BEFORE THE
NEW HAMPSHIRE PUBLIC UTILITIES COMMISSION

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

Winter 2024-2025 and Summer 2025 Cost of Gas

Docket No. DG 24-106

Technical Statement of Marc H. Vatter

October 11, 2024

In this technical statement, I develop the following recommendations with respect to the issues to be resolved in this docket:

- A fixed price adder for Winter 2024-25 of $0.0400/therm;
- A commodity component of the cost of gas for Winter 2024-25 of $0.7587/therm;
- A commodity component of the cost of gas for Summer 2025 of $0.2728/therm;
- An expected carrying charge on undercollections of 4.82 percent; and
- An expected carrying charge on overcollections of 8.77 percent.

<u>Premium in winter fixed price offer</u>

For the past 19 years, Energy North Natural Gas has calculated the rate for its fixed price offering by applying a $0.020/therm adder to the Cost of Gas rate otherwise applicable at the beginning of the winter season. See Energy North letter of September 8, 2005 in DG 05-127, attached as 24-106_2024-10-24_Att_1.pdf, proposing to increase the adder from $0.010/therm to $0.020/therm. The adder, of course, amounts to a risk premium – an extra sum paid by customers in exchange for winter-long price certainty.

Since the adoption of the two-cent adder in 2005, inflation as measured by the Consumer Price Index has been 60 percent (at least through July of 2024). This would imply an inflation-adjusted risk premium/adder of $0.032/therm.

The market for natural gas has also developed over the past 19 years. Tracking and taking these developments into account are important in order to calculate a risk premium for the fixed price option that is just and reasonable.

Soon after 2005, innovations in hydraulic fracturing and horizontal drilling, used in tandem, vastly increased the amount of economically recoverable natural gas and oil in the United States. In response, a large amount of liquefaction and export capacity was acquired along the U.S. Gulf Coast, near Henry Hub, which is the location at which index prices for natural gas are typically set. Substantial exports go to Europe, but the market at Henry Hub also interacts with the large market for liquified natural gas (LNG) in East Asia via this export capacity. By 2005, the industry had largely completed a long process of substituting natural gas for distillate and residual fuel oil in space heat and electric generation; more recently, substitution of electric vehicles for internal combustion-powered vehicles began. Taken together, these changes have maintained the condition that natural gas and other fuels are substitutable. A consequence is that prices for natural gas and oil move up and down together.

For many years, prices of LNG were indexed to the price of oil. Operationally, natural gas is still generally the marginal[1] fuel in electric generation in the U.S.; on a planning basis, some new gas plants are still being acquired in the U.S., the timing of retirement of existing gas plants will keep decrements of gas-fired capacity on the margin, and substitution of gas for coal worldwide will remain low hanging fruit for decarbonization worldwide for some time. Electric vehicles will be fueled by gas on the margin, maintaining the direct relationship between prices for natural gas and oil as substitutes in consumption. Oil prices are volatile, and their volatility will continue to add to the weather-driven volatility in the price of natural gas.

The difference between futures and spot prices for the same date of delivery is the risk premium those who buy at the futures price pay for locking in that price in advance. Table I shows the average difference between monthly futures and spot prices for winter delivery at Henry Hub over three historical periods and future delivery one, two, three, and four months in advance. The risk premium declines as winter approaches, especially between two one month in advance, as normal conditions tend to become more likely. The average over the four months is somewhat above $0.040/therm. Table I is calculated in Cells K6942:P6948 of the tab Henry_Hub_Natural_Gas_Spot_Price of 24-106_2024-10-24_Att_2.xlsb.

Table I: Historic winter futures risk premia at Henry Hub (cents/therm; 2024$)

Months in advance:	Four	Three	Two	One	Average
1997-2024	5.93	5.33	3.74	1.62	4.15
2007-2024	7.75	5.48	3.21	0.90	4.33
2017-2024	6.16	5.44	3.36	1.13	4.02

Source: Energy Information Administration

Table II shows the average difference between futures and spot basis from Henry Hub to gates along the Algonquin pipeline in New England from 2009 to 2018, also one, two, three, and four months in advance. The risk premium tends to rise as winter approaches, as normal conditions tend to become more likely. Its negative values may be caused by the possibility of gas flowing south from the Marcellus Shale toward Henry Hub, but less so north from the Marcellus to New England, given the limited pipeline capacity available going into New England.

[1] The marginal unit of a good is the last unit consumed or produced. Natural gas is the marginal fuel in electric generation if the last MWh produced is produced at a gas-fired plant.

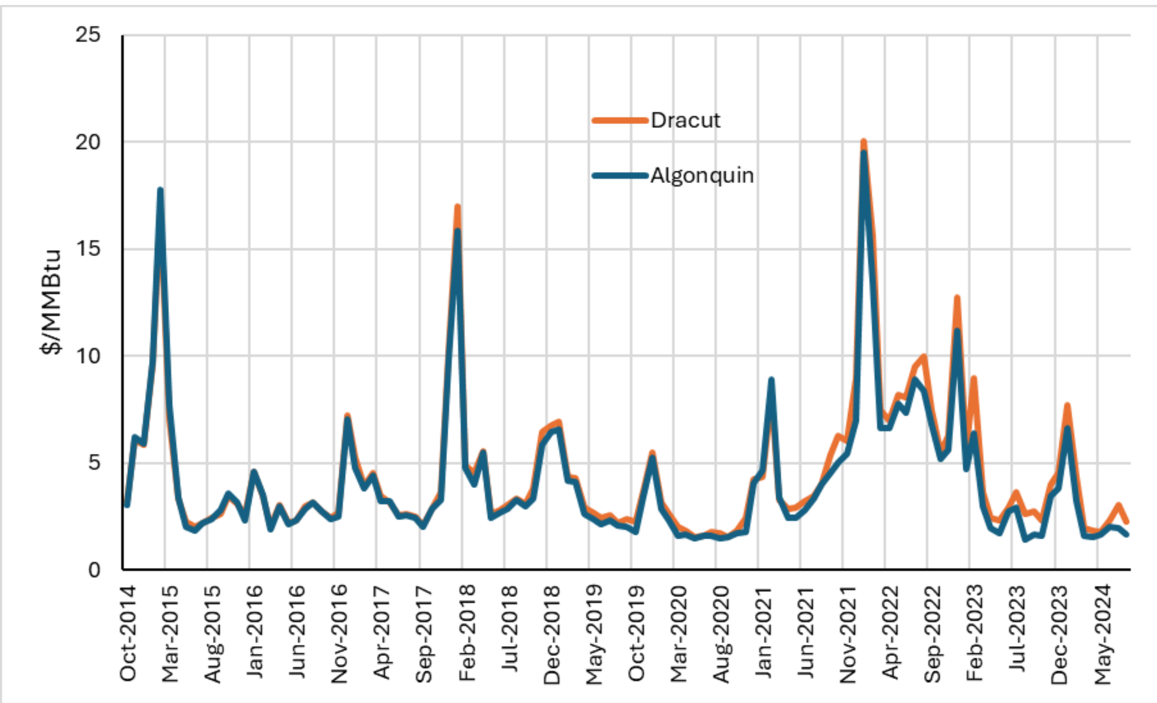
Table II: Historic winter basis futures risk premia at Algonquin gates (cents/therm; 2024$)

Months in advance:	Four	Three	Two	One	Average
2009-2018	-2.30	-0.42	0.05	1.30	-0.34

Source: Standard and Poor's Global IQ

Company witnesses Tilbury, Esposito, and Summerfield report that the Company takes delivery through the Tennessee Gas Pipeline (TGP), which connects to the pricing and trading hub at Dracut. They mention Dracut as a point of delivery several times in their direct testimony, and Dracut is close to New Hampshire. I calculated the expected cost of natural gas this winter using the futures curve on the Intercontinental Exchange (ICE) for the gates in New England along the Algonquin pipeline because I do not have free access to the futures curve at Dracut, but I do have historical data for spot prices at both the Algonquin gates and Dracut, shown in Figure I. They are quite close, though Dracut is slightly higher in recent years. The EIA describes "the Algonquin Citygate" as "a trading hub and the benchmark for the natural gas price in New England".[2]

Figure I: Spot prices for natural gas at Dracut and Algonquin gates



Source: Standard & Poor's Global IQ

Adding the $0.043/therm risk premium at Henry Hub from 2007 to 2024 in Table I and the $-0.003/therm basis risk premium from 2009 to 2018 in Table II results in a total risk premium of $0.040/therm, which is

[2] https://www.eia.gov/todayinenergy/detail.php?id=51158, accessed September 19, 2024.

somewhat higher than the $0.032/therm that results when historic inflation is added to the risk premium calculated in 2005, but not surprising given the amount of time that has passed and the market dynamics I analyze above. I recommend a fixed price adder of $0.040/therm.

Expected cost of gas

To formulate a recommendation as to the Cost of Gas rate itself, I calculated the expected cost of commodity using a recent futures curve for gates along the Algonquin Pipeline in New England. This figure, $0.8020/therm, is higher than the forecasted cost of commodity from the Company, so it gives an expected undercollection. Subtracting the $0.0433/therm futures (risk) premium from the last column of Table I, I recommend a winter cost of commodity of 0.8020 – 0.0433 = $0.7587/therm.

For the summer, a similar calculation from the recent futures curve along the Algonquin gates gives $0.2568/therm. A calculation for 2017-24 analogous to that in Table I gives an average risk premium over the four advance months of $-0.0160/therm, calculated in Cell P6957 of the Henry_Hub_Natural_Gas_Spot_Pric tab of 24-106_2024-10-24_Att_2.xlsb. (The premium has "flipped" from positive to negative in recent years as acquisition of solar electric generation has moderated the demand for natural gas used to meet air conditioning load in the summer in New England.) This gives an expected overcollection. I recommend a summer cost of commodity of 0.2568 + 0.0160 = $0.2728/therm.

Carrying charges

Under the tariff from DG 23-076, the Company would both collect interest from customers on undercollections and pay interest to customers on overcollections at the Prime Rate, which is now 8.00 percent.[3] In my judgment, the Commission should reexamine the question of whether this interest rate is just and reasonable.

Undercollections

Regarding undercollections, the Company is effectively lending to customers without their specific consent. The rate on one-month commercial paper is now 4.82 percent.[4] Using this as the Company's cost of short-term debt, it is collecting interest above cost of 8.00 – 4.82 = 3.18%. According to Fitch Ratings,

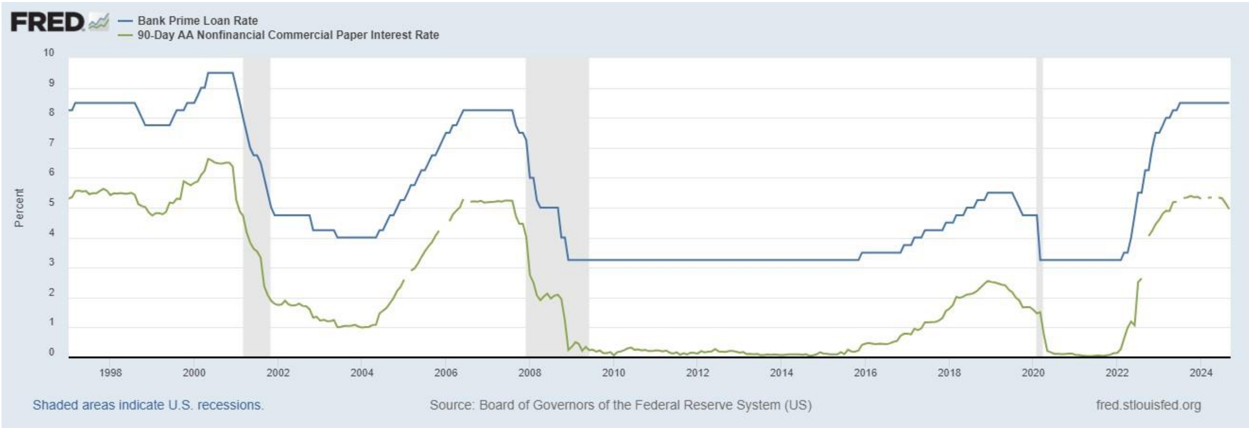
> LUCo primarily meets its short-term liquidity needs through the issuance of [commercial paper] under its $500 million CP program. LUCo also has a $1 billion senior unsecured revolving credit facility (RCF) that matures April 29, 2027, and a $500 million short-term senior unsecured RCF that matures Oct. 25, 2025. LUCo requires modest cash on hand to fund its operations.[5]

The last sentence suggests that the Company has the ability to increase its issuance of commercial paper, if needed, to finance undercollections. Figure II shows that rates on commercial paper have generally fallen below the Prime Rate. The objective of minimizing the cost of financial capital going into

[3] https://www.federalreserve.gov/releases/h15/, accessed October 7, 2024.
[4] Ibid.
[5] https://www.fitchratings.com/research/corporate-finance/fitch-rates-liberty-utilities-co-senior-unsecured-notes-bbb-09-01-2024, accessed September 17, 2024.

residential rates, then, justifies an assumed rolling over of one-month nonfinancial commercial paper, rather than the Prime Rate, as a way to finance undercollections through rates. By inspection of Figure II, the prospect of greater volatility in rates on commercial paper should not be of concern; they rise and fall in tandem with the Prime Rate.

Figure II: Rates of interest on prime bank lending and commercial paper



Aggregating over forecast residential use and applying the 3.18 percent difference in rates of interest, I calculate that residential customers would pay $358,563 in interest above cost for the expected winter undercollection. I recommend that undercollections accrue interest at the rate of interest on one-month nonfinancial commercial paper reported by the Board of Governors of the Federal Reserve at https://www.federalreserve.gov/releases/h15/, for the term during which underollections accrue interest.

Overcollections

Regarding overcollections, the Company is effectively borrowing from customers without their specific consent. It should do so at customers' time value of money, which I denote as r_f and may or may not approximate the Prime Rate. For a consumer to maximize the present value of current and future well-being (typically referred to by economists as"utility"), the rate of decline in the marginal utility[6] of consumption should, as consumption increases, equal the consumer's time value of money. If the former is lower, the consumer would be better of saving more now in order to consume more later; if the former is higher, the consumer would be better off spending more now and consuming less later. I use this principle to derive Equation (6) in the appendix, where g is the rate of growth in i's consumption of private and public goods and σ measures a hypothetical consumer's degree of aversion to volatility in consumption.

$$r_f = g\sigma \tag{6}$$

[6] Marginal utility is the well-being a consumer derives from the last unit of a good consumed. Here, that good is the money the customer spends on all private and public goods combined.

(6) is a risk-free discount rate, based on the assumption that customers have accurate expectations regarding inflation and earn or pay the rates of interest that they do with certainty. Poor (rich) consumers have lower (higher) consumption and tend to have higher (lower) growth in consumption, reflecting income mobility, so their time-values of money are higher (lower).

The annual rate of growth in real gross state product in New Hampshire from 1997 to 2022 was 2.16 percent.[7] I show in the appendix that this approximates growth in consumption of private and public goods combined. With $\sigma = 3$ from Hall (1988)[8], this gives a real time value of money of 2.16 x 3 = 6.47%, a central tendency for residential customers. As of June 12, 2024, the Federal Open Market Committee's (FOMC) median projection of core inflation (excluding food and energy) declines from 2.8 percent for 2024 as a whole to 2.3 percent for 2025 and 2.0 percent for 2026.[9] Using the figure for 2025 gives a nominal time value of money of 6.47 + 2.30 = 8.77%. This is somewhat higher than the Prime Rate. Since it is based on a fairly long history of data, 6.47 percent, the real time value of money for residential customers, is not expected to change rapidly.

Aggregating over forecast residential use and applying the 8.77 – 8.00 = 0.77% difference in rates of interest, I calculate that customers would be paid $5,038 in interest less than their time value of money for the expected summer overcollection. I recommend that residential customers be charged 6.47 percent, with infrequent adjustment, plus the FOMC's forecast of inflation, reported at https://www.federalreserve.gov/monetarypolicy/fomcprojtabl20240612.htm, for the term during which overcollections accrue interest.

[7] https://fred.stlouisfed.org/series/NHRGSP, accessed September 30, 2024

[8] Hall, R.E. (1988). Intertemporal substitution in consumption. *Journal of Political Economy*, 96(2). https://doi.org/10.1086/261539

[9] https://www.federalreserve.gov/monetarypolicy/fomcprojtabl20240612.htm, accessed August 8, 2024.

Appendix: Residential customers' time value of money

I denote residential customers' time value of money as r_f, which is applicable to sums financed by them. Customer i's well-being derived from consumption of economic goods is quantified with a utility function,

$$U_i\left(C_i\right) = -C_i^{1-\sigma} \tag{1}$$

where C_i is i's consumption of private and public goods and σ measures the degree of relative risk aversion that is implicit in the utility function. The marginal utility of consumption is

$$\frac{\partial U_i}{\partial C_i} = -\left(1-\sigma\right)C_i^{-\sigma} > 0 \tag{2}$$

For a consumer to maximize the present value of current and future utility, the rate of decline in the marginal utility of consumption as consumption grows should equal the rate at which she discounts future consumption. For a discrete time illustration, let U'_{it} be marginal utility of consumption at Time t, then $U'_{it} = U'_{it+1}\left(1+r_f\right)$; if $U'_{it} > U'_{it+1}\left(1+r_f\right)$, the consumer can raise the discounted sum of utility over time by moving consumption from $t+1$ to t (increasing savings or decreasing borrowing at Time t), and vice versa. Therefore,

$$r_f = \frac{U'_{it} - U'_{it+1}}{U'_{it+1}} \tag{3}$$

Again, the rate of decline in the marginal utility of consumption as consumption grows should equal the rate at which a consumer discounts future consumption. Differentiating (2) with respect to time gives

$$\frac{d}{dt}\frac{\partial U_i}{\partial C_i} = \left(1-\sigma\right)C_i^{-\sigma}\frac{\dot{C}_i}{C_i}\sigma \tag{4}$$

and

$$\begin{aligned}\frac{\dfrac{d}{dt}\dfrac{\partial U_i}{\partial C_i}}{\dfrac{\partial U_i}{\partial C_i}} &= \frac{\left(1-\sigma\right)C_i^{-\sigma}\dfrac{\dot{C}_i}{C_i}\sigma}{-\left(1-\sigma\right)C_i^{-\sigma}} \\ &= -\frac{\dot{C}_i}{C_i}\sigma = -r_f\end{aligned} \tag{5}$$

From (3), so[10]

$$r_f = \frac{\dot{C}_i}{C_i}\sigma \tag{6}$$

Define $g \equiv \dot{C}_i / C_i$.

I have defined C_i as i 's consumption of both private and public goods. If the government's budget is balanced, then the rate of growth in that metric for a resident of New Hampshire equals the rate of growth in gross state product; I denote GSP as Y. Also, denote private consumption as C_p, private saving as S_p, and taxes paid, which equal government purchases of goods and services, as T.

$$C_p = \left(\sum_i C_i\right) - T.$$

All proceeds from gross state product ultimately accrue to households, and households may privately consume, save, or pay taxes using those proceeds. Therefore,

$$Y = C_p + S_p + T$$
$$Y - S_p = C_p + T$$
$$\dot{Y} - \dot{S}_p = \dot{C}_p + \dot{T}$$
$$\frac{\dot{C}_p + \dot{T}}{C_p + T} = \frac{\dot{Y} - \dot{S}_p}{Y - S_p}$$
$$\frac{\dot{C}_p + \dot{T}}{C_p + T}\frac{Y - S_p}{Y} = \frac{\dot{Y}}{Y} - \frac{\dot{S}_p}{Y}$$
$$\frac{\dot{C}_p + \dot{T}}{C_p + T} = \left(\frac{\dot{Y}}{Y} - \frac{\dot{S}_p}{Y}\right)\frac{Y}{Y - S_p}$$
$$\frac{\dot{C}_p + \dot{T}}{C_p + T} = \left(\frac{\dot{Y}}{Y} - \frac{\dot{S}_p}{S_p}\frac{S_p}{Y}\right)\frac{Y}{Y - S_p}$$

The savings rate in the U.S. is fairly stable, so let

$$\frac{\dot{S}_p}{S_p} = \frac{\dot{Y}}{Y}$$

[10] An adjustment may be made for the effects of global warming, which raises the value of current saving, shown in Equation (29) at https://dx.doi.org/10.2139/ssrn.3821603.

Then

$$\frac{\dot{C}_p + \dot{T}}{C_p + T} = \frac{\dot{Y}}{Y}\left(1 - \frac{S_p}{Y}\right)\frac{Y}{Y - S_p} = \frac{\dot{Y}}{Y}$$

Growth in private and public consumption equals, or, practically speaking, approximates growth in gross state product.