTAL GAS CUSTOMERS	2020 ELECTRICITY CUSTOMERS	% OF TOTAL ELECTRICITY CUSTOMERS
		FG&E	National Grid			
Fitchburg	G / E	11,817	-	73%	19,266	65%
Townsend	G / E	1,810	-	11%	3,982	13%
Gardner	G	-	1,566	10%	-	n/a
Westminster	G	-	500	3%	-	n/a
Lunenburg	E	322	-	2%	5,195	17%
Ashby	G / E	155	-	1%	1,409	5%
Total		**14,104**	**2,066**	**100%**	**29,852**	**100%**
% of Total		**87%**	**13%**			

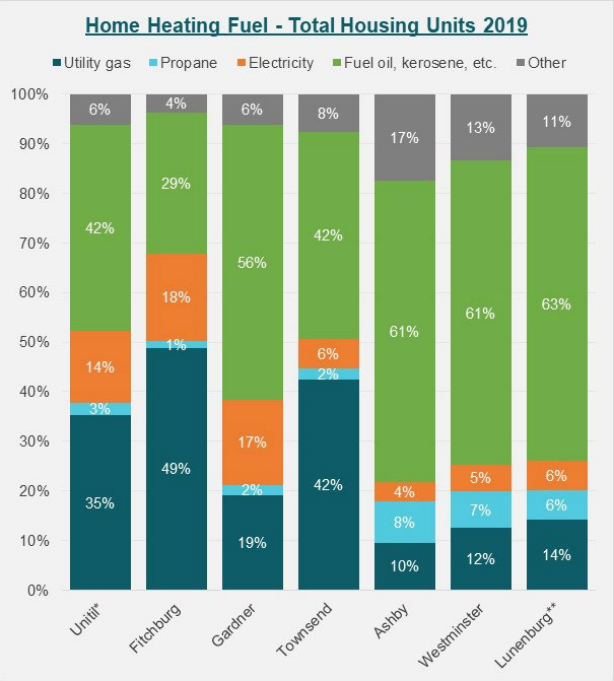
Turning to residential space heating by fuel type, fuel oil is the predominant source (approximately 42%) in the Company's service area, followed by natural gas (approximately 35%),[48] and electricity (approximately 14%).[49] Figure 7 below provides home heating fuel market share by source for the Company's service area, and each municipality within the service area.

[47] Source: FG&E, LDC and Electric Utility Annual Reports to the Massachusetts D.P.U. (2020). Values assume that FG&E's gas customers receive electricity service from the primary electric utility designated for each municipality, which may not reflect actual service.

[48] As discussed in the Consultant Report, the Company has the lowest proportion of housing units in its service area with natural gas space heating. The natural gas market share for the other Massachusetts LDCs ranges from approximately 42% to 64%, while the fuel oil market share ranges from approximately 20% to 32%. See Consultant Report, Appendix 3, at 8.

[49] Notably, these heating systems are predominantly electric resistance heat.

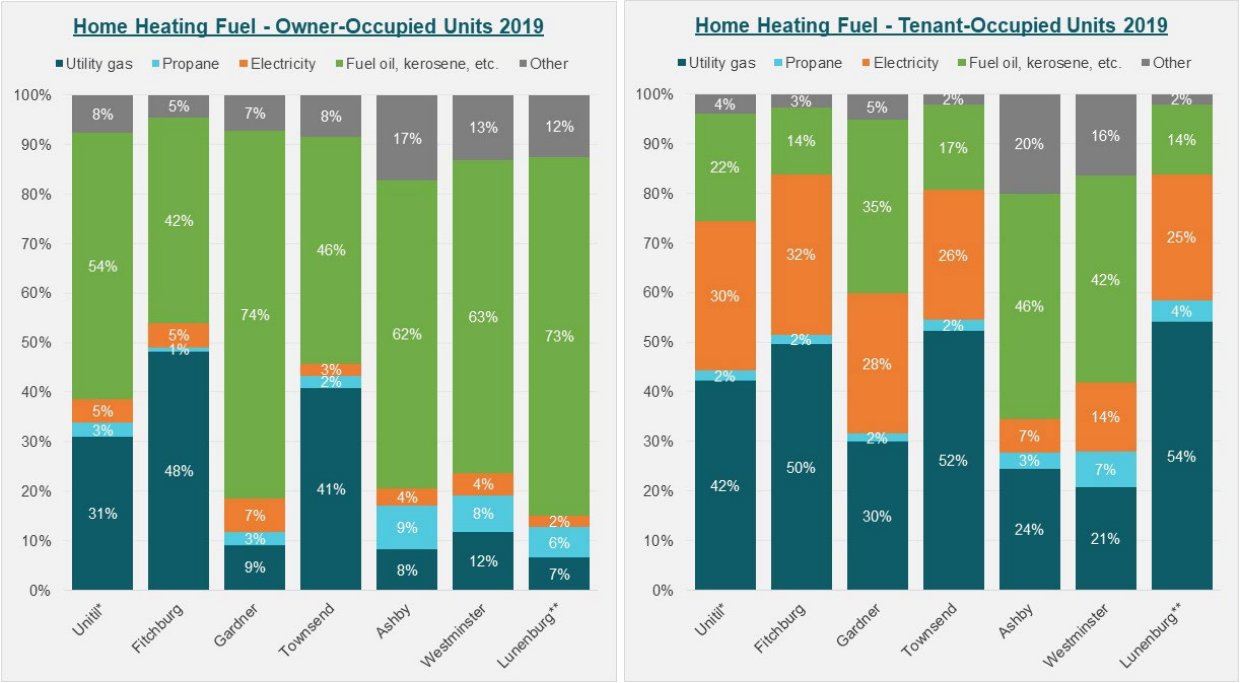
Figure 7: FG&E Home Heating Fuel for Total Occupied Housing Units by Municipality[50]



There are distinct differences in home heating fuel use across owner-occupied and tenant-occupied homes in the Company's service area (see Figure 8 below). In Fitchburg, natural gas is used for home heating in approximately 50% of both owner-occupied and tenant-occupied units; fuel oil accounts for approximately 42% of owner-occupied homes but only 14% of tenant-occupied homes. In a similar vein, electricity is used in approximately 32% of tenant-occupied homes, but only 5% of owner-occupied homes.

[50] Source: U.S. Census, American Community Survey (2019).

Figure 8: FG&E Home Heating Fuel for Owner-Occupied and Tenant-Occupied Units by Municipality[51]



That diversity in home heating fuels across occupancy structures creates strategic opportunities for electrification strategies. For example, the market share of electricity in the tenant-occupied housing sector may provide the ability to replace electric resistance heating with heat pump technology,[52] reducing energy requirements and carbon emissions, lowering customer costs, and providing the option to add more efficient air conditioning.

B. Demographics

The Company reviewed measures of demographic data within its service territory, including:

1. Age and type of housing: Housing stock, including owner- or tenant-occupied units, vintage or age of housing units, and number of units per structure;
2. Household Income: Household income distribution by municipality, gas and electric rates and relative energy burden; and
3. EJ population: Income, minority population, English isolation, and certain combinations of those metrics.

1. Housing Stock

There are two demographically distinct sets of municipalities in the Company's service area: (1) the cities of Fitchburg and Gardner; and (2) the towns of Townsend, Ashby, Lunenburg, and Westminster. Together, Fitchburg and Gardner have the highest number of housing units (26,000) and the highest proportion of tenant-occupied units (over 40%). In contrast, Townsend, Ashby, Westminster, and Lunenburg together

[51] Source: U.S. Census, American Community Survey (2019).

[52] Notably, certain stakeholders in this proceeding, such as National Consumer Law Center and Low-Income Energy Affordability Network, have discussed the opportunity for conversions of electric resistance, oil, and propane heating systems to heat pump technology.

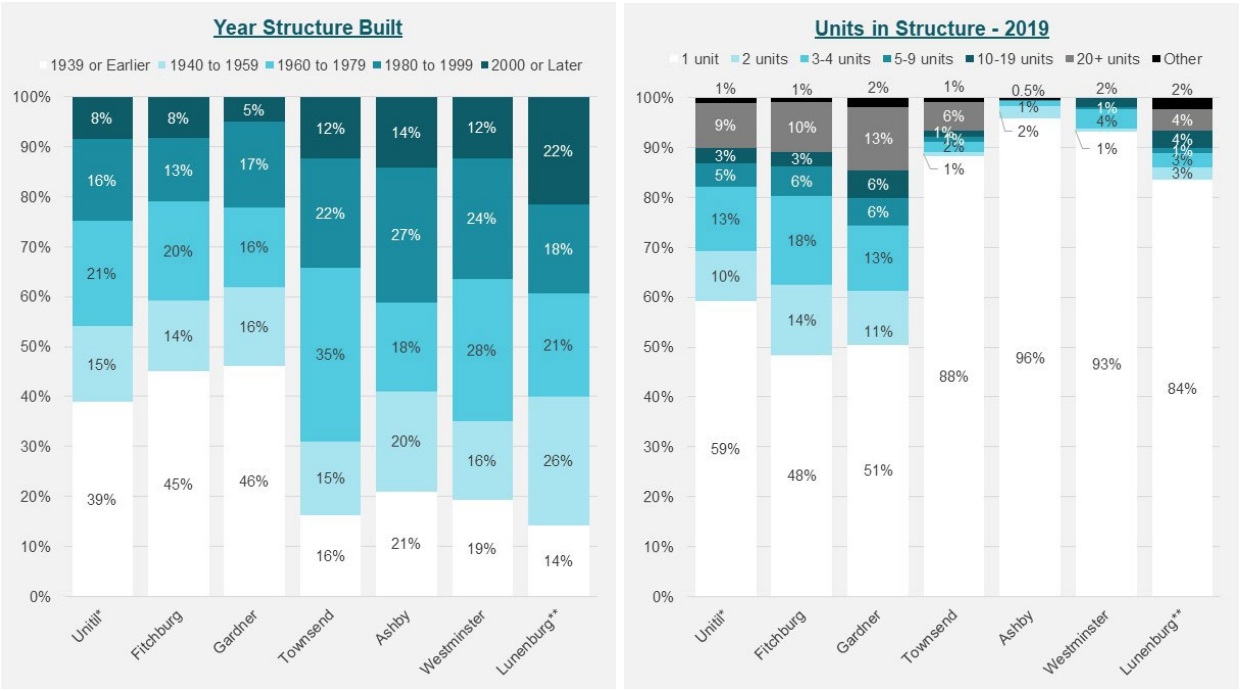
have about 13,000 housing units, the significant majority of which (over 80%) are owner-occupied (see Table 4, below).

Table 4: FG&E Housing Occupancy Status by Municipality[53]

MUNICIPALITY	2019 HOUSING UNITS	% OWNER-OCCUPIED	% TENANT-OCCUPIED	% VACANT
Fitchburg	17,000	48%	42%	10%
Gardner	9,000	47%	43%	10%
Townsend	4,000	82%	13%	5%
Ashby	1,000	86%	7%	6%
Westminster	3,000	85%	8%	7%
Lunenburg**	5,000	79%	15%	6%
FG&E*	**34,000**	**56%**	**35%**	**9%**

The age and type of housing structures across the Company's service territory display a similar pattern. As shown in Figure 9 below, Fitchburg and Gardner have a relatively high concentration of older homes, with approximately 45% built prior to 1940. In contrast, the majority of homes in Townsend, Ashby, Lunenburg, and Westminster were built after 1960. Similarly, about 50% of the housing structures in Fitchburg and Gardner are single-family units whereas the substantial majority (84% to 96%) of housing structures in the towns of Townsend, Ashby, Lunenburg, and Westminster are single-family homes.

Figure 9: FG&E Age and Type of Housing Structures by Municipality[54]



[53] Source: U.S. Census, American Community Survey (2019).

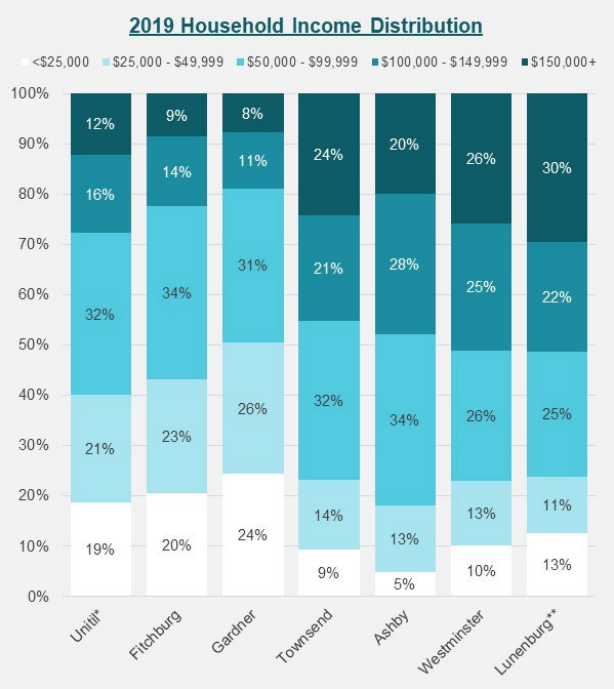
[54] Source: U.S. Census, American Community Survey (2019).

Differences across municipalities and the diversity of housing stock within the Company's service area are factors to be considered in developing and implementing potential decarbonization programs. As the Consultant Report explained, older homes may be more costly to convert to electricity. Improvements to the building shell, on the other hand, may enable significant decreases in energy consumption. Similarly, multi-unit and tenant-occupied units may be more difficult to electrify than single-family, owner-occupied units.[55]

2. Household Income and Energy Burden

Where the nature of the housing stock provides a measure of the potential for decarbonization programs, socioeconomic metrics provide insight as to their affordability. As shown in Figure 10 below, household income distributions in Fitchburg and Gardner are significantly different than those in Townsend, Ashby, Lunenburg, and Westminster. Between 45% and 52% of households in Townsend, Ashby, Lunenburg, and Westminster have income of $100,000 or greater, with 18% to 24% below $50,000. In contrast, only about 20% of households in Fitchburg and Gardner have income of $100,000 or greater, with 43% having income below $50,000.

Figure 10: FG&E Household Income by Municipality[56]



Because households with higher income may be "first movers to" or "early adopters of" new or innovative space heating technologies,[57] low-income electrification programs likely will be needed to provide a large portion of the Company's customers the opportunity to participate in decarbonization service offerings.

The affordability of decarbonization initiatives is directly influenced by existing utility rates. In that respect, FG&E has the highest rates in the Commonwealth. As shown in Table 5 below, in 2020 FG&E's average residential gas price was approximately $18.91 per Mcf, nearly 30% above the state-wide

55 See Decarbonization Pathways Report at 40-41, Table 8.
56 Source: U.S. Census, American Community Survey (2019).
57 See Decarbonization Pathways Report at 40-41, Table 8.

average. The Company's average residential electricity prices were approximately $.25 per kWh, about 13% higher than the Massachusetts average.

Table 5: FG&E Gas and Electric Rates Relative to Massachusetts Average[58]

	GAS ($/MCF)		ELECTRIC (CENTS/KWH)	
2020 Average Price	FG&E	MA Average	FG&E	MA Average
Residential	18.91	14.71	24.73	21.97
Commercial	14.15	11.20	21.70	16.03
Industrial	10.91	9.30	13.29	14.51

As noted earlier, about 83% of the Company's customers reside in Fitchburg and Gardner, where the housing stock has relatively high proportions of older, multi-family units, and household income tends to be lower than in the surrounding towns. That combination creates significant challenges for customers' energy burden (i.e., average annual housing energy costs[59] divided by the average annual household income). Not surprisingly, the energy burden for households with income levels below the state median income ("SMI") is significantly higher than the state-wide average of approximately 3%.

Table 6: FG&E Household Income Distribution[60] Relative to Average Energy Burden[61]

	PERCENT OF HOUSEHOLDS BY INCOME		AVERAGE ENERGY BURDEN (PERCENT INCOME)	
Municipality	<$25,000	$25,000 - $49,999	0% to 30% of SMI	30% to 60% of SMI
Fitchburg	20%	23%	15%	7%
Gardner	24%	26%	15%	8%
Townsend	9%	14%	18%	8%
Ashby	5%	13%	23%	10%
Westminster	10%	13%	18%	10%
Lunenburg**	13%	11%	21%	9%

The average energy burden for households in Fitchburg and Gardner with incomes less than $25,000 is approximately 15%, five times greater than the state-wide average. The average for households (also in Fitchburg and Gardner) with income between $25,000 and $50,000 was 7% to 8%, more than twice the state-wide average. Together, approximately 43% and 50% of households in Fitchburg and Gardner,

58 Source: EIA, annual company level data from Form EIA-176 (2020) and annual electric utility data from EIA-861 (2020). Average prices are EIA calculated values based on annual revenues divided by annual volumes/sales.

59 Average annual housing energy costs are based on "expenditures for electricity, gas (utility and bottled), and other fuels (including fuel oil, wood, etc.)." See U.S. Department of Energy and National Renewable Energy Laboratory, Low-Income Energy Affordability Data (LEAD) Tool Methodology at 3 (July 2019).

60 Source: U.S. Census, American Community Survey (2019).

61 Source: U.S. Department of Energy, Low-Income Energy Affordability Data (LEAD) Tool (2018). Note, the state median income was approximately $80,000 in 2018; therefore, between 0% to 30% of the SMI represents households with income between $0 and $24,000, and between 30% to 60% of the SMI represents households with income between $24,000 to $48,000.

respectively, have annual income below $50,000 and an energy burden at least twice the state-wide average.

3. Environmental Justice Communities

EJ populations in Massachusetts are defined as neighborhoods meeting one or more of the following criteria: (i) the annual median household income is not more than 65% of the statewide annual median household income; (ii) minorities comprise 40% or more of the population; (iii) 25% or more of households lack English language proficiency; or (iv) minorities comprise 25% or more of the population and the annual median household income of the municipality in which the neighborhood is located does not exceed 150% of the statewide annual median household income.[62]

As shown in Table 7 below, the cities of Fitchburg and Gardner have high concentrations of designated EJ block groups relative to their service area population (73% and 80%, respectively). The majority of the EJ population in Fitchburg meets the minority (M), or the minority and income (MI) criteria; the majority of the EJ population in Gardner meets the Income (I) criterion. Notably, there are no EJ block groups in Townsend, Ashby, Lunenburg, or Westminster. Overall, approximately 56% of FG&E's service area population resides in EJ communities, the highest concentration among the Massachusetts LDCs.[63]

Table 7: FG&E Environmental Justice Metrics[64]

ENVIRONMENTAL JUSTICE CRITERIA	FITCHBURG	GARDNER	FG&E*	MA TOTAL
Meets One of Four Criteria				
Income (I)	1,000	11,000	12,000	0.3 million
Minority Population (M)	14,000	4,000	18,000	1.6 million
English Isolation (E)	0	0	0	<4,000
Minority Population and Income (MI)	15,000	1,000	16,000	0.8 million
Meets More than One Criterion				
Minority (M) and English Isolation (E)	0	0	0	0.1 million
Income (I) and English Isolation (E)	0	0	0	<3,000
Minority, Income, and English Isolation	0	0	0	0.2 million
Environmental Justice Population	**30,000**	**16,000**	**46,000**	**3.1 million**
% of Service Area Population	**73%**	**80%**	**56%**	**45%**

C. Operating Statistics

The LDC Operating Statistics reviewed by the Company include:

1. Gas revenues and volumes: Annual revenue and volume by customer segment, by sales and transportation customers;
2. Projected gas demand: Forecast design day and design year volumes with forecast growth rates; and

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62 EEA, EJ Policy at 6 (June 24, 2021); Massachusetts Session Law Acts of 2021, Chapter 8 (codified at G.L. c. 30, § 62).

63 See Consultant Report, Appendix 3, at 27. Notably, for the other Massachusetts LDCs, the EJ population relative to LDC service area population ranges from 31% (the former Colonial Gas Company) to 53% (Berkshire).

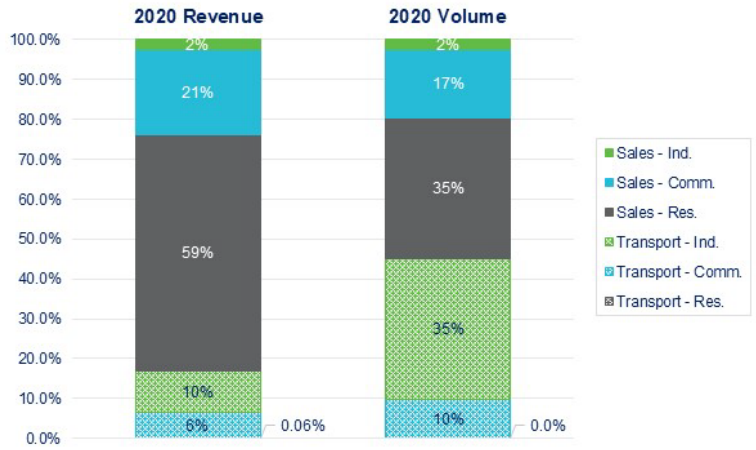
64 Source: Massachusetts Bureau of Geographic Information (2020).

3. Supply resource portfolio: The Company's resource portfolio and relative contributions from pipeline, storage, and on-system resources.

1. Gas Revenues and Volumes

Similar to the other Massachusetts LDCs, approximately 90% of FG&E's gas customers are residential, and 10% are commercial and industrial ("C&I").[65] Based on volumes and revenue, however, the C&I segment is disproportionately large, representing approximately 40% and 65% of 2020 annual revenue and volume (including C&I transportation volume), respectively (see Figure 11 below).

Figure 11: FG&E's Volume and Revenue by Customer Segment[66]



Because commercial transportation (10%) and industrial transportation (35%) customers account for a large portion (approximately 45%) of total annual volume, nearly half the supply delivered on the Company's system is sourced by retail marketers on behalf of customers who are responsible for their own supply procurement. Further, 29% of total delivered volumes are for capacity-exempt industrial transportation customers, who are not included in the Company's "Planning Load."[67] Given that FG&E does not procure supply for transportation customers (45% of annual volume) or plan capacity resources for capacity-exempt customers (29% of annual volume), decarbonization strategies should consider broad approaches to encouraging C&I customers to adopt new technologies, and for the energy marketers providing their supply requirements to include low-carbon options.

2. Projected Gas Demand

As discussed in the Company's most recently filed F&SP, design year planning load for 2021/22 is approximately 2.5 Tbtu with forecast growth of 0.5% per year. The design day planning load for 2021/22 is approximately 22,869 MMbtu, with forecast growth of approximately 0.2% per year.[68] The Company's

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65 See Consultant Report, Appendix 3, at 10.

66 Source: U.S. Energy Information Administration, annual company level data from Form EIA-176 (2020).

67 Source for capacity-exempt percentage: Company billing records. Planning Load is demand for which the Company must plan and procure supply resources for as part of its F&SP process. The Company's Planning Load includes firm sales service plus non-capacity exempt firm transportation customers.

68 Fitchburg Gas and Electric Light Company, d/b/a Unitil, 2021 Forecast and Supply Plan, Initial Filing, D.P.U. 21-10, at 44-56 (January 14, 2021).

volume and growth projections are the lowest among the Massachusetts LDCs,[69] which is largely attributable to population growth trends in its service area. As shown in Table 8 below, historically (from 2010 to 2019) FG&E's service area population grew at about one-half the state-wide average growth rate.[70] Looking forward, from 2020 to 2040 FG&E's service area population growth is expected to be negative.

The implications of the Company's low design day and design year planning loads for decarbonization strategies are significant, especially when considered in the context of the demographic and socioeconomic data discussed earlier. Because the expected load growth is low, and expected population growth is negative, decarbonization strategies must focus on existing customers. Those customers, however, already bear a heavy energy burden, and tend to reside in housing units that do not lend themselves to low-cost electrification conversions. Those constraints must be addressed in the regulatory and policy components of proposed decarbonization strategies.

Table 8: FG&E Population Growth[71]

MUNICIPALITY	2010-2019 CAGR	2020-2040 CAGR	2040 POP. ESTIMATE
Fitchburg	0.13%	0.04%	43,000
Gardner	0.12%	-0.10%	21,000
Townsend	0.73%	-0.36%	8,500
Ashby	0.84%	0.04%	3,000
Westminster	0.81%	-0.02%	7,500
Lunenburg**	1.49%	0.04%	10,000
FG&E*	**0.29%**	**-0.04%**	**83,000**
Massachusetts	**0.63%**	**0.31%**	**7,380,000**

3. Supply Resource Portfolio

To meet existing and forecasted Planning Load requirements, the Company's gas supply portfolio includes upstream pipeline transportation and storage contracts, on-system peaking resources, and off-system peaking supply contracts. As shown in Table 9, pipeline-based resources comprise approximately 60% of FG&E's design day resource portfolio, and a much higher percentage of the annual resource portfolio.[72] Because lower-carbon sources such as Certified Gas may be able to displace a portion of traditional pipeline-based resources, FG&E's decarbonization strategies look to supply options as viable long-term alternatives to supporting the Commonwealth's objectives.

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69 Source: Consultant Report, Appendix 3, at 35.

70 Source: U.S. Census, American Community Survey (2010-2019).

71 Source: U.S. Census, American Community Survey (2010-2019); and UMass Donahue Institute (2010-2040).

72 Pipeline resources represent over 90% of the Company's available supply resources to meet design year requirements. See Fitchburg Gas and Electric Light Company, d/b/a Unitil, 2021 Forecast and Supply Plan, Initial Filing, D.P.U. 21-10, at 55 (January 14, 2021).

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Table 9: Design Day Resource Portfolio[73]

MAXIMUM AVAILABLE SUPPLY (MMBTU)	2021/22	% OF TOTAL
TGP Long haul supply	7,166	30%
Storage	5,273	22%
Zone 6	2,000	8%
Subtotal – Pipeline Resources	*14,439*	*60%*
Propane – Lunenburg	4,631	19%
LNG – Westminster	3,172	13%
Off-system peaking	2,000	8%
Subtotal – Peaking Resources	*9,803*	*40%*
Total Available Supply	**24,242**	**100%**
Design Day Sendout	**22,869**	

D. System Operating Characteristics

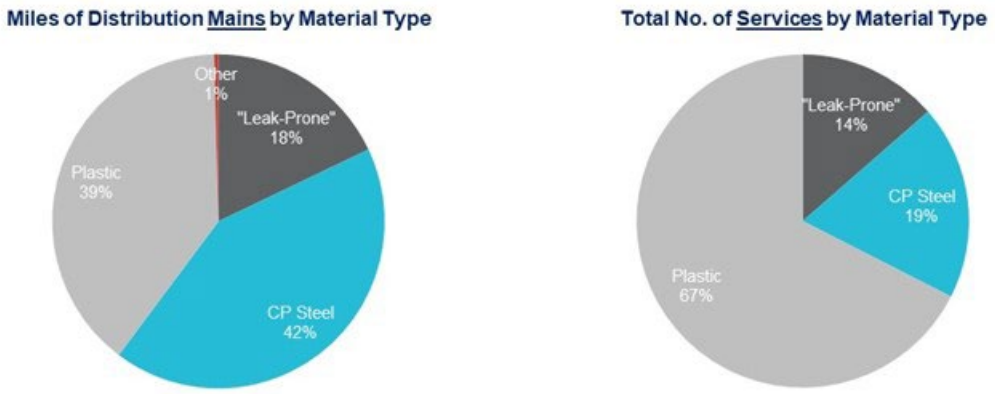
The Company's assessment of operating characteristics includes two measures:

1. Mains and services: Distribution mains and services by material type; and
2. System density: Customer density, measured by services per mile of main.

1. Mains and Services

FG&E's gas distribution system consists of 273 miles of mains and over 11,000 services, the majority of which are plastic and cathodically protected ("CP") steel. As illustrated in Figure 12 below, approximately 18% of mains and 14% of services are cast/wrought iron and unprotected steel, both considered "leak-prone" pipeline materials.

Figure 12: FG&E Mains and Services by Material Type[74]



[73] Fitchburg Gas and Electric Light Company, d/b/a Unitil, 2021 Forecast and Supply Plan, Initial Filing, D.P.U. 21-10, at 45, 64 (January 14, 2021).

[74] Source: U.S. DOT PHMSA (2020); and MA LDC Annual GSEP Filings (2021).

In the interest of public safety and to reduce lost and unaccounted for ("LAUF") natural gas, Massachusetts Law requires LDCs to submit annual plans to replace aging natural gas infrastructure.[75] The Company's Department-approved Gas System Enhancement Program ("GSEP") plan provides for the replacement of its "leak-prone" pipes through the end of 2034.[76] The Department recently found the Company's pace of replacement complies with the legislative purpose of the GSEP statute, to advance the replacement of leak-prone pipe on an accelerated basis over a 20-year period.[77] The Department further found that "the replacement of the designated leak-prone pipe [under the Company's GSEP] achieves the goals of improvements in public safety, infrastructure reliability, and the reduction of LAUF natural gas.[78]

2. System Density

Approximately 95% of the Company's "leak-prone" infrastructure is located in Fitchburg, where the majority of the Company's customers are concentrated (roughly 75% of gas customers and 65% of electricity customers). Fitchburg also has the highest population density in FG&E's service territory, at over 1,400 people per square mile (see Table 10 below). Such moderately high density areas may provide an opportunity in the future to deploy alternative technologies, such as networked geothermal systems. As the Consultant Report observed, "[a]reas that serve a greater diversity of loads, including medium-density residential and commercial areas, may provide more beneficial opportunities for the deployment of networked geothermal systems."[79]

Table 10: FG&E Population and Population Density by Municipality[80]

MUNICIPALITY	2019 POPULATION	POPULATION DENSITY
Fitchburg	41,000	1,448
Gardner	21,000	896
Townsend	9,000	287
Ashby	3,000	134
Westminster	8,000	208
Lunenburg**	11,000	411
FG&E*	**82,000**	**1,005**

75 M.G.L. c. 164, § 145.

76 See Fitchburg Gas and Electric Light Company d/b/a Unitil, D.P.U. 14-130 (2015).

77 Fitchburg Gas and Electric Light Company d/b/a Unitil, D.P.U. 20-GSEP-01, at 11 (2021).

78 Fitchburg Gas and Electric Light Company d/b/a Unitil, D.P.U. 20-GSEP-01, at 9 (2021).

79 Decarbonization Pathways Report at 44-45. Footnote 44 of the Consultant Report references a study on networked geothermal systems by HEET, which indicates that both very low density and ultra-high density areas are not likely to be suitable for such systems. The study indicates that vertical group-coupled Ground Source Heat Pump systems in low to medium density residential and mixed-use commercial districts may provide the best performance to meet buildings' heating and cooling loads. See https://heet.org//wp-content/uploads/2019/10/HEET-BH-GeoMicroDistrict-Final-Report.pdf.

80 Source: U.S. Census, American Community Survey (2019).

E. Additional Considerations

Decarbonization strategies dependent on electrification should consider three additional factors: (1) FG&E's carbon emissions; (2) existing electric system capacity; and (3) the Company's ability to finance the assets and obligations required to support electrification.

1. Carbon Emissions

Based on the most recently available data from the EIA, the total energy-related carbon dioxide ("CO2") emissions in Massachusetts was approximately 64.6 million metric tons ("MMT"), which accounts for only 1.2% of the U.S. total of approximately 5,281 MMT. Of the total CO2 emissions in Massachusetts, natural gas represented approximately 24 MMT (or 37% of the state total), and petroleum represented approximately 41 MMT (or 63% of the state total). Because it represents only 1% of the total gas customers in Massachusetts, it is reasonable to conclude that FG&E is a distinctly small contributor to the overall emissions in the Commonwealth, and the U.S.[81] As discussed throughout this report, the Company's proposed strategies support the Commonwealth's environmental objectives while recognizing the implications of FG&E's unique service territory. Among those considerations are the effect on rates for customers with comparatively high existing energy burdens and the allocation of costs across constituent groups benefitting from reduced carbon emissions. As discussed in Section I, FG&E believes doing so is consistent with the public interest standard, and the principle of just and reasonable rates.

2. Electric System Capacity

As discussed in Section III.A above, the Company provides electric distribution service to approximately 30,000 customers in Massachusetts, and is the electric service provider to approximately 90% of the FG&E gas customers. As such, the Company is well positioned to assess the implications of electrification on the FG&E electric system and identify opportunities and challenges.

3. Financial Wherewithal

As the Department explained in its Order opening this proceeding, on April 22, 2020, the Baker-Polito Administration announced that it is reasonable and appropriate to establish a net-zero emissions target by 2050, in order to adequately protect the health, economy, people, and natural resources of the Commonwealth and to maintain Massachusetts' critically important role as a national and international leader in the global effort to reduce the GHG emissions that cause climate change.[82] As noted in the 2015 update to the Commonwealth's Clean Energy and Climate Plan ("CECP") for 2020, the building sector must make sizeable reductions in its use of fossil fuels to achieve the Commonwealth's mandated GHG emissions limit.[83]

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[81] See U.S. Energy Information Administration, State Energy-Related Carbon Dioxide Emissions Data by Year (March 2, 2021).

[82] Vote and Order Opening Investigation, D.P.U. 20-80, at 1 (2020) citing Executive Office of Energy and Environmental Affairs Determination of Statewide Emissions Limit for 2050 (April 22, 2020), *available at*: https://www.mass.gov/doc/final-signed-letter-of-determination-for-2050-emissions-limit/download.

[83] Vote and Order Opening Investigation, D.P.U. 20-80, at 1-2 (2020) citing 2015 Update to CECP for 2020 (December 31, 2015), *available at*: https://www.mass.gov/doc/clean-energy-and-climate-plan-for-2020/download.

As the Consultant Report explains, "…all pathways result in electrification-driven load growth."[84] Beyond additional investments in electric distribution assets, that load growth will require 14 to 36 GW of additional wind capacity, and 25 to 32 GW of solar capacity.[85] The projects providing that capacity will look to the Commonwealth's electric distribution companies ("EDCs"), including FG&E, to enter into long-term contracts for that capacity. Those contracts, supported by the EDCs' credit ratings, will facilitate the projects' cost-effective financing and directly support the Commonwealth's environmental objectives.[86]

FG&E currently is rated Baa1 by Moody's, and BBB+, with a negative outlook, from Standard & Poor's ("S&P"). The negative outlook (S&P) indicates the potential for a rating downgrade over the coming 24 months if the Company's credit profile does not improve.[87] As noted in the Consultant Report, maintaining utility credit is an important policy considerations as "all investments in electric infrastructure will require some form of credit support (e.g., long-term power purchase agreements) as the [EDCs], the Commonwealth, other energy providers, or some combination, underwrites these major energy investments as counterparties."[88] Accordingly, the Commonwealth must rely on the strong balance sheets and credit profiles of its investor owned utility companies to successfully achieve electrification on the scale contemplated by the Administration.[89]

The size and scope of the Commonwealth's energy transition creates unique and increased risks that potentially will put significantly more importance on investors' confidence in the Department's regulatory support. It will be essential, therefore, to maintain a clear, predictable, stable, and supportive regulatory environment that continues to incorporate considerations of credit quality in its design to ensure that the financial integrity of the state's utilities is preserved during the transition and beyond.[90]

Even before considering the financing requirements and implications associated with the pathways, utilities' financial strength, including the liquidity needed to fund day-to-day operations, has been an important consideration to the financial community. For example, as part of its rating methodology Moody's assigns 40 percent weight to measures of financial strength and liquidity, noting that:

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84 Decarbonization Pathways Report at 57.

85 Decarbonization Pathways Report at 61.

86 NSTAR Electric Company, d/b/a Eversource Energy, Massachusetts Electric Company and Nantucket Electric Company, each d/b/a National Grid, and Fitchburg Gas and Electric Light Company, d/b/a Unitil, D.P.U. 20-16, 20-17, and 20-18, at 28, 88 (2020) (finding that the EDCs' credit ratings directly support project financing of offshore wind energy generation resources); NSTAR Electric Company, d/b/a Eversource Energy, Massachusetts Electric Company and Nantucket Electric Company, each d/b/a National Grid, and Fitchburg Gas and Electric Light Company, d/b/a Unitil, D.P.U. 18-76, 18-77, and 18-88, at 28, 48, 71 (2019) (recognizing that the EDCs' status as credit worthy counterparties has allowed them to enter into highly cost-effective PPAs to facilitate the development of renewable energy resources under Section 83C).

87 S&P Global Ratings, *Unitil Corporation*, November 10, 2021, at 1, 3.

88 Decarbonization Pathways Report at 83.

89 FG&E has long-term ratings of BBB+ (Outlook: Negative) from Standard & Poor's ("S&P") and Baa1 (Outlook: Stable) from Moody's Investors Service ("Moody's"); and Unitil Corporation has long-term ratings of BBB+ (Outlook: Negative) from S&P and Baa2 (Outlook: Stable) from Moody's.

90 See NSTAR Electric Company, d/b/a Eversource Energy, Massachusetts Electric Company and Nantucket Electric Company, each d/b/a National Grid, and Fitchburg Gas and Electric Light Company, d/b/a Unitil, D.P.U. 20-16, D.P.U. 20-17, and D.P.U. 20-18, at 89 (2020) (finding that regulatory consistency is critically important to rating agencies' assessment of the Companies' credit rating); Berkshire Gas Company, D.T.E. 03-89, at 31 (2004) (finding that "the ability of the Company to reduce costs and manage its risks is entirely consistent with its duty to provide utility service.").

> Financial strength, including the ability to service debt and provide a return to shareholders, is necessary for a utility to attract capital at a reasonable cost in order to invest in its generation, transmission and distribution assets, so that the utility can fulfill its service obligations at a reasonable cost to rate-payers.[91]

S&P similarly notes that:

> The financial risk profile is the outcome of decisions that management makes in the context of its business risk profile and its financial risk tolerances. This includes decisions about the manner in which management seeks funding for the company and how it constructs its balance sheet. It also reflects the relationship of the cash flows the organization can achieve, given its business risk profile, to the company's financial obligations. The criteria use cash flow/leverage analysis to determine a corporate issuer's financial risk profile assessment.[92]

S&P also makes clear that the regulatory regime is one of the most important factors in its rating analyses:

> For a regulated utility company, the regulatory regime in which it operates will influence its performance in profound ways. As such, Standard & Poor's Ratings Services' regulatory advantage assessment - - which informs both our business and financial risk scores - - is one of the most important factors in our credit analysis of regulated utilities.[93]

Among S&P's principal considerations is "regulatory stability." As S&P notes, regulatory advantage is "the most heavily weighted factor when S&P Global Ratings analyzes a regulated utility's business risk profile."[94] S&P further explains that:

> The foundation of our opinion of a jurisdiction is the stability of its approach to regulating utilities, encompassing transparency, predictability, and consistency. Given the maturity of the U.S. investor-owned utility industry, the long history of utility regulation (going back to the early 20th century) and the well-established constitutional protections accorded to utility investments, we emphasize the principle of consistency when weighing regulatory stability. We also incorporate the degree to which the regulatory framework either explicitly or implicitly considers credit quality in its design.[95]

Similarly, equity investors will carefully weigh the regulatory environment in their investment decisions and any perception of uncertainty, risk, or the loss of financial flexibility will substantially influence that calculus. To the extent the Company's equity becomes even marginally less attractive relative to its peers, the demand for its equity will fall, and the ability to cost-effectively fund the energy transition will be jeopardized.

FG&E submits the Department should evaluate all decarbonization strategies and enabling regulatory mechanisms in view of its duty to serve the public interest by ensuring that rates are just and reasonable. As discussed earlier, the public interest cannot be divorced from financially healthy utilities. That is

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91 Moody's Investors Service, *Rating Methodology, Regulated Electric and Gas Utilities*, June 23, 2017, at 20.
92 Standard & Poor's, *Corporate Methodology*, November 19, 2013, at 1.
93 Standard & Poor's Ratings Services, *How Regulatory Advantage Scores Can Affect Ratings On Regulated Utilities*, April 23, 2015, at 2.
94 S&P Global Ratings, *Assessing U.S. Investor-Owned Utility Regulatory Environments*, August 10, 2016, at 2.
95 S&P Global Ratings, *Assessing U.S. Investor-Owned Utility Regulatory Environments*, August 10, 2016, at 2.

especially the case when, as with FG&E, the utility's credit profile must support the renewable energy projects that are fundamental to the Commonwealth's climate objectives. The application of this long-standing, fundamental regulatory principle is critical because realizing those objectives is inextricably linked to the Company's ability to attract capital at a reasonable cost in a just and reasonable manner.

F. FG&E's Unique Opportunities and Challenges

In summary, FG&E has a number of unique service area and customer attributes that will frame its approach to evaluating and proposing decarbonization strategies that support the Commonwealth in achieving its climate goals:

- The Company is a combination gas and electric utility with significant overlap in its gas and electric service areas, which provides the Company an opportunity for coordinated gas and electric system planning, and developing programs that optimize the use of its gas and electric systems.
- The Company's service area has a large proportion of residential customers that use fuel oil for space heating, which contributes to higher GHG emissions than using natural gas or electric heat pump technologies for space heating. This high market share for fuel oil and electric resistance heat in the residential space heating segment provides the Company with an opportunity to develop a decarbonization program that targets oil and electric resistance heating to electric heat pump conversions and/or hybrid (oil/electric) heating.
- The Company's gas supply portfolio has a significant component of flowing supplies that could be augmented with supplies, such as Certified Gas, with lower carbon emissions levels. In addition, FG&E has a large proportion of industrial customers that may have applications more difficult to electrify, thus supporting higher quantities of renewable gas supplies, such as Certified Gas.
- The Company's natural gas infrastructure is concentrated in Fitchburg, which has the highest population density in the Company's service territory. The combination of pipeline replacement projects (i.e., compliance with GSEP) and moderately high population density may provide the Company with an opportunity to deploy technologies such as networked geothermal as an alternative to pipeline replacement projects.
- The Company's service area includes a high proportion of lower income customers that receive service from the Company, with an already high energy burden, which will need to be addressed and considered as part of the Company's decarbonization proposals. In addition, any decarbonization program will need to consider the significant EJ population served by the Company, and provide opportunities for stakeholder involvement.

IV. FG&E Transition Strategies

The Company's strategies supporting the transition to the Commonwealth's net-zero GHG emissions energy future are informed by the objectives and guiding principles detailed in Table 1 of Section I above and summarized below in Table 11 for ease of reference. As discussed in Sections I and II, the Company's transition strategies build on the Consultant Report's Finding and Strategy Recommendations, together with FG&E's unique situation and circumstances (discussed in Section III).

Table 11: FG&E Objectives and Guiding Principles

CORE OBJECTIVES	GUIDING PRINCIPLES TO SUPPORT CLIMATE GOALS
• Continue to provide customers with safe, reliable, and cost-effective service • Ensure affordability and equity for all communities - strategies must be in the public interest and result in just and reasonable rates • Preserve financial integrity of FG&E, enabling the Company to convey the strength of its balance sheet to ensure the cost-effective financing of the energy projects required to meet the Commonwealth's decarbonization objectives	• Pursue no/low regrets approaches that contribute to reductions in GHG emissions and ensure the ability/option to modify strategies in the future as the pathway scenarios unfold and as technological innovations and markets evolve • Offer customers multiple options to enhance choice and diversify reliance on any single strategy • Reliable measurement of GHG emissions is essential to inform planning, and to assess progress

Taken together, the Company's strategies enhance energy efficiency (i.e., reduce the demand for energy); promote, pilot, and deploy technologies for electrification and decarbonization; and advance proposals to decrease the carbon content of the gas supply portfolio. Equally important, and consistent with the Department's direction, the Company's strategies address customer affordability and rate equity.

As discussed throughout this report, the Company's strategies provide the flexibility to change or modify proposals in response to changes that inevitably will occur over the course of the transition, including the emergence of new technologies and decarbonization strategies, and the learning that will take place as strategies are implemented. The strategies include a portfolio of near-term, no/low-regrets initiatives that begin the transition to achieving the Commonwealth's climate goals while providing the Company, its customers, and its workforce options as conditions evolve. This balanced approach also intends to mitigate the rate effect on customers, a particularly acute concern given FG&E's high proportion of low-income customers.

Table 12 below summarizes the Company's transition strategies. The regulatory proposals supporting these strategies are discussed in detail in Section V.

Table 12: Summary of FG&E's Transition Strategies

OBJECTIVE	TRANSITION STRATEGY	D.P.U. 20-80 GUIDANCE
Enhance energy efficiency (i.e., reduce demand for energy)	• Support customer building shell retrofits and adoption and conversion to efficient electric heating technologies	Supports decarbonization to meet climate goals
Decrease carbon content of the gas supply portfolio	• Develop programs to procure and utilize renewable and certified gas	
Pilot and deploy innovative electrification and decarbonized technologies to determine their role in the transition	• Develop hybrid heating system programs • Monitor networked geothermal pilot developments and other opportunities	
Manage embedded infrastructure costs	• Manage embedded gas infrastructure costs	Supports cost and rate mitigation efforts
Address customer affordability and rate equity impacts of transition	• Manage customer affordability and equity implications	

A. Enhance Energy Efficiency by Supporting Building Shell Retrofits and Promoting Customer Adoption of and Conversion to Efficient Electric Heating Technologies

Consultant Report Findings

The Consultant Report concludes that the decarbonization pathways require significant customer adoption of energy efficiency and building electrification technologies. The decarbonization pathways show a reduction in energy demand in the residential and commercial sector between 41% and 59%, driven by fuel switching and building shell improvements.[96]

A common challenge facing customers across all decarbonization pathways is the high upfront cost of energy efficiency measures, such as building shell retrofits, and lower GHG technologies, including heat pumps. These costs can reach between $73 billion and $97 billion on a cumulative basis between 2020 and 2050, or an annual average of $2.4 billion to $3.2 billion,[97] substantially higher than current annual MassSave expenditures. It is unlikely that these costs can be absorbed solely by LDC customers, particularly the low- and moderate-income customers that represent a significant portion of FG&E's customer base. The Consultant Report concludes that absent supportive policy initiatives, these upfront costs would represent a substantial barrier to achieving the levels of customer adoption required to meet the Commonwealth's climate goals. Realizing deep decarbonization therefore will require additional consumer incentives similar those currently offered through MassSave.

The Consultant Report recommends LDCs promote energy efficiency measures through funding and customer education, for instance continuing and intensifying the MassSave (or equivalent) program. The Consultant Report also recommends LDCs promote building electrification, including hybrid strategies, via

96 See Decarbonization Pathways Report at 53.
97 See Decarbonization Pathways Report at 82-83.

funding and customer education, and to investigate optimal operation of hybrid systems in support of the electric system.[98]

Company Strategy

The Company currently operates comprehensive energy efficiency programs targeting the residential, income eligible, and C&I customer sectors. The Company's recently approved 2022-2024 Energy Efficiency Plan includes expanded customer education, awareness, and marketing programs, as well as participant incentives.[99] FG&E proposes to expand its energy efficiency programs and investments, including retrofits and building envelope measures. The expanded energy efficiency measures will reduce heat lost to the environment and thus reduce fuel demands for space heating.

FG&E further proposes to prioritize electrification programs for those customers currently heating with oil, propane, or electric resistance heating, which together represent approximately 59% of the homes in its service territory. As discussed in the Company's 2022-2024 Energy Efficiency Plan, these customers are more likely to achieve savings by transitioning to a heat pump technology.[100] In particular, and as discussed earlier, there are significant opportunities in the Company's service territory in terms of the number of customers that currently heat with electric resistance heating. The Company's program to convert electric resistance heating to heat pump technology would reduce energy requirements and carbon emissions, achieve customer savings, and provide the opportunity to add an energy efficient form of air conditioning to these homes.

Any expansion to the Company's heat pump incentive programs also must address customer affordability.[101] As discussed earlier, the Company's service area includes a high proportion of low-income customers and populations in EJ communities. The Company is concerned that the increased deployment of heat pumps under company-sponsored programs may place upward pressure on customer rates and bills. Given the high cost of heat pumps, the Company intends to explore available affordable maintenance options, especially to low income customers, and whether to add a maintenance component to its service offerings. This would be particularly relevant for installations outside a hybrid heating program, since the customer would not have a backup source of heat. As discussed in Section V below, certain regulatory enhancements are needed to mitigate the affordability and equity implications of program expansions.

Any expansion to the Company's heat pump incentive programs also must be informed by an evaluation of electric grid capacity. Deploying increasing numbers of electric heat pumps can increase peak electric system demands, particularly during winter peak events. Such load increases can result in safety, reliability, and resilience concerns for the electric grid and require costly generation, transmission, and

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98 See Decarbonization Pathways Report at 116.

99 Fitchburg Gas and Electric Light Company d/b/a Unitil, 2022-2024 Three-Year Energy Efficiency Plan (Gas Division), D.P.U. 21-122. The Company's 2022-2024 Energy Efficiency Plan was approved by the Department—subject to certain modifications—on January 31, 2022.

100 Fitchburg Gas and Electric Light Company d/b/a Unitil, 2022-2024 Three-Year Energy Efficiency Plan (Gas Division), D.P.U. 21-122, Massachusetts 2022-2024 Energy Efficiency Plan, at 13 (November 1, 2021).

101 See Three Year Energy Plan Order, D.P.U. 21-120 through D.P.U. 21-129, at 17 (2022) ("As electrification efforts expand, ensuring affordability is of particular importance to ensure the cost of electricity remains affordable for customers in order to continue the progress towards decarbonization without overburdening customers.")

distribution infrastructure additions and/or upgrades.[102] As discussed below, hybrid heating system approaches may mitigate these concerns.

B. Decrease the Carbon Content of the Gas Supply Portfolio by Procuring and Utilizing Renewable and Certified Gas

Consultant Report Findings

The Consultant Report indicates that most pathways have a blend of renewable gas-to-pipeline gas in the range of 5% to 10% by 2030. The blend of renewable gas (including biomethane or RNG, SNG, and hydrogen) in most pathways increases over time and by 2050 reflects a large portion of supply portfolios. The Consultant Report finds biomethane to be the most available and most economic renewable gas at this time. Biomethane can be blended into the system from local resources derived from anaerobic digestion, as well as from out-of-state resources. Presently, the availability of biomethane is limited due to three factors: (1) limited supply of sustainable biomass feedstocks in the U.S.; (2) high demand, as other jurisdictions also are developing these resources for decarbonization needs; and (3) concern that some biomass feedstocks may be more cost-effectively converted into other fuels such as renewable diesel and gasoline to meet the needs of transportation or industry sectors.[103]

The Consultant Report states that despite the higher cost of biomethane compared to natural gas, the 5% to 10% blend does not substantially increase gas supply costs.[104] The Consultant Report further concludes that renewable gas supply strategies continue to leverage the natural gas system, which results in more customers and volume for recovery of embedded system costs.[105]

The Consultant Report recommends LDCs develop procurement strategies for renewable gas, starting with lower-cost resources to address customer bill impacts. The recommended additional near-term actions include investigating the deliverability of biomethane, hydrogen, and synthetic gases from a broader range of sources and regions. The Consultants also recommend investigating Certified Natural Gas ("Certified Gas"), which can reduce the overall environmental impact of natural gas use.[106] The Consultant Report points out that early action on these fuels could help clarify their role in supporting the Commonwealth's decarbonization goals and promote scalability toward decarbonization.

Company Strategy

The Company proposes to explore a procurement strategy to add RNG to its resource portfolio.[107] Similar to renewable electric power, RNG may be purchased as a physical supply that includes gas along with (bundled with) any environmental attributes for which the gas may qualify, or unbundled such that one purchases only the physical gas or only environmental attributes, much like electric renewable energy certificates. Because biomethane, or renewable gas created from any other feedstock that has been

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[102] See Three Year Energy Plan Order, D.P.U. 21-120 through D.P.U. 21-129, at 18 (2022) (directing Program Administrators to assess the impact the programs, particularly strategic electrification, have on the distribution system to avoid unintended reliability issues).

[103] See Decarbonization Pathways Report at 50.

[104] See Decarbonization Pathways Report at 18, 109.

[105] See Decarbonization Pathways Report at 14-15, 19.

[106] See Regulatory Designs Report at 28-29.

[107] The Department has found that hydrogen and RNG demonstration programs are the types of proposals that fit squarely into the Department's investigation in D.P.U. 20-80. See Boston Gas Company, d/b/a National Grid, D.P.U. 20-120, at 12 (December 11, 2020).

cleaned and conditioned to meet pipeline standards is fully interchangeable with conventional natural gas, it can be injected directly into the natural gas distribution system.[108] As such, RNG can be used in any application where conventional natural gas is used. The Company's proposed RNG strategy prioritizes the decarbonization of energy supply by optimizing the use of the existing natural gas system. This minimizes disruptions to energy consumers and promotes customer affordability and equity by limiting the need for customers to change their existing energy equipment in the near term.[109]

FG&E further proposes to add Certified Gas[110] to its resource portfolio. Certified Gas (also known as Responsibly Sourced Gas or "RSG") is conventional fossil gas produced in a manner that reduces fugitive methane emissions and other environmental impacts relative to typical production.[111] Certified Gas must be certified by independent auditing firms, which increasingly use techniques such as continuous monitoring to ensure the accuracy of emissions reduction claims. Methane emissions from the production of Certified Gas can be 50% lower than the national average of emissions from natural gas production, which equates to a 30% reduction in emissions along the natural gas supply chain from production to distribution.[112] Similar to RNG, Certified Gas can be purchased for physical delivery to the Company's system via existing upstream pipelines.[113] Alternatively, attributes denoting Certified Gas production may be purchased. A major advantage of Certified Gas is its low price premium relative to other currently available alternatives (i.e., the price of Certified Gas is approximately $0.03 to $0.12 per MMbtu higher than conventional pipeline gas).[114]

As discussed above, reducing the carbon content of natural gas delivered to customers leverages the existing gas system and customers' existing energy appliances. Leveraging the existing natural gas system is an important near-term approach in that it will take time to develop a comprehensive and coordinated electric and natural gas system planning framework to ensure, among other things, adequate capacity (generation, transmission, and distribution) to accommodate increased loads driven by electrification. More immediately, adding RNG and Certified Gas to the supply portfolio will produce environmental

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[108] FG&E recently adopted gas quality and delivery point standards for non-traditional sources of gas to facilitate direct interconnection of RNG into its system.

[109] See Three Year Energy Plan Order, D.P.U. 21-120 through D.P.U. 21-129, at 129 (2022) ("It is imperative that the Program Administrators ensure the subset of customers facing significant technical and financial hurdles to electrification are encouraged to adopt the most efficient, affordable heating system.")

[110] While a formal industry-wide definition for Certified Gas has not yet been established, S&P Global Market Intelligence defines Certified Gas as "[g]as that has been verified by an independent third party to have been produced in a manner consistent with certain environmental, social and governance standards." See https://www.spglobal.com/platts/en/market-insights/latest-news/natural-gas/101421-certified-natural-gas-midstream-sector-begins-embracing-concept-standards.

[111] See NSTAR Gas Company d/b/a Eversource Energy, D.P.U. 19-120, at 472 (2020) (noting that the Company's proposal to procure environmentally responsible natural gas was "in line with the Commonwealth's GHG emissions goals…").

[112] According to the EPA, the national average methane emissions intensity associated with natural gas production is 0.40%. As an example of methane reductions, methane emissions intensity for natural gas production under Project Canary's Gold Standard must be below 0.20%, a 50 percent reduction. Along the entire gas supply chain, from production to distribution, the national average methane emissions intensity is 0.70%. Substituting the lower emissions from Certified Gas production for average emissions reduces supply chain emissions by 30%.

[113] See, e.g., for example FERC Docket RP22-417-001, Tennessee Gas Pipeline Company, L.L.C., Producer Certified Gas Pooling Service Option.

[114] Natural Gas Intelligence, "Certified Natural Gas, Particularly for LNG Exports, Said Likely to Fetch Premium Prices", January 20, 2022.

benefits, contributing to the Commonwealth's objectives. Adding physical RNG to the supply portfolio also would improve supply availability and diversity, both important gas supply planning considerations.

The Company plans to propose specific volumetric targets for Certified Gas and RNG procurement for the Department's consideration in its next F&SP, to be filed on January 14, 2023. The Company also intends to outline the potential range of GHG emissions reductions associated with the proposed volumetric targets as well as estimated costs, including the value of any environmental attributes for which potential RNG supplies might qualify. The Company anticipates these volumetric targets will increase over time and will be capped at a certain cost threshold.

FG&E understands and appreciates that adding RNG to the supply portfolio raises customer affordability considerations (as explained earlier, FG&E already has among the highest rates in the Commonwealth, and FG&E serves a large proportion of low-income households and EJ communities). Therefore, to start, the Company intends to introduce RNG under a voluntary customer offering, potentially bundled with other emissions reduction products such as carbon offsets and Certified Gas, such that customers must make an affirmative election to purchase lower carbon gas supply. The Company would set forth the offering under a Voluntary Renewable Gas Tariff, and may limit eligibility to non-low income customers. As discussed in Section V below, certain regulatory enhancements also are necessary to address the affordability and equity effects of decarbonizing the Company's supply portfolio.

Lastly, the Company recognizes that electrification is not feasible for all natural gas applications. This is particularly relevant to FG&E given the heavy concentration of industrial customers in its service territory. The fact is that some C&I customers require natural gas for process heat applications for which there currently are no electric-driven alternatives. As discussed in Section III, the vast majority of these customers purchase their gas supply from retail marketers. Nonetheless, the Company anticipates that in the long-term, opportunities will emerge to address the energy requirements of such customers with RNG, including SNG made from green hydrogen. The Company also will evaluate additional future options, such as providing compressed natural gas for heavy-duty vehicles to lower carbon emissions, and dedicated hydrogen for industrial end-uses similar to the partnership among Global Foundries, Vermont Gas, and University of Vermont to pilot green hydrogen.[115]

C. Develop and Deploy Programs to Support Electrification and Decarbonization

1. Develop Hybrid Heating System Programs

Consultant Report Findings

The Consultant Report finds customer conversions to electrification and decarbonized technologies, such as hybrid heating systems, are needed to achieve the Commonwealth's climate goals. Hybrid heating systems, such as combined gas and electric heating systems, capture the key advantages of electrification while addressing feasibility and reliability challenges (e.g., insufficient electric system capacity to serve electrified transportation and buildings, and lack of actual renewable power). For example, hybrid heating systems reduce gas throughput, minimize winter peak capacity requirements on the electric system, and may lower retrofit costs in some buildings compared to all-electric options. Hybrid heating systems also leverage the existing gas system while potentially avoiding or minimizing electric system investments, and present the lowest level of challenge relative to other pathways.[116]

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[115] See https://www.uvm.edu/news/story/vermont-partnership-advances-use-green-hydrogen-clean-fuel-future.

[116] Regulatory Designs Report at 28.

The Consultant Report recommends LDCs promote, develop, and deploy programs to support hybrid heating systems. There are certain analytical and process steps to facilitate the deployment of these programs, such as: (1) identifying the benefits and costs of the technology, including customer and gas/electric utility value propositions; (2) engaging installation and service providers in facilitating customer adoption; (3) facilitating customer education, interest, and adoption through communications and incentives; and (4) evaluating hybrid heating systems as a potential for strategic support for the electric system, such as the ability to switch between electric and gas heating to manage electric grid constraints.

One of the principal benefits of the hybrid heating system relative to an all-electric heating system is the ability to manage winter peak demands on the electric grid, especially during extreme winter weather conditions. The Consultants note that whereas the current electric system is summer peaking, under most modeled pathways the electric system becomes winter peaking as a result of significant electrification of transportation and heating.[117] Supporting programs enabling electric utilities to manage the winter peak demands include: (1) smart controls technologies and protocols that enable utilities to switch customer heating systems from electricity to natural gas or from natural gas to electricity depending on operating conditions and cost considerations; and (2) customer incentives to install and maintain gas/oil heating systems.

Company Strategy

The Company proposes to research, evaluate, develop, and deploy programs to support hybrid heating systems. Hybrid heating systems, which use backup fuel to heat during extreme winter weather conditions and electric heat during all other times of the year, (i) contribute to reductions in GHG emissions to meet the Commonwealth's climate goals, and (ii) offer customers options to enhance choice and diversify reliance on any single heating system. The hybrid heating approach is very similar to demand response programs that have been successfully applied in the electric sector for many years, and which may offer insights as to program design and incentives.

The Company is well-situated for hybrid heating programs in its service territory for four reasons. First, FG&E has the largest proportion of homes in its service area with oil or propane space heating, providing opportunities to significantly reduce GHG emissions through the installation of hybrid heating systems. As discussed earlier, the most recently approved 2022-2024 Energy Efficiency Plan indicated that these customers (i.e., with oil and propane space heating) are more likely to achieve savings by transitioning to heat pump technology. Second, the Company has significant overlap between its gas and electric service territory, currently providing electric service to approximately 90% of its natural gas customers. That overlap presents significant opportunities to efficiently deploy hybrid heating programs for those gas customers who adopt electric heat pumps. Third, the Company can leverage its experience and expertise as a combination utility to assess the opportunities for coordinated gas and electric system planning regarding hybrid heating programs.[118] In particular, the Company can leverage and optimize its existing gas and electric systems to support hybrid heating programs and minimize the level of investment required to serve customer needs in the peak winter period. In addition, the Company can serve as a single point of contact for customer education, marketing, communication, and coordination, and to ensure the availability of service, maintenance, and replacement options for heat pump customers, particularly low-income households. Lastly, FG&E currently provides energy efficiency and electrification

[117] Decarbonization Pathways Report at 28-29.

[118] See Vote and Order Opening Investigation, D.P.U. 20-80, at 3 n. 3 (acknowledging that decarbonization strategies for the gas industry may also affect the electric distribution companies).

equipment rebates through the MassSave initiative that can be leveraged to promote hybrid heating systems.

FG&E's proposed strategy includes expanded rebates and promotions for the installation of integrated controls with hybrid heating systems. Integrated controls allow customers to automatically switch between a heat pump and a fuel-based backup heating system depending on the outside temperature, resulting in lower GHG emissions, potential cost savings, and improved system utilization. During the 2019-2021 Energy Efficiency Plan term, FG&E, along with other MassSave Program Administrators ("PAs"),[119] created the first integrated controls specifications and requirements to ensure that heat pumps installed to augment existing systems operate efficiently. In the 2022-2024 Energy Efficiency Plan,[120] the PAs proposed (and the Department approved) additional studies to further understand and optimize the benefits of hybrid heating systems with integrated controls.[121] The Company will leverage the findings of these studies in its hybrid heating programs, such as how the integrated controls may be set and dispatched.

The proposed strategy also would promote reliable and resilient heating service to customers by developing a hybrid heating program with a strategic focus on managing winter peak demands. The program would include: (i) customer incentives that enable electric utilities to manage winter peak demands by switching customer heating systems from electric to gas during pre-defined weather events or emergency operating conditions on the electric system; and (ii) electric and gas rate structures that establish price signals associated with the demand and cost characteristics of hybrid heating systems. In addition, the Company would evaluate an inter-company arrangement under which the electric utility purchases peaking capacity from the LDC.[122]

2. Monitor Networked Geothermal Pilot Programs and Other Opportunities

Consultant Report Findings

The Consultant Report identifies networked geothermal systems as a decarbonization technology requiring further research and development. Networked geothermal systems have the potential to provide renewable decarbonized heating as an alternative to electrification, while leveraging the LDCs'

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[119] The PAs include: The Berkshire Gas Company, Fitchburg Gas & Electric Light Company d/b/a Unitil, Liberty Utilities (New England Natural Gas Company) Corp. d/b/a Liberty, Massachusetts Electric Company, Nantucket Electric Company, Boston Gas Company and former Colonial Gas Company, each d/b/a National Grid, NSTAR Electric Company, NSTAR Gas Company and Eversource Gas Company of Massachusetts, each d/b/a Eversource Energy, and Cape Light Compact JPE.

[120] Three-Year Plan 2022-2024, Docket Nos. D.P.U. 21-120 through D.P.U. 21-129, filed November 2021.

[121] Notably, the recently completed 'DMSHP Integrated Controls Market Effects Study' and proposed 'Heat Pump Crossover Temp Optimization', and 'Heat Pump Metering Impact' studies. Three-Year Energy Efficiency Plan 2022-2024, at 54-57, 68-69.

[122] A similar model is discussed in the Regulatory Designs Report, "Hydro-Quebec (HQD) and Energir have an ongoing "dual energy" agreement, in which gas customers in targeted market areas are converted to electricity to operate on electric heat during non-winter peak periods while operating on gas heat during winter peak periods. . . The agreement also includes an innovative benefit-sharing mechanism that would allow for a semi-annual financial transfer from HQD to Energir as compensation for their role in electrification." Regulatory Designs Report at 35.

existing expertise and workforce. At this time, however, the feasibility and long-term costs for these projects remain uncertain.[123]

The Consultant Report recommends LDCs develop research and development, and pilot opportunities for networked geothermal systems to evaluate the technology as a potential alternative to pipeline replacement projects. Networked geothermal systems may offer an opportunity to avoid planned replacement of mains and services by meeting customer needs through an alternative energy source.[124]

Company Strategy

The Company proposes to monitor the ongoing networked geothermal pilot projects being conducted by Eversource and National Grid and evaluate future opportunities to deploy the technology. Although the Company has concerns about the feasibility and near-term readiness for adopting networked geothermal programs in its service territory, FG&E sees long-term opportunities for this technology for two reasons. First, portions of the Company's service area that include a greater diversity of loads, including medium density residential and commercial areas, may provide beneficial opportunities for the deployment of networked geothermal systems. Second, the Company has planned GSEP expenditures through the end of 2034, and networked geothermal projects may be evaluated as a replacement for those expenditures.

Networked geothermal systems are capital-intensive and raise customer affordability concerns. The Company's assessment of networked geothermal systems therefore would include customer affordability and rate equity effects. As discussed earlier, FG&E's service area includes a high proportion of low-income customers and populations that reside in EJ communities that already have a significant energy burden. The installation of networked geothermal systems may place upward pressure on customer rates and bills, increasing their already-elevated energy burden. In addition, there is uncertainty related to customer group dynamics and protections in terms of converting to networked geothermal systems. There is a risk, for example, that some customers may be willing to convert to a networked geothermal system while others decline. Lastly, because there already are two geothermal pilot programs approved in Massachusetts, an additional pilot program could potentially be duplicative of either or both.[125]

In the near-term, FG&E will review and monitor the pilot programs undertaken by Eversource and National Grid to evaluate the benefits and costs of networked geothermal systems. The Company also will monitor community and customer interest, solicit stakeholder feedback, and assess other innovative electrification and decarbonized gas technologies, such as carbon capture technology, hydrogen blending into the gas stream, and gas heat pumps. The Company will seek and evaluate strategic opportunities as these emerging technologies become commercially mature.[126]

D. Manage Embedded Infrastructure Costs

Consultant Report Findings

The Consultant Report finds several decarbonization pathways result in fewer customers and lower volumes served by the gas system. In general, pathways with faster transitions to decarbonization have steeper declines in customers and throughput utilization, which increases the burden on existing or

123 Regulatory Designs Report at 13.

124 Regulatory Designs Report at 27.

125 See Boston Gas Company d/b/a National Grid, D.P.U. 21-24, at 16, 22 (2021) (taking into account whether the National Grid proposed geothermal pilot was duplicative of the Eversource geothermal pilot).

126 See Decarbonization Pathways Report at 61, 91, 92.

remaining gas customers to recover embedded gas infrastructure costs. The Consultant Report identifies strategies to minimize that effect while meeting obligation to operate the gas system in a safe and reliable manner. [127] For example, LDCs may be able to improve the coordination between gas and electric utility operations, thereby limiting infrastructure requirements while meeting safety and reliability requirements. In addition, through coordinated gas and electric planning, there may be opportunities to strategically deploy all-electric and hybrid heating systems, leveraging the gas and electric systems to efficiently serve customers through the transition, and optimizing the capital investments that best meet demand requirements.

There also may be opportunities to reconsider the standard of review and approval of LDC investments for line extensions. Potential changes to the line extension policies and practices may better align incremental revenues and costs associated with new customer additions.

Lastly, LDCs may be able to identify and evaluate alternative methods to recover costs of the gas system. Presently, LDCs recover costs of the gas system based on the expected useful life rather than utilization life of the gas system. As a result, pathways with a faster decline in customer and throughput utilization lead to misalignment between gas system utilization and cost recovery. The Consultant Report identified one approach to address the misalignment: change the cost recovery mechanism to a Units of Production ("UOP") method, which aligns cost recovery with expected system utilization.[128] Under that approach, the LDCs would begin to accelerate recovery of the gas system costs to align with declines in utilization during the transition to decarbonization. Although the near-term effect of the UOP method is higher delivery rates (resulting from higher depreciation rates based on a long-term decline in utilization), that effect may be addressed through phased or capped increases.

Company Strategy

The Company proposes several strategies to mitigate rate effects associated with the recovery of embedded gas system costs during the transition while continuing to operate its system in a safe, reliable, and cost-effective manner.

- Review standards for coordinated gas and electric system planning and investments: The short- to long-term transition of the gas system must take into account the broader context of the energy system's demands as a whole as the Commonwealth pursues its decarbonization goals and objectives. Accordingly, the Company proposes to review standards for coordinated gas and electric planning and investments to serve customers by examining opportunities for strategic deployment of all-electric and hybrid heating systems. The Company would examine alternative solutions to serve customers, such as deploying all-electric heating systems in areas with gas system constraints but available electric system capacity. This approach also may result in deploying hybrid heating systems in constrained areas of the electric system, with available

[127] LDCs must follow safety regulations regarding the installation, maintenance, and operations of the gas system, including gas mains, services, and meters. In addition, LDCs must follow regulations regarding the reliability of the gas system, such as demonstrating gas supply availability and reliability under extreme winter weather conditions.

[128] National Association of Regulatory Utility Commissioners ("NARUC"), Depreciation Expense: A Primer for Utility Regulators, May 2021. The UOP method is recognized by NARUC as, "Unit of production methods estimate depreciation costs on the basis of units of production (e.g., energy transmitted) rather than as a function of time."

capacity in the gas system. In this manner, the Company could optimize the utilization of the gas and electric systems.

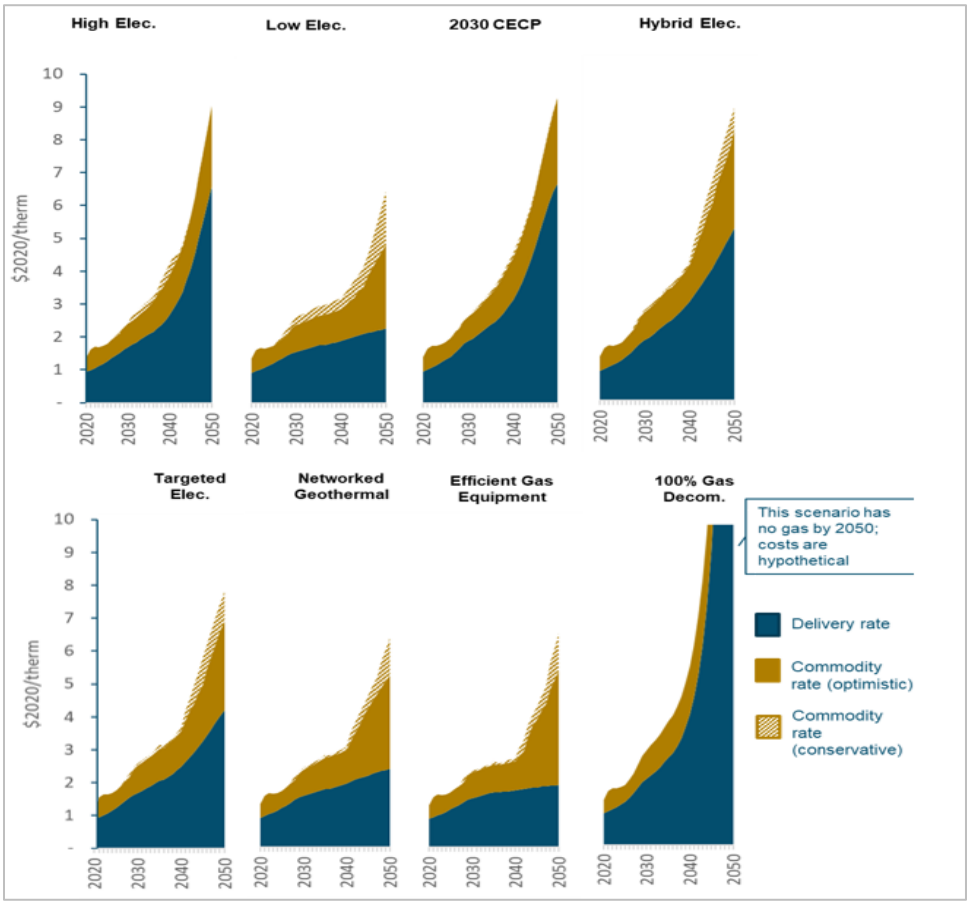
- Propose cost recovery and rate structures that reflect the optimization of benefits and costs across gas and electric systems: In conjunction with coordinated gas and electric system planning, the Company proposes to review cost recovery and rates structures that reflect optimization benefits and costs across gas and electric systems. This approach may include, for example, cost recovery and rate structures providing incentives for customers to install hybrid heating systems in constrained areas of the electric system to avoid facility investments.
- Review standards and evaluation methods for gas system investments to serve new customers: The Company proposes to review its standards regarding gas system investments, for example, examining its line extension policies to align with a forecasted long-term decline in system utilization.
- Modify recovery of embedded gas infrastructure costs: The Company proposes to evaluate accelerated depreciation of its gas system through the UOP method, which would better align cost recovery of embedded gas infrastructure costs with expected utilization of the gas system during the transition period. The expected utilization would be established based on the estimated effect of Company's programs on future gas demand. This approach would help minimize the shift in cost responsibility from migrating customers toward customers remaining on the system. The near-term implication of this approach is higher rates. The Company plans to evaluate these issues in the context of other proposed initiatives and overall customer affordability.

E. Address Customer Affordability and Rate Equity Impacts of Transition

Consultant Report Findings

The Consultant Report finds all decarbonization pathways result in a substantial increase in LDC unit-delivery and commodity costs arising from the transition to decarbonization, as shown in Figure 13.

Figure 13: Gas Unit Rates by Decarbonization Pathway (recreated from Consultant Report)



As Figure 13 demonstrates, under all pathways gas unit rates increase substantially from 2020 to 2050. The increases under some pathways, such as the High Electrification scenario, are largely attributable to higher delivery costs arising from embedded gas infrastructure costs incurred on behalf of customers and throughput leaving the gas system. Those departing customers leave behind uncollected costs that are shifted to remaining customers. Increases under other pathways, such as the Low Electrification scenario, are associated with higher gas supply portfolio costs, including the cost of decarbonized fuel in the gas system. Other costs, such as workforce transition, also would be incurred.

Traditional LDC cost recovery mechanisms are not structured to accommodate the anticipated magnitude of transition costs - Figure 13 suggests there comes a point at which remaining gas customers likely cannot bear the costs left behind by transitioning customers. Figure 13 also indicates that in general, pathways that continue to utilize the gas system have lower unit-cost effects, reducing the need for relatively expansive policy initiatives related to the gas system cost recovery.

The Consultant Report discusses several strategies to evaluate and enable customer affordability and equity of transition. One set of cost recovery strategies looks beyond LDC customers remaining on gas service and include:

- Cost recovery from departing customers and throughput;
- Cost recovery from electric customers based on benefits of transition; and

- Cost recovery from a wider group of funding sources, considering the beneficiaries of the climate goals.

An alternative set of strategies evaluates approaches to finance transition costs, such as through securitization, a form of financing designed to lower the costs of embedded assets to be recovered by the utility. Securitization does so by lower borrowing costs through a "secured," approved payment stream. Securitization has been applied recently to finance extraordinary costs in the utility industry, including Wildfire Cost Mitigation in California and Storm Uri costs in Texas.

Company Strategy

The Company proposes to evaluate strategies to address customer affordability and equity of transition, including solutions that look beyond recovering transition costs from LDC customers remaining on the gas system. FG&E considers such approaches worthy of exploration because (i) to the extent burdens should follow benefits, the beneficiaries of the Commonwealth's climate policies reach beyond remaining LDC customers, and (ii) FG&E's customers current energy burden creates significant concerns regarding the effect of transition costs on affordable, just and reasonable rates. The Company therefore proposes to evaluate transition cost recovery methods that include:

- Cost recovery from departing customers and throughput;
- Cost recovery from electric customers based on benefits of transition; and
- Cost recovery from a wider group of funding sources, considering the beneficiaries of the climate goals.

Lastly, the Company proposes to review and evaluate its current discounted rates for low-income customers (via Tariff Schedules R-2 and R-4). The currently applicable discounts for these customers are 25%. Future decarbonization strategies and initiatives may need to expand those programs to address rate affordability and equity. In addition, the Company recovers the discounts from all Firm customers through the Residential Assistance Adjustment Clause. Because the magnitude of the transition costs may be significant, funding additional discounts for low-income customers through alternative sources and mechanisms also should be considered.

V. FG&E Regulatory Proposals

As discussed in Section I, stable, long-term regulatory and policy support is critical for the success of the transition towards a decarbonized energy future in general, and Company's strategies, in particular. Although the scale, timing, and nature of the regulatory support needed varies based on the specific strategy, in general there are three categories of regulatory support likely required to support the Company's proposed transition strategies.

1. Standards for electrification and decarbonization: The Company proposes to work with the Department to establish a process to review and approve plans and initiatives, including pilot programs, the deployment of electrification and decarbonized technologies, and the purchase of renewable gas. The process also would include a framework to coordinate gas and electric utility system planning and investments providing opportunities for cross-utility coordination, such as hybrid heating systems and strategic deployment of all-electric and hybrid heat systems to serve new customers.
2. Design of cost recovery mechanisms: The Company proposes to work with the Department to establish mechanisms to recover the costs associated with the Company's proposals. In some cases, proposals may modify existing rate mechanisms, such as the Cost of Gas Adjustment Clause and the Energy Efficiency Charge. In other cases, the Company, in conjunction with the other LDCs, proposes to establish new mechanisms (i.e., the Model Tariff), given that the magnitude and timing of the transition costs is outside the scope or applicability of traditional LDC cost recovery mechanisms.
3. Performance metrics and tracking: In conjunction with the other LDCs, FG&E proposes to establish a schedule for periodic filings to the Department communicating progress toward decarbonization (i.e., the LDC Transition Plan as outlined in the Regulatory Framework). These filings will identify opportunities and challenges of the transition and allow for modifications based on new developments, information, and learning.

The Company's regulatory proposals for the transition strategies discussed in Section IV, and proposed metrics for tracking transition progress are provided below.

A. Enhance Energy Efficiency by Supporting Building Shell Retrofits and Promoting Customer Adoption of and Conversion to Electric Heating Technologies

Regulatory proposals to enable this strategy include:

- Expand funding for Three-Year Energy Efficiency Plans to promote adoption and conversion to electrification and decarbonized technologies.
- Authorize expenditures/recovery to reduce customer costs and remove obstacles to decarbonization, including for customer education, marketing, and incentives with focus on equitable access for low-income customers and populations in EJ communities.
- Evaluate alternative funding mechanisms to reflect the expanded funding necessary to achieve the climate goals and to better align cost responsibility associated with the programs to the benefits.
- Evaluate electric and gas rate structures that support hybrid heating systems to reflect the unique demand and cost characteristics of this technology on the gas and electric system.

B. Decrease the Carbon Content of the Gas Supply Portfolio by Procuring and Utilizing Renewable and Certified Gas

- Propose revised requirements for Forecast and Supply Planning: As described in Section IV, the Company intends to propose volumetric targets for Certified Gas and RNG procurement in its next F&SP filing. As part of that effort, FG&E proposes to modify the scope of F&SP requirements to include reporting on actual and projected scope 2 and 3 GHG emissions, including strategies such as Certified Gas and RNG procurement to mitigate future GHG emissions over the forecast period.

  The Company also proposes a "Renewable Heating Fuel" portfolio standard for renewable gas that establishes a minimum level of renewable gas by 2030. The Company proposes to include biomethane and Certified Gas as qualified fuels for the Renewable Heating Fuel portfolio standard. The Company's proposal is similar in concept to the Massachusetts Renewable Portfolio Standard.[129]

  The Company proposes to establish the percentage blends for RNG and Certified Gas in its gas supply based on the customer affordability impacts. Blending with RNG and Certified Gas likely will have a lower rate impact than blending with RNG alone.

- Propose optional renewable gas service: The Company proposes to offer customers an opportunity to purchase renewable gas, potentially bundled with products such as carbon offsets and Certified Gas, through a new tariff. Customers will have the opportunity to purchase renewable gas from the Company at the cost of the renewable gas. The Company's proposal is similar to Vermont Gas's "Renewable Natural Gas Rider".[130]

C. Develop and Deploy Programs to Support Electrification and Decarbonization

1. Develop Hybrid Heating System Programs

- Propose standards for design and approval of a hybrid heating program: The standards will include the costs and benefits of hybrid heating systems as a construct for the electric utility to manage winter peak demands. The standards also will describe reporting requirements.

- Propose a cost recovery mechanism associated with the hybrid heating program as part of the Model Tariff proposed jointly by the LDCs (outlined in the Regulatory Framework), including costs associated with customer education, trade ally participation, technology, and customer conversion. The proposal will include evaluation of alternative funding mechanisms to better align program costs and benefits.

- Propose revisions to the gas rates reflecting the unique demand and cost requirements of hybrid heating systems: Evaluate transfer payments from the electric system to the gas system, perhaps comparable to capacity payments made to demand response resources in the electric market, that reflects the benefits of the gas system in avoiding or minimizing electric system infrastructure investments to serve the winter peak day.

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[129] "The Massachusetts Renewable Energy Portfolio Standard (RPS) requires retail electricity suppliers (both regulated distribution utilities and competitive suppliers) obtain a percentage of the electricity they serve to their customers from qualifying renewable energy facilities." See https://www.mass.gov/service-details/program-summaries.

[130] See http://www.vermontgas.com/wp-content/uploads/2021/11/RNG-adder-Page-14-effective-November-1-2021.pdf.

2. Monitor Networked Geothermal Pilot Programs and Other Opportunities

- As discussed in Section IV.C.4, the Company proposes to monitor various innovative electrification and decarbonized gas technologies, such as the ongoing networked geothermal projects. Consequently, the Company has not yet developed a specific regulatory proposal for this strategy.

D. Manage Embedded Infrastructure Costs

- Revise standards for gas and electric system planning and investments by examining opportunities for strategic deployment of all-electric and hybrid heating systems through coordinated gas and electric planning and investment.
- Propose cost recovery and rate structures that reflect optimization benefits and costs across gas and electric systems, including, for example, cost recovery and rate structures that provide incentives for customers to install hybrid heating systems.
- Review standards and evaluation methods for gas system investments to serve new customers including examining line extension policies to align with a forecasted long-term decline in system utilization.
- Modify recovery of embedded gas infrastructure costs such as implementation of accelerated depreciation of gas system through the UOP method, and moving revenue decoupling structures to target revenue from revenue per customer (as outlined in the Regulatory Framework).

E. Address Customer Affordability and Rate Equity Impacts of Transition

Evaluate solutions that look beyond the LDC customers remaining on the gas system for cost recovery of transition costs.

- Review and evaluate low-income discounts: Decarbonization strategies and initiatives may need an expansion of the discounts for low-income customers, which may also need to be funded through alternative sources and mechanisms.

F. LDC Transition Plans and Monitoring Future Progress

The Company proposes to expand its data collection capabilities to begin tracking customer fuel sources, as well as building, appliance, and occupancy characteristics to enable more accurate future estimates of customer specific emissions. The Company also proposes to provide emissions tracking tools to customers. These initiatives will allow the Company to better track and report energy-related emissions, and to provide a meaningful baseline for proposed future emissions reductions plans and programs.

In conjunction with the other LDCs, the Company proposes to establish a schedule for periodic filings (i.e., the LDC Transition Plans) to provide the Department with data and information to evaluate progress toward decarbonization. Specifically, every three years, the Company will file forward-looking plans and proposals for the following three years to implement its decarbonization strategies.[131] The Company anticipates the LDC Transition Plan would include the following data and information:

- Customer data: Customers currently receiving service, requesting service, being denied service, or departing service; this includes an estimation of customers who have installed electric heating systems but not requested termination of gas service.

[131] This is similar to the Grid Modernization regulatory framework and the Three-Year Energy Efficiency Plan model.

- Decarbonized fuel customers: Customers opting for decarbonized fuel supply offering, volume and costs of decarbonized fuels purchased for customers.
- Emissions calculations: A tabulation of current emissions, including emissions associated with all grades of leaks and a tabulation of leak-prone pipe infrastructure by material.
- Infrastructure: A tabulation of infrastructure that can accommodate renewable natural gas.
- Rates and bills: Current and projected customer delivery rates, delivery bills, and total bills for the next three years; such information will identify incremental impacts from planned activities.
- Effects on EJ communities: Effects of the Company's activities on EJ communities (as defined in Massachusetts law).

In addition, the Company's LDC Transition Plan will identify opportunities and challenges of the transition and allow for modifications based on new developments and advancements in technologies.

VI. Conclusion

FG&E appreciates the opportunity to present its Transition Plan to the Department and the valuable input from stakeholders that have informed both the Consultant Report and the Company's Transition Plan. Unitil Corporation's approach to a sustainable future reflects a broad set of objectives including superior customer service, affordable rates, service to our communities, environmental stewardship, a steadfast commitment to safety, and the growth and well-being of our employees. This proceeding is an extension of that approach, and the decarbonization strategies proposed by FG&E in its Transition Plan reflect a meaningful commitment to reduce GHG emissions and support the Commonwealth in achieving its environmental objectives.

FG&E looks forward to working with the Department in this proceeding as it evaluates strategies to support the Commonwealth's climate goals while maintaining safe, reliable, and affordable energy services for customers. Because each LDC is unique and there are inherent uncertainties with respect to the course of decarbonization, the Department should not consider all-or-nothing or one-track solutions. Instead, FG&E urges the Department to consider all options that will contribute to achieving the Commonwealth's climate goals and allow the LDCs to maintain flexibility in the face of that uncertainty.

FG&E further urges the Department to continue to employ long-standing ratemaking principles in this proceeding, chief among them that proposals must in the public interest, and result in just and reasonable rates. Continuing to apply these bedrock principles will ensure the Commonwealth's climate objectives are achieved in a cost-effective, equitable manner for all stakeholders.

COMMONWEALTH OF MASSACHUSETTS

DEPARTMENT OF PUBLIC UTILITIES

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 Goals	)	D.P.U. 20-80

APPEARANCE OF COUNSEL

In the above-referenced proceeding, we the undersigned hereby appear for and on behalf of Fitchburg Gas and Electric Light Company d/b/a Unitil.

Respectfully Submitted,

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