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Revised Hedging Strategy Work Plan

Objectives and Goals

It remains NW Natural's objective to have a risk-responsive hedging strategy that balances the cost benefit to customers while managing the risks of missed opportunities and extra cost while simultaneously minimizing rate volatility. The three elements to NW Natural's objectives are described below:

- 1) Measuring the risk associated with missed opportunities when hedging in a downward market—if a hedge is placed and gas prices fall, the hedge will incur an extra cost to the customer in the form of a missed opportunity.
- 2) Measuring the risks of not hedging in an upward market—if a hedge is not placed and gas prices increase, the customer will incur extra costs.
- 3) Reducing the volatility in customer gas rates and associated deferrals—while difficult to quantify, stability in the price of gas so customers can effectively budget. Managing rate volatility will be given secondary weight in the objectives.

Over the next year, analysis will focus on the following variables:

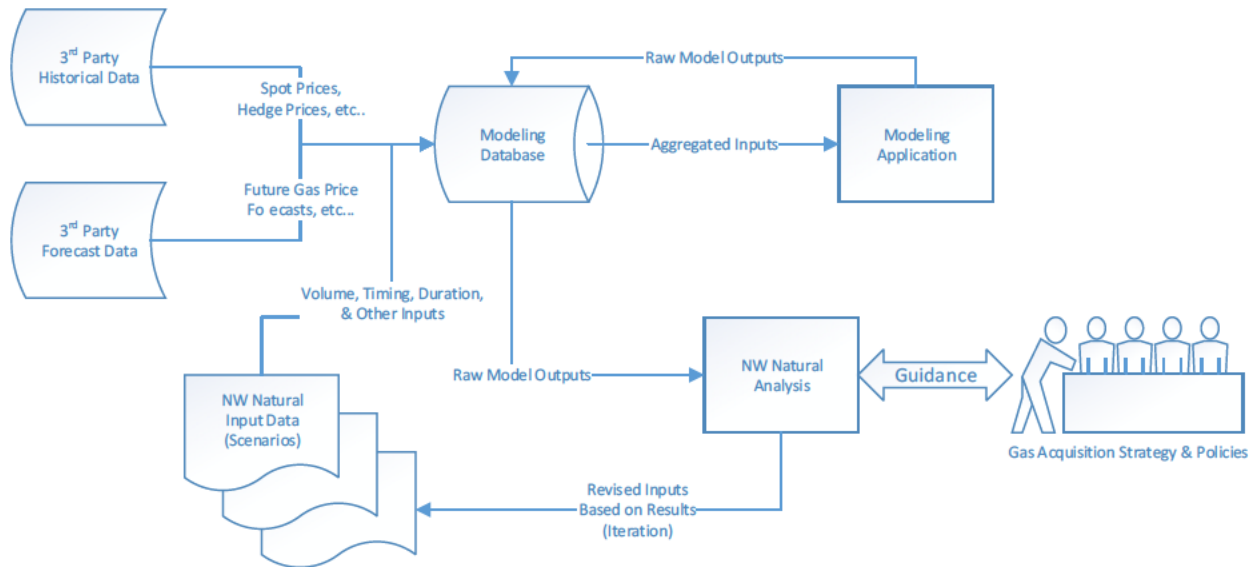
- 1) Total volume to hedge, as a percentage of total required volumes to be purchased.
- 2) The best time to purchase a hedge, given the unknown future performance of commodity prices.
- 3) Duration to hedge – how long of a hedge should be purchased (6-month, 3 year, etc.).
- 4) The best mixture of short/medium/long duration hedges to purchase.

- 5) Steps to take after the decisions have been made – given additional insight into how the market has performed, and what hedges have been executed as well as potential methodology changes going forward.
- 6) The types of hedges to utilize: swaps, options, et al.
- 7) The role of storage as a hedging mechanism—purchased gas can be stored and used at a later date, but can be subject to a variety of operating and contractual requirements and restrictions.

Resources and Approach

To implement this approach, NW Natural has created and filled a new position in the Gas Supply Department. Additionally, the Company intends to restructure existing staff in that department so that two positions can be devoted to this effort. We are currently in the process of hiring for the second position, which is not an incremental position. These positions will work to develop our comprehensive annual hedging plan, incorporating mathematical models which will run the different input values and calculate a range of outcomes, the associated risks, and the resultant tradeoff between cost savings and missed opportunities. Analysis will be completed by the combined use of integer and linear programming analysis, simulation, and other mathematical techniques deemed viable; management judgment and experience will be leveraged to provide direction on risk exposure tolerance, guidelines on the hedging strategy to implement, guidance on the risk mitigation strategy and overall approval of metrics that trigger risk mitigation.

For the 2nd stage of implementation, the Company is also working to develop its data infrastructure and processes to support the analysis. Quality input data is critically important to fuel the mathematical models for both historical and forecasted values. NW Natural will determine the appropriate vendors to provide the data, which datasets to use as a baseline, and which forecasts to use for scenario testing. A budget for this effort will be developed and submitted for approval from NW Natural Management before proceeding, which is likely to occur in the fourth quarter of 2017.



Development of data infrastructure and processes will be necessary to provide the following:

- 1) Staging data is retrieved from 3rd party sources for use in the models. These can include (but are not limited to) historical data such as spot prices and hedge prices as well as forecasted data such as future commodity prices.
- 2) Input variables are defined by NW Natural for each permutation of analysis. These inputs include many different permutations of the seven variables listed above.
- 3) The aggregated inputs are used to model the different hedging strategies. The modeling application extracts the aggregated inputs and executes them against a modeling engine.
- 4) The model outputs raw model results and loads them back into the database.
- 5) Statistical analysis of model outputs is performed; subsequently additional scenarios are defined and executed in an iterative process. Iteration is necessary in order to validate the models as well as to answer any new questions that arise from the model results.

Vendor selection will likely be needed for the purchase of software which NW Natural does not own and is deemed necessary for completion of the modeling.

Risk Exposure Quantification

Exposure to price risk, which is inevitable with all hedge strategies, will be handled in a methodical, quantitative method without engaging in speculation. (Speculation in this case means attempting to realize profits based on predictions of anticipated market movements, or that which is prohibited by Company policy. What-if

analysis will determine quantitatively the impacts of each scenario coupled with the estimated likelihood that they occur. From here, analysis-driven decisions can be made dependent on the amount of risk deemed prudent coupled with the total value delivered to the end customer.

Exposure to market and credit risk will also be assessed. Financial hedges will be executed within Company tolerance levels of market risk which primarily relate to price declines subsequent to hedging and the impact to collateral calls (posting of cash) to counterparties. Financial hedges will only be executed if the creditworthiness of the issuing financial institution is deemed sufficient by the Company's Middle Office. Creditworthiness will be increasingly important as the time horizon of the hedge increases in length, due to associated risk of default. NW Natural will also spread hedges over multiple financial institutions to further diversify risk.

Oversight and Control

The revised hedging strategy will be analyzed and executed by the Front Office, which is the Gas Supply department for physical and financial transactions related to the gas commodity itself. Gas Supply will engage with the Middle Office, Strategic Planning, Rates and other departments where appropriate. For example, the Middle Office will assist in securing input data in areas such as historical commodity prices.

Recommendations presented by Gas Supply will be reviewed by the GASP committee. As previously mentioned, GASP acts as the governing body for hedge strategy approval and execution.

Metrics will be developed to calculate risks that can be hedged and trigger mitigation strategies. Reporting will be developed so that parties such as the Front Office, Middle Office and GASP can assess adherence to the hedging plan and review the need for alterations to the hedging policy.

Interim Risk Management

To mitigate risk in the short term before the revised hedging strategy has been fully implemented, NW Natural will continue to follow the previously approved hedging strategies while transitioning to the revised hedging strategy in a seamless manner over the next 1-2 years.

Conclusion

Over the next year, NW Natural will pursue the implementation of a robust revised hedging strategy that is risk responsive and leverages opportunities to reduce

the overall gas cost to customers while also reducing volatility. Comprehensive details on the revised hedging strategy will be provided at the time of the 2018 PGA filing, with full implementation planned for 2019 PGA filing period.