Table of Contents

Introduction 1
Background and Regulatory Compliance 1
Cascade's IRP History and Responsiveness to the 2016 IRP Acknowledgement Letter 2
2018 IRP Findings 5
Continuous Improvement 7
1. Validation of methods 7
2. Greenhouse gas emissions modeling 8
3. Modeling of significant emergency events 8
4. Clarify distribution system planning priorities 8
5. Continue to monitor renewable natural gas opportunities 9
Additional Staff Recommendations 9
Public Comments 9
Closing Remarks 9

Introduction

Cascade Natural Gas Inc. (Cascade or the Company) is a subsidiary of MDU Resources Group, Inc. (MDU). Cascade provides natural gas service to approximately 214,000 natural gas customers in Washington, which represents about 74 percent of the Company's total customers.[1] Cascade's system-wide energy throughput is composed of approximately 77 percent non-core customer demand (large-volume customers that purchase their own gas supplies and upstream transportation) and 23 percent core customer demand. Core customers are made up of residential customers (representing about 12 percent of total throughput demand), commercial customers (roughly nine percent of total throughput demand), and core industrial customers (about two percent of total throughput demand).[2]

This document provides Commission staff's (Staff) comments on the 2018 integrated resource plan (IRP), which was timely submitted by Cascade to the Washington Utilities and Transportation Commission (Commission) on December 14, 2018, in accordance with Washington Administrative Code (WAC) 480-90-238. Pursuant to this code section, IRPs are submitted every two years and are developed with the input of an advisory group made up of interested parties, the public, and Staff.[3] The comments in this document provide an overview of the requirements in WAC 480-90-238, followed by a synopsis of Cascade's IRP history and a retrospective evaluation of Cascade's responsiveness to the issues raised by the Commission in the Cascade 2016 IRP acknowledgment letter.[4] Next, this document provides Staff's review of the Company's findings and forecasts for new resource acquisitions in Cascade's 2018 IRP, and contrasts them to Cascade's 2016 IRP. The final sections of this document provide Staff's suggestions for improvements that could be made to Cascade's forthcoming 2020 IRP.

Background and Regulatory Compliance

Under WAC 480-90-238, investor-owned natural gas utilities (IOUs or utilities) must develop an IRP every two years which describes "the mix of natural gas supply and conservation designated to meet current and future needs at the lowest reasonable cost to the utility and its ratepayers."[5] In preparing an IRP, utilities are required to use consistent analyses to thoroughly examine a wide range of commercially available resources that would serve customers at the lowest reasonable cost to the utility and the ratepayers. In evaluating the lowest reasonable cost, each utility must consider "resource costs, market-volatility risks, demand-side resource uncertainties, the risks imposed on ratepayers, resource effect on system operations, public policies regarding resource preference adopted by Washington state or the federal government, the cost of risks associated with environmental effects including emissions of carbon dioxide, and the need for security of supply."[6]

---

[1] Docket UG-171186 (2018 Cascade IRP), page 2-2.
[2] Docket UG-171186 (2018 Cascade IRP), pages 2-3 to 2-4.
[3] WAC 480-90-238.
[4] Docket UG-160453 (2016 Cascade IRP), letter dated July 24, 2017.
[5] WAC 480-90-238(2)(a).
[6] WAC 480-90-238(2)(b).

Cascade's IRP History and Responsiveness to the 2016 IRP Acknowledgement Letter

The Commission did not acknowledge Cascade's 2014 IRP, which was submitted on July 20, 2015. The Commission cited a lack of clarity, detail, and organization in the analysis and presentation of the modeling methods, as well as Cascade's failure to follow up with Staff to file the amendments requested by the Commission, as the reasons why the 2014 IRP did not comply with the requirements in WAC 480-90-238.[7] The Commission set a December 2016 deadline for the Company to file its 2016 IRP, which the Company met by filing an IRP on December 14, 2016.[8]

On July 24, 2017, the Commission issued an acknowledgement letter in response to Cascade's 2016 IRP, which indicated that the IRP met the requirements of WAC 480-90-238,[9] but requested that Cascade make numerous changes to its forthcoming 2018 IRP, focusing on the following areas:

1. *Demand forecast*

The Commission requested Cascade to use a regression model to correlate demographic and employment growth with the company's load growth. In response, Cascade has augmented its customer growth forecast formula to include population, employment, and an improved statistical modeling approach to capture time series data. The Company has also incorporated wind speed into its use per customer (UPC) formula, and justified its use of weather data from a source other than the National Oceanic and Atmospheric Administration (NOAA).[10] Together, these changes gave a clearer picture of the expected load growth in Cascade's service territory.

2. *Stochastic analysis*

The Commission requested that Cascade expand its stochastic analysis by including the probability of distributions of costs (including system costs and resource mix) for multiple resource portfolios. In its 2018 IRP, Cascade made the following changes to its stochastic modeling methodology:[11]

- Stochastically analyzing six different resource portfolios (encompassing 20 separate resources in all) using normal growth, pricing, and supply availability, rather than stochastically analyzing just one candidate portfolio.[12] The results of the analyses allowed the Company to rank each portfolio on unserved demand and on a risk-adjusted total system cost metric, which gave a 75 percent weight to total system costs under

[7] Docket UG-140008 (2014 Cascade IRP), letter dated April 14, 2016.
[8] Docket UG-160453 (2016 Cascade IRP).
[9] Docket UG-160453 (2016 Cascade IRP), letter dated July 24, 2017.
[10] Docket UG-171186 (2018 Cascade IRP), pages 3-9 and 3-11; docket UG-160453 (2016 Cascade IRP), Cascade IRP Quarterly Update No. 4, pages 1 and 2.
[11] *See* Docket UG-171186 (2018 Cascade IRP), pages 8-2 to 8-4, for a detailed description of the process.
[12] Docket UG-171186 (2018 Cascade IRP), page 8-23.

deterministic conditions for a given portfolio, and a 25 percent weight to total system costs under stochastic conditions.[13]

- Stochastically analyzing the top-ranked portfolio (candidate portfolio) using 16 growth and supply availability scenarios. The Company calculated a "value at risk" (VaR) metric, which it defined as "the 99th percentile of unserved demand and total system cost," for each scenario.[14]
- If the candidate portfolio's VaR did not exceed the Company's VaR limit (set at "1.25 times the mean total system cost of the portfolio under expected conditions") in each scenario, Cascade ran the candidate portfolio through nine stochastic pricing sensitivities. If the candidate portfolio did not exceed the VaR limit through all sensitivities, it became the Company's preferred portfolio.[15]

3. Conservation potential assessment (CPA) and model

The Commission requested Cascade to develop a request for proposal (RFP) for a new CPA to incorporate into the 2018 IRP. The Company released a RFP for a new CPA in July 2017, and selected Applied Energy Group (AEG) and its LoadMAP tool to complete a new CPA. AEG finalized the CPA in spring 2018, which is included as Appendix D to the 2018 IRP. The CPA found a cumulative 46.7 million therms of technical achievable economic conservation that could be realized by 2038 under the utility cost test (UCT), and 34.5 million therms of technical achievable economic conservation under the total resource cost test (TRC).[16] Cascade used the UCT as its cost-effectiveness test in the 2018 IRP, as it produced a greater cumulative forecast potential throughout the planning period than the TRC.[17]

4. Clean Air Rule (CAR)

The Commission requested the Company to model specific CAR impacts in its 2018 IRP expected case. A Thurston County Superior Court judge invalidated the CAR as applied to natural gas companies on December 15, 2017.[18] Therefore, Cascade did not model the CAR as requested by the Commission in the 2016 IRP acknowledgement letter. Instead, taking a cue from the Commission's acknowledgement letters to Washington's electric company IRPs,[19] the Company's expected case incorporated the social cost of carbon (SCC) with a three percent discount rate. In this scenario, carbon costs started at around $42 per metric ton of carbon dioxide in 2020, rising to nearly $60 per metric ton in 2038. Cascade also modeled both higher and lower

[13] Docket UG-171186 (2018 Cascade IRP), page 8-3.
[14] *Ibid*.
[15] Docket UG-171186 (2018 Cascade IRP), page 8-4.
[16] Docket UG-171186 (2018 Cascade IRP), page 7-24.
[17] Docket UG-171186 (2018 Cascade IRP), page 7-20.
[18] *Ass'n of Wash. Bus. v. Wash. Dep't of Ecology*, Consolidated Nos. 16-2-03923-34 & 16-2-03966-34 (Wash. Super. Ct. Apr. 27, 2018) (order granting petition for judicial review).
[19] Dockets UE-160918 & UG-160919 (2017 Puget Sound Energy IRP), page 13 ("We suggest using the Interagency Working Group on Social Cost of Greenhouse Gases estimate with a three percent discount rate. PSE should also continue to model other higher and lower cost estimates to understand how the resource portfolio changes based on these costs.").

carbon pricing schemes as sensitivities. In the sensitivities, carbon costs ranged from $30 to more than $60 per metric ton by the end of the planning period in 2038.[20]

5. Avoided costs

The Commission requested that Cascade expand its analysis of its avoided cost calculations by quantifying several additional cost streams, including a carbon adder and transport, supply and distribution resources, and a 10 percent conservation adder. The Company has incorporated these cost streams into its new avoided cost formula, which is presented in Section 6 of the 2018 IRP. The Company's system-wide avoided costs started at about $0.29 per therm in 2019, rising to just more than $0.81 per therm in 2038.[21]

6. Distribution system enhancements

The Commission requested the Company to provide additional analysis on distribution system enhancements in future IRPs, as new IRP transmission and distribution planning rules are promulgated. Cascade has been involved in the Commission's electric IRP rulemaking process,[22] which has yet to result in new promulgated rules. In the meantime, Cascade's resource planning team has worked with its engineering team and other departments to incorporate information, such as the timing of resource needs and analyses of least-cost reasonable alternatives, into the 2018 IRP. Finally, the Company conducted a one-time system-wide citygate study that aided the Company's understanding of issues that might arise at the citygate level.[23]

7. Resource cost assumptions

The Commission requested Cascade to regularly update its analyses when new information becomes available, and to make planning decisions based on the most current data available. The Company has incorporated this request into their planning process by, for instance, holding regular conversations with Northwest Pipeline (NWP), which is one of the pipelines from which Cascade receives gas, to confirm the costs of potential expansions.[24] Staff has worked with Cascade to verify that the data used in its IRP is as up-to-date as is reasonably possible.

8. Quarterly reports on action plan

The Commission requested that Cascade submit quarterly reports no later than the final business day of each fiscal quarter detailing the Company's progress towards resolving the aforementioned issues. Cascade submitted quarterly reports on the following dates: September 29, 2017; December 22, 2017; and March 30, 2018. Upon request by Staff, the Company filed a

[20] Docket UG-171186 (2018 Cascade IRP), pages 5-21 to 5-24.
[21] Docket UG-171186 (2018 Cascade IRP), page 6-6.
[22] Docket U-161024. An IRP rulemaking for natural gas utilities is planned separate from the electric IRP rulemaking, but currently has no anticipated start date.
[23] Docket UG-160453 (2016 Cascade IRP), Cascade IRP Quarterly Update No. 4, pages 2 and 4.
[24] Docket UG-160453 (2016 Cascade IRP), Cascade IRP Quarterly Update No. 3, page 4.

final quarterly report on June 25, 2018.[25] Staff acknowledged these quarterly reports with compliance letters filed to this docket on April 18 and August 31, 2018.

2018 IRP Findings

In this section, Staff highlights some of the key findings from Cascade's 2018 IRP. Table 1 illustrates the major changes in IRP inputs from between the 2016 and 2018 IRPs.

Table 1: Comparison of IRP Inputs, 2016 IRP and 2018 IRP

	2016 IRP (2017-2036 planning period)	**2018 IRP (2019-2038 planning period)**
Demand forecast	1.3% annual load growth; 1.3% annual peak day load growth	1.3% annual load growth; 1.2% annual peak day load growth
Gas price forecast (excluding carbon price)	$3.37-6.42/MMBtu	$3.18-4.36/MMBtu
Carbon price forecast	N/A	$42-58/metric ton CO_2e
Avoided costs	$0.52-0.67/therm	$0.29-0.81/therm
Demand side management potential (cumulative, excluding low income)	28.7 million therms	46.7 million therms

Demand forecast

Cascade expects its annual system load to grow by 1.3 percent annually during the planning period (2019-2038), adding about 81 million therms of annual energy demand by 2038. Roughly two-thirds of this additional demand will come from residential customers. The Company forecasts 1.4 percent annual load growth among residential customers; 0.9 percent annual commercial load growth; and 0.5 percent annual industrial load growth in this planning period. Peak day load growth is forecasted to be 1.2 percent per year.[26] Load growth in Cascade's Oregon service territory is expected to outpace growth in its Washington territory. Cascade expects the Walla Walla and Tri-Cities areas to be major drivers of load growth in Washington, while in Oregon, the Bend area will be a major growth driver.[27]

Gas price forecast

Cascade generates a gas price forecast by blending a number of different sources based on the historical performance of those sources. For the 2018 IRP, Cascade has improved its weighting system to ensure that more recent data gets weighted more heavily in the gas price forecast.[28]

[25] Docket UG-160453 (2016 Cascade IRP), letter dated April 18, 2018.
[26] Docket UG-171186 (2018 Cascade IRP), pages 3-15 to 3-17.
[27] Docket UG-171186 (2018 Cascade IRP), page 3-10.
[28] Docket UG-171186 (2018 Cascade IRP), pages 4-9 to 4-12.

System-wide gas prices, exclusive of a carbon adder, are expected to range from $3.18 per million British thermal unit (MMBtu) (in real 2017 dollars) in 2019 to $4.36 per MMBtu in 2038.[29] When a carbon adder is included, gas prices are forecasted to rise to $7.68 per MMBtu by 2038.[30]

Carbon price forecast

As mentioned previously, Cascade has modeled four different possible carbon adders for the 2018 IRP: (1) the SCC with a three percent discount rate; (2) SB 6203, introduced in Washington's 2018 legislative session; (3) Initiative 1631, voted down by Washington voters in November 2018; and (4) the U.S. House of Representatives Market Choice Bill (HR 6463), introduced in July 2018. The SCC is the Company's expected case, and it reaches nearly $60 per metric ton of carbon dioxide equivalent by 2038.[31]

Avoided costs

Cascade's system-wide avoided costs for the 2018 IRP start at $0.29 per therm in 2019. (This does not include a carbon adder, which Cascade modeled as beginning in 2020.) By the end of the planning period, avoided costs are forecasted to be $0.81/therm in 2038.[32]

Demand side management

The CPA performed by AEG formed the basis of Cascade's 2018 IRP demand side management modeling. Based on the new CPA, the 2018 IRP shows a 20-year achievable economic conservation potential of nearly 46.7 million therms using the UCT. This estimate incorporates the avoided costs discussed above, which include a carbon adder beginning in 2020. [33]

Identified system needs

Cascade's 2018 IRP analysis has identified two load centers with potential unserved demand during the planning period. The first is in the Bremerton/Shelton area in Washington, where shortfalls of up to 8,660 dekatherms per year are forecasted, starting in 2019. This shortfall is larger and shows up earlier than in the 2016 IRP. The second load center with potential unserved demand is in central Oregon, where forecasted growth in the Bend area is expected to fuel shortfalls that begin in 2023 and exceed 24,000 dekatherms annually by 2038. This shortfall is smaller than it was in the 2016 IRP.[34] Unserved demand in other parts of Washington and

[29] Docket UG-171186 (2018 Cascade IRP), Appendix H, page 11.
[30] Docket UG-171186 (2018 Cascade IRP), page 8-19.
[31] Docket UG-171186 (2018 Cascade IRP), pages 5-22 to 5-24.
[32] Docket UG-171186 (2018 Cascade IRP), Appendix H, page 4.
[33] Docket UG-171186 (2018 Cascade IRP), page 7-24. Figures exclude low income savings potential, which is not included in cost-effectiveness calculations.
[34] Docket UG-171186 (2018 Cascade IRP), page 8-21.

Oregon that were forecasted in the 2016 IRP are no longer forecasted in the 20-year horizon of the 2018 IRP.

Preferred portfolio

After conducting the modeling process described in the above "Stochastic modeling" section, Cascade used the modeling software SENDOUT® to select two primary resources that would resolve the forecasted shortfalls:

- Bremerton-Shelton realignment: By procuring additional firm lateral rights along the Interstate 5 corridor in northwest Washington, the Company could fill this forecasted shortfall and also reallocate additional gas quantities to help address its forecasted Oregon shortfall.
- Incremental GTN capacity: The Company would purchase up to 23,824 dekatherms per day of capacity by 2038 to resolve the forecasted shortfall in central Oregon. [35]

SENDOUT® also selected incremental capacity on the NGTL pipeline in Alberta, Canada, and additional storage capacity at the Spire facility in Wyoming as part of the Company's preferred portfolio. However, the selected quantities from the NGTL pipeline were very small, and the Company has ongoing concerns about the management and reliability of the Spire storage facility. Cascade will continue to assess these resources.[36] Even without Spire or NGTL capacity, Cascade's preferred portfolio addresses all unserved demand throughout the planning period.

Continuous Improvement

The following Staff comments provide suggestions for improving the 2020 Cascade IRP.

1. *Validation of methods*

Cascade has made dramatic improvements in its modeling processes since the Commission declined to acknowledge its 2014 IRP. Much of these improvements that increase the sophistication and analytical rigor of the 2018 IRP comes thanks to the Company's decision to expand its resource planning team, which added much-needed expertise in statistics and modeling methods. For the 2018 IRP, the resource planning team has made a number of improvements to its modeling techniques. These improvements are detailed, along with their advantages and disadvantages, in Appendix L of the 2018 IRP.

While Cascade's resource planning team has explained these new methods to Staff, and Staff has not uncovered significant flaws in the methodology, Staff notes that some of the new methods (the use of the Cholesky decomposition matrix, to name one) are novel in that they are not being used by the other Washington natural gas utilities in their IRP processes. Therefore, Staff requests that

[35] Docket UG-171186 (2018 Cascade IRP), page 8-27.
[36] Docket UG-171186 (2018 Cascade IRP), page 8-27 and 8-29.

the Company continue to review these methods, for two reasons: first, to validate that they are producing as accurate results as possible; and second, to ensure that there are no other methods that might produce better results, or similar results with less complexity.

2. Greenhouse gas emissions modeling

In 2008, Governor Gregoire established specific goals for greenhouse gas (GHG) reduction in Washington, including reducing emissions to 50 percent below 1990 levels by 2050.[37] Staff requests that the Company model the emissions that its preferred portfolio and sensitivities would produce throughout the planning period in its 2020 IRP. Other Washington natural gas utilities have conducted similar analyses in their IRPs,[38] and therefore Staff feels it is appropriate for Cascade to follow suit.

3. Modeling of significant emergency events

On October 9, 2018, a natural gas pipeline ruptured in northern British Columbia, Canada, causing Washington's natural gas distribution utilities (including Cascade) to take significant actions to ensure that they could continue to serve their customers. While this incident was an extreme occurrence that is not likely to be repeated, it was a significant enough event to warrant concern among the Commission and Washington's natural gas utilities.

The British Columbia rupture event highlights the risks that are an inherent part of depending too heavily on any one resource to meet a company's obligations to core and non-core customers. In its 2018 IRP, Cascade modeled several scenarios that limited supply from its various resources (including British Columbia) throughout the 20-year planning horizon. These scenarios could serve as the basis for the modeling of short-term emergency situations. Staff requests that in its 2020 IRP, Cascade expand upon the results of these scenarios, and work with Staff to identify the appropriate parameters around any additional emergency modeling that should be presented in the 2020 IRP.

4. Clarify distribution system planning priorities

Section 9 of Cascade's IRP details its distribution system planning processes. Within this section, Cascade highlights three particular distribution projects, and provides some details of each project. These three projects were selected at random, and are not necessarily more important than any of the other distribution projects planned by the Company. In future IRPs, Staff recommends that Cascade use the space in Section 9 to highlight any projects of particular importance that it feels the Commission and Staff would benefit from knowing the details of, instead of choosing projects to highlight at random.

[37] RCW 70.235.020.
[38] *See* Dockets UG-170911 (2018 Northwest Natural Gas IRP) and UG-170940 (2018 Avista Corporation Natural Gas IRP).

5. Continue to monitor renewable natural gas opportunities

In its 2018 IRP, Cascade for the first time began to evaluate potential renewable natural gas (RNG; also referred to in the IRP as "bio-natural gas") supply options. Thus far, Cascade has had only preliminary discussions with potential RNG suppliers, and the Company does not anticipate utilizing RNG during the planning period. Noting that state and local policy has begun to increasingly focus on GHG reduction, Staff encourages Cascade to search for and model any feasible GHG reduction options, including RNG projects, in its future IRPs. Cascade can refer to the IRPs submitted by other Washington utilities that have incorporated RNG into their IRP modeling.[39]

Additional Staff Recommendations

While Staff appreciates the lengths to which the Cascade resource planning team has gone to ensure that Staff has as much information about the 2018 IRP as possible, it is unfortunate that outside of Staff, the only stakeholder that has chosen to consistently participate in the IRP process has been Public Counsel. Staff encourages the Cascade team to consider all options on how to engage additional stakeholders in the process.

In addition to the recommendations mentioned above, Staff agrees with Cascade's 2019-2020 Action Plan consisting of new and ongoing activities planned for its 2020 IRP.

Public Comments

The Commission posted a Notice of Opportunity to File Written Comments in Docket UG-171186 on January 11, 2019, with a comment due date of February 15, 2019. As of February 14, no individuals or organizations had provided comments on Cascade's 2018 IRP.

Closing Remarks

Cascade has made great strides in improving its IRP process, resulting in a thorough analysis and a well-considered action plan. Staff's recommendations and the Company's own two-year action plan should result in an even stronger analysis for the Company's 2020 IRP. Staff recommends acknowledgement of the Company's 2018 IRP.

Staff notes that the direction and forecasts indicated by the results of Cascade's 2018 IRP are not binding on the Company, and acknowledgement of the IRP by the Commission is not pre-approval or a determination of the appropriateness or prudence of any Cascade decision regarding future resource acquisitions.

[39] *See ibid.*

The work plan for the 2020 Cascade IRP should be filed with the Commission by December 14, 2019. Staff looks forward to working with Cascade and stakeholders again during the development of its 2020 IRP.