

**STATE OF NEW HAMPSHIRE
BEFORE THE
PUBLIC UTILITIES COMMISSION**

Docket No. DG 17-152

Liberty Utilities (EnergyNorth Natural Gas) Corp. d/b/a Liberty Utilities
Least Cost Integrated Resource Plan

DIRECT TESTIMONY

OF

PAUL J. HIBBARD

June 28, 2019

THIS PAGE INTENTIONALLY LEFT BLANK

TABLE OF CONTENTS

I. INTRODUCTION.....1

II. THE SCOPE OF ENVIRONMENTAL IMPACTS11

 A. State Compliance with the Clean Air Act14

 B. Public Health and the Environment, and GHG Emissions.....22

III. CONCLUSIONS32

THIS PAGE INTENTIONALLY LEFT BLANK

1 **I. INTRODUCTION**

2 **Q. Please state your full name, business address, and occupation.**

3 A. My name is Paul J. Hibbard. I am a Principal at Analysis Group, Inc., an economic, finance
4 and strategy consulting firm headquartered in Boston, Massachusetts, where I work on
5 energy and environmental economic and policy consulting. My business address is 111
6 Huntington Avenue, 14th Floor, Boston, Massachusetts, 02199.

7 **Q. On whose behalf are you submitting this testimony?**

8 A. I am submitting this testimony before the New Hampshire Public Utilities Commission
9 (the “Commission” or “NHPUC”) on behalf of Liberty Utilities (EnergyNorth Natural Gas)
10 Corp. d/b/a Liberty Utilities (“Liberty” or the “Company”).

11 **Q. Please describe your background and qualifications.**

12 A. I have been with AGI for approximately twelve years, first, from 2003 to April 2007, and
13 most recently, from August 2010 to the present. From April 2007 to June 2010 I served as
14 Chairman of the Massachusetts Department of Public Utilities (“MA DPU”) and also
15 served as a member of the Massachusetts Energy Facilities Siting Board (“EFSB”), the
16 New England Governors’ Conference Power Planning Committee, and the NARUC
17 Electricity Committee and Procurement Work Group. I also served as State Manager for
18 the New England States Committee on Electricity and as Treasurer on the Executive
19 Committee of the 41-state Eastern Interconnect States’ Planning Council. My experience
20 as Chairman of the MA DPU and as a Board Member of the EFSB includes considering
21 and deciding on issues relating to need, costs, environmental impacts, and benefits in the

1 zoning, permitting and siting of major energy infrastructure in the Commonwealth of
2 Massachusetts, including power plants, transmission lines, and fuel transport pipelines.

3 I worked in energy and environmental consulting with Lexecon, Inc. from 2000 to 2003.
4 Prior to working with Lexecon, I worked in state energy and environmental agencies for
5 almost ten years. From 1998 to 2000, I worked for the Massachusetts Department of
6 Environmental Protection on the development and administration of air quality regulations,
7 Clean Air Act State Implementation Plans, and emission control programs for the electric
8 industry, with a focus on criteria pollutants and carbon dioxide, as well as various
9 additional policy issues related to controlling pollutants from electric power generators
10 within the Commonwealth. From 1991 to 1998, I worked in the Electric Power Division
11 of the MA DPU on cases related to the setting of company rates, the restructuring of the
12 electric industry in Massachusetts, the quantification of environmental externalities,
13 integrated resource planning, energy efficiency, utility compliance with state and federal
14 laws and emission control requirements, regional electricity market structure development,
15 and coordination with other states on electricity and gas policy issues through the staff
16 subcommittee of the New England Conference of Public Utility Commissioners.

17 I hold an M.S. in Energy and Resources from the University of California, Berkeley, and a
18 B.S. in Physics from the University of Massachusetts at Amherst. A more detailed
19 description of my relevant background and experience and my curriculum vitae are
20 attached as Exhibit 1.

1 **Q. Have you previously testified before any regulatory bodies?**

2 A. Yes. I have filed testimony before the Connecticut Siting Council on the siting of the
3 Killingly Energy Center, Docket No. 470; before the State of Vermont Public Service
4 Board on behalf of Vermont Gas Systems Inc., Docket No.'s 8698 and 8710; before the
5 Massachusetts Department of Public Utilities on behalf of the Massachusetts Department
6 of Energy Resources, DPU 13-07; before the Minnesota Public Utilities Commission on
7 behalf of Calpine Construction Finance Company, Docket No. E-002/CN-12-1240; and
8 before the Florida Public Service Commission on behalf of Calpine Construction Finance
9 Company, Docket No. 140110-E1. I have also filed testimony as an expert witness in
10 litigation and arbitration cases.

11 **Q. What is the purpose of your testimony?**

12 A. The purpose of my testimony is to provide additional environmental impact analysis in
13 response to Order No. 26,225 (Mar. 13, 2019) (the "Order"), which directed the Company
14 "to submit a supplemental filing, including supporting testimony, to address each of the
15 specific elements required under RSA 378:38 and RSA 378:39 that are not already
16 addressed in its LCIRP, with adequate sufficiency to permit the Commission's assessment
17 of potential environmental, economic, and health-related impacts of each option proposed
18 in the LCIRP, as required by RSA 378:39." Order at 7. On April 30, 2019, The Company
19 filed testimony by William Killeen in response to the Order. The purpose of my testimony
20 is to expand on and supplement the testimony of Mr. Killeen.

1 **Q. How have you organized your testimony?**

2 A. In Section II I provide an overview of the scope of my analysis of the potential
3 environmental, economic, and health-related impacts of each option proposed in the
4 Company's LCIRP, based upon my review of the Commission Orders related to the
5 relevant statutes, and present the results of that analysis. In Section III I summarize the
6 conclusions I draw from my analysis. The analysis I summarize is presented in detail in
7 Exhibit 2 to my testimony.

8 **Q. Would you please summarize your analysis and conclusions?**

9 A. Yes. I have reviewed the two options presented and reviewed by Liberty to meet the
10 resource needs identified in its LCIRP. Specifically, I have reviewed the impact of these
11 options on compliance with the Clean Air Act ("CAA"), and on public health and the
12 environment in the state of New Hampshire.

13 Meeting heating and other service needs of the state's residents and businesses is not
14 optional - these are essential services that must be met to avoid adverse public health and
15 safety consequences that would result from a lack of heat, hot water, and cooking fuel. In
16 New Hampshire, the use of natural gas to meet these needs reduces the emissions that
17 otherwise would occur if they were instead met with alternative fuels (in New Hampshire,
18 alternative fuels are primarily oil, propane, and wood). To the extent meeting service needs
19 with natural gas avoids using alternative and higher-emitting fuels, it reduces public health
20 and environmental impacts.

1 This choice of fuels by residents and businesses in New Hampshire to meet their heat, hot
2 water, and process needs (collectively, “service needs”) is the primary driver of emission
3 and health impacts under different scenarios related to the Company’s LCIRP. I evaluate
4 these impacts with a focus on heating technologies. I also analyze any potential differences
5 in impacts of the two projects at issue in the LCIRP associated with fuel transport. Based
6 on my quantitative analysis summarized in this testimony and presented in detail in Exhibit
7 2, I come to the following observations and conclusions:

- 8 • Nearly every household and business in New Hampshire requires the use of some
9 type of fuel and/or electricity to meet these service needs.¹ The CAA compliance,
10 public health, environmental, and climate change impacts of meeting customers’
11 service needs differ depending on the type of fuel used.²
- 12 • Residential, commercial, and industrial consumption of oil, propane, natural gas,
13 biomass, or electricity for meeting service needs results in emissions of air
14 pollutants - such as sulfur dioxide (“SO₂”), nitrogen oxides (“NO_x”), particulate
15 matter (“PM”), mercury (“Hg”), and greenhouse gases (“GHG”) including carbon
16 dioxide (“CO₂”) - that affect (1) public health and the environment within New
17 Hampshire (with associated costs to the state and its residents), (2) the ability of

¹ For a small number of residents in New Hampshire, data are not provided on how heating, cooking, and/or hot water needs are met. See US Census Bureau, 2013-2017 American Community Survey 5-Year Estimates, NH House Heating Fuel, available at <https://factfinder.census.gov>.

² For fuels such as natural gas, oil, propane, and wood, the impacts result from direct combustion at the business or residence. For electricity, impacts result from the generation of electricity at power plants in New Hampshire and elsewhere in New England (using natural gas and other fuels), to meet customer electricity demand.

1 and cost to the state to meet Environmental Protection Agency (“EPA”) CAA
2 requirements, and (3) the risks associated with climate change.

- 3 • Both options proposed in Liberty’s LCIRP - expansion of service through the
4 Concord Lateral, and development and operation of the Granite Bridge Pipeline
5 (“Granite Bridge,” or “Project”) - provide for the use of natural gas to meet service
6 needs for (1) existing demand from current customers in the Company’s service
7 territory, and (2) new demand from new customers in the Company’s service
8 territory, including both newly-constructed buildings and residences and existing
9 buildings converting to natural gas from other fuels (“service conversions”). On
10 top of this, the Granite Bridge Pipeline provides for the use of natural gas to meet
11 resident and business service needs (new customers and service conversions) in
12 communities that do not currently have access to natural gas, and that otherwise
13 would have to meet service needs through alternative fuels (primarily oil, propane,
14 wood, electricity).³

- 15 • In order to assess the impact of the Company’s options on CAA compliance and
16 public health and the environment, one needs to compare project impacts to a
17 hypothetical “status quo” scenario - that is, one where neither project is adopted to
18 meet the Company’s identified resource need. In the status quo case, the Company
19 would not be able to offer natural gas for meeting service needs to new customers
20 or service conversions in either their current service territory or the new

³ The Communities that currently do not have access to natural gas, but would have access with the Granite Bridge Pipeline in operation, include Epping, Raymond, and Candia (towns all located in Rockingham County).

1 communities along the Granite Bridge Pipeline route. These customers would have
2 to meet (or continue to meet) service needs through alternative fuels.

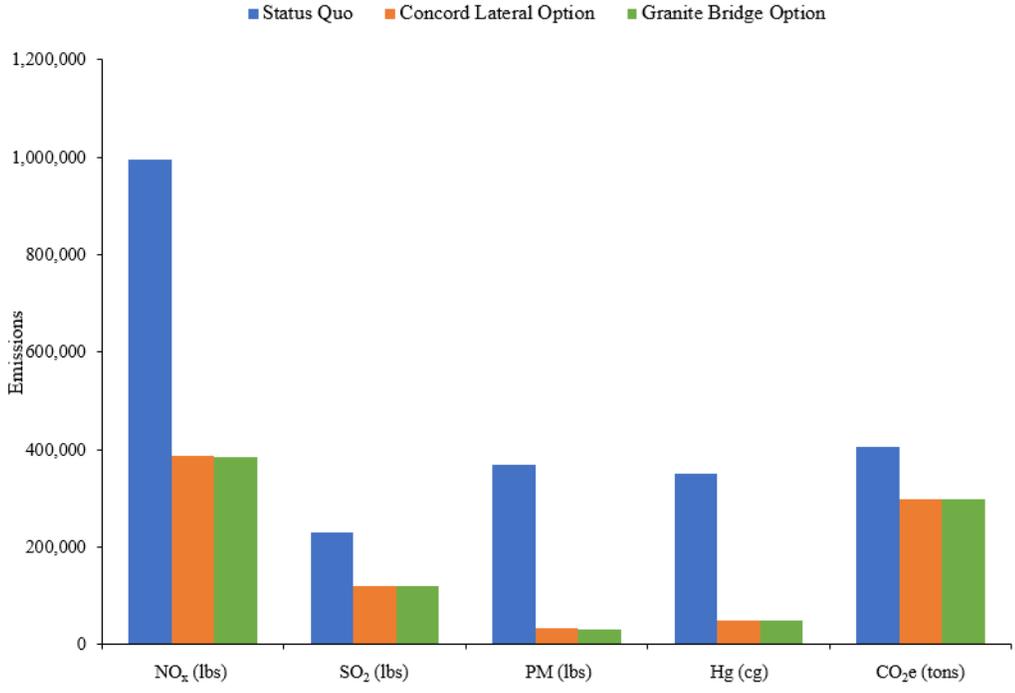
- 3 • The most significant effect the Company's LCIRP has on CAA compliance, public
4 health and environmental impacts, and climate change risks is its overall influence
5 on the use of fuels for heating, hot water, and process needs in residences and
6 businesses in Liberty's current and expected future service territories. As a proxy
7 for these impacts I focus on differences in emissions of harmful pollutants
8 associated with service conversions for heating technologies.⁴

- 9 • Based on my quantitative analysis summarized in this testimony and presented in
10 detail in Exhibit 2, I make several observations related to emissions and public
11 health and environmental impacts. First, the Project will benefit New Hampshire's
12 efforts to comply with the CAA. Most importantly, I find that the proposed options
13 represent meaningful reductions in emissions of SO₂ for heating and other service
14 needs relative to the status quo, with the Granite Bridge Pipeline providing the
15 greatest level of reductions over time. As shown in Figure 1 below, I find that the
16 Granite Bridge Pipeline reduces total emissions of SO₂ relative to the status quo by
17 111,784 pounds (the Concord Lateral expansion also reduces total emissions of

⁴ There are additional benefits of service conversions associated with switching to natural gas not only for heating, but also for other services, such as hot water, cooking, and potentially other commercial/industrial processes. However, since it is difficult to obtain data on or forecast what portion of service conversion customers would use natural gas for these other service needs, I focus only on the heating portion of service needs. As a result, my estimates may meaningfully understate the actual potential benefits of natural gas service conversions in New Hampshire.

1 SO₂ relative to the status quo by 111,292 pounds).⁵ Since under the proposed
2 LCIRP natural gas will displace the use of higher-polluting fuels, particularly oil,
3 the Project will make positive contributions towards New Hampshire’s attainment
4 of NAAQS. In particular, the Project aligns with the focus in New Hampshire’s
5 state implementation plan (“SIP”) to make progress in reaching attainment of SO₂
6 standards (where in nonattainment) in part through a reduction in the combustion
7 of oil for home heating.

8 **Figure 1:** Total emissions from customers remaining on existing heating technologies
9 compared to switching to natural gas heating technologies under the Granite Bridge or
10 Concord Lateral Expansion options - IRP Scenario.



11

⁵ See also Exhibit 2, Table 1.

1 • Second, the options presented in the Company’s LCIRP would generate important
2 public health and environmental benefits relative to the status quo. These benefits
3 include reduced emissions of criteria pollutants and reductions in costs associated
4 with the harmful effects of these pollutant emissions on public health. In addition
5 to the reductions in emissions of SO₂ noted above, the Granite Bridge Pipeline will
6 reduce emissions of NO_x by 612,412 pounds (2,588 pounds more than under the
7 Concord Lateral expansion), emissions of PM by 336,690 pounds (1,016 pounds
8 more than under the Concord Lateral expansion), and emissions of Hg by 107
9 ounces, relative to the status quo (0.5 ounces more than under the Concord Lateral
10 expansion).^{6, 7} As shown in Table 1, the reductions in SO₂, NO_x, and PM together
11 contribute to health benefits of the Granite Bridge Pipeline of between \$1.06
12 million and \$2.39 million, relative to the status quo.⁸ I also find that the options
13 will lead to lower emissions of GHG relative to the status quo scenario, thereby
14 contributing to a lowering of the risks associated with climate change. Specifically,
15 I find that the Granite Bridge Pipeline would reduce CO₂ and CO₂-equivalent
16 (“CO₂-e”) emissions (including methane, or “CH₄”) by 108,903 tons, relative to
17 the status quo.⁹

⁶ See Figure 1; see also Exhibit 2, Table 1.

⁷ The Concord Lateral expansion would reduce emissions of NO_x by 609,824 pounds, emissions of particulate matter by 335,674 pounds, and emissions of mercury by 107 ounces, relative to the status quo. See Figure 1; see also Exhibit 2, Table 1.

⁸ See also Exhibit 2, Table 9.

⁹ The Concord Lateral expansion would also reduce emissions of CO₂-equivalent emissions by 108,435 tons relative to the status quo. See Figure 1; see also Exhibit 2, Table 1.

1 **Table 1:** Summary of Total residential, commercial, and industrial annual average health
2 impacts associated due to the two project options relative to the status quo - IRP
3 Scenario.

		Total Average Annual Impact
Granite Bridge Relative to Status Quo	\$ Total Health Benefits (low estimate)	1,057,086
	\$ Total Health Benefits (high estimate)	2,387,346
Concord Lateral Relative to Status Quo	\$ Total Health Benefits (low estimate)	955,083
	\$ Total Health Benefits (high estimate)	2,156,979
Differential	\$ Total Health Benefits (low estimate)	102,004
	\$ Total Health Benefits (high estimate)	230,366

4

- 5
- Third, the Granite Bridge Pipeline will reduce large truck traffic for deliveries of propane and/or liquefied natural gas (“LNG”), and will further reduce local deliveries of oil and propane to residences and businesses that switch from those fuels to natural gas. I estimate the potential emission reductions from the expected reductions in large truck deliveries for replenishing the Company’s satellite storage tanks. Specifically, this could reduce emissions of CO₂ by roughly 50 to 63 thousand pounds, emissions of NO_x by 290 to 360 pounds, and emissions of PM by seven to nine pounds.¹⁰ The reductions in NO_x, and PM together contribute to health benefits of between \$700 and \$2,000 per year.¹¹
- 14
- Finally, as can be seen in the results presented above, the Granite Bridge Pipeline would lead to lower overall emissions of harmful pollutants and GHG than an expansion of the Concord Lateral, primarily due to increases in the number of
- 16

¹⁰ See Exhibit 2, Table 10.
¹¹ See Exhibit 2, Table 11.

1 customers who would have access to natural gas, and convert to gas from
2 alternative fuels for heating and other service needs.

3 **II. THE SCOPE OF ENVIRONMENTAL IMPACTS**

4 **Q. Have you reviewed RSA 378:38 and RSA 378:39 with respect to LCIRP filing**
5 **requirements for and Commission review of resource plan environmental impacts?**

6 A. Yes. I have.

7 **Q. Please describe which sections are the focus of your analysis and testimony.**

8 A. Section RSA 378:38 provides content requirements for utility LCIRP filings including, in
9 relevant part, the following:¹²

10 V. An assessment of plan integration and impact on state compliance with the Clean
11 Air Act of 1990, as amended, and other environmental laws that may impact a
12 utility's assets or customers.

13 VI. An assessment of the plan's long- and short-term environmental, economic, and
14 energy price and supply impact on the state.

15 VII. An assessment of plan integration and consistency with the state energy
16 strategy under RSA 4-E:1.

17 Section RSA 378:39 states that, “[i]n deciding whether or not to approve the utility's plan,
18 the commission shall consider potential environmental, economic, and health-related
19 impacts of each proposed option.”¹³

¹² 2015 New Hampshire Revised Statutes, Title XXXIV Public Utilities, Chapter 378 Rates and Charges, Least Cost Energy Planning, Section 378:38 Submission of Plans to the Commission.

¹³ 2015 New Hampshire Revised Statutes, Title XXXIV Public Utilities, Chapter 378 Rates and Charges, Least Cost Energy Planning, Section 378:39 Commission Evaluation of Plans.

1 **Q. How do you structure your review in light of this language?**

2 A. Sections 378:38 and 378:39 provide guidance for the filing and Commission review of,
3 among other things, Clean Air Act-related, public health, and environmental impacts of a
4 company's LCIRPs. The sections apply to both electric and natural gas utilities, and need
5 to be interpreted and applied by the Commission on a case-by-case basis based on
6 precedent, state energy policy, and the individual circumstances of and current context for
7 each company's LCIRP.

8 In this case, Liberty is filing its LCIRP at a time when it needs to plan for additional
9 resources and infrastructure to reliably meet the heating, hot water, and process needs of
10 its existing natural gas customers, as well as new customers to be added over the period of
11 the LCIRP 2017-2022.¹⁴ In its LCIRP, Liberty presents and reviews two options for
12 meeting these needs: expansion of the capacity of the Concord Lateral, and the Granite
13 Bridge Pipeline. In this context, RSA 378:38 and 378:39 guide the Company's filing of
14 CAA, public health, and environmental information and data on these two options, and
15 provide for Commission review of this information.

¹⁴ This time period is measured in gas years. Specifically, the LCIRP covers the November 2017 - October 2018 gas year to the November 2021 - October 2022 gas year.

1 **Q. Please describe how you have approached your analysis considering these filing and**
2 **review provisions of RSA 378:38 and 378:39 in light of the Company’s LCIRP**
3 **context.**

4 A. The Company has presented two options in its LCIRP. Each option has positive or negative
5 implications (relative to the status quo) for New Hampshire compliance with the
6 requirements of the CAA, and for the public health and environmental impacts of reliable
7 utility service. Consequently, I focus on how the projects would affect the state’s
8 compliance with the CAA, and would alter emissions that affect public health and the
9 environment, including emissions of SO₂, NO_x, PM, and Hg. Since RSA 378:38 V’s
10 language also includes “...other environmental laws that may impact a utility’s assets or
11 customers,” I also review the emissions of GHGs (including CO₂) for each option, relative
12 to the status quo. Finally, the focus of my analysis is primarily the period of the LCIRP
13 2017-2022;¹⁵ however, given RSA 378:38’s reference to “long-term impacts,” I also
14 present information on the potential longer-term public health and environmental
15 implications of the Company’s options.

16 **Q. Could you please summarize the scope of impacts you have reviewed in your analysis?**

17 A. Yes. Based on my review of RSA 378:38 and 378:39, I present information, data, and
18 analysis on the impact of the options identified in the Company’s LCIRP, relative to the
19 status quo, with respect to (a) state compliance with EPA requirements under the CAA, (b)

¹⁵ This time period is measured in gas years. Specifically, the LCIRP covers the November 2017 - October 2018 gas year to the November 2021 - October 2022 gas year.

1 public health and environmental impacts, and (c) emissions of GHG, including CO₂, that
2 contribute to the risks associated with climate change.

3 **A. State Compliance with the Clean Air Act**

4 **Q. Could you please summarize key elements of the CAA?**

5 A. Yes. The CAA is a federal law establishing air pollution programs and limits on certain
6 types of harmful emissions. The CAA's key provisions, set forth in 1970, require the EPA
7 to determine national ambient air quality standards ("NAAQS") for six common criteria
8 pollutants: particulate matter, ozone ("O₃"), SO₂, nitrogen dioxide (NO₂), carbon
9 monoxide (CO), and lead (Pb). For each of these pollutants, the EPA designates areas
10 nationwide as in "attainment" or "nonattainment" of the standard as determined by air
11 quality monitoring over some period of time, typically three years. For areas designated
12 as in attainment or unclassifiable, SIPs must "prevent significant deterioration of air
13 quality," and for areas designated as in nonattainment, SIPs must "go further, and strive
14 for attainment of the air quality standard 'as expeditiously as practicable.'"¹⁶

15 Each state is required to devise a state implementation plan ("SIP") to ensure that NAAQS
16 are met (i.e., the state is in attainment). SIPs must demonstrate two main components to
17 receive EPA approval - that the state has the infrastructure in place to implement and
18 monitor emissions standards, and that the state has established regulations that will
19 maintain new or existing NAAQS. In addition to NAAQS for the six criteria pollutants,

¹⁶ U.S. Court of Appeals for the District of Columbia Circuit, Samuel Masias et al v. EPA et al., No. 16-1314, dated October 19, 2018.

1 the CAA contains provisions for regulating other hazardous air pollutants (“HAP”), motor
2 vehicle emissions, and stationary source emissions. Finally, New Source Performance
3 Standards (“NSPS”) set forth acceptable levels of emissions from new or modified
4 stationary sources deemed to “contribute significantly to air pollution that may reasonably
5 be anticipated to endanger public health or welfare.”¹⁷

6 Since 1970, the CAA has been amended twice, in 1977 and 1990. These amendments
7 established provisions related to modified NAAQS, acid rain regulation, expanded HAP
8 standards, and air quality deterioration, among other things. The EPA continues to
9 promulgate regulations applicable to new, modified, and reconstructed sources, as well as
10 review and update NAAQS and other pollutant limitations.¹⁸

11 **Q. Please briefly summarize New Hampshire’s compliance with the CAA.**

12 A. New Hampshire’s SIP is the state’s “blueprint for carrying out requirements of the Clean
13 Air Act.”¹⁹ SIP requirements under the CAA vary depending on current and former
14 NAAQS attainment status. As of 2019, New Hampshire has achieved attainment for each
15 criteria pollutant except for SO₂. Table 2 below summarizes New Hampshire’s current
16 and former air quality designations by pollutant.²⁰

¹⁷ Lattanzio, Richard, “Methane and Other Air Pollution Issues in Natural Gas Systems,”
<https://fas.org/sgp/crs/misc/R42986.pdf>.

¹⁸ EPA, NAAQS Table, <https://www.epa.gov/criteria-air-pollutants/naaqs-table>.

¹⁹ NH DES, State Implementation Plan (SIP), <https://www.des.nh.gov/organization/divisions/air/do/sip/index.htm>.

²⁰ NH DES, “State of New Hampshire Air Quality - 2017.” The 2019 statuses are identical to those from 2017,
<https://www.des.nh.gov/organization/commissioner/pip/publications/documents/r-ard-17-01.pdf>.

1 **Table 2:** Summary of New Hampshire current and former air quality designations by
2 pollutant.

Pollutant	Area Designations	
	Former Status	Current Status
Carbon Monoxide (CO)	Nonattainment for Manchester and Nashua; attainment for all other areas ^a	Attainment for all areas
Lead (Pb)	Attainment for all areas	Unclassifiable/Attainment for all areas
Nitrogen Dioxide (NO₂)	Attainment for all areas	Unclassifiable/Attainment for all areas
Ozone (O₃)	<p><u>1-hour NAAQS:</u> Nonattainment for Cheshire, Hillsborough, Merrimack, Rockingham, and Strafford Counties; attainment for all other areas^b</p> <p><u>8-hour NAAQS:</u> Nonattainment for portions of Hillsborough, Merrimack, and Rockingham Counties; attainment for all other areas^c</p>	Attainment for all areas
Particulate Matter (PM)	Attainment for all areas	Attainment for all areas
Sulfur Dioxide (SO₂)	Attainment for all areas	Nonattainment for portions of Hillsborough, Merrimack, and Rockingham Counties; unclassifiable for all other areas ^d

3

4 Due to nonattainment of SO₂ in Hillsborough, Merrimack, and Rockingham Counties,

5 New Hampshire is required under the CAA to detail in its SIP specific programs or

6 regulations efforts to lower SO₂ emissions to the EPA defined standards. According to the

7 New Hampshire Department of Environmental Services (DES), Merrimack Generating

8 Station contributes significantly to the nonattainment status, contributing as much as 83%

9 of all *point-source* SO₂ emissions in the nonattainment area. DES also states that

10 “residential and commercial and industrial oil combustion are the largest area and non-

1 EGU [electric generating unit] point sources of SO₂, contributing over 90 percent in each
2 category.²¹

3 New Hampshire's SIP cites the following major regulations in its plan to achieve SO₂
4 attainment going forward:²²

- 5 • **Multiple Pollutant Reduction Program** (RSA 125-O): Requires mercury
6 reductions of 80 percent or more from New Hampshire coal-fired power plants.
7 This facilitated Merrimack Station's installation of a wet, limestone based flue gas
8 desulfurization (FGD) system, for which SO₂ removal is a "co-benefit."
- 9 • **Sulfur Limits of Certain Liquid Fuels** (RSA 125-C:10-d): Imposed new
10 limitations on sulfur content in Nos. 2, 4, 5, and 6 fuel oil beginning in July 2018.
- 11 • **Statewide permit system** (Env-A 600 and Env-A 2900): An annual budget trading
12 and banking system for SO₂ (among other pollutants).

13 Apart from SO₂, all other criteria pollutants in New Hampshire have achieved air quality
14 designations of attainment or unclassifiable/attainment. As a result, New Hampshire's SIP
15 requirements for other criteria pollutants are less stringent. New Hampshire's SIP proposes
16 maintenance of PM, O₃, NO₂, CO, and Pb through existing regulations, which DES expects
17 will yield continued compliance with CAA limits. By and large, New Hampshire's CAA

²¹ NH DES, "1-Hour Sulfur Dioxide (2010 Standard) Redesignation Request and Maintenance Plan for the Central New Hampshire Nonattainment Area," <https://www.des.nh.gov/organization/commissioner/pip/publications/documents/r-ard-17-06.pdf>. Emphasis added.

²² Ibid.

1 compliance-related legislation is contained within the New Hampshire Air Program Rules
2 (Env-A).²³ Below is a high-level summary of major provisions included in Env-A that aim
3 to achieve CAA compliance:

- 4 • **Ambient Air Quality Standards** (Env-A 300): Sets standards for criteria
5 pollutants at least as stringent as those set by the EPA.²⁴
- 6 • **Standards Applicable to Certain New or Modified Facilities and Sources of**
7 **Hazardous Air Pollutants; State Plans for Designated Facilities and Pollutants**
8 (Env-A 500): Defining NSPS for stationary sources.²⁵
- 9 • **Air Toxics Program** (Env-A 1400): Expands on EPA's list of HAPs and sets
10 ambient air limits (AALs) for pollutants.²⁶
- 11 • **Clean Power Act** (Env-A 2900): Establishes cap-and-trade programs for SO₂, and
12 NO_x.²⁷

²³ NH DES, New Hampshire Infrastructure SIPs, <https://www.des.nh.gov/organization/divisions/air/do/sip/sip-revisions.htm#so2>.

²⁴ NH DES, Code of Administrative Rules, Chapter Env-A 300: Ambient Air Quality Standards, <https://www.des.nh.gov/organization/commissioner/legal/rules/documents/enva300.pdf>.

²⁵ NH DES, Code of Administrative Rules, Chapter Env-A 500: Standards Applicable to Certain New or Modified Facilities and Sources of Hazardous Air Pollutants; State Plans for Designated Facilities and Pollutants, <https://www.des.nh.gov/organization/commissioner/legal/rules/documents/env-a500.pdf>.

²⁶ NH DES, Code of Administrative Rules, Chapter Env-A 1400: Regulated Toxic Air Pollutants, <https://www.des.nh.gov/organization/commissioner/legal/rules/documents/env-a1400.pdf>.

²⁷ NH DES, Code of Administrative Rules, Chapter Env-A 2900: Sulfur Dioxide and Nitrogen Oxides Annual Budget Trading and Banking Program, <https://www.des.nh.gov/organization/commissioner/legal/rules/documents/env-a2900.pdf>.

- 1 • **Open market programs** (Env-A 3000-3100): Voluntary discrete emissions
2 reduction trading and rate-based emission reduction credits trading programs.^{28, 29}

3 **Q. Could you please summarize how the options contained in the Company’s LCIRP**
4 **could affect state compliance with the CAA?**

5 A. Yes. Based on a review of CAA provisions and New Hampshire’s SIP, there are a few
6 areas where the Company’s LCIRP intersects in a positive or negative way with the state’s
7 compliance with the CAA.

8 First and foremost, the Company’s LCIRP has implications for the state’s management of
9 nonattainment with the NAAQS SO₂ standard. As described below, both LCIRP options
10 establish opportunities for residents and businesses to select natural gas for their service
11 needs, either initially if new construction, or through conversion from other fuels.
12 Specifically, there are thousands of customers who could make this selection that otherwise
13 would not have the option under the status quo scenario, reducing dependence on other
14 fuels, primarily oil and propane. As noted above, the New Hampshire SIP notes that
15 “...residential and commercial and industrial oil combustion are the largest area and non-
16 EGU [electric generating unit] point sources of SO₂, contributing over 90 percent in each

²⁸ NH DES, Code of Administrative Rules, Chapter Env-A 3000: Emissions Reduction Credits Trading Program, <https://www.des.nh.gov/organization/commissioner/legal/rules/documents/env-a3000.pdf>.

²⁹ NH DES, Code of Administrative Rules, Chapter Env-A 3100: Discrete Emissions Reductions Trading Program, <https://www.des.nh.gov/organization/commissioner/legal/rules/documents/env-a3100.pdf>

1 category.”³⁰ The U.S. Energy Information Administration (EIA) explains that per capita
2 petroleum consumption in New Hampshire is among the highest nationwide, “in part
3 because of heavy dependence on heating oil and propane during the state’s frigid
4 winters.”³¹ Displacement of heating oil with natural gas, which emits only “trace amounts”
5 of SO₂, would therefore assist in New Hampshire’s compliance with NAAQS.³²

6 According to New Hampshire’s ten-year energy plan, “the dearth of new natural gas
7 capacity... limits [its] attractiveness for heating customers who could potentially transition
8 away from heating oil,” and the “most critical current infrastructure need is for natural gas
9 capacity.”³³ The Project will provide just this, bringing additional natural gas to towns in
10 and bordering the nonattainment area, ultimately making positive contributions to SO₂ and
11 other criteria pollutant NAAQs.

12 With the Concord Lateral expansion, Liberty estimates an additional 10,716 customers
13 would be able to select natural gas over the LCIRP term rather than other sources. With
14 the Granite Bridge Pipeline even more customers could make this selection - 10,778 in
15 total. As noted in our review of long-term impacts, this value for the Granite Bridge

³⁰ NH DES, “1-Hour Sulfur Dioxide (2010 Standard) Redesignation Request and Maintenance Plan for the Central New Hampshire Nonattainment Area,”

<https://www.des.nh.gov/organization/commissioner/pip/publications/documents/r-ard-17-06.pdf>. Emphasis added.

³¹ U.S. EIA, New Hampshire State Profile and Energy Estimates, <https://www.eia.gov/state/analysis.php?sid=NH>.

³² EPA, Natural Gas Combustion, <https://www3.epa.gov/ttnchie1/ap42/ch01/final/c01s04.pdf>.

³³ New Hampshire Office of Strategic Initiatives, New Hampshire 10-Year State Energy Strategy, April 2018, <https://www.nh.gov/osi/energy/programs/documents/2018-10-year-state-energy-strategy.pdf>.

1 Pipeline grows to a total of 37,294 customers over 21 years that would be able to use natural
2 gas over alternative fuels in the state of New Hampshire.

3 This leads to meaningful reductions in emissions of SO₂ for service needs relative to the
4 status quo, with the Granite Bridge Pipeline providing the greatest level of reductions over
5 time (an average of 11 tons per year). Given that under the proposed LCIRP natural gas
6 will displace the use of higher-polluting fuels, particularly oil, the Project is expected to
7 make positive contributions towards New Hampshire's attainment of NAAQS. In
8 particular, the Project aligns with New Hampshire's SIP to make progress in reaching
9 attainment of SO₂ standards in the current nonattainment area in part through reduction in
10 combustion of oil for home heating. However, in addition to helping reach attainment with
11 the NAAQS for SO₂, the Project will help New Hampshire *maintain* attainment with other
12 NAAQS under the CAA, by reducing emissions of criteria pollutants (or their precursors),
13 or reducing the level of expected growth in such emissions.

14 Finally, NSPS and NESHAPS regulated by the CAA and New Hampshire SIP are
15 applicable to pipeline transportation of natural gas. Any new transportation infrastructure
16 must meet certain emissions levels and technological requirements related to methane,
17 VOCs, and HAPs that were put in place to control the potential leakage of fugitive
18 emissions from various stages of the natural gas production and distribution process. Thus
19 either of the pipeline options in the Company's LCIRP would need to meet the NH DES
20 technological standards for these categories of infrastructure, and in doing so would
21 conform to state-specific requirements under the CAA.

1 **B. Public Health and the Environment, and GHG Emissions**

2 **Q. Have you reviewed the impact the resource options identified and reviewed in the**
3 **Company’s LCIRP would have on the public health and the environment of New**
4 **Hampshire?**

5 A. Yes.

6 **Q. How might the identified resource options affect public health and the environment?**

7 A. The Company has identified and reviewed two options to reliably meet the demand of its
8 customers (existing and new), as identified in its Least Cost Integrated Resource Plan.
9 These options include potential expansion of the capacity of the Concord Lateral and
10 development of the Granite Bridge Pipeline. The identified resource options cannot be
11 evaluated in isolation; in order to account for public health and environmental impacts, one
12 must consider the proper context for such an evaluation. In this case, the context is the
13 need of New Hampshire’s residents and businesses for fuels to meet their heating, hot
14 water, cooking and process needs (collectively “service needs”).

15 The service needs of New Hampshire’s residential, commercial, and industrial customers
16 require consumption of oil, propane, natural gas, biomass, or electricity. The use of such
17 fuels, in turn, leads to emissions that affect public health and the environment within New
18 Hampshire (with associated costs to the state and its residents), and contribute to the risks
19 associated with climate change due to emissions of greenhouse gases. The impacts
20 associated with meeting customers’ service needs differ depending on the type of fuel

1 used.³⁴ Importantly, nearly every household and business in New Hampshire requires the
2 use of some type of fuel, and/or electricity, to meet these service needs.³⁵

3 Meeting customer service needs can result in local and regional health impacts. This is
4 because the combustion of fuel to meet home and business heating (and other service
5 needs) is a source of harmful pollutants - including NO_x, SO₂, PM, Hg, and CO₂. CO₂
6 (and other GHGs involved in energy production and use, such as methane) contribute to
7 the risks associated with climate change. The rest of the pollutants can have local and
8 regional impacts, and can lead to or exacerbate premature deaths, asthma, and other major
9 health problems for the state's residents:

- 10 • Nitrogen oxides are implicated in a wide variety of health and environmental
11 impacts. Health impacts include respiratory infection and disease, such as asthma.
12 Environmental effects include acid rain, haze, and nutrient pollution in coastal
13 waters.³⁶

³⁴ For fuels such as natural gas, oil, propane, and wood, the impacts result from direct combustion at the business or residence. For electricity, impacts result from the generation of electricity at power plants in New Hampshire and elsewhere in New England (using natural gas and other fuels), to meet customer electricity demand.

³⁵ For a small number of residents in New Hampshire, data are not provided on how heating, cooking, and/or hot water needs are met. See US Census Bureau, 2013-2017 American Community Survey 5-Year Estimates, NH House Heating Fuel, available at <https://factfinder.census.gov>.

³⁶ "Nitrogen Dioxide (NO₂) is one of a group of highly reactive gases known as oxides of nitrogen or nitrogen oxides (NO_x) [...] NO₂ is used as the indicator for the larger group of nitrogen oxides." EPA, Basic Information about NO₂, accessed September 5, 2018, available at <https://www.epa.gov/no2-pollution/basic-information-about-no2#Effects>.

- 1 • Sulfur dioxide is implicated in a wide variety of health and environmental impacts.
2 Like NO_x, health impacts include respiratory infection and disease, such as asthma.
3 Environmental effects include acid rain and haze.³⁷
- 4 • Particulate matter is implicated in a wide variety of health and environmental
5 impacts. Health impacts include negative effects on the heart and lungs, such as
6 respiratory disease and non-fatal heart attacks. Environmental effects include acid
7 rain, depletion of nutrients in soil and water, and negative effects on the diversity
8 of ecosystems.³⁸
- 9 • Mercury is implicated in a wide variety of health and environmental impacts. Some
10 of the health impacts include headaches, changes in nerve response, and poor
11 performance on tests of mental function. Prolonged high exposure can cause
12 kidney effects, respiratory failure, and death. Environmental effects are
13 concentrated in animals that eat fish. Due to mercury exposure, these animals are
14 subject to reduced reproduction, slower growth and development, abnormal
15 behavior, and even death.³⁹

³⁷ EPA, Sulfur Dioxide Basics, accessed September 5, 2018, available at <https://www.epa.gov/so2-pollution/sulfur-dioxide-basics>.

³⁸ EPA, Health and Environmental Effects of Particulate Matter (PM), accessed September 5, 2018, available at <https://www.epa.gov/pm-pollution/health-and-environmental-effects-particulate-matter-pm>.

³⁹ EPA, Basic Information about Mercury, accessed September 5, 2018, available at <https://www.epa.gov/mercury/basic-information-about-mercury>; Health impacts listed are from inhaling elemental mercury, EPA, Health Effect of Exposures to Mercury, accessed September 5, 2018, available at <https://www.epa.gov/mercury/health-effects-exposures-mercury>.

- 1 • Emissions of greenhouse gases contribute to the social, economic, and
2 environmental risks associated with climate change.

3 Many such impacts can only be identified qualitatively. However, it is possible to quantify
4 and monetize the direct public health impacts of some pollutants. For example, the New
5 Hampshire DES estimates that one premature death due to air pollution results in \$9.35
6 million in costs, one asthma-related emergency room visit costs \$440, and one lost work
7 day averages \$150.⁴⁰ Moreover, DES estimates that fine particulate matter and ozone
8 accounted for approximately \$3.8 billion in health impacts in New Hampshire from 2013
9 through 2015.⁴¹

10 **Q. Does Liberty’s use of natural gas to meet the heating and other service needs of New**
11 **Hampshire residents and businesses necessarily imply negative public health and**
12 **environmental impacts?**

13 A. No. Meeting heating and other service needs of the state’s residents and businesses is not
14 optional - these are essential services that must be met to avoid adverse consequences that
15 would result from a lack of heat, hot water, and cooking fuel. The use of natural gas to
16 meet these needs can reduce the emissions that otherwise would occur if they were met

⁴⁰ “Considerable variability in valuation exists. Valuations presented here are interpolated median 2011 valuations.”
New Hampshire Department of Environmental Services, State of New Hampshire Air Quality – 2017: Air Pollution
Trends, Effects and Regulation, March 2018, available at
<https://www.des.nh.gov/organization/commissioner/pip/publications/documents/r-ard-17-01.pdf>, Table 4.2, p. 64-
65.

⁴¹ Figure reported in 2010 dollars. Economic impacts of air pollution consider ozone and particulate matter pollution
together. New Hampshire Department of Environmental Services, State of New Hampshire Air Quality – 2017: Air
Pollution Trends, Effects and Regulation, March 2018, available at
<https://www.des.nh.gov/organization/commissioner/pip/publications/documents/r-ard-17-01.pdf>, Table 4.3, p. 66.

1 with alternative fuels. To the extent meeting service needs with natural gas avoids using
2 alternative and higher-emitting fuels, it can *reduce* public health and environmental
3 impacts.

4 **Q. Considering this context, how have you analyzed the public health and environmental**
5 **impacts that can reasonably be assigned to the resource/supply options included in**
6 **the Company's LCIRP?**

7 A. The primary public health and environmental impact of the options identified in the
8 Company's IRP relate to the possibility of switching to natural gas from more polluting
9 fuels for heat and other service needs. To the extent this occurs, the LCIRP resource
10 options open the door to achieving reductions in emissions of pollutants, relative to the
11 status quo scenario.

12 Both the Concord Lateral and Granite Bridge options would open access to customers in
13 Liberty's service territory that are currently using other fuels to use natural gas to meet
14 heating and other service needs. In addition, Granite Bridge would open this access for
15 additional residents and businesses along the pipeline route. In terms of magnitude, Liberty
16 estimates that in the first year after Granite Bridge comes into service, it would add
17 approximately 1,800 residential customers and over 500 commercial and industrial
18 ("C&I") customers. In each subsequent year, Liberty expects to add fewer customers, but
19 by 2037/2038, still anticipates adding over 1,000 residential customers and over 200 C&I
20 customers per year. These customers will be choosing natural gas for heating over oil,

1 propane, or some other heating source and would not have access to natural gas without
2 the Granite Bridge Pipeline.⁴²

3 In order to assess the impacts of the resource options in the LCIRP, I take two steps. First,
4 I estimate differences in total emissions to meet heating needs under the Concord Lateral
5 expansion, Granite Bridge Pipeline, and “status quo” scenarios.⁴³ These differences in
6 emissions at least directionally indicate the potential for public health and environmental
7 benefits. However, some public health impacts may be quantified. Thus, in the second
8 step I translate the differences in emissions into quantifiable public health benefits, where
9 possible. To carry out these calculations, I use estimates of average customer heating load
10 in New Hampshire, heating technology efficiencies for different fuel types, and different
11 time frames (i.e., short-term results across the term of the LCIRP, and longer-term results
12 more indicative of total lifetime impacts).

⁴² Expected customer growth stems from new service and conversions within the company’s existing service territory and - in the case of the Granite Bridge option - new access to natural gas along the route of the Project in towns that currently do not have access to natural gas. Liberty Utilities has noted that without Granite Bridge, it may be unable to meet growth in new natural gas services. See New Hampshire Public Utilities Commission, Docket No. DG 17-198, Liberty Utilities (EnergyNorth Natural Gas) Corp. d/b/a Liberty Utilities, Approval of Natural Gas Supply Strategy, Pre-Filed Testimony of Susan L. Fleck and Francisco C. Dafonte, December 21, 2017, p. 23, available at http://www.puc.state.nh.us/Regulatory/Docketbk/2017/17-198/INITIAL%20FILING%20-%20PETITION/17-198_2017-12-22_ENGI_PDTESTIMONY_FLECK_DAFONTE.PDF.

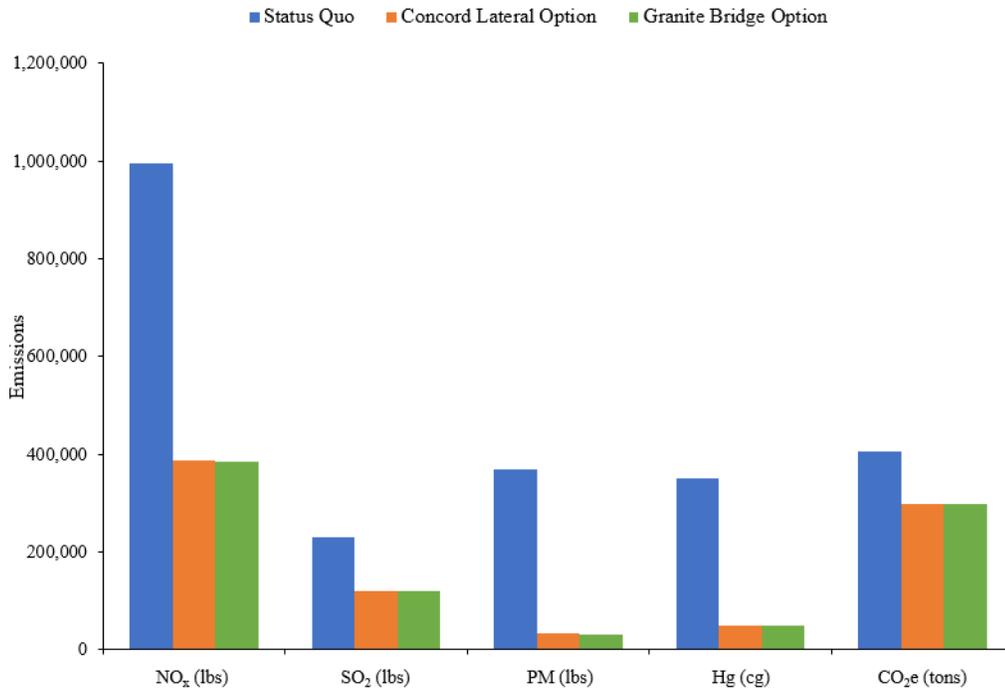
⁴³ There are additional benefits of service conversions associated with switching to natural gas not only for heating, but also for other services, such as hot water, cooking, and potentially other commercial/industrial processes. However, since it is difficult to obtain data on or forecast what portion of service conversion customers would use natural gas for these other service needs, I focus only on the heating portion of service needs. As a result, my estimates may meaningfully understate the actual potential benefits of natural gas service conversions in New Hampshire.

1 **Q. Could you please summarize your results?**

2 A. Yes. The method, inputs and results of my analysis are presented in Exhibit 2 to this
3 testimony. In Exhibit 2, results are presented for the status quo, Concord Lateral, and
4 Granite Bridge scenarios. Results are also presented across different timeframes, and for
5 all classes of customers. Metrics include average per-customer impacts and overall impacts
6 for Liberty's service territory in terms of avoided emissions and cost savings associated
7 with public health benefits. Figures 1 through 2 and Tables 1 through 11 in Exhibit 2 show
8 the results. The options in the Company's LCIRP are likely to lower emissions of all
9 pollutants, in any scenario, with Granite Bridge achieving the greatest emission reductions.

10 To summarize my results in further detail, I find that over the 5-year IRP planning period,
11 the Granite Bridge Pipeline option produces fewer emissions of NO_x, SO₂, PM, and CO₂-
12 e than the Concord Lateral expansion, and that both the Granite Bridge Pipeline option and
13 the Concord Lateral expansion would reduce NO_x, SO₂, PM, Hg, and CO₂-e relative to the
14 status quo in which the New Hampshire residents and businesses that would meet service
15 needs using natural gas would instead (absent the LCIRP options) need to meet service
16 needs using alternative - and generally higher-emitting - technologies. Figure 2 below
17 illustrates these emission differences across options under the 5-year IRP planning period.

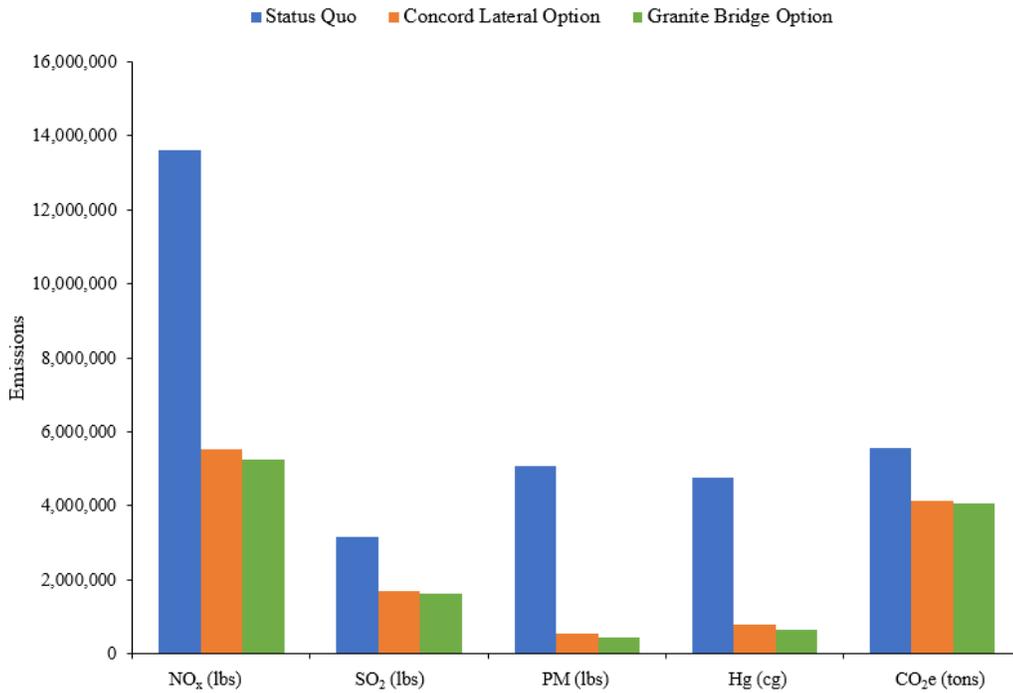
1 **Figure 2:** Short-run emissions impacts associated with additional residential customers
2 under IRP planning period.



3
4 As Figure 3 and Table 3 show, these conclusions hold true over the long-term as well. In
5 particular, my estimates of emissions over the 21-year planning period associated with the
6 Granite Bridge Pipeline show that the project produces the fewest emissions across all
7 categories of pollutants. In particular, the Granite Bridge Pipeline option produces
8 5,250,732 pounds of NO_x, or 270,277 fewer pounds of NO_x than the Concord Lateral
9 expansion option, and 8,738,321 fewer pounds of NO_x than the status quo option.
10 Similarly, the Granite Bridge Pipeline option produces 51,335 fewer pounds of SO₂ than
11 the Concord Lateral expansion and 1,526,653 fewer pounds of SO₂ than the status quo,
12 106,099 fewer pounds of PM than the Concord Lateral expansion and 4,640,199 fewer
13 pounds of PM than the status quo, 51 fewer pounds of Hg than the Concord Lateral

1 expansion and 1,451 fewer pounds of Hg than the status quo, and 48,854 fewer tons of
2 CO₂-e than the Concord Lateral expansion and 1,481,325 fewer tons of CO₂-e than the
3 status quo.

4 **Figure 3:** Long-run emissions impacts associated with additional residential customers
5 under long-term Granite Bridge Pipeline planning period.



6
7 **Table 2:** Total long-run emissions from customers remaining on existing heating
8 technologies compared to switching to natural gas heating technologies under the Granite
9 Bridge or Concord Lateral Expansion options.

<i>GB-LR</i>	Status Quo	Granite Bridge Option	Concord Lateral Option
NO _x (lbs)	13,629,053	5,250,732	5,521,009
SO ₂ (lbs)	3,157,123	1,630,470	1,681,805
PM (lbs)	5,062,057	421,858	527,957
Hg (oz)	1,682	231	282
CO ₂ e (tons)	5,558,784	4,077,459	4,126,312

10

1 I am also able to quantify a subset of the health benefits of the LCIRP options - those
2 associated with emissions of NO_x, SO₂, and PM - across planning periods. Table 4
3 summarizes my results (discussed in more detail in Exhibit 2). In particular, across
4 planning periods, I find that the Granite Bridge Pipeline yields increased health benefits
5 (relative to the status quo option) over the Concord Lateral expansion by between \$57,000
6 and \$230,000, on average each year.

7 **Table 3:** Health impacts associated with residential, commercial, and industrial emissions
8 for the short- and long-term planning periods of the Granite Bridge Pipeline option and the
9 Concord Lateral expansion relative to the status quo.

		IRP	GB - LR
		Average Annual	Average Annual
		Impact	Impact
Granite Bridge Relative to Status Quo	\$ Total Health Benefits (low estimate)	1,057,086	800,789
	\$ Total Health Benefits (high estimate)	2,387,346	1,808,520
Concord Lateral Relative to Status Quo	\$ Total Health Benefits (low estimate)	955,083	743,554
	\$ Total Health Benefits (high estimate)	2,156,979	1,679,259
Differential	\$ Total Health Benefits (low estimate)	102,004	57,236
	\$ Total Health Benefits (high estimate)	230,366	129,262

10

11 Finally, the Granite Bridge Pipeline will reduce large truck traffic for deliveries of propane
12 and/or LNG, and will further reduce local deliveries of oil and propane to residences and
13 businesses that switch from those fuels to natural gas. I estimate the potential emission
14 reductions from the expected reductions in large truck deliveries for replenishing the
15 Company's satellite storage tanks. Specifically, this could reduce emissions of CO₂ by
16 roughly 50 to 63 thousand pounds, emissions of NO_x by 290 to 360 pounds, and emissions

1 of PM by seven to nine pounds.⁴⁴ See Table 5. The reductions in NO_x, and PM together
2 contribute to health benefits of between \$700 and \$2,000 per year.⁴⁵

3 **Table 4:** Annual reductions in emissions associated with reduced delivery truck traffic
4 (estimates in pounds).

	235 trucks	300 trucks
CO ₂ e (CO ₂ + CH ₄)	49,594.5	63,312.1
NO _x	285.7	364.7
PM _{2.5}	6.7	8.5

5
6 **III. CONCLUSIONS**

7 **Q. What do you conclude based on your review of public health and environmental**
8 **impacts?**

9 **A.** Based on my quantitative analysis summarized in part in this testimony and presented in
10 detail in Exhibit 2, I come to the following observations and conclusions:

- 11
- The options presented in the Company's LCIRP are likely to generate meaningful
12 public health and environmental benefits relative to the status quo. These benefits
13 include reductions emissions of criteria pollutants, and reductions in costs
14 associated with the harmful effects of these pollutant emissions on public health. I
15 also find that the options will lead to lower emissions of GHG relative to the status

⁴⁴ See Exhibit 2, Table 10.

⁴⁵ See Exhibit 2, Table 11.

1 quo scenario, and thereby contribute to a lowering of risks associated with climate
2 change.

- 3 • The Granite Bridge Pipeline would lead to lower overall emissions of harmful
4 pollutants and GHG than an expansion of the Concord Lateral, primarily due to
5 increases in the number of customers who would have access to natural gas and
6 convert to gas from alternative fuels for heating and other service needs.

7 **Q. Does this complete your testimony?**

8 **A. Yes.**

THIS PAGE INTENTIONALLY LEFT BLANK