Appendix C

Regulatory Compliance Matrix

2023 OR IRP

Appendix C - Introduction

In Order No. 89-507, the Commission adopted “least-cost planning” as the preferred approach to utility resource planning. As part of the IRP, Cascade followed the adopted rules and guidelines. In this Appendix, Cascade outlines the rules and guidelines as well as how the Company complied with each. Also included in this appendix is Cascade’s response to OPUC Staff and other Stakeholders comments on the Draft IRP.

Cascade Natural Gas Oregon IRP Regulatory Compliance		
Citation	**Requirement**	**Compliance**
Order No. 07-047		
Guideline (1)(a)	All resources must be evaluated on a consistent and comparable basis	Completed throughout the IRP, Chapter 9 provides an in-depth analysis of the resources considered in the derivation of Cascade's preferred portfolio.
	All known resources for meeting the utility's load should be considered, including supply-side options which focus on the generation, purchase and transmission of power – or gas purchases, transportation, and storage – and demand side options which focus on conservation and demand response.	Completed throughout the IRP, Chapter 9 provides an in-depth analysis of the resources considered in the derivation of Cascade's preferred portfolio. Demand side options are discussed in Chapter 7.
	Consistent assumptions and methods should be used for evaluation of all resources.	Cascade uses consistent assumptions and methods while evaluating all resources throughout the IRP.
	The after-tax marginal weighted-average cost of capital (WACC) should be used to discount all future resource costs.	Cascade uses the after-tax marginal weighted-average cost of capital in all calculations involving discounted future resource costs. This is discussed in Chapter 5.
Guideline (1)(b)	Risk and uncertainty must be considered.	Cascade uses Value-at-risk (VAR) analysis to capture the intrinsic and extrinsic value of all resources. This is discussed in Chapter 9.
	At a minimum, utilities should address the following: sources of risk and uncertainty: Natural gas utilities: demand (peak, swing and baseload), commodity supply and price, transportation availability and price, and costs to comply with any regulation of greenhouse gas emissions.	Cascade performs Monte Carlo Simulations to stochastically evaluate scenarios and sensitivities related to demand (peak, swing and baseload), commodity supply and price, transportation availability and price, and costs to comply with any regulation of greenhouse gas emissions. This is discussed in Chapter 9.

Cascade Natural Gas Oregon IRP Regulatory Compliance		
Citation	**Requirement**	**Compliance**
	Utilities should identify in their plans any additional sources of risk and uncertainty.	All sources of risk and uncertainty are discussed in Chapter 9.
Guideline (1)(c)	The primary goal must be the selection of a portfolio of resources with the best combination of expected costs and associated risks and uncertainties for the utility and its customers.	Cascade uses VaR analysis to capture the intrinsic and extrinsic value of all resources, and select the portfolio with the best combination of expected costs and associated risks and uncertainties for the utility and its customers. This is discussed in Chapter 9.
	The planning horizon for analyzing resource choices should be at least 20 years and account for end effects. Utilities should consider all costs with a reasonable likelihood of being included in rates over the long term, which extends beyond the planning horizon and the life of the resource.	Cascade performs its analysis over a 28-year or longer time horizon throughout the IRP. All cost analysis includes any projected costs that may extend beyond the 28-year horizon.
	Utilities should use present value of revenue requirement (PVRR) as the key cost metric. The plan should include analysis of current and estimated future costs for all long-lived resources such as power plants, gas storage facilities, and pipelines, as well as all short-lived resources such as gas supply and short-term power purchases.	Cascade uses PVRR as the key metric to rank its candidate portfolios. This cost figure includes all current and estimated future costs for the resources within each portfolio. This analysis is in Chapter 9.
	To address risk, the plan should include, at a minimum:	
	1. Two measures of PVRR risk: one that measures the variability of costs and	Cascade uses Monte Carlo analysis to measure the variability of costs, and VaR analysis to measure the impact of severe outcomes. Cascade views

Cascade Natural Gas Oregon IRP Regulatory Compliance		
Citation	**Requirement**	**Compliance**
	one that measures the severity of bad outcomes.	any portfolio containing unserved demand as unacceptable. This information is provided in Chapter 9.
	2. Discussion of the proposed use and impact on costs and risks of physical and financial hedging.	Chapter 4 discusses the Company's approach to financial derivatives.
	The utility should explain in its plan how its resource choices appropriately balance cost and risk.	Cascade uses VaR analysis to appropriately balance intrinsic and extrinsic costs. This is mainly discussed in Chapter 9.
Guideline 1(d)	The plan must be consistent with the long-run public interest as expressed in Oregon and federal energy policies.	This IRP is consistent with the long-run public interest. Discussion of Oregon and national energy policies can be found in Chapter 6.
Guideline 2(a)	The public, which includes other utilities, should be allowed significant involvement in the preparation of the IRP. Involvement includes opportunities to contribute information and ideas, as well as to receive information. Parties must have an opportunity to make relevant inquiries of the utility formulating the plan. Disputes about whether information requests are relevant or unreasonably burdensome, or whether a utility is being properly responsive, may be submitted to the Commission for resolution.	Cascade ensures that stakeholders have access to materials and can make comments. The company is always willing to meet with stakeholders to further explain any topics of interest. Further information about public participation can be found in Chapter 10 as well as in Appendix A.
Guideline 2(b)	While confidential information must be protected, the utility should make public, in its plan, any non-confidential information that is relevant to its	Cascade ensures that stakeholders have access to materials and can make comments. The company is always willing to meet with stakeholders to further explain any topics of interest. Further information about public participation can be found in Appendix A.

Cascade Natural Gas Oregon IRP Regulatory Compliance		
Citation	**Requirement**	**Compliance**
	resource evaluation and action plan. Confidential information may be protected through use of a protective order, through aggregation or shielding of data, or through any other mechanism approved by the Commission.	
Guideline 2(c)	The utility must provide a draft IRP for public review and comment prior to filing a final plan with the Commission.	The 2023 Oregon Draft IRP was emailed on 1/5/2023. It will be posted on the CNGC website and distributed to all stakeholders involved in Cascade's IRP Process. There were no hard copies produced for the Draft.
Guideline 3(a)	A utility must file an IRP within two years of its previous IRP acknowledgment order. If the utility does not intend to take any significant resource action for at least two years after its next IRP is due, the utility may request an extension of its filing date from the Commission.	This IRP is filed within Oregon Commission deadlines.
Guideline 3(b)	The utility must present the results of its filed plan to the Commission at a public meeting prior to the deadline for written public comment.	This will be completed when the meeting is scheduled.
Guideline 3(c)	Commission staff and parties should complete their comments and recommendations within six months of IRP filing.	To be completed by Staff.
Guideline 3(d)	The Commission will consider comments and recommendations on a utility's plan at a public meeting before issuing an order on acknowledgment. The	To be completed by Staff.

Cascade Natural Gas Oregon IRP Regulatory Compliance		
Citation	**Requirement**	**Compliance**
	Commission may provide the utility an opportunity to revise the plan before issuing an acknowledgment order.	
Guideline 3(e)	The Commission may provide direction to a utility regarding any additional analyses or actions that the utility should undertake in its next IRP.	To be completed by Staff.
Guideline 3(f)	Each utility must submit an annual update on its most recently acknowledged plan. The update is due on or before the acknowledgment order anniversary date. Once a utility anticipates a significant deviation from its acknowledged IRP, it must file an update with the Commission, unless the utility is within six months of filing its next IRP. The utility must summarize the update at a Commission public meeting. The utility may request acknowledgment of changes in proposed actions identified in an update.	Cascade filed its most recent update on 04/27/2022. Cascade plans to continue to comply with this guideline.
Guideline 3(g)	Unless the utility requests acknowledgement of changes in proposed actions, the annual update is an informational filing that:	
	Describes what actions the utility has taken to implement the plan;	Cascade filed its most recent update on 04/27/2022. Cascade plans to continue to comply with this guideline.
	Provides an assessment of what has changed since the acknowledgment	Cascade filed its most recent update on 04/27/2022. Cascade plans to continue to comply with this guideline.

Cascade Natural Gas Oregon IRP Regulatory Compliance		
Citation	**Requirement**	**Compliance**
	order that affects the action plan, including changes in such factors as load, expiration of resource contracts, supply-side and demand-side resource acquisitions, resource costs, and transmission availability; and	
	Justifies any deviations from the acknowledged action plan.	Cascade filed its most recent update on 04/27/2022. Cascade plans to continue to comply with this guideline.
Guideline 4	At a minimum, the plan must include the following elements:	
Guideline 4(a)	An explanation of how the utility met each of the substantive and procedural requirements;	Cascade has filled out a compliance matrix to meet this requirement. Information regarding the compliance matrix can be found in Appendix C.
Guideline 4(b)	Analysis of high and low load growth scenarios in addition to stochastic load risk analysis with an explanation of major assumptions;	Cascade uses VaR analysis to stochastically test its preferred portfolio in a variety of scenarios, which include high and low load growth scenarios, as well as stochastic analysis around each scenario and sensitivity. This analysis along with an explanation of the major assumptions is discussed in Chapter 9.
Guideline 4(c)	For electric utilities, . . .	Not applicable
Guideline 4(d)	For natural gas utilities, a determination of the peaking, swing and base-load gas supply and associated transportation and storage expected for each year of the plan, given existing resources; and identification of gas supplies (peak, swing and base-load), transportation and storage needed to bridge the gap between expected loads and resources;	Chapter 4 of the IRP discusses the various supply, storage, and transportation resources available for each year of the plan. Additionally, Chapter 9 of the IRP graphically identifies the mix of existing and incremental resources used to meet expected loads on a peak day and annual basis.

Cascade Natural Gas Oregon IRP Regulatory Compliance		
Citation	**Requirement**	**Compliance**
Guideline 4(d)	Identification and estimated costs of all supply-side and demand-side resource options, taking into account anticipated advances in technology;	Appendix E outlines the estimated costs of supply side resource options and Appendix D outlines the estimated costs of all demand-side resource options.
Guideline 4(d)	Analysis of measures the utility intends to take to provide reliable service, including cost-risk tradeoffs;	Cascade discusses the measures that will be taken to provide reliable service in Chapter 9. This plan includes the cost-risk tradeoffs evaluated in the VaR analysis which can be found in Chapter 9.
Guideline 4(e)	Identification of key assumptions about the future (e.g., fuel prices and environmental compliance costs) and alternative scenarios considered;	Cascade uses VaR analysis to stochastically test its preferred portfolio in a variety of scenarios and sensitivities, including high and low load growth, impacts to supply, and various environmental compliance cost scenarios. This analysis along with an explanation of the major assumptions is discussed in Chapter 9.
Guideline 4(f)	Analysis of measures the utility intends to take to provide reliable service, including cost-risk tradeoffs;	Cascade discusses the measures that will be taken to provide reliable service in Chapter 9. This plan includes the cost-risk tradeoffs evaluated in the VaR analysis which can be found in Chapter 9.
Guideline 4(g)	Identification of key assumptions about the future (e.g., fuel prices and environmental compliance costs) and alternative scenarios considered;	Cascade uses VaR analysis to stochastically test its preferred portfolio in a variety of scenarios and sensitivities, including high and low load growth, impacts to supply, and various environmental compliance cost scenarios. This analysis along with an explanation of the major assumptions is discussed in Chapter 9.
Guideline 4(h)	Construction of a representative set of resource portfolios to test various operating characteristics, resource types, fuels and sources, technologies, lead times, in-service dates, durations and general locations – system-wide or delivered to a specific portion of the system;	Discussion of the representative set of portfolios can be found in Chapter 9.

Cascade Natural Gas Oregon IRP Regulatory Compliance		
Citation	**Requirement**	**Compliance**
Guideline 4(i)	Evaluation of the performance of the candidate portfolios over the range of identified risks and uncertainties;	Discussion of the performance of the candidate portfolio over a range of scenarios and sensitivities can be found in Chapter 9.
Guideline 4(j)	Results of testing and rank ordering of the portfolios by cost and risk metric, and interpretation of those results;	Results of the testing and rank order of the portfolios by cost and risk metric, along with an interpretation of those results, can be found in Chapter 9.
Guideline 4(k)	Analysis of the uncertainties associated with each portfolio evaluated;	Cascade analyzes the uncertainties associated with each portfolio in its VaR analysis which can be found in Chapter 9.
Guideline 4(l)	Selection of a portfolio that represents the best combination of cost and risk for the utility and its customers;	Cascade has selected a portfolio that is the best combination of risk for the utility and its customers. Discussion of this portfolio can be found in Chapter 9.
Guideline 4(m)	Identification and explanation of any inconsistencies of the selected portfolio with any state and federal energy policies that may affect a utility's plan and any barriers to implementation; and	Cascade has not identified any inconsistencies with its preferred portfolio and state/federal energy policies. Discussion of Oregon and federal energy policies can be found in Chapter 6.
Guideline 4(n)	An action plan with resource activities the utility intends to undertake over the next two to four years to acquire the identified resources, regardless of whether the activity was acknowledged in a previous IRP, with the key attributes of each resource specified as in portfolio testing.	Cascade's four-year action plan can be found in Chapter 11.
Guideline 5	Electric Transmission	Not applicable.
Guideline 6(a)	Each utility should ensure that a conservation potential study is conducted periodically for its entire service territory.	Cascade partners with the Energy Trust of Oregon (ETO) for its energy efficiency efforts in Oregon. Energy efficiency efforts are discussed in Chapter 7.

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Citation	**Requirement**	**Compliance**
Guideline 6(b)	To the extent that a utility controls the level of funding for conservation programs in its service territory, the utility should include in its action plan all best cost/risk portfolio conservation resources for meeting projected resource needs, specifying annual savings targets.	Cascade partners with the Energy Trust of Oregon (ETO) for its energy efficiency efforts in Oregon. Energy efficiency efforts are discussed in Chapter 7. The impact of conservation on resource needs are integrated in Chapter 9.
Guideline 6(c)	To the extent that an outside party administers conservation programs in a utility's service territory at a level of funding that is beyond the utility's control, the utility should: • Determine the amount of conservation resources in the best cost/risk portfolio without regard to any limits on funding of conservation programs; and • Identify the preferred portfolio and action plan consistent with the outside party's projection of conservation acquisition.	Cascade partners with the Energy Trust of Oregon (ETO) for its energy efficiency efforts in Oregon. Energy efficiency efforts are discussed in Chapter 7. The impact of conservation on resource needs are integrated in Chapter 9.
Guideline 7	Plans should evaluate demand response resources, including voluntary rate programs, on par with other options for meeting energy, capacity, and transmission needs (for electric utilities) or gas supply and transportation needs (for natural gas utilities).	In Chapter 7, the Company explains that it offers interruptible service as a voluntary option to customers in both Oregon and Washington, and that this offering is a load management program. Chapter 4, Supply Side Resources discusses interruptible service as a needle-peaking supply-side resource.

Cascade Natural Gas Oregon IRP Regulatory Compliance		
Citation	**Requirement**	**Compliance**
Guideline 8 (revised – new guideline is from Order No. 08-339)	a. BASE CASE AND OTHER COMPLIANCE SCENARIOS: The utility should construct a base-case scenario to reflect what it considers to be the most likely regulatory compliance future for carbon dioxide (CO_2), etc. The utility also should develop several compliance scenarios ranging from the present CO_2 regulatory level to the upper reaches of credible proposals by governing entities. Each compliance scenario should include a time profile of CO_2 compliance requirements. The utility should identify whether the basis of those requirements, or "costs" would be CO_2 taxes, a ban on certain type of resources, or CO_2 caps (with or without flexibility mechanism such as allowance or credit trading or a safety valve). The analysis should recognize significant and important upstream emissions that would likely have a significant impact on its resource decisions.	Cascade has modeled the current IRP so the preferred portfolio can meet the climate protection program compliance obligations. The results of this can be found in Chapter 9. Additional discussion of Carbon compliance and CO_2 costs can be found in Chapter 6.
	b. TESTING ALTERNATIVE PORTFOLIOS AGAINST THE COMPLIANCE SCENARIOS: The utility should estimate, under each of the	Cascade uses PVRR as the key metric to rank its candidate portfolios. This cost figure includes all current and estimated future costs for the resources within each portfolio. This analysis is in Chapter 9.

Cascade Natural Gas Oregon IRP Regulatory Compliance		
Citation	**Requirement**	**Compliance**
	compliance scenarios, the present value of revenue requirement (PVRR) costs and risk measures, over at least 20 years, for a set of reasonable alternative portfolios from which the preferred portfolio is selected. The utility should incorporate end-effect considerations in the analyses to allow for comparisons of portfolios containing resources with economic or physical lives that extend beyond the planning period. The utility should also modify projected lifetimes as necessary to be consistent with the compliance scenario under analysis. In addition, the utility should include, if material, sensitivity analyses on a range of reasonably possible regulatory scenario futures for nitrogen oxide, sulfur oxides, and mercury to further inform the preferred portfolio selection.	
	c. TRIGGER POINT ANALYSIS: The utility should identify at least one CO2 compliance "turning point" scenario which, if anticipated now, would lead to, or "trigger" the selection of a portfolio of resources that is	In previous IRPs, Cascade analyzed a wide variety of extreme carbon scenarios. Given the current climate protection program order, Cascade is utilizing the compliance obligations of the CPP to model the preferred portfolio around. Information on this can be found in Chapters 6 and 9.

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Citation	**Requirement**	**Compliance**
	substantially different from the preferred portfolio. The utility should develop a substitute portfolio appropriate for this trigger-point scenario and compare the substitute portfolio's expected cost and risk performance to that of the preferred portfolio – under the base case and each of the above CO2 compliance scenarios. The utility should provide its assessment of whether a CO2 regulatory future that is equally or more stringent than the identified trigger point will be mandated.	
	d. OREGON COMPLIANCE PORTFOLIO: If none of the above portfolios is consistent with Oregon energy policies (including state goals for reducing GHGs) as those policies are applied to the utility, the utility should construct the best cost/risk portfolio that achieves that consistency, present its cost and risk parameters, and compare it to those of the preferred and alternative portfolios.	All of Cascade's candidate portfolios are consistent with Oregon energy policies.
Guideline 9	An electric utility's . . .	Not applicable
Guideline 10	Natural gas utilities should analyze, on an integrated basis, gas supply,	Chapter 4 of the IRP discusses the various supply, storage, and transportation resources available for each year of the plan. Additionally,

Cascade Natural Gas Oregon IRP Regulatory Compliance		
Citation	**Requirement**	**Compliance**
	transportation, and storage, along with demand side resources, to reliably meet peak, swing, and base-load system requirements. Electric and natural gas utility plans should demonstrate that the utility's chosen portfolio achieves its stated reliability, cost and risk objectives.	Chapter 9 of the IRP graphically identifies the mix of existing and incremental resources used to meet expected loads on peak day and annually.
Guideline 12	Electric utilities should. . .	Not applicable
Guideline 13(a)	Electric utilities should. . .	Not applicable
Guideline 13(b)	Natural gas utilities should either describe in the IRP their bidding practices for gas supply and transportation, or provide a description of those practices following IRP acknowledgment.	Cascade's bidding practices for gas supply and transportation can be found in Chapter 4.

Cascade Natural Gas Oregon IRP Regulatory Compliance		
Citation	**Requirement**	**Compliance**
Order No. 11-196, UM 1286, PGA Guidelines		
Appendix, Page 2 of 16, No. 1	For natural gas utilities, each IRP preparation process and final published IRP will address both planning to meet normal annual expected demand (as defined by the LOC - both base-load and swing) by day and planning to meet annual peak demand by day. The planning will include gas supply and associated transportation along with expected use of storage.	Chapter 4 of the IRP discusses the various supply, storage, and transportation resources available for each year of the plan. Additionally, Chapter 9 of the IRP graphically identifies the mix of existing and incremental resources used to meet expected loads on peak day and annually.
Appendix, Page 3 & 4 of 16, No. 6	As part of the PGA filing, final IRP submission, and general rate case filing each LDC will include an attestation that it has verified, to the best of its knowledge, the historical values for (but not limited to) customer number, sales volumes, etc. are consistent if not totally equivalent among the following: a) All filings with FERC and the Securities and Exchange Commission (SEC); b) Results of operations reports submitted to the OPUC; c) Most current IRP or IRP update; d) Most recent PGA filing (final); and e) Most recent general rate review filing. If the LDC cannot make such an attestation it should explain the	Cascade has included this attestation in its 2023 IRP.

Cascade Natural Gas Oregon IRP Regulatory Compliance		
Citation	**Requirement**	**Compliance**
	variations and why these variations should be allowed.	
Appendix, Page 4 of 16, No. 7	All forecasts of demand, weather, etc. upon which the gas supply portfolio for the current PGA filing is based should be based on a methodology and data sources that are consistent with the most recently acknowledged IRP or IRP update and most recently concluded general rate review for the utility. If the methodology and/or data sources are not consistent each difference should be identified, explained, and documented as part of the PGA as well as the IRP and general rate review filing work papers.	All of Cascade's forecasts used in the PGA filing are based on a methodology and data sources that are consistent with the 2020 Oregon IRP update.
Order No. 16-054, Appendix A		
Page 5, No. 1	Clearly show the plan to acquire all cost-effective energy efficiency.	Chapter 7 discusses Cascade's plan to acquire all cost-effective energy efficiency.
Page 5, No. 2	Provide complete conservation resource potential results and inputs specific to Cascade only, not including results of other Energy Trust territories or for measures that do not apply to Cascade territory.	Conservation resource potential results and inputs can be found in Chapter 7.
Page 5, No. 3	Provide updated data and explanations for the policies and methodologies used to inform the DSM analysis.	Policies and methodologies used to inform the DSM analysis is discussed in Chapter 7.
Page 5, No. 4	Incorporate commercial market transformation savings similar to	Commercial market transformation savings are discussed in Chapter 7.

Cascade Natural Gas Oregon IRP Regulatory Compliance		
Citation	**Requirement**	**Compliance**
	residential methods and include an explanation for how those assumptions are derived and applied within the IRP.	
Page 5, No. 5	Clearly document assumptions behind capacity contribution of energy efficiency and how the capacity value is incorporated into resource planning.	Assumptions behind capacity contribution of energy efficiency are documented in Chapter 7.
Page 5, No. 6	Provide an explanation regarding how annual energy savings are translated into peak day demand and capacity resources.	The methodology behind the transformation of energy savings to peak day demand and capacity resources is discussed in Chapter 9.
Page 8, 1&2, Nos. 1 & 2	Future Cascade IRPs include portfolio analyses and present the analysis results clearly delineating the three analysis steps, and how those steps progressively lead to identification of the preferred portfolio of resources.	Portfolio analysis and identification of the preferred portfolio can be found in Chapter 9.
Page 8, No. 3	Future Cascade IRPs perform and clearly present this trade-off analysis.	This is discussed in Chapter 9.
Page 8, No. 5	Future Cascade IRPs provide a clear, complete, and concise presentation of the portfolio analysis results in a single Chapter of the IRP.	This is discussed in Chapter 9.
Page 9	Staff recommends that Cascade work with Staff and other interested parties to develop a comprehensive database comprising of both economic and weather variables such as price, income, employment, different Heating Degree	Cascade has improved its forecast modeling for the 2023 IRP. Information about new modeling techniques can be found in Chapter 3.

Cascade Natural Gas Oregon IRP Regulatory Compliance		
Citation	**Requirement**	**Compliance**
	Days (HDD) cutoffs, seasonality, etc., and formulate alternative regression models to identify the drivers of the forecasted values and plausibility of the parameter estimates relative to the economic theory on demand for natural gas.	
Page 10	Staff recommends that future Cascade IRPs include detailed descriptions of, and basis for, the gas purchasing plan and hedging strategy, as well as the gas purchasing risk management plan/policy/strategy.	Cascade includes a detailed description of its gas purchasing plan and hedging strategy in Chapter 4.
Page 10	Staff also recommends that in the next IRP, Cascade comprehensively describe the rationale by which it chooses the hedging percentage levels, including upper limits of hedged gas based on the market environments (e.g., price levels, volatility, etc.), Cascade's risk tolerance (e.g., tolerance bands of potential losses), etc. In the meantime, Staff recommends that Cascade continue to apprise Staff and other parties during the recurring quarterly meetings of changes in the hedged gas percentage levels.	Cascade discusses its hedging practices in Chapter 4.
Page 11	Staff recommends that future Cascade IRPs present separate listings of	A discussion of all distribution system projects can be found in Chapter 8.

Cascade Natural Gas Oregon IRP Regulatory Compliance		
Citation	**Requirement**	**Compliance**
	enhancement projects from the other projects.	
Page 12	Staff recommends for future IRPs that Cascade inform the Commission in its IRP of the price of renewable natural gas as compared to traditional source of natural gas, and report to the Commission how much renewable natural gas it purchased between the IRP filing years.	Cascade discusses the price of RNG in Chapter 4. Cascade has contracted for RNG but does not anticipate it to be on the Company's system until 2024.
Page 12	Staff also recommends that Cascade report its EPA's Greenhouse Inventory Report information to the Commission in each of its future IRPs for each year preceding each IRP.	Subpart NN emissions for Oregon in 2021 was 611,806 MT CO2e and 646,928 MT CO2e in 2022.
Page 12	Staff recommends that Cascade evaluate its staffing approach and make changes where needed, to ensure that its required regulatory IRP activities are performed on schedule and in compliance with Commission requirements.	Cascade made enhancements to its staffing prior to the 2018 IRP, adding two new analysts and retaining the services of a consultant. Cascade has kept the same team through the 2023 IRP.
Page 13	Staff recommends that future IRPs use the Executive Summary to summarize the contents of the IRP, rather than to present additional information.	Cascade's executive summary now summarizes the contents of the IRP, this can be found in Chapter 1.

Cascade Natural Gas Draft 2023 IRP: OPUC Staff Feedback Comments

This document contains comments made by Oregon Public Utility Commission Staff (Staff) with regards to CNGC (Cascade or the Company) 2023 Draft IRP (Draft). Grouped by topic, the comments mainly focus on Staff's suggestions and recommendations for the upcoming filed 2023 IRP.

Topic: General

1. Staff appreciates how Cascade has presented visual information throughout the Draft and the tables provided in the appendices. Staff asks that the company plan to provide the workpapers for all tables in the IRP, including appendices, with formulae intact, as well as all supporting graphs and charts exhibited in the IRP upon filing the IRP.

   Response: Cascade has put together IRP workpapers for all tables in the IRP, as well as inputs to the Company's PLEXOS model. Those will be provided through Huddle.

2. Staff requests that Cascade makes sure the filed IRP is updated to reflect reports or activities that were anticipated to happen in 2022 and ensure that references to preliminary rules are replaced with final rules, where applicable, such as reference to AR 632 rules.

   Response: Cascade has updated the references to any preliminary rules that have been finalized.

3. The Draft appears to use the terms "transportation" and "transport" in ways which may be confusing. It appears to be used to reference non-core customers as well as fuels that could be used for vehicular transportation. To ensure clarity, Staff requests that the Company considers using concise and consistent language throughout the IRP.

   Response: Cascade has updated the language throughout the IRP in an attempt to clarify the terms "transportation" and "transport"

4. For the purpose of more clarity and easier readability of the final IRP, some minor observations and questions on specific words or phrases in the Draft are included at the end of this document.

   Response: Cascade has responded to those at the end of this document.

Topic: Demand Forecast

5. Staff appreciates CNGC's responsiveness to Order No. 21-127 by including the forecasting improvements and the use of the RCP 4.5 climate adjustment to demand. Cascade forecasts an average annual load-growth of 1.43 percent in the Draft IRP. That is an increase from ~1.2 percent in the previous IRP. The 1.43 percent load growth equates to an average increase of approximately 1.5 million therms sold per year. While the Draft IRP does a good job of explaining the sources of this forecasted growth, it generally avoids the potential impact of decarbonization policy, most notably around customer count. Similar to Staff's concerns in

response to NW Natural's 2022 IRP,[1] Cascade's customer count predictions appear to use historical trends without regard to new clean energy policies and uncertainty. As such, the Company needs to develop a sensitivity, to include in the filed IRP, that reflects the potential for declining customer counts.

Response: Cascade utilizes an Autoregressive Integrated Moving Average (ARIMA) model to create the Company's customer forecast for use in the IRP. An ARIMA model is a statistical analysis model that uses time series data to either better understand the data set or to predict future trends. Cascade has seen an annual average customer growth of 1.87% the previous 5 years, so Cascade's customer growth does in fact include a trend of lowering customer counts. Cascade is currently working with a consultant Guidehouse, to see if there are additional ways Cascade can gather more information to determine a decarbonization elasticity value to utilize in parallel to the ARIMA models. Furthermore, Cascade included Scenario 4: Increased Electrification in the IRP. This scenario models lower than expected load growth projections due to both discretionary electrification and increased regional bans on natural gas.

6. It would be helpful in the filed IRP to better understand the methodology of the forecasted Use per Customer (UPC) amounts for all customer types.[2] Further, given the structure and goals of DEQ's CPP the Company should discuss in the filed IRP the extent to which reducing UPC could be a metric for progress in decarbonizing their system.

   Response: Cascade included a presentation on the use per customer in TAG 2. Cascade has also included a description on Page 3-11 of the upc forecast methodology. New to this IRP, Cascade included Price as a regressor to capture increasing prices in the upc forecast. In future IRPs, Cascade will have more customer upc and customer count data from early impacts of the decarbonization policies in Oregon that will better inform the Company on the direction of usage.

7. A majority of the Company's annual through-put on their system is from Transport (non-core) customers for which CNGC is accountable for a sizeable percentage of these customers' emissions under the CPP. Even if the forecast is just a simple projection based on past usage, the filed IRP needs to include a more detailed forecast of Transport customers' future demand, and thus emissions, in the context of overall CPP compliance and associated cost causation.

   Response: Cascade has added language to the Non-Core Outlook subsection in Chapter 3.

Topic: Supply Side Resources

RNG

8. Per OAR 860-150-0400, CNGC must file a petition to participate in the PUC RNG's program. Staff is unclear if the filed IRP's action plan can be acknowledgeable without this filing and

[1] See Docket No. LC 79, NW Natural 2022 IRP, Staff's Opening Comments, December 30, 2022, page 83.

[2] Staff's analysis of annual, weather unadjusted data for residential customers points to their UPC being generally bound in a range between ~670 and ~760 therms/year and somewhat increasing over time. This is based on a simplistic analysis using twelve years of the 2021 Oregon Utility Statistics Book data, where we divided annual residential therms sold by that year's average customer count.

Commission approval, given the levels of RNG acquisition the IRP calls for. The filed IRP should discuss when this filing will be made if the Company has not already done so by the filing of the IRP. Further, it would be helpful to explore the rate cap it will attempt to establish in their petition filing.

Response: Cascade is currently working on the OAR 860-150-0400 petition with the Company's consulting firm, Guidehouse. The petition will follow soon after the IRP filing.

9. Staff appreciates the inclusion of a conversation regarding buying versus building RNG projects. Staff requests that this section be expanded to include more discussion regarding whether and how risk is captured when considering RNG project type and finding ways to ensure that ratepayers are not negatively impacted by Cascade's choice of deal structure.[3]

   Response: Cascade has added narrative to Chapter 4 of the IRP to clarify the difference between purchase and transport RNG projects. Cascade has also added further narrative regarding risk around RNG.

10. The Company describes findings regarding a number of RNG project types,[4] but it is unclear how these findings inform resource planning. Staff recommends that Cascade considers including in the filed IRP more detail about how these findings are reflected in the decision-making process for RNG procurement in the near- and long-term.

    Response: Cascade has added language to Page 4-11. Cascade utilizes a combination of known RNG/RTC projects, along with long-term RNG/RTC/Hydrogen projections, in combination with other carbon compliance options to include in Plexos as competing resources to meet carbon compliance, as discussed in Chapter 9.

11. Staff appreciates the model notes of the proposed RNG Cost Effectiveness calculation. Cascade should consider including additional information about the change in carbon compliance costs over time and how that could be reflected in the cost-effectiveness evaluation methodology.[5]

    Response: Cascade has added narrative to the penultimate bullet point on page 4-12 that discusses the uncertainty and risks around changing carbon compliance costs.

12. The Company describes projects where RNG is injected into its system and Cascade transports the customers RNG so that they may market the environmental attributes to other parties (Transport Projects).[6] The company also mentions 'Transportation Projects', presumably referring to Transport Projects. Please provide more explanation about the role these projects play in Cascade's planning and clarify whether there is a connection between transport or

[3] See Docket No. LC 79, NW Natural 2022 IRP, Staff's Opening Comments, December 30, 2022, pages 49-51.

[4] Cascade Natural Gas Corporation 2023 Integrated Resource Plan Draft, January 5, 2023, page 4-8.
[5] Cascade Natural Gas Corporation 2023 Integrated Resource Plan Draft, January 5, 2023, page 4-9.
[6] Cascade Natural Gas Corporation 2023 Integrated Resource Plan Draft, January 5, 2023, page 4-11.

transportation projects and transport customers or non-core customers. Please also make it clear whether there is any connection between these projects and LCFS or CFP projects (or not).

Response: Cascade has added narrative to Chapter 4 of the IRP to clarify the difference between purchase and transport RNG projects. Cascade has also added further narrative regarding risk around RNG.

13. Regarding Purchase Projects,[7] the descriptions include project design and construction aspects. Staff would also appreciate additional discussion regarding:
    - Cascade's role in designing and building these projects and whether there are O&M costs.
    - The procurement process for these projects.
    - If possible, the emissions impacts from these projects - both in terms of CPP compliance and carbon intensity - and the anticipated or known end use of the gas.

    Response: Cascade has added language on Page 4-13 and 4-14 discussing Cascade's role in designing, building, and the procurement process for the purchase projects. Cascade provided the estimated emissions impacts for these projects. The carbon intensity of each project will be known after the projects are online and in operation.

14. For all RNG projects, please provide additional description about the benefits these projects provide to Cascade and Cascade's Oregon customers and which ones have Environmental Attributes that will apply to CPP compliance.

    Response: Cascade has included estimated emission impacts in the IRP for each project. Cascade's IRP informs, but it does not decide. As discussed in Chapter 9, because of the rules of the CCA/CPP at the time of modeling as well as the costs around all carbon compliance, all RNG/RTCs procured by Cascade are utilized in Oregon. However, the decision of where the environmental attributes from RNG/RTCs will not be decided until Cascade's files the information that proves Cascade has met carbon compliance obligations for the individual CCA and CPP filings.

Hydrogen

15. Staff would appreciate including a brief explanation in the Hydrogen section about the type(s) of hydrogen considered in this IRP.

    Response: All Hydrogen in Cascade's IRP is considered green hydrogen.

RNG and Hydrogen Projections

16. Cascade references some of the same sources for cost and availability used by NW Natural in its 2022 IRP. As Staff provided substantial comments on the cost and availability assumptions of RNG and Hydrogen in its comments in NW Natural's case,[8] it may be helpful to review

[7] Cascade Natural Gas Corporation 2023 Integrated Resource Plan Draft, January 5, 2023, pages 4-11 to 4-13.
[8] See Docket No. LC 79, NW Natural 2022 IRP, Staff's Opening Comments, December 30, 2022, Section 11, pages 64-72.

Staff's comments to see if there are concerns or questions raised in that docket that are applicable to Cascade and that the Company could address with additional clarification in its filed IRP.

Response: Cascade has reviewed the comments by Staff on NWN's 2022 IRP in the LC 79 filing. The Company recognizes the concerns from Staff and agrees that it is challenging to forecast the future of a resource as nascent as the RNG production market. The Company discussed RNG and its assumptions around RNG modeling during TAGs 3 and 4, during which stakeholders were encouraged to provide feedback and any additional resources the Company should considered, as outlined in Cascade's stakeholder engagement document. The Company did not receive any additional studies and thus used the best information it had available for its modeling, which Cascade does believe included appropriate and reasonable assumptions for the potential future of RNG. That being said, Cascade did recognize that some many see these assumptions as overly optimistic, which is why the Company performed sensitivity analyses around RNG pricing at $26/dth for scenarios where high volumes of RNG need to be acquired, along with analyses around low RNG volume assumptions being available for the optimization model to select. The results of these analyses can be found in Chapter 9, Resource Integration.

17. In the Draft, it appears the company anticipates acquiring more RNG for WA than for OR.[9] This was surprising to see given the constraints around environmental attributes in WA. Please provide more explanation about the difference in RNG potential volumes in WA and OR.

    Response: The Company appreciates this feedback as this figure is unclear. The figure is intended to represent the load weighted share of the total RNG projected to be available each yeah, not necessarily what is acquired for each state. Since the Company has a higher load in Washington, more RNG is allocated to "Total WA RNG." These volumes are then allocated to Oregon because of their philosophy related to environmental attributes in the CPP. Actual supply takes can be found in Chapter 9, Resource Integration. Language will be added to the IRP to clarify this.

Capacity Resources

18. Staff recommends more elaboration the meaning of the sentence that says "Cascade released the incremental capacity at max rate to a third party for the first ten years". If the intent is to describe how the incremental costs of the 10,000 dths gained from the hydraulic exchange are paid for, the information as provided makes it hard to understand the impact of Cascade's action.

    Response: Cascade has removed the language to the Bremerton-Shelton lateral in the final version of the IRP.

Pipeline Capacity

19. The Company describes a number of projects but does not make it explicitly clear the role

[9] Cascade Natural Gas Corporation 2023 Integrated Resource Plan Draft, January 5, 2023, Figure 4-4, page 4-16.

these capacity projects play in current or future supply.[10] It would be more helpful to use consistent descriptions about what role each project plays and the extent to which future supply planning relies on these projects or not. If the descriptions are just included to discuss how each capacity will be modeled, please make that clear and consider a table that articulates modeling assumptions.

Response: Cascade added language to Chapter 4 that discusses each project. As mentioned earlier, the decision of where the environmental attributes from RNG/RTCs will not be decided until Cascade's files the information that proves Cascade has met carbon compliance obligations for the individual CCA and CPP filings.

20. Staff urges Cascade to use the name "GTN Express" when referring to the "GTN Capacity Acquisition" project if that is what is meant.[11] Recognizing that GTN Xpress has garnered attention from advocacy groups, please consider additional information about the role this project plays in the Company's planning, any anticipated impacts if this project didn't manifest, and alternative ways to meet the need this project addresses.

    Response: Cascade has added language to Chapter 4 with a GTN Xpress section.

21. It would be helpful to consider providing more information about whether, and the extent to which, each capacity project is related to load growth.

    Response: Cascade added language to Chapter 4 stating the incremental supply side options can potentially solve shortfalls caused by growth, as well as provide different options to transportation agreements that may be expiring during the planning horizon. In the IRP two- to four-year action plan, Cascade does not have any plans to acquire incremental capacity. However, if Cascade does in future IRPs, the Company will include reasoning for the need of the incremental supply side resource.

Storage opportunities

22. With regards to Mist Storage, Staff would appreciate that Cascade state in the filed IRP the reason information about the 2021 Mist RFP wouldn't have been known for this current IRP - and hence was not modeled – considering that this IRP was developed in 2022-2023.

    Response: This information was accidentally left in the IRP from the previous IRP filing. This language has been removed.

23. The section begins with the statement "[t]he purpose of this section is to identify the potential incremental supply resources the Company considered for the current IRP". However, the descriptions for each section don't make it entirely clear how the company is using this information in this planning process. For example, Staff is intrigued by the last sentence in the paragraph about Spire Storage where the company states "[i]ncremental transport involving

[10] Cascade Natural Gas Corporation 2023 Integrated Resource Plan Draft, January 5, 2023, pages 4-25 to 4-27.
[11] Cascade Natural Gas Corporation 2023 Integrated Resource Plan Draft, January 5, 2023, page 4-25.

Questar and possible Ruby would be necessary." In this case, it is not clear what is the nature of the 'necessity' and how it informs the modeling or resource selection. As such, the description of each resource should be consistent so that it is clear to the reader whether, and how, a resource was included in modeling.

Response: Cascade added clarifying language that states these projects are modeled in the instance these projects are needed to solve a shortfall or replace an existing supply side resource that may be expiring. Cascade has also gone through each of these sections and made edits to clarify each project.

Topic: Avoided Costs

24. Staff questions the extent to which the components of Cascade's avoided costs methodology capture the increased costs from RNG. For example, it would appear that CNGC needs to acquire nearly $50 million in RNG by 2028. To the extent that cost could be avoided by energy efficiency, would it be found in the methodology's Commodity Cost or in the Environmental Compliance Costs? If the preferred portfolio's forecasted 2028 RNG costs are not accounted for in energy efficiency's avoided costs, the filed IRP should detail the reasons.

    Response: Cascade challenges the assertion that the cost or acquisition of RNG will automatically be an avoidable cost through the usage of demand side resources. In years where CCIs would be more expensive than RNG, it would be more appropriate to utilize the commodity cost of traditional gas plus the cost of CCIs as the marginal avoided cost versus the cost of RNG, as the former would be most valuable resource to avoid. In its current iteration, the avoided cost utilizes the commodity cost of traditional cost plus the social cost of carbon to model the increased expected costs from environmental compliance. This is consistent with the methodology established in UM 1893, and one that the Company believes reasonably captures this element of the avoided cost calculation. The Company is willing to explore alternative methods of capturing the cost of environmental compliance, but believes this should be handled within the UM 1893 docket or a new docket altogether as opposed to a specific utility's IRP, as this precedent would impact all utilities in Oregon.

Topic: Environmental Policy and Compliance

Federal Regulation and Policy

25. The draft IRP references various incentives that encourage such things as gas heat pumps. However, there are a number of other aspects of the IRA associated with electrification that impact gas utilities and that were not included in the summary. Please include more information about these aspects of the IRA in the filed IRP. For reference, Staff described some of these in its 2023 SB 844 Report,[12] as quoted below:

    > The Inflation Reduction Act allocates funding to States and Tribes to administer two rebate programs designed to reduce residential energy consumption. The State of Oregon's allocation for these two programs is

[12] See "Senate Bill 844 Progress Report: Report to the 2023 Legislature", February 2023, available at: https://www.oregon.gov/puc/forms/Forms%20and%20Reports/2023-PUC-SB844-Biennial-Report.pdf

expected to be $114 million.[13] The first program, a High-Efficiency Electric Home Rebate Program, will encourage electrification of residential combustion appliances by providing substantial rebates to low-to-moderate-income customers for electric heat pumps, electric heat pump water heaters, induction stoves, building envelope weatherization, and electric panel upgrades.[14] The second program, Home Energy Performance-Based Whole-House Rebates, will encourage homeowners to invest in efficiency upgrades that improve the home's overall energy performance.[15]

The Inflation Reduction Act also updates and extends through 2032 an expired residential tax credit for qualified energy efficiency home improvements, which can include natural gas space and water heating appliances and building envelope weatherization.[16] Additionally, the Inflation Reduction Act includes tax provisions that gas utilities, or their industrial customers, may use to reduce GHG emissions. These include a new tax credit for the qualified production of clean hydrogen[17] and extension and modification of the existing tax credit for carbon oxide capture.[18] Finally, the Inflation Reduction Act establishes a fee for methane emissions from pipelines, wells, and other sources, but natural gas distribution utilities are exempt from this fee.[19]

Response: Cascade has updated the language in Chapter 6 to include more information on the Inflation Reduction Act.

26. With regards to the section for Environmental Protection Agency,[20] Staff recommends that Cascade consider removal of reference to activities in 2022 that "might" happen and see if there are any places where policy updates are needed.

Response: Cascade has added clarification language to Chapter 6.

27. Staff appreciates reference to the Securities and Exchange Commission GHG and Climate-related Risk Disclosure Rulemaking.[21] While Staff isn't suggesting that the Company include additional information in the IRP, it should anticipate that Staff will be interested in seeing the filings of the Company, either in the IRP itself or through the discovery process.

[13] See November 2, 2022, announcement by U.S. Department of Energy, available at: https://www.energy.gov/articles/biden-harris-administration-announces-state-and-tribe-allocations-home-energy- rebate.
[14] See Section 50122 of the Inflation Reduction Act.
[15] See Section 50121 of the Inflation Reduction Act.
[16] See Section 13301 of the Inflation Reduction Act, which modifies Internal Revenue Code Section 25C. 17 See Section 13204 of the Inflation Reduction Act, which creates Internal Revenue Code Section 45V. 18 See Section 13104 of the Inflation Reduction Act, which modifies Internal Revenue Code Section 45Q.
[17] See Section 13204 of the Inflation Reduction Act, which creates Internal Revenue Code Section 45V.
[18] See Section 13104 of the Inflation Reduction Act, which modifies Internal Revenue Code Section 45Q.
[19] See Section 60113 of the Inflation Reduction Act. The methane emissions charge is explained in this brief: https://crsreports.congress.gov/product/pdf/R/R47206.
[20] Cascade Natural Gas Corporation 2023 Integrated Resource Plan Draft, January 5, 2023, page 6-7.
[21] Cascade Natural Gas Corporation 2023 Integrated Resource Plan Draft, January 5, 2023, page 6-8.

Response: These filings will likely be available beginning in 2025. Cascade looks forward to working with Staff to share these filings.

Compliance Approach

28. In section b regarding the Climate Protection Program (CPP), Staff is not clear whether the Company meant to say that Cascade's compliance is expected to be predominantly met with no-cost allowances, RNG purchases, and CCIs, or is this a general statement?[22] In addition, please consider adding additional information about the anticipated role of DR and EE.

    Response: That was a general statement. Cascade has added language to page 6-13 to clarify.

Emissions

29. With regards to the section for Customer Emissions,[23] it should include a table of customer emissions from natural gas combustion, similar to what Cascade has provided for emission reductions.

    Response: Cascade has included a table in Figure 6-3 that shows Cascade's historical customer emissions, and a projection of customer emissions that are covered under the CPP.

30. Staff appreciates the inclusion of the Historical DSM Savings table showing total therms and emission reduction for each state by year.[24] Staff recommends Cascade consider also showing these emission reductions by customer broken out by customer type. It would also be interesting to understand the reason behind emission reductions in WA being so much higher - and accelerated, than those in OR.

    Response: Cascade has updated the table in Figure 6-4 to show the historic DSM savings broken out by customer type. Washington has higher potential savings due to the fact that Cascade serves more customers in Washington than Oregon. The reason for the large jump from 2020 to 2021 potential therms savings is due to a large DSM project for a single commercial customer.

31. Regarding leak reductions,[25] Staff would like Cascade to consider including information about the impact or anticipated impact of efforts to reduce leak emissions.

    Response: In March of 2021, Cascade, along with the other utilities under Montana Dakota Utilities umbrella implemented a new leak mitigation policy. At the time of this policy, there were 1,050 leaks that were distinguished as Legacy Leaks. As of May of 2023, the number of Legacy Leaks is down to 11 total. The MDU utility group will continue these efforts in mitigating the remaining Legacy Leaks as well as any future leaks.

[22] Cascade Natural Gas Corporation 2023 Integrated Resource Plan Draft, January 5, 2023, page 6-13.
[23] Cascade Natural Gas Corporation 2023 Integrated Resource Plan Draft, January 5, 2023, page 6-27.
[24] Cascade Natural Gas Corporation 2023 Integrated Resource Plan Draft, January 5, 2023, Figure 6-3, page 6-28.
[25] Cascade Natural Gas Corporation 2023 Integrated Resource Plan Draft, January 5, 2023, page 6-32.

Topic: Natural Gas Fact Finding (NGFF) Report

32. Staff notices and appreciates Cascade's efforts to incorporate some of the IRP suggestions from Docket No. UM 2178. Staff would appreciate the Company identifying which of the NGFF recommendations it has incorporated in this IRP, as well as which ones will it not be incorporating and why. See Table 2 in the Natural Gas Fact Finding Report and respond to at least each of the following recommendations (table 2 in the report includes other recommendations that may not be applicable):[26]

Section 5 Analysis	Recommendation	Comments
Protecting Customers	Estimated ratepayer bill impact	Staff appreciates the inclusion of Appendix J and asks that Cascade include further descriptions about how it estimated the bill impacts associated with compliance with CPP, including, at a minimum, general approaches it is considering for rate spread as well as $/GHG emission reduction, where possible.
	EE programs to include transport	As referenced in various sections in this feedback, Staff looks forward to learning more about the opportunities for EE programs for transport / transportation customers and appreciates Cascade's activities described to date.
	Target IRA Incentives	Consider including a section on how IRP incentives are modeled and whether the Company is pursuing federal incentives.
	Align near-term investments with CPP compliance	Cascade should include in the IRP whether and how action plan items align with CPP compliance.
Full Cost	Develop marginal abatement cost curve	Staff appreciates that the Company intends to explore the use marginal abatement costs in its evaluation of emission reduction strategies and looks
Section 5 Analysis	**Recommendation**	**Comments**
		forward to more discussion of the pros and cons of this approach as compared to the use of SCC.
	Utilities articulate electrification assumption in IRPs	Cascade should provide documentation all electrification assumptions used to support the electrification of heating for each customer class and all associated workbooks. Cascade should explain how its assumptions align, or not, with information provided by the electric utilities of the territories in which it operates. At a minimum, Cascade should craft electrification assumptions that are informed, and ideally validated, by the electric utilities with which it shares territory.
	Electrification info and data from DSP	As applicable, Cascade should work with PacifiCorp to develop electrification assumptions aligned with information and data being submitted in PacifiCorp's Distribution System Planning efforts.

[26] See Docket No. UM 2178, Natural Gas Fact Finding Final Report, January 2023, page 2, available at: https://edocs.puc.state.or.us/efdocs/HAU/um2178hau111621.pdf

Decarb Planning & Cost-Recovery	Gas system maps with infrastructure age and depreciation information	Cascade should indicate what information it can provide in digital map format. In particular, it should be able to show the location, age, size and type of pipe, as well as information indicating where distribution system upgrades are being considered and why.
	CPP as an acknowledgeable item in IRPs	Cascade should ensure that the IRP demonstrates incremental progress toward meeting CPP GHG emission reductions through the actions taken in this IRP and should seek acknowledgement of these actions as those taken to meet CPP compliance.
	Exploring IRP guidance from UM 2178	Cascade should review Appendix B of the NGFF Final Report and identify which of the IRP recommendations it has incorporated, will incorporate, or plans to incorporate in this IRP. Which ones will it not be incorporating and why?
Monitoring, Tracking, and Reporting	Annual PUC report based on DEQ compliance filings	Cascade should demonstrate progress toward meeting CPP compliance through the plans articulated in the IRP with annual reports based on DEQ compliance filings and referencing associated action plan items as appropriate. These reports should also include the associated costs. These reports, where applicable, can be submitted as part of an IRP Update when the timing accommodates this or as a separate report. This report should clearly track and delineate alternative supply actual costs.
	Utilities host annual utility report on CPP compliance filings	
	Enhance tracking of alternative supply of actual costs and report to planning	
Incentivize GHG reduction pathways	Explore use of SB 844 for emerging technologies	Cascade should include a description of all SB 844 related activities.
	Pilot or joint pilots with electric utilities proposal by 2025	Cascade should share opportunities it envisions, or progress made on pilots.

Response: Cascade has included several of the recommendations from the UM 2178 filing. Cascade strongly urges a docket to be opened regarding Integrated Resource Plan rules and guidelines given the requirements around IRPs has shifted.

Topic: Demand Side Management

33. Staff appreciates the work by the Company and Energy Trust for a solid analysis of energy efficiency potential in the upcoming IRP. While the Draft IRP shows an overall increase in total energy efficiency compared to the previous IRP, it is clear about the drivers of energy efficiency growth, the changes in the sources of savings, and why those changes are occurring. Transparency around new technology and realistic rates of adoption are commendable.

    Response: Cascade appreciates Staff's recognition and thanks Energy Trust for the collaborative effort during this IRP process.

34. While the Draft describes briefly the steps taken by the company to improve the performance of its low-income programs, the filed IRP should go a step further and include a description of the Company's plans, if any, to more effectively integrate Energy Trust's residential activities with Cascade's programs designed to reduce energy burden.

Response: Cascade has added language on Page 7-3.

35. Per Figure 6-18 in the Draft IRP, there would appear to be several million more potential therms of energy efficiency savings between $1.08 and a $1.27 on a levelized cost basis that are cheaper than the forecast $1.40/therm for RNG. Staff would appreciate the Company explaining in the filed IRP the extent to which PLEXOS could be allowed to select greater levels of energy efficiency – beyond Energy Trust's forecasts – versus RNG as part of a least-cost/least-risk portfolio. It may be helpful to review Staff's comments on this topic in NW Natural's 2022 IRP.[27]

    Response: Energy Trust of Oregon has clarified that when looking at the potential therms on a levelized cost curve, there still needs to be consideration made towards the deployment process and not simply the avoided cost. Cascade provided a separate, high commodity, avoided cost to ETO where they provided potential therms under a higher avoided cost. The higher avoided cost only produced an extra 1 million therms of potential savings. Cascade included the higher potential savings in Plexos where Cascade selected which Scenarios to model the higher potential savings. In Chapter 9, Cascade discusses in each scenario where the higher potential savings were utilized when modeling scenarios in Plexos. Also, Cascade has updated Appendix H Page 6 and included the high commodity prices that were used to produce the higher projected savings.

36. The discussion in the Draft IRP around Target Load Management (TLM) was helpful but seemed to include no actionable items, especially around demand response as a TLM tool. Staff suggests the filed IRP include a fuller discussion of on-gas demand response pilots.

    Response: Cascade and Energy Trust have kicked off this process. Cascade has gathered the Company information that Energy Trust should use to do the TLM project. Energy Trust will run the TLM project during their 2023 budget process. Cascade expects to receive results from Energy Trust near the end of 2023 or beginning of 2024 and anticipates including this information in the 2025 IRP.

37. Similar to comments on Demand Forecast, Staff would hope to see far more near-term action on Transportation customers' energy efficiency as part of this Action Plan window, as they account for a large percent of covered emissions.

    Response: Cascade has added language on Page 7-35. Cascade is weighing options on how to fund the project, as well as determining the best way to track the process.

Topic: Distribution System Planning (DSP)

38. Following Commission's Order 23-023 in expecting evidence that the company acted with a sense of urgency in pursuing alternatives for distribution system projects,[28] Staff would have

[27] See Docket No. LC 79, NW Natural 2022 IRP, Staff's Opening Comments, December 30, 2022, Section 3
[28] See Docket No. LC 76, CNGC 2020 IRP Update, Order 23-023, February 6, 2023, page 2.

liked to see how the exploration of non-pipe alternatives is included in the distribution system planning process. Apart from a paragraph on "Targeted demand side management" when discussing distribution system enhancements,[29] examples of such alternatives, such as renewable natural gas, electrification, building code changes, energy efficiency programs are mentioned only in passing in the DSP chapter's conclusion section.[30]

Response: As the Company transitions from "just-in-time" analysis on distribution system projects to a more forward looking analysis, Cascade will continue to improve the models and the alternative options.

39. Staff welcomes the capacity enhancement alternative of Demand Side Management (DSM) selected for Ontario and Baker City. If successful, such DSM projects can be considered as models on how to pursue capacity enhancements by reducing load at targeted areas when system usage is at its peak. Although cost estimates have not been finalized, these two projects represent prime examples of not just solving a near-term need, but also supporting the company's system-wide CPP compliance plan. In this regard, Staff recommends Cascade to demonstrate how each of the DSM projects will reduce emissions to meet CPP targets.

    Response: Cascade will not have results of the targeted load management in the current IRP. However, once the impacts of the targeted load management are known, Cascade will provide an update to OPUC.

40. For each distribution system project presented in the Draft, Staff is urging CNGC to follow the Commission's endorsement, in Commission's Order 23-023, of encouraging the use of Attachment A in the Staff's Report for Cascade's 2020 IRP Update when presenting data for each project (in either the IRP document or work papers or both).[31] Staff uses the set of questions in Attachment A for requesting specific information that help build an analytical framework to be used for the assessment of proposed distribution system projects.

    Response: Cascade has put together an Appendix I for distribution system planning in an effort to meet the requirements from attachment A. Cascade provided that Appendix to OPUC Staff prior to filing the final IRP.

Topic: Resource Integration

41. In the description of the new stochastic methodology utilized for the 2023 IRP,[32] the number of Monte Carlo draws is being significantly reduced from 10,000 draws approach in the last IRP (2020) to 200 draws, but each portfolio is run through all the 200 draws. Cascade acknowledges in this section that there is some risk in reducing the sample size by such a large margin. It would be extremely helpful to have some additional explication for this change and

[29] Cascade Natural Gas Corporation 2023 Integrated Resource Plan Draft, January 5, 2023, page 8-9.
[30] Cascade Natural Gas Corporation 2023 Integrated Resource Plan Draft, January 5, 2023, page 8-12.
[31] See Docket No. LC 76, Cascade's 2020 IRP Update, Staff Report, October 7, 2022, pages 19-23.
[32] Cascade Natural Gas Corporation 2023 Integrated Resource Plan Draft, January 5, 2023, page 9-9.

its theoretical foundation. It's entirely possible that the new methodology is sound, and maybe preferable to the old methodology. Staff shares the sentiment of concern due to the reduction in sample size, but can also speculate on some advantages from using the new methodology. Additional information on the concept behind the change would help Staff ascertain the superiority of the new methodology. It is possible that the theoretical foundation for this change is described sufficiently in Appendix G that is not yet available, but if not, more detail would be necessary.

Response: The characterization of the Monte Carlo is misunderstood here. Both the 2020 IRP and the 2023 IRP included Monte Carlo simulations of 10,000 draws. Once the 10,000 draws of weather and price were created, SENDOUT (2020 IRP) and Plexos (2023 IRP) were modeled, optimizing the entire planning horizon, using a sample size of these draws. In the 2020 IRP, only one draw was used (99th percentile) as the time to run a single draw using SENDOUT was very time intensive. In the 2023 IRP, Cascade was able to reduce the run time using Plexos, which allowed Cascade to optimize 200 random draws in a reasonable amount of time. In future IRPs, Cascade will continue to look at efforts to increase the number of draws the Company can reasonably optimize through Plexos.

42. In describing portfolio evaluation,[33] Cascade introduces the evaluation metric of Long-Term Success Probability, which is a combination of the stochastic loss of load probability and emissions reduction compliance. How should this metric be interpreted? As shown in Figure 9-12, the All-In portfolio is shown to have a 98.50 percent long-term success probability. For this portfolio, how can it be determined whether the 1.50 percent chance of failure represents a failure to meet emissions compliance or a loss of load? Acknowledging that the Company will break this metric into two separate metrics in future IRPs, Staff would find it helpful to know in this IRP of any means to disaggregate that number to indicate whether loss of load or failure to comply with emissions is the bigger driver of that probability of failure.

    Response: After further digging of the loss of load under the All-In with DSM portfolio, Cascade determined the loss of load was due to failure to meet emissions compliance. In the three instances of the 200 Monte Carlo Plexos runs, the compliance failure occurred in the year of 2050.

43. Whether in the filed IRP or related workpapers, Staff expects more details of the resource stack of the top-ranking candidate portfolio in Figure 9-14. Given the limited information provided in the Draft IRP, Staff infers that Cascade plans to acquire something closeto 200,000 tons of emissions reductions from RNG by 2028. This equates to over 37 million therms of RNG, which is forecasted to incur additional costs of $39 million.[34] Purchasing such amount of RNG by 2028 would appear to increase the Company's revenue requirement by nearly half.[35] If

[33] Cascade Natural Gas Corporation 2023 Integrated Resource Plan Draft, January 5, 2023, pages 9-17 and 9-18.
[34] Using the EPA's emissions factor, 200,000 tons reduced divided by 0.0053 (emissions factor) equals ~37 million therms of RNG. Given that the cost of RNG in 2028, net the avoided cost of natural gas, will be approximately $1.05 / therm,
~37 million x $1.05 = $39 million in additional costs to acquire RNG levels forecast in 2028.
[35] Based on the 2021 Oregon Utility Statistics Book (page 44), CNGC's Oregon Revenue was $77 million from Natural Gas sales.

a substantial cost as this is planned, Staff looks forward to the Company providing more information and discussion in the filed IRP about the reasons for considering the preferred portfolio as least cost/least-risk to ratepayers.

Response: Under the assumptions used in the 2023 IRP, RNG/RTCs are the least-cost least-risk solution to the IRP.

44. The energy efficiency included in the resource stack of the top-ranking candidate portfolio appears to be entirely from existing energy efficiency programs. To Staff's understanding, CPP-covered Transport customers account for potentially as much as one-third of DEQ-covered emissions, yet it would appear in the Draft IRP they are providing no emission reductions via energy efficiency. Staff sees more aggressive energy efficiency, vis-à-vis higher avoided costs, to achieve CPP compliance as being solely paid for by Core / Cost-of-Service customers. If this is true, in the filed IRP Staff expects the Company to explain how Transport customers who have DEQ covered emissions are not free riders unless and/or until they have an energy efficiency program of their own launched. Staff looks forward to this discussion in the filed IRP and any more aggressive action the Company may take in this regard beyond just simply assessing potential savings with Frontier Energy.

Response: It is unclear if transport customers are considered free riders. The CPP and the CCA in Washington require Cascade to be responsible for several non-core customers although the Company does not purchase their gas supply, therefore there is uncertainty around how compliance costs will be recovered. However, Cascade does agree that a demand side option for transport customers should be implemented. Cascade is currently weighing multiple options regarding how to fund the offerings as well as how to track the process. Cascade is actively working on this and will update stakeholders through the IRP Update filing.

45. In its description of RNG availability,[36] Cascade uses a calculation that assumes the Company will be able to acquire a share of total available RNG equal to its share of total natural gas sales around the country. This might be a reasonable proxy for Cascade's ability to access RNG supplies, but Staff looks forward to the theoretical basis for this assumption. Additionally, it would be helpful to see some description of how the company landed on that assumption. On the other hand, it would be useful to know if it was just a simple proxy.

Response: Assuming enough RNG exists to satisfy market need, which the Company acknowledges is not guaranteed but rather an assumption at this time, Cascade believes there will be a fairly strong quantitative correlation between natural gas sales and the need to acquire RNG to offset emissions from those sales. Furthermore, the Company believes this is a conservative projection, as not all natural gas sales will need to be offset with RNG. Many jurisdictions do not require their emissions to be offset in any way, while others provide alternative attractive mechanisms to do so, such as in Washington with the ability to purchase allowances to comply with the CCA. These factors are what lead to the Company using the blend of the high/technical potential of the AGF/ICF study. This, along with conversations with

[36] Cascade Natural Gas Corporation 2023 Integrated Resource Plan Draft, January 5, 2023, page 9-22.

other regional LDCs and a consultant hired by the Company to assist with environmental compliance, primary informed Cascade's decision making process in landing on these assumptions.

46. When describing Scenario 2 (Carbon Neutral by 2050),[37] Cascade assumes that natural gas prices will fall by 10 percent. Staff understands the basic logic of this assumption – more gas bans, carbon taxes, etc. means lower demand and lower prices. However, given that LNG exports have picked up and that the natural gas market might be trending towards a more homogeneous global market (such as the oil market), Staff questions the assumption that policies restricting gas consumption in the PNW or the US necessarily mean lower prices. It would be helpful to see the Company explore or justify this assumption in a bit more detail.

    Response: While an increase in LNG exports have certainly globalized the natural gas market, Cascade has noticed a significant break in correlation between the Pacific Northwest markets and Henry Hub, the widely considered barometer of national pricing. While this past winter certainly exhibited extreme events that lead to this divergence, it does show that it is not unreasonable to expect exogenous events to have an impact on regional markets.

Topic: Two-Year Action Plan

47. Staff expects the action plan to cover four years. To this end, Staff appreciates the continued development of PLEXOS and encourages the Company to allow the software to compete all resources against one another in developing a portfolio, including energy efficiency and demand response.

    Response: Cascade has reviewed Staff's comments on Northwest Natural's 2022 IRP and Cascade agrees with Northwest Natural's response. There are several aspects of the avoided cost as well as realistic ramp rates and adoption curves that Plexos cannot model. Cascade would like to follow up on a question that NWN asked, does Staff see this as a replacement of Energy Trust's projections, or would this be in parallel?

48. Staff suggests the filed IRP to offer more details than the Draft IRP about the Company's activities to ramp up from a projected 2.5 million RNG therms per year from the Deschutes Landfill project in 2024 to an additional ~30 million RNG therms or credits just four years later. These details should provide an exploration of ratepayer cost impacts and compliance risks.

    Response: Cascade has added more language to Chapter 4, describing the amount of Renewable Natural Gas and RTCs the Company has either procured, or are in discussions to procure in the near future.

Topic: Clerical Suggestions and Questions

Staff has some suggestions and questions regarding textual modifications in the Draft that, although considered minor, would enhance the clarity and readability of the IRP. They are listed as follows (for

[37] Cascade Natural Gas Corporation 2023 Integrated Resource Plan Draft, January 5, 2023, pages 9-25 and 9-27.

each item, place in the Draft identified by preceding reference to page number in the Draft):

- Page 1-2 (p. 8): In the "Key Points" blue-highlighted box, the sixth bullet point shows "Washington" for the energy efficiency projection in therms. Is this meant to be "Oregon"?
  Response: Cascade has updated the key points.
- Page 1-8 (p. 14): In the paragraph before last (re Chapter 6: Environmental Policy), which Climate Protection Program rule is referred to here?
  Response: Cascade is referring to the entirety of the Climate Protection Program.
- Page 1-11 (p. 17): In the first paragraph (re Chapter 8: Distribution System Planning), why is targeted demand response not mentioned as a non-pipeline solution besides the energy efficiency measures?
  Response: Cascade describes demand side options in the penultimate paragraph under Chapter 8.
- Pages 4-17 to 4-18 (pp. 70-71): The descriptions of the utilization of various storage options could be made clearer if there was a consistent structure for how each resource was described.
  Response: The various storages are unique in their own way, which requires separate ways to describe the storage facilities and how the facilities are utilized. Cascade will work with Stakeholders in future IRPs to better align the description of storage facilities so they're best understood.
- Page 4-18 (p. 71): Please define the term "TF-2 firm".
  Response: TF-2 is a secondary firm contract under Northwest Pipelines tariffs.
- Page 4-19 (p. 72): What is meant by "amendment"? It is not clear if this is an amendment to an existing contract or a physical amendment?
  Response: Cascade removed the Bremerton-Shelton lateral subsection. The Bremerton-Shelton lateral was completed prior to the 2023 IRP and was accidentally left in the chapter. If Staff wants more information on the Bremerton-Shelton lateral, Cascade will gladly discuss that further outside of the IRP.
- Page 4-19 (p. 72): Please provide more detail about shortfalls along the I-5 corridor identified in the 2018 IRP and referenced on the last paragraph this page. It will make it easier for the reader to copy the relevant text into the document or at least provide citations to the reference.
  Response: Cascade removed the Bremerton-Shelton lateral subsection. The Bremerton-Shelton lateral was completed prior to the 2023 IRP and was accidentally left in the chapter. If Staff wants more information on the Bremerton-Shelton lateral, Cascade will gladly discuss that further outside of the IRP.
- Page 4-27 (p. 80): Under the first bullet of storage opportunities, please explain or further describe what is meant by Niska.
  Response: Niska was the Company that owned and operated the AECO Hub storage. The new Company is now Rockpoint. Cascade has updated the language in the IRP.
- Page 6-2 (p. 100): Please provide citations for the laws referenced on this page.
  Response: Cascade has updated the language and added footnotes.
- Page 6-3 (p. 101): Please provide a list of the trade associations referenced on this page.
  Response: The list includes but is not limited to Northwest Gas Association, American Gas Association, Western Energy Institute, Utility Solid Waster Activities Group, and MGP Consortium.

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June 2, 2023

Brian L. Robertson
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Phone: (509) 221-9808

Re: ***Cascade Natural Gas Company 2023 Draft Integrated Resource Plan***

Dear Mr. Robertson:

The Oregon Citizens' Utility Board (CUB) would like to thank Cascade Natural Gas Company (Cascade) for their considerable efforts to produce this 2023 Draft Integrated Resource Plan (IRP or Plan). CUB recognizes that this is a complex and challenging process and hopes Cascade will seriously consider and address CUB's comments before final submission of their 2023 IRP to the Public Utility Commission of Oregon (Commission).

These informal comments will address specific portions of the Plan that may require additional information from the Company to aid stakeholders and the Commission in reviewing the final IRP. As highlighted in CUB comments filed in NW Natural Gas Company's ongoing IRP, gas utility IRPs should function, in part, as a roadmap to demonstrate compliance with future Oregon Climate Protection Program (CPP) mandates and other prevailing decarbonization policy.

Chapter 4

RNG Projects Section

Comment # 1: In Cascade's final IRP filing, please provide a narrative explanation of how Cascade's two categories of RNG "transport projects" (currently totaling 7 projects) will be contribute to CPP compliance. The two categories of RNG "transport projects" discussed were:

1. The RNG is too expensive for rate-payer prudency, but a transport customer is willing to pay the premium for the environmental attributes and

2. The environmental attributes were pre-sold by the RNG vendor.

In each above case, will the natural gas being transported be considered brown gas that will increase emissions reductions requirements for Cascade, or will the gas be considered non-emitting in CPP calculations? If the latter is true, please describe any potential differences in CPP accounting between "purchased projects" and "transport projects" in the final IRP. It is CUB's understanding that the Commission will be analyzing RNG projects for contributions to CPP compliance.

Response: Cascade has added language to Pages 4-11 through 4-17 that clarify the different types of RNG projects and the reasoning why projects are chosen to be Transport projects. If a project is a transport project, or a partial purchase project, any gas that does not have an environmental attribute will not be considered non-emitting.

RNG and Hydrogen Projections Section

Comment # 2: To model long-term RNG availability and cost over the planning horizon, Cascade used data from the 2019 AGF/ICF study on the potential of various RNG feedstocks. In your IRP final filing, please provide a narrative explanation of how RNG availability was projected using the AGF/ ICF data.

Comment # 2.1: In particular, please explain why "a 50/50 blend of the High and Technical Resource Potential Scenarios" was deemed appropriate to model RNG "Expected Availability." Reconcile the use of a technical resource measure here with the definition and use of a technical resource measure as discussed in Chapters 6 and 7.

From pp 7-8: "Technical potential is defined as the total potential of a measure in the service territory that could be achieved regardless of market barriers or cost constraints."

From pp 7-9: "[Technical resource] potential does not take into account the various market and cost barriers that will limit a 100% adoption rate."

Response: The 2019 AGF/ICF study was written at a time where many regulatory bodies were still in the process of formulating plans to enact emissions reduction policies. To this end, many of the economic potential assumptions could not have incorporated the increased demand that will come from programs like the CCA and CPP. By setting its RNG potential as the average between the high and technical potential of the study, Cascade is not claiming that the technical potential will become 100% feasible, but rather that the Company is taking the position that market economics will lead to an ultimate potential that is higher than the AGF/ICF high projection, while not at the technical limit. Additionally, this blended value is meant to be considered in conjunction with the fact that Cascade calculates its share of this blend as proportional to its size relative to national gas sales, while in fact the Company expects to be more competitive in the RNG market than its proportional size would indicate. Many jurisdictions do not require utilities to offset their emissions in any way, while others provide alternative attractive mechanisms to do so, such as in Washington with the ability to purchase

allowances to comply with the CCA. These factors are what lead to the Company using the blend of the high/technical potential of the AGF/ICF study.

Comment # 3: Regarding Figure 4-4, in your final IRP filing please provide a narrative explanation of why, based on the data used by Cascade, RNG potential levels off after 2040. Is this a reflection of the AGF/ICF study only forecasting up to 2040, an indication that RNG feedstocks will be saturated at that time, or some other dynamic?

Response: Cascade based its assumption around the availability of RNG on the 2019 ACF/ICF study cited on page 4-15. In this study, it can be seen in Figure 8-23 that RNG level off at or before 2040. While this is the end of the study period, a common theme from these figures is that growth does not appear to be significant leading up to 2040, leading to Cascade's assumption that these resources will maturate at or before this point. This is substantiated by the statement on page 27 of the study, where the ICF says F54 Hydrogen growth potential does not stop around 2040, although it does slow as it is constrained as a function of by volume of traditional natural gas in Cascade's system (20% by volume in the base case.) The Company will add narrative to the final draft with regards to this.

Comment # 4: Regarding Figure 4-5, in your final IRP filing please provide a narrative explanation of how the RNG cost projections were calculated and modeled.

C # 4.1: How were the $13/dth and $19/dth tranches calculated and what was the source data? The projected price of RNG is critically important to Cascade's modeling and the market intelligence Cascade described on pp 4-8 cannot be satisfactorily vetted as currently presented.

C # 4.2: Please indicate how many sources contributed to the finding on pp 4-8 "$13-$30/dth long-term off-take deals" and for what period this projection is expected to be reliable. If possible, provide empirical data or studies relied upon to vet these forecasts. This information will assist CUB as we consider the reasonableness of these projections.

C # 4.3: While RNG capital projects may come online in a "lumpy" fashion, this does not adequately explain the use of a two-tranche price curve or the timing of the tranche transition. Please provide a narrative explanation of these RNG price modeling choices. CUB noticed that the timing of the tranche transition appeared to significantly impact the preferred resource mix from 2030 to 2032 (see for example Figure 9-14), suggesting that these modeling choices were significant.

C # 4.4: The OR RNG market competes with and is affected by other regional RNG markets. In your final IRP filing, please provide a narrative explanation of the expected impact of various RNG competitive markets, such as the California and Oregon Clean Fuels Programs, on the availability and price of RNG in OR.

Response: 4.1 - The pricing for RNG is informed by Figure 34 of the AGF/ICF study utilized in the IRP. These assumptions were vetted by Cascade's environmental compliance consultant, Guidehouse, and discussed with stakeholders during the UM 2178 investigation and throughout the TAG process, with no alternative methodologies proposed. Additionally, these prices were consistent with the deals Cascade was evaluating at the time that modeling assumptions were finalized for the 2023 IRP. As Cascade continues to engage with third parties to gain additional insights and expertise into the RNG marketplace, this assumption will be updated as appropriate for the IRP Update and future IRPs

4.2 - These prices were developed during early discussions with RNG producers. Cascade did not use the results of those early discussion in any modeling, but rather provided that information for compliance of AR 632. 4.3 describes the actual pricing that was modeled for RNG.

4.3 - Utilizing Figure 34 of the AGF/ICF study, Cascade identified that forecasted RNG pricing starts at around $7.5/dth and grows steadily until reaching approximately $17.5/dth. Growth significantly slows down at this point, which covers about 1/3rd of the projected volumes on the X-Axis. While it is difficult to project a price without the exact numbers of this figure, Cascade projects the weighted average price of this ""growth"" tranche to be approximately $13/dth. At this point growth slows down asymptotically, with some slight exceptions on this supply-cost curve, to an approximate weighted average of this ""flat"" tranche to be$19/dth. These constraints were then imported into the Company's PLEXOS modeling, where the first 1/3rd of supply would be able to be purchased at a price point of $13/dth, while the final 2/3rds of supply would be available at the $19/dth price point. These assumptions were vetted by Cascade's environmental compliance consultant, Guidehouse, and discussed with stakeholders during the UM 2178 investigation and throughout the TAG process, with no alternative methodologies proposed. Additionally, these prices were consistent with the deals Cascade was evaluating at the time that modeling assumptions were finalized for the 2023 IRP. As Cascade continues to engage with third parties to gain additional insights and expertise into the RNG marketplace, this assumption will be updated as appropriate."

4.4 – Cascade has expanded the narrative in Chapter 4 in an effort to describe the various RNG markets.

Comment # 5: Regarding Figure 4-5, in your final IRP filing please provide a narrative explanation of how green hydrogen cost projections were calculated and modeled.

C # 5.1: How were the two price tranches created, what specific data was used and from what source?

C # 5.2: Was the data source provided by Cascade, https://www.spglobal.com/commodityinsights/en/market-insights/latest-news/coal/033020-green-hydrogen-costs-can-hit-2kg-benchmark-by-2030-bnef, Cascade's only source of market intelligence?

Response: Being that it is a far more nascent market, Cascade found difficulty in finding multiple sources to accurately project the cost of Green Hydrogen over the planning horizon. Cascade's Green Hydrogen cost projects came exclusively from the S&P Global Forecast, but these assumptions were vetted by Cascade's environmental compliance consultant, Guidehouse, and discussed with stakeholders during the UM 2178 investigation and throughout the TAG process, with no alternative methodologies proposed. While Cascade recognizes the value of Green Hydrogen as a long term solution, Cascade does want to highlight that Green Hydrogen is not part of the Company's 2 to 4 year action plan, and the Company does not project a need to make any path dependency decisions related to Hydrogen until the next IRP at the earliest.

Comment # 6: Commission Staff recently published the UM 2178 Natural Gas Fact Finding Final Report. The report makes clear that IRP assumptions surrounding the price and availability of RNG and green hydrogen are to be given scrutiny their significance to CPP planning and utility customers.

From the report: "Most notably, future IRPs must include rigorously vetted assumptions, and alignment with Staff and Stakeholders on the following topics to help assess least-cost/least-risk compliance strategies…"

- Assumptions about the availability and cost of RNG;
- Cost, availability, timeline, and highest value use of hydrogen"

Given the findings of the report, CUB hopes Cascade will make it a priority to, in their final 2023 IRP filing, ensure that their assumptions about RNG and green hydrogen are as empirically backed and transparent as possible.

Response: Cascade ensures all assumptions are empirically backed and transparent as possible.

Incremental Supply Side Resource Options Section

Comment # 7: Regarding potential GTN Capacity Acquisition, in your final IRP filing please provide a narrative explanation of how acquiring additional GTN capacity would impact the steps Cascade must take to meet CPP emissions regulations. CUB's understanding, which is supported by the UM 2178 Natural Gas Fact Finding Final Report, is that new customers/ load is distinct from existing customers/ load, in that it must be completely offset, rather than offset relative to a baseline, throughout the CPP timeline. How does acquiring significant new capacity align with a least cost/least risk planning?

Response: GTN Xpress was discussed in the 2018 IRPs and acknowledged by both OPUC and WUTC. The purpose of GTN Xpress is mainly for safety and reliability to Cascade's Central

Oregon service territory as well as the system in total. More information on GTN Xpress can be found in a new subsection to Chapter 4, beginning on page 4-24.

Chapter 9:

Hydrogen Blending

Comment # 8: Hydrogen blending has not been piloted in Oregon yet and the percentage of hydrogen that can be safely blended into a natural gas distribution system remains uncertain, particularly given the unique attributes of different NG systems and their unique limitations. CUB notices and appreciates that Cascade discusses these uncertainties, and the need to address them, in multiple places throughout the IRP. Still, Cascade based its assumptions on hydrogen blending on the 2013 NREL study. In your final IRP filing please incorporate findings from the recent California PUC 2022 study on hydrogen blending (https://www.cpuc.ca.gov/news-and-updates/all-news/cpuc-issues-independent-study-on-injecting-hydrogen-into-natural-gas-systems).

The study suggests there are some risks at blends as low as 5% hydrogen, but there are greater risks at higher percentages. From the executive summary and based on results of the study, future demonstration projects and pilot programs should focus on "hydrogen percentages [that] are 5 to 20%."

In your final filing, if Cascade intends to retain hydrogen blends of Expected 20%, High 30% and Low 5%, then please justify these blends in light of the CPUC 2022 study.

Response: Cascade has added language to Chapter 4 acknowledging the CPUC Study, as well as the 2022 Hydrogen-Ready Appliances Assessment Report that was completed by NEAA.[1] Cascade will continue to gather information from outside sources on the hydrogen blend and appreciates CUB pointing out studies the Company has not included in the IRP.

Limited RNG Scenario

Comment # 9: CUB would appreciate clarification regarding the results of the Limited RNG Scenario. In Figure 9-24, the large white space beneath the "Demand less DSM" line seems to indicate that the two resource restrictions of this scenario would inhibit Cascade from meeting demand under CPP emissions requirements (at least, barring pathways not examined in this scenario). Nevertheless, Cascade states "the Company is confident in its ability to meet emissions reduction goals with reduced availability of RNG and Hydrogen."

What data does Cascade have in support of this confidence? Did Cascade continue adjusting this scenario, or create another scenario entirely with the same RNG and hydrogen restrictions, and manage to achieve resource adequacy and CPP compliance in OR? What

[1] https://neea.org/resources/hydrogen-ready-appliances-assessment-report

resource mix, and at what cost to customers, was successful and could Cascade present this information in its final IRP filing?

Response: As a point of clarification, the full sentence quoted is as follows: "The primary takeaway from this scenario is that, while the Company is confident in its ability to meet emissions reduction goals with reduced availability of RNG and Hydrogen, Cascade will have difficulty reaching its goals in Oregon. " The Company acknowledged that there would be challenges to meet its goals in Oregon and appreciates CUB highlighting this sentence as it does contain an error. This sentence should read: "The primary takeaway from this scenario is that, while the Company is confident in its ability to meet emissions reduction goals with reduced availability of RNG and Hydrogen in Washington, Cascade will have difficulty reaching its goals in Oregon (italics for emphasis.)" This edit will be made to the final IRP, which should clarify the result of this analysis. Additionally, as stated later in the key takeaways of Section 3, the Company was not able to identify a portfolio of resources that would meet these targets under the stated RNG and Hydrogen restrictions of that particular scenario. Later in the analysis of this scenario, the Company states the conclusion it draws from this scenario "rather than reject the Top-Ranking Candidate Portfolio, the Company has elected to use these results to reaffirm its position that aggressive pursuit of RNG will be vital to Cascade's successful compliance with the CPP in Oregon." For future IRPs, Cascade plans to evaluate additional resource options to solve for shortfalls in scenarios like this one, such as the utilization of additional demand side measures. Cascade will report on the progress of the development of these measures in the IRP update.

Electrification Scenario

Comment # 10: In the Scenario 4: Key Takeaways Section, in your final IRP filing please provide a narrative explanation of why customer bills increase so dramatically in this scenario.

Response: In the electrification scenario, bill impacts are increasing at an exponential rate due to stranded and newly incurred costs are being spread out to a declining number of customers.

Inclusion of a social cost of carbon

Comment # 11: CUB noticed and appreciated that Cascade responded to our previous feedback and included a social cost of carbon in their 2023 IRP.

Response: Thank you.

Sincerely,

/s/ John Garrett

John Garrett

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February 24, 2023

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RE: Cascade 2023 Draft IRP

Dear Mr. Robertson and the Cascade IRP Team:

Thank you for the opportunity to offer feedback on the 2023 draft IRP. Our comments offer support for Cascade's demand side management plans in lieu of supply side investments, so long as implemented with the needs of customers in mind, but point out significant flaws in other parts of the analysis.

- Failure to comply with IRP Guideline 1(d) and IRP Guideline 4(m)
- Lack of explanation and evaluation of alternatives to investments in the Prineville gate
- Failure to grapple with the need to adopt near-term emissions reduction actions while identifying realistic long-term compliance options
- Lack of rigor in forecasting future load
- Failure to evaluate possible limitations on renewable natural gas and renewable thermal credit use for CPP compliance
- Serious concerns about expending ratepayer dollars to examine hydrogen for future use

I. IRP Guideline 1(d) and Guideline 4(m)

Pursuant to IRP Guideline 1(d), the Company must explain how the plan is consistent with the long-run public interest as set forth in Oregon and federal energy policies. Additionally, to comply with IRP Guideline 4(m), it must identify and explain inconsistencies of the selected portfolio with state and federal energy policies that affect the utility's plan, and barriers to implementation.

Chapter 6 utterly fails to discuss the Company's decision to purchase 20,000 Dth/d from the GTN Xpress, a new gas pipeline expansion proposed by TC Energy, when the Attorneys General of both Washington and Oregon have objected to that expansion. According to comments from the Attorneys General of Oregon, Washington, and California, Cascade's emissions resulting from the GTN Xpress project alone could be over five times Cascade's authorized amount for 2050.

Chapter 6 also negligently fails to summarize the most consequential provisions of the Inflation Reduction Act (IRA) that incentivize electric appliances. Under the IRA, the Federal government has expanded residential tax credits for the purchase of heat pumps and provided additional rebates on electric appliances such as heat pumps, electric ranges, and electric clothes dryers.[1] Additionally, many states have instituted residential energy efficiency and electrification programs, such as California, which will provide $84.7 million in incentives for heat pump water heaters in 2023.[2] Oregon and Washington may each develop new energy efficiency programs, or expand programs, that would further reduce the incremental costs of electric appliance adoption, thus making electrification more cost-competitive for customers.

Response: Cascade believes that the 2023 IRP does in fact comply with the IRP Guidelines. Cascade did not include narrative regarding the GTN Xpress pipeline because the GTN Xpress was contracted for based on results from the 2018 Integrated Resource Plan. In the final filing of the IRP, Cascade did include more language around the 2018 IRP analysis in Chapter 4. In the final filing of the IRP, Cascade included more language providing a summary of the IRA. Given the timing of the IRA and how the demand forecast, avoided cost, energy efficiency, and much of the carbon compliance modeling was completed prior to the IRA being signed into law, much of the IRA is not modeled in this IRP, but rather an Action Item for future IRPs.

II. Action Plan Proposals

We support Cascade's decision to approach the Ontario and Baker City distribution system

[1] Text - H.R.5376 - 117th Congress (2021-2022): Inflation Reduction Act of 2022, Congress.gov, Library of Congress (Aug. 16 2022), https://www.congress.gov/bill/117th-congress/house-bill/5376/text.
[2] CPUC provides additional incentives and framework for Electric Heat Pump Water Heater Program, California Public Utilities Commission, April 7, 2022, https://www.cpuc.ca.gov/news-and-updates/all- news/cpuc-provides-additional-incentives-and-framework-for-electric-heat-pump-water-heater-program.

constraints with targeted demand side management, as guided by Energy Trust of Oregon. We urge consideration of the kinds of DSM that can improve comfort, health, and energy budgets for residential and commercial customers, and that capitalize on the tax credits and rebates available under the federal Inflation Reduction Act. Learnings from NW Natural's GEO-TEE project should provide the ability to expedite implementation of DSM. We look forward to participating in the development of those measures and offering feedback as opportunities become available.

We also eagerly await the outcome of Cascade's collaboration with ETO on a DSM program for transportation (non-core) customers. We similarly urge that any such program provide a complete picture of the energy efficiency opportunities available to transportation customers. Given the significant percentage of Cascade's load that consists of transportation customers, it is critical that the company move quickly and purposefully to assist those customers to identify and implement measures that will reduce the need to rely on natural gas at all. However, we question the rationale supporting Cascade's decision to invest in upgrades to the existing gate station serving Prineville. Cascade has simply failed to present a reasonable analysis justifying the investment, or explain how the investment will help it meet its obligations under Oregon's Climate Protection Program. Little detail is offered to support the expected increasing demand in the area or to explain the asserted urgent need for the project. It is unclear from the discussion whether the gas control alarms are related to the peak need or related to Cascade's inability to control the bypassing that is managed by TransCanada. Cascade has not explained why regulating the ability to bypass the gate station is worth $2,624,000 or what other options are available to it to manage its relationship with TransCanada and that company's staffing failures. In this new regulatory context, a higher standard of proof is necessary to demonstrate that any investments in the gas network will be "used and useful." Finally, Cascade's decision to reject DSM on the basis that it will require too much time to develop is not acceptable, especially when NW Natural and ETO have undertaken a geographically targeted DSM pilot for the last three years that provides important learnings for expedited implementation of DSM in other locations.

Finally, we will be asking the Commission to treat CPP compliance as an "acknowledgeable" item, or ask for a similar imprimatur from the Commission that Cascade has appropriately demonstrated the least risk and least cost pathway to CPP compliance. The draft IRP does not clearly demonstrate how it can realistically reduce its emissions in compliance with the CPP caps, other than purchasing CCI credits at the outset. In the long-term, a strategy that relies on RNG, renewable thermal credits (RTCs), and hydrogen is a highly risky approach. Additionally, despite state and local movements to electrify buildings, state decarbonization policies, and natural gas prices that are presently increasing and inherently unstable and unpredictable, Cascade assumes a steady growth in customers.

Pursuing this strategy also enables Cascade to continue operating as usual for the next decade

with minimal decarbonization efforts—a strategy that has been aptly named "tech-crastination."[3] This exposes Cascade to short-term compliance risk. Cascade relies on unrealistic RNG supply estimates, allowances, and credits to meet targets while it begins to explore hydrogen's role in its system. Short-run inaction and policy changes, such as excluding RTCs as a CPP compliance mechanism, or changes in RNG emissions accounting, increase the risk of non-compliance and higher rates. As a publicly regulated utility, Cascade must pursue decarbonization measures that reduce ratepayer risk in both the short- and long-term and this IRP does not provide valid reasoning that operating in a "business as usual" manner is the least cost, least risk approach to decarbonization.

Response: Cascade disagrees and believes the Company has provided sufficient support for the Prineville gate. Chapter 3 of the IRP includes a detailed analysis on the customer forecast, sharing results in Appendix B. From 2017 to 2022, Prineville average 2.56% growth for Cascade's service territory. From April 2022 to April 2023, Prineville saw 2.98% growth. The reason for the project is for safety and reliability, keeping in mind the Company needs to meet carbon compliance goals, which Cascade shows the least cost option of how to do that in Chapter 6. Given that the Company has experienced gas control alarms, and ETO has stated targeted load management needs a 3-4 year lead time, Cascade would put customers at risk of losing gas waiting on the targeted load management to complete.

Cascade disagrees that the IRP does not demonstrate CPP Compliance. Cascade used a demand forecast that had the best information at the time it was locked in for the IRP, while utilizing the best energy efficiency information, as well as RNG/RTC and CCI information. Cascade also included multiple scenarios and sensitivities that model other likely outcomes (e.g. Electrification Scenario).

III. Load Projections are Optimistic

The IRP reference case's load forecast is not realistic. Cascade's customer count trends do not realistically account for: 1) residential and commercial building code updates in Washington, 2) the possibility of line extension allowance updates in Oregon, 3) likely building code updates in Oregon, and 4) Inflation Reduction Act incentives to accelerate building electrification. Cascade is also not accounting for the possibility of reduced load associated with local policies supportive of beneficial electrification, particularly in Bend. These policy changes will likely have near- term impacts.

In its 2020 IRP, Cascade forecasted an average of 1.26% per year over the 20-year planning horizon. Now, purportedly recognizing the climate policies in place, Cascade forecasts "1.56% per year over the 20-year planning horizon" in the key points of Chapter 1 in its 2023 IRP. If

[3] Borgeson, M., and Fakhry, R., Hydrogen in Buildings: The Poster Child of Tech-Crastination, September 7, 2021. https://www.nrdc.org/experts/rachel-fakhry/hydrogen-buildings-poster-child-tech- crastination

"1.56%" is an error, as it appears it must be from the summary provided later in the IRP, we nevertheless question the basis of the Company's assertion that it will continue to grow through 2050.

As an initial matter, Cascade does not discuss the Commission's recent rate case Order that requires NW Natural to reduce its line extension allowances.[4] The Commission ordered that NW Natural set its line extension allowance to $2,300 starting November 1, 2022, and decrease it each year after November 1, 2024. The Commission expressed concern with the higher LEA citing the unrecovered rate base investment from new plant even after 30 years.[5] Additionally, the Commission noted the impact of the CPP and local policy changes in the Order stating, "These changes point to a reasonable possibility that the company will encounter a trend of decreasing gas usage, potentially driven by economic signals toward fuel switching." While the Commission does not stipulate how line extension allowances should decrease, it anticipates gas customer exits and a risk that gas line investments will be stranded. A similar LEA change is a risk Cascade faces that will affect its growth prospects.

Additionally, the Company's load forecast anticipates a growth rate in commercial customers of around 1.14%. We are not confident that such a forecast is aligned with rising natural gas prices, electrification trends, and climate policy that directs reductions in carbon emissions on the local, state, and federal level. Considering that policies such as the IRA heavily incentivize electrification, and Washington and Oregon have both introduced legislation that will severely limit new customer growth, it seems more likely that there will be a continual decline in demand as existing customers transition to electric alternatives. For all of these reasons, the IRP's load forecast is unrealistic.

Response: The load forecast is the first item that is locked in for the IRP process. During the IRP process, Cascade has kept stakeholders involved regarding when certain items are locked in. The load forecast model was locked in prior to the Washington Building and the Inflation Reduction Act were passed. If IRP stakeholders had communicated their issues earlier on in the process, Cascade could have delayed the IRP to incorporate these changes to the load forecast model. Cascade disagrees with statements regarding the Company's load forecast. Cascade has continued to see growth in the Company's service territory, most recently seeing a growth of 1.94% from April 2022 to April 2023 in the State of Oregon. Cascade agrees that the "possibility" or "likely" chance that something impacts the demand forecast should be modeled, which is the reason for the scenarios and sensitivities.

IV. RNG Expectations are Unrealistic

[4] UG 435, Order No. 22-388, First Partial Stipulation Adopted Subject to Modification; Second and Third Partial Stipulations Adopted; Application for General Rate Revision Approved as Revised (Oct. 24, 2022).
[5] UG 435, Order No. 22-388 at 49, First Partial Stipulation Adopted Subject to Modification; Second and Third Partial Stipulations Adopted; Application for General Rate Revision Approved as Revised (Oct. 24, 2022).

Cascade does not grapple with the volume of RNG available to it despite competition from other entities faced with the same decarbonization challenges. The incremental cost for each RNG site will escalate as the available supply dwindles, forcing Cascade to source increasingly costly RNG to meet its decarbonization targets. The transportation sector is the predominant customer of RNG due to policies such as the California and Oregon Low Carbon Fuel Standards. The U.S. Department of Energy estimates that there are 500 landfills, 120 dairies, 70 wastewater treatment systems, and 10 other livestock RNG projects in the United States.[6] The transportation sector uses an estimated 75 percent of the RNG produced, suggesting that this sector will continue to compete aggressively for RNG supply, ultimately resulting in price increases.[7] The Plan's rapid adoption forecast and procurement challenges will increase customer costs. Cascade must provide reasonable rates for customers and thus must bear the burden of proving that it can supply affordable RNG.

Cascade's solution to these issues may be to purchase Renewable Thermal Credits (RTCs), which the company believes will comply with the Oregon Climate Protection Program. Purchasing RTCs from other parts of the country does not help Cascade decarbonize *its* energy system, despite the RTCs purportedly counting for compliance. Additionally, Cascade has not properly explored the possibility that these credits may not be an acceptable compliance mechanism under future Oregon laws. The Environmental Quality Commission or legislature could more properly conclude that RNG emissions should be calculated on a lifecycle basis, require RNG projects to reduce GHG emissions *in Oregon*, or cap the number of RTCs that might be used for compliance. If the Company cannot purchase an unlimited number of RTCs for compliance, it risks non-compliance. Ultimately, the more Cascade relies on RTCs to meet compliance goals, the greater the risk that it will need to resort to uneconomical methods to meet compliance targets and pass those costs to ratepayers.

Relatedly, any final IRP *must* be clear about which projects in the list of RNG opportunities are those that will assist Cascade with its CPP compliance obligations. Any project that Cascade calls a Transport or Transportation Project, which does not provide Cascade with the RTCs, does not appear to be relevant, other than as a way to allow Cascade to keep natural gas piping in place and look climate conscious. In Chapter Four, Cascade lists two Transportation Projects but does not explain why the projects without RTCs are relevant to this planning exercise.

Response: Cascade incorporated the best RNG/RTC projections that the Company had at the time of the modeling. In many of the Company's TAG meetings, Cascade requested feedback on the RNG/RTC projections, however, there were no suggestions from stakeholders. Cascade

[6] Advancing Technology For America's Transportation Future - Chapter Fourteen, U.S. Dep't of Energy, https://www.energy.gov/sites/default/files/2022-10/Chapter_14-Natural_Gas.pdf.
[7] Paulos, Bentham. Analysis: Why Utilities Aren't Doing More with Renewable Natural Gas. Energy News Network (Feb. 14, 2019), https://energynews.us/2019/02/14/analysis-why-utilities-arent-doing-more-with- renewable-natural-gas/.

has added language to Chapter 4 that outlines which projects are for meeting Cascade's compliance obligations and those that are transport only projects. Cascade included transport only projects for multiple reasons such as transparency, including transportation sector decarbonization efforts even if it's not for Cascade's system, and potential RNG if rules ever align closer to the LCFS market.

V. Cascade should prioritize reducing emissions over investigating hydrogen investments

Cascade indicates it will continue to investigate the cost and feasibility of hydrogen in its Action Plan. Given the serious concerns with hydrogen in pipelines, including an increase in pipeline capacity (pressure-associated or volumetric), additional leaks and safety concerns, and costs, we urge Cascade to refrain from spending ratepayer dollars on any hydrogen-related efforts. A recent California Public Utilities Commission study shows that the greater the hydrogen concentration in the gas network, the more significant the leaks become.[8] Research also shows these risks increase significantly in service lines when hydrogen blends exceed 20 percent, with smaller distribution networks most vulnerable.[9] These hazards increase operational costs, since additional leak detection technology and more frequent maintenance inspections are necessary.

Additionally, while hydrogen blends can erode some gas distribution pipes, the greater concern is their impact on appliances. Studies suggest that some appliances cannot tolerate even the slightest blends.[10] Even if most appliances are compatible with hydrogen, it could only account for a small percentage of fuel until modifications to end use appliances are required.[11] The widespread blending of hydrogen in gas lines could thus require the abrupt retrofit of home appliances as soon as blending reaches the requisite level, likely well before the end of many installed appliances' useful lives. Given gas utilities' service mandates, hydrogen's incompatibility with appliances poses a genuine risk to Cascade's decarbonization strategy.

Hydrogen production is also dependent on substantial water availability. Electrolysis studies estimate that one kg of hydrogen requires between 18 and 24 liters of water.[12] And since 1 kg of hydrogen has an energy density equal to 33.6kWh,[13] each liter of water results in only 1.4 to

[8] Cal. Pub. Util. Comm'n, Hydrogen Blending Impacts Study (July 1, 2022), https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M493/K760/493760600.PDF
[9] Melaina, M. W., et al. "Blending Hydrogen into Natural Gas Pipeline Networks: A Review of Key Issues." National Renewable Energy Laboratory, U.S. Department of Energy, Mar. 2013, https://www.nrel.gov/docs/fy13osti/51995.pdf.
[10] Melaina, M. W., et al. "Blending Hydrogen into Natural Gas Pipeline Networks: A Review of Key Issues." National Renewable Energy Laboratory, U.S. Department of Energy, Mar. 2013, https://www.nrel.gov/docs/fy13osti/51995.pdf.
[11] Melaina, M. W., et al. "Blending Hydrogen into Natural Gas Pipeline Networks: A Review of Key Issues." National Renewable Energy Laboratory, U.S. Department of Energy, Mar. 2013, https://www.nrel.gov/docs/fy13osti/51995.pdf.
[12] Blanco, Herib, Hydrogen Production in 2050: How Much Water Will 74EJ Need?, Energypost.eu, (July 22 2021), https://energypost.eu/hydrogen-production-in-2050-how-much-water-will-74ej-need/.
[13] Molloy, Patrick. Run on Less with Hydrogen Fuel Cells. RMI (Oct. 2 2019), https://rmi.org/run-on-less-with-hydrogen-fuel-cells/.

1.867 kWh. Replacing piped natural gas with locally produced hydrogen will thus substantially increase water consumption. Climate change has significantly altered weather patterns across Oregon over the last two decades, leading to the driest conditions in over a thousand years in some parts of the state.[14] Long-term reductions in precipitation threaten to eliminate the Oregonian wet season, affecting water supply. High-volume production of hydrogen will exacerbate the effects of drought conditions in the region and competition for water resources will intensify. Water scarcity may pose challenges to hydrogen production in Cascade's service territory.

Hydrogen blending also exposes customers to unknown and potentially severe air pollution and health risks. Hydrogen blending is likely to increase NOx pollution because hydrogen burns hotter than methane, and NOx is formed under high temperature conditions during combustion. A 2022 meta-analysis of NOx emissions from equipment analogous to domestic burners operating on hydrogen/natural gas blends found "a huge range of possible changes in NOx emissions from H2-[natural gas] fuel blends."[15] In a mean case that reflects the results across the relevant literature, hydrogen blends of over 5%–20% led to NOx emission increases of 7%–30%. Pollution, health, and safety risks were among the concerns that led community members and climate, health, and environmental organizations to oppose a recent hydrogen blending proposal by NW Natural, ultimately resulting in withdrawal of the proposal.[16] NOx emissions from existing gas appliances are already a health concern and a threat to indoor and outdoor air quality.[17] Rather than exacerbating this threat by introducing hydrogen blends, Cascade should pursue opportunities to eliminate these emissions through electrification.

Hydrogen has limited potential to reduce gas distribution emissions. Since safety, infrastructure, and end customer appliance issues may limit hydrogen blending to between 5 and 20 percent by volume, fossil fuels will continue to account for a significant majority of the gas network energy. Even if green hydrogen blends can reach the 20 percent upper bound, this will only result in about a 7 percent reduction in emissions. To accommodate the same load with a 20 percent blend would require a substantial increase in pressure and capacity, while exacerbating potential leakage issues. It is unclear if Cascade can accommodate such a capacity increase without significant capital upgrades. Moreover, for hydrogen blending to play a role in decarbonization, green hydrogen will have to overcome significant barriers to becoming cost-competitive, which we will not discuss here. In short, Cascade should not invest ratepayer dollars in continuing to study this risky and costly option.

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[14] Oregon Drought, Oregon.gov, https://www.oregon.gov/owrd/programs/climate/droughtwatch/pages/default.aspx.
[15] Madeleine L. Wright & Alastair C. Lewis, Emissions of NOx from blending of hydrogen and natural gas in space heating boilers, at 7, 11, Elementa: Science of the Anthropocene (May 31, 2022), https://doi.org/10.1525/elementa.2021.00114.
[16] NW Natural Withdraws Application for Controversial Hydrogen Blending Experiment Following Community Uproar. Sierra Club (Nov. 2, 2022), https://www.sierraclub.org/press-releases/2022/11/nw- natural-withdraws-application-controversial-hydrogen-blending-experiment.; UM 2251, Oregon Pub. Util. Comm'n, NW Natural's Application for Approval of Eugene Hydrogen Project (Nov. 1, 2022).
[17] Multnomah Cnty, A Review of the Evidence Public Health and Gas Stoves (Nov. 2022), https://multco- web7-psh-files-usw2.s3-us-west-2.amazonaws.com/s3fs-public/gas-stoves-health-risk-report-2022- FINAL.pdf.

Response: Cascade has made it very clear throughout the IRP, that if the Company were to pursue a potentially low cost hydrogen option, that the Company would need to do further research on studying Hydrogen. Cascade appreciates GEI and Riverkeeper pointing out the CPUC study and would like to also state that Cascade is reviewing a recent Hydrogen-Ready Appliances Assessment Report done by NEAA.[18]

Thank you for the opportunity to comment on this 2023 Draft IRP.

Sincerely,

Carra Sahler
Staff
Attorney
Green Energy Institute at Lewis & Clark Law School

Dan Serres
Conservation Director
Columbia
Riverkeeper

[18] https://neea.org/resources/hydrogen-ready-appliances-assessment-report