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March 18, 2022

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

Re: Investigation into the Role of Gas Local Distribution Companies as the Commonwealth Achieves its Target 2050 Goals – D.P.U. 20-80

Dear Secretary Marini:

On behalf of NSTAR Gas Company and Eversource Gas Company of Massachusetts, each d/b/a Eversource Energy (“Company” or “Eversource”), enclosed is the Company’s Operating Plan (“Plan”) pursuant to the Vote and Order Opening Investigation issued by the Department of Public Utilities (“Department”) on October 29, 2020.¹

¹ Please note that, under separate cover, Eversource is also submitting its Gas Clean Energy Business Case Analysis pursuant to the D.P.U. 20-59 Settlement Agreement. In October 2020, the Department issued an order approving a Settlement Agreement that would resolve the proposed sale of all of Bay State’s assets to Eversource Energy (D.P.U. 20-59/D.P.U. 19-140/D.P.U. 19-141). The Settlement Agreement was filed by Eversource Energy, Eversource Gas Company of Massachusetts (EGMA, collectively “Eversource”), NiSource, Bay State Gas Company, the Attorney General for the Commonwealth of Massachusetts, the Department of Energy Resources and the Low-Income Weatherization and Fuel Assistance Program Network. As part of the Settlement Agreement, the Eversource was required to retain an independent consultant to prepare and submit a business case analysis of potential decarbonization strategies that could be implemented in relation to the reduction of GHG emissions associated with the sale and distribution of natural gas consistent with the 2030 Interim CECP and 2050 Roadmap. D.P.U. 20-59, Settlement Agreement, Appendix 6 at 2.

In developing the Plan, the Company utilized the Technical Analysis of Decarbonization Pathways Report (“Decarbonization Pathways Report”) and Considerations and Alternatives for Regulatory Designs to Support Transition Plans Report (“Regulatory Designs Report”) developed by Energy & Environmental Economics (“E3”) and ScottMadden and submitted under separate cover concurrently.

The Company’s Plan includes a comprehensive set of initiatives that advance efforts towards the Commonwealth’s climate goals, maintain safety and reliability, and recognize customer choice. The main strategies underlying Eversource’s Plan are: reduce energy demand; hybrid electrification; strategic electrification; and decarbonization of the gas network.

The Company is pleased to offer its Plan and support the Commonwealth in the achievement of its climate goals. The Company looks forward to working with the Department, peer local gas distribution companies, and stakeholders in D.P.U. 20-80 and the transition to a net zero future.

Also enclosed are Notices of Appearance of Counsel for Danielle C. Winter, Esq. and Kerri A. Mahoney, Esq.

Thank you for your attention to this matter. Please contact me with any questions you may have regarding this filing.

Sincerely,

A handwritten signature in blue ink, appearing to read "Daniel Crisp".

Enclosures

cc: D.P.U. 20-80 Service List
Alexandra Blackmore, Esq. – National Grid
Andrea Keeffe, Esq. – National Grid
Danielle Winter, Esq. – Keegan Werlin LLP
Kerri Mahoney, Esq. – Keegan Werlin LLP
R.J. Ritchie, Esq. – Liberty
Daniel Crisp, Esq. – Berkshire Gas
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MA D.P.U. 20-80 Filing

March 8, 2022

EVERSOURCE

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Glossary of Terms

ASHP: Air-Source Heat Pump.

BTU or Btu: British thermal unit. 1 BTU = 1,055 joules.

Biomethane: Methane produced from organic matter, through anaerobic digestion or gasification.

Bundled customers: Customers who receive both energy supply and delivery services from their local natural gas distribution utility.

C&I: Commercial and Industrial.

CO₂: Carbon dioxide.

Consultants: E3 and ScottMadden.

Consultants' Report: The independent consultant team report on the Role of Gas Distribution Companies in Achieving the Commonwealth's Climate Goals performed by E3 and ScottMadden. The Consultants' Report includes a Technical Analysis of Decarbonization Pathways ("Decarbonization Pathways Report") and Considerations and Alternatives for Regulatory Design to Support Transition Plans ("Regulatory Designs Report") engaged for the purposes of D.P.U. 20-80.

COP: Coefficient of Performance. A measure of efficiency for a heating or cooling appliance.

CNG: Compressed Natural Gas.

Decarbonization Pathways: Economywide transformations that result in emissions reductions over time, involving replacing end-use appliances with high efficiency models, electrifying end uses, employing efficiency measures, and decarbonizing fuel and electric supplies. Eight such pathways were developed by the Consultants for Massachusetts, all of which achieve the same economy-wide climate goals, i.e., 90% gross GHG reductions and net-zero GHGs by 2050 compared to 1990 levels,¹ as well as interim statutory emissions reduction goals of 50% by 2030 and 75% by 2040.²

Production Certified Gas (PCG): Geological natural gas that undergoes third-party certifications that verify the gas was produced or transported in a manner consistent with certain environmental, social and governance standards.³

¹ Consistent with the 2050 Roadmap, remaining emissions in 2050 are assumed to be netted off by carbon sinks to achieve carbon neutrality by 2050.

² *An Act Creating a Next-Generation Roadmap for Massachusetts Climate Policy*. Commonwealth of Massachusetts. 2021. <https://malegislature.gov/Laws/SessionLaws/Acts/2021/Chapter8>

³ Certified natural gas: Midstream sector begins embracing concept, standards. S&P Global. October 2021, <https://www.spglobal.com/platts/en/market-insights/latest-news/natural-gas/101421-certified-natural-gas-midstream-sector-begins-embracing-concept-standards>

DPU or Department: Massachusetts Department of Public Utilities.

D.P.U. 20-80: Docket number referring to the investigation by the Department of Public Utilities on the role of local gas distribution companies as the Commonwealth achieves its 2050 climate goals.

E3: Energy and Environmental Economics, Inc. Consultants contracted by the LDCs to investigate decarbonization pathways and the role of gas LDCs.

EJ: Environmental justice.

Embedded costs: A utility's investment supporting existing distribution-systems infrastructure.

Energy efficiency: Energy saving measures. In this study, energy efficiency is a foundational component of all decarbonization pathways and include building shell efficiency improvements; electrification; in-kind, high-efficiency replacements; and industrial manufacturing efficiency.

ERM Report: The stakeholder engagement process report developed by Environmental Resources Management, or ERM, the stakeholder facilitation consultant contracted for the D.P.U. 20-80 process.

EV: Electric Vehicle.

FERC: Federal Energy Regulatory Commission. An independent agency that regulates the interstate transmission of electricity, natural gas, and oil.

GHG: Greenhouse Gas.

GSEP: Gas System Enhancement Plans. The Gas Leaks Act passed in 2014 permitted gas distribution companies in Massachusetts to submit annual Gas System Enhancement Programs for replacement of aged infrastructure during the following calendar year.⁴

GSHP: Ground-Source Heat Pump.

GW: Gigawatt. One gigawatt is equal to one billion (1×10^9) watts.

Hybrid heat pump system: An air-source heat pump that is linked to, or paired with, an auxiliary natural gas furnace. It can also be called a dual fuel heat pump system.

Hybrid electrification: Electrification strategy that combines electric heat pumps with a gas back-up for space heating.

H₂: Hydrogen gas.

⁴ GSEPs Pursuant to 2014 Gas Leaks Act. Massachusetts Department of Public Utilities. <https://www.mass.gov/lists/gseps-pursuant-to-2014-gas-leaks-act>.

Interim 2030 CECP: *Interim Clean Energy and Climate Plan for 2030* developed by the Massachusetts Executive Office of Energy and Environmental Affairs, released in December 2020.⁵

ISO-NE: The Independent System Operator of New England. An independent organization that oversees the operation of New England's bulk electric power system, administers the region's competitive wholesale electricity markets, and manages the regional power system planning process.

KW: Keegan Werlin LLP, regulatory counsel to the LDCs.

Large energy user: Customers that purchase large volumes of natural gas, including large commercial and industrial customers. These customers are usually "delivery only" customers that utilize an LDCs delivery service but procure natural gas separately.

LDCs: The five Massachusetts gas local distribution companies: The Berkshire Gas Company ("Berkshire"), NSTAR Gas Company and Eversource Gas Company ("Eversource"), Liberty Utilities (New England Natural Gas Company) Corp. ("Liberty"), Boston Gas Company ("National Grid"), and Fitchburg Gas & Electric Light Company ("Unitil").

LNG: Liquefied Natural Gas.

Long-term capacity contracts: A gas supply contract that guarantees supply over a long period of time.

kWh: Kilowatt-hour. 1 kWh = 3.6×10^6 joules.

Mass Save: An initiative in Massachusetts designed to provide services, incentives, trainings, and information promoting energy efficiency that help residents and businesses manage energy use and related costs. The initiative is a partnership between the Massachusetts Department of Energy Resources and program sponsors, including Massachusetts' natural gas and electric utilities and energy efficiency providers.

Migrating or non-migrating customers: Gas customers that adopt ("migrating customers") or do not adopt ("non-migrating customers") a decarbonization technology. Migrating customers do not necessarily depart from the gas system under this definition.

Networked geothermal: A shared system of ground-source heat pumps that delivers heating and cooling through a network of pipes.

PEAT: Eversource Pro-Equity Advisory Team

⁵ *Massachusetts Clean Energy and Climate Plan for 2025 and 2030*. Massachusetts Department of Public Utilities. <https://www.mass.gov/info-details/massachusetts-clean-energy-and-climate-plan-for-2025-and-2030>.

Regulatory Framework: The LDC Common Regulatory Framework and Overview of Net Zero Enablement Plans, including a Net Zero Enablement Model Tariff, submitted jointly by the Massachusetts LDCs.

Renewable fuels: Umbrella term referring to renewably produced alternatives to fossil fuels. This includes renewable gases in the distribution system, as well as renewable fuels in the transportation sector.

Renewable gas: Umbrella term referring to renewably produced alternatives to natural gas that can be blended into the distribution pipeline system. Renewable gases include biomethane produced through anaerobic digestion or gasification, renewable hydrogen and Synthetic Natural Gas (SNG) produced from renewable hydrogen and a climate-neutral source of carbon.

Renewable hydrogen: Hydrogen produced from electrolysis powered by renewable energy.

Retail choice: Customer choice program that gives customers the option to “unbundle” their natural gas service and purchase natural gas from a natural gas supplier/marketer that is different from the local natural gas utility.

RNG: Renewable Natural Gas. See Biomethane.

Roadmap: The Massachusetts 2050 Decarbonization Roadmap study developed by the Executive Office of Energy and Environmental Affairs to explore strategies to reduce emissions and achieve the Commonwealth’s climate goals.⁶

ScottMadden: ScottMadden, Inc. Consultants contracted by the LDCs to investigate decarbonization pathways and the role of gas LDCs.

SNG: Synthetic Natural Gas. In this study, synthetic natural gas refers to methane that is chemically synthesized from renewable hydrogen and a climate-neutral source of carbon dioxide from biomass or Direct Air Capture.

Therm: Unit of heat energy. 1 therm = 100,000 BTU.

T&D: Transmission and Distribution.

TBTU or TBtu: Trillion BTU.

TWh: Terawatt-hour. 1 TWh = 1×10^9 kWh = 3.6×10^{15} joules.

Utility gas plant: Physical assets owned by LDCs, including mains, meters & services, and storage facilities.

⁶ MA Decarbonization Roadmap. Massachusetts Department of Public Utilities. <https://www.mass.gov/info-details/ma-decarbonization-roadmap>.

Executive Summary

In fulfillment of obligations established pursuant to the Notice of Investigation of the Massachusetts Department of Public Utilities in D.P.U. 20-80, dated October 2020, Eversource is pleased to present its long-term decarbonization plan (the “ES Plan”), inclusive of a detailed near term Operating Plan (2023-2025). The ES Plan sets out the Company’s recommendations and plans for assisting the Commonwealth of Massachusetts achieve its 2050 and interim climate goals.

Eversource’s Operating Plan

As an energy leader in New England and Massachusetts, Eversource has a responsibility to drive the energy transition, especially in the building sector. The ES Plan memorializes our commitment to the communities and customers we serve and utilizes Eversource’s expertise as an experienced thermal energy provider to achieve the Commonwealth’s net zero policy goals. Eversource is well positioned to offer services to customers to meet their thermal requirements. In that regard, the ES Plan is structured as a “portfolio approach,” leveraging several Pathways, or scenarios, collaboratively developed as part of the D.P.U. 20-80 proceeding. The ES Plan consists of six new initiatives comprising the Operating Plan. Eversource recommends that pushing forward on the decarbonization efforts will require close internal coordination between gas and electric companies; an expansion of stakeholder engagement; and further integration of equity and environmental justice principles. All D.P.U. 20-80 stakeholders have embarked on an effort to tackle the difficult issues that must be resolved to advance long-term decarbonization beyond the initial Operating Plan period.

- **Portfolio Approach:** The ES Plan is structured as a portfolio of options that are all concordant with elements that make up the eight Pathways, as established by the independent consultants’ study in the Consultants’ Report and the Commonwealth in the Roadmap. This “portfolio approach” vests Eversource with the ability to meet the Commonwealth’s important “net zero” policy goals and associated milestones (2030, 2040 and 2050), while mitigating cost and reliability impacts to customers. This outcome aligns closely with Eversource’s own clean energy and carbon-reduction initiatives, including the industry leading target to become carbon neutral by 2030. The portfolio approach is very important to Eversource’s commitments because it provides flexibility and multiple pathways to “net zero,” thereby diversifying risks as technologies, customer preferences and markets evolve. The flexibility also creates multiple pathways for Eversource to reach all its customers equitably.

- **Regulatory Mechanisms:** Eversource is aligned with the LDCs’ regulatory recommendations provided in the jointly filed Regulatory Designs Report ().⁷ These recommendations include: (a) adjustments to forecast and supply plan standards; (b) research and development of decarbonization technologies; (c) changes to revenue decoupling mechanisms; (d) and identifying strategies to address embedded costs as the need arises. Additionally, greater gas and electric coordination will support the diligent use of these regulatory support mechanisms. Implementing applicable regulatory support mechanisms will propel the success of Eversource’s Operating Plan and support future cycles of the transition plan.
- **Key Success Factors/Proposed Metrics:** Eversource identifies within its Proposal several elements for planning for emission reductions. These include an alignment to core cost of service requirements for safety, reliability, and affordability. Additionally, the Pathways are long-term and high level in their nature, and a lot of work is needed to translate them into specific initiatives, programs, and projects. In turn, this “translation” of Pathways into specific activities will demand considering a range of qualitative criteria, including those involving Technology Risk and Customer Choice alignment. Gas delivery system physical attributes are also hugely important -- in fact, often dispositive for whether an initiative makes sense in a particular location. So too, will be the nature of the building stock within Eversource’s service territory.⁸ To meet these planning needs, the ES Plan elaborates on qualitative planning criteria that must be considered as part of initiative development. Ultimately the success of the ES Plan will be dependent on how well the operating plan tracks against emissions reductions while providing safe, reliable and cost-effective service for customers. To that end, Eversource is providing factors that we propose to evaluate success.
- **Equity, Environmental Justice and Workforce Transition:** The ES Plan also includes an emphasis on expanding the integration of its efforts in equity and environmental justice area to decarbonization planning. The focus on ensuring benefits of the clean energy transition to environmental justice and other populations is critically important, as is mitigating negative and/or disproportionate impacts. This includes developing ways to link up workforce development needs, environmental justice and equity commitments and the needs for skilled labor to carry out initiatives. Eversource looks to continue equity conversations with environmental justice stakeholders to engage and tap into their expertise around best practices.
- **Whole System Thinking:** Whole system thinking is essential for guiding the energy transition. Accordingly, the ES Plan is grounded on the importance of cross-company electric and gas integrated planning. The ES Plan includes commitments to continue and

⁷ LDC Common Regulatory Framework and Overview of Net Zero Enablement Plans, submitted to the Department of Public Utilities in D.P.U. 20-80, March 18, 2022, on behalf of the Massachusetts LDCs.

⁸ Eversource’s notes, for example, that its relatively older housing stock, its large number of Environmental Justice blocks, and its fair level of electric integration (around 50% of Eversource’s customers receive both electric and gas services), are unique attributes of the Eversource system, and will need accommodation in the development and review of initiatives.

expand the influence of its internal multi-disciplinary planning group into decarbonization planning. This emphasis on whole-system thinking is essential in Eversource's view for securing long-term success. In fact, this emphasis is one of the key reasons for the Company's portfolio approach to decarbonization efforts. On a macro level, Eversource views that the Commonwealth will achieve the 2050 emissions reductions by working holistically across all the different sectors to secure a successful pace and implementation for the energy transition.

- **Stakeholder Input:** The ES Plan reaffirms the Company's deeply held commitments to collaboration with valued stakeholders, who have contributed extensively to the progress within this proceeding. The stakeholder input has sharply influenced the several Pathway recommendations offered by the independent consultants. Eversource also affirms as part of its ES Plan the importance of going further and expanding stakeholder engagement. We look forward to providing more formal stakeholder engagement to ensure transparency and diverse input as we progress with the ES Plan.
- **Practical Initiatives:** The ES Operating Plan will be carried out during the 2023-2025 time period. The Company recommends a triennial cycle to guide decarbonization forward. The Company's initial Operating Plan presented here is built on a set of six new initiatives. These are diverse in nature and focus, entailing a mix of infrastructure, end-use applications (including geothermal), energy efficiency, low-carbon gas supply, and research and development efforts.
- **Reliability Commitment:** Eversource remains committed to serving customers reliably and safely today, and into the future, utilizing the established planning standards and a diverse supply portfolio and on-system facilities. Eversource will continue to evaluate and procure gas supplies now and in the future with the heightened awareness that New England's physical location is at the end of the gas system and whose electric grid has challenges. To that end, the ES Plan will support a balanced approach to ensure reliability is maintained and highlight the coordinated effort needed between the gas and electric businesses within.

A Deep Commitment to Decarbonization

Eversource is deeply committed to supporting the region's future and recognizes the importance its customers and other stakeholders place on meeting the obligations presented by climate change. The climate change challenges involve large transitions within many core and essential economic sectors, which is not surprising since gas and electricity services touch nearly all aspects of modern life. Eversource fully supports the Commonwealth's 2050 GHG emissions reductions. As the largest energy delivery company in New England, we have an important role to play as a leader driving the energy transition forward especially as we think about thermal needs in the building sector. We look forward to reflecting our leadership and ideas on how to assist our communities, customers and businesses make the energy transition.

Introduction

Eversource is pleased to present its long-term decarbonization perspective, inclusive of a near-term Operating Plan (the “ES Plan”), in response to the notice of investigation issued by the Massachusetts Department of Public Utilities on October 29, 2020 (“NOV”). The ES Plan sets out the Company’s recommendations and plans for assisting the Commonwealth in achieving its 2050 climate goals.⁹

Eversource has created its decarbonization recommendations and plan by taking into account the findings and recommendations of the Consultants’ Report that lays out possible, long-term decarbonization “Pathways” for all the Massachusetts LDCs¹⁰ and for various market sectors.

Eversource has relied on the Consultant Report (inclusive of several appendices) to create its long-term decarbonization perspective presented here, and in fulfillment of the Department’s NOV. This long-term perspective includes an Operating Plan for the period 2023-2025, which is comprised of a set of specific climate-oriented initiatives and continuing existing programs.

Eversource’s Decarbonization Vision

Eversource recognizes the urgency of mitigating climate change, the imperatives for action, and the unique role we play. A key dimension of long-term decarbonization planning and implementation is to embrace both gas and electric services, reflecting a mix of technologies, initiatives, and regulatory and planning support mechanism. This approach is a critical element of a meaningful path forward, in Eversource’s opinion, as it diversifies the risk associated with securing the needed progress on long-term decarbonization. This approach is embedded within the ES Plan.

Utilizing evaluation criteria and establishing success factors that ultimately lead to metrics will be critical to demonstrate progress in meeting the Commonwealth’s net zero emissions reductions. We describe these criteria and success factors later within this filing for the Department’s consideration.

Eversource’s long-term decarbonization perspective, inclusive of Eversource’s Operating Plan, enhances and compliments an ambitious carbon reduction and clean-energy vision that Eversource has laid out and advocated for several years. Central to that vision is our target to become carbon neutral by 2030 across Eversource operations (Scope 1 and Scope 2 emissions).

The plan to achieve carbon neutrality by 2030 is centered on five key areas: line loss (the emissions associated with energy lost when power is transmitted and distributed across the electric system), methane leaks from natural gas distribution system, emissions from operations

⁹ Information regarding the NOV, including related procedural information, is available in the “LDC Common Regulatory Framework and Overview of Net Zero Enablement Plans” as submitted to the Commonwealth on March 18, 2022.

¹⁰ For the purpose of this filing, the term LDCs refers collectively to The Berkshire Gas Company, NSTAR Gas Company and Eversource Gas Company of Massachusetts, each d/b/a Eversource Energy, Liberty Utilities (New England Natural 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, each d/b/a National Grid, and Fitchburg Gas and Electric Light Company d/b/a Until.

of Eversource's facilities and vehicle fleet, and sulfur hexafluoride (SF6) leaks from electric equipment.

Identifying and executing deep emission-reduction measures, investing in credible offsets for emissions that cannot be avoided and continuing our deep engagement and collaboration with internal and external stakeholders are all essential for success. Eversource's efforts are overseen by cross functional teams with a dedicated governance structure; progress on Eversource's performance meeting its carbon neutrality goal (along with other climate and environmental initiatives) is described in the Eversource Sustainability report and in other company communications.¹¹

In addition to making operational emissions carbon neutral by 2030, Eversource is currently evaluating indirect emissions across its value chain, which include upstream and downstream emissions such as those associated with customer end use of the energy we supply. As part of this effort Eversource aims to identify opportunities to reduce these emissions. From a gas perspective, this would dovetail with the options Eversource intends to pursue within the ES Plan.

Looking beyond operational emissions, Eversource's long-term decarbonization perspective, inclusive of its Operating Plan, introduces a set of six (6) new initiatives. These initiatives add vital components to Eversource's long-term decarbonization strategy. The initiatives are diverse in nature, and include roles for energy efficiency, targeted electrification, continued geothermal efforts, renewable fuels, and innovation efforts (including demonstrations).

What is noteworthy about both the Operating Plan, and the long-term planning "vehicle" provided through the D.P.U. 20-80 process, is that Eversource formally recognizes the need to embrace cross-company and multi-sector planning, bringing to the table holistic thinking, analysis and aspirations involving the gas and electricity energy sectors, as well as transitions within the transport, equipment supply (of major energy consuming devices) and building sectors, to name several.¹² Eversource, in fact, has already started this integrated cross-company planning by standing up a comprehensive gas/electric planning group. The coordination and integration of gas and electric planning is a pivotal first step in Eversource's decarbonization journey.

The D.P.U. 20-80 process also recognizes that the lynch pin for coherent, enduring and resilient long-term decarbonization planning and implementation rests on the Commonwealth's collective capacity to formulate and implement a wide range of regulatory support mechanisms, which are needed to unlock climate transition potentials across many intertwined market sectors. Addressing the challenges of regulatory support, including the need for a new

¹¹ See Eversource Commitment to Environmental Sustainability & Carbon Neutrality.

<https://www.eversource.com/content/nh/residential/about/investors/sustainability-the-environment/commitment-to-environmental-sustainability>.

See Eversource 2020 Sustainability Report, Our Commitment Section Pg. 6-14. <https://www.eversource.com/content/docs/default-source/community/2020-sustainability-report.pdf>

¹² The Consultants' Report is based on a characterization of stock rollover of equipment in major sectors of the economy, tracking the turnover of energy consuming devices.

decarbonization funding mechanism and revisions to the least cost planning standard, creates an additional building block within Eversource's climate friendly, decarbonization vision and strategy.

Eversource also elevates as part of the D.P.U. 20-80 decarbonization planning, and its Operating Plan, certain foundational principles, or "must haves," that support common goals for coherent, market-friendly decarbonization programs.

- Core to our proposal is achieving measurable emission reductions in the heating sector, aligned with the Commonwealth's goals and stakeholder input.
- Safety, reliability, and affordability are established bedrock guiding principles that have served Eversource customers and the broader economy well over many decades and should continue to be relied upon as we embrace and pursue decarbonization strategies and policies.
- These bedrock principles need to be complemented, not eroded, with additional considerations through a regulatory reform process that ensure that decarbonization programs do not cause unfair and punitive cost shifts, failures to meet environmental justice and equity goals, or failures to recognize the value of keeping risks to safe and reliable operations always in mind.
- Decarbonization, given its multi-sector nature, and extent in terms of market transformation, requires a healthy dose of perspective on feasibility, flexibility in planning, and adaptability as more is learned over time. Programs and reforms will need adjustment. This flexibility will help steer programs in the right direction, allow them to adapt in meaningful ways to support innovation, company learning and customer adoption, and keep customer costs in check.
- Feasibility will require paying attention and addressing many site-specific considerations involving the expansion of electricity infrastructures, the needs for new rights-of-way to support programs such as geothermal, and other local land use considerations. Decarbonization planning, and the adoption of strategies and programs, must be realistic in assessing what is working and what is not, and if issues and challenges grow that impact program costs, schedules, risks and outcomes, then the planning process needs to directly address them more fundamentally in order to resolve them.
- The customer is at the center of this decarbonization transition. Programs and investments opportunities must fit with customer preferences expand their choices and be well informed in terms of climate transition beneficial opportunities. Additionally, Eversource -- along with all stakeholders -- has a very important role in educating customers and expanding their access to good information about technology choices that they can make to help further reduce emissions. Finally, to succeed in this role of

expanding information and mindsets, Eversource needs to listen to its customers and stakeholders to bring forward the best options to customers. These commitments to customers include ensuring decarbonization planning pursues policies and guidelines established as part of Eversource's Equity and Environmental Justice commitments.

Eight Long Term Decarbonization Pathways

The Consultants' Report identifies eight Pathways, or scenarios, that lead to the fulfillment of the Commonwealth's climate progress goals at various milestones out to 2050. As the Consultants explain, the Pathways are not forecasts nor do they recommend a single or preferred (technical or policy) solution. Rather, the Pathways bundled together technologies with assumptions about implementation timetables, costs, and emission reduction potentials to illuminate key features of "plausible futures" to identify the feasibility of these Pathways, their relative costs, and their risks. These Pathways reflect reasonable points of view about future directions and help drive out key issues and tradeoffs, and as such represent a reasonable starting point to inform detailed climate planning. Of note is that, as part of D.P.U. 20-80, Eversource has actively and extensively collaborated with its stakeholders in identifying and developing these Pathways; with this input the Pathways reflect holistic thinking and represent multiple points of view.

The eight Pathways are identified in detail in the Consultants' Report. Common across the Pathways are important roles for: (a) a reliance on energy efficiency measures through building shell retrofits and new equipment (like heat pumps); (b) whole-building electrification (including strategies for all-electric residential new construction); and (c) biomethane from wastes and residuals (to inject and blend into the gas stream).

As explained in this Eversource long-term decarbonization perspective, there are attributes of the Eversource service territory and system that create both pros and cons for the various Pathways and their underlying technology and market assumptions. This does not mean that an individual Pathway might be superior or deficient per se as compared to others, but rather that aspects of these Pathways (e.g., their potential form and fit, taking into account local system attributes and planning requirements) make them either more or less attractive in particular circumstances. Some measures may provide significant benefits for new construction. Other options may be advantageous given cost points and building upgrade requirements. Additionally, because Eversource is supporting elements of all Pathways, if a given Pathway is not achieving the desired outcomes (i.e., as reflected in objectives related to cost, schedule, performance, etc.), Eversource's long-term perspective is flexible and can pivot to those directions that are more successful.

Eversource has taken specific account of the Pathways, the various pros and cons of them, into the design of its long-term climate actions, and in the formalization of its initiatives as part of its Operating Plan. Furthermore, particularly at these early stages in planning, Eversource is recommending the implementation of a portfolio approach to make progress on many fronts to pursue most of the suggested Pathways. As noted in the Consultants' Report, over time knowledge grows about these directions and options and climate plans will have to adjust in their emphasis. Additionally, some Pathways have inherently greater reliance on regulatory

reforms, which are pending. The success, therefore, of any individual Pathway, will depend on the timely resolution of these reforms.

Serving Customers Safely, Reliably and Equitably as part of the Transition

Eversource observes the importance and relevancy to maintain system safety and reliability as part of climate planning and initiative implementation. The Consultants' Report describes the eight Pathways with the assumption there are no detrimental effects to safety and reliability. However, there are safety and reliability issues that are difficult to identify now in such a massive transition of energy from gas to electricity. For example, gas systems as a whole must be considered throughout a transition as the systems are interdependent and transitioning one area may affect the surrounding customers. This will be an ongoing challenge as the details about how this transition will be safely managed have not been established. It will also be important to continue ongoing safety and reliability programs to ensure that the gas system does not degrade throughout the transition period.

Eversource's Operating Plan

Eversource's long-term decarbonization perspective, inclusive of its Operating Plan, is based on a portfolio of Pathways approach that considers Eversource's unique service territory attributes. The timeframe for this plan is 2023-2025. Eversource, to be consistent with the other LDCs, also anticipates future iterations of the Operating Plan on a three-year cycle, similar to what is conducted today for Energy Efficiency plan.

Eversource's alignment to the Pathways is an important consideration in reviewing and appreciating the plan. For example, Eversource has a greater level of commercial and industrial (C&I) customers who may be hard to electrify than other LDCs; this may imply a greater level of opportunity to pursue decarbonized fuels (such as hydrogen) as a supply service to meet the needs of these dedicated C&I customers. Networked geothermal holds promise in the Eversource territory due to efforts with our ongoing pilot in Framingham, MA (a community with state-designated Environmental Justice Populations) and our unique skill set as a gas and electric utility.

Because of the essential nature of Eversource's current Energy Efficiency (EE) plan to decarbonization, this is included as part of the Operating Plan (see Figure 1 below), recognizing at the same time that this EE plan is well structured and guided by way of existing regulatory planning mechanisms.

Initiatives	2022	2023	2024	2025
Energy Efficiency	Reduce the energy demand by maximizing the application of all energy efficiency investments in concert with decarbonization options			
Initiative 1 – Hybrid Heat Pumps	<ul style="list-style-type: none"> Develop and propose a hybrid heat pump pilot in an Eversource dual electric and gas territory with electric grid constraints Assess LNG facilities as a mechanism to shave winter peaks for electrification in constrained electric grid areas 		<ul style="list-style-type: none"> Assess a new combined electric and gas rate structure Seek Regulatory Approval on pilots and cost recovery mechanism 	
Initiative 2 – Networked Geothermal	<ul style="list-style-type: none"> Build & operate geothermal pilot program in Framingham, MA Identify partnerships with new construction developer community Build & operate second geothermal pilot program in MA targeting new development 		<ul style="list-style-type: none"> Work within geothermal vendor ecosystem to prepare for increased volume of work Utilize data obtained to maximize gas/electric planning and peak shaving Coordinate workforce training and further customer education 	
Initiative 3- Production Certified Gas (PCG)	<ul style="list-style-type: none"> Track and collaborate on GTI's Veritas initiative to develop accepted methodology to measure and verify methane emissions reductions Assess feasibility of sourcing and procuring PCG and PCG supply potential for Eversource network 		<ul style="list-style-type: none"> Seek regulatory approval for procurement of PCG contracts Allow Eversource to identify ways to offer PCG solutions to customers requesting them 	
Initiative 4 – Renewable Natural Gas (RNG)	<ul style="list-style-type: none"> Conduct and validate market assessments for in-state and out-of-state RNG Procure RNG from at least one locally sourced project Conduct a feasibility assessment of RNG storage at Eversource LNG sites 		<ul style="list-style-type: none"> Seek regulatory approval for cost recovery of RNG commodity and associated infrastructure investments Allow Eversource to identify ways to offer RNG solutions to customers requesting them Continuing exploring other opportunities to inject RNG within Eversource's pipeline 	
Initiative 5 – Hydrogen	<ul style="list-style-type: none"> Pursue small scale pilot targeting C&I customer(s) Identify potential sites for pilot Engage with stakeholders on hydrogen opportunities and education 		<ul style="list-style-type: none"> Pursue federal funding through DOE IJA grant funding Assess safety, feasibility, operational performance and cost effectiveness Engage in further R&D for hydrogen production for end use 	
Initiative 6 – R&D Innovation	<ul style="list-style-type: none"> Partner with National Labs and industry players to test and evaluate emerging technologies and end-use applications Undertake concept studies examining feasibility, pre-engineering, planning, solicitations, etc. Lead/collaborate on innovative pilots/demonstrations, if applicable 			

Figure 1: Eversource Operating Plan Initiatives Overview

Qualitative Planning Criteria and Success Factors

As part of its individual report, Eversource notes the importance the Consultants' Report places on certain qualitative factors: *infrastructure requirements, technology readiness, air quality, workforce development, customer practicality, customer affordability and equity*. Moreover, for each pathway, the Consultants' Report measures these qualitative factors based on a straightforward "level of challenge." The reasoning for the scoring is also explained.

Although this is a good and informative start, Eversource provides a more extensive set of qualitative criteria, which warrants attention as part of both long-term planning and near-term Operating Plans and initiatives. These criteria include safety, reliability, the effects on the gas system, affordability, technology risk, infrastructure requirements, environmental justice, equity, air quality, other environmental benefits, workforce development, and customer choice. Some of these overlap the Consultants' Report factors, in which case the Eversource recommendations elaborate on these issues and concerns.

Also as explained, some of these require a different type of focus depending on the timescale of the planning horizon. It is quite possible that some actions targeted at decarbonization impose tradeoffs that can be mitigated at a local and project level. However, if those actions recur time and time again then they may represent a bigger and more serious type of constraint that challenges the wisdom of the broader initiative.

Cumulative, these factors point to the collective challenges associated with the transition to a decarbonized future. Decarbonization Pathways, initiatives, programs, and projects all provide unique attributes, and so weighting of these tradeoffs will have to be part of robust planning and (post hoc) evaluation frameworks. They also help reinforce the importance of diversity of actions and Pathways as part of climate planning, as there is no preferred solution that doesn't represent tradeoffs in these important areas of program planning.

The Need for Regulatory Support

Eversource, as with the other LDCs, notes that the long-term transition contemplated by the decarbonization Pathways are not achievable without significant regulatory reform. The current regulatory frameworks are not designed to accommodate a transition towards decarbonized options, nor are they sufficiently clear about how best to balance and accommodate qualitative criteria that inform planning for a cleaner energy future.

Eversource notes the many regulatory support mechanisms and recommendations that are identified within the Consultants' Report, and as further elaborated in the separate regulatory submittal made to the DPU by KW on behalf of the LDCs.¹³ Eversource details any specific regulatory support mechanisms required for our initiatives within the ES Plan.

¹³ See LDC Common Regulatory Framework and Overview of Net Zero Enablement Plans submitted as part of the D.P.U 20-80 filing to the Massachusetts Department of Public Utilities on March 18, 2022.

Initiative Planning Criteria and Success Factors

The Consultants' Report emphasizes that the decarbonization Pathways are not forecasts and do not lean preferably toward any one solution but highlight the relative costs, feasibility, and risks of various choices in policy direction. The report also elevates for consideration several key criteria – costs, safety, reliability & resiliency, infrastructure requirements, technology readiness, air quality, workforce development, customer practicality, customer affordability and equity – and, for each pathway, measures these on a continuum using a qualitative ranking based on three category “level of challenge” scale. These outcomes and criteria are reproduced in Table 1 below from the Consultants' Report.

Evaluation criteria	Description
Energy system costs	The cumulative (simple sum) incremental annual cost of energy supply and delivery infrastructure, end-use equipment, and fuel costs, net of fuel savings, relative to a Reference scenario.
Safety	The extent to which natural gas and electric safety is maintained, per industry and D.P.U. standards. Note that in this analysis, all pathways are assumed to comply with D.P.U. and industry standards.
Reliability & Resilience	The extent to which natural gas and electric reliability & system resilience are maintained, per industry and D.P.U. standards. Note that in this analysis, all pathways are assumed to comply with D.P.U. and industry standards.
Infrastructure requirements	The pace and scale of electric and gas sector infrastructure additions.
Technology readiness	The extent to which a pathway relies on technologies that are commercially available.
Air quality	The combustion of fuels, used as a proxy for indoor and outdoor air quality.
Workforce transition	Estimate of the scale of the LDC workforce that will need to transition.
Customer practicality	The pace, scale and types of customer-side retrofits required to achieve decarbonization, and necessity or implication of building electrification mandates to achieve scenario outcomes
Customer affordability	The total cost of ownership for LDC customers who adopt building decarbonization measures.
Customer equity	The effect of LDC customer migrations on equity (across generations of LDC customers, migrating vs. non-migrating customers, and between rates classes)

Table 1 – Evaluation Criteria¹⁴

¹⁴ “To assess the implications and feasibility of each of these pathways, the Independent Consultants considered a broad set of evaluation criteria, analyzed through a combination of both quantitative and qualitative factors,” See *Decarbonization Pathways Report as part of the DPU 20-80 submittal*.

Eversource supports this qualitative assessment but suggests that the set of criteria should be clarified and expanded for purposes of supporting the long-term decarbonization planning. Also, more effort is needed in determining how to apply the qualitative criteria as part of more detailed initiative planning. These steps will assist in reviewing the practicality and feasibility of decarbonization initiatives. They may also play a role in the evaluation of measures during and after their implementation. To these ends, Eversource describes in this section some key criteria that it recommends be subject to additional planning attention. Lastly, Eversource suggests that emissions reductions and environmental benefit should be at the heart of the criteria used to evaluate any planned initiative. If emissions reductions drive the development and evaluation of any pathway, Eversource contends that it can be technology agnostic in its offerings to customers and provide additional choice while still achieving the emissions reductions we need to in the Commonwealth.

Planning Criteria and Success Factors

Safety

All the Pathways assume that the decarbonization goals can be met with limited detrimental effect to safety and reliability. While this might be a reasonable approach from an analysis perspective (involving long time spans), any and all new initiatives will need to promote changes to the electrical and gas delivery systems that maintain and preserve safety within both systems throughout the transition. Any emission reduction initiatives require careful screening to ensure they do not erode safety or include project features to mitigate potential safety-related impacts.

Safety-related impacts are possible as the gas system is drawn down, gas system assets are decommissioned, and the electricity transmission and distribution systems expanded. Managing potential gas asset retirement requires careful system planning to understand how the gas system performs under changing, locationally distinct, and fluctuating volume and flow conditions. Safety outcomes are also related to system reliability – both gas and electric. Drawing down the use of the gas system and expanding the electricity transmission and distribution system may drive more outage risk on either system. When they occur, large-scale outages (due to a variety of different causes, such as storms) can contribute to broad economic losses, direct customer damages, and concerns for safety.

Today the gas system also supports safety by providing back up fuel for emergency purposes for critical facilities (gas fired backup generation to hospitals, schools etc.). Any changes to this back up service role requires careful attention to ensure critical facilities remain fully supported (and resilient in the face of outage risks).

Reliability

As part of climate planning, and the design and implementation of a broad set of initiatives, attention is needed to ensure that the transition maintains the reliability of both the electricity and gas systems. There are several dimensions of this reliability challenge.

First, the gas LDCs are highly skilled in the planning and operations of safe and reliable gas networks under all conditions. They are also accustomed to expanding and growing the networks gradually at modest levels of growth and expansion. The draw down in services associated with decarbonization will need to be equally gradual -- and preferably subject to controlled and anticipated decreases in loads, volumes, and network segment utilization - so reliability challenges can be mitigated as they are identified.

Second, whole energy system reliability requires attention on how the gas system provides essential natural gas supply and delivery services to the power sector. Even with an abundance of renewable power, there will remain needs for centralized and dispatchable clean firm backup power resources to support resource adequacy in relation to energy, capacity, and balancing and other ancillary services. The decarbonization transition cannot put at risk the capability of the energy system to support the electrical grid under all operating conditions.

Third, the gas system also supports individual customers and facilities in their backup generation needs. Critical facilities, such as hospitals, require immediate, always available backup electrical energy to mitigate the risk of power outages from a variety of threats. As energy load shifts from the gas system to the electric grid, there will be needs to supplement, sustain, and replace backup energy sources so that facility and whole-house backup electrical energy service is always available should the central electric grid be unavailable.

Fourth, the decarbonization transition also requires a tremendous expansion in the electrical grid across generation, transmission, and distribution segments. New physical infrastructure is needed, as are new capacities to serve a wide range of energy system services across a spectrum of needs (energy, capacity, and ancillary services). With increased electrification the electrical system peak (now summer) will shift (to winter, to meet space heating demands). The nature of loads will also change given the nature of space heating equipment and how it cycles.

As this transition occurs in peaks and loads, it is imperative that Eversource and others responsible for the energy system do not make poor tradeoffs between decarbonization measures and the maintenance of system reliability. This is particularly relevant as risks of power outages increase with a changing climate. A significant power outage, for example, affecting the electrical grid due to a major and prolonged storm could readily result in billions of dollars in economic losses, which would offset the gains of decarbonization, and erode public confidence in the policy directions being taken. In addition, if customers sense these risks (of a less resilient electrical system¹⁵) due to its expansion, -- and the absence of gas back-up services, -- they may reflect this risk in their private market choices in various forms of 'workarounds'. These private investments will drain investment potential from other decarbonization measures, and

¹⁵ In this discussion Eversource focuses mainly on reliability, avoiding reference to resiliency except in passing. Resiliency is an important dimension in grid planning and is closely affiliated with reliability. Resiliency represents the ability of the system to respond to unexpected and significant harm, such as a power outage and a cybersecurity event. "Resiliency" has two dimensions; one dimension represents the ability of the system to withstand damage from occurring, and the other is the ability of the system to recover from damage quickly, safely, and efficiently. Eversource builds its networks to meet reliability standards, which address principally known and common operating conditions, and subject to careful measurement and performance tracking. Eversource also builds and maintains its networks to be resilient in the face of extraordinary risks, such as those represented by the threats posed by major storms.

delay decarbonization progress. In summary, concerns are growing to address system *resiliency* due to weather-induced power system interruptions, as a key dimension of comprehensive system reliability planning.

Effects on Gas System

The distribution gas system is a complex networked system. Gas demand volume, pressures, pipe diameters, and ambient temperature all effect gas flow requirements throughout the system. These parameters are carefully monitored and controlled throughout the system through a variety of means, including the use of pressure regulators, heaters, and valves to control gas flow where needed. Pressures, gas volumes, and gas quality must be carefully maintained throughout the system, and enough gas volume must be available to fulfill customer load requirements at every point on the system simultaneously. Deficiencies in the amount of gas, should they arise -- such as in the case of cold days when demand is very high -- can be made up by injecting additional gas from LNG injection facilities.

Maintaining the safe and reliable operating condition of the gas network is essential under all operating conditions, and there may be unknown mitigation costs associated with any retirements. As the gas system demand changes, and the system experiences different load patterns, the performance of the system will change, and this may require the installation and use of additional control and monitoring equipment to maintain safe and reliable operation.

Customer Preferences, Choice, and Experience

Advocating the importance of customer preferences and choice is easy; placing these concepts into action as part of major market reforms is more challenging. Achieving efficient outcomes¹⁶ requires that customers are provided meaningful choices in their energy deliberations, reflecting their preferences for cost, convenience, performance, and other purchase and use attributes (including their consideration of product and service substitutes). A greater versus lesser degree of choice in relation to their preferences also implies competition, and further opportunities for innovation. This innovation drives more product and service choices into the market and may lower prices and/or improve value.

Questions concerning customer preferences and choice become implicated in the design of decarbonization initiatives. Policy makers and the LDCs will need to collaborate to identify and fund meaningful incentives to motivate customer, supplier, and other value-chain participant behaviors. Incentives modify and amplify preferences and provide essential 'nudges' towards carbon-friendly energy product and service choices. On the other hand, incentives won't motivate behaviors in the right direction if they are not well aligned to customer preferences and sentiments.

¹⁶ The decarbonization transition will be best served if the energy and adjacent markets such as transportation and building construction are not negatively impacted with additional direct or indirect costs, or other externalities.

To support the customer in this transition it is also essential that Eversource, -- along with other stakeholders – provide leadership in the goals of educating customers and expanding their access to sound information emission-friendly technology and choices that help secure the decarbonization goals. But this is also a two-way street: to succeed in this role of expanding the customer’s access to good information and influencing mindsets, Eversource needs to listen to its customers and stakeholders to bring forward the best possible options to its customers. This listening involves understanding what the customers’ experiences are as they consider and adopt new technologies to meet their energy service needs, and determine their level of satisfaction (e.g., performance, cost, reliability, etc.) overtime.

Environmental Justice and Equity

The Consultants’ Report, and the work of ERM with stakeholders, take into account the needs of meeting environmental justice (EJ) and equity considerations.¹⁷ The Pathways recognize the possibility of negative equity-related effects as the system transitions, with customers migrating to electricity, and the resulting fairness implications for residual cost recovery.¹⁸ Without good program designs, and a balance of programs (providing multiple Pathways for customers to participate in decarbonization), it is possible that residual gas system costs rise, and that these costs become concentrated within residential rate classes.

Equity concerns also involve matters of program participation, program outreach (such as disseminating program information as part of marketing and recruitment), efforts to address local community impacts that may arise due to the transition, and workforce development.

Eversource has a significant commitment to the needs and concerns of meeting environmental justice and equity concerns. Eversource has formed its Pro-Equity Advisory Team (PEAT) to help drive additional innovation into its EJ and equity planning and implementation. Eversource is also focusing its EJ efforts in the area of workforce development to help support the clean energy transformation. Because of the importance of these efforts to Eversource generally as well as in the frame of decarbonization planning, it includes a detailed description of its Equity and Environmental Justice priorities and efforts in the Appendix.

Meeting Equity and Environmental Justice priorities will also involve attention to the way programs are structured and paid for. Attention is needed in how decarbonization costs flow thru customer rates, particularly as customers depart the gas system as they opt for electric service options. Addressing these concerns will require, as a conceptual matter, that programs are balanced in their consideration around both economic efficiency and fairness (i.e., equity). For example, multi-tenant customers should have the same levels of access as other Eversource customers to climate programs. This is one reason Eversource is proposing a portfolio approach

¹⁷ ERM also gathered many comments from stakeholders concerning equity and EJ concerns and policy considerations.

¹⁸ The pathways reveal significant differences amongst them in the residual cost recovery implications. Pathways with more moderate levels of electrification result in less cost shift, but even they lead to significant equity concerns for residual costs. Pathways that continue to utilize the natural gas system, on the other hand, and that maintain and grow the number of gas customers, minimize the cost burdens.

in relation to the Pathways, so that there will be many types of available decarbonization programs, improving the range of options for all its customers.

Affordability

While decarbonization represents an urgent priority there is also a need to fund initiatives to fund sector-wide decarbonization, while considering what customers can afford. The Pathways described by the Consultants' Report all require additional funding support, albeit at differing levels. They also require a significant expansion in electrical system capacity and the purchase and use of millions of electric vehicles with associated charging infrastructure. While these costs are embedded within the economic wide input/output model backing up the Pathways, there are uncertainties about the ultimate costs to meet these additional infrastructure and sector requirements.

As the transition proceeds, decisions will be required about how much of the total cost of decarbonization is placed onto customers through utility rates, both gas and electric, and for both adopting and non-adopting customers. Inherent in these decisions are matters of cost shifting and allocation, as mediated by the rates process. There are difficult feedback loops, however, because adopting customers will require the right incentives in order to motivate their behaviors, but these subsidize their carbon-friendly energy choices while also offsetting some of their recurring energy costs.

Workforce Requirements

Eversource is aware of the challenges associated with ensuring there is an adequate skilled technical workforce available to support the energy system transformation across all the implicated market sectors and values its current workforce today. It is one thing to design initiatives, but if they lack the necessary resources needed to implement them, they fail in their practicality and feasibility.

Therefore, attention is needed on identifying the skilled labor work force requirements needed to support the level of equipment installations and building retrofits, to maintain the gas system as demand is reduced, and to build out the electricity system infrastructure. Novel approaches may be required by the utility and other industries to attract and secure the needed skilled labor demanded by this whole energy system transformation. These challenges could be acute given the region's high cost of living, and how those costs can dampen the efforts to attract needed talent.¹⁹ Additionally, Eversource recognizes the important linkage amongst decarbonization programs, workforce development, and its environmental justice / equity program goals.

¹⁹ Attracting resources at scale to support the energy transition won't be easy, as recently noted by public officials. See *Senators warn Mass. Lacks the workers it needs for clean-energy transition*. Boston Globe. February 11, 2022.
<https://www.bostonglobe.com/2022/02/11/business/senators-warn-mass-lacks-workers-it-needs-clean-energy-transition>

Technology Risk

As new technologies develop and are brought to market, they may be more prone to quality problems, failure, or underperformance. This is quite common as technologies are initially adopted and as they mature with scale and learning effects. Suppliers are typically and often responsive to these dynamics, and focus attention on addressing underperformance and quality issues as market adoption grows. Left unaddressed, quality perceptions can most definitely impede or stifle market adoption. The transition to decarbonization should take technology risk into account as a potential barrier to customer adoption. Some ways that technology risk can be addressed include: (a) more collaboration across sectors (e.g., manufacturers, distributors, installers, end users), (b) research and development expenditures, (c) risk sharing provisions as part of early end use adopter activities, and (d) demonstrations and pilots meant specifically to resolve technology adoption risk factors.

Infrastructure Requirements

The decarbonization transition will require the building of new infrastructures in the gas and electricity sectors. Eversource, for example, expects that networked geothermal systems will hold significant promise for many locations within its service territory. These networks will require resolution of local right-of-way and land-use issues in order to build the networks at scale and in a time efficient manner. Additionally, to build out the electrical grid capacity requires new generation, transmission, and distribution system infrastructure (substations, poles, new conductor, communications, etc.). This additional grid capacity will require the resolution of rights of way and siting issues, to facilitate timely planning, engineering, and construction. These factors will have an impact on the practicality and feasibility of the decarbonization approach and need to be systematically taken into account as part of transition planning.

Emissions Reductions, Air Quality and Other Environmental Benefits

As stated above, emissions reductions and associated environmental benefits should be a key success factor in determining the success of any initiative or pathway it takes to reach the Commonwealth's 2050 targets. Eversource would encourage the Department to take a holistic view on emissions reductions across the value chain when considering and contrasting options presented.

Decarbonization initiatives that result in reduced fossil fuel generation and the combustion of fossil fuels in residential, commercial, industrial and transportation applications would directly reduce greenhouse gas (GHG) emissions (including carbon dioxide and methane) and reduce (or eliminate) the emissions of criteria air pollutants (NO_x, SO_x, PM, HC, and many air toxics).

The reduced emissions of GHG and air pollutants would benefit the global and local airshed and reduce the associated health effects and costs of these emissions. The benefit of these health effects is generally most pronounced in urban areas with lower income and environmental justice communities.

Summary of Criteria-Related Recommendations

Eversource makes the following summary recommendations concerning initiative planning criteria and success factors:

Area	Eversource Observations and Recommendations
Safety	<ul style="list-style-type: none"> ■ Recognize potential for safety-related issues that could drive added effort and costs, as system transitions ■ Recognize role gas system plays in emergency backup of critical facilities, businesses, and households
Reliability	<ul style="list-style-type: none"> ■ Ensure transition does not impede or erode acceptable levels of gas and electrical system reliability and resiliency ■ Recognize role the gas system plays in providing fuel for emergency backup ■ Recognize need for firm clean power and long duration storage ■ Recognize role that decarbonized fuels may play in meeting these system needs
Effects on Gas System	<ul style="list-style-type: none"> ■ Identify effects of system for changes in loads, customer counts etc.
Customer Choice	<ul style="list-style-type: none"> ■ Recognize the importance of aligning decarbonization initiative incentives to motivate customer behaviors, preserving customer choice, and maximizing the potential for market efficient outcomes ■ Recognize importance of LDCs working with customers to understand preferences and inform decisions to adopt new technologies ■ Recognize the importance of influencing preferences by providing good and useful information that can support customers in their choices
Environmental Justice, Equity	<ul style="list-style-type: none"> ■ Pursue a 'portfolio of measures' approach to create maximum flexibility in reaching different customer demographics in fair and equitable manners ■ Address ways to avoid high costs for non-adopting gas system customers ■ Leverage and apply Eversource's PEAT guidelines, policies, trainings and other resources ■ Link Eversource's workforce development efforts with decarbonization planning

Affordability	<ul style="list-style-type: none"> ■ Identify total long-term cost burdens that may flow to utility rates as part of design ■ Seek fair cost alignment, allocation, and assignment of costs recognizing all costs and benefits and participation levels and options
Workforce Requirements	<ul style="list-style-type: none"> ■ Identify skilled labor requirements ■ Identify novel approaches to support these requirements ■ Integrate workforce development and equity and EJ goals
Technology Risks	<ul style="list-style-type: none"> ■ Recognize the impediment that technology risk may pose to early adopters, and how, if left unaddressed, the risk could blunt customer adoption decisions
Infrastructure Requirements	<ul style="list-style-type: none"> ■ Recognize that site control, right-of-way access, permitting, and other site-specific conditions will influence local project feasibility
Emissions Reductions, Air Quality and Other Environmental Benefits	<ul style="list-style-type: none"> ■ Derive GHG and air quality effects, determine net effects, incorporate into measure evaluation

In addition to these planning criteria and success factors, there are additional factors that influence the development and implementation of decarbonization measures.

Use of Marginal Costs Effectiveness Tests

Eversource contends there is a need to evaluate the marginal cost effectiveness of the various pathways, applying various ‘tests’, such as the total resource cost test, the societal cost test or customer impact measure. Incremental program costs should be gauged in relation to a collection of offsetting benefits, many of which may be difficult to quantify or monetize.

These tests help illuminate how various costs and benefits impact various program actors (utility, customer/adopter, customer/non-adopter, societal, etc.). Understanding these viewpoints helps in decision making about how to apply program funds (program support costs, customer incentives, etc.) given offsetting benefits (reduced customer costs, other benefits). Often incentives and benefits interact – proper incentives induce the right responses, driving customer adoption and benefits.

There will be limits to what costs and avoided costs can be embedded into the marginal cost-effectiveness evaluation. There are many criteria noted in this section that merit consideration in decarbonization planning but may be difficult to quantify or measure. Therefore, some form of weighting of these criteria may be needed alongside the quantification of costs and avoided costs.

In addition to the marginal cost effectiveness test considerations, attention is also needed to the time value of securing decarbonizing steps. Within certain technology options there may be tradeoffs customers may face in securing more modest levels of decarbonization sooner than greater levels later, depending on a host of consumer choice attributes. Choices sooner could make good sense depending on the scope of the emissions reduction, the cost to achieve them, and the time horizon of competing alternatives. Similarly, it will be important that customers are provided meaningful and attractive choices in support of their energy needs (in equipment, appliances, building upgrades, etc.), and do not forestall needed investments, which is possible if they perceive unreasonable prices or lack of technology reliability.

Eversource Unique Service Territory Factors

Eversource’s initiatives are designed in consideration of the Company’s unique gas distribution service territory and operating characteristics, including:

- Eversource operates electric and two separate gas companies
- About one-half of its gas customers are served by separate electric utilities
- There are significant differences in population density throughout the Commonwealth. Eversource’s NSTAR company has the second highest population density within Massachusetts
- Housing stock is older (on average) in the Eversource territory than in other parts of the state, and there is a higher proportion of multi-unit residential dwellings
- Eversource has a high concentration of commercial and industrial gas loads (and therefore lower space heating demands)
- The Eversource system continues to experience steady customer growth
- Eversource has the second highest percentage of customers within its defined environmental justice population among the LDCs

Eversource Planning for Two Gas Operating Companies

Eversource operates two LDCs within the Commonwealth. Each LDC has its own relationship with the electric utilities providing electric service in the LDCs’ service territory. The LDCs also have several unique attributes including customer loads by segment, the age distribution of housing stock, and the proportion of environmental justice (EJ) block groups. Figure 2 presents some of these statistics by company. Eversource intends to use a common planning framework and set of initiatives for both operating companies, governed as a common corporate effort. Notwithstanding this governance, unique operating company differences in conditions will be considered in the design and implementation of initiatives.

Eversource Customers in MA				% Gas Volume by Class			Housing Stock Avg. Age	EJ Block Groups	Housing Units (2019)
	Other Electric	Eversource Electric	Total	Residential	Commercial	Industrial			
EGMA	N/A	N/A	329,500	40%	20%	25%	70% built prior to 1980 25% built prior to 1939	607,000	65% Owner Occupied 29% Tenant Occupied
NSTAR	N/A	N/A	316,300	30%	40%	8%	70% built prior to 1980 32% build prior to 1939	567,000	56% Owner Occupied 37% Tenant Occupied

Figure 2 – Representative Operating Company Data

Gas and Electric Comprehensive Planning and Opportunities

As indicated in Figure 2, 52% of its gas customers are provided electricity service by other companies (42% and 10%, National Grid and municipal electric companies, respectively). This attribute is shared with Berkshire and National Grid, (which has 61% of its gas customers served by other electricity providers), but less so with Until. The relationship between electricity and gas services is highly relevant because extensive coordination is required between the gas and electricity services. This coordination may be particularly relevant around ensuring electricity *resource adequacy*, which requires attention to the long-time frames involved with expanding electrical grid capacity two or three times.

Eversource's company initiatives, such as targeted electrification, will benefit from coordinated electric and gas system planning. Supporting 100% electrification in a particular portion of the service territory requires insights about the location's capacity to support electric loads, at a particular point in time, and in a manner that is cost and benefit conscious. This coordination will also be useful in minimizing the potential for embedded costs and/or residual service challenges for non-adopters. This common planning opportunity is greater in areas where Eversource provides both services.

As noted previously, Eversource has already convened an internal, cross-functional coordination and planning team with representation from both the gas and electric engineering, operations, asset planning, finance, and other departments.

Nature of Loads and Role of C&I

One of the most relevant and crucial factors that influences Eversource's climate action and Operating Plan design relates to the nature of the customer loads it services with its natural gas delivery service.

There is significant emphasis placed within the Consultants' Report, and related Pathways, on the impacts of shell retrofits and space heating requirements. This is a reasonable emphasis. However, Eversource has a higher proportion of C&I customers, in terms of loads, than other Commonwealth LDC gas companies. This includes large loads to support non-firm power generation customers, which are important in supporting resource adequacy.²⁰ Eversource's C&I class also includes customers with process-related thermal needs, some of which may be difficult or cost-prohibitive to transition to electrification. However, the nature of these facilities and loads may also provide focused opportunities for decarbonized fuels, such as hydrogen, with dedicated services.

²⁰ It is also worthwhile to point out the Consultants' Report also identifies the importance of firm (electrical) capacity in *all* Pathways, and the *particular* challenge in meeting this requirement under certain pathways, such as the high electrification and networked geothermal pathways.

Growth

The Eversource system is experiencing modest growth in the number of business and residents, and this drives an increase in the requests for new gas service. The growth over the past five years has hovered around 0.5% new customers per year, amounting to ~ 50,000 in total. This growth provides an opportunity to explore a full range of decarbonization opportunities as part of the planning, permitting, and building process. It also places requirements on climate programs for both existing building stocks and new construction.

Age and Nature of Housing Stock

The age and nature of the housing stock will have a large effect on the nature of Eversource's portfolio of initiatives. About 1/3rd of the single-family homes within the service territory were built prior to 1940, making the housing stock older (on average) than other LDCs' housing stock. The housing stock condition influences the feasibility of measures across a wide range of program design considerations. Older buildings and homes, for example, are more costly to retrofit, requiring more extensive shell upgrades, and more electrical wiring and duct work (compared to more modern buildings). Multi-unit and tenant occupied dwellings provide separate challenges *and* opportunities – a lot depends on the nature and age of the building and what types of programs can be designed to motivate owners and occupants to perform shell upgrades and make equipment investments.

It is worth noting that older housing stock is often associated with higher density as compared to modern suburban housing developments. Older neighborhoods could be served with older electrical distribution infrastructure. The transition to electrification must be coordinated, matching the distribution grid's capacity upgrade requirements with the pace of the transition.

Meeting Environmental Justice Needs

The transition to a low carbon future must be carried out in an equitable fashion. This means appropriate attention in design, implementation and evaluation of climate actions and initiatives to the principles and requirements Eversource has established Environmental Justice principles for its utility planning and program development, and as part of its ESG and other corporate efforts. Eversource's Environmental Justice (EJ) efforts as part of decarbonization will reflect the physical nature of its gas distribution service territory in relation to income distribution, minority population, language, and other EJ criteria.

Implications for Supply and Resiliency as the System Decarbonizes

An important feature of the Eversource gas distribution system is its physical relationship to upstream supplies. The system is designed to meet loads under all weather and operating conditions, considering present demands, LNG resources, and physical and market delivery capabilities. As the system requires less gas to be distributed attention will be needed on any implications this has to the local gas system reliability and resiliency, which is (in part) a function of how the system is configured and interconnected to the upstream gas supply system.

Decommissioning of parts of the gas system could have impacts on the overall reliability and safety of the system.

Joint Customer Care Functions

The design and implementation of some climate action initiatives should benefit from Eversource's ability to leverage data and company / customer interaction opportunities, supported by common metering, billing, call center, meter services, marketing, and customer education functions. Customers often seek out solutions from their energy provider regardless of commodity. Having the ability to respond to these customers with a common set of energy-related information about historical gas and electric loads provides opportunities to improve program design and delivery.

Bundled vs. Transportation Customers

Eversource must implement decarbonization measures for both bundled and transportation customers. For bundled customers, Eversource takes full responsibility for the gas delivery, whereas with transportation customers, Eversource is not involved in the marketing of the gas, just its delivery. Eversource may have different sets of decarbonization metrics for these distinct types of customers, and therefore, Eversource's initiatives to decarbonized gas delivery programs may differ. Eversource may also need to provide unique forms of incentives to third-party marketers and related end-users.

Practical Steps Forward: Eversource's Operating Plan

ES Operating Plan: Overview

Based on its specific characteristics noted above, Eversource is proposing a comprehensive set of initiatives along the entire natural gas value chain that would meaningfully contribute to the Commonwealth 2050 net zero emissions goals, maintain safety and reliability, and recognize customer choice. These initiatives attempt to leverage coordinated gas and electric planning at Eversource, address the existing customer portfolio, and enable decarbonization cost effectively, safely, and reliably at a fast pace. Eversource ultimately intends these initiatives to show an actionable way to demonstrate its desire to be the thermal leader and provider of choice to customers.

The main strategies that underly Eversource's Operating Plan are:

- **Reduce energy demand** and maximize energy efficiency investments in concert with all decarbonization options
- **Hybrid electrification** with mitigation of system constraints, potential investments and promotion of customer adoption while preserving reliability, especially in markets where full electrification is challenged
- **Strategic electrification** that relies on clean electricity while lowering costs to customers and society, and leverages Eversource's comprehensive planning and execution across its gas and electric companies
- **Decarbonized gas network** that focuses on the procurement of low carbon fuels (e.g., RNG, Hydrogen) and investment in its pipeline network to deliver cleaner fuel to natural gas customers, especially those where electrification is not practical

A value chain approach (upstream, midstream and downstream) will contribute most cost-effectively to the Commonwealth 2050 net zero emissions goals, while maintaining safety and reliability. In the Operating Plan, Eversource plans to: (1) continue energy efficiency and pipeline replacement efforts that reduce/eliminate GHG emissions; and (2) establish a foundation of activities and pilots that decarbonize its fuel supply sources, introduce networked geothermal and hybrid electrification systems, and explore the potential role for hydrogen. Eversource proposes to implement this value chain improvement through continuation of existing programs and plans and six new initiatives.

ES First Operating Plan: Existing Programs and Plans

Energy Efficiency

As noted in the Consultants' Report, energy efficiency is a foundational strategy to enable decarbonization of heating across all scenarios and reduce challenges associated with both electrification and decarbonized fuel-based strategies. While the cost of all forms of energy will

increase in pursuit of net-zero emissions targets, energy efficiency (EE) is often the most cost-effective emissions-reduction strategy and in many cases should be the first action taken.

Eversource has made significant progress over the past few years to reduce its carbon footprint through EE: between 2010 and 2020, Eversource Electric and Eversource Gas have together saved over 1.68 million short tons of CO₂ equivalents from all fuels.²¹

In its 2022–2024 EE plan recently approved by the Massachusetts DPU²², Eversource intends to 1) prioritize and incentivize energy efficiency upgrades (e.g., building envelope upgrades) before pursuing building electrification, and 2) focus on increased participation of existing EE programs in environmental justice or similar communities where participation is historically lower.

In its Operating Plan, Eversource proposes to implement the activities outlined in its 2022-2024 EE plan: drive emissions reductions through significant expansion of EE programs, as approved therein; promote efficient gas technology, building shell retrofits, and more stringent fuel-neutral building energy code; increase reliance on renewable and low-carbon fuels.

Through its recent EE plan approval by the DPU, Eversource has the necessary regulatory authority and cost recovery mechanisms in place to implement these measures. Only accelerating or adding measures beyond those in the approved 2022-2024 EE plan would require DPU approval.

Gas Pipeline Replacement Program

As of 2017, the US Department of Transportation (DOT) estimated that 30,000 miles of cast-iron pipe still carried gas in the United States, with the highest percentage of these mains located in older eastern cities such as New York City, Philadelphia, Boston, Baltimore and Washington, D.C. While considerable progress has been made in replacing these legacy pipes, they still comprise roughly 17% of the Eversource distribution pipes in use in Massachusetts. It is these legacy pipes that account for a disproportionate number of leaks compared to modern infrastructure.

In addition to ensuring safe, reliable service for customers through the gas pipeline replacement programs, the Commonwealth has also reduced methane emissions by approximately 25% in the last decade²³. Most reductions have been accomplished through regulatory compliance by utilities to fix leaks by replacement of old and leak-prone pipes and service lines with low-leak, plastic pipes.

Safety and reliability are paramount and Eversource plans to continue its DPU-approved Gas System Enhancement Plan (GSEP)²⁴ to 1) replace its older pipeline infrastructure and 2) improve

²¹ *Electric & Gas CO₂ Equivalent Emissions Reductions Summary*. Mass Save Data. 2021. <https://www.masssavedata.com/Public/GHGReductions>

²² See, DPU 21-121 and DPU 21-125 filings with the Massachusetts Department of Public Utilities.

²³ *Interim 2030 CECP*. Massachusetts Executive Office of Energy and Environmental Affairs. December 30, 2020.

²⁴ Eversource replaced nearly 125 miles of older gas mains and 10,000 individual services in Massachusetts over the past five years. During 2016 alone, Eversource invested nearly \$53 million on gas line improvement projects in Massachusetts to replace approximately 35 miles of main gas lines made of cast iron and steel, along with nearly 3,000 individual service lines. Eversource plans to replace approximately 50 miles of older pipeline per year.

the underground network of natural gas pipelines with an emphasis on those networks with the highest risk to Eversource customers. At the end of 2020, Eversource had replaced 16.1% of the bare steel and cast-iron mains across its system.²⁵ In addition, Eversource has doubled its previous Methane Challenge program commitment to now replace 6% of bare steel and cast-iron mains between 2022 and 2026.

In its Operating Plan, Eversource intends to continue upgrading its gas infrastructure and operations system through such programs as GSEP. The goal of the GSEP is to promote safety, increase system reliability and minimize lost and unaccounted for gas.

In the longer term—or as the need arises—Eversource will assess the feasibility of using parts of its system for injecting, handling, storing and distributing hydrogen for the building and transportation markets. Through the existing process and cadence of review and reconciliation of GSEP investments, Eversource has the necessary regulatory authority and cost recovery to continue these measures.

Forecast and Supply Resource Plans

Eversource acknowledges gas growth in its existing forecast and supply resource plans and the reliability projects associated with supporting that existing and projected demand are still warranted. Going forward, as the initiatives described below mature and grow in scale, customers will have multiple choices to address their thermal needs that also address emissions reductions.

ES Operating Plan: New Initiatives

Electrification Strategies

In order to effectuate the electrification strategies described, Eversource is looking at coordinated planning between its gas and electric businesses to maximize infrastructure build out and electrification measures where possible. Additionally, Eversource sees applying energy efficiency measures for heat pumps (both air source and ground source) as critical to defraying cost to all customers, but especially those who qualify for low-income support. The two main electrification strategies of hybrid electrification and strategic electrification are addressed with the initiatives below.

Initiative 1 – Hybrid Heat Pump Systems

A hybrid heat pump system, or dual fuel heat pump system, is comprised of an air-source heat pump that is linked to an auxiliary natural gas furnace. In a hybrid heat pump installation, heat pumps are installed alongside an auxiliary heating system such as a boiler or furnace. Typically, in these installations, the system will be programmed to switch from the heat pump to the auxiliary system below a specified outdoor temperature. This is done because the efficiency of air source heat pumps varies with outdoor temperature, declining as the temperature drops.

²⁵ *Climate Change 2021*. Eversource Energy. 2021. <https://www.eversource.com/content/docs/default-source/community/sustainability-cdp-2021.pdf>

Although heat pumps can operate at 300% efficiency at warmer temperatures, that efficiency starts to drop measurably at temperatures below 10 degrees. Utilizing the backup gas system at those cold temperatures helps provide system resiliency and improve occupant comfort.

Hybrid heating solutions offer immediate emission reductions and renewable heat uptake, without causing electricity resource adequacy concerns. The overall system benefits can be higher than those offered by full electrification, which can have more limited applicability and higher costs for customers and burden on the electricity system. Deployed at the individual building level, hybrid heating solutions support local energy system integration. They combine electricity consumption at times of abundant renewables with (low carbon) gas consumption at times of low renewable electricity availability or peak heat demand, potentially mitigating some customer costs and increased electric infrastructure build-out.

While only limited, in-building infrastructure investment is required for heat pumps, there is a need to develop strong partnerships between market, customer, policy/regulatory and technology partnership to scale the adoption of heat pumps.

Hybrid heating systems are a relatively mature sustainability technology; in Europe energy savings of approximately 19% with carbon savings of 25% for grid connected systems, and up to 60% for off grid systems, have been achieved. The European Green Deal singled out building renovation as a key initiative to drive energy efficiency in the sector and deliver on objectives. With around 90% of buildings today expected to still be in place by 2050, this is a sizeable challenge.²⁶

Within the Operating Plan, Eversource is proposing to:

- Develop a hybrid heat pump pilot in a dual Eversource electric and gas territory community where the electric grid is constrained that includes a mix of residential and commercial and/or industrial customers. This pilot would ultimately test the demand response and fuel switching of customers utilizing hybrid heat pumps during the winter peaks to reduce cost, build-out and stress on the electric system.
- Assess its LNG facilities as a mechanism to help shave winter peaks for electrification, especially in areas with the electric grid is already constrained.

Eversource envisions the following as key activities for this pilot:

- Utilize educational and marketing material on heat pump value to customers in conjunction with the current energy efficiency plan
- Collaborate with vendors and contractors on heat pumps deployment plans and marketing material in conjunction with the current energy efficiency plan

²⁶ *Unlocking the hybrid heating potential in European buildings*. Hybrid Heating Europe. March 2021. https://hybridheatingeurope.eu/wp-content/uploads/2021/03/hhe_vision-paper_final.pdf

- Demonstrate risk mitigation for strategic electrification on a system wide basis through use of hybrid heat pumps
- Collaborate with policy makers and regulators to develop an appropriate rate structure for customers who are willing to change their heating fuel source in response to short-term reliability concerns
- Design and launch a hybrid heat pump pilot to address peak heating load demand, emissions reduction and cost

From a regulatory support perspective, Eversource is requesting the Department approve the incremental costs associated with the activities described above would be recovered within the Net Zero Enablement Tariff.

Eversource sees the following as potential outcomes from the pilot:

- Assess a coordinated gas and electric rate structure
- Lower transmission and distribution network buildout and associated costs
- Lower peak demand generation capacity needs and associated costs
- Coordinate with energy efficiency findings and approved plans to offer customer choice through heat pumps
- Offer a potential decarbonization pathway for commercial and residential heating customers

Ultimately, if this pilot proves successful, hybrid electrification and hybrid heat pumps could reduce emissions and assuage concerns over electric reliability associated with increasing electric demand.

Initiative 2 – Networked Geothermal

Geothermal heating and cooling is one of the most environmentally safe and cost-effective options²⁷ on the market. Increasing the use of geothermal energy for heating and cooling in the United States can contribute to decarbonization goals by reducing U.S. GHG emissions by half in 2030 and achieve a carbon-free electric sector by 2035.

There are, currently, 23 geothermal district heating (GDH) systems in the United States, with a capacity totaling more than 75 MW of thermal energy (MWth). The systems range in size from 0.1 MWth to over 20 MWth. Of these 23 commercial projects, 10 received DOE loan and/or grant support. Federal, state, and local funding support have proven critical to develop a majority of the existing GDH projects in the United States.

Networked geothermal refers to a concept where several buildings are connected to a distributed network of pipes that provide heating and cooling, and buildings are equipped with individual heat pumps. The non-profit HEET commissioned a technical feasibility study for the

²⁷ *Geothermal heat pumps use the earth's constant temperatures for heating and cooling.* Environmental Protection Agency. November 19, 2020. <https://www.eia.gov/energyexplained/geothermal/geothermal-heat-pumps.php>

state of Massachusetts in 2019, primarily investigating Ground Source Heat Pump (GSHP) systems that connect several homes to a central thermal infrastructure.²⁸ The core hypothesis was that these systems could replace aging gas infrastructure, efficiently heat buildings, and provide an alternative business model for gas utilities.

Advantages of networked geothermal systems include reducing weather dependency as compared to ASHPs, smoothing demand patterns by connecting a diversity of heating and cooling loads to the closed system and allowing LDCs to leverage their current business models and workforce while operating the systems, given that they require similar infrastructure and maintenance to a gas network.

Eversource launched a geothermal pilot program in 2021 to advance knowledge in the field and inform future applications of geothermal heat pump networks. The objectives of this pilot, located in Framingham MA, are to:

- Generate data and insights on design, construction, operation, and maintenance of geothermal networks (including costs),
- Inform operational standards,
- Understand customer adoption barriers and,
- Assess feasibility and required policies to scale

Design and construction are anticipated to begin in 2022 and once online, the pilot will run for two heating and cooling seasons. This pilot has been well received within Massachusetts; multiple communities have expressed interest in participating this pilot program and were actively engaged with Eversource on the final site selection.

The Operating Plan seeks to expand the Company's currently approved geothermal pilot into a program by authorizing the Company to offer networked geothermal solutions in targeted areas, identify partnerships with builders in new construction areas, collaborate with regulators to develop a utility-scale program and pursue grant funding to support activities with respect to its networked geothermal program.

Eversource envisions the following as key activities for networked geothermal:

- Pursue a second networked geothermal project with new development to foster relationships with the building community on the next generation of thermal energy
- Build out the vendor ecosystem so that consultants, vendors, and contractors are prepared for increased volume of work

²⁸ *GeoMicroDistrict Feasibility Study*. HEET & BuroHappold. 2019. <https://heet.org/energy-shift/geomicrodistrict-feasibility-study/>

- Assess how to offer workforce training programs and conferences utilizing our existing training centers, such as in Shrewsbury, MA, and partnering with federal and state organizations, such as the Massachusetts Clean Energy Center
- Utilize data gained to assist in coordinated gas/electric planning review of peak shaving
- Coordinate workforce training efforts around networked geothermal and further customer education

From a regulatory support perspective, Eversource is requesting the Department approve the incremental costs associated with the activities described above would be recovered within the Net Zero Enablement Tariff. Based on data gathered during the Company’s pilot program, the Company intends to evaluate potential networked geothermal rate structures which would enable the Company to provide networked geothermal as a formal customer offering over time.

Eversource sees the following as potential outcomes from networked geothermal installations:

- Stimulate the market for geothermal heat pump systems to accelerate adoption
- Reduce overall electric demand on the system
- Lower network reinforcement costs and peak demand generation capacity
- Offer a potential decarbonization pathway for commercial and residential heating customers

Eversource is proud to be a first adopter of networked geothermal systems and intends to leverage that for customers as an electrification technology that not only efficiently addresses customer needs but also provides potential for workforce transition and decreased emissions.

Decarbonized Biogas Strategies

The Consultants’ Report identified gaps and risks associated with complete electrification including reliability, increased buildout of the electric grid and increased costs to customers. To the extent electrification will not achieve the Commonwealth’s 2050 goals in a reliable, safe or cost-effective manner, the following biogas strategies will be critical. They are described in the initiatives below.

Initiative 3 – Production Certified Gas (PCG)

Today, some studies have shown up to 3.7% of natural gas is emitted to the atmosphere during its extraction, processing, and transportation.^{29 30} PCG mitigates these methane leakages through enhanced operational practices, which then undergo independent, third-party certification.

²⁹ *Methane Leaks Erase Some of the Climate Benefits of Natural Gas*. Benjamin Storrow. May 5, 2020. <https://www.scientificamerican.com/article/methane-leaks-erase-some-of-the-climate-benefits-of-natural-gas/>

³⁰ *Majority of US urban natural gas emissions unaccounted for in inventories*. Proceedings of the National Academy of Sciences of the United States of America. November 2, 2021. <https://www.pnas.org/content/118/44/e2105804118>

The major third-party certification standards currently in the market are Project Canary's TrustWell Standard, Equitable Origins EO100 Standard and MiQ, which was developed through a partnership between Rocky Mountain Institute (RMI) and SYSTEMIQ.³¹ Each standard utilizes its own certification schema as there are currently no universally accepted certification requirements. Industry collaborations such as GTI's Veritas intend to "demonstrate emissions reductions in a consistent, credible and transparent way."³²

On a voluntary basis, the gas industry (producers, pipelines and utilities) is increasingly seeking certification by Project Canary's TrustWell or a combination of the EO100 and MiQ standard. EO100/MiQ or TrustWell standards focus on methane emissions and associated monitoring; they also contain qualitative ESG criteria that suppliers must meet.³³ Eversource supports standardizing the certification process across the industry, with regulations and requirements set for PCG at the federal level.

By the end of 2022, it is expected that 12.3 Bcf/d of PCG will be online; about 14% of US gas steps GHG emissions (both methane and carbon) by as much as 60 to 80%, relative to average geologic gas levels.³⁴

To enable execution of this initiative, Eversource will need support from the DPU to broaden the standards used to review LDC supply purchases and long-term contracting, together with any tariff adjustment if there is a PCG price premium (adder).

Natural gas producers and transportation companies are also exploring certification of their gas supplies to reduce the GHG footprint of the natural gas supply chain. In addition, many utilities—including Eversource—are exploring reliance on PCG to decarbonize their gas supply systems and provide customer choice.

Eversource envisions the following as key activities for PCG:

- Track and collaborate on the GTI's Veritas initiative to develop an accepted methodology to measure and verify methane emissions reductions;
- Assess the feasibility of sourcing and procuring PCG;

³¹ *Certified natural gas: Midstream sector begins embracing concept, standards.* S&P Global. October 2021, <https://www.spglobal.com/platts/en/market-insights/latest-news/natural-gas/101421-certified-natural-gas-midstream-sector-begins-embracing-concept-standards>

³² In 2021, the Gas Technology Institute (GTI) launched Veritas, a Differentiated Gas Measurement and Verification Initiative intended to develop accurate and verified methane emissions intensities and the necessary protocols to calculate measurement-informed methane emissions for natural gas systems. While they do not intend to create an industry standard, but instead develop a set of protocols and methodologies. <https://www.gti.energy/gti-launches-veritas-an-initiative-to-measure-and-verify-companies-methane-emissions-reductions/>

³³ *Certified natural gas: Midstream sector begins embracing concept, standards.* S&P Global. October 2021. <https://www.spglobal.com/platts/en/market-insights/latest-news/natural-gas/101421-certified-natural-gas-midstream-sector-begins-embracing-concept-standards>

³⁴ *Opportunities for Evolving the Natural Gas Distribution Business to Support the District of Columbia's Climate Goals.* AltaGas. April 2020. <https://sustainability.wgiholdings.com/wp-content/uploads/Technical-Study-Report-Opportunities-for-Evolving-the-Natural-Gas-Distribution-Business-to-Support-DCs-Climate-Goals-April-2020.pdf>

- Quantify any cost impact on consumers of increased PCG volumes procured at scale; and
- Evaluate the potential of PCG supply in the Eversource transportation network.

From a regulatory support perspective, Eversource is requesting the Department authorize the following:

- Allow for the cost recovery of PCG contracts, which will be subject to DPU approval prior to execution.
- Allow companies to identify ways to offer PCG solutions to customers requesting them

Eversource sees the following as potential outcomes from PCG:

- Immediate emissions reductions by sourcing PCG in lieu of traditional gas supplies with minimal to no infrastructure required

Initiative 4 – Renewable Natural Gas (RNG)

Renewable Natural Gas (RNG) is methane captured from releases at landfills or generated by technologies reliant on wastewater treatment, agricultural residue and/or animal waste feedstocks. RNG is carbon neutral and once processed, fully compatible with current pipeline infrastructure, without requiring customers to modify or change their gas appliances or other equipment.

While RNG production technologies—primarily anaerobic digestion and gasification—are mature, with production throughout the U.S., RNG supply is not approaching technical market potential due primarily to economics.^{35 36} The Consultants’ Report also cited cost as a current challenge for RNG and cited local feedstock supply as the main factor. New England has limited access to local RNG feedstocks, especially when compared to other regions in the country.³⁷ For instance, in New England there is an estimated 0.63 dry tons of feedstock available per person per year, whereas the average availability of feedstocks for the US as a whole is 2.47 dry tons per person per year.³⁸ For this reason, New England would likely have to import feedstocks or RNG if it played a significant role in meeting future energy needs in the region.

Barriers or uncertainties impacting reliance on in-state and out of state RNG include:

- Policies that impact how quickly production levels can be ramped up

³⁵ *Renewable Natural Gas: Potential Supply and Benefits*. M.J. Bradley & Associates. July 2019. <https://www.mjbradley.com/sites/default/files/RNGSupplyandBenefits07152019.pdf>

³⁶ *Evaluating Market Conditions for Renewable Natural Gas and Clean Hydrogen*. Dang Ding, Sam Pollan, Zoe Yang. April 2021. https://dukespace.lib.duke.edu/dspace/bitstream/handle/10161/22676/ding_pollan_yang_levline.pdf?sequence=1

³⁷ *2016 Billion-Ton Report: Advancing Domestic Resources for a Thriving Bioeconomy, Volume 1: Economic Availability of Feedstocks*. U.S. Department of Energy. 2016. <http://energy.gov/eere/bioenergy/2016-billion-ton-report>

³⁸ *Renewable Sources of Natural Gas: Supply and Emissions Reduction Assessment*. American Gas Foundation. 2019. <https://gasfoundation.org/wp-content/uploads/2019/12/AGF-2019-RNG-Study-Full-Report-FINAL-12-18-19.pdf>

- Access to and sufficient, reliable volumes of feedstock
- Contracting procedures and terms (5-10 years v. 20 years) for feedstock and RNG supply
- RNG sourcing cost, volumes and interconnection

All of the 8 pathways in the Consultants' Report assume a role for renewable fuels, either as a blend or as part of a dedicated service. There is more potential for renewable fuels than captured within the Pathways in both instances. Blending percentages vary within the Pathways assessment from 5-15% in 2030 up to 85% in 2050. Eversource also anticipates that there may be commercial and industrial customers who will be interested in dedicated service for renewable fuels given their energy intensive processes and decarbonization goals (such as large campuses and power generators).

Of note is the fact that Eversource's C&I sector is responsible for approximately 50% of total gas load on the Eversource system. This is due mainly to the importance of power generation, and combustion turbines specifically. As the independent consultants have observed, there is a significant need under all pathways for firm electricity capacity. Renewable fuels supporting the power sector and combustion turbines may support this firm capacity need.

Given its potential to significantly reduce GHG emissions on its network and to utilize much of the existing network, Eversource is prioritizing efforts to support the development and procurement of RNG. In early 2020, Eversource conducted a request for information ("RFI") to explore RNG opportunities for its gas companies. Eversource received several responses and continues to engage with some of those RFI participants as well as others to inevitably secure a portfolio of RNG supplies for its customers. It is currently exploring an in-state landfill and anaerobic digestion sourcing opportunity to inject RNG into its pipeline.

To realize the potential for RNG as a network decarbonization strategy, Eversource also plans to collaborate with regulators, policy makers and stakeholders regarding education, customer acceptance, and standards used to review LDC supply purchases and long-term contracting. Eversource is a member to the Coalition for Renewable Natural Gas (RNG Coalition), which through public policy and education, advocates for sustainable development, deployment and utilization of renewable natural gas so that present and future generations will have access to domestic, renewable, clean fuel and energy. The Sustainable Methane Abatement & Recycling Timeline (SMART) is one RNG Coalition initiative; it will capture and control methane from 43,000+ organic waste sites in North America by 2050, achieving significant benchmarks by 2025, 2030 and 2040.³⁹

In the Operating Plan, Eversource intends to continue discussions with RNG providers and conduct a market assessment—both in-state and out of state—of RNG from landfills and anaerobic digestion, including animal manure, wastewater, and food waste. Beyond the technical and resource potential, Eversource plans to explore the supply, interconnection, and

³⁹ *The Coalition for Renewable Natural Gas*. 2011. <https://www.rngcoalition.com/>

contractual dimensions of RNG to determine its ability to decarbonize the Eversource gas pipeline network and contribute to the Commonwealth 2050 net zero emissions goal.

Eversource envisions the following as key activities for RNG:

- Conduct and validate market assessments for in-state and out-of-state RNG
- Procure RNG from at least 1 locally sourced project
- Conduct feasibility assessment of RNG storage at LNG sites
- Identify and develop partnerships to build a small-scale demonstration project for RNG storage at an LNG site, pending successful feasibility assessment

Eversource intends to collaborate with regulators and policy makers to develop frameworks that support RNG delivery costs, develop measurement metrics and track decarbonization potential by scaling RNG projects/procurement. From a regulatory support perspective, Eversource is requesting the Department authorize the following:

- Allow for the cost recovery of RNG commodity and infrastructure investments
- Allow for companies to identify ways to offer RNG solutions to customers requesting them

Eversource sees the following as potential outcomes from RNG:

- Develop long term supplies of locally-sourced and out-of-state RNG
- Stimulate the market for low carbon fuels more regionally (e.g., outside of the California marketplace)
- Realize off-system benefits such as cost savings from waste disposal

Ultimately, Eversource sees RNG as an expeditious way to accelerate emissions reductions especially for the C&I sector that may have to wait for electrification techniques to mature to serve their thermal needs.

Initiative 5 – Hydrogen

Hydrogen can play an important role in decarbonization as represented in the Consultants' Report; all eight pathways include a contribution from green hydrogen as part of its "renewable fuels module." While the technical analysis for hydrogen is based on a set of assumptions that are not unreasonable given the goal of modelling the economy over 30 years, they require significant refinement and elaboration to comply with the demands of detailed planning.

Hydrogen can be safely and cleanly produced by using solar and offshore wind renewable generation resources, creating a zero-emissions fuel source. As such, it can provide a clean alternative to natural gas in residential and business heating, thermally intensive processes found in heavy industry, heavy duty on- and off-road transport, and maritime and aviation.

Hydrogen is also an important energy carrier. This means that it can be stored locally and used to generate clean electricity, providing an important form of cost-effective long duration energy storage. Storage is a critical energy system requirement for an electricity supply system heavily dependent on renewable energy, which is highly variable in its availability.

Hydrogen was identified as a breakthrough technology at COP26⁴⁰ meeting in November 2021. The imperative now is to prove hydrogen's potential at industrial scales across its value chain – production, storage, transport, and end-use.

In its Operating Plan, Eversource proposes to:

- Initiate a feasibility study to evaluate the potential capital costs of repurposing and readying the existing gas network across the hydrogen value chain from production, transportation, storage, and potential demand sources.
- Assess hydrogen blended into its natural gas network by up to 2% by volume in a target area of its network
- Collaborate with regulators, policies makers, industry stakeholders and others to develop hydrogen pilots/demonstrations to examine, the percentage of hydrogen capable of being delivered and used by industrial and commercial customers, and the capability to re-purpose the Eversource gas network to transport hydrogen.

Eversource will draw upon the multiple global trials underway demonstrating the safety and equivalent customer experience of hydrogen.

Because of hydrogen's versatility as a low-carbon fuel, during this initial Operating Plan, Eversource will also explore different hydrogen investment opportunities, including federal grant funding available through the Infrastructure Investment & Jobs Act (IIJA). The IIJA includes grant monies for clean hydrogen research, development, and demonstration purposes. Since IIJA grant funding is expected to continue over the next five years, Eversource would continue to monitor and pursue grant funding, tax incentives and other IIJA provisions that fit its strategic goals and project priorities.

Eversource needs DPU support to help stimulate hydrogen supply and demand growth and to engage with multiple hydrogen supply chain stakeholders and public and local authorities to foster support for new hydrogen end use programs such as commercial and residential heating programs. The latter requires an explicit hydrogen heating policy together with a regulatory policy that supports the deployment of repurposed and new build hydrogen infrastructure.

Eversource envisions the following as key activities for hydrogen:

- Pursue small scale pilot targeting a C&I customer or set of customers

⁴⁰ Uniting the World to Tackle Climate Change. COP26. November 2021. <https://ukcop26.org>. A hydrogen breakout goal (one of four major goals) was established – and agreed upon by 42 countries -- as part of the COP26's "Breakthrough Agenda," commonly referred to as the "Glasgow Breakthroughs."

- Determine sites suitable for pilot based on access to infrastructure such as clean water and renewable electricity using wind or solar energy, and proximity of connections between the electricity, heating, and transport sectors.
- Engage with multiple stakeholders, the public and local authorities on hydrogen opportunities and for technology education
- Become a front-runner in developing the organizational capabilities to deliver these types of projects in a similar way to current renewable projects (such as offshore wind).
- Bring in required partners across the different market sectors to develop a hydrogen economy.
- Explore federal funding through DoE IJA grant funding.

From a regulatory support perspective, the activities listed above would be covered within the Net Zero Enablement Tariff for any associated cost recovery. Additionally, if any DOE grant funding was received, Eversource would apply the money to defray any pilot costs, as applicable. Lastly, Eversource is proposing to recover applicable research and development costs it incurs in order to advance hydrogen as a potential solution through the Net Zero Enablement Tariff.

Eversource sees the following as potential outcomes from hydrogen:

- Assessing the safety, feasibility and operational performance of hydrogen for C&I customers
- Developing knowledge of the hydrogen value chain and what may be needed to scale production
- Developing the initial knowledge of how cost-effective hydrogen is
- Engage in research and development opportunities on hydrogen production for end use

ES Operating Plan: Innovative Pursuits

While not the extension of an existing program or a new initiative, Eversource also plans to engage in innovative pursuits to identify and engage in market activities that could contribute to future initiatives that decarbonize its value chain.

Initiative 6 – Innovative Pursuits: Monitor Research and Development

To support and accelerate the path to the Commonwealth 2050 goals, Eversource recognizes that it needs to anticipate “major changes” in the market and how customers use electricity and gas while ensuring safety and reliability. “Innovation in utility business models must match the accelerating pace of technology innovation.”⁴¹

⁴¹ Bryan Hannegan (President and CEO). *Holy Cross Energy*

To grow its knowledge based on practical feasibility of emerging technologies and end-use applications, Eversource will actively track and collaborate with the Department of Energy (DOE) National Laboratories, research institutions such as MIT Energy Initiative (MITEI), the Gas Technology Institute (GTI), policy makers and industry stakeholders to assess innovative technologies in terms of maturity, viability, impact on operations and policies, barriers of adoption etc. (e.g., hydrogen fuel cells, carbon capture, etc.). Based on intelligence gained, Eversource would then define any relevant initiatives in a future Operating Plan.

Regulatory Support Mechanisms

The LDCs have developed and submitted extensive comments in the Regulatory Framework describing a range of regulatory support mechanisms that are needed to promote decarbonization planning and program implementation.

Eversource recognizes that there is a need for many regulatory and policy updates to implement the LDC transition plans. These updates are needed to achieve long term climate outcomes in a prudent and reasonable manner, including in a manner that meets safety, reliability, and affordability.

Additionally, the pace and nature of the changes will have a direct influence on the design, implementation, timing, and ultimate feasibility and success of climate initiatives, so it is important to determine what changes to tackle first.

Broadly and generally, the changes would support the following:

- Unlock barriers to help the LDCs move from pilots and demonstrations to full implementation. For example, reforms are needed to authorize the LDCs to purchase decarbonized fuels or invest in the decarbonization technologies (and related programs).
- Address the most effective way to recover costs related to assets that are taken out of service prior to the end of their useful service life.
- Support the fair consideration and balancing of all initiative goals and outcomes, some of which are qualitative in nature. For example, climate initiatives may depart from narrow least-cost planning criteria to emphasize important outcomes such as reliability, safety, and environmental justice.
- Address customer affordability and fairness considerations by identifying alignment of cost responsibility of initiatives with how benefits and costs of those initiatives accrue to customers.
- Incentivize and support utility plans and programs and other actions that may promote new utility business models and non-traditional utility roles. For example, climate initiatives might require helping to promote new services and markets to get efficient appliances and heating technologies markets under new market relationships (with equipment suppliers, developers, general contractors, end-use-customers).

One of the regulatory support mechanisms identified in both the Regulatory Designs Report and the Regulatory Framework is the LDCs' existing revenue per customer decoupling mechanisms, which may need to be augmented over time to keep pace with the electrification transition. As described above, in this Operating Plan, the Company is intending to promote hybrid electrification, in which customers, upon request, may retain natural gas supply as a backup fuel source. In this way, the revenue decoupling mechanism may, or may not, provide sufficient regulatory support to mitigate lost revenues to the LDCs. The Company intends to evaluate the

implications of this, and any potential adjustments to the revenue decoupling mechanism that may be necessary in the short term, as part of its hybrid pilot program proposed herein and discussed above as Initiative 1.

Lastly, the Regulatory Designs Report identifies improved coordination of gas and electric system planning as a potential approach to help mitigate the risk of stranded assets and to support system reliability and resilience. In D.P.U. 20-75, the Department is assessing long-term system planning to enable the strategic development of renewable energy assets in distributed energy resource planning and cost assignment. This docket is important in starting to align electric and gas system considerations.

In its sequential three-year Operating Plans, Eversource plans to present the Department with the following evaluative components: (1) progress made on the first three-year Operating Plan; (2) changes and updates to the new three-year Operating Plan; (3) actions take over the past three years in relation to long-term capital planning on the distribution system, including evaluation of non-pipe alternatives; (4) five-year capital plans for safety and reliability projects; and (5) results of coordination between electric and gas companies in relation to system planning activities. With respect to gas and electric coordination, Eversource plans to work with the other LDCs to initiate a joint gas and electric planning process to provide an opportunity for the LDCs to work together to develop coordinated plans for strategic electrification, which could be submitted to the Department on a cyclical basis as part of the transition plan filings.

Lastly, throughout this process in D.P.U. 20-80, the stakeholder process has proven to be extremely helpful to the LDCs in gaining insight and perspective and in socializing with stakeholders the specific operational considerations that the LDCs have to address in transitioning customers from their current service to a future state. Eversource anticipates maintaining this interaction over the course of the Three-Year Operating Plan.

The tariff developed on behalf of all the LDCs covers many of the initiatives within the Operating Plan and Eversource has outlined any additional, specific regulatory asks above in the initiatives section.

Next Steps

Eversource's Operating Plan and related decarbonization plans define a pathway to meet the Commonwealth's 2050 goals. Eversource's pathway is informed by the Consultants' Report while also considering characteristics of its service territory and criteria critical to its business, customers and the community. This pathway is further based on the following:

- Energy efficiency – reducing the energy demand to the extent possible
- Hybrid and strategic electrification – testing and converting as much as is possible to safely, reliably and cost-effectively provide service to customers
- Biogas - a strategic component of the Commonwealth's future with decarbonized gas contributing to the 2050 goal while meeting customer needs not reliably or cost-effectively served by electrification
- Customer first—focus on affordability and adoption

Eversource can undertake many of the initiatives defined in the Operating Plan without any regulatory reforms, although regulatory support and flexibility are essential. For example:

- Networked Geothermal—additional pilots to permit the market and customers to realize the value of this technology option
- Hybrid Electrification—transparency in computing the business case and quantification of benefit value streams.
- Decarbonized Gas—customer contracts with gas premium

To be successful going forward, however, some regulatory support mechanisms will be necessary to unlock the potential initiatives, markets, technologies, and customer choice-driven decarbonization investments. As part of this regulatory reform process the role of funding, cost alignment and allocation, and cost sharing will be key issues and considerations. Utility costs need to be recovered in a way that is fair to customers (across all segments, including electric and gas), aligned to cost recovery principles of utility rate making, and reflective of the needs of low income and other disadvantaged communities.

It is essential to maintain, if not enhance, safety and reliability as part of system decarbonization. Over the next three years, Eversource recommends that the Commonwealth, LDCs and stakeholders address these foundational system needs and explore how activities to decarbonize the gas system—and expand the electricity system—will likely (1) impact gas and electricity system reliability and overall system resiliency; and (2) place some additional cost burden on maintaining safety.

Safety and reliability are bedrock principles of utility cost-of-service regulation, and as such they lead to numerous direct utility operating standards and requirements. The nature and capacity of both systems must be considered, in a prudent and reasonable manner, as decarbonization measures change how these two systems are utilized.

An important component of determining the success of any initiative in the Operating Plan or other decarbonization initiatives, and being able to “pivot” based on results obtained or lessons learned, is defining the evaluation criteria and metrics for success, in advance. Eversource recommends a working group be established to gain alignment on the method and metrics to be used, which provide clarity in comparing alternatives and removing barriers to achieving the 2050 goals in the most cost effective, efficient, and expeditious manner.

Appendix

Eversource Equity and Environmental Justice Priorities and Efforts

Equity and Environmental Justice are core priorities for Eversource, and Eversource supports and is partnered with our states, customers, and the communities we serve, to advance EJ and equity initiatives, while supporting on-going rulemaking. We are prepared to address regulatory compliance initiatives through many of our infrastructure projects designed to address a rapidly changing energy mix.

In the fall of 2021, Eversource established a Pro-Equity Advisory Team (“PEAT”) to develop several new policies, guidelines and trainings, to ensure stronger equity, accountability and fairness in our daily practices and interactions with our customers and the communities we serve. PEAT is a diverse internal team of Eversource employees appointed to create a structure and method for operationalizing equity throughout Eversource. This 15-person Team includes representatives from all major business units and levels of employees, diverse in race, gender, experience, and location. PEAT’s mission and goal is to operationalize Eversource’s commitment to equity across key business areas by creating decision guidelines that provide a clear equity lens for business partners to use before launching work, thus creating more equitable alternatives, outcomes for all customers and strengthening our corporate reputation.

Eversource’s coordinated planned advancement of its equity work means engaging all stakeholders – including our customers and communities - with respect and dignity, while working toward fair and just outcomes, especially for those burdened with economic challenges, racial inequity, negative environmental impacts and justice disparities. PEAT’s four core strategies that serve as pillars for the guidelines are to:

1. Improve communication effectiveness company-wide, especially with underserved communities;
2. Increase engagement with environmental justice and other underserved communities;
3. Augment investment and operating activities by proactively listening to communities to balance equity, resiliency, and affordability; and
4. Increase inclusion and education of programs and services to underserved communities to ensure equitable accessibility and outcomes between all communities served by Eversource.

In addition to our PEAT initiative, various state agencies are promulgating new regulations that also address a variety of EJ topics. On January 1, 2022, the Massachusetts Environmental Policy Act Office (MEPA) promulgated new regulations requiring substantially enhanced community outreach, meaningful engagement, and an environmental and public health impacts analysis by MEPA applicants, such as Eversource, for projects exceeding a certain regulatory threshold and

located within a certain proximity to an Environmental Justice (“EJ”) community. Such analysis includes an assessment of existing unfair or inequitable public health and environmental burdens and how a proposed project might add to these burdens.

Eversource is fully prepared to comply with the new MEPA regulations in MA, as well as with any additional EJ-related regulatory requirements in the development stage. Eversource has developed a thoughtful and effective cross-functional planning approach that includes both an Enhanced Environmental Justice MEPA Outreach and Communications Roadmap, as well as a list of all upcoming projects that exceed the MEPA thresholds and will require such enhanced community engagement and analysis of impacts. The communications plan and objective are to provide EJ community members in a geographic proximity to an Eversource project with an awareness and understanding of the project (as defined by the regulations), including its benefits, impacts, and mitigation, and to provide them with meaningful opportunities to participate in the project development process using a variety of communications options that work best for them. Such enhanced outreach will consist of mapping EJ communities within a 1-mile radius (5-mile radius if certain MEPA air quality thresholds are exceeded), providing information about the project, and inviting dialogue, questions, and feedback from the communities. Our initiatives will rely on mass and social media in translated form, project websites, and other digital forms of communication, as well as traditional forms of community engagement and outreach.

In addition to Eversource moving forward with a thoughtful and effective cross-functional planning approach to comply with the new MEPA rules (and all other related EJ rules being developed by the regulators), Eversource is going above and beyond by creating guidelines and policies that put a laser focus on ensuring equity, avoidance of harm, and enhanced meaningful partnerships and engagement with the communities and customers that it serves, across all Eversource operations.

Moreover, Eversource is well prepared in the areas of talent acquisition, retention and development, to advance its clean energy transformation, with a commitment to developing a workforce that fully reflects the diversity of the people and communities we serve. Our hiring practices emphasize DE&I, and we encourage employees to embrace different people, perspectives, and experiences in our workplace and within our communities – regardless of their background. Our practices for inclusive hiring include developing recruiting strategies that support recruitment of diverse candidates:

- crafting inclusive job descriptions that welcome candidates
- educating hiring managers and interview teams on the benefits of diverse interview teams, recognizing unconscious bias, and mitigating the impact bias on hiring
- a consistent interview guide and scoring matrix for evaluating candidates

We have sustained our successful drive to increase workforce diversity over time: in 2021, 58% of our external hires are women and BIPOC individuals and 41.2% percent of new hires and

promotions into leadership roles were women and BIPOC individuals. In addition, our Key Talent Program has provided a rich pipeline of diverse talent for promotional opportunities, and in 2021, female and BIPOC participants were 40.8% of key talent promotions.

Educational Partnerships to expand our reach for our workforce of the future: Eversource has continued to expand our recruiting strategies for practices and partnerships with colleges and universities to grow our diverse talent pipeline (e.g., Bunker Hill CC, Capital Community, Univ of Massachusetts, Univ of Hartford, Manchester CC, Wentworth, WPI). As the energy industry faces a major depletion of its workforce, Eversource has had to get creative in how we recruit our future workforce. Eversource continuously looks for innovative ways to replenish our workforce by expanding and changing programs to meet business needs, specifically building a pipeline of diverse individuals who are technically oriented, with an interest in career advancement. The development of several unique talent pipeline programs in partnership with local colleges has proven to be a successful strategy to recruit our future workforce.

Customer Feedback around the Future of Natural Gas

In addition to the stakeholder outreach facilitated by ERM and the customer outreach by the Massachusetts LDCs, Eversource pulsed its online community to understand how customers are thinking about the role of natural gas in the future in Massachusetts.

Eversource online community members were asked two open-ended questions to get their view on what the future of gas is, and what natural gas-related upgrades they are looking to make in their homes over the next five to ten years. Customers expressed a broad range of opinions towards the concept of the "future of gas." Many feel that gas will remain a reliable, affordable path relative to other options for many years to come, while others hope to phase out natural gas as quickly as possible in favor of cleaner, renewable sources of energy. Several customers specifically noted their preference to continue using natural gas for cooking. Most are not currently planning on replacing any of their natural gas infrastructure in their home at this time.

The customer feedback collected is included on the next page.

Future of Gas				
n=108				
Question 1 of 2 As part of Eversource's effort to achieve Net Zero carbon emissions by 2030, Eversource is looking beyond traditional natural gas service and exploring different ways to help achieve this goal. Thinking about this, what do you think is the future of natural gas? What role – if any – do you see natural gas playing in the future? If you don't see a role for it, how do you feel about that? Why?				
Date	Reply to Mod	Content	Account Type	Service Type
18:13:12	-	I think that natural gas will be a backup for sustainable energy.	RESI	-
2022-01-21 18:31:28	-	I hope that natural gas will play less and less of a role in our lives. It is cleaner than oil and coal, but is still a fossil fuel.	COMM	EMA-G
2022-01-21 18:51:52	-	I few that over the use of gas wil decrease as renewable energy increases. This will take many years. It will be a gradual transition.	RESI	EMA-G
13:56:15	-	I am thinking renewable sources- wind, solar and thermal	RESI	EMA-G
19:01:47	-	Should continue to be used for heat. Is very low in carbon	RESI	EMA-G
2022-01-21 19:04:27	-	I like it. It is versatile and can be used for many different energy related needs.	RESI	EMA-G
2022-01-21 20:17:28	-	I honestly do not know what the effect of natural gas is on the environment.	RESI	EMA-G
2022-01-21 23:58:07	-	I don't see natural gas going away entirely anytime soon. If nothing else, it would be great as a backup energy source considering the somewhat more fragile nature of the electric grid.	RESI	EMA-G
2022-01-24 21:22:22	Reply to Mod	I think it's most compelling for fueling a standby backup generator, but I could also see using it as as emergency heat if combined with a heat pump.	RESI	EMA-G

<p>2022-01-21 23:58:45</p>	<p>-</p>	<p>I think natural gas will remain in use for heating and cooking for a long, long time. The installed base is huge and the costs of switching all of that is immense. If anything I think it will be gradual. We may see new homes built without using natural gas, perhaps even legislated out of new construction. At some point gas heating may be legislated out for retrofit as well, but it would be a long time - if ever - before all existing furnaces and boilers are replaced. And then you have stoves, cooktops, and ovens - and gas fireplaces, dryers, firepits, etc. Unless there is some massive program to fund upgrading all of the install base, and sunset gas service to force it, I don't see most people jumping to replace their gas appliances. I just don't see natural gas going away in the next few decades. And in commercial use, such as power generation, natural gas is a better alternative than coal or oil. Modern gas turbine plants with energy recovery on the exhaust are highly efficient. Relying more on gas, instead of coal and oil, would reduce carbon emissions. Renewables are great, and more solar and wind are needed, but we need generation capacity to handle long periods without sun (I have a solar roof, with winter weather there can be days on end with minimal generation), calm stretches, etc. Natural gas plants can be brought online quickly to deal with those needs. Battery systems, like the Tesla Megapack, can handle short term dips - but they have their limits. I think the future of power generation will be a mix of nuclear, which provides a great baseline, renewables, battery systems, and natural gas - coal and oil will be phased out completely.</p>	<p>RESI</p>	<p>EMA-G</p>
<p>2022-01-22 12:06:00</p>	<p>-</p>	<p>More alternatives to dependence on natural gas and other environmentally unfriendly energy sources must be developed and advanced.</p>	<p>RESI</p>	<p>EMA-G</p>
<p>2022-01-22 15:36:38</p>	<p>-</p>	<p>I think clean burning high efficiency fuel will be a factor for a long time to come. I do think we'll explore more of an hybrid approach to heating and cooking. Blending technologies and building more robust and diverse feul sources in the home is a smart approach to any aging source.</p>	<p>RESI</p>	<p>EMA-G</p>
<p>2022-01-23 13:10:23</p>	<p>-</p>	<p>I believe that aiming for carbon neutral is the right thing to do. I don't think it is realistic to think that all of the current systems that use natural gas can be phased out and replaced by 2030, so there will still be a place for natural gas for some time to come. Hopefully Eversource can achieve the 2030 goal with other carbon offset programs. I'm not sure of the practicality of replacing national gas with hydrogen, but that could be one avenue for phasing out natural gas.</p>	<p>RESI</p>	<p>EMA-G</p>

2022-01-26 23:03:30	Reply to Mod	I am all in favor of it. Anything that can lower carbon emissions and slow global warming is a positive thing as far as I am concerned.	RESI	EMA-G
2022-01-24 19:58:01	-	I think the future of gas is excellent. The US has a surplus supply and a large potential. The large corporate interests in the US will not allow gas to go away.	RESI	EGMA
2022-01-24 20:00:27	-	I see NG as a backup to electrical utilities with the ability to generate my own electricity on site	RESI	EGMA
2022-01-24 20:00:41	-	Natural gas should only be used as a backup to renewable energy in the future. I do not see natural gas as part of any other long-term solution to electrify the planet.	RESI	EGMA
2022-01-24 20:01:35	-	I feel like natural gas is still going to be a huge part of energy as we know it. So many buildings - from homes, to offices, to factories (I presume) run on natural gas. In the long -future - maybe there will be other sources, but for the next decade at least, I believe it's crucial.	RESI	-
2022-01-24 20:01:54	-	I hope we are weaned from natural gas and will use renewable sources for energy such as solar, wind, hydro, and geothermal	RESI	EGMA
2022-01-24 20:02:16	-	Bridge fuel while renewables and more storage and transmission come online	RESI	EMA-G
2022-01-24 20:02:34	-	I think the future of natural gas is to use it in balance along with solar and wind power.	RESI	EGMA
2022-01-24 20:03:47	-	I see natural gas being used for heating and electricity generation for another 20 years	RESI	EGMA
2022-01-24 20:04:29	-	In my opinion Gas will always be needed to heat, cook, and hot water, solar power and wind power and Ev cars have a long way to go to prove to the American people that they will bring total trust to all of us.	RESI	EGMA
2022-01-24 20:04:59	-	I think natural gas extraction has many negative consequences for the planet and for extraction workers. However, unless we can further develop alternative energy delivery and use, we'll need it in the future.	RESI	EGMA
2022-01-24 20:06:36	-	According to the US DOE approximately 50% of American homes are heated with natural gas. I don't know the implication of Eversource's Net Zero Carbon emission as to how much natural gas will be utilized. If the plan is to turn more to electric heat I don't see how that will work. Our power grid does not have the capacity to provide electricity under current demand. Add the desired move to electric vehicles and I don't see how this will work. I believe natural gas will continue to be an important part of our future. Having been raised in a home that heated with oil, I find natural gas to be a cleaner alternative.	RESI	EGMA

2022-01-24 20:10:28	-	Natural gas will play a role until coal is completely phased out, as it is preferable even if still a fossil fuel. In the absence of nuclear power plants, there needs to be a source that utilities can use to compensate for the intermittency of renewables like solar and wind. However, if nuclear ramps up, or if power storage continues to decline in price, then natural gas could also start to be phased out in the longer-term. Some jurisdictions are already banning new gas infrastructure in new construction, which might accelerate that trend.	RESI	-
2022-01-24 20:10:59	-	Honestly? I'd like to see it eventually end. I'd like us to get to the point where we can obtain all the energy we need from cleaner sources, namely wind and solar power. While natural gas is probably the best option of the traditional energy sources (coal, oil, etc.), I'd still prefer us not to continue destroying the planet by continuing to remove limited natural resources.	RESI	EGMA
2022-01-24 20:12:06	-	Hoping there is no future for natural gas and the switch is made to complete use of renewable energy. From an environmental and global standpoint, the shift needs to happen sooner than later for sustainability and for future generations.	RESI	-
2022-01-24 20:19:01	-	I think it will be of a greater need in the future. I think we should be optimistic in saying that it will be a larger player in the upcoming years in all countries.	RESI	EGMA
2022-01-24 20:19:37	-	Natural gas cannot play the central role it does today. Would it be feasible, given the infrastructure and mining operations it requires, to reserve it as a backup energy source? I don;t know enough to answer that question, It would certainly be cleaner than oil or coal as a backup. I can see many challenges to eliminating natural gas from our energy market basket, but I think it must be done..	RESI	-
2022-01-24 20:21:34	-	With reserves dwindling, natural gas's future needs to be carefully evaluated. Whether it's incentivizing current users to use more efficient technologies or gradually shifting to more sustainable solutions.	RESI	EGMA
2022-01-24 20:25:45	-	I don't believe natural gas or even other fossil fuels will be going away any time soon. From what I've read, these fuel sources still supply a majority of the electricity generated in our country. To fully replace these sources there would need to be enourmous leaps made in how clean energy solutions produce electric supply and how those sources are distirbuted across the country. I still see natural gas as one of the cleaner fossil fuels to use for home use, our household relies on it for cooking, drying our clothes and heating. I don't see this changing in the long run at all, without subsidizing heating conversions and appliance replacement for anyone who uses gas as a source.	RESI	EGMA

2022-01-24 20:26:28	-	I would hope that we move mostly to nuclear, solar, wind, and hydro power, but I expect that natural gas and oil will be around for backup or to cover gaps in availability.	RESI	EGMA
2022-01-24 20:34:07	-	The future of natural gas is as little as possible, and only when unavoidable. I suspect I will still use natural gas for my camping stove, since it's the most energy-dense and efficient way to carry cooking heat. My domestic hot water at home will probably remain gas due to the energy demand of multiple bathrooms. However, we're already investigating replacing (or augmenting in a multi-stage system) our forced hot water heating zones with a heat pump as our existing air conditioning unit reaches the end of its usable life.	RESI	EMA-G
2022-01-24 20:34:09	-	Getting gas from the ground is way too destructive for the environment and especially underground water systems. We should get off Natural gas unless we can come up with a safer and less destructive way to extract it.	RESI	EMA-G
2022-01-24 20:37:18	-	I believe natural gas will play a role for a while, and in my opinion there probably should be a role for natural gas. While I believe that it is important to reduce pollution to the extent possible and have cleaner sources of energy, I believe it is very short sighted and imprudent to "put all our eggs in one basket" by electrifying everything. Especially in a part of the country with some of the highest electric rates. Diversification has value.	RESI	EMA-G
2022-01-24 20:41:12	-	No future in natural gas. Wind and solar and nuclear is the future for climate change	RESI	EGMA
2022-01-26 12:15:35	Reply to Mod	Probably 5-10 years	RESI	EGMA
2022-01-24 20:43:25	-	Natural gas is preferred to other sources of fuel. It plays an important role in reducing carbon emissions. Burning natural gas yields less carbon dioxide emissions than coal or petroleum. The goal to achieve Net Zero carbon emission by 2030 is a pipe dream and unlikely to occur, but that doesn't mean companies like Eversource should stop trying to reduce their contribution to environmental demise. The issue is complex. I cannot speak to it with any authority. Some of the research I have read indicates that natural gas can be used in other ways to continue reducing CO2 emissions. Some of those ways include: substituting natural gas as an energy source in buses and large trucks utilizing natural gas in manufacturing power systems finding ways to incorporate renewable energy in conjunction with natural gas exploring the use of hydrogen with natural gas in pipelines and the production of blue hydrogen	RESI	EGMA

2022-01-24 20:45:48	-	If the resistance to nuclear power plants persists, and fusion power is not realized in the near future (still a long way off), then natural gas would always have a place in generating electricity in areas where sufficient renewable energy sources are not possible or practical. Then there are the ~62 million homes, plus commercial and industrial facilities, in the United States that are heated with natural gas. That could take a while (and a lot of willing home and business owners) to change to another source of heat.	RESI	-
2022-01-24 20:48:15	-	It's a legacy fuel used (and preferred) by many. It should be incentivized heavily to be phased out to more efficient renewable sources including HVAC and cooking.	RESI	EGMA
20:49:30	-	I think natural gas will be used for many years to come.	RESI	EGMA
2022-01-24 20:52:32	-	I see natural gas as still viable and useful in the future, although in lesser amounts with the increase in both solar and wind power.	RESI	EGMA
2022-01-24 21:01:16	-	Although I am not an energy scientist, so I don't know how it could be done, I think natural gas should always be part of the energy equation as long as its supply remains steady. Get some clever folks to figure out a way to trap the bad gases at the exhaust of the unit.	RESI	EGMA
2022-01-24 21:02:46	-	I think natural gas should be used and continue to be advertised as cleaner than oil and easier than oil. I like how natural gas is consistent and can power multiple things and is renewable. That being said, Solar should be a big piece going forward.	RESI	EMA-G
2022-01-24 21:04:41	-	Natural gas is vital for the future. It is the cleanest burning fuel. Wind and solar currently cannot give us 100 percent of our power needs especially for a 24/7 demand. I see natural gas as the best alternative to meet our needs for now and into the future without harm to the environment. Natural gas can be used along with wind and solar and as more progress is made in making them more dependable then natural gas usage could be reduced.	RESI	EGMA
2022-01-24 21:08:41	-	I think natural gas is the best thing for the environment and for our homes. I used to have oil, it's not bad but gas is better	RESI	EGMA
2022-01-24 21:11:39	-	This is going to be very dependent on the overall environmental consequences of using gas. That is, if we can find a way to produce gas in environmentally-friendly ways, to finding ways to capture and clear the emitted carbons. In essence, I think that gas will be with us for a while, and we will see decreasing new construction (either residential or otherwise) using gas. We'll continue to see gas used to generate electricity, until we can replace the production plants with carbon-friendly alternatives.	RESI	EMA-G
2022-01-24 21:16:23	-	I really don't see natural gas playing much of a role other than fueling outdated equipment.	RESI	EGMA

2022-01-26 03:20:19	Reply to Mod	I think this will be a forced action as the weather becomes more unpredictable causing severe damage throughout the world. I see the change difficult as change normally is. People will have to adjust to new equipment along with the new ways of doing things that come along with it. It will be worth it. Ultimately, do we really have a choice? We only have one planet, and it is our responsibility to leave it in better shape than we found it with each generation FOR each generation.	RESI	EGMA
2022-01-24 21:18:33	-	I don't see how we can function without gas. I use it to cook and do laundry. Also use it to heat water.	RESI	EMA-G
2022-01-24 21:40:20	-	I see the role of natural gas declining as it clearly contributes to carbon emissions in a significant way. I prefer the option of using natural gas and I think it helps keep prices lower due to that competition and will miss that. I also prefer natural gas cooktops and will miss them as well.	RESI	EMA-G
2022-01-24 21:44:20	-	I don't see natural gas usage disappearing in the foreseeable future. It is a significant component of many homes and industries: heating, cooking, etc.	RESI	-
2022-01-24 21:50:49	-	I can't think of any source of energy that could replace natural gas. Solar and wind power can't do what is needed. Nuclear power is potentially dangerous. Fossil fuels are dirty. Natural gas should be more affordable in the future.	RESI	EMA-G
2022-01-24 21:59:15	-	I think it will take a while to get to Zero emissions. Natural gas will still be needed and have a strong hold in the households for cooking and heating. If we decide to go to other alternative sources of fuel, it will be a very slow process. As fuel cells get better and solar power gets stronger, then little by little I can see more households start to adop to change but only if there are more benefits, especially financial benefits for all involved.	RESI	EGMA
2022-01-24 22:24:43	-	Natural gas can be a clean fuel to use, but extracticng it has become increasingly costly. Perhaps efforts to synthesize combustable fuel from composting and other recycling efforts will allow us a better sourcing option for this type of fuel.	RESI	EGMA
2022-01-24 22:30:08	-	Very simply, for the foreseeable future natural gas will remain a clean fuel source for both home heating and power generation. Wind energy is sporadic as a generator. Solar is tough with a snow covering.	RESI	EMA-G
2022-01-24 22:44:53	-	I really don't see natural gas for use as a home heating fuel going away.....well, in my lifetime anyway.....	RESI	EGMA
2022-01-24 22:46:32	-	I do not know enough about the alternative to natural gas to render an opinion.	RESI	-
2022-01-24 22:50:27	-	Make it as clean and renewable as possible. Where there's a will, there's a way! We have to be thinking more about renewable energy sources and the longevity of our planet.	RESI	EGMA

2022-01-24 22:51:18	-	Natural gas must remain as part of our country's fuel supply. Wind, solar and water power are all great - but as was proven in Texas during their frost a whiel back, we must keep a variety of options on the ready.	RESI	-
2022-01-24 22:57:25	-	I still see it playing a role but much smaller than it is currently. It is not a renewable resource so we should consider cutting it completely soon. I want to take better care of our planet.	RESI	EGMA
2022-01-27 23:14:57	Reply to Mod	Hi! I am hoping that solar energy can be used in its place. Natural gas can probably be used in an emergency if needed. I think we will be able to store the energy created a lot easier in the future. If some great solar engineers put their minds together I am sure they can work to improve solar energy storage.	RESI	EGMA
2022-01-24 23:29:08	-	Natural gas will be with us until a cheaper and plentiful alternative fuel can be developed.	RESI	EGMA
2022-01-24 23:53:25	-	Natural Gas will be around for awhile. Until solar& wind are scalable, I don't see alternatives. Coal is so dirty it needs to go.	RESI	EGMA
2022-01-24 23:54:34	-	I think natural gas will be a bridge until there are affordable renewables. I expect it to be used another 30 years.	RESI	-
2022-01-24 23:57:03	-	I believe that the use of natural gas will continue and possibly increase as the use of other petroleum based fuels decrease. Instead of oil burning furnaces in homes, I believe more and more will gas furnaces and heat pump units.	RESI	EGMA
2022-01-25 01:59:35	-	Essential to reducing carbon footprint and emissions in the environment	RESI	EMA-G
2022-01-25 02:26:52	-	Natural gas is still important for many families and due to the cost involved with trying to Convert to say solar energy is cost prohibitive and out of reach for many. So as I see it natural gas is here to stay for some time. use of natural gas will continue to be necessary	RESI	EGMA
2022-01-25 03:17:33	-	Methane ("natural gas" is greenwashing) is a fossil fuel. We have to stop burning all fossil fuels if the planet is to survive. "Net zero" is also greenwashing. We need Zero Carbon. Rebuild the grid for nationwide distribution. The SW desert can supply all needed electricity thru solar.	RESI	-
2022-01-25 04:07:13	-	I don't know enough about how natural gas is produced and delivered to have an opinion. I do know that I like to cook with open flames that natural gas provides.	RESI	-

2022-01-25 11:13:52	-	I think the future for natural gas is looking great. With electric cars increasing, the use of gasoline will decrease and therefore the price will rise. This will put the natural gas in the drivers seat. I switched to gas 10 years ago and I don't have a single complaint. My daughter lives on Stevens Street in Ludlow and we've been hoping for gas for five years. Many residents would like to convert to gas but they need a pipeline. Your gas lines are located at the end of Stevens and the beginning of Stevens. Hopefully she can get some gas in the near future.	RESI	EGMA
2022-01-25 11:16:12	-	I think that natural gas will be around forever. We may reduce our carbon footprint, but cannot live comfortably without gas	RESI	EGMA
2022-01-27 19:02:20	Reply to Mod	I think we will use significantly less gas as before, but I don't see it not being used at all. We as humans use up anything that is available to us as long as it helps us. But, I also know that we are also admit reducing out carbon footprint, Judy not enough people on board with that	RESI	EGMA
2022-01-25 13:32:18	-	Natural gas isn't zero carbon emissions but it is one of the cleanest energy sources of them. There are a lot of other energy types that can be eliminated and replaced by natural gas while the ultimate answers canbe obtained. Natural gas could be the source of energy to be used for standby power when other sources are reduced because of weather conditions. I believe there must be some reliable source of power that can be brought online when the wind dies down or the clouds are out.	RESI	EGMA
2022-01-25 13:34:12	-	I believe climate change is real and threatens the future of humanity on Earth. We need to reduce our carbon emissions. That said, I also think natural gas is a clean burning fuel. Though its use does add to the carbon mix in our atmosphere, considering all the other fossil fuels clean burning natural gas is a good bridge to the time when the bulk of our energy use can be satisfied by renewable sources.	RESI	EGMA
2022-01-25 15:25:43	-	Since there is a limited supply of natural gas and we will run out eventually, we need to start moving to renewables. However, natural gas is still cleaner than some other sources of energy, so if it is needed, it could be a reasonable second choice, but ways to make its use less harmful to the environment should be implemented.	RESI	EGMA
2022-01-25 18:15:26	-	I understand that natural gas is economical and clean, but I am terrified of gas. Every time I hear about a gas explosion, I'm glad that I only have water and stove by gas. If I could, I wouldn't have any.	RESI	EMA-G
2022-01-25 19:42:20	-	I think gas will still be used in the furture. It's a clean(ish) fuel. Solar and Wind are too cost prohibitive, and would make a poor replacement for natural gas, at this thime	RESI	EGMA

2022-01-25 20:31:03	-	I think it is a finite resource, so renewable resources should be what companies are switching to.	RESI	EGMA
2022-01-27 16:01:22	Reply to Mod	Definiety solar and wind energy. I think natural gas should be phased out eventually for the greener more environmentally friendly resources. Natural gas could be used as a backup for these if needed. I also think these are safer. I believe Eversource is improving natural gas safety but it can still be dangerous due to its combustibile nature. Thank you for listening to my response!	RESI	EGMA
2022-01-25 23:37:09	-	I hope it would continue to be used due to cost effectiveness and ease of delivery.	RESI	-
2022-01-25 23:38:43	-	Gas and renewable energy will be equal as future power sources	RESI	EGMA
2022-01-25 23:58:20	-	Much as I love natural gas heat I know that it is not good for the environment.	RESI	EGMA
2022-01-26 13:25:13	-	It would be nice to have an alternative to natural gas, but it needs to also be an economical option. Going Green is very good for Earth and the future, but it seems to appear as the more expensive option.	RESI	EGMA
2022-01-26 16:18:20	-	I think short-term yes and honestly on the high end, there is no substitute for gas in stovetop cooking. We already see electricity being the oven of choice so that will continue. I think in terms of efficiency, gas has a place for the next decade or two, Heat pumps will continue to gain presence and you'd be silly to not take a look at split systems in new construction. I suspect once solar/wing can keep up in generation the KW needed and as battery tech improves we'll need a more sustainable move away from carbon fuels.	RESI	EMA-G
2022-01-26 13:30:38	-	I do not see natural gas going anywhere. It is a good clean natural resource that is energy effecient compaired to other energy sources.	RESI	EGMA
2022-01-26 17:15:16	-	We need to keep natural gas as a reliable, affordable, clean energy source. Hoping Eversource and its sister utlities will be able to keep up the good work.	RESI	-
2022-01-27 14:31:54	-	I think we still need natural gas for the future as it is very important.	RESI	EMA-G
2022-01-27 15:31:08	-	I think natural gas will continue to be around. I believe there will be constant improvements. But I feel there will always be a demand.	RESI	EGMA

<p>2022-01-27 19:40:12</p>	<p>-</p>	<p>I feel that natural gas, like other fossil fuels has no place in our future. I understand why it is so attractive now because it is cheap and less dirty than coal but that doesn't make it clean energy. I am happy that energy companies will stop fracking the country and polluting the ground and water with contaminants to make a quick profit. I for one will be extremely happy the day we go all renewable, clean energy and stop trying to kill the only planet that we can live on.</p>	<p>RESI</p>	<p>EMA-G</p>
<p>2022-01-27 22:41:19</p>	<p>-</p>	<p>Until we have achieved complete alternative fuels, we will still need some gas component in the energy mix. We can reduce our use of it with a goal of total elimination, but that will be not easy to achieve. I would not miss gas as long as a good efficient alternative heating method exists.</p>	<p>RESI</p>	<p>-</p>
<p>2022-01-28 12:34:08</p>	<p>-</p>	<p>Depends on the horizon. For the next 20 years I view it as a bridge to greener electric generation and heating. Beyond that I don't see it playing much of a role beyond possibly some extreme backup/peak events. I view it as greener than coal and oil but less than renewables.</p>	<p>RESI</p>	<p>EGMA</p>

Future of Gas												
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Question 2 of 2 What natural gas upgrades are you looking to make in the next 5-10 years? Why are these your priority? If you are not looking to make upgrades why not?												
Date	Reply to Mod	Content	Which of the following are you CURRENTLY USING NATURAL GAS for in your home? Select all that apply.								Account Type	Service Type
			Heating	Cooling	Washer / Dryer	Hot Water Heater	Stove/ Oven	Fire- place	Somethi ng Else	Something Else (Response)		
21 18:14:09	-	We recently converted from oil and find gas a bit cheaper.	1	0	0	1	1	0	0	-	RESI	-
22 12:29:32	-	however, looking into solar panels for the near future.	-	-	-	-	-	-	-	-	RESI	-
21 18:32:17	-	We are hoping to leave natural gas at some point-our next appliances will be all electric.	1	1	1	1	1	0	0	-	COMM	EMA-G
2022-01-21 18:54:24	-	I hope to install solar panels and eventually switch to electric heat if it works. I love cooking on gas and hope to keep it.	1	0	0	1	1	1	0	-	RESI	EMA-G
22 13:57:49	-	I believe in solar heating and see it as a great way to lower the use of non renewable sources.	-	-	-	-	-	-	-	-	RESI	EMA-G
21	-	it works great and is clean.	0	0	0	0	0	1	0	-	RESI	EMA-G
2022-01-22 13:50:51	-	Clean in the sense that it does not create dirt when used. It would be nice to keep gas around and would be nice to find ways to make it more carbon neutral. Such a good source for electricity compared to oil. So much cleaner overall	-	-	-	-	-	-	-	-	RESI	EMA-G
2022-01-21 20:18:31	-	Is electric cleaner than gas? Is it feasible to do solar? These are all questions that I have that I wish I were better informed about.	1	0	0	0	1	0	0	-	RESI	EMA-G
22 00:03:05	-	Considering some of the following: Gas fireplace insert, generator, water heater	1	0	1	1	1	0	0	-	RESI	EMA-G

2022-01-24 21:27:23	Reply to Mod	gas insert and generator would be nice to have (we don't currently have them), and the water heater has a limited lifespan so when replacement time comes it's a good excuse to upgrade to a more efficient type (on demand or indirect) to save money.	-	-	-	-	-	-	-	-	RESI	EMA-G
2022-01-22 00:05:13	-	Our home is new construction - 2019 - and we have a gas furnace (high efficiency condensing), gas hot water (tankless), gas cooktop (electric ovens separate), and a gas fireplace. Given everything is new we have no plans to replace anything in the near term. If I were to replace anything I might put in a heat pump instead of A/C, to handle more heating without needing the furnace. Power outages are an issue here - we have a solar roof and batteries, but that would not be sufficient to heat out home in winter during an extended outage. With gas we can keep the heat on and only need to power the blower, so we can make it much longer without the grid power - indefinitely if the sun is out. Same with the hot water - heating it electrically would drain our batteries quickly. We kind of defaulted to a gas cooktop - but I'd probably go with induction today, it just didn't occur to us when picking appliances back in 2018. I've had more exposure to induction systems since and	1	0	0	0	1	1	0	-	RESI	EMA-G
22	-	None, already have all.	1	0	1	1	1	0	0	-	RESI	EMA-G
22 15:38:41	-	Water is the next system that needs upgrade beyond solar.	0	0	0	0	0	0	1	tankless hot water (gas)	RESI	EMA-G

2022-01-26 16:12:31	-	Well I had gas as the fuel type, I upgraded systems to avoid failure of the 30 year old units and to gain efficiency (about 30% fuel savings) . The gas fireplace was pure convenience as the wood burning existing fireplace was seldom used and honestly costs more to run. We use the fireplace almost every day in the winter,	-	-	-	-	-	-	-	-	RESI	EMA-G
22	-	I don't need any updates	1	0	0	1	1	0	0	-	RESI	EMA-G
2022-01-23 13:15:17	-	I would like to upgrade the heating and hot water systems on both units in my two family house. They currently have older style boilers and standing hot water tanks. I'd like to replace them with more efficient tankless systems that provide both heat and on demand hot water.	1	0	0	1	1	0	0	-	RESI	EMA-G
2022-01-26 16:11:34	Reply to Mod	assumed that a more efficient system would be both good for the environment and save on energy cost. Both of those factors are important to me. Thanks, Dave	-	-	-	-	-	-	-	-	RESI	EMA-G
26 23:01:39	Reply to Mod	Just a standard tankless system that serves both heat and hot water needs.	-	-	-	-	-	-	-	-	RESI	EMA-G
24	-	NG is more efficient	1	0	1	0	1	1	0	-	RESI	EGMA
2022-01-26 16:27:15	Reply to Mod	I meant that Natural gas is more efficient than heatpumps, which was the option we considered when we replaced our boilers. the only upgrades we are considering is adding solar, although we still don't feel that the complexity is worth it yet.	-	-	-	-	-	-	-	-	RESI	EGMA
2022-01-24 20:02:21	-	I'm not sure, because I live in apartment building. If I own a home, the goal for it would be as energy efficient as possible	1	0	1	1	0	0	0	-	RESI	-

2022-01-24 20:03:11	-	stove, as having to pay for plumbers (in Massachusetts) to handle all the work when I need to replace these units is a pain. That said, I have no intention of switching from gas heat/hot water. The units in my house are fairly new and work very well.	1	0	1	1	1	0	0	-	RESI	EGMA
24 20:03:11	-	I am a renter, so unfortunatly I'm not looking to make any of these changes	1	0	1	1	1	0	0	-	RESI	EMA-G
24	-	I don't know if I will be making any upgrades.	0	0	1	1	0	0	0	-	RESI	EGMA
24 20:03:51	-	fairly updated so don't foresee upgrades in near future	1	0	1	1	1	1	0	-	RESI	EGMA
24	-	possible gas heating stove	1	0	0	1	0	0	0	-	RESI	EGMA
26 15:35:57	-	It doesn't require electricity to heat the house, and would function during outages	-	-	-	-	-	-	-	-	RESI	EGMA
26 15:38:08	-	It could be used during outages, as it doesn't require electricity	-	-	-	-	-	-	-	-	RESI	EGMA
24 20:06:33	-	My home is set up for Gas and as far as I am concerned it always will be.	1	0	1	1	1	0	0	-	RESI	EGMA
24 20:07:43	-	Gas will always be used and needed for our home usage.	-	-	-	-	-	-	-	-	RESI	EGMA
2022-01-24 20:08:11	-	We may explore solar for some home heating needs. Not looking to do much of an overhaul due to having a historic home and it being hard to retrofit.	1	0	0	1	0	0	0	-	RESI	EGMA
2022-01-24 20:11:01	-	and possibly install an instant gas water heater. If I replace my stove it will be with a dual fuel unit with an electric oven (gas oven is not my favorite).	1	0	1	1	1	1	0	-	RESI	EGMA
24 20:11:49	-	At this point, the only upgrades I would make would be to invest in solar panels.	1	0	0	1	1	1	0	-	RESI	EGMA
2022-01-24 20:11:50	-	I am looking to move all my heating and colling to electric. Will continue to cook with gas for the foreseeable future.	0	0	0	0	0	0	1	None	RESI	-

2022-01-26 15:18:22	Reply to Mod	in the process of installing solar. Most of the heating is oil, except for fireplaces and garage heating which are gas. Those will stay as gas, it's primarily the oil-based heating that we are planning to replace.	-	-	-	-	-	-	-	-	RESI	-
2022-01-24 20:15:20	-	Hopefully in the next few years we can install a forced air split system to get completely away from using natural gas as way to heat our home.	1	0	0	0	1	0	0	-	RESI	-
2022-01-26 15:53:19	Reply to Mod	resource primarily composed of methane. Methane is a greenhouse gas, 32x stronger than CO2. With our current global warming predicament, action is needed not only by our representatives and politicians, but also by individuals. If I can aid in reducing our emissions by changing our heat from natural gas to solar powered forced air, hopefully I can be an example to family, friends, and neighbors to also make the switch and aid in reducing greenhouse gas emissions. Hope this helps! Brie	-	-	-	-	-	-	-	-	RESI	-
24 20:21:01	-	We are currently looking into switching from oil to gas to heat our home.	0	0	1	1	1	0	0	-	RESI	EGMA
26 15:18:17	-	We are hoping it will be cheaper in the long run. Oil prices fluctuate so much it is hard to budget.	-	-	-	-	-	-	-	-	RESI	EGMA
2022-01-24 20:22:43	-	I am not looking to add any natural gas usage over the next 10 years. If anything, I might try eliminating some by switching to solar panels or a heat pump which would also provide cooling.	1	0	0	1	1	0	0	-	RESI	-

2022-01-26 16:45:09	Reply to Mod	possible. Fracking us a really damaging way to access gas reserves and has become an important mining method that I believe should be slowed if not stopped. Renewable sources of energy are the best choices for the future, based on availability, safety, and the health of the earth.	-	-	-	-	-	-	-	-	RESI	-
2022-01-24 20:22:53	-	in the next few years. Our hot water is connected to our boiler and that would also upgrade in the process.	1	0	1	1	1	1	0	-	RESI	EGMA
2022-01-24 20:27:11	-	We have recently upgraded all of our natural gas appliances within the past 3 years to more efficient models and leveraged the HEAT Loan through MassSave to help finance the upgrades over 7 years at a 0% interest rate.	1	0	1	1	1	0	0	-	RESI	EGMA
2022-01-24 20:28:06	-	I'm hoping my natural gas heating system doesn't need an upgrade. I may upgrade my water heater to add more capacity.	1	0	0	1	1	0	0	-	RESI	EGMA
2022-01-24 20:37:17	-	any further upgrades to anything gas related but I was stuck needing heat. Geothermal unfortunately is just too expensive to make it a reality around here.	1	0	1	0	0	1	0	-	RESI	EMA-G
2022-01-24 20:37:59	-	boiler with a newer model in the next year due to corrosion of the aluminum heat exchanger; as part of this we may downsize capacity and augment household heating with an air source heat pump.	1	0	0	1	1	1	0	-	RESI	EMA-G
2022-01-24 20:40:34	-	upgrades in the next 5-10 years. We recently replaced our hot water heater and would only replace our boiler or cooktop stove if our current one stopped working.	1	0	0	1	1	0	0	-	RESI	EMA-G

2022-01-24 20:46:28	-	My heating system is currently natural gas. I would love to upgrade all appliance to natural gas if able. I will be exploring ways to incorporate natural gas in any way that I can.	1	0	0	0	0	0	0	0	-	RESI	EGMA
2022-01-24 20:50:13	-	our home for efficiency (with exception of fireplace). To replace heat, the incentives would need to be major in the short term. Our house is heavily reliant on natural gas currently including backup generator.	1	0	0	1	1	1	0	0	-	RESI	EGMA
24 20:50:56	-	Solar panels already on house. Maybe switch to all electric.	1	0	0	0	0	0	0	0	-	RESI	EGMA
24	-	No new comment	-	-	-	-	-	-	-	-	-	RESI	EGMA
2022-01-24 20:53:54	-	Not expecting to make any upgrades with the possible exception of a new stove, only if my current one breaks down.	1	0	1	1	1	0	0	0	-	RESI	EGMA
2022-01-24 20:58:37	-	I'm satisfied with the use of natural gas for heat, hot water and cooking and have no desire to convert my current electrical appliances or my fireplaces to natural gas. There is no advantage for my household to convert those items, and I feel that my contribution to global warming is minimal with such a small carbon footprint.	1	0	0	1	1	0	0	0	-	RESI	-
24 21:03:15	-	we are going to upgrade out cooking to natural gas as well as our fireplace.	1	0	0	1	0	0	0	0	-	RESI	EMA-G
2022-01-24 21:04:33	-	cuite new, energy efficient models. So I see no need to complete any upgrades in the near term. To clarify, the stovetop is gas, but the oven is electric.	1	0	1	1	1	1	0	0	-	RESI	EGMA
2022-01-24 21:09:19	-	the layout we cannot change our water heater an dryer to gas. We had all natural gas at our previous homes an wish we could at our current location.	1	0	0	0	1	1	0	0	-	RESI	EGMA

2022-01-24 21:09:55	-	I converted to gas for heating my home last year. I don't have any other things I'm going to do in the near future.	1	0	0	1	1	0	0	-	RESI	EGMA
2022-01-26 18:53:56	-	for a long time. I had been resistant. Oil is cheaper than gas and we'd had oil for such a long time.	-	-	-	-	-	-	-	-	RESI	EGMA
2022-01-24 21:12:51	-	All of our systems have been upgraded within the last 10 years, and are high-efficiency. We do not plan any upgrades at this time.	1	0	1	1	1	0	0	-	RESI	EMA-G
2022-01-24 21:18:13	-	I currently have a furnace that uses gas. It was installed with the property in 2007. I cannot imagine lasting until 2032.	1	0	0	0	0	0	0	-	RESI	EGMA
24 21:20:15	-	I like cooking with gas versus electricity. I think clothes dry better using gas.	0	0	1	1	1	0	0	-	RESI	EMA-G
24 21:22:29	-	Not looking to make any upgrades I the foreseeable future	1	0	0	0	1	1	0	-	RESI	EGMA
24 21:42:18	-	I am potentially looking at replacing the current wood burning fireplace with a gas fireplace.	1	0	0	1	0	0	0	-	RESI	EMA-G
2022-01-26 15:41:33	Reply to Mod	much maintenance and is too inefficient. While I love the feel and look of the fireplace, the need to buy the wood, bring in the wood, start the fire, the potential smoke, etc. is something that I'm looking to replace with a gas fireplace that can instantly be turned on, provides better heat, less smoke, and overall less work to use. I will miss the smell and feel of the wood burning but am looking to put in a wood burning firepit so I can enjoy that during other months.	-	-	-	-	-	-	-	-	RESI	EMA-G
2022-01-24 21:46:41	-	I foresee installing a natural gas fireplace within 10 years. We currently use a pellet stove insert, but as I get older I believe the convenience of a gas fireplace will be attractive.	1	0	0	1	0	0	0	-	RESI	-
24	-	I love natural gas appliances.	1	1	1	1	1	0	0	-	RESI	EMA-G

2022-01-27 14:48:21	Reply to Mod	tankless one, so it's only using gas when the hot water is on. I also upgraded my furnace which was a high efficiency one to a newer high efficiency, multi-stage furnace with a heat pump & central air. Having the new central air unit replaced older, inefficient window AC units and the new furnace can alternate from the heat pump for slight temp adjustments to using gas when a there is a greater demand. The multi-stage aspect of the furnace also helps maintain an even temperature and eliminating the furnace just being on or off. The programmable thermostat that came with the new unit also helps to be more energy efficient by allowing us to control the temperature of the house using our phone so we're not wasting energy when	-	-	-	-	-	-	-	-	RESI	EGMA
25 02:00:32	-	Ideally every appliance would be using natural gas to save money and on emissions	0	0	0	0	0	0	1	these I think?	RESI	EMA-G
25 02:29:08	-	At present not looking to upgrade as I can't afford to make changes	1	0	0	1	0	0	1	Cooking	RESI	EGMA
2022-01-25 03:21:00	-	If we stay in current house we would not dream of upgrading anything gas. We'd do mini split heat pumps, elec stove & hot water, so we'd go fossil fuel free as the grid goes. Stop even asking about anything else.	1	0	1	1	1	0	0	-	RESI	-
2022-01-25 03:24:23	-	upgrades, then tell people to "vote" about what they have now. That is a survey, not a vote. Then you give a blank screen where people are supposed to remember that you asked about upgrades. Talk to someone who knows how to design surveys.	-	-	-	-	-	-	-	-	RESI	-
25 04:09:32	-	heater and several furnaces and possibly the hot water tanks.	1	0	1	1	1	1	1	Outdoor grill	RESI	-

2022-01-25 11:18:14	-	and electric heat on other homes, but gas is so much better-it's cleaner and it costs a lot less too!	1	0	0	1	1	0	0	-	RESI	EGMA
2022-01-25 11:18:29	-	I am very happy with my system and don't need any upgrades. My system is 10 years old and working just fine.	1	0	0	1	1	0	0	-	RESI	EGMA
2022-01-25 13:34:36	-	I am thinking about buying a natural gas dryer instead of another electric dryer. It is more efficient and quicker than electric.	1	0	0	0	0	0	1	generator and barbecue	RESI	EGMA
2022-01-25 13:40:21	-	We recently converted our old fuel oil boiler and hot water heater to a high efficiency combi-boiler. So we have no plans to update with any gas appliances. If, however, we convert our barn to an apartment for our son, we will likely use a ductless heating/AC type of product.	1	0	1	1	0	1	0	-	RESI	EGMA
2022-01-25 15:28:37	-	6 months and our water heater is only a few years old, so both are very efficient and don't need upgrading.	1	0	0	1	0	0	0	-	RESI	EGMA
25 18:16:54	-	won't be looking to expand gas usage in my home.	0	0	0	1	1	0	0	-	RESI	EMA-G
2022-01-25 19:44:22	-	Both my stove and water heater are getting closer to end of life. Will replace the stove with a new gas one. Looking to change out hot water heater, and go to tankless hot water	1	0	0	1	1	0	0	-	RESI	EGMA
25 20:32:35	-	I am interested in learning more information on renewable resources.	1	0	0	1	0	0	0	-	RESI	EGMA
25	-	Within 5 years	-	-	-	-	-	-	-	-	RESI	EGMA
25	-	Gas fireplace insert,	1	0	0	0	1	0	0	-	RESI	-

2022-01-25 23:39:43	-	Heating and hot water	0	0	0	0	0	0	1	updates. I utilize gas to the fullest and have recently updated all	RESI	EGMA
2022-01-26 13:28:16	-	Currently, I'm not in the market to update any new natural gas appliances. All natural gas appliances have been upgraded.	1	0	1	1	1	0	0	-	RESI	EGMA
26 13:32:29	-	currently useing natural gas to the fullest extent as it is cheaper then electric or oil	1	0	1	1	1	0	0	-	RESI	EGMA
26	-	currently using natural gas for everything	-	-	-	-	-	-	-	-	RESI	EGMA
2022-01-26 18:53:56	-	for a long time. I had been resistant. Oil is cheaper than gas and we'd had oil for such a long time.	-	-	-	-	-	-	-	-	RESI	EGMA
27 14:33:30	-	I may be looking into the heat/ac unit you hang in the wall.	0	0	0	1	1	1	0	-	RESI	EMA-G
2022-01-27 19:25:27	-	Reliability/backup Total cost with integrated air conditioning not significantly different than separate appliances	-	-	-	-	-	-	-	-	RESI	EMA-G
2022-01-27 19:43:18	-	I will not be upgrading to natural gas or any other form of fossil fuel as we seek to phase them out. If you put in an upgrade in the next 5-10 years that is locking in the natural gas use for another 20 on top of that and by 2050 if we haven't switched to renewable energy half the world will be under water so it may not matter anyways.	1	0	0	1	1	0	0	-	RESI	EMA-G
27 22:42:52	-	Not looking to make any upgrades as heating system, stove and hot water heater are all new.	1	0	0	1	1	0	0	-	RESI	-
28	-	upgrades beyond equipment failures. After 10	1	0	0	1	1	1	0	-	RESI	EGMA

THE 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 climate goals.)))))))))	D.P.U. 20-80
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APPEARANCE OF COUNSEL

In the above-entitled proceeding, I hereby appear for and on behalf of NSTAR Gas Company and Eversource Gas Company of Massachusetts each d/b/a Eversource Energy.

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