

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

Docket No. DG 17-\_\_\_

Liberty Utilities (EnergyNorth Natural Gas) Corp. d/b/a Liberty Utilities  
Approval of Natural Gas Supply Strategy

**PRE-FILED DIRECT TESTIMONY**

**OF**

**TIMOTHY S. LYONS**

December 21, 2017

THIS PAGE INTENTIONALLY LEFT BLANK

**TABLE OF CONTENTS**

1

**I. Introduction.....1**

**II. Purpose of Testimony .....2**

**III. Approach .....4**

**IV. Levelized Cost Analysis .....7**

    A. Methodology ..... 7

        1. Development of Annualized Costs ..... 9

        2. Calculation of Net Present Value of Annualized Costs ..... 13

        3. Calculation of Levelized Stream of Costs ..... 13

    B. Granite Bridge Pipeline..... 14

        1. Annualized Costs ..... 14

        2. Net Present Value of Annualized Costs..... 16

        3. Levelized Cost Results..... 17

    C. Granite Bridge LNG Facility ..... 18

        1. Annualized Costs ..... 18

        2. Net Present Value of Annualized Costs..... 20

        3. Levelized Cost Results..... 20

**V. Conclusion .....21**

11

THIS PAGE INTENTIONALLY LEFT BLANK

1 **I. INTRODUCTION**

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

3 A. My name is Timothy S. Lyons. I am a Partner at ScottMadden, Inc. (“ScottMadden”). My  
4 business address is 1900 West Park Drive, Suite 250, Westborough, Massachusetts 01581.

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

6 A. I am submitting this testimony before the New Hampshire Public Utilities Commission  
7 (the “Commission”) on behalf of Liberty Utilities (EnergyNorth Natural Gas) Corp. d/b/a  
8 Liberty Utilities (hereinafter referred to as “EnergyNorth” or the “Company”).

9 **Q. Please describe your educational background.**

10 A. I hold a Bachelor’s degree from St. Anselm College, a Master’s degree in Economics from  
11 The Pennsylvania State University, and a Master’s degree in Business Administration from  
12 Babson College.

13 **Q. Please describe your professional experience.**

14 A. I have more than 30 years of experience in the energy industry. I started my career in 1985  
15 at Boston Gas Company, eventually becoming Director of Rates and Revenue Analysis.  
16 In 1993, I moved to Providence Gas Company, eventually becoming Vice President of  
17 Marketing and Regulatory Affairs. Starting in 2001, I held a number of management  
18 consulting positions in the energy industry, first at KEMA and then at Quantec, LLC. In  
19 2005, I became Vice President of Sales and Marketing at Vermont Gas Systems, Inc. before  
20 joining Sussex Economic Advisors, LLC (“Sussex”) in 2013. Sussex was acquired by  
21 ScottMadden in 2016.

1 **Q. Have you previously provided testimony before the Commission?**

2 A. Yes, I sponsored testimony before the Commission on behalf of Liberty Utilities (Granite  
3 State Electric) Corp. d/b/a Liberty Utilities to support a lead-lag study in the general rate  
4 case proceeding in Docket No. DE 16-383.

5 **Q. Have you sponsored testimony in other jurisdictions?**

6 A. Yes, I have sponsored testimony before fourteen state regulatory commissions on various  
7 topics, including class cost-of-service, rate design, revenue requirements, customer bill  
8 impact, lead-lag studies, and natural gas system expansion. A summary of my testimony  
9 experience is included in Exhibit TSL-1.

10 **II. PURPOSE OF TESTIMONY**

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

12 A. The purpose of my testimony is to present the methodology, assumptions, and results of  
13 the levelized cost analysis used to evaluate EnergyNorth's proposed infrastructure  
14 development projects. The results of the levelized cost analysis were only used to evaluate  
15 the projects on a comparable basis with alternative resource options, as discussed in the  
16 joint testimony of William R. Killeen and James M. Stephens (the "Killeen/Stephens  
17 Testimony").

18 **Q. Please summarize the Company's proposed infrastructure development projects.**

19 A. As detailed in the joint testimony of Susan L. Fleck and Francisco C. DaFonte (the  
20 "Fleck/DaFonte Testimony"), the Company plans to develop the Granite Bridge Project,  
21 which consists of the Granite Bridge Pipeline and the Granite Bridge LNG facility. The

1 Company proposes to construct, operate, and include in distribution and supply rate base  
2 the Granite Bridge Pipeline and Granite Bridge LNG facility, respectively.

3 **Q. Please provide a brief overview of the levelized cost analysis of the Granite Bridge**  
4 **Pipeline and Granite Bridge LNG facility.**

5 A. A levelized cost analysis is commonly used to convert an investment into annualized costs  
6 that reflect the total cost of the investment over its lifetime. To develop the levelized cost  
7 analysis for the Granite Bridge Project, I relied on certain financial and operational  
8 assumptions provided by the Company, as well as conceptual engineering and construction  
9 cost estimates from CHA Consulting, Inc. (“CHA”) and Sanborn, Head & Associates  
10 (“Sanborn Head”). Based on the analysis, the levelized cost for the Granite Bridge Pipeline  
11 is approximately [REDACTED] per year, or a unit cost of [REDACTED] per Dth per day<sup>1</sup>. The  
12 levelized cost for the Granite Bridge LNG facility is approximately [REDACTED] per year.  
13 The results of the levelized cost analysis are summarized in Exhibit TSL-2.

14 **Q. How is the remainder of your testimony organized?**

15 A. The remainder of my testimony is organized as follows:

- 16 • Section III – Approach: This section provides an overview of the purpose and  
17 approach of a levelized cost analysis.

---

<sup>1</sup> As discussed later in my testimony, the unit cost assumes a capacity of 75,000 Dth per day for the Granite Bridge Pipeline.

- 1           • Section IV – Levelized Cost Analysis: This section provides a detailed description  
2           of the assumptions and results of the levelized cost analysis for the proposed  
3           Granite Bridge Pipeline and Granite Bridge LNG facility.
- 4           • Section V – Conclusion: This section summarizes the results of the levelized cost  
5           analysis for the proposed Granite Bridge Project.

6           My testimony includes the following exhibits, which were prepared by me or under my  
7           direction:

- 8           • Exhibit TSL-2: Summary of Levelized Cost Analysis
- 9           • Exhibit TSL-3: Levelized Cost Analysis – Granite Bridge Pipeline
- 10          • Exhibit TSL-4: Levelized Cost Analysis – Granite Bridge LNG Facility
- 11          • Exhibit TSL-5: Assumptions

12   **III. APPROACH**

13   **Q. Please describe the purpose of a levelized cost analysis.**

14   A. The objective of a levelized cost analysis is to compare investments that have different cost  
15   characteristics by converting an investment into annualized costs that reflect the total cost  
16   of the investment over its lifetime. In the context of energy projects, a levelized cost  
17   analysis can be used to compare generation technologies (e.g., wind, solar, natural gas) that  
18   have different cost characteristics, such as varying life spans, project sizes, capital costs,  
19   risks, regulatory requirements, return requirements, and capacities.



1 **Q. Is there precedent for developing a levelized cost analysis?**

2 A. Yes, a levelized cost approach has been relied upon by various entities. Levelized cost  
3 analysis is commonly used by the U.S. Department of Energy (“DOE”)<sup>2</sup> and U.S. Energy  
4 Information Administration (“EIA”)<sup>3</sup> to evaluate generation technologies. As defined by  
5 the DOE, the levelized cost “calculates [the] present value of the total cost of building and  
6 operating [an investment] over an assumed lifetime.”<sup>4</sup> Notably, the DOE states that “the  
7 upfront costs do not paint a complete picture” and a levelized cost of energy is “critical to  
8 making an informed decision to proceed with development of a facility, community or  
9 commercial-scale project.”<sup>5</sup> In addition, the Commission relied on a levelized comparison  
10 of costs in approving the expansion of the TGP Concord Lateral a decade ago.<sup>6</sup>

11 **Q. Please describe the purpose of the levelized cost analysis in this proceeding.**

12 A. The levelized cost analysis in this proceeding is used to evaluate supply options that have  
13 different cost characteristics. The Company’s proposed investments in the Granite Bridge  
14 Pipeline and Granite Bridge LNG facility would result in a stream of annualized costs that  
15 decline over time as the investments are depreciated. In contrast, a contract for upstream  
16 interstate pipeline capacity would result in a stream of annualized costs that would remain  
17 constant over the initial term of the contract.

---

<sup>2</sup> See, for example, U.S. DOE, Renewable Energy Project Development: Advanced Financing Concepts.

<sup>3</sup> See, for example, U.S. EIA, Levelized Cost and Levelized Avoided Cost of New Generation Resources in the Annual Energy Outlook 2017.

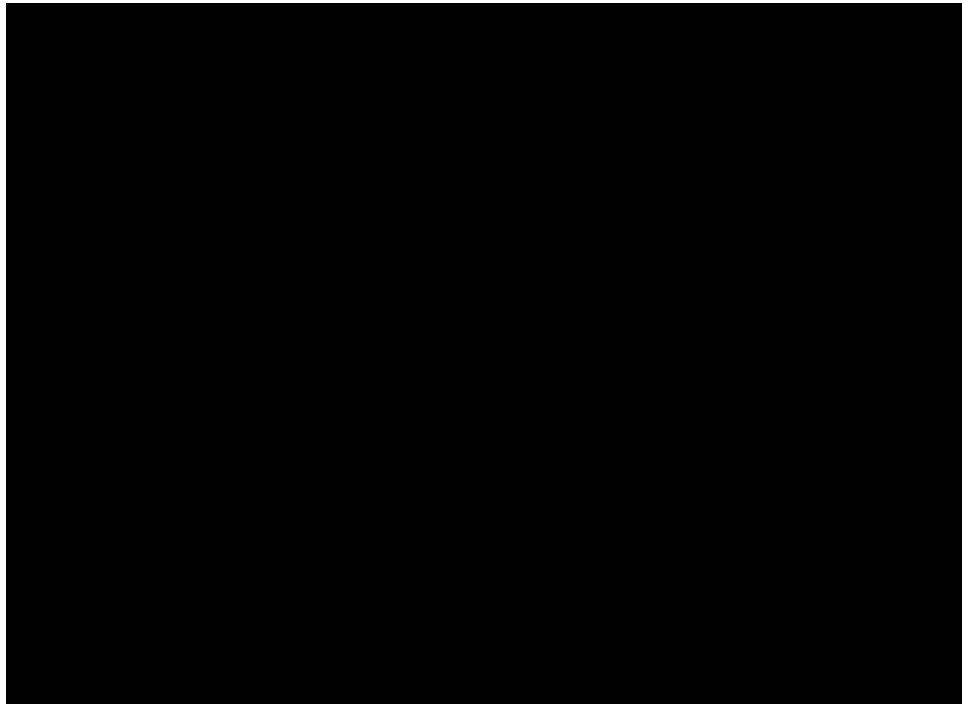
<sup>4</sup> U.S. DOE, Levelized Cost of Energy (LCOE), at 3.

<sup>5</sup> Ibid, at 2-3.

<sup>6</sup> See, Order No. 24,825 (Feb. 29, 2008) in Docket No. DG 07-101, at 11.

1 The levelized cost analysis is used to convert the declining stream of annualized costs to a  
2 levelized stream of annualized costs over the life of the investment, thus enabling an  
3 “apples-to-apples” comparison between a company investment and a proposal from a  
4 pipeline company. This is an important step in development of the portfolio optimization  
5 analysis conducted by the Company as each resource option can be compared on the basis  
6 of annual fixed charges and variable gas commodity costs. Confidential Figure 1 illustrates  
7 the relationship between annualized and levelized costs of the investment for the Granite  
8 Bridge Pipeline.

9 **Figure 1: Cost of the Granite Bridge Pipeline**



10

1 **IV. LEVELIZED COST ANALYSIS**

2 **A. Methodology**

3 **Q. Please describe the financial and operational assumptions and costs underlying the**  
4 **levelized cost analysis.**

5 A. The Company provided financial and operational assumptions and costs for the levelized  
6 cost analysis, including the estimated spending schedules for construction of the Granite  
7 Bridge Pipeline and Granite Bridge LNG facility. The financial and operational  
8 assumptions and costs used in the levelized cost analysis included:

- 9 • Estimated capital costs of the investment were based on the conceptual engineering  
10 and construction cost estimates provided by CHA and Sanborn Head for the Granite  
11 Bridge Pipeline and Granite Bridge LNG facility, respectively.
- 12 • Income taxes were based on a composite rate of the current federal income tax rate  
13 of 34.00 percent and a projected state income tax rate of 7.90 percent.<sup>7</sup>
- 14 • A capital structure of 50.00 percent common equity and 50.00 percent long-term  
15 debt was used. The cost of long-term debt was assumed to be 4.43 percent, and the  
16 cost of equity was assumed to be 9.50 percent.
- 17 • Annual inflation rate of 2.00 percent was based on the U.S. gross domestic product  
18 (“GDP”) inflation over the past 20 years.<sup>8</sup>

---

<sup>7</sup> New Hampshire income tax rates are legislated to change in 2019.  
<https://www.revenue.nh.gov/assistance/tax-overview.htm#profits>

<sup>8</sup> U.S. Bureau of Economic Analysis, Implicit Price Deflators for Gross Domestic Product.

- 1           • Uncollectible expenses were based on the Company’s experience, and were  
2           estimated to be 1.00 percent of revenues.
- 3           • Working capital requirements were based on the results of a recent lead-lag study,  
4           which showed a net lead-lag of 27 days for cash working capital on expenses related  
5           to operations and maintenance (“O&M”).
- 6           • Property taxes were based on the Company’s 2016 property taxes as a percentage  
7           of net utility plant, and were estimated to be 2.29 percent of net plant.<sup>9</sup>
- 8           • Property insurance was based on the Company’s 2015 and 2016 insurance expenses  
9           as a percentage of net utility plant, and were estimated to be 0.013 percent of net  
10          plant.<sup>10</sup>
- 11          • Depreciation rates were based on the book life of the investment.

12          A summary of the financial and operational assumptions used in the levelized cost analysis  
13          for the Granite Bridge Pipeline and Granite Bridge LNG facility is provided in Exhibit  
14          TSL-5. Although certain assumptions were the same for both the Granite Bridge Pipeline  
15          and Granite Bridge LNG facility (e.g., income and property taxes, and cost of capital),  
16          there were certain assumptions that differed (e.g., book depreciation and O&M expenses)  
17          as discussed in detail in Sections IV.B. and IV.C. below.

---

<sup>9</sup> 2016 Annual Report of Liberty Utilities (EnergyNorth Natural Gas) Corp. to the Public Utilities Commission of the State of New Hampshire, at 25.

<sup>10</sup> Ibid, at 39.

1 **Q. Please describe the process used to develop the levelized cost analysis.**

2 A. The levelized cost analysis was based on the following three steps:

- 3 1. Develop a stream of annualized costs over the lifetime of the investment;
- 4 2. Calculate the net present value (“NPV”) of the annualized costs; and
- 5 3. Calculate a levelized stream of costs that reflect the NPV.

6 The various inputs and assumptions were modeled in an Excel-based model developed  
7 specifically for this analysis. The remainder of this section provides details regarding the  
8 three steps of the analysis.

9 **1. Development of Annualized Costs**

10 **Q. Please describe the development of the annualized costs.**

11 A. Using a general cost-of-service approach, the annualized cost of the investment was  
12 calculated as the return on investment plus annual operating expenses. The Company’s  
13 return on investment was based on the weighted average cost of capital applied to rate base.  
14 The total annual operating expenses were calculated based on the aforementioned financial  
15 and operational assumptions and cost estimates. The components used to develop the  
16 annualized cost of the investment are presented below.

1 **Figure 2: Annualized Cost of Investment**

2 *Return on Investment*  
3 + *O&M Expense*  
4 + *Uncollectible Expense*  
5 + *Depreciation Expense*  
6 + *Property Taxes*  
7 + *Property Insurance*  
8 + *Income Taxes*  
9 = *Total Annualized Cost*

10 Using the equation above, a stream of annualized costs was developed over the lifetime of  
11 the investment.

12 **Q. How was the weighted average cost of capital calculated?**

13 A. The weighted average cost of capital consisted of an equal blend of long-term debt and  
14 equity. Specifically, 50.00 percent of the investment was assumed to be financed through  
15 long-term debt with a cost of debt of 4.43 percent, and 50.00 percent of the investment was  
16 assumed to be financed through equity with a cost of equity of 9.50 percent. Based on  
17 these assumptions, the weighted average cost of capital was estimated to be 6.97 percent.  
18 The capital structure is consistent with that used to set the current rates for the Company  
19 and is also consistent with the planned capital structure used to fund the Company's  
20 investment in the Granite Bridge Pipeline and Granite Bridge LNG facility. The cost of  
21 debt used in this analysis is the Company's current cost of debt. As the project gets closer  
22 to construction, additional long-term debt will be obtained at the prevailing market rates.

1 **Q. How was rate base determined?**

2 A. Rate base consisted of net plant, adjusted for cash working capital and accumulated  
3 deferred income taxes. The equation for calculating rate base is provided below.

4 **Figure 3: Rate Base**

5 *Construction Cost*  
6 *+ Allowance for Funds Used During Construction*  
7 *- Accumulated Depreciation*  
8 *= Net Plant*  
9 *+ Cash Working Capital*  
10 *- Accumulated Deferred Income Taxes*  
11 *= Rate Base*

12 As shown above, net plant included the construction cost of the facilities, Allowance for  
13 Funds Used During Construction (“AFUDC”), and accumulated depreciation. AFUDC  
14 was included in rate base to recover the financing costs incurred during the construction  
15 period.<sup>11</sup> AFUDC includes “the net cost for the period of construction of borrowed funds  
16 used for construction purposes and a reasonable rate on other funds when so used.”<sup>12</sup> The  
17 funds used during construction were assumed to consist of short-term debt, long-term debt,  
18 and equity.

19 To arrive at rate base, cash working capital on O&M-related expenses was included based  
20 on the results of a recent lead-lag study which showed a net lead-lag of 27 days, and

---

<sup>11</sup> See, FERC, Uniform System of Accounts Prescribed for Natural Gas Companies Subject to the Provisions of the Natural Gas Act, Gas Plant Instructions, No. 17.

<sup>12</sup> Id.

1 accumulated deferred income taxes were calculated based on the differences between tax  
2 and book depreciation.

3 **Q. Please describe the calculation of annual operating expenses.**

4 A. The annual operating expenses were calculated using the following assumptions for both  
5 the Granite Bridge Pipeline and Granite Bridge LNG facility:

- 6 • Uncollectible expenses were estimated to be 1.00 percent of the annual revenues.
- 7 • Property taxes were estimated to be 2.29 percent of net plant.
- 8 • Property insurance expenses were estimated to be 0.013 percent of net plant.
- 9 • Income taxes were based on the composite federal and state income tax rate applied  
10 to the return requirement.

11 In addition, the following operating expenses, which were specific to the Granite Bridge  
12 Pipeline and Granite Bridge LNG facility as discussed in Sections IV.B and IV.C, were  
13 included:

- 14 • O&M expenses for the investment were based on a representative proxy, adjusted  
15 for inflation.
- 16 • Depreciation expenses were calculated based on the book life of the investment.

17 The annual operating expenses were added to the return on investment to arrive at the total  
18 annualized cost of the investment.



1                   **2. Calculation of Net Present Value of Annualized Costs**

2   **Q. Please describe the calculation of the NPV of the annualized costs.**

3   A. Following the calculation of the annualized cost of the investment, the next step was to  
4       calculate the NPV of the annualized costs over the lifetime of the investment. The NPV  
5       calculation reflects a fundamental financial concept of the “time value of money” which  
6       states that the money available at the present time is worth more than the same amount in  
7       the future due to its potential earnings capacity. To determine the NPV, the cash flows  
8       were discounted by a discount rate that represents the time value of money.

9   **Q. How was the discount rate determined?**

10   A. The discount rate used to calculate the NPV was based on the weighted average cost of  
11       capital. Since the investment would be financed partially by debt, the debt portion of  
12       weighted average cost of capital was tax-adjusted to reflect the tax benefits resulting from  
13       the interest expense. The tax-adjusted weighted average cost of capital of 6.10 percent was  
14       used as the discount rate in the NPV analysis.

15                   **3. Calculation of Levelized Stream of Costs**

16   **Q. Please describe calculation of the levelized annual cost.**

17   A. The final step in the analysis was to calculate the levelized annual cost for the investment.  
18       The levelized cost is a fixed stream of costs that reflects the NPV of the annualized costs  
19       over the lifetime of the investment. Figure 4 presents the formula for calculating the  
20       levelized annual cost.

1 **Figure 4: Levelized Cost of Investment**

2 
$$\text{Levelized Cost} = \text{NPV} \times \frac{r \times (1 + r)^n}{(1 + r)^n - 1}$$

3 Where,

4 NPV = the NPV of the annualized costs over the life of the investment;

5  $r$  = the discount rate; and

6  $n$  = the book life of the investment.

7 Finally, dividing the levelized annual cost by the initial investment cost provides the  
8 levelized carrying charge for the investment.

9 **B. Granite Bridge Pipeline**

10 **Q. How was the levelized cost of the Granite Bridge Pipeline calculated?**

11 A. The levelized cost analysis for the Granite Bridge Pipeline was developed using the  
12 financial and operating assumptions and the three-step process discussed above.

13 **1. Annualized Costs**

14 **Q. How were the annualized costs of the Granite Bridge Pipeline calculated?**

15 A. The first step of the analysis required the development of the annualized costs for the  
16 Granite Bridge Pipeline, which were calculated as the return on investment plus annual  
17 operating expenses. The analysis included the financial and operational assumptions  
18 discussed earlier and an estimate of the initial capital cost of the investment developed  
19 through a conceptual engineering design provided by CHA, which reflects detailed  
20 mapping of the proposed route and several discussions with the NHDOT.

1 **Q. Please discuss how the investment cost for the Granite Bridge Pipeline was developed.**

2 A. The investment cost for the Granite Bridge Pipeline was based on (a) the likely path and  
3 approximate length of the pipeline; (b) a cost per mile to construct the pipeline based on  
4 conceptual engineering and construction costs provided by CHA; and (c) an estimated  
5 spending schedule for construction of the Granite Bridge Pipeline. As shown in Exhibit  
6 TSL-2, the initial capital cost, including overheads, to construct the proposed Granite  
7 Bridge Pipeline is approximately \$110.0 million.

8 **Q. How was the return for the Granite Bridge Pipeline calculated?**

9 A. To calculate the return, the weighted average cost of capital of 6.97 percent was applied to  
10 rate base for the Granite Bridge Pipeline. Rate base for the Granite Bridge Pipeline in the  
11 initial year was calculated to be approximately [REDACTED], as included in Exhibit TSL-  
12 3. The return for the Granite Bridge Pipeline was calculated as 6.97 percent applied to rate  
13 base of approximately [REDACTED], or approximately [REDACTED].

14 **Q. How were the annual operating expenses calculated for the Granite Bridge Pipeline?**

15 A. As discussed previously, the assumptions used to calculate the annual operating expenses  
16 for the Granite Bridge Pipeline and Granite Bridge LNG facility were similar, except for  
17 the assumptions regarding depreciation rates and O&M expenses, which were specific to  
18 the investment. The assumptions for the Granite Bridge Pipeline are as follows:

- 19 • Depreciation expenses for the Granite Bridge Pipeline were based on a book life of  
20 55 years based on the Company's experience, and were estimated to be  
21 approximately [REDACTED] per year.

- 1           • O&M expenses were based on historical O&M expenses for Granite State Gas  
2           Transmission, Inc. (“GSGT”). Since a portion of GSGT’s pipeline operates in New  
3           Hampshire, it provided a reasonable proxy for Granite Bridge Pipeline’s O&M  
4           expenses. GSGT’s O&M expenses in 2015 and 2016 were on average \$21,000 per  
5           mile of pipeline.<sup>13</sup> Applying GSGT’s O&M expenses per mile to the Company’s  
6           proposed 27-mile Granite Bridge Pipeline results in annual O&M expenses of  
7           approximately \$0.6 million, adjusted for inflation.

8           The annual operating expenses for the Granite Bridge Pipeline for certain years over the  
9           lifetime of the investment are summarized in Exhibit TSL-3.

10   **Q.   Please summarize the annualized costs for the Granite Bridge Pipeline.**

11   A.   The return on investment plus the annual operating expenses resulted in annualized costs  
12   for the proposed Granite Bridge Pipeline of approximately [REDACTED] in the initial year.  
13   The annualized costs for the Granite Bridge Pipeline for certain years over the lifetime of  
14   the investment are provided in Exhibit TSL-3.

15                   **2. Net Present Value of Annualized Costs**

16   **Q.   Please describe the calculation of the NPV of annualized costs for the Granite Bridge**  
17   **Pipeline.**

18   A.   The discount rate of 6.10 percent was applied to the annualized costs to calculate the NPV  
19   of the annualized costs of approximately [REDACTED], as shown in Exhibit TSL-3.

---

<sup>13</sup> 2016 FERC Financial Report Form No. 2-A of Granite State Gas Transmission, Inc., at 325.

1                   **3. Levelized Cost Results**

2   **Q.    What were the results of the levelized cost analysis for the Granite Bridge Pipeline?**

3    A.    The results of the modeling effort produced a levelized annual cost of approximately [REDACTED]  
4           [REDACTED] for the Granite Bridge Pipeline, and an estimated levelized carrying charge for the  
5           investment of 11.68 percent.

6   **Q.    How were the results of the levelized cost analysis for Granite Bridge Pipeline used in**  
7           **the Company’s analysis of supply options?**

8    A.    A unit cost was calculated to reflect the cost per volume of capacity of the Granite Bridge  
9           Pipeline. Specifically, the levelized annual cost was divided by the annual capacity to  
10           determine the unit cost. The unit cost was used by the Company to evaluate the Granite  
11           Bridge Pipeline on an “apples-to-apples” basis with alternative supply options. As  
12           discussed in the Killeen/Stephens Testimony, the Granite Bridge Pipeline was compared  
13           to an expansion of the TGP Concord Lateral. Since the estimated daily rate on the  
14           expansion of the TGP Concord Lateral was based on a proposed capacity of 75,000 Dth  
15           per day, the same volume level was used to calculate the unit cost for the Granite Bridge  
16           Pipeline.<sup>14</sup> Therefore, the resulting unit cost for the Granite Bridge Pipeline was estimated  
17           to be approximately [REDACTED] per Dth per day.

---

<sup>14</sup> As outlined in the Fleck/DaFonte Testimony, the operating capacity of the Granite Bridge Pipeline is approximately 150,000 Dth per day.

1           **C. Granite Bridge LNG Facility**

2           **Q. How was the levelized annual cost of the Granite Bridge LNG facility developed?**

3           A. The levelized cost analysis for the Granite Bridge LNG facility was developed using the  
4           same three-step process discussed above.

5                           **1. Annualized Costs**

6           **Q. Please discuss the first step of the analysis (i.e., calculation of the annualized costs) for**  
7           **the Granite Bridge LNG facility.**

8           A. The annualized costs of the Granite Bridge LNG facility consisted of the return on  
9           investment plus annual operating expenses. Using the financial and operating assumptions  
10          and costs discussed above, the annualized costs were calculated over the life of the  
11          investment.

12          **Q. How was the investment cost for the Granite Bridge LNG facility developed?**

13          A. EnergyNorth retained Sanborn Head to provide a detailed evaluation of the engineering,  
14          regulatory and permitting requirements, and expected costs associated with an on-system  
15          LNG facility. The conceptual engineering and construction cost estimate provided by  
16          Sanborn Head to construct the proposed Granite Bridge LNG facility with a 2 Bcf storage  
17          tank, 150,000 Mcf per day and 8,000 Mcf per day of vaporization and liquefaction  
18          capability, respectively, is approximately \$201.7 million, including overheads.

1 **Q. Please discuss the calculation of return for the Granite Bridge LNG facility.**

2 A. As discussed previously, the return was calculated as the weighted average cost of capital  
3 of 6.97 percent applied to rate base. Therefore, the return for the Granite Bridge LNG  
4 facility was approximately [REDACTED].

5 **Q. Please discuss the annual operating expenses for the Granite Bridge LNG facility.**

6 A. As discussed previously, the assumptions used to calculate the annual operating expenses  
7 for the Granite Bridge Pipeline and Granite Bridge LNG facility were similar, except for  
8 the assumptions regarding depreciation rates and O&M expenses, which were specific to  
9 the investment. The assumptions for the Granite Bridge LNG facility are as follows:

- 10 • Depreciation expenses for the Granite Bridge LNG facility were based on a book  
11 life of 40 years,<sup>15</sup> and were estimated to be approximately [REDACTED] per year.
- 12 • O&M expenses were based on estimates provided by Sanborn Head of  
13 approximately [REDACTED] per year. The O&M expenses included certain labor  
14 costs (e.g., salary for facility operators) and non-labor costs (e.g., electricity costs)  
15 to operate and maintain the LNG facility.

16 The annual operating expenses for the Granite Bridge LNG facility for certain years over  
17 the lifetime of the investment are summarized in Exhibit TSL-4.

---

<sup>15</sup> The depreciation period of 40 years was consistent with the levelized cost analysis conducted by the Company for an on-system LNG facility in Docket No. DG 07-101.

1 **Q. What were the resulting annualized costs for the Granite Bridge LNG facility?**

2 A. The annualized costs, which consisted of the return on investment plus the annual operating  
3 expenses, resulted in approximately [REDACTED] for the Granite Bridge LNG facility in  
4 the initial year. The annualized costs for the Granite Bridge LNG facility for certain years  
5 over the lifetime of the investment are provided in Exhibit TSL-4.

6 **2. Net Present Value of Annualized Costs**

7 **Q. How was the NPV of annualized costs for the Granite Bridge LNG facility calculated?**

8 A. The next step of the analysis was to calculate the NPV of the annualized costs using a  
9 discount rate in order to account for the time value of money. The discount rate of 6.10  
10 percent was applied to the annualized costs of the investment over its lifetime to calculate  
11 the NPV of the annualized costs of approximately [REDACTED] as shown in Exhibit TSL-  
12 4.

13 **3. Levelized Cost Results**

14 **Q. What were the results of the levelized cost analysis for the Granite Bridge LNG  
15 facility?**

16 A. The results of the levelized cost-of-service model is an annual cost of approximately [REDACTED]  
17 [REDACTED] for the proposed Granite Bridge LNG facility, and an estimated levelized carrying  
18 charge for the investment of 13.90 percent. The levelized annual cost for the proposed  
19 Granite Bridge LNG facility was used in the SENDOUT® portfolio optimization analysis  
20 conducted by EnergyNorth to evaluate alternative resource options as discussed in the  
21 Killeen/Stephens Testimony.



1 **Q. What is the potential impact of the proposed reduction in the corporate income tax**  
2 **rate included in the U.S. Senate and House of Representative’s tax reform legislation?**

3 A. The U.S. Senate and House of Representatives recently passed tax reform legislation that  
4 among other things calls for a reduction in the corporate income tax rate to 20.0 percent.  
5 A reduction in the corporate income tax rate would reduce the Company’s costs associated  
6 with the Granite Bridge Pipeline and Granite Bridge LNG facility investments since  
7 income taxes paid on the Company’s return on the investments would be lower.  
8 Specifically, a reduction in the corporate income tax rate to 20.0 percent would reduce the  
9 levelized annual cost of the Granite Bridge Pipeline from approximately [REDACTED] to  
10 [REDACTED], and the levelized annual cost of the Granite Bridge LNG facility from  
11 approximately [REDACTED] to [REDACTED].

12 **V. CONCLUSION**

13 **Q. Please summarize your conclusion with respect to the levelized cost analysis for the**  
14 **Company’s proposed infrastructure development projects.**

15 A. A levelized cost analysis is commonly used to compare investments that have different cost  
16 characteristics. The levelized cost analysis in this proceeding converts the investments in  
17 the proposed Granite Bridge Pipeline and Granite Bridge LNG facility from a declining  
18 stream of annualized costs to a levelized stream of annualized costs over the life of the  
19 investment, which enabled the Company to compare the proposed investments to  
20 alternative resource options on an “apples-to-apples” basis. Based on a three-step process  
21 used to develop the levelized cost for the investments, the levelized cost for the proposed  
22 Granite Bridge Pipeline is approximately [REDACTED] per year, or a unit cost of [REDACTED] per

1 Dth per day,<sup>16</sup> and the levelized annual cost for the proposed Granite Bridge LNG facility  
2 is approximately [REDACTED].

3 **Q. Does this conclude your testimony?**

A. Yes, it does.

---

<sup>16</sup> The unit cost assumes a capacity of 75,000 Dth per day for the Granite Bridge Pipeline.