STATE OF NEW HAMPSHIRE

BEFORE THE

PUBLIC UTILITIES COMMISSION

DG 15-494

Liberty Utilities (EnergyNorth Natural Gas) Corp. d/b/a Liberty Utilities

Petition for Approval of Supply Path Precedent Agreement with Tennessee Gas Pipeline Company, LLC

DIRECT TESTIMONY OF

AL-AZAD IQBAL

April 15, 2016

Q. Please state your name, current position, and business address.

A. My name is Al-Azad Iqbal, and I am employed by the New Hampshire Public Utilities Commission (Commission) as Utility Analyst. My business address is 21 South Fruit Street, Suite 10, Concord, New Hampshire, 03301.

Q. Please summarize your educational and professional background.

A. My educational and professional backgrounds are summarized in Attachment AI-7.

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to present Staff's position on the petition filed by Liberty Utilities (EnergyNorth Natural Gas) Corp. d/b/a Liberty Utilities (Liberty) for approval of a long-term contract with Tennessee Gas Pipeline Company, LLC (TGP), for pipeline capacity on a new pipeline referred to as the "Supply Path" (Supply Path PA). The Supply Path PA will provide Liberty transportation capacity from the Marcellus Shale region in Pennsylvania to Wright, New York. My testimony summarizes my review of the methodology and underlying assumptions used by Liberty to evaluate alternatives and the reasonableness of Liberty's conclusion.

Q. Please summarize your testimony.

A. The primary focus of my testimony is whether or not the Supply Path PA is reasonable. Based on Liberty's filing and responses to data requests, Staff concludes that the

company has not adequately demonstrated that the contract, at the proposed capacity level, is reasonable, and Staff recommends that the Commission deny Liberty's petition.

Q. Briefly describe Liberty's filing.

A. Liberty filed a petition with the Commission for approval of the Supply Path PA. The Supply Path PA is a 20-year contract pursuant to which the company would purchase on a firm basis up to 78,000 Dth/day of capacity on TGP's proposed pipeline. The initial twenty-year term begins on the later date of November 1, 2018, or the date on which TGP is able to begin service to Liberty using the Supply Path facilities. The company's decision to procure capacity on the Supply Path Project was based on its analysis of the potential cost savings that could be obtained for its customers by procuring transportation capacity upstream of the Market Path Project.[1]

Q. Please briefly describe Liberty's supporting analysis.

A. The company started with two potential options to deliver firm transportation capacity to Wright: (i) the Constitution Pipeline; and (ii) the Supply Path Project. Because the capacity on the Constitution pipeline is fully subscribed, Liberty did not consider it further as a viable alternative for the Supply Path Project.. Then, using its SENDOUT® resource optimization modeling tool, Liberty evaluated three scenarios for the Supply

[1] The Market Path PA was approved by the Commission in DG 14-380. Liberty Utilities (EnergyNorth Natural Gas) Corp. d/b/a Liberty Utilities, Order 25,822 (October 2, 2005), on appeal in Case No. 2016-0002, Appeal of Pipeline Awareness Network for the Northeast, Inc.

Path: zero Dth of firm capacity per day, effectively 100% of supply from the Wright spot market; 115,000 Dth per day, which is the maximum level of Market Path capacity Liberty holds; and 78,080 Dth per day, the "optimum" result of a SENDOUT® run. Dafonte at 21-22 and 25. In addition, Liberty developed a volume scenario using the SENDOUT® optimum rounded to 78,000 Dth per day to confirm the results.

For each Supply Path volume scenario, Liberty performed detailed cost simulations using SENDOUT® over a twenty-four year period beginning November 1, 2014. Dafonte direct at 21, lines 7-9. Liberty also used SENDOUT® to calculate for each Supply Path volume scenario the total portfolio cost over the twenty-year period from November 1, 2018, the Supply Path in-service date, through October 31, 2038.

Q. Do you agree with the methodology and assumptions that Liberty used to determine the amount of capacity it needed?

A. No. Liberty's analysis was insufficient given the long-term nature of the and the significant associated costs to customers. Liberty's analysis could be described as deterministic. A deterministic analysis provides only a "snapshot" of information and is not necessarily representative of potential, future operating conditions. A deterministic model, like the one Liberty used, assumes perfect knowledge about how the future will play out and relies on one snapshot of Liberty's possible future. The usefulness of the deterministic analysis, therefore, is limited.

Q. Please explain.

A. Just like any model, the outcome is dependent on the assumptions and input data used. Most of my concerns are related to the number of scenarios considered, the details of the scenarios, and the corresponding data inputs. Any long-term contract like the Supply Path PA requires robust analysis of all possible scenarios. The company's analysis focused only on the reward potential of the Supply Path PA and totally ignored any risk associated with such a long-term contract. To get to a rational conclusion, a reasonable number of alternative and realistic scenarios needed to be considered to ensure that the decision is based on a balanced understanding of the consequences related to the commitment. The Supply Path PA provides an opportunity to save cost, because it enables access to less-expensive gas supply from the Marcellus production area, but a capacity over commitment might be burdensome for Liberty's customers. All market projections have some level of uncertainty, which requires a better understanding of the risk/reward trade-off associated with a long-term contract. A planning horizon of 20 years makes the projection harder and more complicated. It increases the risk and reward possibility to a wider swath of scenarios compared to a five-year or 10-year planning period. Given the complexity of forecasting future demand, and future market condition, the deterministic analysis conducted by the company is too simplistic or minimalistic.

Q. Could you give an example of what you mean by possible scenarios?

A. If we consider Liberty's approach to its demand forecast, it shows how simplistic its approach is compared to any reasonable level of analysis. To get the base demands, the company relied on the demand forecast it used in Market Path docket (DG 14-380), in

which it used the same methodology of forecasting as in its IRP (DG 13-313). Then, Liberty adjusted for three elements – the demand associated with returning capacity exempt customers, iNATGAS, and new growth (*e.g.*, Keene, new franchise areas). For IRP, the company looked at different growth scenarios over a projection period of five years, but in this case it looked at only the base case scenario and did not considered a high-case or a low-case scenario. As the forecast supporting the Supply Path PA is for 20 years, Staff asserts that a more robust approach should be taken compared to methodology used for a five-year IRP forecast. It is also true that all adjustments would also have at least the same number of scenarios (low, base, and high). If we assume that the returning capacity-exempt customer-related growth is negligible and embedded in the company's growth projection, this gives us a possible 27 scenarios to examine. However,Liberty used only one scenario to support the Supply Path PA. For each of the assumptions related to price forecast in the company's analysis, one can make a similar observation. This illustrates the minimalistic nature of Liberty's approach.

Q. Please describe Liberty's price assumptions.

A. For existing resources the company used futures price basis developed by the Local Distribution Company (LDC) consortium.[2] For Wright, Liberty assumed that the supply will be used on an as-needed basis, so the company developed future daily spot prices from monthly futures price by applying a multiplier corresponding to projected daily Heating Degree Day (HDD) data. For LNG, propane, and "Operational" supplies,

[2] Liberty negotiated the terms of the Supply Path PA jointly with a group of New England LDCs.

Liberty used fixed prices for each. Operational Supply is only dispatched by SENDOUT® when there is a capacity shortfall in the portfolio, and it is priced at an unprecedented $100/Dth. Without the Operational supply, the SENDOUT® model would not be able to optimize the portfolio due to a shortfall.

Q. How did Liberty develop its futures prices for its analyses?

A. The company compared three alternatives, buying supply at Wright, at Marcellus, or at both points. For Marcellus, Liberty used the Leidy price, and, for Wright, it used the IROZ2 price, as proxies. To generate a spot price for Wright, the company developed price multipliers based on historical prices at Leidy and a calculated structured price at Wright in relation to HDD. This multiplier is used to calculate the future daily price. Next, Liberty calculated the daily basis by subtracting the NYMEX price from the calculated futures price. Beginning in November 2020, the company repeated the same monthly basis from 2019-2020 and applied it to the monthly NYMEX value.

Q. Do you have any concern about Liberty's approach to forecasting the price for its existing resources?

A. It is difficult to develop an accurate price projection in a dynamic market, and to do it for twenty years with a good level of confidence is almost impossible. The company used only one price projection for the first few years of the 20-year contract period (*i.e.*, November 2018 to October 2021) and then repeated the 2020 monthly price projections for the rest of the 20-year period. This was not a reasonable approach, because prices

change and prices change differently. Instead, Liberty should have modeled different price forecasts for the contract period. It is evident if we compare the price projections used by Liberty in its original filing and the recent projected prices for the same period. This generally raises an important concern about the company's approach. At the least, it shows the need to model different price forecasts to test the robustness of the optimum level of the Supply Path PA. Such an analysis should, ideally, be conducted within a stochastic modeling framework.

Q. What is a stochastic analysis and how does it differ from the deterministic analysis used by Liberty?

A. A stochastic model is a tool for estimating probability distributions of potential outcomes by allowing for random variation in one or more inputs over time. Liberty uses stochastic analysis and modeling to develop its Integrated Resource Plans for the Commission.

Q. What is your opinion about Liberty's use of multipliers?

A. To calculate daily price based on HDD from a monthly futures price, developing a multiplier to represent prices at Wright relative to Leidy is certainly not unreasonable. However, it is essential that the multiplier reasonably reflects the possible future variability in spot market prices.

Q. Does Staff believe that use of Liberty's multiplier for the entire period is reasonable?

A. No. The company's approach does not reasonably capture the variability in spot prices expected in the future at Wright. Liberty used spot price data from the most recent years at Wright and used it for the twenty years. This implies that the same level of volatility will remain for the entire period of twenty years.

Q. Why do you think that including variability is important?

A. There are two issues with Liberty's approach. First, 2011-2015 data includes two of the most extremely volatile years in history.[3] That creates upward bias in the resultant projection for spot prices at Wright. Second, considering a 2011-2015 multiplier instead of yearly multipliers does not show how the multiplier changes from year to year. Staff calculated yearly multipliers using the Liberty's data and assumptions. Attachment IA-5 shows that year 2014-15 has a higher yearly multiplier than rest of the years. That difference can partially be explained by the colder- than-normal winter but also could be considered as an outlier both price- and weather-wise. Staff's analysis shows the limitations of applying a deterministic approach to a predominantly stochastic situation. To understand the variation, Staff looked at the historical price at Leidy and IROZ 2 (two proxies) and calculated average winter monthly prices from spot price data. Attachment IA-1 1 shows that the 2013-14 winter was an anomaly. So was 2014-15 to some extent as well. As prices at Leidy have shown little volatility and are projected to be that way in the future, using a multiplier from the most volatile years of IROZ2 spot pricing would not reflect future market condition.

[3] The Company did not include data for 2010-11 period without any explanation although the data was available.

Q. What is your conclusion regarding the multiplier used by Liberty?

A. The company's multiplier gives us the combined historical variability of the last five years, but it does not reflect the volatility for the next five years let alone the future 20 years. Attachment IA- 2 compares futures price with Liberty's corresponding price. It is also evident that if we compare calculated future monthly average price (using the company-developed multiplier) and SNL[4] futures price for the same period, there is a significant difference. The Liberty futures price needs to be adjusted downwards to be consistent with the SNL futures price.

Q. How do different multipliers perform compared to the futures price?

A. Staff calculated monthly prices for future years using Liberty's daily price model for IROZ2. Attachment IA-3 shows that Liberty's multiplier produces the highest price estimates. Differences in the IROZ2 price have a big impact on the results of Liberty's model.

Q. Please explain.

A. If we assume that the most recent futures price reflects the possible condition of future years in the long run, then we need to focus on which multiplier scenario in Attachment IA-3 better replicates the current futures price for the relevant periods. For the first few years (2018-2021), the futures prices in the winter months are closer to the price calculated with the multiplier (-40%), and then the price with multiplier (-33%) replicates

[4] S&P Global Market Intelligence

the future price more accurately. Liberty assumed that the last year's price (2023) will prevail for the rest of the planning period. The peak month includes the peak day capacity requirement which is the determining factor of the optimization results. So, Staff compared the price relationship of peak month of 2023 (January 2023) for different multiplier scenarios, Attachment IA-4 shows that the futures price ($6.77/Dth) falls between the (-33%) and (-40%) multiplier scenarios ($6.95/Dth and $6.22/Dth, respectively). Without knowing the exact multipliers that could produce the matching futures price, and without running the model with those multipliers Staff cannot estimate the optimum contract level for the Supply Path based on the futures price. Staff can only estimate the range within which the optimum contract level falls using the results of available, limited scenarios. So, if we look at the corresponding optimization results in Attachment IA-6 for the (-33%) and (-40%) multiplier scenarios (OCA Tech 1-4), it gives us a range from 65,000 Dth/day to 68,000 Dth/day compared to proposed 78,000Dth/day.

Q. What is your opinion about using futures prices?

A. Futures prices are a better predictor of the future than a historical price trend. Futures price incorporates the latest market information, and it does a good job of predicting prices in the immediate future months. Futures price, however, does not perform very well predicting the distant future. The shorter the maturity of a futures contract, the better the forecasting accuracy. If we need to use futures price, I believe introducing price variability within a limit would give us a better prediction than a prediction based

on a historical price for the rest of the contract period. It is only possible if a stochastic model is used instead of a deterministic model.

Q. How should Liberty have determined the volume of Supply Path capacity it needs?

A. Liberty should have used a stochastic modeling framework.

Q. Please elaborate.

A. In any decision making we develop scenarios to understand the consequences. A primary purpose of analyzing different scenarios is to create holistic, integrated images of how the future might evolve. Probabilistic modeling provides an expansive view of operating and economic conditions across a range of possibilities reveals areas of risk and opportunity. Scenarios should inform decision makers and influence, as well as enhance, decision making. Scenarios are used to anticipate future threats and opportunities. In any reasoned decision making, when faced with uncertainty, one cannot look at just one possible future scenario. Uncertainty calls for a variety of futures and the mapping a possibility space. It is important to run several possible scenarios to get a reasonable understanding of the consequences of a decision. Given the uncertainty at so many levels (in the demand forecast, the price forecasts for each resource, the weather, regulatory requirements, etc.), and considering Liberty's proposed matching of the length of the Supply Path PA and its planning horizon, the Commission is faced with a huge decision space. In this situation, Staff believes that it is imperative to be conservative to minimize

the risk exposure, especially because Liberty will have tools to address any future capacity deficiency but fewer options to mitigate the risk of over commitment exist.

Q. Does SENDOUT® have the capability to do stochastic modeling?

A. Yes. Liberty could use its **SENDOUT®** to conduct stochastic optimization for the Supply Path PA. The SENDOUT® –"Monte Carlo" Analysis[5] can be used for: a) an uncertainty/volatility analysis; b) running hundreds or even thousands of draws; c) simulating price, weather, or nearly any other parameter; d) running different price scenarios. The Monte Carlo analysis is not a new method for the Commission. Liberty uses a Monte Carlo analysis to assess the impact of severe weather for its IRP.

Q. Do you think total costs, or net costs, should be considered for overall decision making.

A. No. Total costs, or net costs, should not be used in the context of comparing results of two deterministic optimization model runs without knowing how probable each of those scenarios are. One of the limitations of a deterministic model is it does not address the probability of the scenario to be realized. In the context of good decision making, a very attractive cost-based scenario with very little probability is less preferable to a very probable scenario.

Q. Please elaborate.

[5] A Monte Carlo analysis is one specific multivariate modeling technique that allows researchers to run multiple trials and define all potential outcomes of an event. The Monte Carlo model creates a probability distribution or risk assessment for a given investment or event under review.

A. Looking at total cost, or net cost, could lead to erroneous decision making for two reasons. First, deterministic models only provide the best solutions based on fixed inputs irrespective of any other possible scenarios. So, it is difficult to compare the overall impact on a portfolio of two different scenarios without going into the details and how those details would play out in real world. As we are dealing with part of the portfolio, a large change may not reflect on the overall portfolio level. Second, total cost, or net cost. might give us a wrong impression particularly when we face a certain cost decrease and a uncertain cost increase. For example, if Supply Path capacity is lower, the capacity cost reduction could be deemed as certain, but the corresponding cost increases in supply are dependent on the assumptions used and how accurate those assumptions are to predict future market price for the entire twenty-year period. The same is true for capacity-release revenue. In Liberty's case, the model did not incorporate any price stabilization tools for supplies, either. All of the uncertainty of a 20-year commitment period is exactly why using a stochastic model is preferable in this type of decision making.

Q. What is your recommendation for the Commission?

A. Staff recommends that the Commission deny the Supply Path PA as-filed. Also, the Commission should require Liberty to prepare and file a Monte Carlo analysis if the company continues to seek approval of the Supply Path PA as filed or if it seeks approval of an amended Supply Path PA in this or another docket. Additionally, Staff recommends that the Commission require Liberty to develop and file a Monte Carlo analysis for all contracts longer than five years that it seeks approval for in the future.

Q. Does that conclude your testimony?

A. Yes.