

Appendix A

IRP PROCESS

2025 WA IRP

Appendix A - Introduction

Appendix A provides comprehensive responses to the first and second draft of the IRP narrative, addressing all feedback and questions Cascade has received throughout the IRP process. Appendix A provides a brief insight to how Customers were notified of Cascade's Integrated Resource Plan through bill inserts. This appendix also includes TAG presentations and minutes, ensuring that all stakeholders have access to detailed information and discussions. This level of transparency is crucial for building trust and fostering open communication, as it allows stakeholders to see how their input is considered and integrated into the planning process. By maintaining transparency, Cascade demonstrates its commitment to accountability and collaborative decision-making.



INTEGRATED RESOURCE STAKEHOLDER GROUP

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CASCADE'S INTEGRATED RESOURCE PLAN

WHAT IS IT? Cascade's Integrated Resource Plan describes the two-year, four-year, and twenty-year expectation of how Cascade expects to safely serve customers' energy needs at the lowest reasonable and safest cost. The analyses in this 12-18-month process includes examination of existing and potential new pipelines and natural gas supply contracts (among others), consider emerging policies and regulations, as well as benefits of energy efficiency to customers. The IRP provides a comprehensive and transparent insight into how Cascade plans for customers' energy future.

WHO IS IT FOR? Customers and the general public are invited to participate in a series of meetings

on the variety of topics contained in the IRP, including energy efficiency and carbon emission reductions. Together, customers and the general public participating in the IRP process are called Stakeholders. Stakeholders also include

the professional analytical staffs of the state utility commissions and groups representing residential and industrial customers. Community-based organizations and independent experts also attend the series of meetings.

SIGN UP! Join Cascade's distribution list. You may participate in multiple ways, ranging from attending meetings either in-person or remotely, receiving the agendas/presentations, to having the opportunity to comment. Scan the QR code for more information!



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GRUPO DE PARTES INTERESADAS DE RECURSOS INTEGRADOS

¿Interesado en los planes futuros de Cascade?

¿Desea proporcionar comentarios sobre esos planes?

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PLAN INTEGRADO DE RECURSOS DE CASCADE

¿QUÉ ES? El Plan de Recursos Integrados de Cascade describe las expectativas a dos, cuatro y veinte años de cómo Cascade espera satisfacer de manera segura las necesidades energéticas de los clientes al costo más bajo, razonable y seguro. Los análisis en este proceso de 12 a 18 meses incluyen el examen de nuevos gasoductos existentes y potenciales y contratos de suministro de gas natural (entre otros), considerar políticas y regulaciones emergentes, así como los beneficios de la eficiencia energética para los clientes. El IRP proporciona un análisis integral y transparente información sobre cómo Cascade planifica el futuro energético de sus clientes.

¿PARA QUIÉN? Los clientes y el público en general están invitados a participar en una serie de reuniones sobre una variedad de temas contenidos

en el IRP, incluida la eficiencia energética y la reducción de emisiones de carbono. Juntos, los clientes y el público en general que participan en el proceso del IRP se denominan Partes interesadas. Las partes interesadas también incluyen el personal analítico profesional de las comisiones estatales de servicios públicos y los grupos que representan a clientes residenciales e industriales. A la serie de reuniones también asisten organizaciones comunitarias y expertos independientes.

¡INSCRIBIRSE! Únase a la lista de distribución de Cascade. Puede participar de múltiples maneras, desde asistir a reuniones en persona o de forma remota, recibir las agendas/ presentaciones hasta tener la oportunidad de comentar. ¡Escanee el código QR para más información!



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Cascade 2025 Draft IRP Chapters 2-7 Informal Comments

Chapter 2- Company Overview

- Staff notes that the 2020 IRP mentions interruptible service (see pages 13-7 and 13-15) and that the 2022 IRP also mentions interruptible service (see pages 12-7 and 12-15). Why doesn't the 2025 IRP discuss interruptible service? [Cascade provided only Chapters 2-7 thus far. Cascade will discuss interruptible services in the later Chapters.](#)
- Page 2-4,
 - figure 2-2, what is included in "other"? Would it be possible to use a graphic map to communicate this information more effectively? [Cascade added language to Chapter 2 to further describe this figure.](#)
 - "Northwest Pipeline LLC (NWP) provides access to British Columbia and domestic Rocky Mountain gas, Gas Transmission Northwest (GTN) provides access to Alberta and Malin gas, and Enbridge (Westcoast or WCT)" How does Cascade consider RNG in this framework? Consistent with WAC 480-90-238(2)(b) "... **consistent analysis** of a wide range of commercially available sources." Staff encourages Cascade to align its analysis of conventional and non-conventional fuels to be more consistent.
- Page 2-5 "The remaining non-core industrial customers represented the remaining balance of 78% of total throughput." Staff highlights this as a point of concern regarding Cascade's later analysis regarding GTN.
- Page 2-6 "Equity Considerations" Staff wants to communicate its support of Cascade including equity analysis in the IRP document. However, Staff reiterates its earlier position that that equity should be considered throughout the IRP document and not confined to a section. It should be integral to the analysis of the IRP document. [Cascade has discussion points throughout the IRP narrative regarding equity in the second IRP draft as it includes more chapters that discuss results. As mentioned throughout this document, equity is an evolving process and Cascade anticipates the level of equity analysis to increase over time.](#)
- Page 2-8, Staff appreciates Cascade's equity efforts and its desire to share those efforts. It is not clear that all of the equity efforts shared in the IRP draft are related to resource planning. [Cascade is making a best effort to include equity and equity information in the IRP. If there are any specific areas where equity efforts are shared and the relationship to the IRP is not clear, Cascade would be happy to answer any clarifying questions.](#)
- Page 2-9
 - "In 2023 Cascade began mapping the Washington Department of Health's highly impacted community (HIC) rankings per census tract in Cascade's service territory and correlating the HIC data with billing data, such as customer-level information on arrearages, disconnections for non-payment, and participation in income-qualified programs." Staff lauds these efforts. What plans does Cascade have to link this data and analysis to resource planning? [Cascade's equity efforts will continue on beyond this IRP as more information is made available. Cascade has mapped the Highly Impacted Communities \(HICs\) and vulnerable populations within its service territory. Cascade has been working on correlating billing data with vulnerable communities to determine where outcomes differ. Cascade can do the same for its energy efficiency programs by mapping past participants to determine if program benefits are being received equally](#)

across the Company's customer base. If Cascade learns that fewer customers in vulnerable communities are taking advantage of Cascades energy efficiency program, Cascade will work with its Conservation Advisory Group to implement restorative justice by changing outreach and, or program delivery. Cascade made an effort to analyze differing load forecasts by HIC when the Company was producing the 2025 IRP load forecast, however, there wasn't enough data for Cascade to state the results of the analysis was statistically significant. Cascade will continue to analyze equity information, listen to feedback on equity considerations, and continue to find ways to link it to resource planning.

- "To do this, Cascade has been developing a distributional equity analysis (DEA) to gauge the impacts a Company decision, such as a new or modified pipeline, may have on vulnerable communities. To date, the Company has a draft DEA that it has introduced to its EAG. Further conversations are needed to better develop the DEA with leadership. Once approved by the EAG, Cascade plans to adopt the use of DEA scoring for all projects exceeding a set dollar amount." Staff lauds these efforts. How will Cascade include this analysis in its Lowest Reasonable Cost analysis? Staff looks forward to further conversations with Cascade Staff on this point as it develops. *Cascade will have more information on this once the DEA has been finalized.*
- Pages 2-10 "Great Plains Natural Gas Co. distributes natural gas in western Minnesota and southeastern North Dakota. Intermountain Gas Company distributes natural gas in southern Idaho. Montana-Dakota Utilities Co. generates, transmits and distributes electricity and distributes natural gas in Montana, North Dakota, South Dakota and Wyoming." What is the interaction between gas contracts made by other parts of MDU and Cascade? *There is no co-mingling of contracts between the utilities at MDU due to geographic locations, pipeline specific contracts, and FERC rules. The Companies only coordinate staffing within some of the groups.*

Chapter 3- Demand Forecast

- Generally: Previously, Cascade has noted that it intends to include customer electrification in its PLEXOS portfolio selection model. Staff notes that the Demand forecast does not include customer responses to service price increases. Staff anticipates reviewing Cascade's work on this question in the relevant chapter. *Cascade will now be modeling electrification external to Plexos. Cascade is utilizing Plexos to determine the costs to serve customers with low carbon alternative fuels, creating bill impacts from the results. These results will then be compared to electrification costs in a whole home electrification model separate of Plexos. This model will analyze the potential impact electrification may have on future customers.*
- Page 3-2 "Historically, Cascade's forecast was at the citygate level rather than the pipeline zonal level." What are the advantages and disadvantages of this new method? *Cascade doesn't see any disadvantages to this new method. Advantages include reduction in the number of regressions allowing for more time to focus on verifying the results for the pipeline zonal regressions. With that said, Cascade is continuously looking at ways to improve its customer and load forecast model.*

- Page 3-3, Figure 3-1, Staff would like more clarity regarding the pipeline zones. This language was added to the narrative: “A pipeline zone is a segment of pipe on the upstream pipeline, typically between compressor stations. On a typical upstream transportation contract, it will contain Maximum Daily Delivery Obligations, or the amount in dekatherms Cascade is allowed to flow on a given day. These contracts will contain a receipt point, where the gas comes from, and a delivery point, where the gas goes. Some delivery points will be a single citygate, or it could be several locations where the gas can go. The purpose of the pipeline zones is because as long as gas can be delivered to a location within the pipeline zone, then it can be reallocated to any location within that pipeline zone. The change allows Cascade to reduce the number of regressions being run, therefore reducing the amount of time it takes to complete the load forecast models.”
- Page 3-7, Figure 3-4
 - Staff assumes the “Value” axis label refers to HDDs. The graph has been updated. The vertical axis now reads "HDD".
 - Staff reads this figure to, on average, communicate a 20-25% reduction in HDDs between now and 2050. Is that accurate? The average that was provided in the draft IRP was actually what Cascade used in the previous when the Company forecasted climate change on its own. Cascade has updated this chart to include the correct average change over time from ICFs analysis.
 - What steps has ICF taken to support its selection of models? How do the predictions of these models compare to historic and local conditions? ICF generated daily average temperature (tas) and Heating Degree Day (HDD) time series for a historical baseline of 1985-2014 and future projection period of 2025-2064. The projections span a set of 7 weather station locations, and HDD calculations assume two base temperatures of 60°F and 65°F and the average of daily maximum and minimum temperatures. The HDD projections were calculated for an ensemble of 22 Localized Constructed Analogs Version 2 (LOCA2) downscaled Coupled Model Intercomparison Project Phase 6 (CMIP6) Global Climate Models (GCMs) with a 1/16th degree (~6km) grid spacing. Projections were evaluated for two Shared Socioeconomic Pathways (SSPs): SSP2-4.5 and SSP3-7.0, which represent significantly mitigated global greenhouse gas emissions and continued increases in global greenhouse gas concentrations, respectively. Prior to the HDD calculations, daily temperature data for the LOCA2 GCMs were bias-adjusted using the station-specific historical observations provided by Cascade via a Quantile Delta Mapping (QDM) method. Bias adjustment methods are commonly used to make climate model projections more accurate for specific locations and remove relative biases compared to in-situ observed weather time series. The QDM method helps to resolve important climate characteristics specific to each weather station location related to elevation, topography, proximity to the coastline, and other factors. QDM is a specific adjustment method well-suited to model extreme events with improved accuracy. QDM achieves this by matching the cumulative distribution functions (i.e., the quantiles) of observational weather data and climate model data over a matching reference time period, and then applies those differences between observed and modeled data (the "deltas") to future projections. As these biases can also vary seasonally, ICF further computed separate quantile deltas for each day of the year

using a rolling window of ± 2 weeks. Ultimately, ICF bias corrected the climate projections to each weather station location to account for the overall mean model bias, differential biases for more extreme conditions, and variations in model bias based on time-of-year.

- Page 3-8,
 - Figure 3-5, Would it be possible to get a stack plot graph by customer class? Which customers' usage is most impacted by climate change? Does this graph include transport/non-core customers? Cascade's current load forecast wouldn't accurately depict what impact only climate change had on usage since there are other factors included in the model, such as retail rates. This graph includes core customers only.
 - "The stochastic peak day that was analyzed in the forecast model is a weather zone specific 99th percentile peak day." Why is 99th percentile preferred over the previous 1-in-30 standard used in the 2020 IRP? The 1-in-30 may not represent the possibility of a colder event that hasn't happened in the past 30 years. The 99th percentile is a more statistically sound model that models 10,000 potential weather patterns and pulls a realistic cold temperature.
- Page 3-9,
 - Figure 3-6, In the 2020 IRP the peak design was for 56 HDDs, that appears to be an outlier, even for this chart. Visually, in this chart, 56 HDDs appears once in 10,000 draws rather than as a 1-in-99. Is that accurate? The 99th percentile analysis is applied to the seven weather locations. Since Cascade is geographically disperse, the Company must ensure each weather zone has enough contractual demand to meet demand in the specific area that's experiencing cold weather. The 56 HDD is a coincidental peak event.
 - "Based on feedback from ICF's cold weather qualitative analysis, Cascade maintains the same peak day throughout the planning horizon and does not adjust it for climate impacts." Staff requests some graphical presentation of the data relied upon for this conclusion. Staff would like to see more quantification and graphical communication of the peak day that Cascade is planning for. Cascade utilized this source to come to this conclusion: <https://journals.ametsoc.org/view/journals/clim/32/23/jcli-d-19-0344.1.xml>. See section 4 for non-Gaussian cold tails spatial patterns and section 5b for long tail individual cases, specifically Pendleton, OR.
- Page 3-11 "Consideration of net emissions is important, as it allows for a broader and more reliable energy portfolio. To achieve net-zero, emitting energy uses can be offset by renewable energy production (i.e., wind or solar) or energy that has a negative carbon intensity (i.e., renewable natural gas); thus, allowing for emitting (i.e., natural gas) energy use during severe weather events, while still having a house/building that has net-zero emissions" While Staff retains its own reading of the statute, is Cascade preparing a "net-zero emissions" portfolio to align with this analysis? Is it feasible for new buildings with natural gas service to be "net-zero emissions" by 2031? Given Cascade's reference case forecast being flat and remaining flat due to current and anticipated impacts of the WSEC, technically, new construction would be "net-zero emissions". In Cascade's high customer scenario, this comes with an assumption that building codes are either redacted or re-written that lessen the restriction on access to gas.

- Page 3-14 “Historically, Cascade loses approximately 0.15% customers per year as they shut off gas connection without reconnecting.” Staff reiterates past communications about this data point, especially the need to improve the applicability of the data collected to the question at hand. Namely, Staff is concerned that many customers who shut off gas for a remodel or other change to a building and then return to service might not be representative of customers who choose to remodel in the future but do not return to service. Does Cascade assume this rate of 0.15% will remain constant over time? [For the base assumption of Cascade’s reference case forecast, yes, Cascade assumes the same rate over time. With that said, Cascade is modeling electrification that will compare electrification vs a customer remaining on gas, which may suggest that the 0.15% could increase over time.](#)
- Page 3-15, “Cascade is not predicting either will happen, nor is Cascade saying one is more likely than the other, but the Company must understand the risks that pertain in a high and low customer count future.” Staff can appreciate Cascade’s position especially in light of recent election results. However, since the portfolios vary between the three core scenarios, how does Cascade plan to translate these three models into a single action plan? [Yes, Cascade must determine a single action plan by utilizing the results of these three core scenarios, attempting to find commonalities and areas of potential risk. However, Cascade’s goal is not to have a “set it and forget it” action plan. Instead, Cascade aims to develop a dynamic action plan that can adjust to market forces, changing policies, and other factors that could impact the Company. By continuously monitoring and analyzing these scenarios, Cascade can ensure that the Company’s strategy remains flexible and responsive to evolving conditions, thereby effectively managing risks and seizing opportunities as they arise.](#)
- Page 3-16
 - “A regressor is the name given to any variable in a regression model that is used to predict a response variable.” Staff appreciates steps like this toward document accessibility. Steps like this make the document easier for non-technical reading.
 - “The largest coefficients were on the commercial and industrial customer classes, and even then the coefficients were quite small, seemingly insignificant.” Staff suggests there may be little room for marginal substitution of an essential good. Some data indicates that some households may substitute food when heating costs rise. Cascade might find more traction comparing a given customer’s income and building shell efficiency. A deeper dive into poverty metrics and HDDs might be useful data analysis to improve customer equity.¹ [Thanks for providing this article. As mentioned earlier, Cascade has mapped the Highly Impacted Communities \(HICs\) and vulnerable populations within its service territory. Cascade has been working on correlating billing data with vulnerable communities to determine where outcomes differ. Cascade can do the same for its energy efficiency programs by mapping past participants to determine if program benefits are being received equally across the Company’s customer base. If Cascade learns that fewer customers in vulnerable communities are taking advantage of](#)

¹ [Inequalities across cooling and heating in households: Energy equity gaps - ScienceDirect](#)
[Cold homes, fuel poverty and energy efficiency improvements: A longitudinal focus group approach - PMC](#)
[Hot or cold temperature disproportionately impacts U.S. energy burdens - IOPscience](#)
[Study Says Black Households Pay Higher Heating Costs, Seek Cold-Related Medical Care More Often - UConn Today](#)

Cascades energy efficiency program, Cascade will work with its Conservation Advisory Group to implement restorative justice by changing outreach and, or program delivery.

- Page 3-17,
 - Figure 3-10, Does this figure include DSM? This does not include DSM yet. Cascade will update the charts for the next draft to clarify which demand charts include and don't include DSM.
 - "Figure 3-7 illustrates the growth forecast for Cascade's system load year over year, showing growth on Cascade's system but at a declining rate." It is unclear which figure this is referring to. Two figures are labeled "Figure 3-10". Thanks for catching this. Cascade will update the figures to ensure accuracy for the next draft circulation.
- Page 3-18,
 - "Figure 3-10 represents the load comparison for Washington state between SSP 3-7.0 and SSP 2-4.5." By 2050 these pathways represent less than a 10% difference in concentrations or about 0.1 degrees Celsius, why doesn't this result in a statistically significant HDD difference?² This likely has to do with the timeframe. The difference between SSP 3-7.0 and SSP 2-4.5 are the two likeliest scenarios where the SSP 3-7.0 has a reversal of a few climate policies. These differences in climate policies will likely take time to show a significant difference in future emissions. Referencing slide 14 of TAG 1, the gap between SSP 3-7.0 and SSP 2-4.5 really begins to increase after 2050 when global emissions under the SSP 2-4.5 begin to decline.
 - "For the SSP 3-7.0 HDD projections, the reference case results in Washington growth rates of -0.09%." The US Dept. Of Health and Human Services tracked a 25% reduction in HDDs between 1979 and 2020.³ Are these findings consistent with Cascade's modeling of SSP 3-7.0 HDD projections? Yes. In Cascade's modeling of SSP 3-7.0 HDD projections from Cascade's service territory decline approximately 21% from 2025 to 2064, a similar timespan as the US Dept. Of Health and Human Services value.
 - Figure 3-10, Would it be possible to show this data as a stacked area plot? Perhaps with a secondary chart emphasizing customer classes that are more impacted by climate change? Cascade's current load forecast wouldn't accurately depict what impact only climate change had on usage since there are other factors included in the model, such as retail rates.
- Page 3-19, Figure 3-12, Would it be possible to get a stack area graph that provides the change in load stack per year by cause (HDDs, CCA compliance, DSM, customer loss etc) so that Cascade and interested parties can understand the changes in system demand by cause? Additionally, it would be useful to have a stack area graph of daily core and non core customer load, also differentiating between curtailable and non curtailable customers and then compared to peak

² <https://doi.org/10.5194/gmd-13-3571-2020>
<https://www.bing.com/ck/a?!&&p=ed7593ed2db77ad4176d9b8544a7c7fe6677dbd7fbb863459545bd22c96ea33eJmItdHM9MTczNTE3MTIwMA&pptn=3&ver=2&hsh=4&fclid=28928787-60c5-6f2f-08be-96e561766ed0&psq=study+low+income+heating+degree+days&u=a1aHR0cHM6Ly93d3cuYWNmLmhocy5nb3Yvc2I0ZXMvZGVmYXVsdC9maWxlcY9kb2N1bWVudHMvb2NzL1JQVF9MSUhFQVBFSEVOMDJIRVRyZW5kc19GWTIwMjAu>
 3

³ <https://www.bing.com/ck/a?!&&p=ed7593ed2db77ad4176d9b8544a7c7fe6677dbd7fbb863459545bd22c96ea33eJmItdHM9MTczNTE3MTIwMA&pptn=3&ver=2&hsh=4&fclid=28928787-60c5-6f2f-08be-96e561766ed0&psq=study+low+income+heating+degree+days&u=a1aHR0cHM6Ly93d3cuYWNmLmhocy5nb3Yvc2I0ZXMvZGVmYXVsdC9maWxlcY9kb2N1bWVudHMvb2NzL1JQVF9MSUhFQVBFSEVOMDJIRVRyZW5kc19GWTIwMjAu>
 See figure 2-16.

capacity. Cascade would not be able to provide changes in load stack per year by cause at this time. The Company has provided a load stack by core customer class compared to peak capacity by pipeline zone in Appendix F. It's not clear if this questions is referring to upstream peak capacity or distribution system capacity so any clarification would be appreciated.

- Page 3-20,
 - “With DSM projections factored in, Cascade’s anticipated Washington average annual growth rate drops from -0.09% to -0.42%.” Does this equate to an annual therm savings of 0.33%. The previous IRP estimated .56%. This appears lower than the previous IRP. Can Cascade please explain this change? [This change has to do with a lower growth forecast. Under the reference case, Cascade does not anticipate adding new customers which results in a decline of potential energy efficiency savings.](#)
 - “This represents approximately 22 million therms saved by 2050.” The 2023 IRP states “Cascade targets the saving of approximately 64.5 million therms systemwide through 2045” (page 1-9). Why does the 2025 IRP have a lower savings estimate? [The 64.5 million therms are referencing both Washington and Oregon therm savings whereas the 22 million is referring to only Washington therm savings. With that said, the Washington portion in the 2023 IRP is lower due to the 2025 IRP reference case having flat growth.](#)
 - “Peak day average annual growth is expected to be approximately 1.58%.” Please explain the causes of this. Can Cascade please provide more graphics and analysis regarding peak day design. [This language is an error. This has been updated in the IRP Narrative.](#)
- Page 3-21, Figure 3-14, The line associated with “GTN” appears to have the largest decrease over time. Why? Please explain how this is consistent with Cascade’s later analysis about peak load and GTN. [Cascade assumes the reference to the later analysis about peak load and GTN is in regard to the GTN XPress section in Chapter 4. The GTN XPress section is discussing the analysis of the 2018 IRP when Cascade was experiencing its highest growth in recent history. Cascade has since removed the GTN XPress section in the IRP since that transportation is now fully in service and will be treated like all other transportation contracts. Cascade is](#)
- Page 3-22, “In both Washington and Oregon, the 2025 forecast for non-electric generation customers is approximately 525 million therms and that for electric generation customers is about 598 million therms for a total of 1.123 billion therms for the transportation customers.” How much of this is curtailable? [If the question is in regard to upstream capacity, Cascade does not purchase upstream capacity for the non-core \(transportation customers\), therefore does not plan upstream capacity for the non-core. On the distribution system plan, the Company plans for the non-core customers Contract Demand \(CD\). Cascade can curtail non-core customers on the Company’s distribution system as per the customers rate schedule and defined priority of service.](#)

Chapter 4- Supply Side Resources

- Page 4-15, “Information to be provided once low carbon alternative fuels projections are finalized.” Is that anticipated for this IRP? [Yes.](#)
- Page 4-16, Figure 4-6, Is the Middle Column total storage that Cascade has contracted for? Is the right column withdrawal rate per day in therms? [That is correct.](#)

- Page 4-17, Figure 4-7, Slide 15 of TAG 2 indicates that non-core emissions are the majority of emissions associated with fuels that pass through Cascade's distribution system. Similarly, page 2-5 notes that "The remaining non-core industrial customers represented the remaining balance of 78% of total throughput." Relatedly the two prior IRPs refer to both interruptible service and seasonal peaking service. Does Cascade still have interruptible and seasonal peaking services? Are these services provided to customers associated with GTN pipeline? How much of unserved demand is associated with curtailable load? Can Cascade please explain how figure 3-14 is consistent with the information in Figure 4-7? Why does peak day load associated with GTN increase if System Annual Therm Usage trends downward (see figure 3-11). Staff requests a stacked area graph that shows demand by customer class on a peak day along the GTN pipeline. Such a graph would benefit from showing which demand is curtailable, a line showing the capacity limit without the GTN capacity expansion and with the capacity expansion, as well as historical annual peak demand. [Yes, Cascade has interruptible service and seasonal peaking services. Yes, some of the interruptible rates apply to GTN, but only the core customers. All transport customers are responsible for contracting their own upstream transportation. Speaking system wide, core interruptible customers are approximately 0.9% of core peak day. GTN specifically, core interruptible customers are approximately 0.5% of core peak day. Figure 3-14 and Figure 4-7 are from separate IRPs with separate assumption. Figure 4-7 is from the 2018 IRP, where Cascade was experiencing significant growth and projecting high growth as there was limited climate and building code policy at the time of that analysis. In the current IRP, even though Cascade is experiencing growth, Cascade's reference model has removed upward trends in order to show effects of downward pressure on natural gas customers. Due to the increased downward pressure on natural gas customers, Cascade is considering all possible options of capacity releasing contracts, including GTN capacity. Figure 4-7, which has not been removed, should not be associated with the current peak day projections of GTN.](#)
- Page 4-18, In terms of lowest reasonable cost analysis, what is the cost associated with curtailing non-core customers associated with a 1-in-99 peak day event versus the cost of the GTN capacity contract?? Is there a greater than 1-in-99 chance of a peak day that would require curtailment? How frequently would Cascade anticipate needing to curtail various non-core customers to meet peak demand? Note Staff's comment responding to the previous IRP "Finally, Staff notes that the GTN Xpress contract is a 30-year annual contract. That is, it is a contract to provide an additional 20,000 dth per day, every day of the year, rather than a more targeted winter-capacity contract. Cascade is attempting to demonstrate the need for this contract using a peak day event it anticipates happening less than every 30 years." (See page 28 of Staff's comments responding to the 2023 IRP). [Cascade does not contract for the non-core on the upstream GTN pipeline so there is no associated non-core load that Cascade can curtail. Cascade can only curtail core interruptible customers, rate schedule 170 in Oregon, which is approximately 0.5% of Cascade's core peak day load on GTN.](#)
- Page 4-19, "Further evidence that Cascade needs the expansion occurred when Cascade flowed approximately 66,000 dth of gas along GTN on December 22, 2022. On this day, Cascade experienced 52 HDD temperatures, which is approximately 18 HDDs warmer than what the Company models for peak day HDDs. Cascade's contracted capacity without the 20,000 dth is 72,603. Therefore, Cascade was about 6,000 dth from exceeding upstream pipeline contracted capacity while experiencing cold, but not peak day temperatures."

- Staff is reticent to accept the inference suggested by Cascade without knowledge of Cascade’s ability to curtail non-core customers. Staff reiterates its previous concerns: “Relatedly, Cascade does not clarify if the 66,000 dth was caused by the 52 HDD temperatures. 78 percent of Cascade’s throughput is non-core or transportation customers.” and “It is not clear that this number is a narrow margin. There is no description of the degree to which the system was stressed meeting this demand. It is also unclear if Cascade has curtailable demand available to meet more extreme weather. Cascade notes elsewhere that some transportation arrangements on GTN are interruptible” (See pages 27 and 28 of Staff’s comments on the 2023 IRP) Staff’s previous concerns have not been addressed in this IRP draft. *Cascade will reiterate that the Company does not contract for non-core customers on the upstream pipeline so there is no load to curtail. The definition that Staff is referencing states “NWP and GTN transportation may be firm or interruptible” meaning that NWP and GTN offer contracts that are firm, where the service is guaranteed and not subject to interruption, or interruptible, where the contract can be interrupted if the pipeline needs to accommodate firm transportation customers. Cascade only has firm contracts on GTN.*
- Page 4-21, Figure 4-9, What are the determinants for this upward trend? Why are prices believed to trend in this way? Is this graph in nominal dollars? Compared to historic time series data how accurate have these sources been in the past?
 - *This graph is in 2024 Real Dollars and shows a long-term upward price trend. According to the Company’s long-term sources, this price increase is due mainly to the anticipated increase in demand for natural gas, particularly through LNG exports. The price forecasts Cascade uses have been fairly accurate compared to historical data. Cascade records each source’s accuracy compared to actuals to determine the weight of each source in Cascade’s forecast. This ensures the more accurate forecasts get a higher weight and the less accurate forecasts get a lower weight.*
- Page 4-29
 - Has Cascade considered any equity analysis on the sourcing of its Natural gas? Staff highlights the scholarship around “Man camps” and violence against indigenous women associated with fossil fuel extraction.⁴ *When purchasing supply, generally through a marketer, it is common for the gas being purchased to have been purchased multiple times and pooled from different sources. It is extremely difficult to near impossible to determine the exact sourcing of the gas.*
 - What would be the outcome of CNG unloading transportation contracts and how does CNG offload those contracts? *There are several ways a Company can offload a contract but the most common is with a capacity release. A capacity release is where the utility*

⁴ “Man Camps” a term used in this field of scholarship to refer to large temporary housing facilities, largely populated with men, constructed near resource extraction projects. https://heinonline.org/hol-cgi-bin/get_pdf.cgi?handle=hein.journals/illlr116§ion=17 (Condes, A. (2021). "Man Camps and Bad Men: Litigating Violence Against American Indian Women." *Northwestern University Law Review*, 116(2), 515-559.)
 Martins, Kathleen, *Community on edge as LNG plans ‘man camps’ to start building gas pipeline* (Nov. 30, 2018), available online here: <https://www.aptnnews.ca/national-news/community-on-edge-as-lng-plans-man-camps-to-start-building-gas-pipeline/>.

can release their contracted capacity to other market participants, either temporarily or permanently.

- Page 4-33
 - “In the procurement process for physical natural gas the Company posts an RFP to Cascade’s 25+ physical supply parties to solicit offers on needed supply.” What equity criteria does Cascade consider in its RFP? If it does consider equity criteria, then how are those criteria considered in planning? *Currently, the marketers who provide supply do not provide an equity analysis for Cascade to consider.*
 - Is 5-12% of the annual portfolio being met with spot purchases consistent with industry practices? What is industry norm? *Over the last 3 years the Cascade portfolio has ranged from 23%-13% of Front of the Month Spot, or Daily Spot purchases. Cascade has worked in general to reduce Spot purchases over the last 2 seasons to avoid winter volatility that occurred in the winter of 22/23 where Sumas and Rockies experienced pricing in the \$40-\$50 range. Every utility has a different geographic location, different transportation resources, storage resources and access to various markets. Each year brings varying weather, markets pricing and storage positions. Each utility makes decisions about their annual portfolio plan around these factors and plans appropriately. While it would be difficult to say that there is an industry standard, it would be reasonable to say that most utilities likely have a range of 5-20% of the portfolio in Spot market purchases. Also, in general, Cascade is more susceptible to a higher need of spot purchases compared to regional utilities due to the lower amount of storage Cascade has.*

Chapter 5- Avoided Costs

- Page 5-3,
 - A reminder that the 10% adder as recommended by the NWPPCC is a preference adder and not an environmental adder. *Thanks. Cascade has clarified this language in the IRP Narrative.*
 - Has CNG modeled on other discount rates and if so what were the outcomes? *No, not in this IRP.*
 - Has CNG considered that variable transportation costs may increase by more than CPI escalators every year? Is there a risk that as Natural Gas usage declines that transportation costs may increase more than CPI? *No, we have not considered it as we don't anticipate gas pipelines will see declining natural gas usage during our planning horizon as the gas pipelines serve more than Washington and Oregon.*
- Page 5-4,
 - “Commodity costs are the costs of acquiring one therm of gas.” Does this analysis include RNG? If Cascade is going to pursue a “net zero” portfolio as noted on page 3-12 how would that impact the avoided cost calculations? *No, the commodity cost analysis does not include the cost of utilizing RNG. Cascade does include environmental compliance costs, as discussed below.*
 - “Cascade first uses PLEXOS® to calculate the monthly percentage of gas that the optimizer would purchase from each of the three basins to serve that climate zone.

These weights are then used to derive a single price for the acquisition of that therm.”

Why is this value weighted and not equal to the most expensive source of fuel? Prices are blended, so each customer is paying the same cost regardless of zone. Thanks to the flexibility of Cascade's upstream transportation, reducing one therm will likely have the same effect, no matter the location.

- “The source for the price that is used for each month’s calculation is the monthly price from each year of Cascade’s 25-year price forecast.” Does Cascade consider the elevated costs of gas associated with meeting peak demand or supply crises similar to the Enbridge event, or potential repeats of price spikes associated with geopolitical events, such as the war in Ukraine? The risks associated with supply crises and meeting peak demand is accounted for in our risk premium calculation.
- “Environmental Compliance Costs” Why aren’t CCA compliance costs included here? CCA costs are included. On page 5-4, Cascade states “Cascade is also using the marginal abatement cost for emissions compliance in a given year, in addition to the SCC, as reflected by the cost of the next most expensive resource for emissions reduction (RNG, Hydrogen, projected allowance price in auction.)”
- Page 5-5,
 - “Cascade includes a 10% adder for non-quantifiable environmental benefits as recommended by the Northwest Power and Conservation Council. “ Staff notes Northwest Power Act 3(4)(D) “For purposes of this paragraph, the "estimated incremental system cost" of any conservation measure or resource shall not be treated as greater than that of any nonconservation measure or resource unless the incremental system cost of such conservation measure or resource is in excess of 110 per centum of the incremental system cost of the nonconservation measure or resource.” Thanks. Cascade has clarified this language in the IRP Narrative.
 - Sumas is not the only market CNG buys from, could risk premium be calculated to include other markets? The reference to Sumas is just for illustrative purposes, in our risk premium calculation, pricing from all basins CNG basins from are utilized.
- Page 5-7, Figure 5-2,

	2012 IRP	2014 IRP	2016 IRP	2018 IRP	2020 IRP	2023 IRP	2025 IRP
Nominal \$/Therm	\$0.810	\$0.528	\$0.610	\$0.673	\$0.936	\$1.779	\$1.379

Why is the avoided cost lower in 2025 than in 2023? This chart had an incorrect value for the 2025 IRP. This chart is supposed to reflect the average avoided cost over the planning horizon and Cascade accidentally put the first years avoided cost in the chart. The chart has been updated to reflect the correct average of \$1.99/therm.

- Page 5-8, Figure 5-3, Why don’t avoided costs vary by zone? Why doesn’t avoided costs consistently trend either up or down? Thanks to the flexibility of Cascade's upstream transportation, reducing one therm will likely have the same effect, no matter the location. With that said, Cascade will reevaluate how the avoided cost is done by zone in future IRPs. Since Cascade utilizes an environmental compliance cost, which has the largest impact on avoided cost, this results in the avoided cost varying as there are changes in compliance costs over time.
- Page 5-9, Figure 5-4, Why does avoided cost trend downward in real terms? Does this account for CCA compliance costs, Cascade’s “net zero emissions” portfolio noted earlier, or state

emissions goals? [Nominal AC goes up, but our discount rate used outpaces growth in major costs drivers like commodity cost and the cost of allowances.](#)

- In the event that Cascade’s modeling finds that there is the possibility of customer count instabilities, will the company investigate mitigation strategies like an elevated avoided cost? [Cascade has discussed this internally and even with a high avoided cost, the penetration rate for DSM programs will mitigate much of the impact that an elevated avoided cost may have. Cascade did not find any evidence of customer instabilities in this IRP but will continue to monitor that possibility and will reconsider an elevated avoided cost in that scenario.](#)

Chapter 6- Environmental Policy

- Page 6-4, “As of November 21, 2022, there are no regulations at the federal level that would require the Company to reduce GHG emissions.” Update to a more recent date. [Cascade has updated language in the IRP Narrative.](#)
- Page 6-11 “The CCA gives direction to Ecology to implement a cap on greenhouse gas emissions from covered entities and a program to track, verify, and enforce compliance through the purchase of auction allowances and other compliance instruments.” Staff notes RCW 70A.65.060(1) which states “(1) In order to ensure that greenhouse gas emissions are reduced by covered entities consistent with the limits established in RCW 70A.45.020, the department must implement a cap on greenhouse gas emissions from covered entities and a program to track, verify, and enforce compliance through the use of compliance instruments.” Staff recognizes that CCA rules enacted by Ecology are intended to reduce emissions consistent with State emissions goals and that this creates two modeling interpretations: 1. Modeling the outcomes of Ecology’s CCA rules as they exist now and 2. Modeling Cascade’s emissions declining consistent and proportionate with State emissions goals assuming that Ecology will responsively manage the CCA program to align with State emissions goals. [Cascade is required to comply with the Climate Commitment Act for its greenhouse gas emissions reductions. The CCA sets the framework for emissions caps, which follow the state emissions goals, and sets the framework for compliance through auction allowances and other instruments.](#)
- Page 6-13, “Cascade provides charts and additional discussion of the compliance instruments and proposed compliance pathways modeled in Chapter 9, Resource Integration.” Is Cascade considering both current CCA rules as well as State emissions goals? Is Cascade planning to model a “net-zero emissions” scenario? [Cascade is considering both CCA rules and State emissions goals. Cascade is not planning a net-zero emissions scenario.](#)
- Page 6-15, “Remaining revenue can be used under the oversight of the UTC for the benefit of customers in other ways, such as investing in additional emissions reductions and/or providing bill credits to reduce customer cost impacts.” How does Cascade include this in planning? [For the 2025 IRP, Cascade assumes that the revenues from consigned allowances will be used to eliminate any additional cost burden to low-income customers and any remaining revenue is used to provide a bill credit to reduce customer cost impacts. These are reflected in the bill impact analysis. Cascade is still exploring other avenues that may be modeled in future IRPs.](#)
- Page 6-16, “If a covered entity would reach the end of a four-year compliance period and was not able to purchase sufficient instruments for compliance, the rule allows for covered entities to request Ecology to issue higher priced “price ceiling units” to address the shortfall.” How do

price ceiling units factor into Cascade's compliance strategy? Price ceiling units (PCU) are considered in Cascade's compliance strategy. Specifically, PCUs are modeled as an option for Cascade to take similar to any other carbon reduction or offset is modeled. Cascade will likely utilize price ceiling units when lower cost options are not enough to meet compliance obligations.

- Page 6-17 “prohibits the WUTC from approving any multiyear rate plan requiring or incentivizing a natural gas company or utility company to terminate natural gas service or implement requirements that would make access to natural gas service cost-prohibitive.” How might Cascade determine the level at which access to natural gas service is cost-prohibitive? How close is current gas service to being cost-prohibitive? For which customers? Under CCA compliance how long might Cascade have until natural gas services might become cost-prohibitive? It's the resource planning teams understanding that cost-prohibitive will be determined over time between collaborative efforts to define and agree on the term.
- Page 6-26, “Cascade decremented commercial customer counts by 50, cumulatively, each year for the forecast for this sensitivity.” Does this mean that commercial customer counts decreased by fifty relative to the previous year? What percentage of Cascade's customers in Bellingham are commercial and multifamily buildings? This language should have been removed. Cascade is not running a Bellingham specific scenario in this IRP as the Company has incorporated WA State building code impacts to the reference case forecast.
- Page 6-31, “Cascade is not involved in hydrogen projects; however, we are following various projects that are underway in case they provide opportunities in the future.” When is the soonest that Cascade anticipates it could practicably have hydrogen on its system? Cascade does not have a date that it can provide at this time. All hydrogen Cascade is modeling is considered off system at this time.
- Page 6-35, “Cascade is currently piloting an emissions survey using Picarro's AMLD technology in Washington. By using AMLD, Cascade is looking to identify and fix super emitter leaks within its system, as well as identify potential problem areas and prioritize company repair efforts.” Staff would appreciate time series graphs demonstrating Cascade's progress. The emissions survey pilot began in the fall of 2024. Cascade is still in the process of completing the first survey of Cascade's WA state-side distribution system emissions and anticipate this first survey will be complete by the fall of 2025. Cascade plans to utilize the Picarro data for demonstrating emissions reduction progress and will consider using a time-series chart format to demonstrate progress.
- Page 6-36 “To comply with the CCA requirements, Cascade is purchasing allowances and exploring carbon offsets and RNG opportunities.” Is Cascade exploring hydrogen opportunities? Cascade's previous IRP, the “All-in portfolio” included Hydrogen by 2040. The “All-in portfolio” did not include RNG. (See page 9-20 of the 2023 IRP). Why is RNG being considered, but Hydrogen is not? The 2023 IRP also selected offsets as soon as 2023 (ibid.) Has Cascade acquired offsets pursuant to these previous models or are these options still being explored? Yes, Cascade is considering hydrogen. The IRP language will be updated to reflect this. Cascade has not purchased offsets at this time, however, Cascade does anticipate offsets will be a part of the Company's compliance portfolio in 2025.

- Page 7-3,
 - “Cascade targets the saving of approximately 64.5 million therms systemwide through this time period: 22.9 million therms in Washington and 16.1 million therms in Oregon.” Staff notes that 64.5 minus 22.9 and minus 16.1 equals 25.5. Where are these other 25.5 million therms accounted for? [This has been corrected to “Cascade targets the saving of approximately 64.5 million therms systemwide through 2045; 48 million therms in Washington and 16.5 million therms in Oregon.”](#)
 - “There are two basic types of demand side resources: base load resources and weather dependent resources. Base load resources offset gas supply requirements throughout the year, regardless of weather conditions. Base load DSM resources include equipment such as high-efficiency water heaters and higher efficiency cooking equipment. Weather dependent DSM resources are measures whose therm savings increase during cold weather. For example, a high-efficiency furnace will lower therm usage in the winter months and will provide little to no savings in the summer months. These types of weather dependent measures for space heating offset some peaking or seasonal gas supply resources and are typically more expensive than base load supplies (such as water heating).” Paragraphs like these improve procedural equity and accessibility.
- Page 7-14, “Overall, the WIP program is operating as intended, with increased engagement by the agencies that deliver weatherization services in Cascade’s service territory. Though Agencies continue to face supply chain issues and labor shortages, we have seen a steady increase post COVID-19.” A graph demonstrating this improvement over time would be appreciated. [Cascade has added a graph to the narrative.](#)
 - Page 7-22, What is the difference between moderate and regular income customers? [Households in the Moderate income group are above the 200% FPL level but below the Washington state median income by household size. Regular income is classified as households that meet or exceed the Washington state median income level.](#)

Staff informal comments responding to Cascade's 2025 WA DRAFT IRP

Commendations

Staff would like to begin with commendations: noting improvements from the previous IRP and encouragement to pursue certain changes further.

Page 2-6, Staff wants to commend the creation of the EAG. Within the IRP Staff would like to see more connection between the EAG and planning. Staff recognizes the tension between keeping the content of the IRP salient planning, the contents of Final Order 09 requiring an equity lens in all aspects of its business, and the current lack of an appropriate filing or docket to demonstrate its progress on equity issues.

Page 2-8, Staff commends Cascade's efforts to improve equity with the CARES program. Staff recognizes the tension between salience to the IRP and planning, and the lack of another venue for Cascade to demonstrate its progress on equity issues. Quantification of program results, if available, may help communicate Cascade's progress.

Page 2-9, Staff commends the Environmental Community Opportunity Fund. Quantification of the size of this program may help communicate Cascade's progress.

Pages 2-9,2-10, Cascade discusses mapping Highly Impacted Communities and Distributional Equity Analysis. Staff is supportive of these efforts. Connecting these efforts to planning methods and outcomes will be critical and Staff enthusiastically looks forward to those conversations for the 2027 IRP.

Page 2-10, "Cascade will monitor equity considerations in other regional IRPs and follow guidance from the Commission and its EAG." Staff supports this.

Page 3-16 "The current restrictions under the 2021 WSEC regarding new construction, the Climate Commitment Act, the passage of initiatives such as I-2066, and the City of Berkeley appeal causes forecasting natural gas customer counts to be difficult and must include wide ranges of outcomes." Staff agrees with the imperative to consider a wide range of outcomes.

Page 4-2, "In Cascade's last IRP, renewable natural gas was addressed in the Renewable Natural Gas chapter but is now included in this chapter." Notes like these are helpful.

Page 4-5, "QUICK REFERENCE TO RNG LOCATIONS IN IRP" Additions like this are helpful.

Page 8-10, "Pipe options" Many of these selection guidelines seem equity-related. Depending on the nature of this analysis, this could contribute to demonstrating Cascade's equity work. Cascade may want to consider describing this in greater detail.

Page 9-5, Footnotes 1-5, These are good steps toward improving accessibility. Defining these terms below is helpful. A step further would be lowering the reading level of these footnotes down to about 8th grade.

Page 9-25, “Electrification Model” Staff wants to highlight the hard work that Cascade IRP staff have put into developing and considering the electrification model. This is a large step in the right direction and Cascade IRP staff should be commended for their efforts. UTC Staff looks forward to working with Cascade to improve the model further for the 2027 IRP.

Page 9-25, “Cascade has made a “best effort” to outline key attributes of future electrification and has attempted to initiate associated intra-utility collaboration in lieu of no statewide entity coordinating meetings and analyses.” Staff appreciates hearing that Cascade has taken these efforts for coordination.

Page 9-30, “Pipeline zone 20 (Tri Cities area per Figure 9-1) was chosen for illustrative purposes as it has the lowest electric rates in Cascade’s service territory.” This is useful context. **Page 10-2,** “Cascade has notified these segments in the past in several ways, including” Cascade might consider adding some examples of outreach messaging to the appendices to demonstrate Cascade’s procedural equity progress.

Page 10-3, “Cascade has a dedicated Internet webpage where customers and interested parties can view the IRP timeline, TAG presentations and minutes, as well as current and past IRPs.^{5,6} Cascade’s webpage is also available in multiple language.” Staff commends these steps to promote accessibility of the IRP process.

[Response: Cascade appreciates Staff’s kudos and has added language to the IRP in response to these comments.](#)

Time-constrained Comments and Recommendations

Staff acknowledges that there are limitations to the amount of change and updates that can be made between the submission of Staff comments and the final IRP that the company submits.

Generally:

Much of the Equity content, while encouraging, isn’t clearly connected to resource planning within the draft. Perhaps the document could articulate how the various equity strategies connect to the resource planning methods and outcomes of the IRP?

[Response: Cascade is finalizing the agreement and scope of work with GTI Energy Community Benefits Team for its Distributional Equity Analysis \(DEA\). GTI will provide technical assistance to develop a guidance document that addresses Washington equity requirements for projects with a cost of \\$1M or more.](#)

[GTI Energy will focus on the development of a guidance document which includes instructions and tools, the compilation of resources, processes and other methods for each category in the DEA](#)

Checklist form. The guidance document will provide the necessary information and assistance for Cascade to complete the DEA Checklist for individual large projects in Washington state.

Figures are often presented without commentary. Clear analytical takeaways for figures might be helpful.

Response: Thanks for the feedback. Cascade will look at adding additional commentary for the Figures in the IRP.

Please state whether Cascade includes the purchase of price ceiling units as part of its strategy to comply with the Climate Commitment Act.

Response: Cascade's strategy to comply with the Climate Commitment Act is through the least cost compliance options, which is consistent with the Company's overall IRP objective of acquiring all least cost/least risk resources. As part of those options, Cascade does include the opportunity to purchase price ceiling units, if such a resource satisfies the modeling objective stated above. As described on Page 9-16, Cascade states that under current modeling assumptions, price ceiling units are a lower cost option compared to carbon capture until 2030 and RNG until 2040, even when acknowledging path dependency benefits of earlier procurement of these resources. Without knowing exact details of each entity's CCA compliance strategy, Cascade cannot determine whether or not price ceilings will be required to meet CCA. Cascade can and does analyze in this IRP whether or not price ceiling units may be a lower cost option compared to other low carbon alternative fuels, therefore choosing price ceiling units if needed.

Page 1-8, "Next, 10% was added to the avoided cost to account for nonquantifiable, environmental benefits." Staff notes this is not an environmental benefits adder but is a preferential adder stemming from statutory mandate. See the Pacific Northwest Electric Power Planning and Conservation Act. [Emphasis added by Staff] "3(4)(D) For purposes of this paragraph, the "estimated incremental system cost" of any conservation measure or resource shall not be treated as greater than that of any nonconservation measure or resource unless the incremental system cost of such conservation measure or resource is in excess of **110 per centum** of the incremental system cost of the nonconservation measure or resource."

Response: Cascade updated the language in the IRP to clarify the 10% adder.

Page 2-7, "The EAG, which began meeting December 13, 2024," and "Since its first monthly meeting in December 2023, the EAG". These dates don't align.

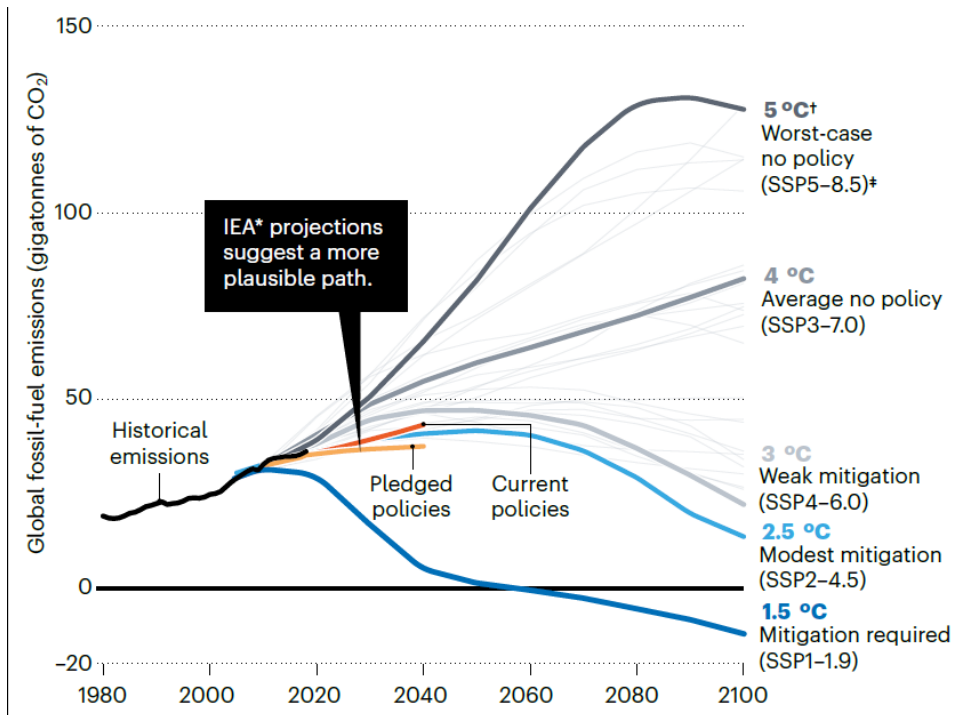
Response: The December 13 date has been updated to correctly reflect the year 2023.

Page 3-6, "Historically, Cascade has accessed data from National Oceanic and Atmospheric Administration (NOAA), but found many months/locations with missing data." This is concerning. Is this a recent development or just the nature of NOAA data? Was the data provided by Schneider Electric more complete?

Response: This issue has not been a recent development. Cascade's older weather normalization models utilized NOAA data and there are several instances where there are gaps of missing data. Schneider Electric uses many of the same NOAA locations, the National Weather Services, but reviews the data prior to providing them to their customers to ensure all data is provided. Any missing data is supplemented using a Forward Error Corrected process.

Page 3-8, Figure 3-5: Annual Usage by SSP Projection, These two datasets appear to be statistically indistinguishable, as Cascade notes, "The difference the impact between the two SSPs have on usage is minimal, which can be seen in Figure 3-5.". The graph appears to compare SSP2-4.5 and SSP3-7.0. The Hausfather article cited by Cascade indicates that by 2100 that SSP3-7.0 corresponds with 4 degrees Celsius of warming and SSP2-4.5 corresponds with 2.5 degrees Celsius of warming. Included below. Can Cascade explain this apparent discrepancy? It may be prudent to double-check these values or the data inputs.

Response: It's important to remember that Cascade's IRP only goes through 2050, where the gap between SSP3-7.0 and SSP2-4.5 is much smaller than the gap in 2100. Also, Cascade's usage is only impacted during winter and shoulder months, when it comes to weather impacts, which minimizes the differential impacts between the two SSP's.



Page 3-10, “Based on feedback from ICF’s cold weather qualitative analysis, Cascade maintains the same peak day throughout the planning horizon and does not adjust it for climate impacts.” What was the feedback?

Response: Cascade has added this narrative to Appendix B.

Page 3-10, “Climate change is projected to continue to drive warmer temperatures in the Pacific Northwest, reducing the overall frequency of extreme cold events across the region in the long term.” How does this impact Cascade’s utilization and contracting for storage resources?

Response: Cascade does not anticipate an impact on the utilization or contracting of storage resources currently. It’s important to remember that while storage does offer additional capacity to meet peak loads, storage also provides opportunities to keep costs low for customers. Cascade currently holds a lower percentage of storage resources compared to peer utilities. With upstream pipelines being fully, or nearly fully subscribed, the Company is susceptible to operational flow orders under peak and non-peak situations. Operation flow orders could require Cascade to purchase gas at a much more expensive basin, where storage would provide relief opportunities until the operation flow orders are removed.

Page 3-12, “Cascade uses population and employment growth data from Woods & Poole (W&P)” How does Cascade consider these data for the low and no growth scenarios?

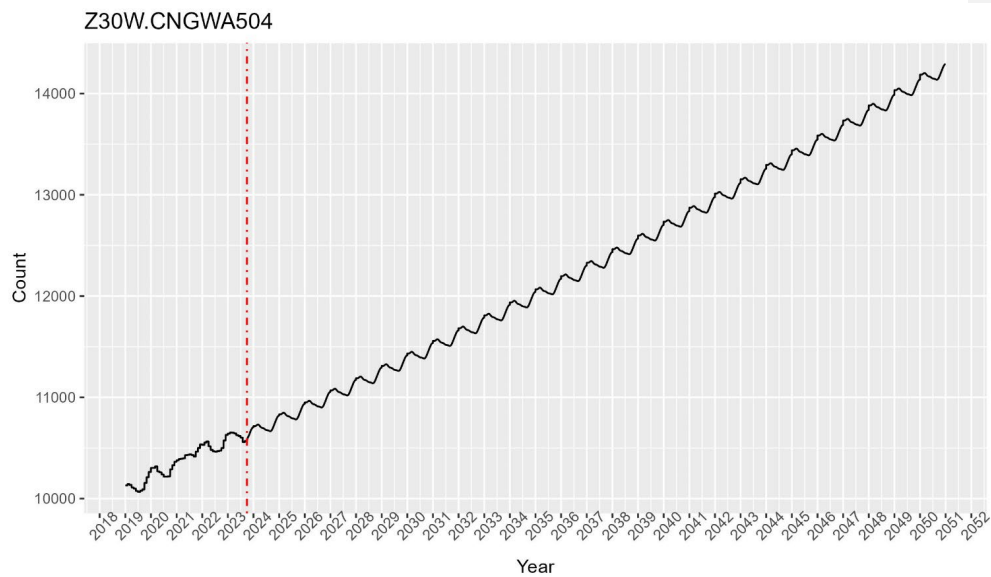
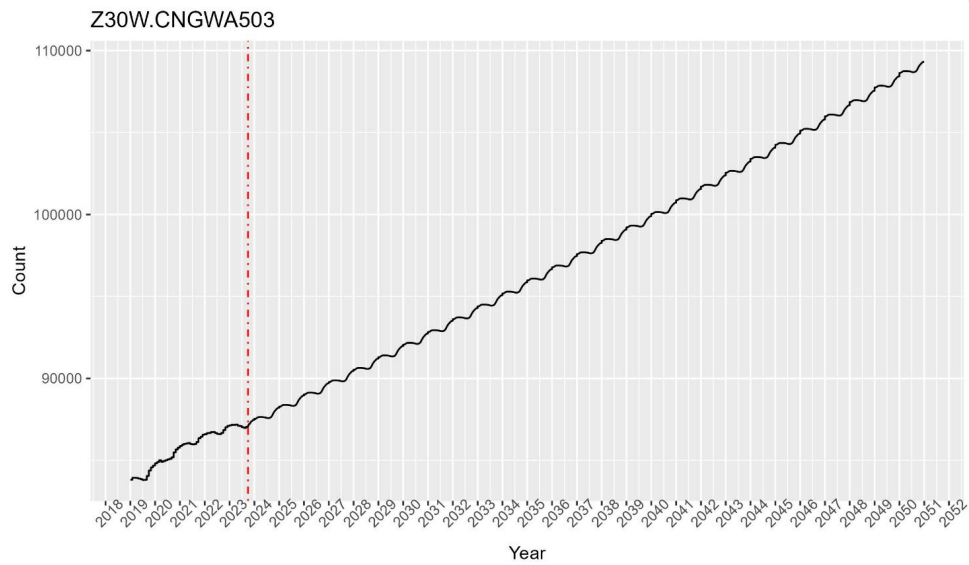
Response: The Woods & Poole data is used to create the base forecast. From the base forecast, Cascade assumes that the relationship between population and employment growth diverges from historical trends. This assumption is made because factors like building codes or compliance costs are influencing growth more significantly than population and employment impacts customer growth.

Page 3-12, “It should be noted that W&P forecasts can be adjusted where about a demand area indicates a significant difference from W&P regarding observed economic trends.” Were W&P forecasts adjusted? How many times? How much did these adjustments impact the outcomes of the IRP?

Response: Cascade did not adjust the Woods & Poole data in the 2025 IRP.

Page 3-12, “ $\alpha_3 Rate^{Zone} Fourier(k)$ ” Does this mean that customer counts are a linear function of rates multiplied by a seasonal function? Can Cascade explain the theoretical basis for customer counts being a linear function of rates? Which types of customers have a seasonal existence as customers?

Response: The formula was incorrect. Cascade has updated it to include a plus sign between $\alpha_3 Rate^{Zone}$ and $Fourier(k)$. Cascade does not have seasonal impacts for rates. As can be seen in the CNGWA503 (Residential) and CNGWA504 (Commercial), these customers generally have a seasonal existence.



Page 3-12, “Model Notes:” This list does not include “Rate”

Response: Thanks. This has been updated.

Page 3-19, “Load growth across Cascade’s system through 2050 fluctuates due to accounting for leap years and including retail rates in the customer and load forecast models.” What is the impact of retail rates on customer forecast models? What data was used to model this?

Response: The impact ranges depending on area and what customer class was impacted. Cascade did not find rates to be statistically significant within the residential class, but did find it statistically significant in some commercial and industrial customer classes. In one case, Cascade found it statistically significant, but the impact was very minimal. In that case, a \$1 per dth increase in rates would result in a decline of 0.14 customers. In another case, Cascade found that a \$1 per dth increase in rates would result in a decline of 60 customers.

Cascade utilized the rate impacts from the 2023 IRP that included compliance costs. In the low growth scenario, Cascade utilized the high rate impacts from the electrification scenario in the 2023 IRP. Cascade lagged these by 1 year to capture the lag rates have in a normal regulatory environment.

Page 3-19, “For the SSP 3-7.0 HDD projections, the reference case results in Washington growth rates of -0.09%. For the SSP 3-7.0 HDD projections, the reference case results in Washington growth rates of -0.06%.” This appears to be the same sentence twice but with different values.

Response: The second SSP should be referencing SSP 2-4.5. This has been updated in the IRP narrative.

Page 3-23, Figure 3-14, What are the causes for different pipeline zones to change at different rates? Z10 seems to grow while GTN seems to decline the fastest. Generally, descriptions of the dynamics that drive the outcomes shown in graphs and figures would be appreciated.

Response: This is due to large volume core commercial or industrial customers that aren’t subject to building code impacts being in areas where Cascade has seen recent growth for those customer types.

Page 3-23, Figure 3-15, Can Cascade explain why peak day demand does not decline despite energy efficiency efforts?

Response: Cascade’s peak day demand under no growth and low growth (declining) scenario do decline. Figure 3-15 is prior to energy efficiency impacts.

Page 3-24, “Non-Core Outlook” This section does not mention the existence of curtailable contracts or the role it could have in Cascade’s models. Curtailment isn’t discussed at all in this IRP, in contrast to previous IRPs. Can Cascade either include curtailment in its analysis or explain why it was removed from the IRP?

Response: Cascade has provided information to WUTC explaining that Cascade does not purchase upstream transportation for non-core customers.

Page 4-4, The bottom half of this page might benefit from a visual.

Response: Cascade has added Figure 4-2 on page 4-5 to help give context to the gas purchasing options the Company has.

Page 4-8, “The Company’s current timeline to incorporating RNG onto the system under its first contract is late 2023.” Did this happen? Could this be updated?

Response: Cascade has removed this language as Page 4-12 best describes the Company’s current RNG projects and timing.

Page 4-19, “coincidental demand basis” What does this term mean?

Response: Given Cascade’s non-contiguous distribution system, Cascade can experience peak events in one location and not another. For example, Cascade could experience a peak event in pipeline zone 30-W while not experiencing a peak event in pipeline zone 11. In this context, coincidental demand basis refers to the method of planning and managing capacity with interstate pipeline transportation and Cascade’s distribution system to meet the peak demand of all connected customers at the same time as the system’s overall peak demand. This means that the system is designed to handle the highest level of demand that occurs simultaneously across all customers, ensuring that there is enough capacity to serve firm loads during peak periods.

Page 4-22, figure 4-9, How is geopolitical turmoil reflected in this forecast?

Response: The first year of the forecast is exclusively forwards contracts. Theoretically, geopolitical turmoil should be “baked-in” to this price. Regarding the tariffs, Cascade has been running a separate price forecast tacking on a 10% adder to the long-term forecasts. Under USMCA regulations, Cascade does not currently pay a tariff for Canadian natural gas. Due to this, the Company is monitoring the 10% adder forecast and using the original forecast.

Page 4-25, “GTN Capacity Acquisition: The Company would acquire currently unsubscribed capacity on GTN in order to secure its gas supplies at liquid trading points primarily to serve Central Oregon.” Page 9-13 “Additionally, the Company identified ... acquiring currently unsubscribed GTN capacity that can be used to meet customer growth and address potential capacity shortfalls.” What is the nature of GTN’s capacity? From the previous IRP “It is Cascade’s understanding that GTN is near fully subscribed.”

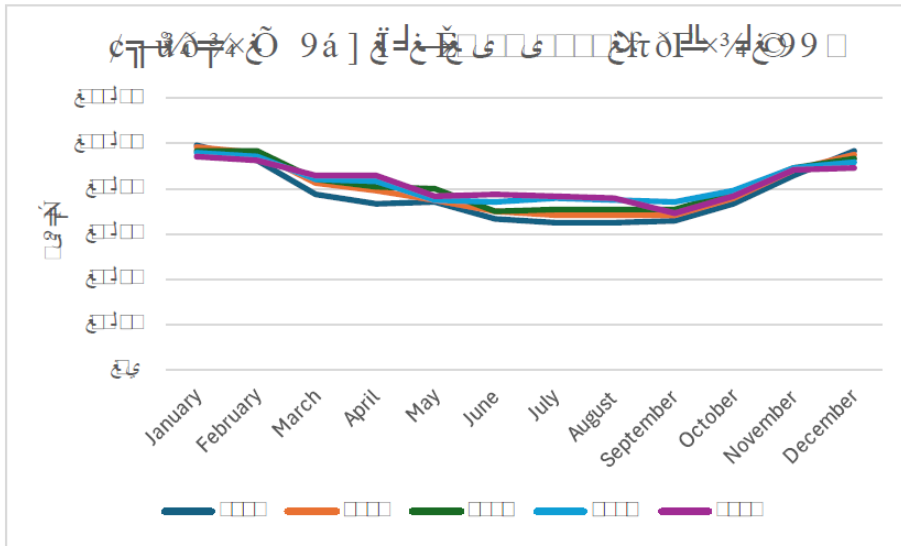
Response: Cascade has updated the GTN Capacity Acquisition with this language “GTN has not announced expansion plans and currently defines itself as being fully subscribed through at least 2030. However, Cascade did consider the opportunity of acquiring any material capacity release to help secure its gas supplies at liquid trading points primarily to serve Central Oregon.”

Commented [BR1]: @DeBoer, Jenny I thought you had put a response to this question. Did it get removed somehow?

Page 4-33, Figure 4-10, The graph is glitchy.

Response: Thanks for catching this. This has been fixed.

Figure 4-10: Projected Cascade WACOG as of July 2024



Page 5-8, Figure 5-3, A graph might be more useful because all the zones have the same value. Further it would be helpful to explain what the main drivers of the AC are over time, and why it goes up and down.

Response: Cascade has language on page 5-8 that states “Overall, avoided costs for the 2025 IRP are higher than in the 2023 IRP. The main driver of this would be the increase in the commodity cost as well as the addition of the SCC.”

Page 5-9, Figure 5-3 and Figure 5-4, Why are the real and nominal values for 2025 the same if they are in 2021 dollars? What variables in the model are driving the declining AC? Some narrative in the IRP describing these trends might make it clearer.

Response: These are in 2025 dollars but Cascade missed updating the chart titles. This has been updated.

Page 6-7, “As WEC fees go into effect starting in 2024, the cost of natural gas could increase as the upstream segments begin to pay their fees.” Did this happen?

Response: Cascade has updated Chapter 6 with the current status of WEC fees.

Page 6-21, “The Company is now actively pursuing potentially viable TENs opportunities across our Washington service area.” Is this included in the 2-year action plan?

Response: Cascade added language to the Short-Term Action Plan regarding TENs projects.

Page 6-26, “Cascade pulled historical data from 2017-2021 to see which customers would have been affected if this ban took place earlier and determined this impacted approximately 50 customers per year.” What percentage of Bellingham commercial customers does this equate to? “However, it should be noted that the changes to Bellingham’s allowed uses of natural gas are redundant to the state energy code that was later passed by SBCC, therefore, Cascade is not running a separate sensitivity analysis on just Bellingham in this IRP.” Does Cascade anticipate a comparable percentage loss across impacted customer categories across its entire Washington service territory?

Response: 50 commercial customers is about 1.4% of Bellingham’s commercial customer base. Yes, Cascade anticipates a similar impact to the residential and commercial customer classes throughout the entire WA service territory. Cascade’s highest year over year growth rate prior to impacts of 2018 Washington State Energy Code (WSEC), which went into effect February 1, 2021 and the 2021 WSEC, which went into effect March 15, 2024, was 1.92%. Currently, Cascade’s year over year growth rate is 0.63%.

Page 7-2, “The average nominal system Avoided Cost per therm increased from ~\$0.94 in 2020 to ~\$1.78 in 2024 representing an average increase of ~47%.” Does the AC change between different scenarios?

Response: No, the avoided cost remained the same. For the 2027 IRP, Cascade will investigate if the AC should be adjusted between different scenarios.

Page 7-7, “Potential refines technical potential by applying customer participation rates that account for market barriers, customer awareness and attitudes, program maturity, and other factors that affect market penetration of conservation measures.” How does EAG consider these variables? Does EAG make program improvement recommendations based on this analysis?

Response: The Achievable Technical Potential applies customer participation rates that affect all feasible measures that were used in the Technical Potential analysis. These ramp rates from the 2021 Power Plan were customized by AEG for use in natural gas programs and applied in a manner similar to the 2017 CPA. Since the 2021 Plan does not explicitly assign ramp rates for the majority of natural gas measures, AEG assigned these based on similar electric technologies present in the 2021 Plan as a starting point. AEG’s recommendations are based upon the UCT Achievable Economic Potential analysis which builds upon the Achievable Technical Potential by further refining with economic cost-effectiveness screening.

Page 7-18, Figure 7-9, Why do cumulative savings go down around the year 2038? Cumulative savings appears to have a negative second derivative (concave down), is this trend corroborated in historic savings data?

Response: Therms savings are directly influenced by projected consumption, and the lower demand from the flat growth rate in the reference case forecast creates a net decline in potential savings. This along with additional assumption updates impacts the cumulative savings over time. This concave seen in Figure 7-9 can also be explained by the ramp rates from the Council's 2021 Plan and equipment measure saturation increasing towards 2045, which decreases the potential savings available.

Page 7-22, It is unclear what "regular income" means versus "moderate income" and "low income".

Response: The Low Income threshold corresponds with 200% of the Federal Poverty Level (FPL), which is also the eligibility cutoff for the Washington low income weatherization assistance program. Households in the Moderate income group are above the 200% FPL level but below the Washington state median income by household size. Regular income is classified as households that meet or exceed the Washington state median income level.

Page 8-7, "Cascade also completes annual reviews of its distribution system models as part of the annual budgeting process and continually updates the five-year budget, as needed, based upon new information that impacts the five-year plan." How do the five-year budgets interact with the two-year action plans?

Response: Any project over the \$1 million threshold in the five-year budget related to meeting historical or future load growth are put into the two-year action plan.

Page 9-10, "System core peak day average annual growth over the planning horizon is expected to be approximately 0.11%." What factors contribute or subtract from peak day demand? If customer counts are flat and use per customer declines where does the growth come from?

Response: Cascade's customer classes that are not impacted by building codes, such as certain commercial customers and industrial customers, with some being large volume customers, are still showing growth in the 2025 IRP. The main reason for a small increase in usage during peak events is due to that growth. Cascade will note that this percentage is prior to demand side management is applied.

Page 9-14, " Under the reference case, Cascade not only doesn't anticipate a need for any additional upstream transportation, but the Company is considering a capacity release. Cascade added additional capacity on NOVA, Foothills, and GTN in 2024. With the recent drop in growth rates, the need for capacity has been delayed, allowing the Company to investigate options to reduce costs to customers." Can Cascade explain how the Williams Pipeline and acquisitions related to it factor into this analysis? Please provide quantified values to support this analysis.

Response: The Kelso-Beaver Reliability Project is related to the North Mist Storage Project. The additional capacity would allow the Company to get gas to and from between Northwest Pipeline

and the North Mist facility. This capacity does not increase the capacity to the Company's pipeline zones.

Page 9-15, Figure 9-7, This graph and its previous iteration in the 2023 IRP indicate that Cascade would add offsets to its portfolio. Why doesn't this IRP discuss acquiring any offsets? Has Cascade acquired any offsets?

Response: Cascade had included some language in Appendix A. Cascade has added language to Chapter 6 for the final filing.

Page 9-16, "When analyzing stochastic results..." This is useful analysis. Diagrams illustrating this point may be helpful.

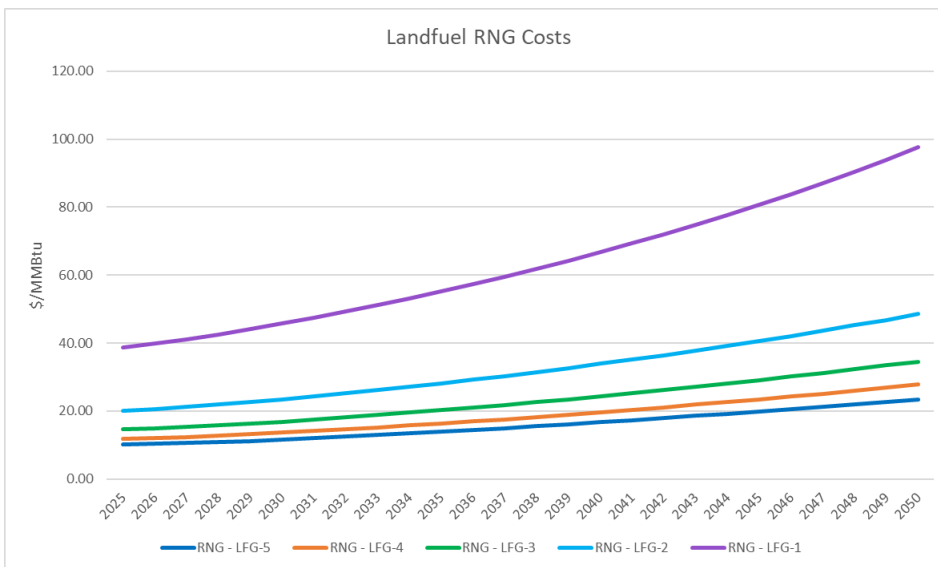
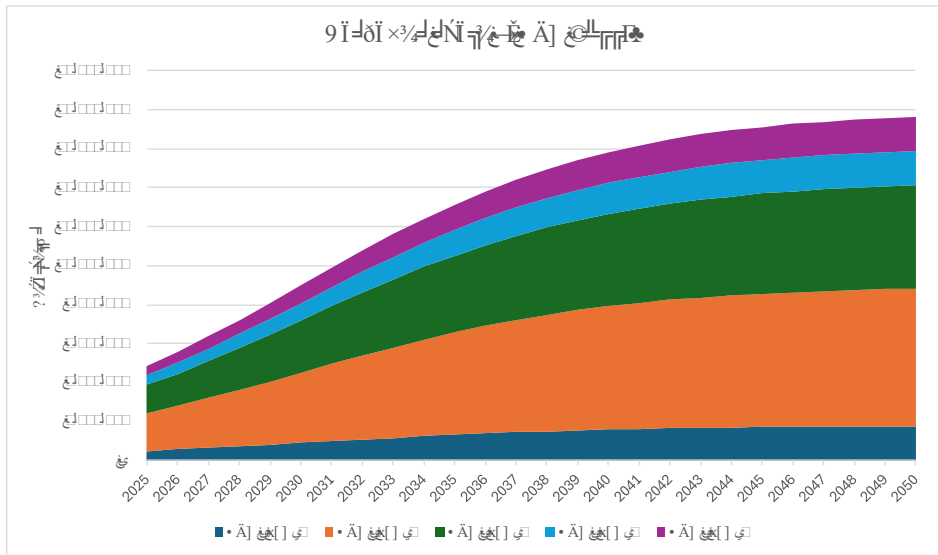
Response: Thanks for the feedback. Cascade provided results in Figure 9-10, 9-11, and 9-12 describing some of these results. Cascade would appreciate any specific feedback regarding diagrams WUTC would like to see.

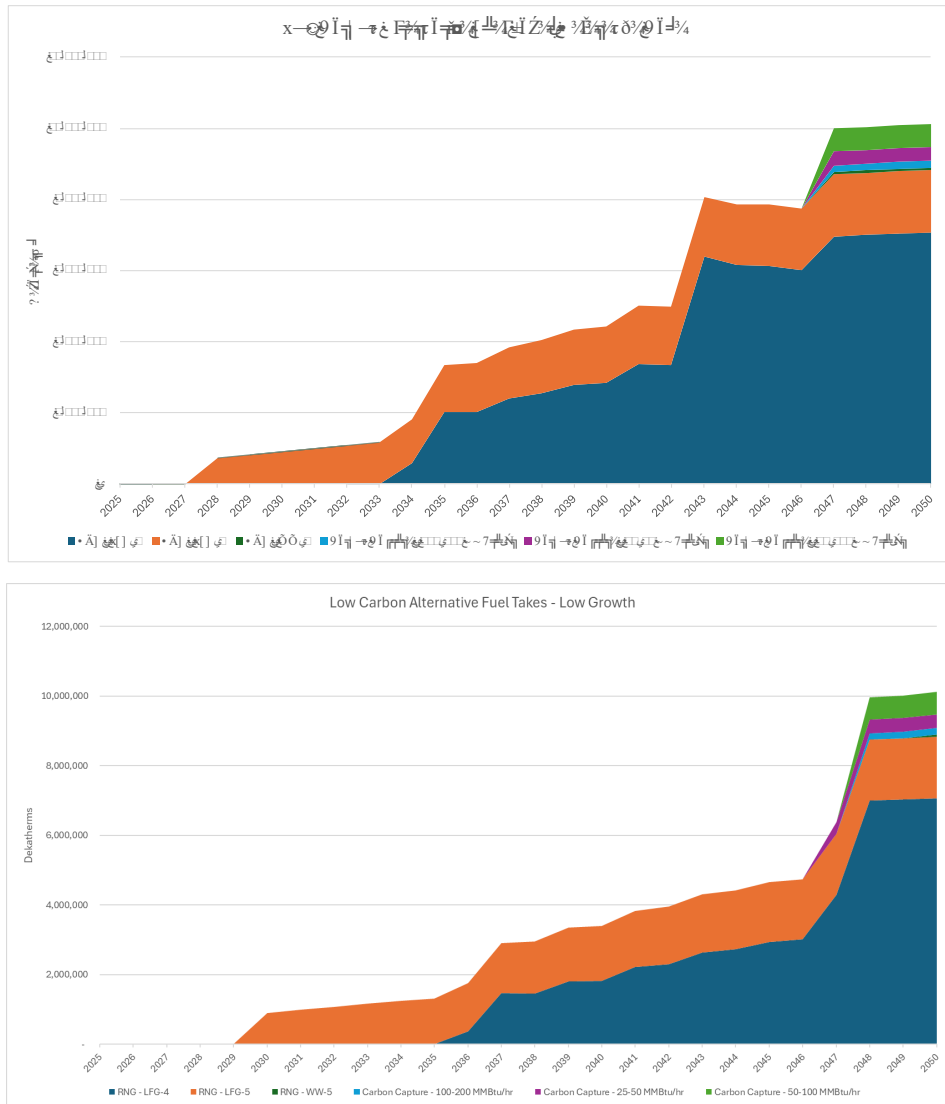
Page 9-19, Figure 9-12, Why do total system costs go down in 2050?

Response: As seen in Figure 9-8, costs go up over time. Plexos has the ability to bank no cost allowances in Washington and Oregon. Because the model runs through 2050, Plexos optimizes in a way that banks allowances until 2050 in order to not have to pay the highest prices in 2050. Cascade takes the total system costs and smooths out the results in order to capture a more realistic result before applying the costs to the bill impact analysis and electrification analysis.

Page 9-19, "Cascade's modeling shows the Company acquiring more RNG/RTCs in the low scenario. This is due to the fact that the lower cost options such as LFG-4 are not being fully acquired by Cascade in Oregon under the CPP, therefore, are still available for the CCA in Washington" This seems to contradict earlier statements regarding the abundance of non-conventional fuels. Can Cascade explain this apparent discrepancy?

Response: Cascade's statement regarding the abundance of non-conventional fuels applies to all buckets of non-conventional fuels in total, not to each individual resource or bucket of resources. As described on page 4-16, Cascade is looking at RTCs, Hydrogen, synthetic methane, and carbon captures. As Cascade shows in Figure 9-8, there are different levels of costs for these non-conventional fuels. For example, the lowest cost option for RTCs from RNG is LFG-5 and then LFG-4, so on and so forth, down to LFG-1. However, the amount of supply at each project size is limited. As can be seen in the first chart below, LFG-5 is limited to approximately 1 million dekatherms (MMBtu) and LFG-4 is limited to approximately 7 million dekatherms by 2050. The second chart provides each of the landfill gas buckets by cost. Under a lower growth scenario, Cascade's need for these resources is lower, specifically for Oregon's CPP, resulting in more of the cheaper resources being available for Washington's CCA. Supply takes can be seen in the third and fourth charts.





Page 9-23, Figure 9-17, Can Cascade provide some explanation about the shape of this graph? Why does it peak around 2045?

Response: Figure 9-15 through Figure 9-20 is a variety of customer impacts for reference case and Monte Carlos. For Figures 9-15, 9-17, and 9-19, the grey line is the estimated customers' average monthly bill with no compliance obligations and the orange line is the estimated customers'

average monthly bill with compliance obligations. The blue line is the difference between the orange line and grey line, in an incremental annual bill perspective. The reason bill impacts peaked in 2045 is because of Plexos optimizing banking allowances and utilizing them in the years with the highest costs for non-conventional fuels.

Page 9-24, Figure 9-17 and Figure 9-19, Both high and low cases seem to result in a 2050 bill that is higher than the reference case, but not by much. Can Cascade explain why? Is the reference case an optimized saddle point or is this coincidental?

Response: Cascade would not describe it as an optimized saddle point but would agree that it is an optimized saddle point compared to the high and low growth scenario. There may be other instances, slight growth for example, that would optimize at an even lower per customer cost. Cascade believes this is driven by higher growth scenarios having to purchase higher cost low carbon alternative fuels and low growth scenarios having higher bill impacts due to spreading out more fixed costs to a lower customer base.

Page 9-28, Figure 9-24, Does “HP” in the graph key refer to Heat Pump? And “Combined COP” refers to combined Heat Pump plus Gas?

Response: Yes, HP refers to Heat Pump. The combined COP refers to the coefficient of performance for a heat pump and auxiliary heat. Cascade has added additional language to the IRP to clarify Figures 9-24 through Figure 9-27.

Page 9-30, Figure 9-27, This graph could use some explanation.

Response: Cascade has added language to the IRP narrative.

Page 9-30, “The first is through a utility cost test, where the Company focuses on the costs and benefits to the utility itself.” Which costs and benefits to the Utility were considered?

Response: Under the utility cost test, Cascade assumed that electrification would be a compliance option. Therefore, the Company would assume all costs required to electrify a home with no marginal benefit of not having to pay for a furnace. The benefits would include a reduction in carbon emissions, thereby requiring fewer carbon compliance measures.

Remaining Comments

Staff acknowledges that some changes and improvements cannot be implemented on a short timeline. Staff includes these last comments for the sake of transparency that they may be included in response to the final draft. If the company believes these comments stem from misreading or misunderstanding the draft document the final revision would be an opportunity to provide that clarification, discuss how it might be considered in the 2027 IRP, or provide clarification to Staff separately.

Generally:

Staff highlights the absence of discussion relating to GTN and the amount of curtailable demand (namely from transport customers) available to Cascade to help meet peak demand.

[Response: Cascade clarified with Staff that the Company does not purchase upstream transportation for transport customers, nor is Cascade entitled to their upstream transportation by curtailing them.](#)

Cascade has not been successful getting customers to attend IRP meetings.

[Response: Cascade has notified customers of IRP meetings via social media, IRP webpage, bill inserts, flyers, through the equity advisory group, and emails. The Company has even held TAG meetings in Cascade's service territory with little success. Cascade has a dedicated webpage where the Company provides the IRP timeline as well as minutes, presentations, and videos of all TAG meetings. Cascade believes it has taken reasonable steps to inform customers of Cascade's IRP meetings. With that said, Cascade understands the importance of increasing customer attendance and will continue to monitor other LDCs to see what has been successful.](#)

Cascade's IRP Draft is not lay person accessible. Staff also wants to acknowledge the inherent difficulty of making a complex planning document lay accessible. Staff does not see this as a criticism per se, but as a long-term goal.

[Response: Cascade appreciates Staff's comments and understanding of the difficulty of making a complex planning document lay accessible. The Company will continue to work on the document to ensure it is accessible to everyone.](#)

Staff hopes that with the development of the DEA, use of actual customer meter data, deeper examination of the demographics of program participation etc. that Cascade and Staff can work together to integrate analysis relating to the distributions of Cascade's customers into its core IRP modeling for 2027.

[Response: Cascade looks forward to these discussions in the 2027 IRP.](#)

Staff notes the lack of quantification of distribution system leak reductions. Previously in meeting with Cascade staff, Cascade staff spoke enthusiastically about the progress made addressing

distribution system leaks. This seems like a missed opportunity for Cascade to acknowledge good work that it has done.

Response: Cascade appreciates this feedback. While the Company would like to provide progress made on distribution system leaks, however, Cascade would feel more comfortable waiting to finalize the first survey prior to providing any quantified results.

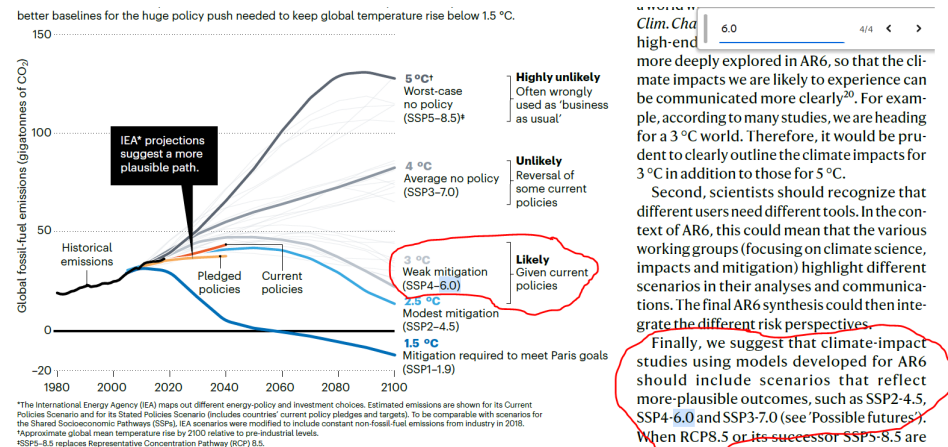
Staff would appreciate greater clarity about how modeling results will be translated into the design of the preferred portfolio. Staff highlights the discussion of methods contained in the email from Brian Robertson dated to 7/1/2024. Staff would appreciate a clearly articulated methodology and consistent application when designing the preferred portfolio.

Response: Cascade will add language to Chapter 9 regarding the preferred portfolio.

Staff stresses the imperative to model futures in which Cascade's emissions align proportionately with State emissions goals for consideration in its preferred portfolio and electrification analysis.

Response: Cascade added a scenario where the Company modeled meeting emission targets that align proportionately with State emission goals in Chapter 9.

Page 3-6, "SSP 2-4.5 represents a more likely scenario assuming meaningful greenhouse gas emissions reductions by mid-century when compared to the likely scenario in Figure 3-3. SSP 3-7.0 represents a less likely scenario assuming greenhouse gas emissions increase throughout the century." Staff highlights that the document cited in footnote 2, *Emissions – the 'business as usual' story is misleading*, by Zeke Hausfather, doesn't align with the quoted language from the IRP draft. Screenshot with relevant language circled in red included below. The cited document states that SSP 3-6.0 is regarded as "likely" and not SSP2-4.5.



Regarding the work of Hausfather, he appears to remain consistent in later work about the scope of anticipated emissions. See [An assessment of current policy scenarios over the 21st century and](#)

[the reduced plausibility of high-emissions pathways - Zeke Hausfather, 2025](#)

However, He also warns that, despite his assessment of emissions aligning with more mild scenarios like SSP4-6.0, those models do not appear to align with current heating trends. See [We Study Climate Change. We Can't Explain What We're Seeing. - Document - Gale Academic OneFile](#). **Staff reiterates its position, responding to the 2023 IRP, that assessing more aggressive heating scenarios, such SSP5-8.5 that better align with the accelerating heating trend we are seeing, is likely prudent.**

Staff highlights the following additional sources:

[Climate change: striking new visualization tells an alarming story about what's happening to the planet | CNN](#) (note this data visualization is produced by Hausfather)

[Climate Reanalyzer](#) - Staff notes that the last three years have been large deviations in sea surface temperatures. That is, consistently, except for 3 days, the past approximately 760 days have been above all previous sea surface temperature extremes.

[Climate Reanalyzer](#) - Staff notes that daily surface air temperatures have been anomalously high for the last three years as well, though not as consistently as sea surface temperatures.

[Copernicus: 2024 is the first year to exceed 1.5°C above pre-industrial level | Copernicus](#) - Staff quotes "2024 is confirmed by the Copernicus Climate Change Service (C3S) to be the warmest year on record globally, and the first calendar year that the average global temperature exceeded 1.5°C above its pre-industrial level." Staff juxtaposes this reality with the models of AR6, [AR6 Synthesis Report: Climate Change 2023](#):

Footnote 29 of the "Summary for Policymakers" [Staff **bold** added]: Median five-year interval at which a 1.5°C global warming level is reached (50% probability) in categories of modelled pathways considered in WGIII is 2030–2035. By 2030, global surface temperature in any individual year could exceed 1.5°C relative to 1850–1900 with a probability between 40% and 60%, across the five scenarios assessed in WGI (medium confidence). **In all scenarios considered in WGI except the very high emissions scenario (SSP5-8.5), the midpoint of the first 20-year running average period during which the assessed average global surface temperature change reaches 1.5°C lies in the first half of the 2030s. In the very high GHG emissions scenario, the midpoint is in the late 2020s. {3.1.1, 3.3.1, 4.3} (Box SPM.1)**

Response: Cascade appreciates Staff's feedback on climate modeling. The chart below shows the decline in HDDs Cascade has experienced on an annual basis using NOAA actuals and then including the SSP 2-4.5 and SSP 3-7.0 projected slopes. While Cascade does not disagree with Staff's assessment of global temperatures, Cascade does point out that the Company's service territory has experienced minimal temperature impacts. With that said, Cascade does not disagree with ICFs projected HDD values as the past does not always predict the future. If Staff does

recommend Cascade uses SSP 5-8.5, Cascade does want to caution that projections that overly reduce HDDs will lead to lower projected usage, resulting in potential under planning for future resources and carbon compliance obligations.

Location	NOAA Actual Slope	SSP 2-4.5 Projected Slope	SSP 3-7.0 Projected Slope
Bellingham	-9.3	-18.2	-20.9
Bremerton	-6.7	-17.9	-21.1
Walla Walla	-4.4	-16.2	-20.3
Yakima	-5.6	-15.1	-19.2

Page 3-8, Figure 3-4: SSP 3-7.0 HDD projections, Staff appreciates the breadth of models considered by Cascade. Does Cascade weigh these models differently? Do some of them align with regional historical weather data better than others? Does Cascade have criteria for its selection of models?

Response: Cascade looked at the data in multiple ways. Cascade looked at individual models as consideration to run, however, as can be seen in Figure 3-4 there is a lot of variance from one year to the next year. Cascade did not want to have a singular model drive when low and high resource need and compliance obligations happened. Cascade also looked at an ensemble of models, as seen in the table below, to see which model performs at each quartile in terms of HDD reduction over time. Again, Cascade wants to avoid selecting a singular model. Cascade found that selecting all models smoothed out the data so there weren't any years that produced extremely high or low usage. Cascade will continue to analyze this data for future IRP selections.

Quantile	ssp245	SSP2-4.5 Model HDDs	ssp370	SSP3-7.0 Model HDDs
0	KACE-1-0-G	3779	CanESM5	3807
0.25	ACCESS-ESM1-5	4253	MIROC6	4202
0.5	AWI-CM-1-1-MR	4490	FGOALS-g3	4438
0.75	MPI-ESM1-2-LR	4752	GFDL-ESM4	4616
1	MPI-ESM1-2-HR	4952	MPI-ESM1-2-HR	4770

Page 3-10, Wind, Has Cascade considered how climate change might impact wind patterns? Is this an output of existing downscaled climate models? Does Cascade plan to apply climate change analysis to wind in the next IRP?

Response: Cascade has not considered impacts to wind and appreciates this feedback. The Company will consider it for the next IRP.

Page 3-13, “To achieve net-zero, emitting energy uses can be offset by renewable energy production (i.e., wind or solar) or energy that has a negative carbon intensity (i.e., renewable natural gas); thus, allowing for emitting (i.e., natural gas) energy use during severe weather events, while still having a house/building that has net-zero emissions.” While Staff persists in its disagreement on the meaning of these statutes, perhaps more interestingly, if Cascade adopts this interpretation, then will Cascade model compliance where its fuel portfolio is “net zero” by 2031? Facially, this does not appear to align with any of Cascade’s current scenarios. Staff anticipates that “net zero” by 2031 would be substantially more expensive than compliance with CCA rules or alignment with state emission goals.

Response: Cascade has clarified with WUTC that it is not Cascade’s interpretation that the Company must achieve a net energy goal under these statutes, rather that the State Building Code Council is to achieve this net energy goal. Cascade’s scenarios are attempting to align with what the SBCC is doing to meet these statutes.

Pages 3-15 to 3-16, “These assumptions are built with the understanding that Cascade will see very little growth, assuming only homes with gas stoves or other appliances are added to the system.” Staff appreciates the need to make assumptions for the purposes of modeling unknown futures. However, Staff anticipates that going into 2027 that these assumptions can be replaced with data.

Response: Thanks for the feedback. Cascade anticipates having more information on building code impacts in the 2027 IRP.

Page 3-16, “Cascade loses approximately 0.15% customers per year as they shut off gas connection without reconnecting.” Staff plans to object to this value after the year 2031 if not before. The value does not appear to align with historic losses of building stock. A century of this rate of building stock attrition would equate to 86% of the initial buildings still standing.

Response: Cascade would appreciate this feedback. Cascade is interested in gathering more information on building stocks, gathering more information on older vs newer homes, and finding studies that analyze building stock attrition rates changes based on energy supply changes in that area.

Page 7-3, “For example, a high-efficiency furnace will lower therm usage in the winter months and will provide little to no savings in the summer months.” Does Cascade consider savings from cooling associated with weather dependent measures like wall insulation? Might there be additional savings to be gained through coordination with electric utility DSM programs?

Response: Cascade’s Conservation Potential Assessment and related modeling factors in the value of natural gas therm savings. It is reasonable to assume additional savings could be gained by modifying this process in collaboration with an electric utility DSM, but Cascade postulates the

additional savings value would be fairly minimal. For example, Pacific Power offers an attic insulation rebate for customers without electric heat of only \$.07/sq.ft. This is just 3.5% of Cascade's similar attic insulation rebate, and about 15% of the rebate Pacific Power offers for a home with electric heat, as of April 2025.

Page 9-26, "Cascade has gathered current residential rates for each electric entity that Cascade shares service territories with and has weighted them by customer counts for each pipeline zone." Staff notes the efforts Cascade IRP staff has gone to collect this data and the complexity of modeling these varied utilities. Staff appreciates the intuition to weight these values. Staff highlights the need to be aware of outliers who might electrify first. Has Cascade conducted any analysis regarding outliers?

Response: Cascade appreciates this comment as the Company had not analyzed these outliers. Cascade will include some narrative around outlier modeling in the final version of the IRP.

Page 9-27, Figure 9-23, Looking at the "Indoor Dry Bulb" column compared to the COP rows, if customers keep their homes cooler during the winter (perhaps at 68 degrees), would that improve the COP? How might the vagaries of customer circumstances factor into this analysis?

Response: Cascade understanding is that an Indoor Dry Bulb of 68 degrees would not have a significant impact on the COP. Cascade's goal for this model was to attempt at capturing an average customer. The Company understands that customer behavior can vary quite a bit, but capturing all these behavioral differences is quite difficult to nearly impossible. In an effort to gather more information, Cascade is pursuing a Heat Pump pilot in Oregon in which the results will help provide potential projects in Washington.¹

Page 9-28, "This could occur if the differential between future natural gas prices and electricity prices is exacerbated." This is interesting analysis. How likely is this? Is there evidence builders are making this calculus?

Response: The quoted sentence is a forward-looking statement focusing on "could occur" if significant electrification happens in the near term. This situation could increase revenue requirements for electric utilities (due to the need for distribution strengthening and the potential for contributing to changing out customer equipment) disproportionately to natural gas utilities. Underlying data may be better known when all utilities file their IRPs with expectations of future costs based on differing electrification scenarios. The likelihood of material differentials depends on the trajectory of, or which scenario (e.g., high or medium) is occurring for, electrification. This, in turn, depends on public policy and funding. Since this portion of Cascade's IRP was written, the likelihood may be lesser due to IRA funding being in jeopardy and inflation continuing to increase, among other factors.

¹ See: <https://apps.puc.state.or.us/edockets/DocketNoLayout.asp?DocketID=24452>

As space and water heating equipment are among key building expenses, most builders and some customers are highly attentive to energy sources and related costs (both initial installation and ongoing operating costs). Builders have different perspectives. Some "spec home" builders constructing residences for later sale to an unknown customer frequently focus on "first cost" space and water heating rather than life-cycle costs. While not true of all spec home builders, some may be indifferent to future energy pricing. Custom builders, or those who are retained by a customer with specific floor plans in mind, can generally be cognizant of future energy sources. While much of this is speculative (with more information available through current and future IRP cycles), an example can be found with electric utility sourcing of power. For publicly owned utilities having access to lower cost Federal power through the Bonneville Power Administration, end-use HVAC systems have historically been electric. Moreover, as electric rates have significantly increased in California, more customer-owned solar generation is being installed.

Cascade Natural Gas Integrated Resource Planning Feedback Report

Item #	Date	TAG Meeting	Name/Company	Comment/Question	Cascade Response
1	2/12/2024	Targeted TAG 2	WUTC	On slide 7, Cascade notes Environmental Compliance Costs as an element of its avoided cost calculation. Is Cascade considering how these costs will change over time? Both tendentially going up as more allowances are required and the price ceiling increases, and how there might be downward pressure on compliance costs due to the possibility of declining customer counts or per customer demand?	Environmental compliance costs are modeled on an increase price curve for all values considered. Marginal Compliance costs will increase over time as identified by Staff, while the Social Cost of Carbon is already presented on an increasing price curve. Declining customer counts/demand would only impact the avoided cost if it entirely eliminates the need for the highest cost resource, creating a potential stepwise impact on the compliance cost element of the avoided cost. Cascade is evaluating the marginal cost to serve the next highest cost unit of one therm of demand with traditional natural gas, to evaluate whether it would be more cost effective to reduce this demand via energy efficiency or not. Unless demand reductions fully eliminated the need for the highest cost tranche of environmental compliance, declining demand will not impact this element. To preempt a potential question about the need to look at this more holistically, as one could potentially argue that there could be enough demand reduction to exogenously move Cascade into a lower tranche of the stepwise function, the volumes we identified in the 2023 as part of the highest tier of the marginal abatement cost curve are significant, to the point that even aggressive conservation acquisition projections and projected demand decreases as outlined in prior IRPs would not move Cascade to a different step of the curve.
2	2/12/2024	Targeted TAG 2	WUTC	<ul style="list-style-type: none"> On slide 8: <ul style="list-style-type: none"> Are there avoided costs associated with keeping customers on the system or avoided costs associated with declining customer counts? Commodity Costs are taken from Cascade's 27-year price forecast." Has this forecast changed since the previous IRP? Does it include non-conventional fuels? Cascade will be requesting feedback regarding its methodology related to environmental compliance costs." Will cascade be reaching out to the Department of Ecology? Or is this a generalized request for the IRP process? The Company's distribution system cost calculation looks at forecasted capital expenses related ONLY to growth, and uses the company's load growth forecast to translate these costs to a per therm basis." Staff would like to hear more. What is meant by "related only to growth"? Risk premium is calculated as the delta from deterministic and stochastic pricing" How might this differ if Cascade were to use the brownian motion prices from the previous IRP? 	<ul style="list-style-type: none"> This is an interesting question and one that Cascade does not have a response to yet. The Company stated during the Targeted TAG 2 meeting that we'll discuss this idea internally to determine if this should be included and how it would be quantified. Cascade also asked Staff if they had any thoughts on how this would be quantified, and they responded that they would provide some thoughts a week after the Targeted TAG meeting. Has been shifted one year from last year's 28-year forecast as Cascade ultimately aims to have projections out to 2050. Slide 11 discusses why this specific element only uses traditional fuels. This is requested of the all participants of the TAG. Distribution system projects can be broken down into two classifications: "System Integrity Enhancements" and "Growth Related Projects." System integrity projects would only be avoidable if the demand associated with the project were eliminated entirely. Reducing demand, as is the objective of the twin processes of avoided cost calculations and conservation efforts, does not prevent embrittled pipes from needing to be replaced, for instance. Thus, these projects are not avoidable. Growth related projects, on the other hand, are projects that are identified as needed to support forecast demand growth on a given distribution system. Since the need is purely related to growth, these are potentially avoidable, or at the very least deferrable, and thus part of the avoided cost calculation. This line can become blurred when projections are identified as system integrity projects but also involve an upsizing of pipe. The system integrity side would not be avoidable or deferrable as there is a significant safety risk identified, but the upsizing element could theoretically be deferred. There are further economic challenges with deferral here, however, as you have already acquired permitting and committed labor toward digging up the pipe. It would rarely make sense to replace it twice, once for integrity and then again for growth, but a qualitative decision would need to be made as to whether that would make sense. The stochastic element of this calculated does use the Geometric Brownian motion prices from the previous IRP for the "Shock" element of the "Drift & Shock" methodology as discussed in the IRP
3	2/12/2024	Targeted TAG 2	WUTC	Slide 10, "For Cascade's system, all storage is off-system and provides a net-positive benefit to customers, so it does not qualify as an avoided cost." Staff would appreciate more explanation of this distinction.	Cascade fills its storage assets during the non-heating season, when gas prices are significantly lower than in the winter. When performing a life cycle analysis of a therm that is purchased from a basin, stored in the summer, and then injected in the winter, the cost savings of the summer/winter spread far supersede any costs associated with the storage of that therm, thus the statement that it is a net positive, and not a cost one would be able to avoid.
4	2/12/2024	Targeted TAG 2	WUTC	Slide 12, "With the passing of the Climate Commitment Act, Cascade believes it may be more accurate to utilize the company's marginal compliance cost associated with this rule." What is the statutory/rule basis for excluding either cost?	Staff's historical position has been that Cascade has need to follow RCW 80.28.395 when evaluating the cost of carbon, which dictates the use of the Social Cost of Carbon with a 2.5% Discount rate, adjusted to real dollars, as the cost of carbon. With the passing of the Climate Commitment Act, Cascade knows what its marginal abatement cost for carbon is with regards to this piece of legislature, and believes this may be a more accurate representation of the Company's cost of carbon. Both of these items attempt to quantify the cost to abate one metric ton of CO2e, and thus using both would be double counting this element.
5	2/12/2024	Targeted TAG 2	WUTC	<ul style="list-style-type: none"> Slide 13, <ul style="list-style-type: none"> The Company's new distribution system cost calculation looks at forecasted capital expenses related ONLY to growth, and uses the company's load growth forecast to translate these costs to a per therm basis." Staff inquires if there are avoided costs associated with the possibility of declining customer counts – either avoided costs in customers leaving or policies designed to retain customers. Put another way, would an energy efficiency rebate program that might function to keep customers on the system and works to avoid of some CCA compliance obligations be cheaper (to ratepayers) than the loss of customers due to the possibility of declining price competitiveness of gas service relative to electric service? Has Cascade considered this as a basis for avoided costs? Since Avoided Cost is based on peak day, this deferral value is then multiplied by the ratio of peak day demand to an average day's demand to get the impact on peak day." Might the possible retention of customers through EE programs have broader impacts beyond peak day? Staff would like clarification about the savings in deferring system enhancements might go to if there are savings? 	<ul style="list-style-type: none"> In response to bullet 1 and 2, this is an interesting question and one that Cascade does not have a response to yet. The Company stated during the Targeted TAG 2 meeting that we'll discuss this idea internally to determine if this should be included and how it would be quantified. Cascade also asked Staff if they had any thoughts on how this would be quantified, and they responded that they would provide some thoughts a week after the Targeted TAG meeting. There isn't really a savings persay, but delaying the system enhancement, or removing it all together, would avoid costs being passed to the ratepayers through a rate case.
6	2/12/2024	Targeted TAG 2	WUTC	Slides 14-21, how might the dynamics communicated in these slides work with a declining customer count? How would a decrease or decreasing peak load impact the model?	Addressed in item 5 response.
7	2/12/2024	Targeted TAG 2	WUTC	Slides 18-20, Staff would appreciate more information regarding the calculation of present value of deferral.	To illustrate this with an example, suppose Cascade had a hypothetical project in Kennewick scheduled for 2026 to spend \$1,000,000 towards what was identified as a needed distribution system expansion to satisfy growth. Relating to the figure on slide 15, this would represent the hypothetical point of deficit occurring in 2026. Furthermore, let's assume that peak day growth from 2026 to 2027 is 10,000. Finally, let's assume that the real discount rate is 4%. It's important to use the real discount rate as it's assumed that year over year costs will increase by inflation, so that must be backed out of the discount rate. The Company would now know that by reducing demand through conservation by 10,000 therms, Cascade would delay the point of deficit by one year. To quantify this value, first Cascade would need to adjust the capital outlay to 2024 dollars with a simple PV calculation of $1,000,000 * (1 / (1 + \text{Real Discount Rate})^{(2026-2024)})$ or $1 / 1.04^2$. This gives the Company the value of the cash outlay in today's dollars. From here, Cascade calculates the value of not spending the money in 2026, but rather spending it in 2027, by multiplying the PV of the 1,000,000 by the real discount rate, which represents Cascade's Real Weighted Average Cost of Capital. The value is deferral value, which the next step is to divide by the number of therms needed to avoid, 10,000 in this example, to get your deferral value per therm.

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Item #	Date	TAG Meeting	Name/Company	Comment/Question	Cascade Response
8	2/12/2024	Targeted TAG 2	WUTC	•Slide 25, "Accurately captures the increasing uncertainty around pricing, as nominal risk premium generally increases over time" Does this premium include CCA compliance cost uncertainties such as variations in prices at auction? Additionally, can you speak to Cascade's preference here for Stochastic prices over Brownian price forecasts?	Currently compliance costs are modeled at the Social Cost of Carbon which is a known quantity. If Cascade does shift to the Company's marginal abatement cost, there might be value in the certainty of conservation versus the risk in CCA Allowance price variance. Cascade will need more data to discern the nature of allowance price movements. If they ultimately follow a normal distribution, for instance, the risk of rising and falling prices would be equivalent, and thus no quantifiable value to mitigate. Cascade's position regarding stochastic modeling is that, due to the seasonal nature of natural gas pricing, it is most appropriate to use the "Drift and Shock" model as described in the IRP versus a pure Geometric Brownian price forecast. A Geometric Brownian Motion model is appropriate when there are no discernable seasonalities to what is being modeled, as is the case, typically speaking, with stock prices, a common application of Brownian or Geometric Brownian motion models. If applied to natural gas prices, such a model could commonly result in summer prices higher than winter prices which, while not impossible, is certainly improbable. The "Drift" or deterministic trend element of Cascade's model allows the model to consider this seasonality while still allowing for the desired variance of a stochastic model.
9	2/12/2024	Targeted TAG 2	WUTC	•Slide 28, "% CH4 per unit of natural gas: 93.4%". Are there CO2e emissions associated with the remaining 6.6%?	The remaining 6.6% is made up of N2, CO2, Ethane, Propane, Ibutane, Nbutane, Ipentane, Npentane, and Hexanes. It's Cascade's understanding that, other than CO2 and methane, the other gases don't have as much of a global warming impact and are not defined as Greenhouse gases under HB 1257. In the 2023 IRP, Cascade noted that in several areas where Cascade serves, the methane and CO2 content was approximately 93.5%, which is very similar to what others are reporting at 93.4%. Cascade will re-evaluate this figure for the 2025 IRP.
10	2/12/2024	Targeted TAG 2	WUTC	•Slide 28, How has Cascade considered distribution system emissions?	The distribution system emissions are captured in the Upstream Emission Loss Factor. The Upstream Emission Loss Factor is supposed to represent the loss of fuel in emissions from production to delivery to the customer before it's combusted.
11	2/22/2024	Post Targeted TAG 2	WUTC	1.What actions are being taken by Cascade to increase the attendance of Energy Justice Communities during the IRP process?	In 2023, Cascade formed an Equity Advisory Group (EAG) consisting of seven members who live in and provide representation for six of the most vulnerable communities in the Company's service territory. To enhance collaboration with various community representatives, Cascade is also considering holding meetings throughout Cascade's service territory during the first circulation of the Company's Draft IRP. Cascade is also considering other means of increasing participation if bill inserts and hosting meetings at various sites within the Company's service territory are unsuccessful.
12	2/22/2024	Post Targeted TAG 2	WUTC	2.What actions are being taken by Cascade to inform their customers and community-based organizations about the IRP process and encourage attendance?	Cascade is fully committed to ensuring the public is invited to participate in its IRP process. The Company notifies five general segments of stakeholders using multiple communication channels. The five segments are: Commission Staff, customer representatives, community-based organizations, the expert public, and the general public. Many of the IRP members that have attended IRPs in the past, such as Commission Staff, customer representatives, and expert public, are notified via Cascade's email distribution list. Cascade did separately reach out to the Company's Washington Community Partners via email regarding the IRP and how to join as well. As mentioned in response one and the response below, the Company is looking into other methods to target community-based organizations, Energy Justice Communities, and the general public. Cascade notifies these segments in several ways, including: •Social media •Bill Inserts provided in both English and Spanish •Meetings throughout service territory •Invite to docket distribution lists relevant to the IRP •Web page •Commission web page Cascade has a dedicated Internet webpage, which can be translated into multiple languages, where customers and interested parties can view the IRP timeline, TAG presentations, minutes, video recordings of the meeting, as well as current and past IRPs. Also, the Company provides information on how to join the IRP Stakeholder group. Cascade is exploring targeted outreach to increase attendance of Energy Justice Communities in the IRP process. This includes working with Health Districts, the Washington Department of Social and Health Services, Community Action Agencies, and the WorkSource Unemployment Office which are resources commonly accessed by vulnerable populations. In addition, Cascade participates in two separate coalitions which represent Energy Justice Communities. Both are made up of 80+ members including CBO's, small business owners, nonprofits, school districts, social services etc. Mid-Valley Providers Consortium Sunnyside United Unidos Monthly Coalition
13	2/22/2024	Post Targeted TAG 2	WUTC	3.Has Cascade considered hosting TAG meetings after typical work hours or on weekends to accommodate the needs of their customers whose schedules cannot accommodate a meeting at 9am?	Cascade is considering holding a meeting outside of typical work hours in a low-income or disadvantaged community. The Company is planning to run a series of questions by the Equity Advisory Group to gain a better understanding of topics such as timing, location, childcare services, and best ways to promote the meeting.
14	2/22/2024	Post Targeted TAG 2	WUTC	4.Staff acknowledges the highly technical nature of the IRP, however, in order to make the presentations more accessible, Staff offers that Cascade could provide frequent summary sentences that highlight key processes, trade offs or dynamics, and that these summary sentences could be written in non-Latinate English. (e.g. "I acquired an automobile" becomes "I got a car" or "the derivative rapidly increases" becomes "the slope of the line goes up").	Cascade will provide the presentations to the Company's communication's group when it is finalized in order to have someone review the presentation with an eye on making technical terms more accessible. Cascade cannot guarantee the edits will make it in the presentation that is provided a week in advance but will put in a best effort to ensure these edits are included in the presented version and the version that is posted on the Company's website.
15	2/22/2024	Post Targeted TAG 2	WUTC	5.During TAG 2, Cascade staff requested that WUTC Staff provide possible methods for determining the avoided costs associated with the retention of customers. That is, from a customer's perspective it may be cheaper to pay a higher rate knowing the rate increase goes to EE measures that keep other customers on the system and thereby avoiding the bill increase due to the increasing ratio of fixed costs to customers. This question presents many nuances and potential complications: a.The impacts of raising rates to pay for EE may drive customer losses, but at a slower rate and may require optimization. It may present short-term higher bill impacts with the promise of long-term lower bill impacts b.Converting the marginal bill impact incurred from customer loss into an additional component to the avoided cost seems straightforward, but it is unclear that EE expenditures would translate that directly into customer retention. Rather, the bill impact benefit of customer retention and the efficacy of EE programs at retaining customers may need to be a back-end determination - after Cascade has modelled customer responses to building codes, rising compliance costs, and incentives to electrify. This may be a guess and check process: running the model with various avoided cost values and honing in on a set of values that approximates optimal. c.Another approach might be to optimize the portfolio for lowest customer bill impacts and let the optimization software set/find the avoided cost associated with customer retention. This might be messy and create a moving avoided cost associated with this optimization. This would also have to be done on the back end once the other parts of the model were lined up. d.Alternatively, Cascade might consider conservation as a portfolio resource, with constraints, and have Plexos optimize the portfolio to retain customers.	Cascade is still trying to fully understand this request. From Cascade's understanding, the avoided cost calculation is looking at the avoidable costs from the Company's perspective, or in other words, the utilities cost or utility-centric measure. Cascade does agree that utilities have a responsibility to consider the interests of their customers, so the Company does not want to totally ignore this request. However, Cascade argues that if there is a fundamental change in the Avoided Cost, going from a utility-centric measure to also including customer-centric benefits, the Company would prefer this be discussed through a meeting with all utilities.
16	2/22/2024	Post Targeted TAG 2	WUTC	•Slide 28, Cascade clarified that "Upstream Emission Loss Factor" included losses in the distribution system. Has this loss factor associated with the distribution system been corroborated by Cascade's leak reduction efforts and data collection associated with those efforts?	The process of calculating the upstream emission loss factor is not a perfect science. When Cascade purchases gas, it is generally in blocks of 5,000-10,000 dekatherms which are then added to or cut based on actual usage. This value is not too difficult to track. The difficult part is that gas can either transfer from pipe to pipe or go into storage to be pulled out later. Finally, if Cascade was able to track those volumes, then the Company would have to estimate what is flowed to each customer due to billing cycles. Based on a rough estimate of 2023, Cascade estimates the loss from purchase to citygate is ~1.37% for NWP and GTN combined, giving slightly more weight to NWP as Cascade transports more gas on NWP. Cascade estimates the Company's distribution system loss rate is 0.2479% (which can be found on the Company's 663 tariff). Given the difficulty of calculating the loss from basin to citygate, the roughly estimated loss rate calculated by Cascade appears to be slightly higher than the calculation in the avoided cost model. Cascade does think that the values in the avoided cost model are better vetted and should be used in the avoided cost model. For the record, The current fuel loss rate on NWP is 0.93% and GTN is 0.0043% per mile, which is lower than what is currently used in the avoided cost and what Cascade estimates. Finally, the Company wants to also point out that the difference to the avoided cost when comparing Cascade's estimated loss rate vs the current loss rate is \$0.014/therm on average.

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Item #	Date	TAG Meeting	Name/Company	Comment/Question	Cascade Response
17	2/22/2024	Post Targeted TAG 2	WUTC	•Previously UTC Staff inquired "Slides 14-21, how might the dynamics communicated in these slides work with a declining customer count? How would a decrease or decreasing peak load impact the model?" Cascade staff said that they would follow up on this question as it may relate to stranded assets.	As Cascade mentioned in an earlier response, a decrease or decreasing peak load would essentially eliminate all distribution system projects related to growth. Given that this is in context to stranded assets, the Company would need to determine the impact stranded assets would have on the customers remaining on the system. There are several remedies to stranded assets that Cascade could explore (e.g. sell assets to industrial or large volume customers, fiber optics, etc.), each being determined in a case-by-case situation. Cascade does anticipate customer counts to be relatively flat in the near future but does not anticipate customer counts to decline in any significant matter. With Staff's agreement, Cascade would like to investigate stranded assets throughout the 2025 IRP in regard to the avoided cost for inclusion in future IRPs.
18	3/4/2024	Pre Targeted TAG 3	WUTC	•Staff recommends that Cascade spell out acronyms in full the first time they are used in the presentation to improve accessibility.	CNGC acknowledges and agrees.
19	3/4/2024	Pre Targeted TAG 3	WUTC	•Has Cascade considered the impacts of IRA and IUA funding upon EE? If so, what steps have been taken to integrate those impacts into the EE and DSM programs?	CNGC is evaluating the relevance of IRA and IUA funding for natural gas utilities. At this point it looks to be electric utility focused. This could be relevant for fuel switching programs, but that is yet to be fully investigated.
20	3/4/2024	Pre Targeted TAG 3	WUTC	•How does the low-income program factor into this analysis?	The Low-Income Weatherization program is administered independently from the LoadMAP analysis.
21	3/4/2024	Pre Targeted TAG 3	WUTC	•Has Cascade cultivated relationships with non-English speaking trade allies?	Cascade does not track non-English speaking trade allies, although CNGC is confident a subset of our trade allies does have this capability.
22	3/4/2024	Pre Targeted TAG 3	WUTC	•Has Cascade identified trade deserts in its service territory? Has Cascade cultivated trade allies in conservation deserts?	Yes, Cascade has created heat mapping and metrics for market penetration by county in the service territory. CNGC has found trade allies, in particular point of sale vendors, have penetrated into areas which have historically been thought to be underrepresented. An example of this is Benton and Yakima counties which are now being aggressively sought after for insulation and home sealing.
23	3/4/2024	Pre Targeted TAG 3	WUTC	•Has Cascade conducted an equity analysis of EE program participation?	We have begun to address equity considerations in our energy efficiency program with our low-income weatherization program. This program begins to bridge the gap between regular incentives accessible to all customers and the additional incentives available to income qualified customers who otherwise may not have the resources to access the standard Energy Efficiency program. We work with agencies across Washington who are funded by the Department of Commerce, our local Agencies give priority, but are not limited to provide Weatherization services to: <ul style="list-style-type: none"> •Elderly (60 years of age or older). •Persons with disabilities. •Children nineteen years of age, or under. •High Residential Energy Users •Households with High Energy Burden and •Native American, with particular emphasis on households residing on reservations. The Weatherization Incentive Program provides energy efficiency measures, health and safety and repairs to income qualified households at no cost to customer.
24	3/4/2024	Pre Targeted TAG 3	WUTC	•Has Cascade identified the demographics of customers who participate?	The only demographic data that is captured by our application is owner/renter status. We do, however, use aggregated population demographic data for modeling and program performance initiatives aimed at increasing participation.
25	3/4/2024	Pre Targeted TAG 3	WUTC	•Has Cascade identified the steps to take advantage of EE rebates/trade allies and identified barriers within those steps that might limit more equitable participation? •These barriers may include: <ul style="list-style-type: none"> •Knowledge of the program •Economic/financial barriers to participation •Asking for too much/sensitive information •Time poverty barriers to participation •Renter/property owner barriers •Finding/communicating with Trade allies •Forms/Paperwork – especially as it relates to language accessibility •Submission of rebate forms •Review of rebate forms 	Knowledge of the program: Standard Rebate Program & Point of Sale: We use bill inserts, TAs, Energy Services Representatives, and regional events to provide education and create awareness of the Programs. Low-Income Program: We use bill inserts, Cascade Website, leverage Community Action Agencies (CAA) for program awareness, in the of form sandwich boards on active weatherization projects, flyers, word of mouth, radio slots. We leverage the bill discount program (CARES), auto enroll customers receiving Weatherization Assistance to our bill's assistance programs and vice versa. WA EE Outreach Analyst focused on targeted outreach, video/eligibility quiz development. Target audience housing authorities and Section 8 landlords to increase participation in Weatherization Incentive Program. Economic/financial barriers to participation: Standard Rebate Program & Point of Sale: Point of Sale provides an instant discount for EE measure upgrades; we do not offer any zero % financing. Low-Income Program: LI Programs we have worked to reduced economic financial barriers by aligning with department of commerce requirements, we do not add additional requirements to our customers/CAAs, we follow one set of requirements/guidelines based on the Weatherization Assistance Manual issued by the state. This ensures we align with the CAAs, we also increased our project coordination fees. As this was something the CAAs expressed as a continued barrier to project completion. The LI program is at no-cost to customers. Asking for too much/sensitive information: Standard Rebate Program & Point of Sale: Account information, heating source and payee information is required, and we regularly look for ways to reduce the friction in our rebate processes. Low-Income Program: Our CAAs collect and maintain confidential demographic information at agency level; information collected follow commerce guidelines as previously noted and is not collected directly by Company. We do not add any additional program requirements, this ensures we do not add undue burden to customer or agencies, guarantees we do not duplicate efforts, we use department of commerce eligibility and weatherization specifications.
26	3/4/2024	Pre Targeted TAG 3	WUTC	•Has Cascade identified the steps to take advantage of EE rebates/trade allies and identified barriers within those steps that might limit more equitable participation? •These barriers may include: <ul style="list-style-type: none"> •Knowledge of the program •Economic/financial barriers to participation •Asking for too much/sensitive information •Time poverty barriers to participation •Renter/property owner barriers •Finding/communicating with Trade allies •Forms/Paperwork – especially as it relates to language accessibility •Submission of rebate forms •Review of rebate forms 	Time poverty barriers to participation: Standard Rebate Program & Point of Sale: The program is designed to require minimal time investment. Low-Income Program: CAAs handle eligibility for Company, there are multiple options for customer participation they can email documents, call, apply in person, mail in documents, depending on situations there are home visits available. Most information needed for applications can be completed via phone, prior to appointment to reduce time barriers for customers. CAAs also offer after hour appointments during harvest season for our migrant-seasonal workers. We now have a designated LI staff to address all LI inquiries to refer appropriate to agencies. Renter/property owner barriers: Standard Rebate Program & Point of Sale: EE recognizes the challenges to reach property owners and renters may apply if they are the account holder. Low-Income Program: On going barriers, fear of rent increase for tenants, owners not willing to agree to a 12 month no rent increase. Agencies continue to provide education of tenant rights and owner/landlord rights; however, it is an ongoing barrier. Finding/communicating with Trade allies: Standard Rebate Program & Point of Sale: EE has over 120 TAs and we monitor performance through random inspections and services like the Better Business Bureau Forms/Paperwork: Standard Rebate Program & Point of Sale: especially as it relates to language accessibility - Online portal has been launched and incentives and applications are available in Spanish; translation is also an option. Low-Income Program: Rebate forms are available to our CAAs in English and are available in Spanish by request. Our rebate applications are not customer facing, they are completed by CAA representatives.
27	3/4/2024	Pre Targeted TAG 3	WUTC	•Has Cascade identified the steps to take advantage of EE rebates/trade allies and identified barriers within those steps that might limit more equitable participation? •These barriers may include: <ul style="list-style-type: none"> •Knowledge of the program •Economic/financial barriers to participation •Asking for too much/sensitive information •Time poverty barriers to participation •Renter/property owner barriers •Finding/communicating with Trade allies •Forms/Paperwork – especially as it relates to language accessibility •Submission of rebate forms •Review of rebate forms 	Submission of rebate forms: Standard Rebate Program & Point of Sale: Rebates are available through the Point of Sale program and can be submitted via email, post, FAX, the online portal, and occasional walk in. Low-Income Program: Rebates can be submitted via secure email (Biscom) CAA representatives can request a secure link from Sr. Conservation Analyst and or use our online portal for submissions. Review of rebate forms: Standard Rebate Program & Point of Sale: Rebate forms are reviewed, revised, and simplified in tandem with tariff updates. Our TAs have communicated their preference to minimize the changes/revisions to program forms. Low-Income Program: Same process followed for LI rebate forms, updated on calendar year and with tariff updates.
28	3/4/2024	Pre Targeted TAG 3	WUTC	•What drove the significant increase in EE savings from 2022 to 2023 and what did Cascade learn from that experience that it is implementing now?	Investment in The Point of Sale and Trade Ally programs are significant contributors to the increase in EE savings in 2023 compared to 2022. Over half of all applications received in the second half of 2023 were attributed to these offerings. CNGC is continuing to invest in and grow these offerings for the upcoming biennium.
29	3/4/2024	Pre Targeted TAG 3	WUTC	•What changes led to the shift in more residential therm savings?	Growth in the Point of Sale and Trade Ally programs were significant factors. The POS program in particular provides instant rebates for the work, from the customer's perspective. We have seen this being particularly effective in covering a large portion of the project cost for insulation and air sealing jobs. CNGC has increased insulation rebates while remaining extremely cost effective in the upcoming biennium to drive further growth and opportunity for all income levels.
30	3/4/2024	Pre Targeted TAG 3	WUTC	•What does CNGC foresee as coming challenges for energy efficiency programs?	Consumer sentiment around energy codes, building codes, and the future of natural gas is a significant challenge and increases risk for program participants. Participants are less likely to make significant investments in their home and business when risks of fuel choice use are present. Additionally, supply issues with insulation materials are still being noticed by select contractors.
31	3/4/2024	Pre Targeted TAG 3	WUTC	•How does the likelihood of a decrease in gas customers/increase in customers who are electrifying factor into the CPA calculation?	Customer counts by segment (residential, commercial, industrial) and by climate zone are provided as inputs to the CPA calculation. Gas use and savings potential are generally directly related to customer count.
32	3/4/2024	Pre Targeted TAG 3	WUTC	•What kind of sensitivity analysis did CNGC do when calculating the CPA? Staff would like to know more about the methods used to generate the CPA.	CNGC has conducted sensitivity analyses in the past. A recent example is alternative scenario modelling to inform chapter 7 of the 2023 Washington IRP. The alternative scenarios included an update to baseline fuel usage and avoided costs, a scenario of high future Renewable Gas (RNG) usage, and a scenario combining high future RNG usage and increased municipal gas bans with decreasing customer counts. Further details can be found on pages 7-22 through 7-24 of the 2023 Washington IRP.
33	3/4/2024	Pre Targeted TAG 3	WUTC	•Staff would like some clarity to why the baseline forecast for therms goes up for industrial over time, but goes down for residential and commercial. What are the drivers both for decreases and increases?	This is a function of average use per customer per segment and total number of expected customers. On average, industrial customer count expectations increased more than commercial or residential in this CPA. Average use per customer for commercial and residential decreases over time, driven by energy code restrictions impacting gas use for residential and commercial construction.

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34	3/4/2024	Pre Targeted TAG 3	WUTC	oStaff would like greater clarity what is causing the gap in the achievable technical and achievable economic potential in the CPA.	From page 7 of the 2023 CPA: UCT Achievable Economic Potential further refines achievable technical potential by applying an economic cost-effectiveness screen. In this analysis, primary cost-effectiveness is measured by the utility cost test (UCT), which assesses cost-effectiveness from the utility's perspective. This test compares lifetime energy benefits to the costs of delivering the measure through a utility program, excluding monetized non energy impacts. These costs are the assumed incentive, represented as a percent of the incremental cost of the given efficiency measure, relative to the relevant baseline course of action (e.g., federal standard for lost opportunity and no action for retrofits), plus any non-incentive costs that are incurred by the program to deliver and implement the measure. If the benefits outweigh the costs, a given measure is included in the economic potential. Note that we set the measure-level cost-effectiveness threshold at 0.9 for this analysis since Cascade may include non-cost-effective measures as long as the entire portfolio is cost-effective. This is important because a portfolio considers more than just energy savings. Cascade may include popular measures that are on the cusp of cost-effectiveness, accommodate variance between climate zones, maintain a robust portfolio, or include a measure that improves customer outreach and communication. It also supports the inclusion of borderline cost-effective measures, increasing overall savings through energy efficiency offerings.
35	3/4/2024	Pre Targeted TAG 3	WUTC	oHow is CNG modeling scenarios with benefits from the Inflation Reduction Act	Repeating the response in item 19; CNGC is evaluating the relevance of IRA and IIJA funding for natural gas utilities. At this point it looks to be electric utility focused. This could be relevant for fuel switching programs, but that is yet to be fully investigated. CNGC welcomes modeling scenarios and inputs from the CAG and commission staff in regard to the IRA during the upcoming CPA cycle.
36	3/4/2024	Pre Targeted TAG 3	WUTC	"Customer Segmentation" Does this analysis include an equity analysis?	Customer segmentation involves allocating portions of the customer count per program segment: Residential, Commercial, Industrial. For each segment, the count is further segmented into income level, home size, type of business, type of production process, etc. Details on residential customer segmentation by income group can be found on page 25 of the 2023 CPA under docket 210838.
37	3/4/2024	Pre Targeted TAG 3	WUTC	oMarket size, Equipment Saturation, Technology Shares, Vintage distribution" Do these analyses include equity analysis? Does it consider demographics of the market? Does it consider demographics of equipment vintages and ownership?	This is separate from an equity analysis. It involves calculating the average of what exists in the market, equipment vintages, etc. per income level, home type, commercial business type, etc. A full description of this market characterization can be found on pages 21-32 of the 2023 CPA docket 210838.
38	3/4/2024	Pre Targeted TAG 3	WUTC	oUnit energy consumption" Does unit energy consumption include an equity analysis? Are there distributional inequities in how much energy different customer groups might be consuming?	Unit Energy Consumption is a calculation for the average amount of energy a given piece of equipment is expected to use in one year. It is broken down by specific market segment in the CPA. It embodies an average level of service and average equipment efficiency for the specific market segment. This includes a calculation of average therm usage per home by building type and income level in the residential sector. Lower income homes and multifamily homes are assumed to use less energy on average. A summary of Energy consumption by income group can be found on page 26 of the 2023 CPA.
39	3/4/2024	Pre Targeted TAG 3	WUTC	oNew Construction Profile" In the past year how has participation in the new construction energy efficiency program changed? Have similar patterns been seen with new customer uptake?	One way to measure new construction participation is through incentives only available for new construction homes. In 2022 136 projects were submitted for the "Built Green Certified Home" offering. In 2023 only one project was received. This offering was deemed to no longer be viable with the implementation of WSEC 2021. New service points in the service territory dropped approximately 10% from 2022 to 2023.
40	3/4/2024	Pre Targeted TAG 3	WUTC	oCustomer growth" Has Cascade already calculated the customer growth or is this value determined at the end of the IRP process?	The customer growth for the 2023 CPA comes from the previous IRP cycle. The 2025 CPA is anticipated to use customer count figures from the 2025 IRP which is yet to be finalized.
41	3/4/2024	Pre Targeted TAG 3	WUTC	oElasticities" What types of elasticities is Cascade considering? Does 'elasticities' include an equity analysis of EE program participation?	Elasticities come from EPRI End-Use Models (REEPS and COMMEND). These models provide the energy-use elasticities applied to equipment prices, household income, home size, heating requirements, etc.
42	3/4/2024	Pre Targeted TAG 3	WUTC	oAchievable Economic" Does achievable Economic include an equity analysis of who is able to participate?	Yes, savings potential screening methods do involve equity analysis, market segmentation, and participation assumptions. Within AEG's LoadMAP model, we estimate potential using the Council's preferred approach of beginning with technical potential, applying ramp rates to estimate achievable technical potential, and finally screening for cost effectiveness to estimate achievable economic potential. Cost effectiveness varies by commercial/industrial business type, income bracket, average equipment cost etc. More details on the potential screening can be found on pages 7 and 8 of the 2023 CPA.
43	3/4/2024	Pre Targeted TAG 3	WUTC	oUCT/TRC Achievable Economic Potential" Do these future projections anticipate that EE measures will become more cost effective in the future?	Generally speaking, EE measures become less cost effective over time as the "low hanging fruit" becomes exhausted from the market. This is of course augmented by changes in technology, consumer behavior, avoided costs, and market adoption rates to name a few. Should avoided costs increase in the future, for example, we would anticipate measures becoming more cost effective. For the 2023 CPA, UCT achievable economic potential does increase year over year through a 20-year forecast window.

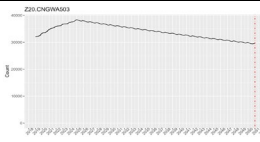
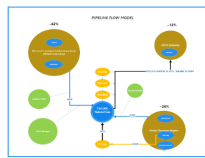
Cascade Natural Gas Integrated Resource Planning Feedback Report

Item #	Date	TAG Meeting	Name/Company	Comment/Question	Cascade Response
44	3/4/2024	Pre Targeted TAG 3	WUTC	offTechnical Potential" Does technical potential assume increasingly efficient options in the future?	Yes, from page 7 of the 2023 CPA: Technical Potential is defined as the theoretical upper limit of energy efficiency potential. It assumes customers adopt all feasible measures regardless of their cost. At the time of existing equipment failure, customers replace their equipment with the most efficient option available. In new construction, customers and developers also choose the most efficient equipment option. Technical potential also assumes the adoption of every other available measure, where technically feasible. For example, it includes the installation of high-efficiency windows in all new construction opportunities and furnace maintenance in all existing buildings with installed furnaces. These retrofit measures are phased in over a number of years to align with the stock turnover of related equipment units, rather than modeled as immediately available all at once. It also involves estimates for technology and equipment advances in the future.
45	3/4/2024	Pre Targeted TAG 3	WUTC	offSummary of Energy Efficiency Potential as % of Baseline Projection" Does this projection contemplate the possibility of declining customer counts?	Customer counts is an input into the LoadMAP model. LoadMAP could handle a forecast with decreasing customer counts. In general, an input of decreasing customer counts would decrease energy efficiency potential and baseline energy usage.
46	3/4/2024	Pre Targeted TAG 3	WUTC	offCumulative UCT Achievable Potential Forecast, Around the year 2035 there is a change in concavity of the graph. What are the causes of this concavity change?	There are many factors at play in calculating UCT achievable potential. Around the year 2035 opportunity and retrofit ramp rates change concavity or begin to phase out which significantly impacts achievable potential. These graphs can be found in appendix D of the 2023 CPA.
47	3/4/2024	Pre Targeted TAG 3	WUTC	offThe avoided cost analysis changes substantially (see Staff comments on TAG 2), is this analysis capable of pivoting to match the new data? What is the time lag/interaction between EE program data and IRP analysis data?	Yes, avoided costs will be a changeable input into the 2025 CPA. The CPA informs EE program data with inputs from the IRP including avoided costs, HDDs, customer counts, inflation assumptions, etc. The 2025 CPA is anticipated to include IRP data inputs through approximately Q4 2024.
48	3/4/2024	Pre Targeted TAG 3	WUTC	offIn the last BCP, many of the rebates offered had UCT and TRC ratios well above 1.0. If these ratios were lowered (by increasing the rebate offered) would it increase the achievable potential?	The achievable potential is impacted by a cost effectiveness screening. In the last CPA, this level was .90. Lowering this cutoff could increase the achievable economic potential by allowing more measures through cost screening. Adjusting rebate amounts comes much later in the process in the program planning phase, after the achievable potential has been set.
49	3/4/2024	Pre Targeted TAG 3	WUTC	"Furnace Direct Fuel" Do customers adopt these measures before their old furnace fails? Looking to the demand forecast, how might data associated with this measure inform the model of customer decision making when it comes to furnace replacement and electrification?	The average lifespan for measures assumes that some equipment items are replaced prior to failure and that some pieces of equipment last longer than anticipated. The average lifespan of the measure, or average energy usage per unit could be adjusted in future CPAs to reflect a higher rate of replacement prior to failure. More concrete data on consumer decisions would be useful in informing this.
50	3/13/2024	Post Targeted TAG 4	WUTC	Staff would appreciate it if the TAG meetings could be simulcast to YouTube. Cascade can use Puget Sound Energy's IRP process as an example. This would upload the meeting immediately and give staff ample time to review TAG meetings and give more informed feedback. In addition, this would give members of the public a way to monitor TAG meetings on a website they are more familiar with. If Cascade is unwilling or unable to do this, Staff request that Cascade provide Staff with a recording of the meetings prior to the deadline for comment.	Cascade does not have the resources to simulcast to YouTube. Cascade will do its best to upload information post TAG meetings, but would like to remind Staff that the Resource Planning Team does not have access to update the IRP webpage. The Resource Planning Team must work with IT and their schedule to get information posted.
51	3/13/2024	Post Targeted TAG 4	WUTC	* If Cascade's CPA is, in part, aiming to focus on measures with long term benefits, has Cascade considered emphasizing EE measures that focus on envelope efficiency (especially in residential), and other measures that are beneficial for customers in the long run even if they leave gas service (i.e., not appliances)?	Cascade agrees that fuel agnostic Energy Efficiency Measures are optimal. Cascade has sought to increase uptake in these Residential Envelope measures by increasing insulation incentives in the 2024-2025 BCP by 60-100% compared to the previous BCP. Additionally, Cascade has invested significant resources into the Point of Sale rebate program which is currently heavily skewed towards fuel agnostic envelope measures including ceiling insulation and air sealing.
52	3/13/2024	Post Targeted TAG 4	WUTC	* Why is achievable potential anticipated to go up for the next 20 years? Does this align with Staff concerns regarding building codes and compliance costs, and the potential for declines in customer counts?	It's important to note the difference between cumulative savings potential (compounding over time) and incremental savings potential (a single year snapshot). While the CPA did consider the impacts of Washington Energy Code on customer fuel adoption and future use of gas, many measures serving existing customers were still found to be cost effective and will continue to be important to help customers reduce their energy burden. Using adoption ramp rates and achievability methodology consistent with those used by the NWPCC 2021 Power Plan, the achievable remaining market for these measures is captured over the study period, which means new installations or captures of turnover equipment in each year. The cumulative savings from these annual measures are what is reported in the CPA. The available savings potential in each year (i.e., the incremental potential) does start to decline starting around 2030, partly due to the shape of Council's ramp rates, but also due to changes in the underlying market baseline loads expected.
53	3/13/2024	Post Targeted TAG 4	WUTC	* Staff would like to remind Cascade that the 10% RTF preference adder does not relate to Non-Energy Benefits.	Cascade asked Staff to share their thoughts on what the 10% RTF preference adder does cover, from their perspective. Staff's response: UCT Staff cannot speak for the RTF. However, the RTF refers to the 10% preference adder as a "regional preference adder" (slide 11). In that 2019 presentation, the RTF cites to [Northwest Power Act, §3(4)(D), 94 Stat. 2699.] which states "3(4)(D). For purposes of this paragraph, the "estimated incremental system cost" of any conservation measure or resource shall not be treated as greater than that of any non-conservation measure or resource unless the incremental system cost of such conservation measure or resource is in excess of 110 per centum of the incremental system cost of the nonconservation measure or resource."
54	3/13/2024	Post Targeted TAG 4	WUTC	* Staff will be following up regarding how Cascade can put IRA/IIJA implementation assumptions into their modeling assumptions. There will be continued discussion around this issue.	Cascade appreciates the follow up.
55	3/13/2024	Post Targeted TAG 4	WUTC	* Staff emphasizes the need for an empirical foundation for the customer forecast theory that will guide the development of Cascade's model. Staff notes that understanding the conditions in which customers adopt "furnace - direct fuel - AFUE 97% (CEE Tier 3)" measures may shed like on future customer behaviors.	Cascade appreciates staff emphasizing this need and will look into it.
56	4/17/2024	Post Targeted TAG 5	WUTC	Staff lauds Cascade's initiative in developing a building stock attrition rate. Staff would appreciate greater clarification about what is captured by the building stock attrition rate, especially to avoid double counting between building/customer loss due to anticipated bill impacts/customer flight and non-economic drivers of customer loss.	Cascades intent for building stock attrition rate is that this rate would reflect natural building decay, in which a building is either demolished and rebuilt under current WA State Building Codes, or remodeled/renovated to a point in which the home must follow current WA State Building Codes.
57	4/17/2024	Post Targeted TAG 5	WUTC	Customer Count Forecast and Price Elasticities - Staff lauds Cascade's efforts to engage with this topic. Staff looks forward to further conversations with Cascade staff as it develops its methods. Has Cascade staff considered evaluating its historic customer count and retail price data by controlling for economic growth or some other econometric proxy for "bullishness"? Further, Staff questions whether historic price data is probative since the prices and bill impacts anticipated from CCA compliance costs and the likely changing ratio of fixed costs to customers likely exceeds historic data in the intermediate to long run. Staff questions if customer choices to electrify might be better understood as a stepwise function? Has Cascade considered that customers, individually, may leave gas service at a service-price tipping point? Has Cascade considered the dynamics of a heterogeneous population of such individuals as service prices increase?	Cascade does attempt at controlling for economic growth by including total household and employment growth in the Company's customer forecast model. Cascade agrees that historic price data may not be probative as Staff states. Thus, Cascade will also be including a separate electrification analysis that looks at service-price tipping points.
58	4/17/2024	Post Targeted TAG 5	WUTC	WA State Building Codes - The presentation noted "The new building codes have made it impractical for new residential and commercial buildings to use natural gas." Cascade staff noted during the TAG that, currently, new residential customers were typified by gas stoves, and barbecues and space heaters for shared spaces. On a use per customer basis how does this align with previous IRPs' assumptions around future use per customer? In addition to changes in customer end-uses, how has growth in customer counts changed in the last year?	If Cascade continues to see growth in residential homes with appliances such as stoves, barbecues, and space heaters in shared areas, the Company would anticipate the use per customer declining. Historically, Cascade's use per customer is flat the slowly declining, which is what we would anticipate with new residential homes being limited to stoves, barbecues and space heaters in shared areas. As of March 2023, Cascade experienced 1.05% growth. Update - As of June 2023, Cascade's year-over-year growth is at 0.69%.
59	4/17/2024	Post Targeted TAG 5	WUTC	Cascade staff proposed running an alternative scenario modeling the possibility that the CCA and/or Washington State building codes are overturned. Staff supports modeling this alternative scenario.	Cascade appreciates Staff support.
60	4/17/2024	Post Targeted TAG 5	WUTC	Weather Normals and Climate Change Impact - Does Cascade or ICF have an evidentiary basis for deviating from RCP 8.5 or SSP5-8.5 as used by the NWPCC? Staff stresses the centrality of empiricism in our work and urges that the baseline scenario represent the most likely future for Cascade Planning based on available data, even if that deviates from RCP 8.5. Staff also invites Cascade to consider climate change models that deviate from current expectations in additional scenarios. Staff would further appreciate more information about the "Cold Weather Review Relevant to Peak Forecasts".	Cascade does not plan on running the RCP 8.5 or SSP5-8.5. Cascade explained that the RCP 8.5 and SSP5-8.5 have been deemed as highly unlikely and often wrongly used as "business as usual". See more in this article: comment article
62	5/17/2024	Post Targeted TAG 7	WUTC	Staff appreciates Cascade's receptivity to comments and feedback from Staff and interested parties. Staff highlights that Cascade's efforts in the current IRP process thus far have been quite productive. Staff looks forward to continued work with Cascade throughout the IRP process.	Cascade appreciates the feedback and the collaborative efforts in producing the IRP.
63	5/17/2024	Post Targeted TAG 7	WUTC	Staff appreciates Cascade's clarifications about future hydrogen strategies. Staff looks forward to Cascade investigating both hydrogen fuel blending and a parallel hydrogen-only system as pathways to decarbonization. Staff also looks forward to ongoing discussions with Cascade staff about the collateral costs of hydrogen blended fuels. Staff is supportive of Cascade investigating decarbonization strategies, but Staff also reiterates its concerns about hydrogen contained in its comments responding to the 2023 IRP.	Cascade understands Staff's concerns regarding hydrogen and looks forward to working through any concerns in the future.
64	5/17/2024	Post Targeted TAG 7	WUTC	Staff looks forward to future talks about equity in distribution system planning and analysis. Staff recommends that Cascade work with the EAG and future TAGs to develop an equity framework for distribution system planning for the 2024 IRP.	Cascade looks forward to continuing the collaborate efforts on equity in the IRP.

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65	5/17/2024	Post Targeted TAG 7	WUTC	Staff questions whether a 5-year planning horizon is appropriate for distribution system planning. Staff questions if a shorter planning horizon might result in path dependency issues compared to a longer planning horizon. Staff acknowledges the difficulties of accurate planning with longer time horizons, but recommends that Cascade investigate the possibility of longer planning horizons that align with the 2050 planning horizon of the IRP document. Staff questions whether useful, though perhaps generalized, information might be gleaned from a longer planning horizon that might provide insights into strategies and capabilities to mitigate risks to rate payers and the utility.	Cascade appreciates Staff's feedback. With growth uncertainty being at an all time high, it is extremely difficult to plan for a longer planning horizon. With that said, Cascade does agree that there are some benefits that could be explored looking further out into the future when planning distribution system upgrades.																																																								
66	6/6/2024	Post Targeted TAG 8	WUTC	During Targeted Tag 8, Cascade requested other sources for electrification data. Staff offers the following resources, however UTC Staff cannot vouch for the accuracy or reliability of these resources, nor does the following list convey any endorsement of these resources: Avista offers a Heating Comparison Calculator (ppogee.net) on its website. While this does not predict future electric rates, it does compare indoor heating costs. Avista's work papers associated with its 2023 Gas IRP and Electric Progress Report are publicly available under docket UE-200301. Puget Sound Energy also has various of its work papers publicly available under docket UE-200304.	Cascade appreciates Staff's feedback.																																																								
67	6/6/2024	Post Targeted TAG 8	WUTC	Staff is concerned about the lack of a preferred portfolio. Staff is open to having an extended conversation about this with the Company and the Oregon PUC.	Cascade appreciates the feedback on the lack of preferred portfolio. Cascade has re-evaluated the preferred portfolio and will be including one in this IRP.																																																								
68	6/6/2024	Post Targeted TAG 8	WUTC	Staff would like to see Cascade's data that supports "Reference Case: Washington State Building Code Council rules w/ flat customer growth".	Cascade was able to put together a report that pulls service line retirements without reconnection. When a line that feeds a customer is retired, Cascade does not collect a reason for why they're being disconnected. This is the best estimate the Company has been able to establish for customers leaving, whether it be through home destruction or electrification. Here are the results from this report for our Washington service territory: <table><tr><th>Year</th><th>Customers</th><th>Retirement</th><th>% of customers</th></tr><tr><td>2011</td><td>196,015</td><td>399</td><td>0.20%</td></tr><tr><td>2012</td><td>197,548</td><td>369</td><td>0.19%</td></tr><tr><td>2013</td><td>199,949</td><td>407</td><td>0.20%</td></tr><tr><td>2014</td><td>202,195</td><td>396</td><td>0.20%</td></tr><tr><td>2015</td><td>204,867</td><td>432</td><td>0.21%</td></tr><tr><td>2016</td><td>207,868</td><td>420</td><td>0.20%</td></tr><tr><td>2017</td><td>211,164</td><td>410</td><td>0.19%</td></tr><tr><td>2018</td><td>214,996</td><td>400</td><td>0.19%</td></tr><tr><td>2019</td><td>218,811</td><td>366</td><td>0.17%</td></tr><tr><td>2020</td><td>222,778</td><td>341</td><td>0.15%</td></tr><tr><td>2021</td><td>226,633</td><td>342</td><td>0.15%</td></tr><tr><td>2022</td><td>229,418</td><td>391</td><td>0.17%</td></tr><tr><td>2023</td><td>231,539</td><td>314</td><td>0.14%</td></tr></table> <p>This is showing that the number of service line retirements each year is in the ballpark of .15% to .20% per year, which is much flatter than the 1.5% decay rate that has been discussed between the parties in the past. Cascade is still seeing customers who are interested in adding non-space and water heating appliances, which are allowed under the current building codes. This is currently how Cascade is coming to the conclusion for utilizing a flat growth rate, with a declining upc, for the reference case.</p>	Year	Customers	Retirement	% of customers	2011	196,015	399	0.20%	2012	197,548	369	0.19%	2013	199,949	407	0.20%	2014	202,195	396	0.20%	2015	204,867	432	0.21%	2016	207,868	420	0.20%	2017	211,164	410	0.19%	2018	214,996	400	0.19%	2019	218,811	366	0.17%	2020	222,778	341	0.15%	2021	226,633	342	0.15%	2022	229,418	391	0.17%	2023	231,539	314	0.14%
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69	6/6/2024	Post Targeted TAG 8	WUTC	During Targeted-Tag 8, Staff asked for a more detailed description of PLEXOS' selection criteria for electrification. Staff would like to schedule a meeting with Cascade staff to walk through this aspect of the model.	Cascade is still working on the electrification analysis. Cascade will present this at TAG 2, or at a Targeted TAG meeting after TAG 2.																																																								
70	6/6/2024	Post Targeted TAG 8	WUTC	Staff continues to stress the benefits of conducting a plausible worst-case scenario where all variables that are demonstrated to increase systemic instability are each simultaneously increased/decreased, within plausible parameters, to increase systemic instability. Staff urges Cascade to consider the non-arithmetic impacts of model inputs.	Cascade understands Staffs concern regarding a plausible worst-case scenario. Cascade will address this under the declining customer growth scenario.																																																								
71	6/6/2024	Post Targeted TAG 8	WUTC	Staff reiterates its previous feedback regarding the possibility of targeted energy efficiency/elevated avoided costs to mitigate customer losses.	Cascade appreciates Staff's feedback.																																																								
72	6/6/2024	Post Targeted TAG 8	WUTC	Staff reiterates its previous feedback regarding the possibility of system pruning as a strategy to lower fixed costs	Cascade appreciates Staff's feedback.																																																								
73	9/10/2024	Pre-TAG 1	WUTC	How was the Company able to adjust the model based on the extra time it was given by the Commission?	The Company utilized the extra time to gather information on Cascade's system to understand the number of customers who disconnect and do not reconnect each year. Cascade also used this time to understand decomposing regression models in order to adjust the forecasts for flat and declining growth. This has also allowed the Company time to ensure the climate data was accurately being incorporated into the final forecast. This time has also allowed Cascade to continue to build out an electrification workbook, which will analyze electric costs vs natural gas costs across the service territory and income levels.																																																								
74	9/10/2024	Pre-TAG 1	WUTC	Slide 14 "Likely-given policies" Does Cascade see itself in alignment with these larger policy goals? Does Cascade believe this is likely given the Annual Energy Outlook 2022 -U.S. Energy Information Administration (EIA) citation from slide 32?	The CMIP6 models that are listed as likely-given policies are created by several expert groups from several different countries who take into account policy goals from around the globe. It's important to note that natural gas is approximately 1/3 of greenhouse gas emissions and the CMIP6 models consider all GHG emission policies. Natural gas has and continues to be a resource that is replacing coal.																																																								
75	9/10/2024	Pre-TAG 1	WUTC	Slide 17 "The non-Gaussian temperature distribution in the Pacific Northwest" Does Cascade have a chart/graphic to represent this?	Cascade utilized this source to come to this conclusion: https://doi.org/10.1175/JCLI-D-19-0344.1 . See section 4 for Non-Gaussian cold tails spatial patterns and section 5b for long tail individual cases, specifically Pendleton, OR.																																																								
76	9/10/2024	Pre-TAG 1	WUTC	Slide 19 "Might the portfolio choices impact the customer count?"	Possibly. The customer forecast is merely a starting point. Each portfolio choice will have an electrification analysis that could impact the customer counts.																																																								
77	9/10/2024	Pre-TAG 1	WUTC	Slide 20 "Unifying inputs is an important part of the forecasting process." What does it mean to unify inputs?	Under the current forecast model, Cascade uses pipeline data because it aligns with temperatures since Cascade can get pipeline data at a daily level. However, pipeline data does not provide data by customer class. To allocate the pipeline data to the customer class, Cascade must align the customer care and billing data to the pipeline data to determine how much usage is coming from each customer class.																																																								
78	9/10/2024	Pre-TAG 1	WUTC	What is the theory regarding Retail Price and the Customer Forecast? Has Cascade considered household income instead?	In the 2023 IRP, Cascade included price as a forecast in the upc forecast as the theory is that as prices go up, customers will use less gas. The theory behind retail price as a regressor for customer count is that if there is a negative relationship between increasing prices and customer counts, indicating customers leaving the gas system, the regressions would capture that. Cascade has considered household income and has begun testing it on fixed network data in addition to the income included in the current forecast model. However, fixed network implementation has yet to be complete, creating issues with the results of the analysis on customer count. Cascade will continue to analyze the data once fixed network implementation is complete. Another way Cascade is looking at impacts to customer counts is in the electrification model, which analyzes electrification at varying levels of customer income.																																																								
79	9/10/2024	Pre-TAG 1	WUTC	In a zero or low-growth scenario, what is the theoretical basis for HH as a regressor to forecast customers?	HH and employment is used to build out the business-as-usual customer forecast. Then the model is decomposed, which provides seasonal components, the trend (which is the growth), and randomness of the regression. For the flat growth, Cascade removes the trend and for the declining growth, Cascade implements a decay rate.																																																								
80	9/10/2024	Pre-TAG 1	WUTC	What are the drivers of retail cost? Does it include Fixed costs, CCA, and Cascade's Financial ratings?	Retail costs include fixed costs and CCA costs from the previous IRP.																																																								
81	9/10/2024	Pre-TAG 1	WUTC	What effect does the data indicate that Retail Price and Income have on the Customer Forecast? What data is being relied upon?	Retail price was not found to be statistically significant in any customer forecast results.																																																								
82	9/10/2024	Pre-TAG 1	WUTC	Why does the Customer Forecast rely on average incomes? Are there insights that could be gleaned from looking at the actual distribution, such as which customers are more likely to electrify? How is customer income data being used to forecast customers? What progress has Cascade made in its equity analysis and how has that factored into this analysis?	Cascade's customer count models found income to be statistically significant, however, the impact is very minimal. Cascade has utilized the fixed network data and Cascade's equity mapping to analyze customer counts with an equity lens. However, since the fixed network implementation is not yet complete, Cascade cannot accurately account for customer counts yet. Cascade will continue to look at fixed network data for future IRPs. With that said, Cascade is looking at income levels in the electrification model that would be able to glean more information than analyzing historical data.																																																								
83	9/10/2024	Pre-TAG 1	WUTC	Slide 23 "Note that this is a goal, not a mandate." While Staff can appreciate the difference in theory, in practicality, does Cascade have any basis to believe that both imperatives are not being pursued with diligence?	Cascade does not have a stance on how it is being pursued. Cascade must understand the risks to customers, therefore it is reasonable to note when a policy is a goal vs a mandate. As can be seen in Cascade's customer forecast ranges, the Company is modeling multiple outcomes of potential building code policy futures.																																																								
84	9/10/2024	Pre-TAG 1	WUTC	Slide 26 What is the basis for the return to normal growth assumption? Why does this not take other policy into account?	The basis for the return to normal growth assumption is that the building codes are redacted. Again, it would be a risk for customer if Cascade's growth returned to normal and Cascade did not have a plan in place to meet high CCA carbon compliance targets.																																																								
85	9/10/2024	Pre-TAG 1	WUTC	Slide 24 "The new building codes have made it impractical for new residential and commercial buildings to use natural gas." How impractical? In quantifiable terms where are the impacts of the codes?	It has yet to be determined the exact quantifiable impacts of the building codes. With that said, Cascade had a 1.42% growth rate prior to the 2018 building codes going into effect in February of 2021 and a 0.81% growth rate when 2021 building codes went into effect in March of 2024. As of August 2024, Cascade's year-over-year growth rate is at 0.78%. As a reminder, building codes have a trickling effect once they're effective as in most cases buildings can still be built under old building codes as long as the permitting was complete prior to the effective date.																																																								

Cascade Natural Gas Integrated Resource Planning Feedback Report

Item #	Date	TAG Meeting	Name/Company	Comment/Question	Cascade Response																																																								
86	9/10/2024	Pre-TAG 1	WUTC	Slide 26 "Base – Washington State Building Code Council rules w/ flat customer growth" What is the basis for a flat customer growth? What data or literature supports this? Is it currently the case that customers leaving = customers joining?	<p>Cascade utilized a report that pulls service line retirements without reconnection. When a line that feeds a customer is retired, the Company does not collect a reason for why the customer is being disconnected. This is the best estimate Cascade has established for customers leaving, whether it be through home destruction, electrification, or any other reason. Here are the results from this report for Cascade's Washington service territory:</p> <table><thead><tr><th>Year</th><th>Customers</th><th>Retirement</th><th>% of customers</th></tr></thead><tbody><tr><td>2011</td><td>196,015</td><td>399</td><td>0.20%</td></tr><tr><td>2012</td><td>197,548</td><td>369</td><td>0.19%</td></tr><tr><td>2013</td><td>199,949</td><td>407</td><td>0.20%</td></tr><tr><td>2014</td><td>202,195</td><td>396</td><td>0.20%</td></tr><tr><td>2015</td><td>204,867</td><td>432</td><td>0.21%</td></tr><tr><td>2016</td><td>207,868</td><td>420</td><td>0.20%</td></tr><tr><td>2017</td><td>211,164</td><td>410</td><td>0.19%</td></tr><tr><td>2018</td><td>214,996</td><td>400</td><td>0.19%</td></tr><tr><td>2019</td><td>218,811</td><td>366</td><td>0.17%</td></tr><tr><td>2020</td><td>222,778</td><td>341</td><td>0.15%</td></tr><tr><td>2021</td><td>226,633</td><td>342</td><td>0.15%</td></tr><tr><td>2022</td><td>229,418</td><td>391</td><td>0.17%</td></tr><tr><td>2023</td><td>231,539</td><td>314</td><td>0.14%</td></tr></tbody></table> <p>The table shows that the number of service line retirements each year is in the ballpark of .15% to .20% per year, which is much flatter than the 1.5% decay rate that has been discussed in the past. Cascade is still seeing customers who are interested in adding non-space and water heating appliances, which are allowed under the current building codes. This is currently how Cascade is coming to the conclusion for utilizing a flat growth rate, with a declining upc, for the reference case.</p>	Year	Customers	Retirement	% of customers	2011	196,015	399	0.20%	2012	197,548	369	0.19%	2013	199,949	407	0.20%	2014	202,195	396	0.20%	2015	204,867	432	0.21%	2016	207,868	420	0.20%	2017	211,164	410	0.19%	2018	214,996	400	0.19%	2019	218,811	366	0.17%	2020	222,778	341	0.15%	2021	226,633	342	0.15%	2022	229,418	391	0.17%	2023	231,539	314	0.14%
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87	9/10/2024	Pre-TAG 1	WUTC	"Low - Washington State Building Code Council rules w/ 1.5% decay in building stock attrition" What is the basis for 1.5% decay rate? What data or literature supports this?	Cascade includes a 2% per year rate where a housing stock drops out of the existing building shell class in the Energy Efficiency model. So while some decline in Existing customers is possible from either voluntary electrification and/or complete demolition, it probably won't be at 2% per year. Cascade would want a second assumption for what portion of those renovating properties (the 2% in our model) would choose to fully disconnect from gas as their path to compliance credits vs those who would continue with HE gas equipment and take higher building shell credit paths. Unfortunately, there is no specific analysis for this assumption. Although Cascade believes a 1.5% decline is conservative, it is a plausible decline to model for a low customer count rate.																																																								
88	9/10/2024	Pre-TAG 1	WUTC		Historically, Cascade's customer base has a seasonal effect due to people suspending service for several reasons such as vacationing, seasonal business, or simply not needing gas services until the winter period.																																																								
89	9/10/2024	Pre-TAG 1	WUTC	Why does the customer forecast seasonally go up? What are the impacts of this potential customer loss on bill impacts?	This will be determined later on in the IRP process when low-carbon alternative fuels are modeled.																																																								
90	9/10/2024	Pre-TAG 1	WUTC	Slide 27 Why are there slight bumps in usage in the more recent IRP scenarios?	This is due to retail prices being included in the upc forecast and the retail prices are lumpy due to the optimization process of Plexos.																																																								
91	9/10/2024	Pre-TAG 1	WUTC	Do the demand forecast results include Demand Side Management?	It includes demand side management programs that have been implemented in the historical data. It does not include future DSM yet, but it will once the demand side management analysis is complete for the IRP.																																																								
92	9/10/2024	Pre-TAG 1	WUTC	Slide 30 "Cascade's transportation customer forecast decreased from the previous forecast." How much did it decrease?	The previous forecast was 243. One thing to note is that Cascade will often times have customers move from core to non-core and vice versa, creating some volatility in the non-core customer counts.																																																								
93	9/10/2024	Pre-TAG 1	WUTC	"Cascade projects the non-electric gen transportation customers in Washington and Oregon to consume approximately 525 million therms in 2025." What is the long-term trend beyond 2025?	Cascade projects relatively flat growth. The Company is still receiving interest from transport customers that would like to add natural gas. With that said, long term impacts on non-electric gen transport customers remains uncertain.																																																								
94	9/10/2024	Pre-TAG 1	WUTC	"Cascade is communicating with the transportation customers on CCA impacts, but it is too early to determine the impact CCA will have on these transport customers." Tentatively what does the data indicate? How indeterminate are the impacts? What is the nature of the ambiguity?	This was a carry over sentence from the previous iteration this was presented. Since that presentation, Cascade has provided this notice to the public: https://www.cngc.com/wp-content/uploads/PDFs/Brochures/2024/2024_03_cngc_wa_cca_bilingual_bw_8haIX7.pdf . Cascade will continue to communicate with transport customers regarding future CCA impacts.																																																								
95	9/10/2024	Pre-TAG 1	WUTC	Slide 32 Is similar analysis being conducted for non-conventional fuels?	Yes, Cascade has contracted with ICF on a low-carbon alternative fuels study which contains short- and long-term outlooks on non-conventional fuels.																																																								
96	9/10/2024	Pre-TAG 1	WUTC	Slide 33 "Electric power generation is the primary driver for natural gas consumption during the hot summer months. The electric power sector consumed 13% (5 Bcf/d) more natural gas in July than it did in June because of a heat wave and subsequent spike in natural gas-fired electricity generation." Does this assumption hold when reviewing the Clean Energy Implementation Plans shared by electric utilities?	The quote referenced here is based on actual recorded data for June and July of 2024.																																																								
97	9/10/2024	Pre-TAG 1	WUTC	Slide 37 "EAdder = Environmental Adder, as recommended by the Northwest Power and Conservation Council" Staff notes that it is a preference adder, not an Environmental Adder, and that it is required by Federal statute.	Thanks. Cascade has clarified language around the 10% adder in the IRP.																																																								
98	9/10/2024	Pre-TAG 1	WUTC	Slide 38 "The Company's distribution system cost calculation looks at forecasted capital expenses related ONLY to growth, and uses the company's load growth forecast to translate these costs to a per therm basis." Why does this aspect of avoided costs apply only to growth and not degrowth?	It applies to growth, whether it's positive or negative.																																																								
99	9/10/2024	Pre-TAG 1	WUTC	Slide 39 As of right now the policy statement in U-230161 has been withdrawn. Staff does not recommend doing anything differently and has no other guidance on this.	Thanks. Cascade is aware of the policy statement being withdrawn and will make note of this during the presentation.																																																								
100	9/10/2024	Pre-TAG 1	WUTC	Slide 40 "The avoided cost has increased by about 30-40% from the 2023 IRP due to the increase in commodity costs as well as the addition of the SCC to the carbon tax based off Staff's policy statement." Staff does not issue policy statements.	Noted and fixed.																																																								
101	9/10/2024	Pre-TAG 1	WUTC	Slide 46  This diagram appears to show all transmission lines terminating on "Cascade Natural Gas" in the center. It also indicates the proportions of gas supply from Canada, AECO, and the Rockies. However, the diagram on slide 43 shows that Cascade has non-contiguous service territory And the image on slide 44 indicates that there are various transmission pipelines going between the various non-contiguous elements of Cascade's service territory. Further, the table on slide 40 indicates a consistent avoided cost between the various zone.	This is intended to be a simplistic model to show flow into Cascades System. While CNG is non-contiguous this is not intended to indicate otherwise. The proportions of supply are estimated, and the size is an approximate representation.																																																								
102	9/10/2024	Pre-TAG 1	WUTC	Why doesn't the proximity of various zones to various supplies and their position relative to different transmission routes result in different avoided costs by zone?	The way fixed costs and commodity costs are recovered are spread throughout the customer base. A customer in the Kennewick area on a 503 rate is paying the same rate as a customer in Bellingham on a 503 rate.																																																								
103	9/10/2024	Pre-TAG 1	WUTC	Slide 47 "PORTFOLIO PROCUREMENT DESIGN BASED ON A DECLINING PERCENTAGE EACH YEAR, ACCORDINGLY" What is declining each year? "Annual load expectation (Nov-Oct) is approximately 37,000,000 dths, consistent with recent load history." Is this expectation just for the next year, through 2025?	The percentage of portfolio acquired declines each year (Year 1 is 90%, Year 2 is 60%, year 3 is 30%). The load expectation is approximately 37,000,000 each year for all three years of the portfolio design. Slide 48 better describes these calculations. In year 1, the annual expectation is 36,680,873 with a hedge target of 55%, or 20,174,480.																																																								

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104	9/10/2024	Pre-TAG 1	WUTC	Slide 51 Generally, Staff would find more discussion of storage useful. "At 100% of demand, Cascade can meet approximately 67% of Peak Day Needs." What does 100% of demand mean? Can Cascade meet 67% of peak day needs with storage? Does this consider curtailable users, Energy Efficiency, or Demand Response?	Typically, we plan on Nov 1-March 31 to use storage. Not all days are used and not all days are storage withdrawals. There were only 27 days over the past winter that there were no storage withdrawals/injections for the winter period of 152 days. Storage has become a more and more integral part of operating the system given the constraints on the pipeline, annual throughput increases and increasing days with entitlement warnings and/or entitlement periods.
105	9/10/2024	Pre-TAG 1	WUTC	"Total storage capacity accounts for approximately 14.75% of winter demand" What percentage of days in the winter is storage typically tapped into?	At a 275,000 0th peak day, CNG could deliver approximately 67% of that demand from Storage resources if available, dependent upon storage levels. Not taking into account any curtailments, EE or Demand response. We can discuss more around EE, Demand Response and curtailments which are not useful tools to be considered for high usage days.
106	9/10/2024	Pre-TAG 1	WUTC	Slide 55 What is Cascade's peak day methodology?	Based on ICs cold weather qualitative analysis, Cascade's understanding is that there is uncertainty on how climate change will impact peak day. Although there is a warming trend on annual HDDs, this does not preclude cold snaps from occurring and some evidence has suggested climate change could worsen cold extremes. Cascade will continue to use the 99th percentile of peak days, similar to the 2023 IRP.
107	9/10/2024	Pre-TAG 1	WUTC	Slide 57 "Electrification - Expected Costs" How is electrification considered by Cascade's model? How does the decision logic work in the model? What resources/data/literature does Cascade rely on for the expected costs?	Cascade will provide more information on Electrification at a later TAG meeting.
108	9/10/2024	Pre-TAG 1	WUTC	Does Cascade consider accelerated depreciation of fixed costs, targeted energy efficiency, or elevated avoided costs to estimate their impact on avoiding undesirable outcomes or systemic instability?	Cascade does not consider accelerated depreciation. If Cascade had distribution system plans for the reference case, targeted energy efficiency would be considered.
109	10/22/2024	Pre-TAG 2	WUTC	Page 5, "Cascade Natural Gas, along with MDU Resources Group's other natural gas companies, established a GHG reduction target to reduce methane emissions 30% by 2035 compared to 2022 levels." What is the scope of this 30% reduction? Does it include customer emissions?	The target includes distribution system methane emissions. It does not include emissions resulting from customer combustion of natural gas.
110	10/22/2024	Pre-TAG 2	WUTC	Page 6, "Cascade reported 1,721 mT CO2e emissions from leak emissions per HB 2518 to the UTC in 2023. Cascade reported 27,198 mT CO2e emissions for distribution system and compressor station emissions to the Department of Ecology and the EPA's GHG Reporting Program in 2023." According to the MethaneSAT new findings and other scientific findings , methane loss at gas sites is much greater than the EPA estimates. Is Cascade planning to reflect the new available data in the model?	As discussed during Cascade's TAG 2 meeting, the emissions included on page 6 are operational emissions and are not included in the supply-side modeling in Plexos.
111	10/22/2024	Pre-TAG 2	WUTC	Page 7, "Cascade is committed to methane emissions reductions" What is the scale of the emissions that Cascade intends to reduce?	We do not currently have specific WA total methane emissions broken out of our total 8-state company-wide emissions total. For understanding the scale of these emissions, a 30% reduction of our company-wide distribution system methane emissions from 2022 would result in a reduction of about 49,000 metric tons CO2e. This reduction would include a portion of methane emissions from Cascade's Washington distribution system.
112	10/22/2024	Pre-TAG 2	WUTC	Page 9, "Anthropogenic GHG Emissions Reductions" In terms of modeling compliance with reductions goals, what is Cascade planning to do for the IRP?	Cascade is considering both CCA rules and State emissions goals in modeling.

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113	10/22/2024	Pre-TAG 2	WUTC	Page 14, "Other: Carbon Capture, Synthetic methane, etc." What other options are encapsulated by "etc"?	etc would encapsulate electrification among other resources that may not be available yet.
114	10/22/2024	Pre-TAG 2	WUTC	Page 15, Please explain the shape of this graph.	Prior to 2024, Cascade is sharing total Washington Customer Emissions. After 2024, Cascade is only sharing the customer emissions that Cascade is responsible for under the Climate Commitment Act.
115	10/22/2024	Pre-TAG 2	WUTC	Page 16, What will make up the "compliance need"? How will that be modeled?	It is important to note that this is just an example. What will make up the compliance need could potentially be banked allowances as well as low carbon alternative fuels that will be stress tested against electrification.
116	10/22/2024	Pre-TAG 2	WUTC	Page 16, From an equity perspective, how would these costs fall on customers? What are the distributive equity consequences of this?	Cascade will continue to follow the requirements of the CCA and spread the costs of RNG in the appropriate way, whether that's via the CCA methodology, or through a typical rate design, or through a different option all together. Specifically for low-income (LI), there are ways that the CCA can offset costs for the LI customers. There is also the CARES program to consider. Aside from the CCA, all other RNG investments would flow through rates (however applicable at the time), but the overall bill impacts to low-income customers would then be assisted by the CARES program.
117	10/22/2024	Pre-TAG 2	WUTC	Page 17, "WA IA 2066 could have a large impact on the WA State Energy Codes (WSEC). If passed in November, there will likely be a review and/or rewrite of the current WSEC." What impacts will it have on the IRP if IA 2066 does not pass?	The impacts would be consistent with how Cascade projected outcomes were associated with the current WA energy code, essentially flat growth. There could also be the possibility of additional limitations on the use of gas in future.
118	10/22/2024	Pre-TAG 2	WUTC	Page 26, Why are the reference graphs so wiggly?	This is due to including retail rates in the customer and upc regression models. In future IRPs, Cascade will investigate ways to smooth out those jumps.
119	10/22/2024	Pre-TAG 2	WUTC	Page 29, Why is there so much less savings?	Therm savings potential is directly influenced by projected consumption. The top 2 graphs on pages 26-28 show that projected consumption, the red line, is pretty significantly lower in the 2025 reference case, high growth, and low growth scenarios compared to the 2023 CPA throughout the forecast horizon.
120	10/22/2024	Pre-TAG 2	WUTC	Page 30, How does Cascade anticipate new technological developments in this analysis?	For the CPA, AEG developed a preliminary list of efficient measures which assessed their energy saving characteristics, incremental cost, service life, non-energy impacts, and other performance factors. Over 150 unique energy savings measures were considered in the CPA, with permutations across vintage and segment adding up to over 4,000 variations. Following the measure characterization, AEG performed an economic screening of each measure, which serves as the basis for developing the economic and achievable potential scenarios.
121	10/22/2024	Pre-TAG 2	WUTC	Page 30, Some values in this table vary while some do not, why?	The variance that arises depends on the changes that were made between the different scenarios. For example, if HDDs, weather normal inputs, avoided costs, inflation, and demand are all updated then that will produce different results than if only demand is changed. The variables across scenarios will then change based on the correlation with what is being changed.
122	10/22/2024	Pre-TAG 2	WUTC	Page 33, Is cascade doing any equity analysis regarding the sourcing and siting of RNG?	Cascade is currently working with the Equity group in the development of the Distributional Equity Analysis (DEA) along with leadership. The Company has a first draft, however, Cascade is diligently working on identifying all potential areas of reporting that must be considered in the DEA.
123	10/22/2024	Pre-TAG 2	WUTC	Page 34, "Typically priced similar to regional gas pricing" Does this mean that RNG without green attributes has a similar market price as conventional natural gas?	Yes, relative to the basin its closest to.
124	10/22/2024	Pre-TAG 2	WUTC	Page 36, "Principles of RNG Cost-Effectiveness Evaluation" Is RNG being considered on a cost-effective basis or lowest reasonable cost basis?	The first test when evaluating an RNG project is always cost-effectiveness. A cost-effective project would theoretically always want to be acquired, unless there was no identified need for the RNG, and even then, the project should be considered on a non-regulated basis. After testing for cost-effectiveness, the next evaluation is on a lowest reasonable cost basis relative to all other marginal abatement alternatives.
125	10/22/2024	Pre-TAG 2	WUTC	Page 41, "pipelines while maintaining the benefits of reliability and resiliency provided by our distribution system" Is Cascade investigating competing demand for Hydrogen and the impacts that other uses beyond space heating will have on the price and practicality of meeting its customers' demand with hydrogen?	Cascade is utilizing a 3rd party consultant that is providing Hydrogen cost and technical supply projections.
126	10/22/2024	Pre-TAG 2	WUTC	Page 45, What is the cost of synthetic methane?	We're still working with our 3rd party consultants to finalize synthetic methane projections.
127	10/22/2024	Pre-TAG 2	WUTC	Page 45, "Cascade is looking at Carbon Capture for all customers." What might this look like for residential customers?	This has been fixed to indicate that we're only looking at carbon capture on large industrial customers.
128	10/22/2024	Pre-TAG 2	WUTC	Page 47, how does this price forecast compare/contrast to the previous IRP's forecast?	This EIA forecast is comparable to our price forecast used in the 2023 IRP. Prices drop between \$2-\$4 in the short-to-medium-term and rise to around \$4/MMBtu in the long-term.
129	10/22/2024	Pre-TAG 2	WUTC	Page 52, how does this method compare/contrast to the previous IRP's forecast?	The methodology is the same.
130	10/22/2024	Pre-TAG 2	WUTC	Page 54, how does Cascade consider future gas price volatility and the increasing uncertainty the further into the future that the forecast looks?	Cascade will include Monte Carlo simulations on natural gas prices.
	11/8/2024	Post-TAG 2	NWEC	During the second TAG meeting, Cascade showcased an example on Page 16 of the slide deck regarding the purchase limit of available allowances, capping it at 10% of the allowances up for auction. NWEC values the planning team for including this figure, as it was a useful visual aid. In 2024, Washington enacted SB 6058, which initiated several adjustments to the state's carbon market to better align with California and Quebec. This legislation stipulates that, under certain conditions, Cascade would be restricted to acquiring no more than 25% of allowances during an auction. It would be beneficial to create a similar graphic illustrating the purchase limit at this 25% threshold to understand its potential impact on Cascade's Washington IRP action plan in the event of linkage.	Thanks for this information. Cascade has updated it's modeling to reflect the 25% purchase cap.
	11/8/2024	Post-TAG 2	NWEC	NWEC would like to know if the Company has found that purchasing up to the allowance limit is viable as an economic auction strategy. When a covered entity such as Cascade Natural Gas submits bids into a quarterly auction, covered entities submit bids detailing the quantity and price of bids it plans on submitting in the auction. Covered entities can submit more than one bid in an auction. The CCA auction process is not revenue maximizing for the state. Instead, the quarterly CCA auction process is a sealed-bid uniform price auction. Bids are sorted from the largest price bid to the lowest price bid. A fixed quantity of allowances is allocated for each auction. The highest bidder receives their requested quantity of allowances first, and so on until the amount of allowances is fully allocated. The settlement price of the bid is the lowest winning bid. In future CCA compliance periods, Cascade would have to place high-priced bids to guarantee that it receives 100% of available allowances in auctions. NWEC would like the Company thoughts on this being a prudent bidding strategy or if this is an assumption to simplify modeling.	NWEC's summary of the CCA auction is accurate. As described in Chapters 4 and 9, Cascade provides a chart that includes the allowance forecast, monte carlo's, as well as the price ceiling along with other low carbon alternative fuels. Throughout the discussion in Chapter 9, Cascade showed that allowances, even at the price ceiling, are generally lower than other compliance options in the near- and mid-planning horizon. Cascade's resource planning strategy in regards to carbon compliance is to acquire the least cost, least risk option, which in many instances is through allowance purchases. Cascade cannot disclose it's bidding strategy.
	11/8/2024	Post-TAG 2	NWEC	NWEC acknowledges that the Climate Protection Program has yet to finalize its rulemaking process. Final guidelines should have included more detailed information regarding CPP compliance and its specific implications for Cascade Natural Gas operations in Oregon. Despite these uncertainties, NWEC finds it plausible to assume that the framework for Community Climate Investments will be a compliance option for the CPP. In this context, NWEC posits that it is reasonable to project limits on the use of CCI credits for compliance purposes, suggesting a threshold of 20% for CCI credits in the initial compliance period of the CPP. NWEC recommends a more conservative limit of 15% for subsequent compliance periods. Furthermore, NWEC advocates for Cascade Natural Gas to consider an updated forecasting approach regarding Oregon's customer growth. Specifically, it is suggested that Cascade should formulate its growth projections under the assumption that the allowance for line extensions—a financial mechanism supporting the expansion of utility infrastructure—will gradually diminish to zero in its preferred or reference customer scenario. This recommendation is informed by the practices of peer utilities in Oregon, such as Avista and NW Natural, which have progressively reduced their line extension allowances in response to direction from the Oregon Public Utility Commission. NWEC is aware that Cascade currently has an LEA for residential customers. Lastly, NWEC is strongly interested in reviewing Cascade's analytical framework surrounding funding opportunities for electrification programs. NWEC is particularly receptive to exploring incentives such as rebates for hybrid heating equipment and water heating solutions.	Cascade can confirm that Cascade's modeling has been updated to reflect the final ruling of the CPP. Cascade is gathering information in order to include line extension allowances as an explanatory variable in the next iteration of the customer forecast model.
	11/8/2024	Post-TAG 2	NWEC	When assessing renewable natural gas (RNG) resources, NWEC believes it would be best helpful to the planning process to consider the impact of changing the carbon intensity factor of RNG. In Washington, the Climate Commitment Act exempts "carbon dioxide emissions from the combustion of biomass, renewable fuels of biogenic origin, or biofuels from any facility, supplier, or first jurisdictional deliverer." Similarly, in Oregon, prior rules under the Climate Protection Program clarify that covered emissions do not include "emissions resulting from the combustion of biomass-derived fuels." These biomass-derived fuels encompass biomethane, biodiesel, renewable diesel, renewable propane, woody biomass, and ethanol. NWEC acknowledges that RNG is currently considered carbon-free according to existing regulations in Washington and Oregon. However, the emission factor for RNG can differ based on the feedstock used. NWEC deems it essential to evaluate this risk and remain vigilant about potential shifts in emission factors and regulations for RNG in the planning process.	Cascade appreciates NWEC's comments. Cascade does not include the emission factor of RNG in Resource Planning at this time, however, the Company does consider the emission factor when contracting for RNG.
	11/8/2024	Post-TAG 2	NWEC	If this IRP intends to acquire RNG, NWEC is interested in understanding Cascade's risk assessment methodology between purchasing renewable thermal credits through a contractual agreement and utilizing traditional utility financing to obtain them.	Cascade's action plan does not recommend purchasing RNG in the short term.

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	11/8/2024	Post-TAG 2	NWEC	When Cascade evaluates hydrogen resources, NWEC would appreciate more clarity on the cost assumptions the Company is making regarding its electricity acquisition plans. It is NWEC's understanding that clean hydrogen production tax credits are available. Cascade's Washington service territory includes electricity service from Puget Sound Energy, PacifiCorp, and other public power organizations. In Oregon, the service territory involves PacifiCorp, Idaho Power, Hermiston Electric Co-op, and Oregon Trail Electric Co-op. The carbon intensity differs across these territories; generally, public power companies tend to have a lower carbon intensity than their investor-owned counterparts. NWEC seeks detailed insights into Cascade's assumptions about electricity costs associated with hydrogen production. Additionally, NWEC would like to know if Cascade Natural Gas intends to use a book-and-claim system for hydrogen facilities or is only assess system hydrogen resources.	Cascade does include clean hydrogen production tax credits. The Company has consulted with ICF, who has provided Cascade with support on Low Carbon Alternative Fuel (LCAF) projections, including hydrogen. In this analysis, there are assumptions around electric rates. This can be found in Appendix L where ICF discusses their assumptions for LCAFs.
	11/8/2024	Post-TAG 2	NWEC	NWEC understands that Cascade does not own any natural gas storage projects and instead relies on contracted storage at Jackson Prairie and Mt. NWEC values natural gas storage facilities for their reliable and cost-effective services to Cascade's customers. In this IRP, NWEC wishes to explore how the future actions outlined in the action plan might affect Cascade's use of natural gas storage.	As mentioned in the TAG 4 and Chapter 9, Cascade is planning to add additional supply capacity beginning in 2029.
	11/8/2024	Post-TAG 2	NWEC	NWEC appreciates Cascade's efforts to provide information on Thermal Energy Networks in Washington. In the upcoming IRP, NWEC would like to see more details regarding these Thermal Energy Networks' economics and resource characteristics. Furthermore, NWEC inquires whether Cascade also plans to explore Thermal Energy Networks in its Oregon service territory.	Cascade has hired a Geothermal Network manager in January of 2025 who is focusing on TENs projects in both Washington and Oregon. Cascade will likely have limited information in the 2025 IRP on TENs, but anticipates that TENs will be a larger part of future IRPs.
131	1/3/2025	Pre-TAG 3	WUTC	Slide 5 "Cascade is considering removing low carbon alternative fuels from the model that are lower than current market prices" What does this mean?	Some of the ICF projections that were provided for RTCs in 2025 were lower than Cascade was seeing when in talks with RTC producers and marketers. Cascade used the different ICF buckets to blend the values into a reasonable cost assumption.
132	1/3/2025	Pre-TAG 3	WUTC	Slide 5 Why does CNGC not anticipate doing CC in the near future? What is the near future? (5 years, 10 years, 20 years)	While carbon capture costs look reasonable through the ICF low carbon alternative fuels, Cascade has had discussions with developers but it doesn't appear a project will be ready to implement prior to 2030.
133	1/3/2025	Pre-TAG 3	WUTC	Slide 6 "Prices are averaged between Northwest and National to reduce model inputs" How do these prices compare	Generally, they're close.
134	1/3/2025	Pre-TAG 3	WUTC	Slide 6 "Cascade is allocated 13% each of Northwest and National" Can you expand on what it means for Cascade to be allocated 13% of national?	National refers to the Low Carbon Alternative Fuels in the rest of the nation (outside the Northwest) that are expected to be available to the Northwest. ICF allocated the National values into a Washington and Oregon share. ICF also put together projections for WA and OR specifically, and called it Northwest. Cascade is expected to get 13% of that percentage allotted to the Northwest share as well as 13% of the Northwest share of the national share.
135	1/3/2025	Pre-TAG 3	WUTC	Slide 6 "All low carbon alternative fuels except Carbon Capture will be evaluated as off-system" Does off system mean that it won't flow in Cascade's distribution system? What are the ramifications of this assumption?	This is correct. At this time, there are no ramifications that Cascade anticipates. In the future, if these are determined to be peak day reliable resources, then it would impact upstream transportation and distribution system modeling.
136	1/3/2025	Pre-TAG 3	WUTC	Slide 6 What is ICF and is there another source of data that CNGC is using for price?	ICF Resources, LLC is their technical name, and they are a business consulting service that proves technical, administrative, and project management support for the public interest energy research program, geothermal resources development account program, and other energy-related research and development activities. Other than market prices that Cascade sees through conversations with brokers and developers on low carbon fuels.
137	1/3/2025	Pre-TAG 3	WUTC	Slide 6 What are some examples of IRA incentives that will be applied?	For hydrogen, there is the 45V tax credit. CCUS, RNG, and RTCs consider the Investment Tax Credit or Production Tax Credit until 2030.
138	1/3/2025	Pre-TAG 3	WUTC	Slide 7 Good charts. "Renewable Natural Gas Prices" Does this include green attributes	These costs are the cost only for the green attribute. These are unbundled and do not include the cost of the gas molecule itself. The reason RNG and RTC are treated separately is because an RTC that is bundled with the gas is generally cheaper than if you're just buying the RTC.
139	1/3/2025	Pre-TAG 3	WUTC	Slide 7 What are the differences between the price models? What are specific examples of differences?	I assume this question is about the difference between the different buckets, like FW-1 vs FW-2 vs FW-3. The difference has to do with the sizing. The smaller the number the smaller the facility.
140	1/3/2025	Pre-TAG 3	WUTC	Slide 8 "Renewable Thermal Credit Prices" Are these unbundled from the gas?	Yes, see the response to Slide 7, first bullet, for more info on RTC vs RNG. This is item number 138 in this sheet.
141	1/3/2025	Pre-TAG 3	WUTC	Slide 8 What are the differences between the price models? What are specific examples of differences?	Again, just the size of the facility.
142	1/3/2025	Pre-TAG 3	WUTC	Slide 8 Waste Water and Landfill Gas seem significantly cheaper, will this change anything in the portfolio?	We haven't finalized the portfolio modeling, but likely this will result in WW and LFG being chosen as the selected RNG and RTC choice, if chosen. This is not different than what Cascade has seen in the current market.
143	1/3/2025	Pre-TAG 3	WUTC	Slide 9 "Synthetic Methane" Can you explain the shape of this plot?	These are just real dollars for the cost of synthetic methane.
144	1/3/2025	Pre-TAG 3	WUTC	Slide 10 Can you please explain why some of the hydrogen fuels appear so cheap on this graph?	We don't expect those hydrogen fuels to be available for a couple of years. In the original graph, the hydrogen fuel prices were incorrectly input as \$0 for the first year and slowly ramped up to when hydrogen was first available. The graph has been fixed to remove the pricing before hydrogen is available.
145	1/3/2025	Pre-TAG 3	WUTC	Slide 11 "Cascade had a weighted share of 13% of the Northwest" how important is this assumption to Cascade's forecasting? What happens if this value is higher or lower? Will the value fluctuate and if so how will that be handled?	This value represents the amount of low carbon alternative fuel technical supply that is available to Cascade vs the other utilities in the Northwest. If the value decreases, this would reduce the amount available for Cascade to purchase. Currently, Cascade does not anticipate that value to fluctuate in the 2025 IRP.
146	1/3/2025	Pre-TAG 3	WUTC	Slide 12 Are these graphs scaled to Cascade's 13%? Is there enough at any point in the future to fully decarbonize	Cascade has not completed the full resource integration modeling to determine a response to this at this time.
147	1/3/2025	Pre-TAG 3	WUTC	Slide 18 "There are several hundred air-source heat pump models. Cascade must reduce this for modeling purposes." Which make/model did Cascade select? What was the selection criteria?	In order to keep modeling consistent with other utilities, Cascade chose the same heat pump that Avista is using.
148	1/3/2025	Pre-TAG 3	WUTC	Slide 20 How do these systems' costs compare annually?	This is explained in slide 26.
149	1/3/2025	Pre-TAG 3	WUTC	Slide 24 "Assuming a lognormal distribution with a standard deviation of 1, 41.3%, 24.6%, and 34% of people would fall under the first, second, and third threshold from the above bullet, respectively." Staff understands the need to have a functional assumption for the purposes of modeling. In future IRPs, getting actual distributional data may be a useful incremental improvement.	Agreed. Cascade will look into this further. I'll also note that this is merely a calculation exercise to understand the impact of the IRA dollar allocation and how that impacts the number of projects that can be done.
150	1/3/2025	Pre-TAG 3	WUTC	Slide 24 Will CNGC be modeling effects from the CCA in line with IRA rebates and incentives?	The intent of having a low-income residential vs residential for the gas when comparing electrification costs, this is the goal.
151	1/3/2025	Pre-TAG 3	WUTC	Slide 26 "Annual Cost Preliminary Results (Whole Home)" Annual cost of what? The following graphs could benefit from more explanation.	Cascade has added narrative to the resource integration chapter that discusses electrification modeling.
152	1/8/2025	Post-TAG 3	WUTC	Slide 6 "All low carbon alternative fuels except Carbon Capture will be evaluated as off-system" Staff would like to know what "off-system" means in this case. Is it Cascade's plan to purchase non-conventional fuels and circulate those fuels in its distribution system to avoid emissions, to purchase RTCs to offset emissions, or a combination of the two? At what point will these resources start to become peak day resources?	Off-system means that the company would use book and claim to purchase the renewable thermal credits needed to offset emissions. Outside of RNG, Cascade is not looking at purchasing non-conventional fuels and circulating those fuels on the Company's distribution system. Cascade recently added RNG projects to the system and will evaluate how well these projects do in peak conditions to see if these facilities are reliable under a peak event. There is no timetable to determine this as these results are dependent on weather.
153	1/8/2025	Post-TAG 3	WUTC	Slide 7 Staff appreciates the comparison of various alternative fuel inputs. For the IRP, Staff would appreciate a graph that shows the anticipated prices of the less expensive alternative fuels compared to natural gas (combined with CCA compliance costs). Comparisons like this may be helpful for Staff and interested parties reviewing the IRP's lowest reasonable cost findings.	Cascade will aim to include a comparison of this in the IRP.
154	1/8/2025	Post-TAG 3	WUTC	Slide 11 Do volumes for the purpose of this analysis include transportation customers or is it only metered customers? If it does not include transportation customers how would that change the analysis? How broadly are other industrial customers considered for this analysis.	This includes all customers, transport and core customers.
155	1/8/2025	Post-TAG 3	WUTC	Slide 11 How important is the 13% weighted share to Cascade's analysis? If the share is larger or smaller how might this impact Cascade's portfolio? In the previous IRP Cascade discussed the compliance strategy of aggressively acquiring CCA allowances early. Might a similar logic apply to non-conventional fuels?	The 13% determines the potential supply Cascade has to the projected low carbon alternative fuels. Cascade will provide scenario analysis around the reference case with different weights. The previous IRP included a compliance strategy that aggressively acquired CCA allowances because of the relative cost of an allowance vs a low carbon alternative fuel. This is the same case for the 2025 IRP. Cascade would appreciate Staff's thoughts on aggressively pursuing non-conventional fuels that may not be the least cost option when compared to a CCA allowance.
156	1/8/2025	Post-TAG 3	WUTC	Slide 24 Staff encourages Cascade to decide on interest rate assumptions for electrification measures. Traditional bank loans and HELOC rates might be some rates to look into depending on where installation costs seem to fall.	Thanks for that feedback.
157	1/8/2025	Post-TAG 3	WUTC	Slide 24 Staff is encouraged by Cascade considering the distribution of income groups in its service territory. Staff looks forward to seeing how Cascade refines this analysis in future IRPs.	Cascade appreciates the feedback. I will reiterate that this is the first time Cascade has modeled electrification in the IRP and welcomes any and all feedback in order to improve the modeling.
158	1/8/2025	Post-TAG 3	WUTC	Will CNGC be considering a reduction in installation costs with the possibility of the SHEAP program funded through the CCA like it is with IRA funding?	The Resource Planning team was not aware of the SHEAP program so we appreciate you putting this on our radar. The Company will need to do some research and understand how this can apply and intertwine with the IRA funding. Cascade will give it's best effort to include it in this IRP.
159	2/4/2025	Pre-TAG 4	WUTC	Slide 5 The decrease in demand appears to be the result of DSM. Are there other losses and gains of demand that are not readily apparent here? In this chart, the decrease is from DSM.	Cascade does include a low case where there is naturally occurring decline in customer counts. Cascade will also utilize bill impacts in the electrification model.

Cascade Natural Gas Integrated Resource Planning Feedback Report

Item #	Date	TAG Meeting	Name/Company	Comment/Question	Cascade Response
160	2/4/2025	Pre-TAG 4	WUTC	Slide 5 Does DSM in this graph account for the increased cost of CCA compliance and RNG/RTC/CCUS?	The avoided cost included the Social Cost of Carbon as well as the Company's highest marginal compliance cost. At the time of doing the avoided cost, Cascade only had compliance results from the 2023 IRP and therefore, utilized allowances as the marginal compliance cost.
161	2/4/2025	Pre-TAG 4	WUTC	Slide 5 The graph appears to consider the acquisition of offsets this year. What offsets is Cascade considering? Will Cascade's process for considering offsets mirror its discussion of RNG?	Cascade is not currently looking at developing any offset programs, but rather procuring offsets from the market similar to how the Company evaluates secondary market allowance purchases. As such, Cascade is agnostic to the type of offset, so long as it complies with the WA CCA. While the Company will evaluate all types of offsets in terms of invalidation period, Cascade expects to prioritize Golden Offsets to mitigate invalidation risk, so long as they are price competitive. At this time, offsets are a supplemental resource with Allowances, so the evaluation of the procurement of offsets is done relative to allowances as opposed to RNG. Additionally, since there is not currently a robust Offset market, it is difficult to do alternatives analyses with Offsets as the Company would do with RNG.
162	2/4/2025	Pre-TAG 4	WUTC	Slide 6 If Cascade adopts RNG/RTC in Oregon like this, how will this impact rate payers in Washington? If Customers respond to these costs by electrifying then what might happen to Washington rate payers? Are Washington customers in Walla Walla vulnerable to stranded fixed costs in Bend?	No impact on WA for CPP. Each state's recovery of CPP and CCA are independent. As the RNG portfolio grows Cascade will continue to evaluate which state will utilize the resource in order to assign the assets. If the assignment changes over time, a deferral request in each state would be needed to match the recovery of the asset with the use of the associated attributes. WA rate payers, such as Walla Walla rate payers, could be impacted by reallocations of certain assets. Certain asset classes are allocated by customer counts. Some general assets are allocated using the three-factor formula which uses customers as one of the three factors. Of course, the company would constantly be looking at selling such assets if not used and useful.
163	2/4/2025	Pre-TAG 4	WUTC	Slide 7 Why do WA Auction and WA Offsets drop around 2035/6?	This has to do with several climate goals in WA State that have a target or a goal set in 2035 as part of the broader goal of achieving a 95% reduction by 2050. For example, the Zero-Emission Vehicles policy states that new light-duty cars and trucks sold in WA must be zero-emissions vehicles after 2035. There is also a level of uncertainty around linkage with the CA/Quebec allowance market as well.
164	2/4/2025	Pre-TAG 4	WUTC	Slide 8 Why do the values appear to bottleneck around 2042/3 The monte carlo pricing profiles are tethered to the expected allowance forecast that is seen on slide 7.	Since the expected forecast drops while the allowance floor price rises, this gives the appearance of a bottleneck.
165	2/4/2025	Pre-TAG 4	WUTC	Slide 8 Why do the values appear to spread out in the last 5 years?	The values provided by ICF were in real dollars, which were then adjusted to nominal dollars for inclusion in Cascade's modeling. When adjusting to nominal dollars, this has created a widening in costs over time.
166	2/4/2025	Pre-TAG 4	WUTC	Slide 8 "Cascade utilized returns (quarter over quarter changes) from the California/Quebec auction as a proxy for standard deviation." Are these values log normally distributed similar to historical prices changes? Is there any historical trend in the data?	The returns, or quarter over quarter percentage change, were considered normally distributed, which results in a log normal price change. The Monte Carlo simulations utilize the Geometric Brownian Motion (GBM) to develop random movement of allowance pricing. With the GBM, the allowance forecast, which likely includes historical trends, is used as the trend (drift) term.
167	2/4/2025	Pre-TAG 4	WUTC	Slide 8 Does this data account for the Quebec, CA, and WA carbon markets eventually integrating?	There is a level of uncertainty around linkage that is baked into the expected allowance price forecast, which in turn is utilized in the Monte Carlo pricing profiles.
168	2/4/2025	Pre-TAG 4	WUTC	Slide 12 The graph appears to show a greater adoption of RNG/RTC/CCUS under low growth conditions relative to high growth. Why?	This is due to the availability of lower cost RNG/RTC/CCUS resources still available in future years.
169	2/4/2025	Pre-TAG 4	WUTC	Slide 12 Between 2047 and 2050 the amount of RNG/RTC/CCUS and Purchased allowances go up and down. Is this actionable? Why do these values move this way? This happens in the Oregon slide as well.	Cascade is an active participant in low carbon markets and expects to be in the future for current and evolving markets as would be the case for CCUS. This would allow the company to be price responsive to the lowest cost resources for its customers, as the Company would expect to implement a strategy similar to its current hedging philosophy, where certain volume targets would be procured in advance while others would be procured on a shorter-term basis.
170	2/4/2025	Pre-TAG 4	WUTC	Slide 14 Why do customer bills increase until around 2040 and then decline?	This is due to Plexos optimizing in a way that may not be totally realistic. Plexos, in general, will optimize allowance banking in both Washington and Oregon in order to avoid paying for the more expensive options in the future. Cascade has leveled these results, however, it's not totally unreasonable to expect a slight decline when banked allowances are finally utilized.
171	2/4/2025	Pre-TAG 4	WUTC	"Cascade expects average bills to double from 2025 to 2050 under the reference case." Does Cascade anticipate any customer flight from this?	Cascade is still finalizing the electrification model and will have results for the Draft IRP.
172	2/14/2025	Post-TAG 4	WUTC	Slide 5, What offsets is Cascade currently looking to add to its portfolio?	1) Cascade is currently looking at any and all offsets that qualify for the WA CCA, which are referred to as Washington Carbon Offsets, or WCOs, in the market. Cascade is agnostic to the type of offset, as long as it meets WA CCA guidelines for offsets, which typically fall under one of four categories a) US Forestry b) Urban Forestry c) Livestock Projects d) Ozone Depleting Substances. Additionally, there are different levels of protection you can purchase an offset with based on how long claw back exposure is shifted from the buyer to the seller. This element ranges from a WCO-8 - where the buyer has 8 years of claw back risk from the project being found to not generate the amount of offsets expected - to Golden WCOs - where that liability is fully shifted to the seller. Being more risk adverse, Cascade is more than likely to procure golden WCOs, but this is an economic decision that depends on the premium Cascade would have to pay for this extra level of protection for its customers. Cascade is looking to acquire offsets as soon as May 2025.
173	2/14/2025	Post-TAG 4	WUTC	DSM appears to be the only loss of demand. Are there other losses and gains to demand that may not be readily apparent?	DSM is the main loss of demand in the reference case and high growth.
174	2/14/2025	Post-TAG 4	WUTC	Slide 6, Are there any collateral impacts to Washington ratepayers if Oregon adopts the resources in this graph? Are there any risks to Washington ratepayers if Oregon ratepayers respond to this portfolio selection by electrifying?	No impact on WA for CPP. Each state's recovery of CPP and CCA are independent. As the RNG portfolio grows Cascade will continue to evaluate which state will utilize the resource in order to assign the assets. If the assignment changes over time, a deferral request in each state would be needed to match the recovery of the asset with the use of the associated attributes. WA rate payers, such as Walla Walla rate payers, could be impacted by reallocations of certain assets. Certain asset classes are allocated by customer counts. Some general assets are allocated using the three-factor formula which uses customers as one of the three factors. Of course, the company would constantly be looking at selling such assets if not used and useful.
175	2/14/2025	Post-TAG 4	WUTC	Staff is not sure the assumption around lowering of auction prices as a result of allowance buyers dropping out because they decarbonize is a sound assumption. Staff would like to see the information that CNGC staff is using to make that assumption.	Cascade will clarify that the expectation is not that buyers will withdraw, but rather that their demand will decrease as allowance costs rise. This is mainly due to the marginal abatement costs, primarily low carbon alternative fuels that impact the transportation and electric sectors, will become more cost-effective.
176	2/14/2025	Post-TAG 4	WUTC	If the above assumption is relaxed and WA Auction continues to increase after 2030 similar to how it increased before 2030, what impact would that have on the portfolio selected by Cascade on slide 5	These assumptions are tested in the monte carlo analysis of low carbon alternative fuels as Cascade also includes monte carlo's on allowance pricing.
177	2/14/2025	Post-TAG 4	WUTC	Slide 8, The graph appears to bottleneck around 2043, what are the causes for this apparent narrowing of values?	See item 175.
178	2/14/2025	Post-TAG 4	WUTC	Slide 12, Why does the low customer growth scenario appear to result in more RNG being selected relative to the high customer growth scenario?	This is due to the availability of lower cost RNG/RTC/CCUS resources still available in future years.
179	2/14/2025	Post-TAG 4	WUTC	In the last few years the amount of RNG goes up and down, why?	This is due to Plexos optimizing in a way that may not be totally realistic. Plexos, in general, will optimize allowance banking in both Washington and Oregon in order to avoid paying for the more expensive options in the future. It's important to remember that Plexos results provide helpful information, but Cascade must utilize that information in a more practical manner. Cascade leveled the total system cost results in order to show the more balanced approach, which resulted in bill impacts to be at the highest level in 2045 and a leveled impact for the final five years.
180	2/14/2025	Post-TAG 4	WUTC	Slide 13, similar to slide 12, this graph goes up and down during the last few years, is such volatility actionable? Does Cascade consider RNG to be responsive to demand in this way? Or is RNG more typically purchased in long term contracts more akin to yearly supply contracts?	As mentioned in response to item 179, Cascade will likely take a more balanced approach than the results Plexos is providing. Yes, RNG is more typically purchased as long term contracts. However, it's not uncommon to find short term
181	2/14/2025	Post-TAG 4	WUTC	Slide 14, why does incremental annual spike around 2045?	This is due to Plexos optimizing in a way that may not be totally realistic. Plexos, in general, will optimize allowance banking in both Washington and Oregon in order to avoid paying for the more expensive options in the future. It's important to remember that Plexos results provide helpful information, but Cascade must utilize that information in a more practical manner. Cascade leveled the total system cost results in order to show the more balanced approach, which resulted in bill impacts to be at the highest level in 2045 and a leveled impact for the final five years.
182	2/14/2025	Post-TAG 4	WUTC	Staff will follow up with information on TENs. We would like to see if they do show up as a generic resource.	Cascade appreciates the information that Staff has shared with Cascade. The Company just recently hired a TENs manager and will actively work with the new manager in determining how TENs best fits in the Company's plans. Cascade will likely have limited information in the 2025 IRP, but expects TENs to have a much larger roll in future IRPs.
183	2/14/2025	Post-TAG 4	WUTC	Slide 23, "We export current CC&B billing data to CMM to create an updated demands file" Staff sees many benefits if these data were applied to the electrification analysis contained in TAG 3. Particular the analysis in slides "Annual Cost Preliminary Results", and "Levelized Cost Preliminary Results". Understanding the distribution of comparative levelized costs might be useful to understanding the spectrum of customer responses. Staff believes this would be an important step toward recognition justice and distributional justice. Staff highlights this as a paramount recommendation for the 2027 IRP process.	Thanks for this recommendation.
184	2/14/2025	Post-TAG 4	WUTC	Slide 41, "Segment of pipe that minimizes environmental concerns and impacts to the community" Staff would appreciate this being explained in detail in the IRP. There is a lot of opportunity for Cascade to demonstrate its ongoing application of energy justice and equity principles in this topic, or for Cascade to seek feedback for improvement to demonstrate its desire to work toward equity and energy justice.	Cascade has added narrative to the distribution system planning chapter.
185	2/14/2025	Post-TAG 4	WUTC	Slide 46, "Provides capacity for continued growth in Aberdeen" does Cascade anticipate growth in some areas but not others?	The level of anticipation depends on the building codes and if they continue as is. Cascade has always had varying levels in growth, for example Richland, WA had over 4% growth from 2018-2022 while an area like Walla Walla, WA only saw growth of about 1.5% in that same timeframe, even with the relative proximity of the two cities. The gap between cities growth rate has shrunk, mainly due to the limitations that building codes have put on adding new construction buildings. In 2024, Richland saw 2% growth while Walla Walla saw .2% growth, for example.
186	2/14/2025	Post-TAG 4	WUTC	Slide 47, "Solves capacity deficit in Richland and provides a back feed to Richland HP" Is this a current deficit or a forecasted deficit?	This is a current deficit.
187	2/14/2025	Post-TAG 4	WUTC	Slide 48, "Addresses high pressure capacity deficit in Pasco" Is this a current deficit or a forecasted deficit?	This is a current deficit.
188	2/14/2025	Post-TAG 4	WUTC	Staff is curious about what modeling results would look like if CNGC modeled more storage and is also curious about the possibility of CNGC adding company-owned storage resources.	Currently, Cascade doesn't have any additional storage opportunities to model. As mentioned during TAG 4, Cascade has been looking for storage opportunities for several years, however, the demand for storage is extremely high and availability of storage is scarce. Cascade won't have time to model company-owned storage during the 2025 IRP, but the Company will consider this feedback for future IRPs.



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CASCADE NATURAL GAS STAKEHOLDER ENGAGEMENT DESIGN DOCUMENT

Abstract

This document contains the rational, assumptions, and explanation behind the Stakeholder Engagement process of Cascade's IRP Process

December 4, 2023

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Introduction

Cascade welcomes input from technical experts and the interested public in developing its Integrated Resource Plan (IRP). Cascade seeks to employ best industry practices and recognizes external participation can add incremental improvements.

Cascade recognizes stakeholders have a multitude of projects before them. This Design Document is intended to assist in optimizing participation by interested parties to yield a solid IRP to the benefit of customers and the Company.

Purpose


The goal of the IRP process is to produce a plan that addresses meeting long-term load giving consideration to the best combination of expected costs and associated risks and uncertainties for the utility and its customers. Cascade strongly believes this process is best accomplished with input from all stakeholders.

The purpose of this document is to align perspectives for maximizing the effectiveness, influence, and amount of contributions from stakeholders in an environment of robust workloads by all parties. The stakeholder engagement process is summarized in Box #1.

Box #1: From OPUC 5/15/18 Workshop

Stakeholder Engagement Process

- Input and feedback from Cascade's Technical Advisory Group (TAG) is an important resource to help ensure the IRP includes perspectives external to the Company and responsive to stakeholders.
- Five Technical Advisory Group (TAG) meetings were held in Salem and Portland, OR, and Kennewick, WA.
- Informal workshops with various stakeholders were held as requested.
- Multiple opportunities for public participation were available.



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Principles

Cascade applies the following four principles throughout this Design Document and the overall IRP process.

- A quality stakeholder engagement process is an iterative activity that requires collaboration and commitment.

- Input from diverse perspectives improves the resulting IRP.
- Removing barriers to participation and communicating in clear language with solid data is critical.
- Transparency, and availability of Cascade staff for associated discussions, is central to the IRP process.

Context

This Design Document is provided with the understanding that some organizations (e.g., Commission Staffs) may rotate its members through its various utility's IRP processes as well as onboard new Staff. Thus, beyond memorializing Cascade's commitments, this Document can be a primer for analyst-to-analyst mutual expectations.

Cascade's perspective is to capture the benefits of interested parties' knowledge by seeking to implement best-practices of stakeholder engagement, beyond this simply being a regulatory requirement.

Mutual Expectations

The Company will commit to the following series of actions for an efficient process to enhance stakeholders' participation. In turn, Cascade hopes that participating stakeholders will agree to general expectations on their part. The following Cascade and Stakeholder commitments are intended to coordinate communication throughout the IRP process and lay out mutual expectations.

Cascade Commitments

The following depicts Cascade's approach to "what the Company is trying to do and how it intends to do it."

1. The Company will provide reasonable accommodations for people with disabilities. Additionally, the Company will reasonably accommodate items such as requests for meeting locations, audio and visual capabilities, and other items requested by external stakeholders, including translation services upon advance request by meeting participants.
2. Publishing an annual schedule of meetings, for calendaring and coordination purposes, to be included in the workplan. Instructions for Google/Microsoft translate will be provided for all published documents (through a brief explanation, initially in Spanish)
3. Publish a brief section that lists the recommendations from the previous Commission IRP acknowledgement.
4. Providing meeting materials (agenda and PowerPoint) approximately 7 days in advance of meetings, including an itemization of key questions and issues to be addressed during the meetings. Stakeholders are welcome to suggest additional agenda items in advance of meetings. So as to let other Stakeholders know of suggested topics, the Company prefers to have such topics submitted three days prior to the scheduled meeting.

5. Responding to pre- or post-meeting communication going over information of interest to stakeholders.
6. Offering separate workshops (e.g., forecasting, SENDOUT®, DSM, as well as an industry overview and Cascade-specific planning approaches to those Stakeholders newer to resource planning) as requested in addition to pre-planned topical sessions outlined in the Work Plan.
7. Keeping a running list of action items from Technical Advisory Group (TAG) meetings that need to be further addressed if not directly related to the then-meeting topic or if more time is required to respond with the intent to follow-up with Stakeholders accordingly to assure responsiveness to any given issue.
8. Provide TAG minutes that include the action items from bullet #7 as well as any upcoming deadlines for feedback on the IRP.
9. Allowing for open, inclusive, and balanced participation and information sharing. Cascade's facilitation of meetings is contemplated to provide an agenda review at the beginning of each meeting (allowing for additions and modifications as appropriate) and seeking questions regarding additional clarity after each topic prior to moving to the next agenda item. Prior to adjournment, time will be provided for further discussion as well as availability of Cascade Staff for further discussion by phone or email.
10. Recognizing that some parties may not have the industry knowledge or the resources to devote to analyzing all aspects of the IRP and that their interest may be one of breadth. Cascade welcomes additional input, in this regard, through follow-up communications including either by individual contacts or a request for related workshops as stated in bullet 6, above.
11. Understanding TAG members can and should speak up if they need more information or if the time for discussion is too short and merits further discussion.
12. Responding to questions in a reasonable time period.
13. Noting when confidential information has been requested (or provided) and associated treatment.
14. Seeking perspectives on inputs and results of the components of the IRP particularly early in the process for inputs.
15. Present information in a clear and transparent manner.
16. During the course of a two-year planning cycle, material changes in policy direction (e.g., new legislation or regulations) may occur that can overtake assumptions made as recently as mid-process. Cascade will provide a best-efforts response for these "inflection points" either through meetings as envisioned by #5, 6, and 10, above; alternatively, if such policy direction occurs late in the two-year process, then understanding this would be included as Action Items for the next cycle.

Cascade Requests of Stakeholders

1. Ask questions of the Company on technical and methodological aspects, preferably early in the process so that Cascade can effectively model and include desired assumptions or policy direction.
2. Be a point of contact within their organization to distribute information to peers or let Cascade know who should be on Cascades' direct distribution list.
3. Provide organizational positions, opinions, or perspectives to all stakeholders on various issues, while recognizing the following bullet point #4. (This is particularly relevant for

organizations that have different lead analysts assigned to different companies or who have relatively new Staff members participating in any given IRP process.)

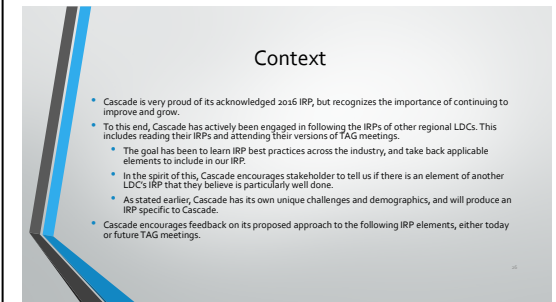
4. All should understand that some (e.g., Commission Staffs) organizational representatives cannot bind their organizations (i.e., Commissioners) but are making best efforts to provide relevant information even if only on an informal basis not necessarily representing an organizational position. This can be done in several ways, including a caveat at the beginning of a comment or by noting one is in a brainstorming mode (wherein one is free to conjecture without being held to that comment later)
5. Recognize relative informality of the meetings and ability to interject for clarification and understanding with the explicit facilitation of such by the meeting facilitator as she/he seeks participation throughout each meeting.
6. These requests of stakeholders are not to say, “speak now or forever hold your peace” or to put undue pressure on others’ timelines and workload; rather these are ways to maximize the effectiveness of the stakeholders’ comments, which optimizes the process. Again, comments received earlier in the process can better influence the final draft document.
7. When possible, provide feedback to meeting materials in advance of the meeting, to give Company representatives time to prepare information for an informed discussion. Cascade encourages Stakeholders to review the slides in advance and reply with questions and comments as well as any requested additional agenda item(s).
8. Review bullet points #5 and #8 of Cascade’s Commitments to ensure all action items are included and have been satisfactorily responded to by Cascade.

Desired End-Result

A well-planned and executed stakeholder engagement process would have all technical and methodological issues examined in meetings prior to parties later providing comments on the final draft document. Focus by stakeholders on responding to the draft IRP can clarify or improve the final IRP. This is the proverbial win-win-win situation. Commission Staffs and interested parties would have full understanding of the Company’s data and analytical approaches. These studies can be refined through analyst-to-analyst discussions. Consideration of new approaches can be put to the forefront for current or future IRPs, based on budgets and benefit to customers. The Company benefits by gaining access to perspectives perhaps not otherwise known. Commission Staff and others may be aware of emerging policies and approaches given the breadth of their interactions with Commissioners and new issues. As Cascade strives to implement best planning practices, as depicted in Box #2, stakeholders can provide advice based on what they’ve seen in the industry.

The Company has and will continue to encourage stakeholder feedback, questions, and suggestions to assist Cascade in producing an IRP that meets the regulatory requirements and Cascade’s customers’ needs. Cascade prefers to receive feedback as early as possible in the process (e.g., in the course of its technical advisory group meetings or soon thereafter) so that the Company has a better opportunity to address questions or analyze/apply more stakeholder

Box #2: From WUTC 6/18/18 Workshop



Context

- Cascade is very proud of its acknowledged 2016 IRP, but recognizes the importance of continuing to improve and grow.
- To this end, Cascade has actively been engaged in following the IRPs of other regional LDCs. This includes reading their IRPs and attending their versions of TAG meetings.
 - The goal has been to learn IRP best practices across the industry, and take back applicable elements to include in our IRP.
 - In the spirit of this, Cascade encourages stakeholder to tell us if there is an element of another LDC's IRP that they believe is particularly well done.
 - As stated earlier, Cascade has its own unique challenges and demographics, and will produce an IRP specific to Cascade.
- Cascade encourages feedback on its proposed approach to the following IRP elements, either today or future TAG meetings.

suggestions. Cascade recognizes that all parties are extremely busy, but strongly believes that stakeholder participation is crucial from the outset.

The above recognizes that key analytical components of the IRP—such as the demand forecast—need to be “locked down” at least midway through the process so that resource integration can be addressed. Interested parties can best influence these components earlier, rather than later, in the process.

Conclusion

While Cascade “owns” and is responsible for the IRP, the Company desires to have involvement from stakeholders to provide a diversity of perspectives. A best practices IRP is informed by perspectives, analyses and access to concerns and approaches that the Company may not have considered. Some stakeholders participate in multiple IRP processes and have a line-of-sight that may not be available to Cascade, despite the Company monitoring other utilities’ IRPs and associated processes.

Cascade recognizes parties will submit sometimes-detailed comments at the conclusion of the stakeholder involvement process in advance of Commission acknowledgement. Cascade will make a “best effort” to respond to and incorporate significant changes in external policy or direction (i.e., legislation or other material guidance) that occurs within the two-year cycle. The Company’s hope is that the guidelines contained in this Document will allow stakeholders to demonstrate to the Commission their work in the final IRP while concurring with its conclusions given the parties’ influence and active participation.



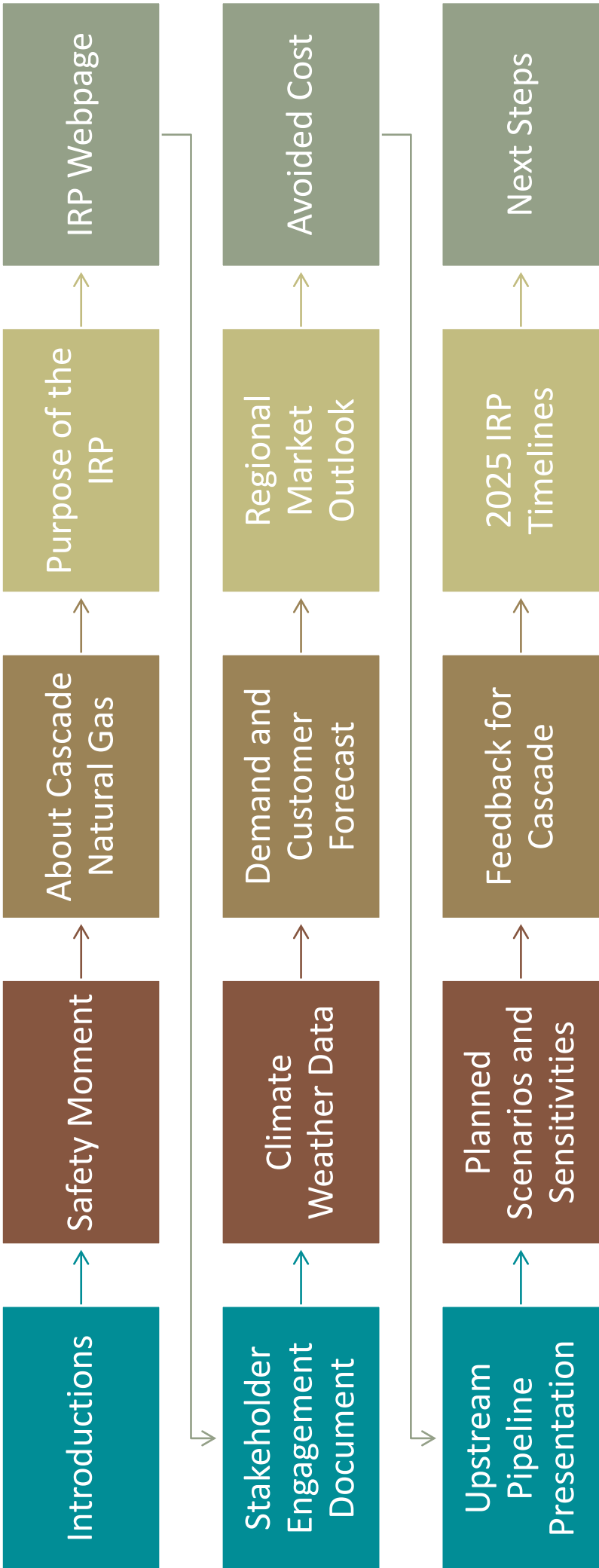
In the Community to Serve®

Integrated Resource Plan Technical Advisory Group Meeting #1

SEPTEMBER 12, 2024

MICROSOFT TEAMS/TELECONFERENCE

Agenda



Safety Moment

PEDESTRIAN SAFETY

TIPS FOR DRIVERS:

- Always be on the look out for pedestrians
- Be aware of children in neighborhoods and near school zones
- Reduce speed during inclement weather
- Be prepared to stop for pedestrians when approaching crosswalks or intersections
- Check for pedestrians before turning
- Do not block paths, crosswalks or intersections
- Check for pedestrians when leaving a parking space or driveway
- Avoid Distracted Driving

TIPS FOR PEDESTRIANS:

- Use sidewalks when available
- Always look both ways before crossing the road
- Only cross at marked crosswalks or intersections
- Obey all traffic signals, including Walk/Don't Walk signs
- Watch out for turning vehicles
- Keep an eye out for vehicles coming out of parking spaces and driveways
- Avoid Distracted Walking



A Little History Lesson...

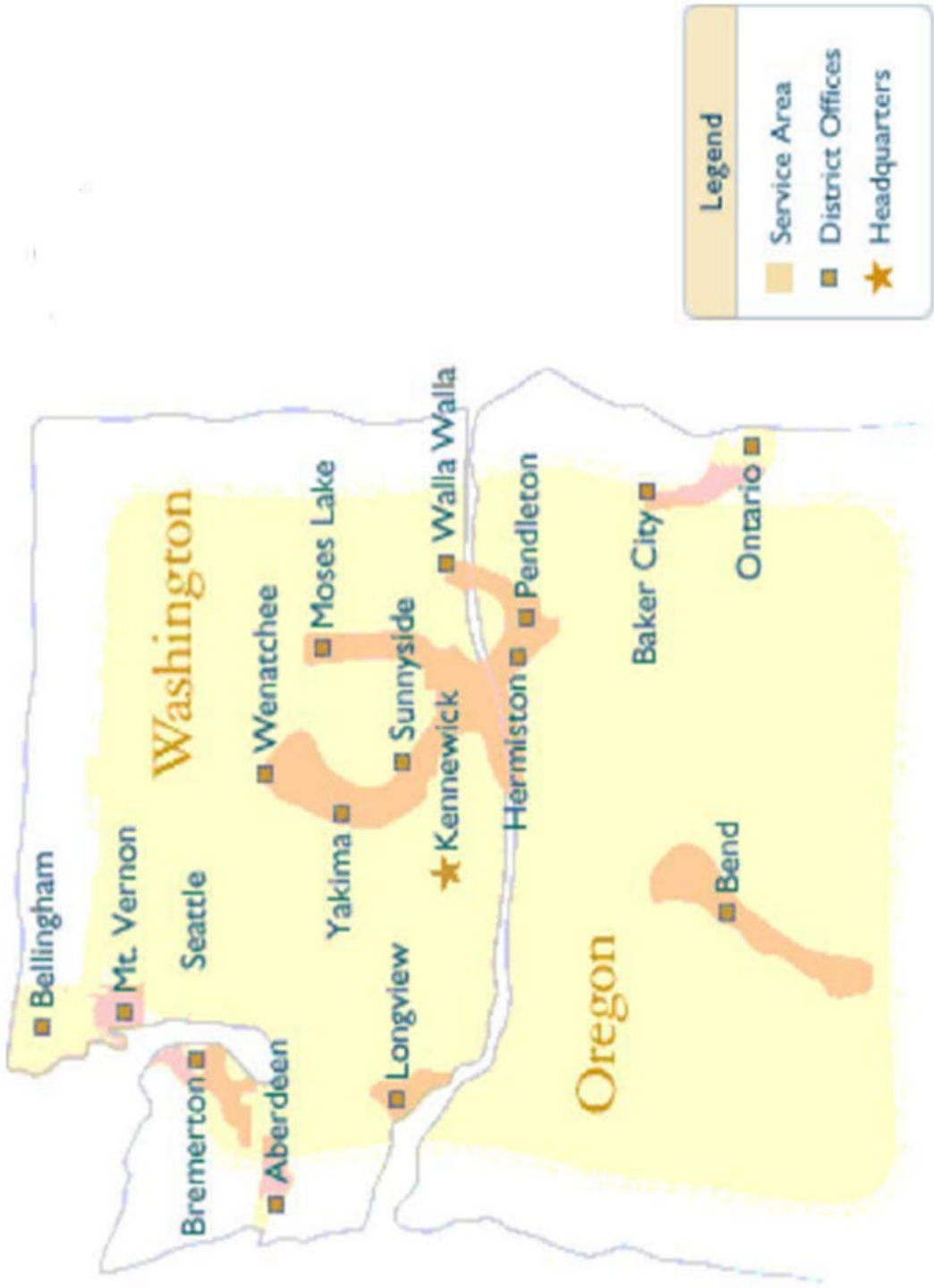
- Prior to 1955, natural gas was virtually unheard-of in the Pacific Northwest. Seeing an opportunity, Lester Pettit, Spencer Clark, and Stewart Matthews led a group of associates to form a company that would rise to the challenge. Cascade Natural Gas Corporation was incorporated January 2, 1953.
- In July 2007, Cascade was acquired by MDU Resources headquartered in Bismarck, ND.
 - Founded in 1924 as an electric utility.
 - Core businesses are gas & electric utilities, and pipeline.
 - Approximately 11,000 employees, operating in 43 states.
 - Operates four utilities across eight states:
 - Montana-Dakota Utilities Co.
 - Great Plains Natural Gas Co.
 - Cascade Natural Gas Corporation
 - Intermountain Gas Co.



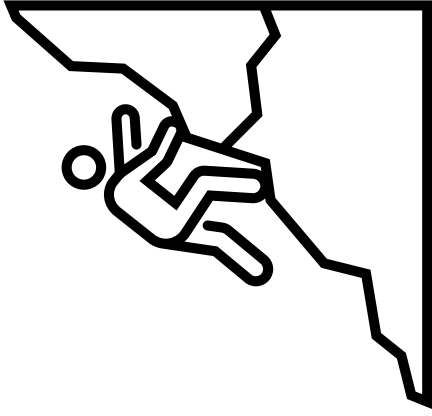
Today We Are...

Cascade serves more than 316,800 customers in 95 communities – 67 of which are in Washington and 28 in Oregon. Cascade’s service areas are concentrated in western and central Washington and central and eastern Oregon.

Cascade serves a diverse territory covering more than 32,000 square miles and 700 highway miles from one end of the system to the other. Interstate pipelines transmit Cascade’s natural gas from production areas in the Rocky Mountains and western Canada.



Purpose of IRP



IRP Guidelines and Content

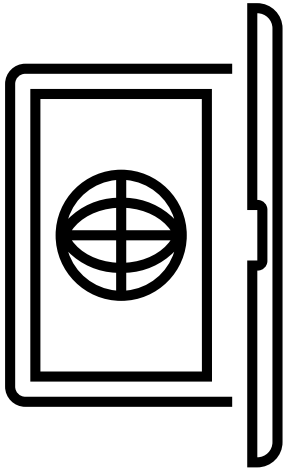
Washington

- IRP Guidelines from WUTC WAC 480-90-238.

Cascade’s Basic Philosophy

- Primary purpose of Cascade’s long-term resource planning process has been, and continues to be, to inform and guide the Company’s resource acquisition process, consistent with state regulatory requirements.
- Input and feedback from the Company’s Technical Advisory Group (TAG) is an important resource to help ensure that CNGC’s IRP is developed from a broader perspective than Cascade could have on its own.
- As the scope of the IRP continues to expand, Cascade is committed to securing and supporting the appropriate internal and external resources necessary to work with all stakeholders to produce an Integrated Resource Plan that meets the requirements of Washington and Oregon.

IRP Webpage





Cascade Home » Rates & Services » Rates & Tariffs » Washington Integrated Resource Plan

WASHINGTON | CASCADE NATURAL GAS | NATURAL GAS – INTEGRATED RESOURCE PLAN

The What: Cascade’s Integrated Resource Plan describes the two- to four-year and twenty-year expectation of how Cascade expects to safely serve customers’ energy needs at the lowest reasonable and safe cost. The analyses in this 12–18-month process includes existing and potential new pipelines and natural gas supply contracts (among others) as well as benefits of energy efficiency to customers. The IRP provides comprehensive and transparent insight into how Cascade plans for customers’ energy future. To view what an IRP looks like, please see Previous Years’ IRP at the bottom of the page. The Executive Summary and Key Points are designed to provide a quick, but descriptive, explanation of the process and plan.

The Who: Customers and the general public are invited to participate in a series of meetings on the variety of topics contained in the IRP, including energy efficiency and carbon emission reductions. Together, customers and the general public participating in the IRP process are called Stakeholders. Stakeholders also include the professional analytical staffs of the state utility commissions and groups representing residential and industrial customers. Community-based organizations and independent experts also attend the series of meetings.

How it works: The IRP process begins with a kick-off meeting to lay out the 12-18 month schedule of four to six meetings as well as provide an overview of what issues will be covered. These meetings are called Technical Advisory Group meetings or TAGs. Links are available to the TAG presentations, minutes, and written responses to Stakeholder’s requests and comments.

What to expect: Expectations of participants and tips for the best way for Stakeholders (including customers and the general public) are described in Cascade’s Stakeholder Engagement Design Document. This is a “living document” and suggestions for improvement are welcome.

Sign up! Join Cascade’s distribution list. You may participate in multiple ways, ranging from attending the TAG meetings (either in-person or remotely) and receiving the agendas/presentations to opportunity to comment. Do so by contacting the Supervisor of Resource Planning, Brian Robertson at either Brian.Robertson@cngc.com or (509) 221-9808. You may also contact the Company’s IRP email address at irp@cngc.com. Cascade uses MTeams as its means to connect participants remotely. MTeams is a free application to be used by Stakeholders including customers and the general public.

Accommodations: As shown as point #1 on page 2 of the Stakeholder Engagement Design Document, Cascade will provide reasonable accommodations for people with disabilities. Additionally, the Company will reasonably accommodate items such as requests for meeting locations, audio and visual capabilities, and other items requested by external stakeholders. If you have a request for accommodations, please reach out to one of the contacts listed above and the Company will gladly coordinate any reasonable requests for accommodations.

Pre- and Post-IRP feedback report:

What, Who, How?

Information on Cascade’s IRP can be found on the Company’s webpage.

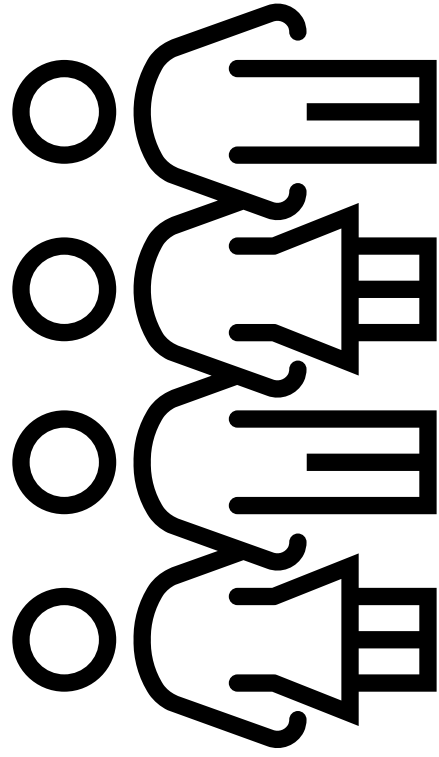
Stakeholder Engagement Design Document

Pre- and Post-IRP Feedback Report

IRP Timeline

Previous IRPs

[Washington Integrated Resource Plan - Cascade Natural Gas Corporation \(cngc.com\)](https://www.cngc.com/washington-integrated-resource-plan)



Stakeholder Engagement Document

“Cascade seeks to employ best industry practices and recognizes external participation can add incremental improvements.

Cascade recognizes stakeholders have a multitude of projects before them. This Design Document is intended to assist in optimizing participation by interested parties to yield a solid IRP to the benefit of customers and the Company.”

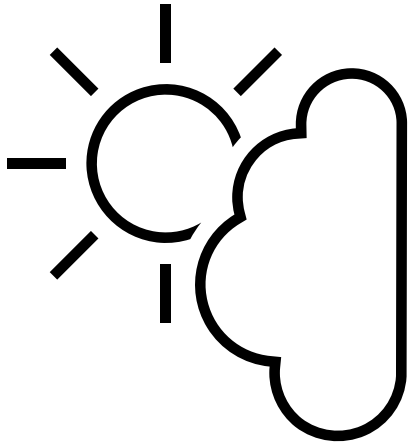


In the Community to Serve®

CASCADE NATURAL GAS STAKEHOLDER ENGAGEMENT DESIGN DOCUMENT

Abstract

This document contains the rational, assumptions, and explanation behind the Stakeholder Engagement process of Cascade’s IRP Process



Climate Weather Data

Climate Science Background

- Scientists develop climate change projections using **Global Climate Models (GCMs)**, which are simulations of Earth's climate and physical processes.
- Using a method called **downscaling**, scientists can translate global climate data to a higher spatial resolution. This allows for projections to capture local climate characteristics and improve planning.
- **Probabilistic projections** draw on an ensemble of models to capture a fuller range of potential future climate conditions.



Representation of gridded earth system to represent downscaling from GCMs. Source: [Encyclopedia of the Environment](#)

Future Climate Scenarios

- Cascade developed climate projections under **multiple future emissions scenarios and a large ensemble of GCMs** to account for uncertainty in future greenhouse gas emissions and climate response.
- The most recent climate projections use **Shared Socioeconomic Pathways (SSPs)** emission scenarios:
 - **SSP2-4.5** represents a **more likely** scenario assuming meaningful greenhouse gas emissions reductions by mid-century.
 - **SSP3-7.0** represents a **less likely** scenario assuming greenhouse gas emission increase throughout the century.

Possible Emission Futures Under CMIP6

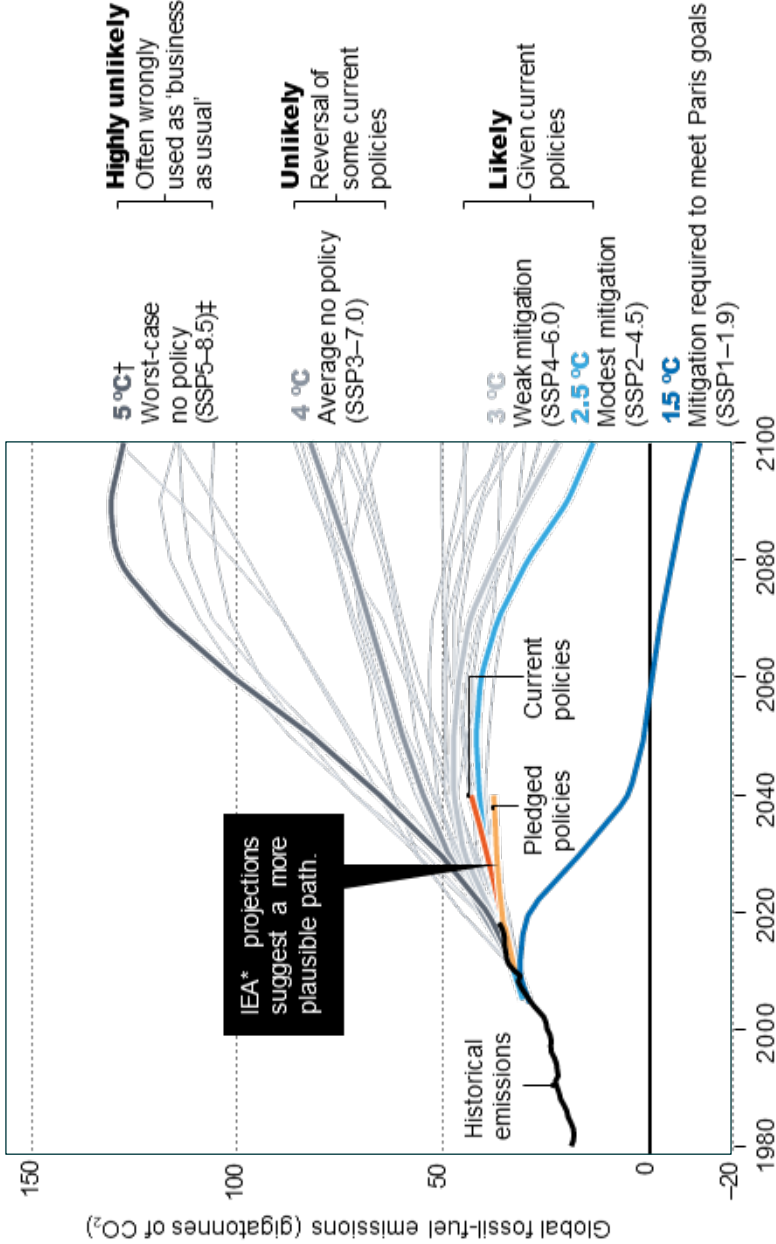
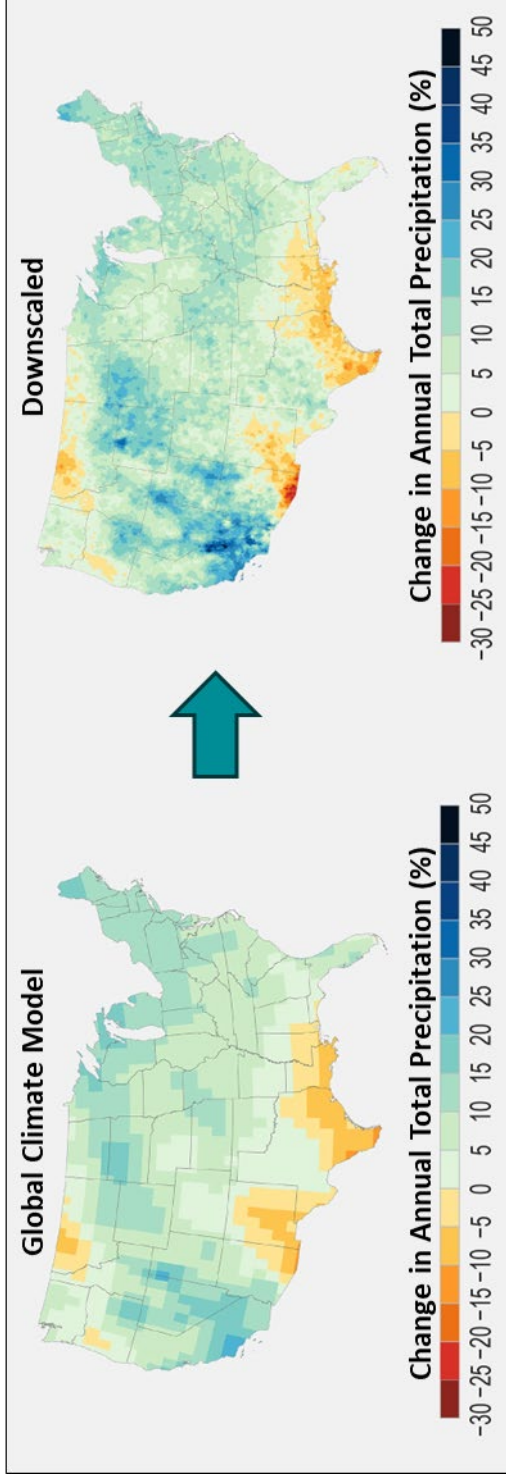


Illustration of SSP emissions scenarios and associated likelihoods. Source: [Zeke Hausfather & Glen P. Peters](#).

Methods

- Cascade leveraged **Localized Constructed Analogs Version 2 (LOCA2)**¹ downscaled temperature projections to developed custom **heating degree day (HDD)** projections for weather stations across the service area.
- **Peer-reviewed and used in landmark climate assessments** (e.g., Fifth National Climate Assessment).
- **Supports 22** common models between **SSP2-4.5** and **SSP3-7.0**.
- **Downscales projections** to a 6km resolution across the service area to better resolve temperature extremes.
- Cascade paired LOCA2 projections with observational time series to **correct historical biases** relative to observations and better resolve local climatology



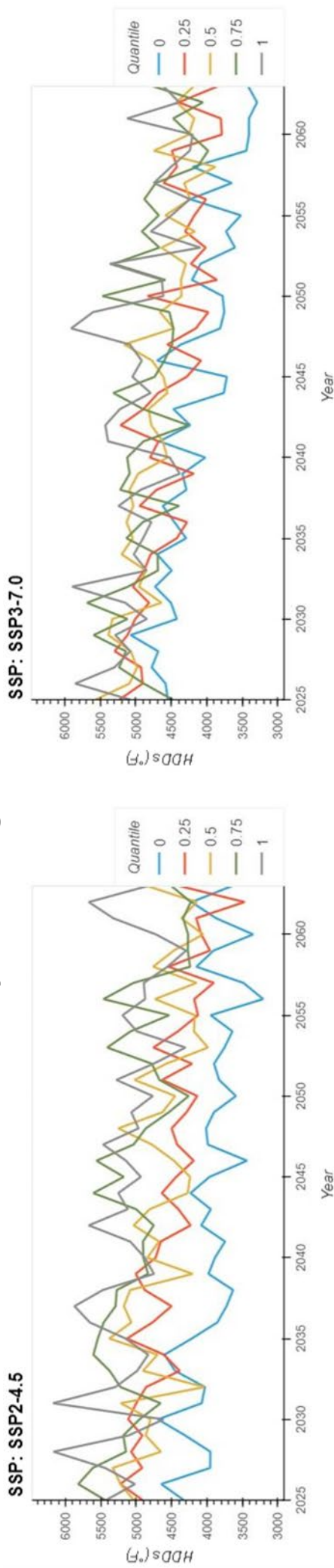
Localized Constructed Analog Version 2 (LOCA2)

Illustration of LOCA2 statistical downscaling of percent change in total annual precipitation from 1985-2014 to 2071-2100 for an example GCM under SSP5-8.5 across the Continental United States.
Source: Adapted from [5th National Climate Assessment](#).

Results: HDD Projections

- Projections for **both SSP2-4.5 and SSP3-7.0** show potential **decreases in HDDs** across the service area during the 2025-2064 period.
- The **SSP3-7.0** model ensemble has more agreement on the potential for a **greater decrease** in HDDs than is shown by the **SSP2-4.5** model ensemble.
- Future projected HDDs under both scenarios show **significant interannual variability** with some models representing cooler climate futures than other models.

System-Weighted Annual HDDs



Results: Cold Weather Qualitative Analysis

- Cascade Natural Gas’ service area has historically experienced extreme cold events, though the magnitude of these extremes varies by region.
- Climate change is projected to continue to **drive warmer temperatures** in the Pacific Northwest, **reducing the overall frequency of extreme cold events** across the region in the long term.
- This does not preclude cold snaps from occurring. Some evidence suggests that climate change could worsen cold extremes resulting from polar vortex events or other processes in the near to medium term (e.g. through 2050).
- The non-Gaussian temperature distribution in the Pacific Northwest suggests that the region could experience a slower decrease in the number of extreme cold threshold exceedances.¹

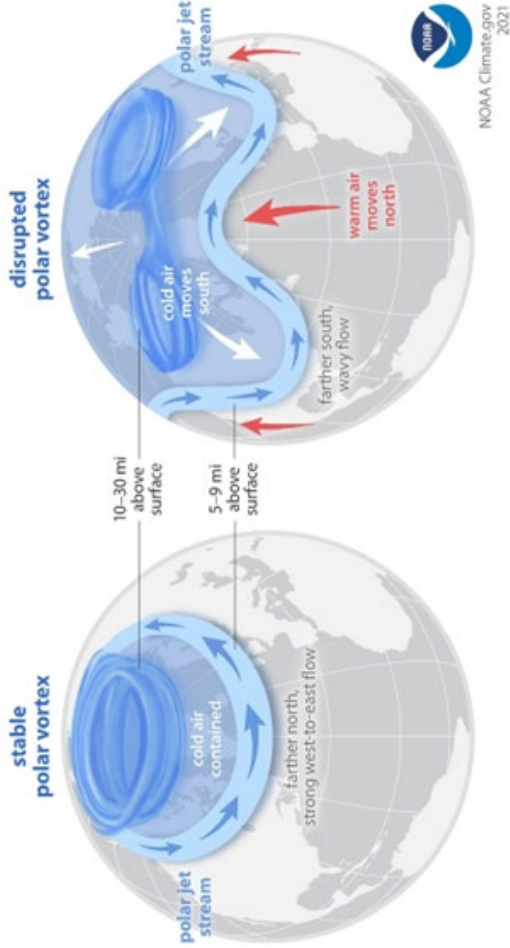
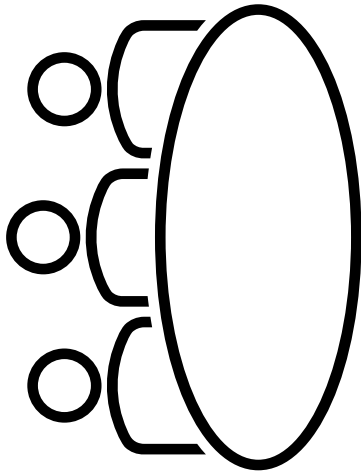
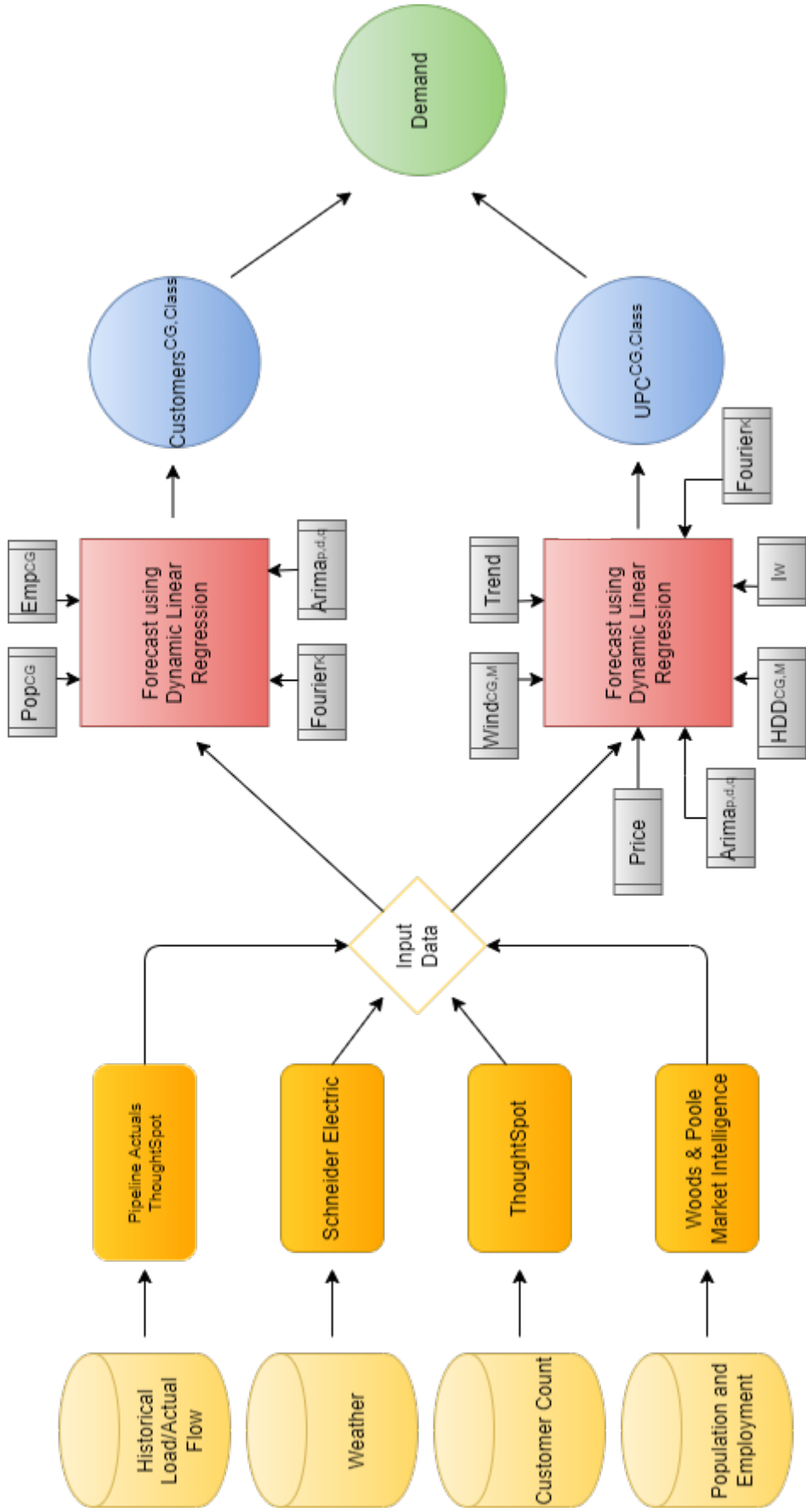
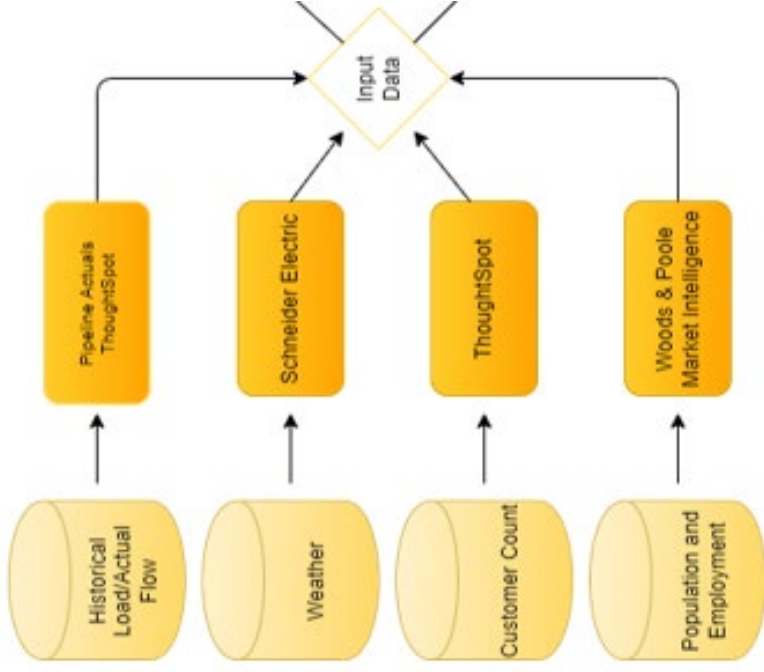


Illustration of a stable and unstable polar vortex and how each scenario impacts temperature at lower latitudes. Source: [NOAA](https://doi.org/10.1175/JCLI-D-19-0344.1).

Demand and Customer Forecast

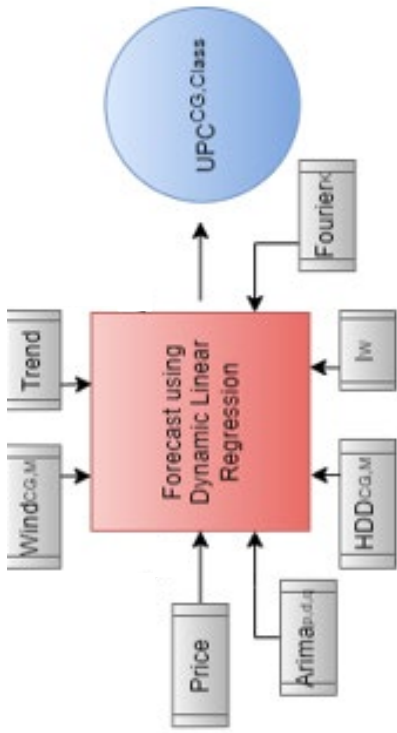






Inputs

- Cascade uses data from various sources:
 - Pipeline actuals at daily/Citygate level.
 - Woods & Poole at county level.
 - ThoughtSpot citygate/monthly allocations
- Market intelligence monthly.
- Unifying inputs is an important part of the forecasting process.

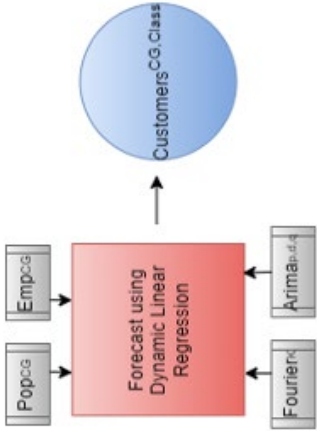


Use Per Customer Forecast

$$\text{Therms}/C^{Z,\text{Class}} = \alpha_0 + \alpha_1 \text{HDD}^{Z,M} + \alpha_2 I_w + \alpha_3 \text{WIND}^{Z,M} + \alpha_4 \text{Retail Price} + \text{Trend} + \text{Fourier}(k) + \text{ARIMA} \in (p,d,q)$$

Model Notes:

- Therms/C = Therms per customer; Z = Zone; Class = Residential, Commercial, Industrial, or Interruptible; HDD = Heating Degree Days; M= Month; I_w = Indicator Variable set to 1 if it is a weekend; T = Trend Variable increasing by 1 for each day forecasted; WIND = Daily average wind speed; Retail Price = Price customers see on their bill.



Customer Forecast

$$C^{Z,Class} = \alpha_0 + \alpha_1 HH^Z + \alpha_2 Emp^Z + \alpha_3 Retail\ Price + \alpha_4 Income + Fourier(k) + ARIMA \in (p,d,q)$$

Model Notes:

- C = Customers; Z = Zone; Class = Residential, Commercial, Industrial, or Interruptible; ARIMA ∈ (p,d,q) = Indicates that the model has p autoregressive terms, d difference terms, and q moving average terms; HH = Households; Emp = Employment; Retail Price = Price customers see on their bill; Income = Average income at the zonal level; Fourier(k) = Captures seasonality of k number of seasons.

Start with Linear Model

Some are Naïve models

Tests for any collinearity

Building Code Impacts (Cont'd)

- Under RCW 19.27A.020(2)(a), the SBCC is directed to “...help achieve the broader goal...” of zero emission homes/buildings. Note that this is a goal, not a mandate. Conversely, RCW 19.27A.160 is an explicit direction to the SBCC to move towards a 70% reduction in annual net energy consumption by 2031. This is a mandate and is clear that the goal is a “net” energy.
- Since RCW 19.27A.020(2)(a), the enacting legislation resulted from 2009 SB 5854. Therefore, the 2012, 2015, 2018, and 2021 code cycles were all likely impacted by the legislation. This chart provides an explanation of how the SBCC has addressed the more explicit legislative direction of RCW 19.27A.160.

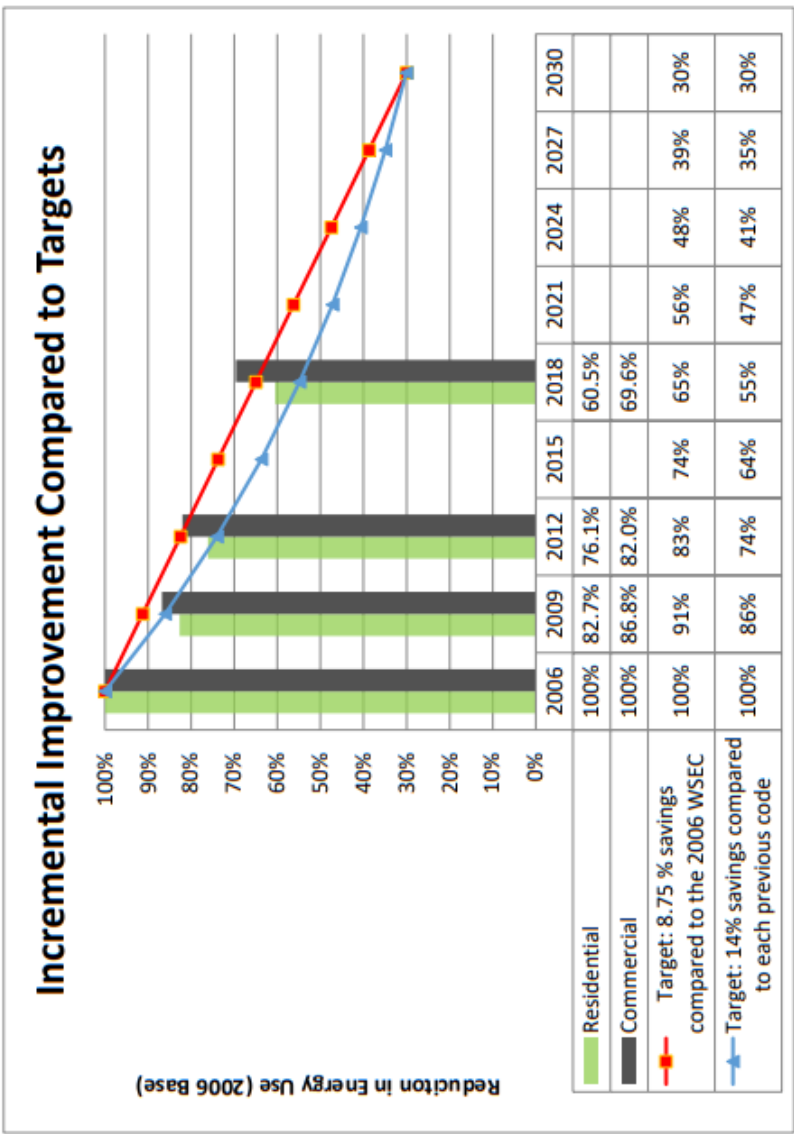


Chart Source: Final Cost Benefit Analysis for the 2021 WSEC-R

WA State Building Codes

Effective March 15, 2024, the 2021 Washington State Energy Codes¹ went into effect.

Each new dwelling unit in a residential building must comply to the WSEC. Each dwelling must meet the required number of credits (ex. Small dwellings must have 5 credits).

The new building codes have made it impractical for new residential and commercial buildings to use natural gas.

1 [HTTPS://SBCC.WA.GOV/STATE-CODES-REGULATIONS-GUIDELINES/STATE-BUILDING-CODE/ENERGY-CODE](https://sbcc.wa.gov/state-codes-regulations-guidelines/state-building-code/energy-code)

TABLE R406.2
ENERGY EQUALIZATION CREDITS

System Type	Description of Primary Heating Source	Credits	
		All Other	Group R-2 ^a
1	For combustion heating equipment meeting minimum federal efficiency standards for the equipment listed in Table C403.3.2(5) or C403.3.2(6)	0	0
2	For an initial heating system using a heat pump that meets federal standards for the equipment listed in Table C403.3.2(2) and supplemental heating provided by electric resistance or a combustion furnace meeting minimum standards listed in Table C403.3.2(5) ^b	1.5	0
3	For heating system based on electric resistance only (either forced air or Zonal)	0.5	-0.5
4 ^c	For heating system using a heat pump that meets federal standards for the equipment listed in Table C403.3.2(2) or C403.3.2(9) or Air to water heat pump units that are configured to provide both heating and cooling and are rated in accordance with AHRI 550/590	3.0	2.0
5	For heating system based on electric resistance with: 1. Inverter-driven ductless mini-split heat pump system installed in the largest zone in the dwelling, or 2. With 2kW or less total installed heating capacity per dwelling	2.0	0

Oregon Customer Count Impacts

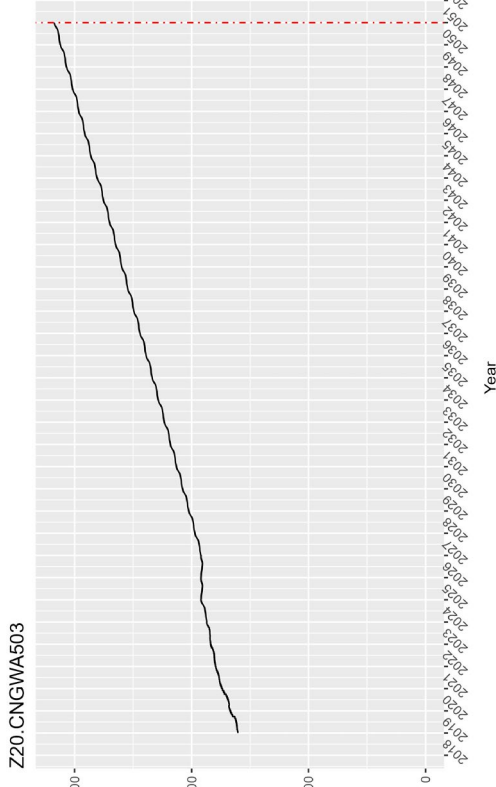
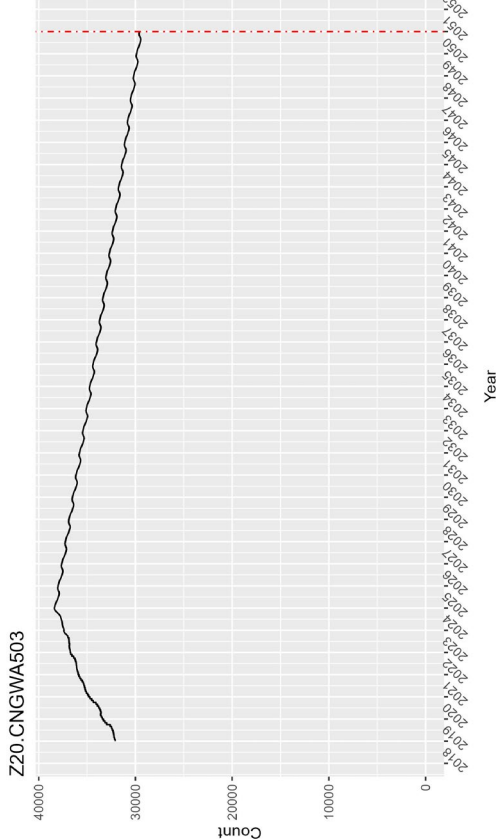
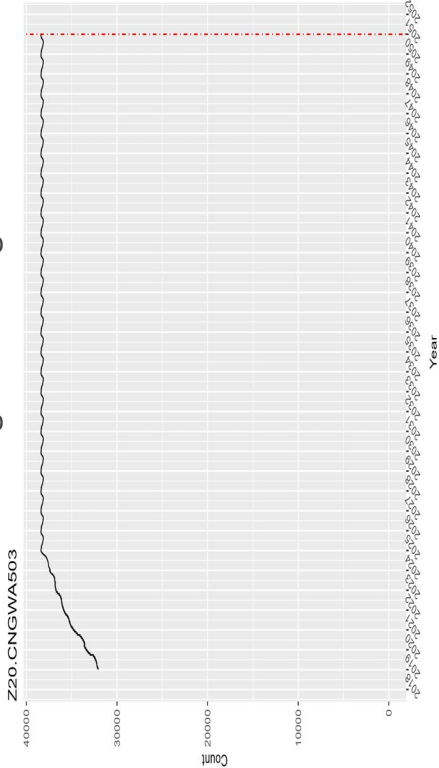
- Oregon has signed on with eight other States to create a Nine States Pledge Joint Action to Accelerate Transition to Clean Buildings¹.
- Under the MOU, these states have set a shared goal for heat pumps to meet at least 65% of residential-scale heating, air conditioning and water heating shipments by 2030 and 90% by 2040 across the participating states.
- The MOU is not legally binding, but it does send a signal that these states have strong targets to increase heat pump and electric space and water heating, effectively reducing the use of Natural Gas.

Customer Growth Scenarios

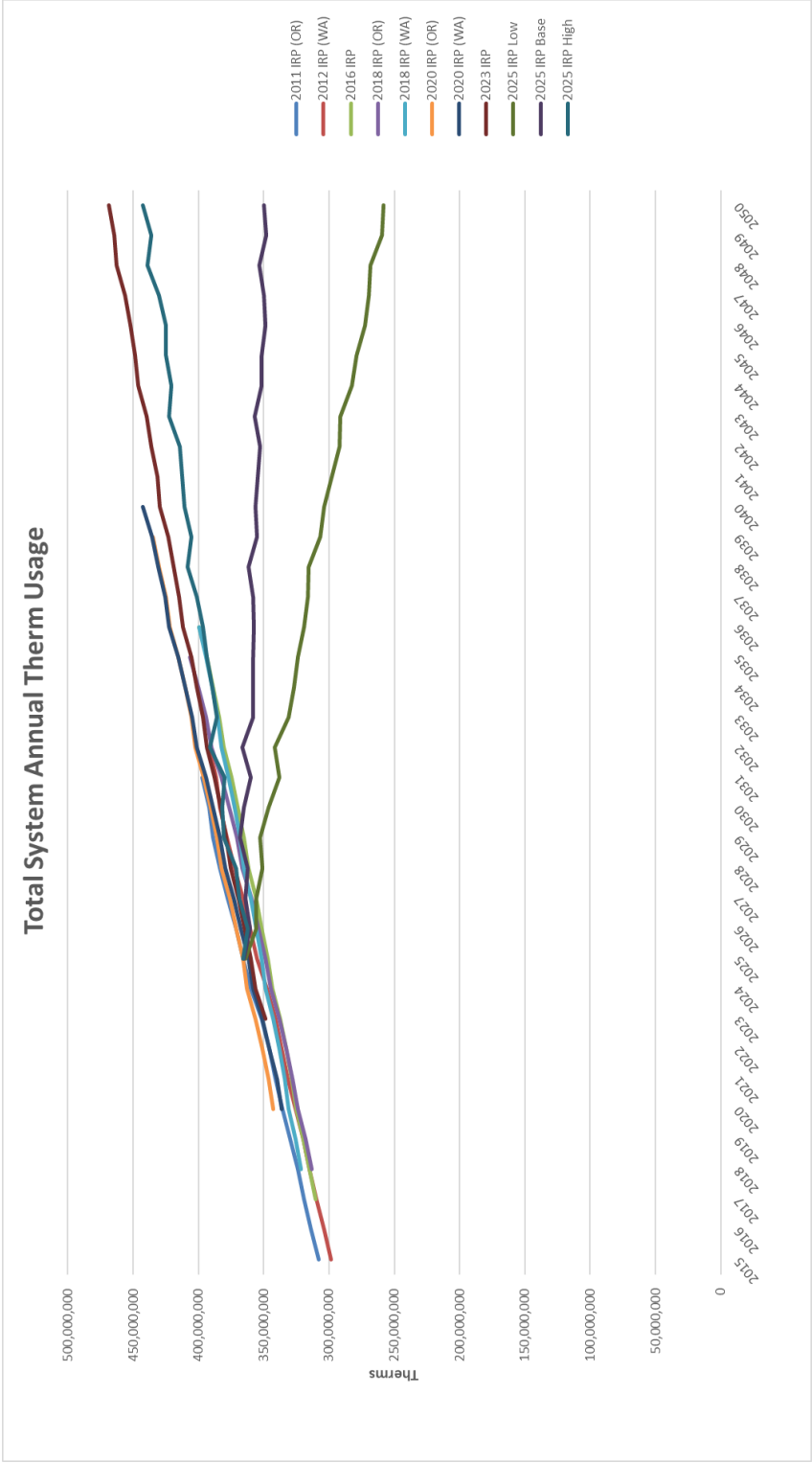
Cascade has a base, high, and low customer growth scenarios

These three scenarios will stress test Cascade’s resource planning assumptions under varying customer count scenarios

- Base – Washington State Building Code Council rules w/ flat customer growth
- Low - Washington State Building Code Council rules w/ 1.5% decay in building stock attrition
- High - Washington State Building Code Council repealed after 2 years, return to normal growth after



Demand Forecast Results



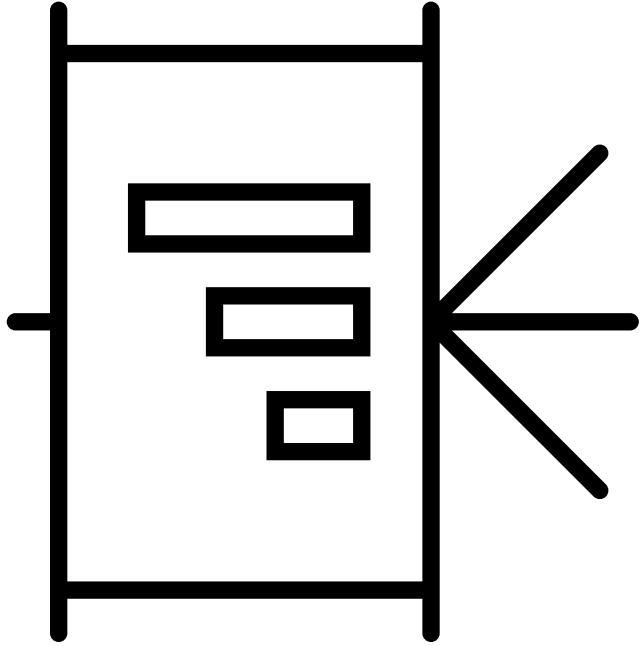
Non-Core Outlook

Non-Core Outlook

- Cascade forecasts the non-core out to 2050.
- Unlike the core, non-core (or transportation) customers are customers who schedule and purchase their own gas, generally through a marketer, to get gas to the citygate. The customer then uses Cascade's distribution system to receive the gas.
- Cascade's transportation customers include all types of industrial customers. It includes farms that may not use any gas during the winter to food manufacturers that average 800,000 therms per month throughout the year.
- Cascade also serves six electric generation customers in Washington and one in Oregon. Those seven customers project to use approximately 598,000,000 therms in 2025.

Transportation Customers

- Cascade's transportation customer forecast decreased from the previous forecast. The current forecast projects the customer count to be 241 in 2025. Cascade's industrial managers are working closely with potential industrial customers.
- Cascade projects the non-electric gen transportation customers in Washington and Oregon to consume approximately 525 million therms in 2025.
- Cascade is emission responsible for approximately 105 million therms under the CCA and 13 million therms under the CPP for transport customers in 2025.
- Cascade is communicating with the transportation customers on CCA impacts, but it is too early to determine the impact CCA will have on these transport customers.



Regional Market Outlook

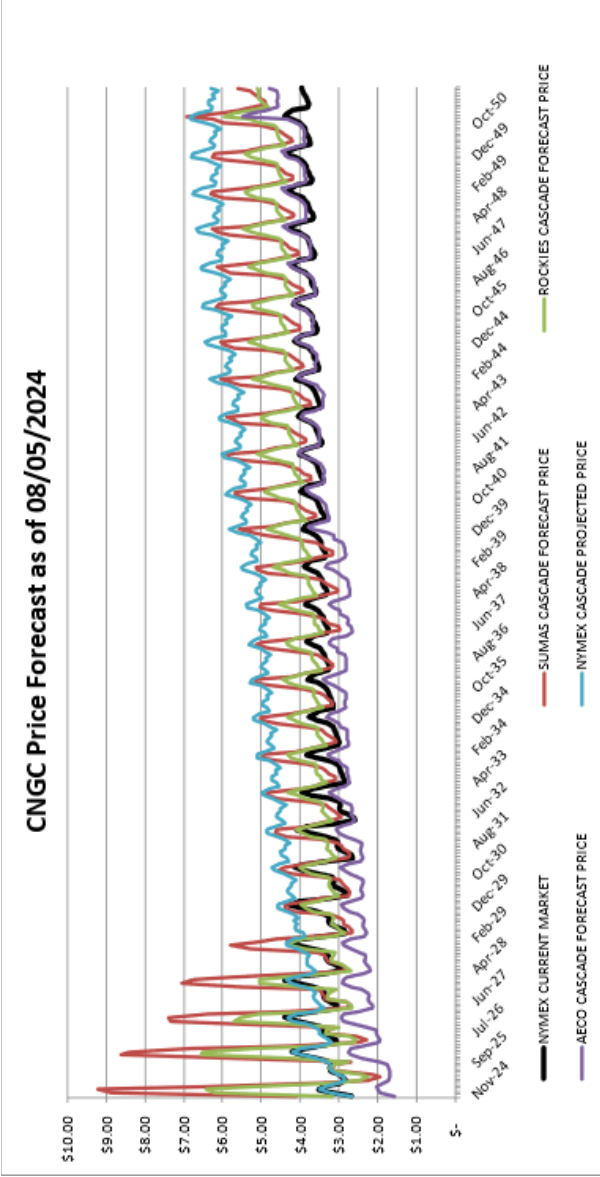
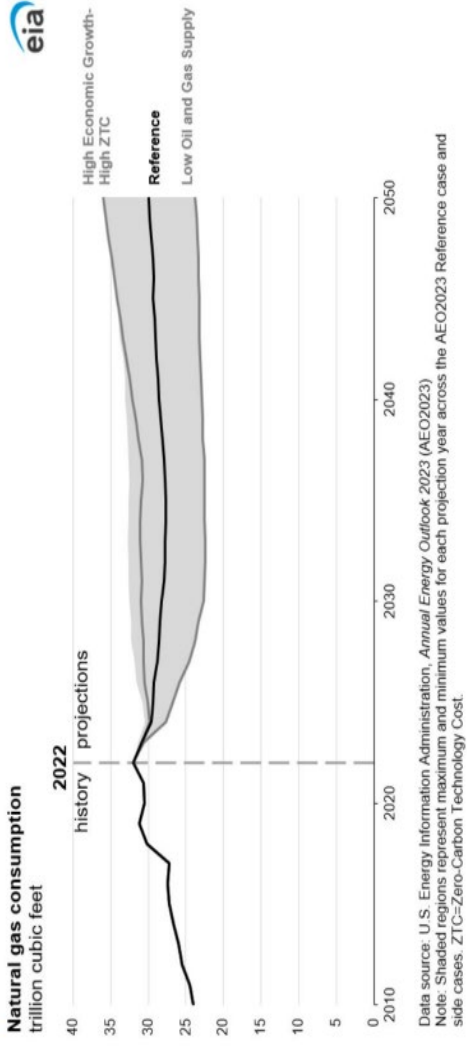


Figure 14.



Regional Market Outlook – Long Term

The EIA's Annual Energy Outlook for 2023 was released March of 2023. In this report, natural gas consumption is highlighted. As electricity generation shifts to using more renewable and battery sources, domestic natural gas consumption for electricity generation is likely to decrease by 2050 relative to 2022, which contrasts with relatively stable growth over the past decade. ¹

According to the EIA's 2023 Annual Energy Outlook, natural gas production increases by 15% from 2022 to 2050, and in all cases domestic production outpaces domestic consumption. ¹

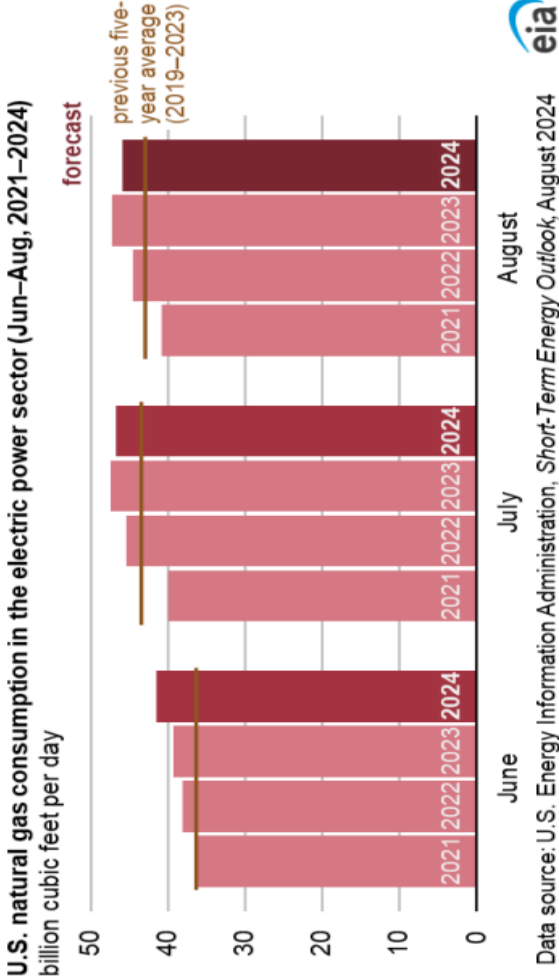
The EIA states that growing international demand for natural gas encourages growth in domestic natural gas production. ¹

Regional Market Outlook Short-Term

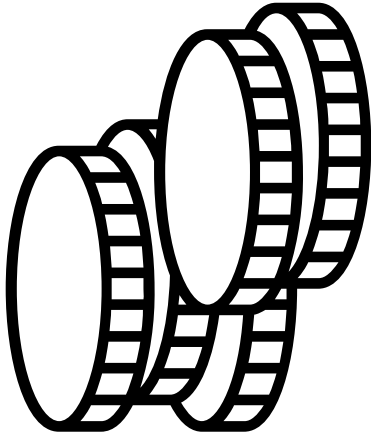
Electric power generation is the primary driver for natural gas consumption during the hot summer months. The electric power sector consumed 13% (5 Bcf/d) more natural gas in July than it did in June because of a heat wave and subsequent spike in natural gas-fired electricity generation.

According to Cascade's hedging consultant, "while comfortable storage levels and steady production point towards a bearish outlook for natural gas prices in the near term, the potential for extreme weather events and increased cooling demand could introduce upward price pressures as the month progresses.

"Record low Henry Hub natural gas prices in 1H24 led producers to curtail natural gas production earlier this year."



¹ Short-Term Energy Outlook - U.S. Energy Information Administration (EIA)



Avoided Cost

Avoided Cost Overview

As part of the IRP process, Cascade produces a 27-year price forecast and 45 years of avoided costs.

The avoided cost is an estimated cost to serve the next unit of demand with a supply side resource option at a point in time. This incremental cost to serve represents the cost, including environmental impacts, that could be avoided through energy conservation.

The avoided cost forecast can be used as a guideline for comparing energy conservation with the cost of environmental impacts, acquiring, and transporting natural gas to meet demand.

Avoided Cost Overview

For the 2025 IRP, Cascade will continue to use the information learned from prior IRPs to create a transparent and intuitive final avoided cost.

The various elements of the avoided cost will need to be reconsidered with regards to emissions reductions goals.

The Company produces an expected avoided cost case based on peak day and, in the case of distribution system costs, peak hour.

Avoided Cost Formula

The components that go into Cascade’s avoided cost calculation are as follows:

$$AC_{nominal} = (TC_v + TC_F + SC_v + CC + E_{Comp} + DSC + RP) * P_{adder}$$

Where:

$AC_{nominal}$ = The nominal avoided cost for a given year. To put this into real dollars you must apply the following: $\text{Avoided Cost} / (1 + \text{Discount Rate})^{\text{Years from the reference year}}$.

TC_v = Variable Transportation Costs

TC_F = Fixed Transportation Costs (When Avoidable)

SC_v = Variable Storage Costs

CC = Commodity Costs

E_{Comp} = Environmental Compliance Costs

DSC = Distribution System Costs

RP = Risk Premium

P_{adder} = Preference Adder, 10% as required by Federal statute

Avoided Cost Methodology

Variable Transportation costs are pulled directly from the major pipelines that Cascade utilizes (NWP, GTN, Enbridge, Ruby, Nova Gas Transmission (NGTL) and Foothills).

Fixed Transportation are only included when avoidable (i.e.. potential to offset upstream capacity acquisition)

Storage costs are only captured if there is an avoidable future storage cost (i.e.. On system storage).

Commodity Costs are taken from Cascade’s 27-year price forecast.

SCGHG and CCA costs are both included in the avoided cost calculation per U-230161 CCA Policy Statement guidelines.

The Company’s distribution system cost calculation looks at forecasted capital expenses related ONLY to growth, and uses the company’s load growth forecast to translate these costs to a per therm basis.

Risk premium is calculated as the delta from deterministic and stochastic pricing

Preference Adder, 10% as required by Federal statute

Environmental Compliance Costs

- The following was presented previously in Targeted-TAG 2:

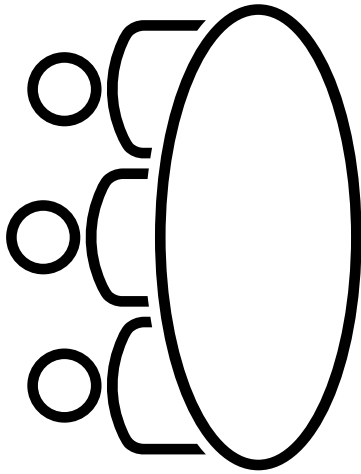
- "-In the 2023 IRP, Cascade utilized the Social Cost of Carbon with a 2.5% discount rate, adjusted to real 2021 dollars.
 - o This is done in accordance with RCW80.28.395 which requires the use of the Social Cost of Carbon to value cost of greenhouse gas emissions resulting from the use of natural gas.
- With the passing of the Climate Commitment Act, Cascade believes it may be more accurate to utilize the company's marginal compliance cost associated with this rule.
 - o For example, projected cost of CCA allowances."
- o Per U-230161 CCA Policy Statement guidelines, both the Social Cost of Carbon and the Climate Commitment Act costs are now included in the Avoided Cost Calculation.

Avoided Cost Final Results

- The avoided costs in 2025, 2040, and 2050 are \$1.38/therm, \$2.07/therm, and \$2.54/therm respectively.
- 84% increase from 2025 to 2050
- The avoided cost has increased by about 30-40% from the 2023 IRP due to the increase in commodity costs as well as the addition of the SCC to the carbon tax based off WUTCs policy statement.

Nominal Avoided Cost (By Zone) - \$/Therm						
	Zone 1	Zone 2	Zone 3	Zone 4	Oregon	Washington System
2025	\$ 1.379	\$ 1.379	\$ 1.379	\$ 1.379	\$ 1.379	\$ 1.379
2040	\$ 2.066	\$ 2.066	\$ 2.066	\$ 2.066	\$ 2.066	\$ 2.066
2050	\$ 2.539	\$ 2.539	\$ 2.539	\$ 2.539	\$ 2.539	\$ 2.539

Upstream Pipeline Presentation

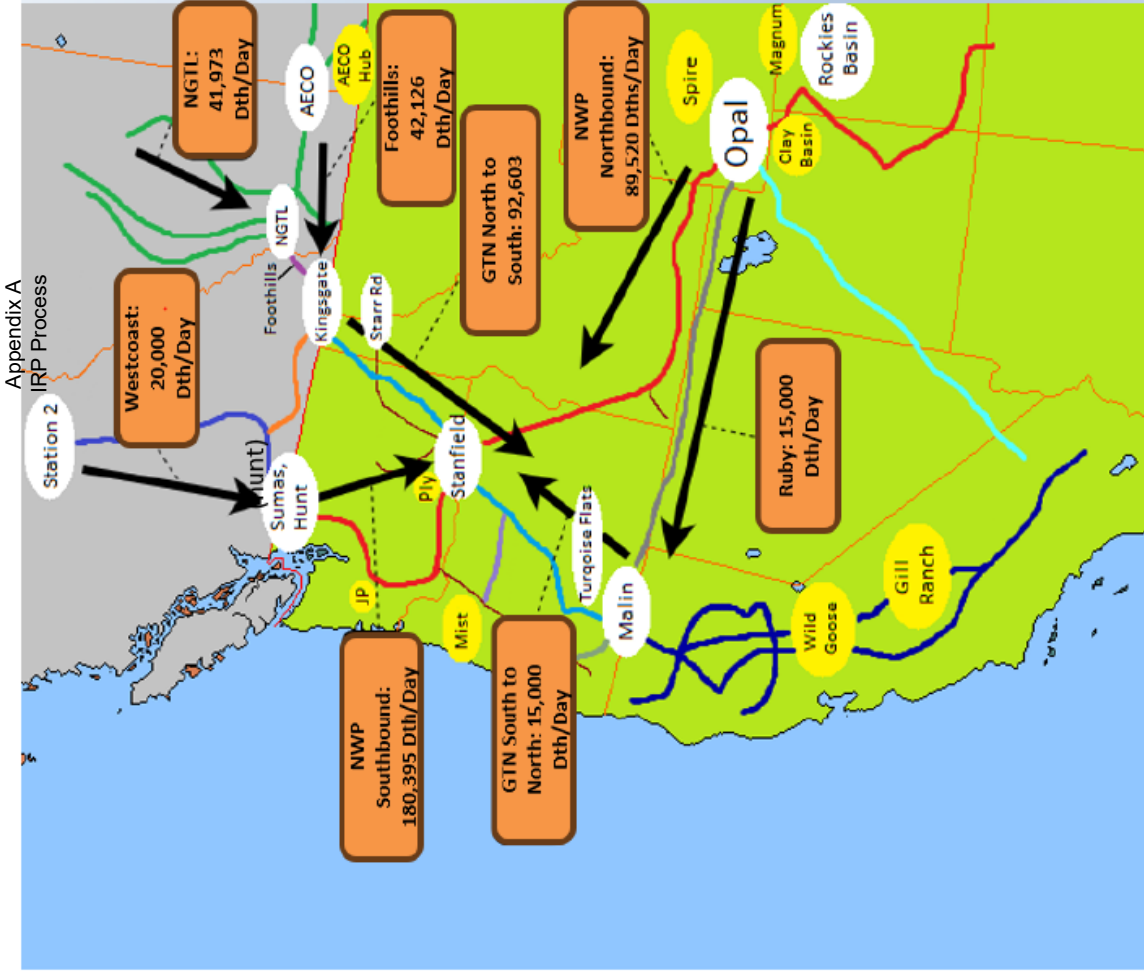


Gas Supply Components

- **Transportation**
 - Our Portfolio is built around our transportation Resources
- **Commodity**
 - Physical Gas Purchased on Open Market
 - Commodity Market Hubs
 - Done Via RFP process/ Or direct contact with the Supplier
 - CNG works with 12-15 active suppliers
- **Storage**
 - Used a hedge and price arbitrage- Summer to winter, Protection against high day market prices.
 - Day to day operations for balancing and entitlement requirements.

System Map





Pipeline transport flow

TRANSPORTATION

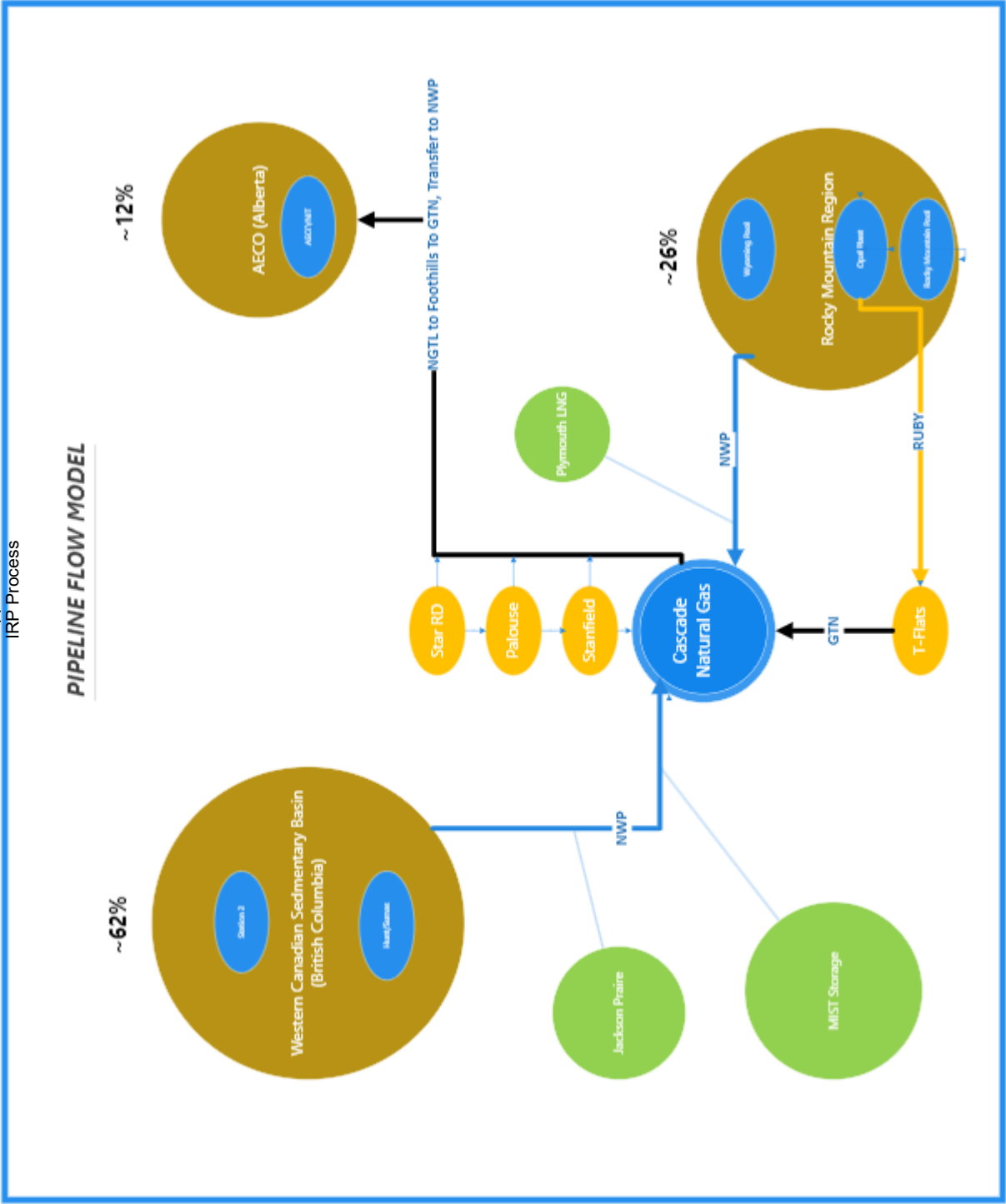
Cascade holds transport on 6 Pipelines

- Enbridge
- Williams Northwest Pipeline
- GTN Pipeline
- Nova
- Foothills
- Ruby

End delivery is on 3 pipelines

- Enbridge
- Williams Northwest Pipeline
- GTN Pipeline

Portfolio is arranged around available transport and system demands.



HIGHLIGHTS FOR THE 2024 PORTFOLIO DESIGN

PORTFOLIO PROCUREMENT DESIGN BASED ON A DECLINING PERCENTAGE EACH YEAR, ACCORDINGLY: Year 1: Approximately 90% of annual requirements; Year 2: 60%, Year 3: 30%.

- 90% allows more flexibility operationally.
- Allows Storage Utilization, with some cushion (Storage capacity is 15% of winter load)
- Allows us to be in the market monthly through First of Month (FOM) purchase or Day Gas purchases.

Hedged Percentages (fixed-price physical) Currently 55% of annual requirements. Second year max is set at 35%, and 20% hedged volumes for year three.

- Cascade’s hedging program is flexible and can be adjusted in response to changes in market conditions.
- We review percentages annually and make adjustments as needed

CNGC’s Gas Supply Oversight Committee (GSOC) would consider a modification of this plan if the outer year 3 year forward price is 20% higher/lower than the front month over a reasonably sustained period.

Annual load expectation (Nov-Oct) is approximately 37,000,000 dths, consistent with recent load history.

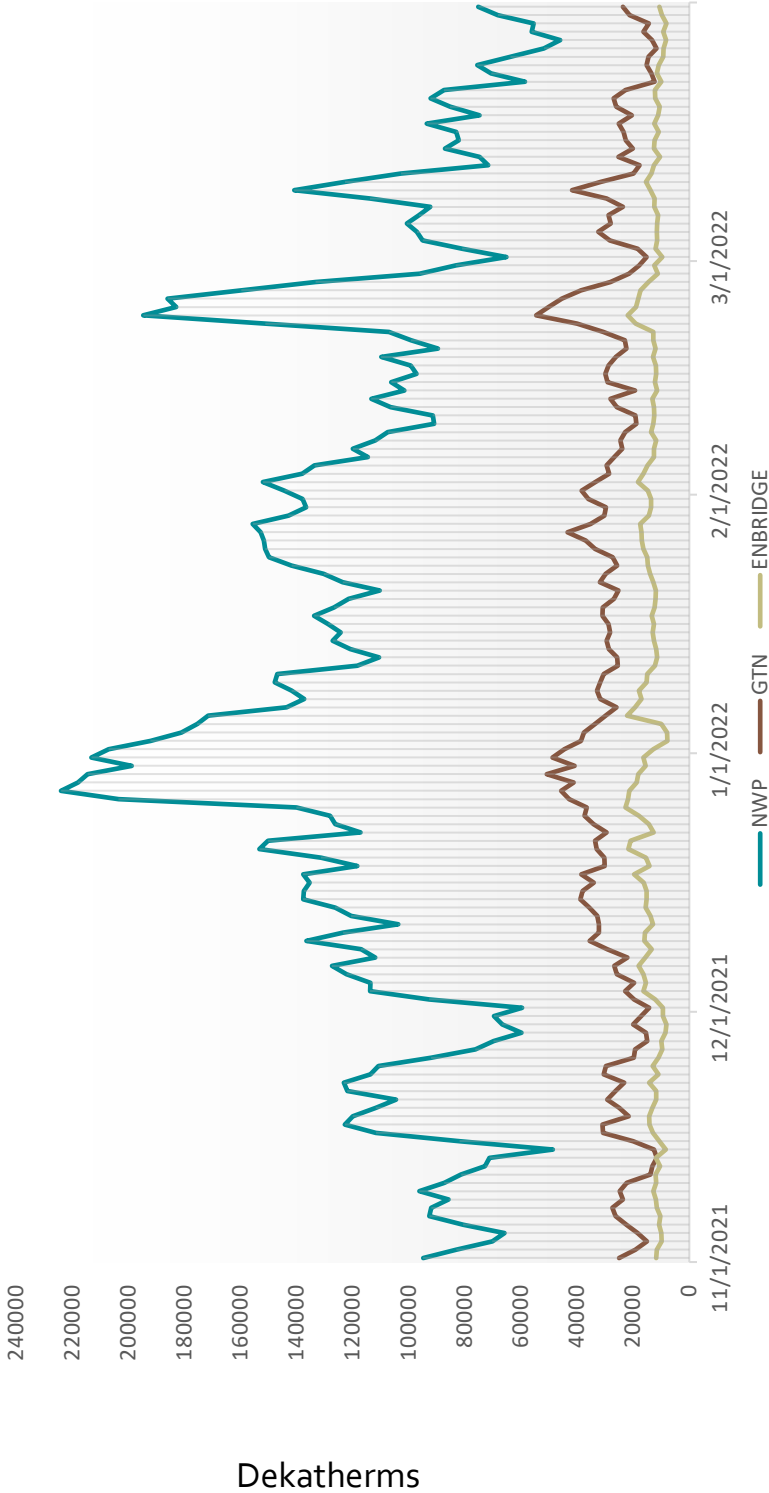
CNG Purchases multiple lengths of contracts from a pool of various counterparties- Purchases line up with available transport from our market points

Hedge Calculation Table			
	Year 1	Year 2	Year 3
Contracted Base Supply Target	90%	60%	30%
Hedge Target Mid	55%	35%	20%
Hedge Target Range	50%-60%	30%-40%	15%-25%
Forecast Annual Usage	36,680,873	36,996,312	37,030,660
Needed Base Supply to Contract	33,012,786	22,197,787	11,109,198
Hedge Target	20,174,480	12,948,709	7,406,132
Current Hedged	18,178,000	10,527,000	906,000
Current Indexed	3,872,500	-	-
Remaining to Hedge	2,137,551	2,182,805	6,469,924
Remaining Indexed Supply Needed	9,055,578	9,078,432	3,687,962
*Forecast	The Forecast is based on the IRP 20 year forecast		
*Contracted Base Supply	Base Supply is the overall amount of the contracted supply whether indexed or hedged. CNG used 90% in the prompt year to allow for storage usage and operational flexibility. The outward years use a ladder scale down to obtain a portion of the portfolio annually.		
*hedge Target	A percentage of the forecasted amount		

Renewable Natural Gas

- Cascade is currently flowing RNG on 2 Projects into our system.
- One Landfill and One Bio digester
- Upstream resources are off-set by the volumes
- Approximate 900 Dth day
- Cascade's business development department is continuously looking at new RNG opportunities.
- More information on RNG opportunities will be provided in subsequent tags.

Winter Usage Sample



Jackson Prairie

- 4 accounts with 1,235,593 dth capacity, 56,366 dth of withdrawal rights
- CNGC targets cycling Jackson Prairie, with pricing and other market and operating conditions considered
- Winter 23/24 was a warmer winter and with less storage cycled

Plymouth

- 2 accounts with 662,200 dths capacity, 78,125 dth of demand
- In addition to above we have TF-2 (Firm Redelivery Transportation) of 10,675 dths
- CNGC remains committed to using Plymouth as a peaking resource.

MIST

- Added in the spring of 2019, addition capacity and demand added in fall of 2021.
- The added Demand and capacity is a valuable operating resource in winter
- Consolidated to one account of 1,640,000 dth of capacity, 50,000 dth of demand
- CNGC targets cycling Mist, with pricing and other market and operating conditions considered.

Total Storage

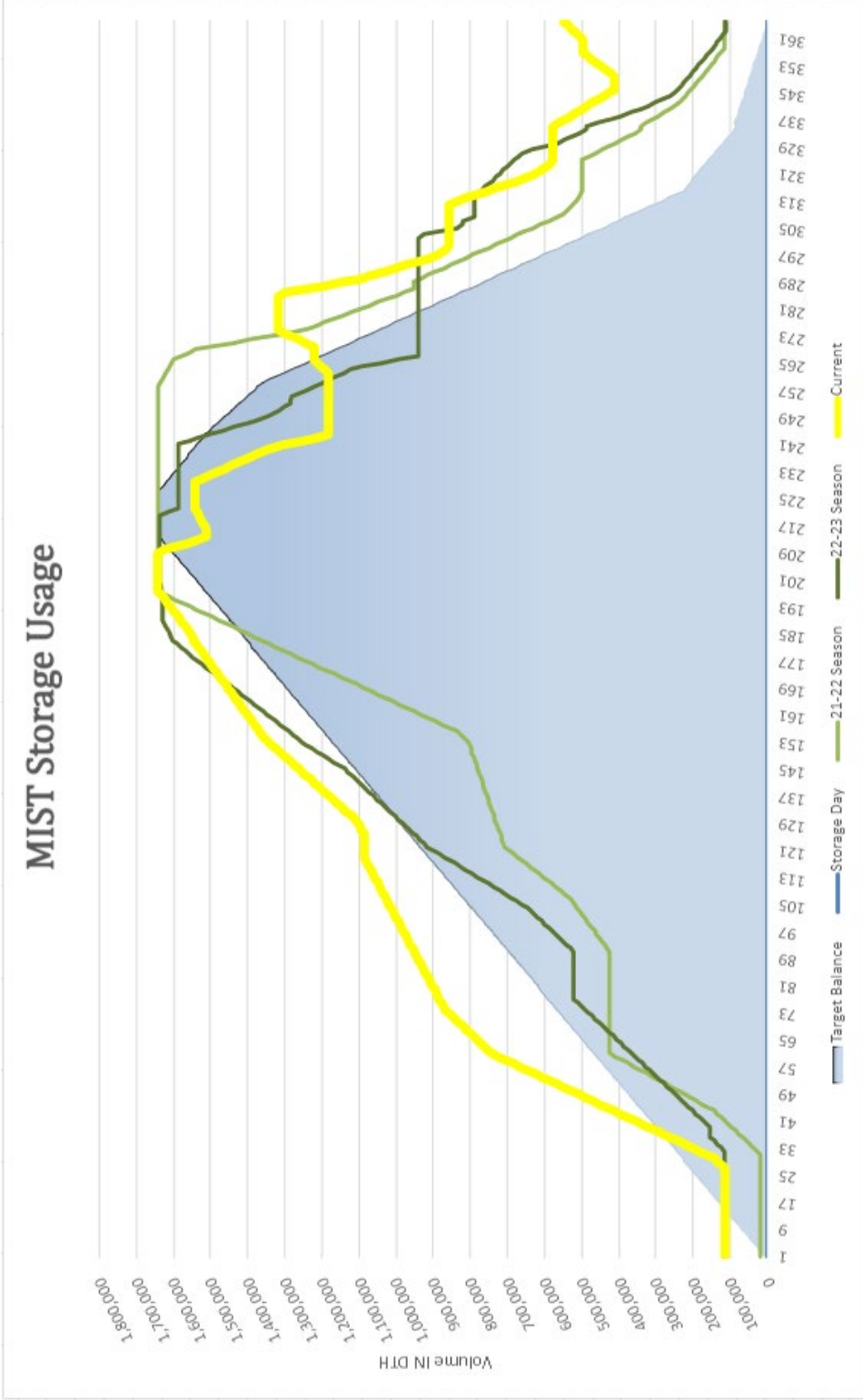
- At 100% of demand, Cascade can meet approximately 67% of Peak Day needs.
- Total storage capacity accounts for approximately 14.75% of winter demand
- Winter demand is approximately 68% of annual demand.

Storage Resources

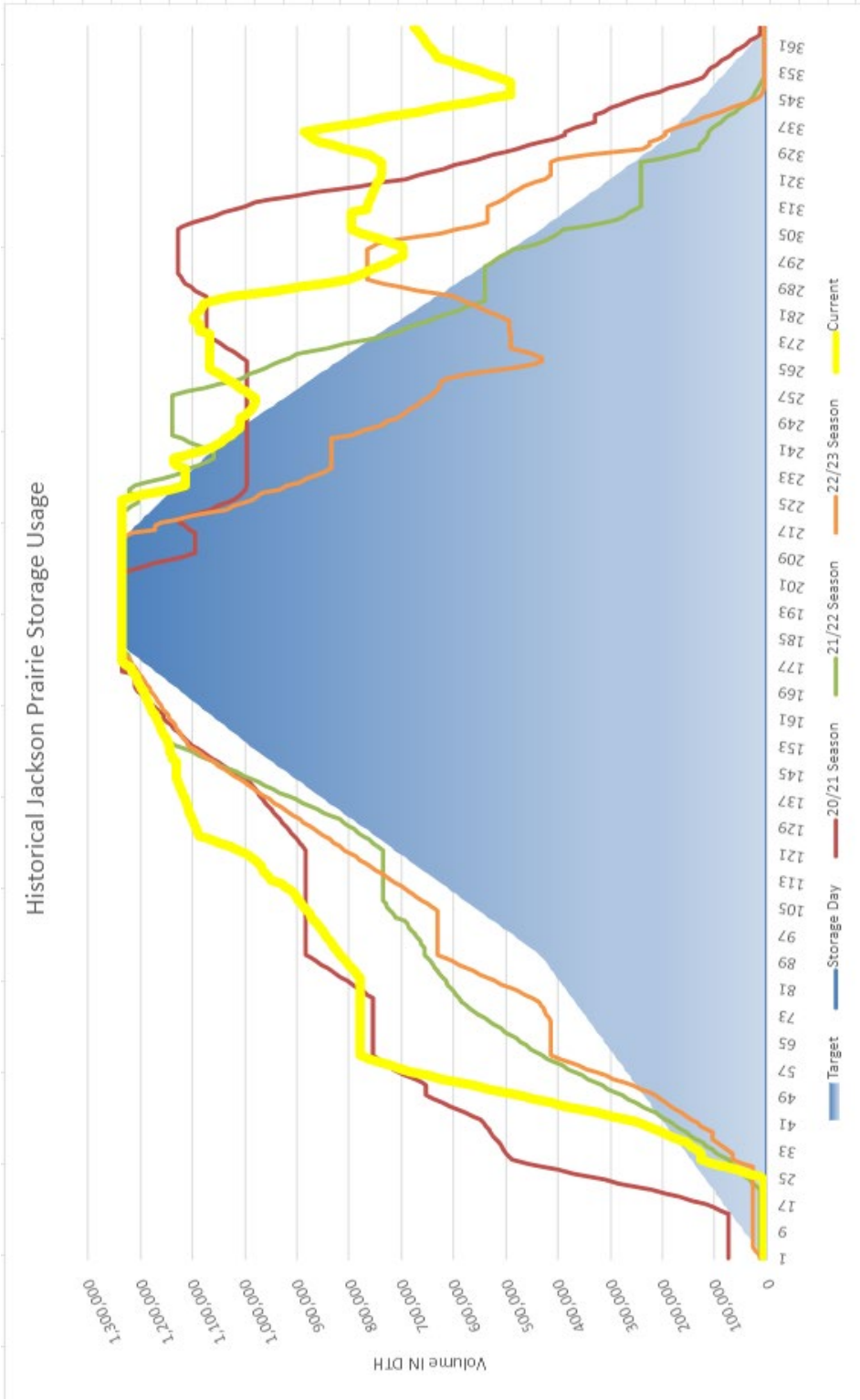


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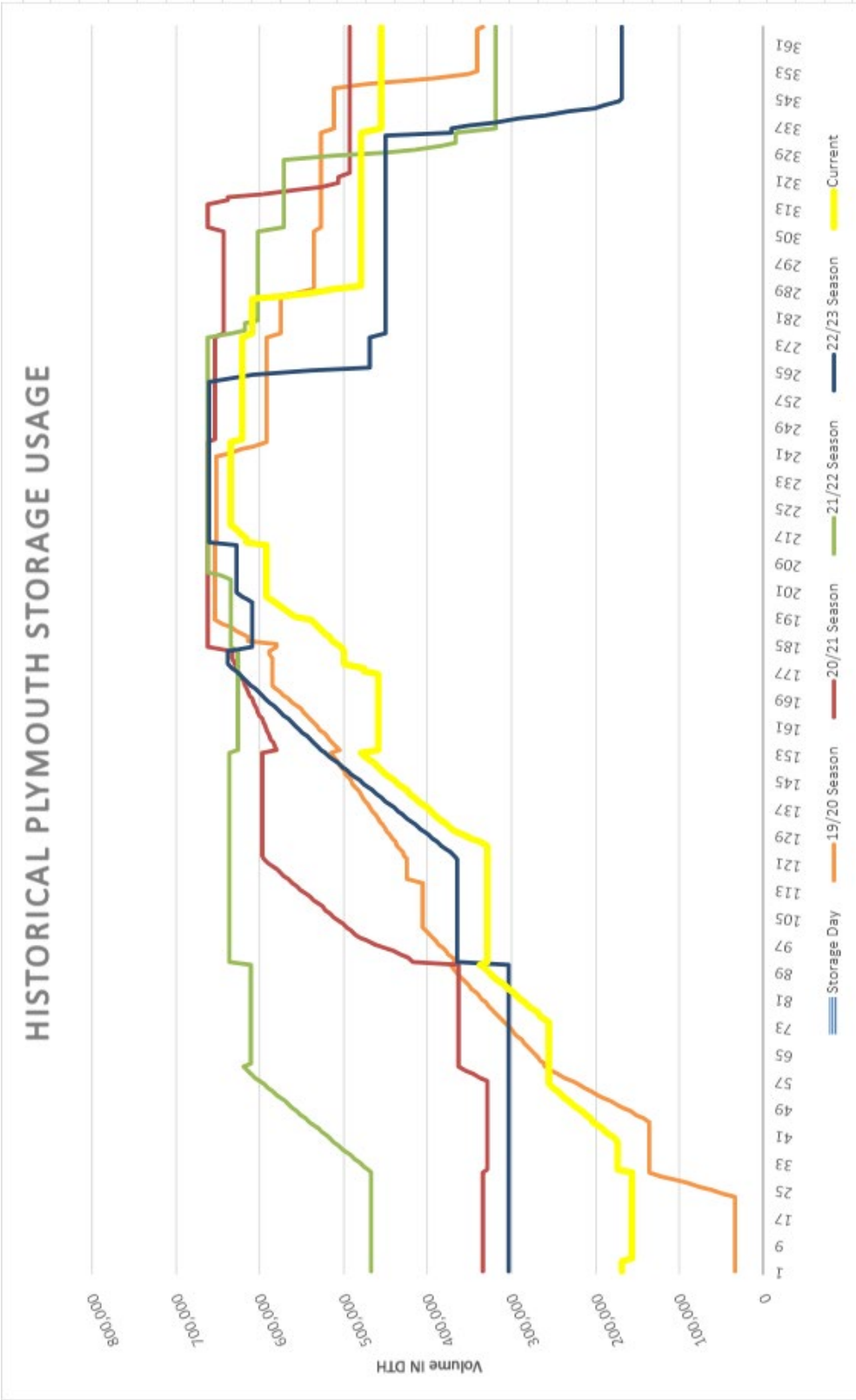
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Storage Utilization 4/23-03/24



Storage Utilization 4/23-03/24

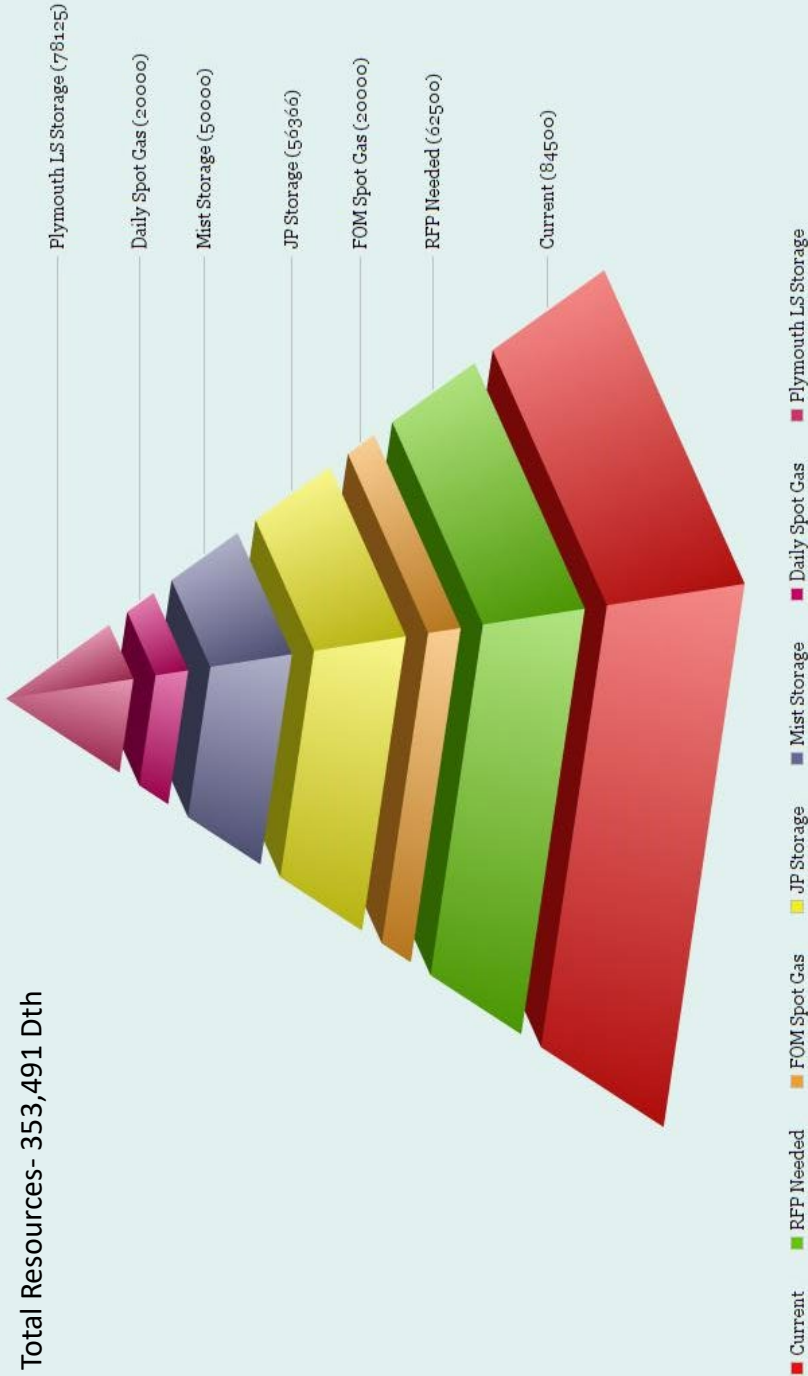


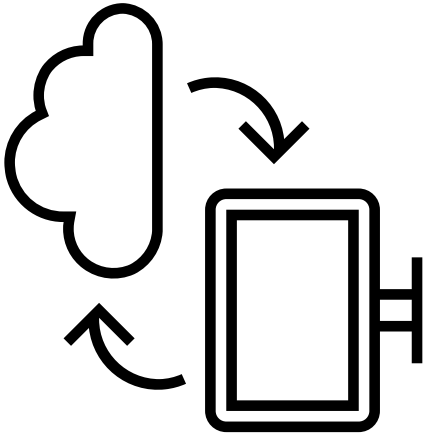
Storage Utilization 4/23-03/24

Peak Day Stack Example

Peak Day- 275,000 Dth

Total Resources- 353,491 Dth





Planned Scenarios and Sensitivities

Resource Integration

Scenarios:

- Customer Growth
 - Washington State Building Code Council rules w/ flat customer growth
 - Washington State Building Code Council rules w/ 1.5% decay in building stock attrition
 - Washington State Building Code Council repealed after 2 years, return to normal growth after
- Climate Regulation
 - Climate Commitment Act/Climate Protection Plan
 - Social Cost of Carbon
- Electrification
 - Expected Costs
 - Low Costs
- Weather
 - SSP 2-4.5
 - SSP 3-7.0
- Low Carbon Alternative Fuels
 - Monte Carlo Simulations (100+ draws)

Resource Integration Cont'd

Reference Case:

- Washington State Building Code Council rules w/ flat customer growth
- Climate Commitment Act/Climate Protection Plan
- Electrification – Expected Costs
- SSP 3-7.0 Climate Model
- Low Carbon Alternative Fuels – Reference Case

Stochastic Scenario Modeling:

- Cascade plans to run the combination of growth policies, climate policies, electrification costs, climate models, and low carbon alternative fuels.
- The combination of the three growth policies, two climate policies, and two electrification costs results in twelve scenarios.
- These scenarios will be modeled under both climate models and all 100+ draws of the low carbon alternative fuels.
- This will result in 2400+ draws.

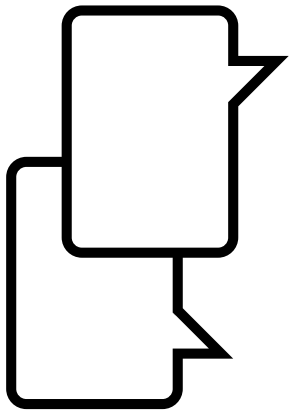
Resource Integration Cont'd

Cascade will utilize the twelve scenarios, as well as the stochastic results from each scenario, to build out the short- and long-term plans for Cascade.

For the long-term plan, Cascade will utilize the stochastic scenario modeling to provide future potential portfolios, providing results on low carbon fuel acquisitions, incremental or offtake transportation, storage, total system cost, demand shortages, carbon compliance, and overall risk to ratepayers.

The two- to four-year action plan will utilize the results of the long-term action plan and implement the portfolio that meets system demand with the least cost least risk mix of natural gas, low carbon alternative fuels, and conservation.

Feedback for Cascade





Questions/Next Steps



Review Plans for TAG 2 Discussion

- Respond to TAG 1 Feedback
 - Integration Results
 - TAG 2 is Thursday, October 24
- Alternative Resources
- Price Forecast
- Carbon Impacts
- Energy Efficiency
- Renewable Natural Gas
- Preliminary Resource

2025 WA IRP Schedule

Process Item	Date	Process Element
Receive feedback on TAG 1	Friday, September 27, 2024	
TAG 2	Thursday, October 24, 2024	Respond to TAG 1 Feedback, Alternative Resources, Price Forecast, Current Supply Resources, Transport Issues, Carbon Impacts, Energy Efficiency, Bio-Natural Gas, Preliminary Resource Integration Results.
Receive feedback on TAG 2	Friday, November 8, 2024	
First Draft	Friday, December 6, 2024	
Comments Due	Friday, January 10, 2025	
TAG 3	Wednesday, February 5, 2025	Respond to TAG 2 feedback, Distribution System Planning, Final Integration Results, finalization of plan components, Proposed new 2- to 4-year Action Plan
Final Draft	Tuesday, March 4, 2025	
Comments Due	Tuesday, April 15, 2025	
TAG 4 (if needed)	Thursday, May 1, 2025	
Final Complete By	Friday, May 16, 2025	
File	Friday, May 23, 2025	



In the Community to Serve®

Integrated Resource Plan Technical Advisory Group Meeting #1

SEPTEMBER 12, 2024

MICROSOFT TEAMS/TELECONFERENCE



In the Community to Serve®



2025 IRP TAG #1 Meeting

Date & time: 9/12/2024, 9:00 AM to 11:40 AM

Location: Microsoft Teams Meeting

Presenters: Brian Robertson, Mason Fried, Bailey Steeves, Eric Wood

In attendance: Alessandra de la Torre, Bailey Steeves, Becky Hodges, Brian Robertson, Bruce Folsom, Byron Harmon, Caleb Reimer, Carolyn Stone, Chris Robbins, Devin McGreal, Eric Shierman, Eric Wood, Jennifer De Boer, Jodie Albert, Jon DeVaney, Kathleen Campbell, Mark Sellers-Vaughn, Mason Fried, Megan Koelzer, Michael Freels, Michael Meyers, Michael Parvinen, Patrick Darras, Patrick Hanks, Quinn Weber, Robert McCloud, Russ Nishikawa, Ryan Denton, Shawna Nieraeth, Tamy Linver, Tom Pardee, Will Gehrke, Zachary Sowards

Brian Robertson, Supervisor of Resource Planning, opened the meeting by welcoming and thanking stakeholders for participating in Cascade's IRP Process. Brian then proceeded to do introductions.

Presentation #1 – Safety Moment (Brian Robertson)

- Brian presented a safety moment, covering pedestrian safety. Topics include tips for both drivers and pedestrians to increase safety for all.

Presentation #2 – About Cascade Natural Gas (Brian Robertson)

- Brian presented a slide covering a brief history of Cascade Natural Gas (hereinafter referred to as the "Company" or just "Cascade"), including its origin and acquisition by MDU.
- Brian then covered the state of the Company today, including customer counts and service territories.

Presentation #3 – Purpose of the Integrated Resource Plan (IRP) (Brian Robertson)

- Brian covers the purpose of the IRP, the guidelines it follows, and the content within the IRP. This purpose is to inform and guide the Company's resource acquisition process consistent with state regulatory requirements.
- The Company plans to use feedback from TAG meetings to improve the IRP.

Presentation #4 – IRP Webpage (Brian Robertson)

- Brian covers the Company’s website, giving a brief walkthrough of the IRP webpage and how to navigate it. This also includes changing languages for those that may desire to do so.
- The IRP describes the two- to four-year and 20-year expectation of how the Company expects to safely serve the energy needs of customers at the lowest reasonable and safe cost. He emphasized the importance of public participation during these TAG meetings.
- He also explained how Cascade plans to address the feedback given. The full TAG meeting schedule is available on Cascade’s website, as well as links to previous IRPs for anyone to view anytime they wish. Appendices may also be made available upon request.

Presentation #5 – Stakeholder Engagement Document (Brian Robertson)

- Brian covers the stakeholder engagement document, the importance of it, and encourages participation in the IRP process by stakeholders.
- The document is intended to help align perspectives, so the Company maximizes the effectiveness, influence, and amount of contributions from stakeholders.
- It’s important to ask methodology and technical questions early in the process to allow Cascade time to make any changes. The desired result is to be confident in the quality of the draft IRP with feedback from external stakeholders to ensure the final draft exceeds expectations.

Presentation #6 – Climate Weather Data (Mason Fried)

- Mason covers various topics that help incorporate climate science into the IRP process so the Company can ensure the highest accuracy in the modeling process.
- Mason starts with a background that explains how climate scientists use “Global Climate Models” (GCMs) in their projections. These are simulations of the Earth’s climate and processes. Scientists then use a method known as “downscaling” to allow for projections that can capture local climate characteristics as well as harness probabilistic projects and an ensemble of models to capture a wider range of potential climate conditions.
- Mason then covers the future climate scenarios that were developed using these methods. These scenarios help us understand the uncertainty in future greenhouse gas emissions and responses by the climate to those emissions. These range from “likely” to “highly unlikely”.
- Mason explains how the Company is using a particular projection method called “Localized Constructed Analogs Version 2” (LOCA2). This allows for downscaled temperature projections to develop custom heating degree day (HDD) projections for Cascade’s service area. This method is peer-reviewed and used in landmark climate assessments, ensuring that the Company is using high quality data and methods for the IRP.
- Cascade also paired these projections with observational time series data to correct and historical biases.
- Mason then covers the HDD projections that are a result of the methods mentioned above. The more likely and less likely scenarios are presented. Graphs are shown to

represent the different quantiles from 0 to 1 in both scenarios for the simulations ran. This allows for a representation of the possible range among the simulations. Both scenarios show significant interannual variability.

- Mason then covers a more qualitative analysis that mentions that, though climate change is projected to drive warmer temperatures in the Pacific Northwest, extreme cold weather days can still occur. Mason mentions how some evidence suggests that climate change could worsen these cold extremes that result from “polar vortex events” in the near to medium term.
- Further, research out of Portland State University suggests that the Pacific Northwest has a “non-Gaussian temperature distribution”, meaning cold snaps are relatively rare.

Question (Byron Harmon): Byron asks for clarification on the differences between the SSP2-4.5 and SSP3-7.0 models in terms of the range of possible HDDs forecasted by the models (see slide 16).

Answer (Mason Fried): Mason explains one reason is that the “less likely” SSP3-7.0 model is a higher greenhouse gas emissions (ghg) scenario due to reversed climate policy, which is driving a greater forcing on the climate system relative to the SSP2-4.5 model. As a result of this, the quantiles graphed will have a tighter spread. Mason comments that there may be other macro factors influencing this as well.

Question (Byron Harmon): Byron has a follow up question (see slide 14). Byron asks if the models are taking into account the potential for large greenhouse gas (GHG) emitting entities to move operations to locations that are not as strict in their regulations of GHG emissions.

Answer (Mason Fried): Mason comments on an inability to speak about the source paper at such a level on the top of their head. But does further comment that the paper considered many scenarios, including those asked by Byron.

Question (Byron Harmon): Byron further follows up by asking if it accounts for land-use issues and potential “feedback loops”. An example given is how in the summer if it was hotter in northern Canada than it was in Florida and the emission consequences of such situations. Byron is seeking clarification of global fossil fuel emissions (represented in the graph) vs these types of “land-use” changes.

Answer (Mason Fried): Mason talks about how the global emission models consider feedbacks, responses to emissions, and those types of scenarios but that the SSP models may not treat those variables that explicitly. Mason continues, though, to ensure that the higher ghg models (such as SSP3-7.0) do implicitly capture such variables and changes.

Presentation #7 – Demand and Customer Forecast (Brian Robertson)

- Brian briefly covers the overall process of the forecasts before diving into each piece. Brian also mentions there is a more detailed explanation in the targeted TAG #5 meeting for those that are interested in that.
- First covered are some of the inputs. The input data comes from pipeline actuals at a daily/citygate level, Woods & Poole market intelligence economic data at the county level, weather data from Schneider Electric, and customer count/billing from ThoughtSpot.

- Brian covers the process in which they adjust customer billing data to properly reflect the usage of a customer in each month.
- Next covered is the use per customers forecast. Here Brian explains how each zone and rate schedule (residential, commercial, etc) has its own forecast. Then the model incorporates several explanatory variables that help predict the usage per customer for each zone and rate schedule combination. These explanatory variables are as follows:
 - HDD: The lower the average temperature (or the higher the HDD) on a given day, then the higher the demand.
 - I: This is an indicator variable that equals 1 if the day falls on a weekend. We notice lower usage on the weekends, especially for commercial and industrial customers that close on the weekends.
 - WIND: The higher the average wind speed on a given day, the higher the demand.
 - Retail Price: If the price of gas goes up for customers, the demand may go down.
 - Trend: This captures any overall increase or decrease in the data over time.
 - Fourier(k): This helps capture the seasonality of the data. Combinations of sine and cosine are modeled to help capture this trait.
 - ARIMA(p,d,q): This part of the model involves any autoregressive (AR), integrated (I), and/or moving average (MA) components of the data.
- Brian explains the explanatory variables that go into the customer forecast:
 - HH: This stands for “households” and captures household data from Woods & Poole. This is the projected total number of households in the service area. HH is typically statistically significant for residential customers.
 - Emp: This stands for “employment” and captures projected rate of change in employment. Emp is typically statistically significant for commercial and industrial customers.
 - Retail Price: If prices rise there may be a negative effect on customer count. Note that this variable has not been found to be statistically significant.
 - Income: Higher income areas lead to a higher number of customers in an area. Note this value is indeed statistically significant but very low.
 - Fourier(k): Again, this helps capture seasonality.
 - ARIMA(p,d,q): This part of the model involves any autoregressive (AR), integrated (I), and/or moving average (MA) components of the data.

Question (Eric Shierman): How is the retail price lagged?

Answer (Brian Robertson): It is lagged one year using historical data. We take the actual prices customers see on their bill and lag it one year.

- Brian explains that anyone interested in this should also look at IRP associated documents on the Company’s webpage so that they can understand the column names in the excel sheet. He also goes over a couple graphical representations of the Company’s service areas that also show information, such as zones and pipelines.
- Brian covers how to find the exact rate for each type of customer in both Washington and Oregon, using Cascade’s website.
- Brian then covers building codes and how they can impact the model. These codes are implemented to reduce net energy consumption.

- Brian explains how the 2021 Washington State Energy Codes as well as provides some descriptions of jargon used (such as what constitutes a “dwelling”). These new codes appear to make it impractical for new residential and commercial buildings to use natural gas.
- Brian then moves to customer count impacts in Oregon and how Oregon has signed with 8 other states to create a Nine States Pledge Joint Action to transition to “clean buildings”.
- Next, he covers the customer growth scenarios and mentions the high level of uncertainty around customer growth. There is a base case, low growth case, and a high growth case.

Question (Patrick Hanks): Patrick notes the plan is created including 2024, but also notes that the situation can change dramatically if voting for things, such as the CCA, go a certain way. Patrick asks if these are covered in the scenarios that Cascade considers or if there is a particular one that is chosen based on likelihood of occurrence.

Answer (Brian Robertson): Brian notes that all scenarios are considered but one is chosen as the base case. Brian further notes that the Company adds low carbon alternative fuels around different climate policies are also considered. Brian mentions the level of uncertainty in forecasting and how Cascade prepares for such scenarios so that there is a plan in place by adding this uncertainty into the process.

Question (Byron Harmon): Byron asks why there appears to be seasonality in the customer count forecasts. Byron adds an example scenario, asking what if the zero-emission buildings goal is met by 2030, and hence no new buildings that use natural gas are built, why would there be seasonality in the number of customers?

Answer (Brian Robertson): Brian comments that this is not necessarily customer growth, rather customer counts. Brian notes that this seasonality exists in the actual data (highlighting the graph of the historical data) and that customers appear to turn off natural gas services when they go on vacation or during the summer months. Those customers will then return services during the winter months, leading to the seasonality seen in the data. Brian also mentions potential other reasons that may contribute to this trait of the data.

Question (Byron Harmon): Byron asks if the Company is willing to share more recent customer count data.

Answer (Brian Robertson): Brian states he will make sure that is okay, and if so, will share that data with Byron.

- Brian then covers the demand forecast results. Shares a graph of the current forecast scenarios as well as previous IRP forecast results as comparison. He notes the significant effect that customer counts have on demand.

Presentation #8 – Non-Core Outlook (Brian Robertson)

- Core customers are those in which Cascade purchases and distributes the gas for and recovers the associated costs.

- Non-core (or “transportation”) customers, typically large industrial or electric generation customers, purchase and schedule their own gas. These customers take responsibility of their own gas needs to get it to Cascade’s citygate. They then pay Cascade to use our distribution system.
- He then covers the Company’s transportation customers and associated forecasts.
- Cascade is emission responsible for about 105 million therms under the CCA and 13 million under CPP for transport customers in 2025.
- Brian explains how it is too early to determine the impact the CCA will have on these customers.

Presentation #9 – Regional Market Outlook (Bailey Steeves)

- Bailey first covers the long-term regional market outlook, using data and insights from the US Energy Information Administration (EIA). Looking at the role of natural gas in electricity generation, we see a decrease by 2050 relative to 2022, contrasting with relatively stable growth over the past decade.
- Natural gas production increases by 15% from 2022 to 2025. In all cases domestic production outpaces domestic consumption.
- Growing international demand encourages growth in domestic natural gas production.
- Next covered is the short-term outlook. Bailey mentions how electric power generation is the main driver for natural gas consumption during summer months.
- A consultant is quoted stating that comfortable storage levels and steady production point to a bearish short-term outlook for natural gas prices, but potential for extreme weather events and increased cooling demand could put upward pressure on prices as the month progresses.

Question (Byron Harmon): Byron asks if the Company has looked at any clean energy implementation plans from any electric utility companies on how much natural gas they intend to use for their electricity generation.

Answer (Brian Robertson): Brian states the Company has looked at this at a high level. He notes that the IRP is mainly focused on the customers in which Cascade is responsible (in terms of planning for emissions and transportation). Noting that we are not responsible for the emissions of electricity generation customers, he concludes by assuring that this is considered and tracked.

Question (Byron Harmon): Byron follows up, seeking clarification on how the change in demand for one of these electric generation companies can affect the Company in areas such as the capacity need of their system and if the Company is factoring this into their analysis.

Answer (Brian Robertson): Brian notes that the Company doesn’t plan for the electric generation on the distribution since these customers are “interruptible”.

Michael Parvinen jumps in to clarify that this is true for Oregon but not in Washington.

Presentation #10 – Avoided Cost (Bailey Steeves)

- Bailey covers the Company's avoided cost overview and calculation. She explains these are estimated costs to serve another unit of demand with a supply side resource option at a point in time. These represent costs that could be avoided through energy conservation.
- Bailey notes the similar information used in this IRP as in the previous ones, while also noting that the elements of it will be reconsidered with regards to emission reduction goals.
- Bailey then covers the avoided cost formula and the various components that go into it. These components are:

- $AC_{nominal}$: Nominal avoided cost for a given year
- TC_v : Variable transportation costs → pulled from major pipelines used by Cascade
- TC_F : Fixed transportation costs (when it is avoidable)
- SC_v : Variable storage costs (when it is avoidable)
- CC : Commodity Costs → taken from the Company's price forecast)
- E_{comp} : Environmental compliance cost → as per U-230161 CCA Policy Statement guideline
- DSC : Distribution system costs → from forecasted capital expenses related to growth only, which is then converted to a per therm measure
- RP : Risk premium → delta from deterministic and stochastic pricing
- E_{adder} : Environmental adder → 10% as per NWPCC guidance

Question (Byron Harmon): Byron clarifies that UTC staff does not speak on behalf of the commission. Then asks if Cascade has considered an elevated avoided cost methodology. Wondering if this could be a way to keep customers on the system that may be most likely to leave.

Answer (Bailey Steeves): Bailey mentions that attempting to elevate avoided costs to keep CCA costs down and to retain more customers would lead to an iterative loop. This loop comes from lowering CCA costs while maintaining customers leading to higher customer growth, which leads to higher CCA costs in addition to distribution system costs that leads to customers leaving, which leads to lower CCA costs and lower distribution costs, and so on. Further, the avoided cost is more of a "utility-centric measure", noting that if we switched to an avoided cost calculation being more a "customer-centric" benefit that this would likely need to involve other utilities as well.

Byron then comments his opinion about the potential benefit and recommends the Company keep this idea in mind as a potential tool.

Devin McGreal also comments, noting the careful approach needed in this type of analysis. Further stating that the avoided cost is a cost effectiveness analysis and how going beyond the current methodology too much may itself lead down a path that directly contradicts the goal.

Byron recognized the "balancing act" that the Company must take in such analysis.

Devin reiterates the emphasis on this "balancing act" and the complications that would arise from using such a tool.

- Bailey continues the presentation to cover environmental compliance costs.
- With the passing of the CCA, the Company thinks using the Company's marginal compliance costs that are associated with this rule may be most accurate.
- Bailey notes that since the withdrawal of the U-230161 CCA Policy Statement Guidelines, the Company is going to continue to evaluate the Social Cost of Carbon being included in the avoided cost calculation.

Question (Patrick Hanks): Patrick asks how the Company adjusts for the Social Cost of Carbon. Asking if the value used is adjusted because of the CCA.

Answer (Brian Robertson): Brian states the Company's uncertainty around this, while noting it has been the Company's stance that the CCA compliance cost does capture the Social Cost of Carbon properly.

Question (Patrick Hanks): Patrick follows up by asking if the policy or statute has a typical methodology used or if there is room to calculate the Social Cost of Carbon.

Answer (Brian Robertson): Brian states there is a technical document used for guidance in this regard. Offering to provide it.

Byron Harmon comments that the Social Cost of Carbon is also found on the UTC website.

- Bailey then covers the results of the avoided cost analysis. Here she shares the costs for 2025, 2040, and 2050, while noting an increase of about 30%-40% from the 2023 IRP from an increase in commodity costs and the addition of the Social Cost of Carbon.

Question (Byron Harmon): Byron asks why different zones have the same avoided costs.

Answer (Bailey Steeves): Bailey states that the way prices are distributed involves a blend so that each customers pays the same regardless of zone.

Brian Robertson further comments that Byron has a good point and that he will need to further discuss this internally to provide further information.

Byron Harmon comments how a consisted avoided cost may be more efficient rather than differentiating between each zone.

Presentation #11 – Upstream Pipeline Presentation (Eric Wood)

- Eric first covers the gas supply components. These are transportation, commodity, and storage. Eric notes the contracts the Company has and how it builds its portfolio. For commodity, he explains how the Company purchases gas based on daily need when these types of purchases are required. Storage is used to hedge prices and price arbitrage between summer and winter.
- Eric then briefly covers the Company's system map. Noting how the Company's service areas are scattered, leading to more transportation needed. He then covers the pipeline transport flow and how these help meet demand. Noting the typical flow amounts on these pipelines and how/when they are typically used.

- Eric then shows a simple representation of where the Company's gas comes from. Note that this is a simple diagram for representative purposes only. Brown circles are regions where the Company gets gas, the blue are the markets within those regions, green is storage, and orange are interconnects between pipelines.
- Eric then covers the highlights of the 2024 portfolio design.
- Eric then shows a "hedge calculation table". Here he explains the hedge amounts for each of the 3 years. It also shows information such as forecasted usage, needed supply, hedge target, how much is hedged, and how much is left.
- Eric comments on renewable natural gas and how he deals with the physical molecules on the system. He takes approximately 900 Dth a day on the system into account as well.
- Eric then shows a winter usage sample graph, showing how much more NWP flows than GTN and Enbridge.
- Eric then goes over the Company's storage resources and how the Company desires to harness them.
- With these, at 100% of demand, Cascade can meet about 67% of peak day needs.
- Eric then shows graphs of MIST, Jackson Prairie, and Plymouth storage usage from 04/2024 to 03/2024. These graphs show that the Company's target does not fall far from the actual usage. Further noting that the previous winter did not see as much demand.
- Eric then goes over an example of a peak day stack, using a diagram to show an example representation. Noting that this can change depending on a variety of conditions.

Presentation #12 – Planned Scenarios and Sensitivities (Brian Robertson)

- Brian first covers resource integration scenarios. These scenarios include customer growth, climate regulation, electrification, weather, and low carbon alternative fuels.
- Brian explains the reference case modeling and the variety of stochastic scenarios that will be modeled. Noting how the stochastic modeling will be used to better understand how different scenarios will impact the Company's preferred portfolio. Brian offered running a single climate scenario which would reduce the number of scenarios. Reducing the number of scenarios will allow more monte carlo simulations to be run for each one, while maintaining the number of outcomes from this analysis. These will allow the Company to implement the portfolio that meets system demand with the least cost and least risk mix of fuel options and conservation.

Post Presentations –

There were no post presentation feedback or questions. Brian briefly went over the schedule for the 2025 Washington IRP, the topics to be discussed in TAG #2, and reiterated the willingness of the Company to answer any questions.

The Meeting was Adjourned

Per Cascade Commitment #8 (Stakeholder Engagement Design Document, 2/22,2022: “Provide TAG minutes that include the action items from bullet #7 as well as any upcoming deadlines for feedback on the IRP”), here are additional action items to track, coming out of the TAG meeting:

1. Cascade requests any feedback be given by September 27, 2024 to allow proper time for consideration into the model.
2. Cascade will consider recommendations suggested during the meeting, specifically regarding the avoided cost zones and the impact of the clean energy implementation plans.
3. Cascade will continue to monitor the CCA and CPP and the implications/impact it has on the IRP, adjusting accordingly.



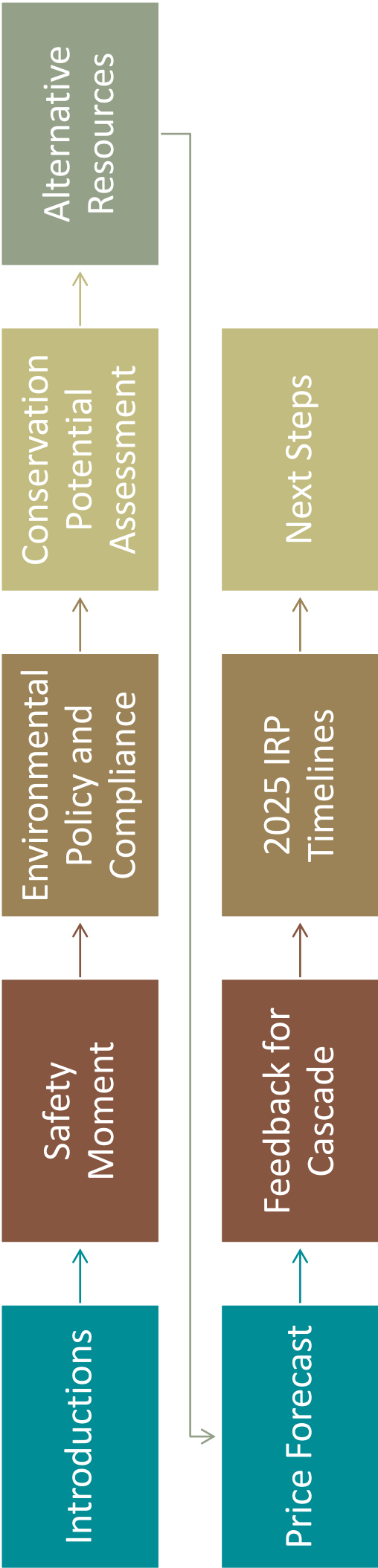
In the Community to Serve®

Integrated Resource Plan Technical Advisory Group Meeting #2

OCTOBER 24, 2024

MICROSOFT TEAMS/TELECONFERENCE

Agenda

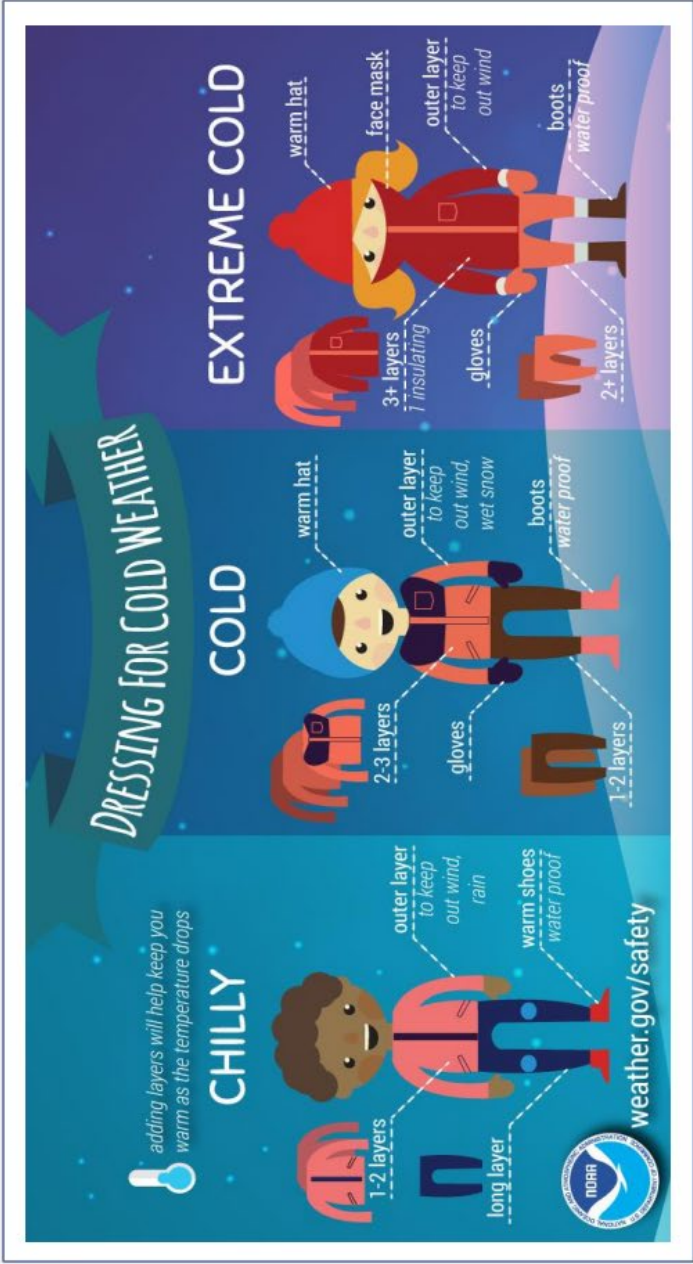


Safety Moment

Winter Safety – Protecting Yourself from the Cold

What you wear in winter can make the difference in protecting yourself from the cold and preventing frostbite and hypothermia.

- Keep your head warm with a hat
- Cover mouth with face mask or scarf to protect your lungs
- Outer coat should be tightly woven and water repellant
- Wear several loose-fitting, lightweight warm layers
- Wear mittens; they are warmer than gloves
- Wool socks and waterproof boots keep feet warm



Environmental Policy and Compliance

Cascade's commitment to reducing emissions

Cascade Natural Gas, along with MDU Resources Group's other natural gas companies, established a GHG reduction target to reduce methane emissions 30% by 2035 compared to 2022 levels.

Environmental Policy:

The Company will operate efficiently to meet the needs of the present without compromising the ability of future generations to meet their own needs. Our environmental goals are:

- *To minimize waste and maximize resources;*
- *To be a good steward of the environment while providing high quality and reasonably priced products and services; and*
- *To comply with or surpass all applicable environmental laws, regulations and permit requirements*

Emissions from Natural Gas Distribution Operations

Cascade's methane emissions from pipeline infrastructure and GHG emissions from combustion equipment

- Cascade reported 1,721 mT CO₂e emissions from leak emissions per HB 2518 to the UTC in 2023.
- Cascade reported 27,198 mT CO₂e emissions for distribution system and compressor station emissions to the Department of Ecology and the EPA's GHG Reporting Program in 2023.
- EPA finalized updates to Subpart W natural gas distribution system reporting that starts in RY 2025.
 - Updated emissions factors
 - Reporting of emissions from pneumatic devices, blowdowns, and other large release events
- Cascade and sister companies joined One Future Coalition in 2024.
- EPA GHG Reporting Program released the 2023 data on October 15, 2024.

Reducing Operations Emissions

- Cascade is committed to methane emissions reductions
 - Since 2019, Cascade replaced approximately 54 miles of vintage steel with new polyethylene plastic or protected steel in Washington. Cascade has no unprotected steel pipeline and no cast iron pipe.
 - Created a more robust inventory of GHG emissions in all operational areas for 2024 and ongoing
 - Joined One Future Coalition and will be collaborating with entities nation-wide to reduce methane intensities and improve distribution operations.
 - Cascade mitigates methane leaks and has adopted a program to quickly address even small leaks that are not considered a public safety concern.
 - Exploring more ways to reduce emissions in normal operations, including the use of methane capture technology for pipeline blowdowns.
 - Piloting an emission survey using Picarro and Advanced Mobile Leak Detection technology in 2024.

Reducing Customer Emissions

Energy Efficiency and Conservation/DSM

- Maximizing cost-effective therm savings for Residential, Commercial, and Industrial Customers
- Adaptive management for changing codes, standards, and forecasts

Low-Income Weatherization Offerings

- Targeted outreach, increased participation in Low-Income EE programs
- Funding 100% project cost



Annual EE and Conservation/ DSM Savings	WA		OR	
	therms	MT CO2e	therms	MT CO2e
2019	760,956	4,038	499,135	2,648
2020	659,176	3,498	427,060	2,266
2021	1,243,223	6,597	525,372	2,788
2022	627,941	3,459	508,067	2,799
2023*	912,782	5,028	601,036	3,311
*Report is pending WUTC approval				

Climate Commitment Act

Program establishing a declining cap on GHG emissions from covered entities consistent with the limits established in RCW 70A.45.020, and a program to track, verify, and enforce compliance with the cap through the use of compliance instruments.

Anthropogenic GHG Emissions Reductions:

- Achieve 1990 levels (90.5 million metric tons) by 2020
- 45% below 1990 levels (50 million MT) by 2030
- 70% below 1990 levels (27 million metric tons) by 2040
- 95% below 1990 levels (5 million metric tons) by 2050

Covered Entities:

- Fuel suppliers, natural gas distribution, electric utilities, and large facilities.
- Landfills and certain emissions intensive and trade exposed (EITE) entities are added in during 2nd and 3rd compliance periods.

Climate Commitment Act - Linkage



Most recently, Washington, California and Quebec made a joint announcement on September 23, 2024, stating they are currently considering amendments to their cap-and-trade regulations to ensure the achievement of their 2030 goals.

Climate Commitment Act

Cascade's regulated emissions:

- Customer Emissions – about 2 million metric tons CO₂e in 2023
 - All core customers
 - Non-core customers that are not covered entities under the CCA ($\leq 25,000$ mT CO₂e), and excludes customers that may "opt-in" to program individually, fall under the national security designation, or successfully petition to be emissions-intensive and trade exposed (EITE) entity
- Operations Emissions – 27,198 metric tons CO₂e
 - Methane leakage
 - Large fuel combustion equipment (e.g. compressor stations)

Climate Commitment Act

Baseline emissions

- 2015-2019 average

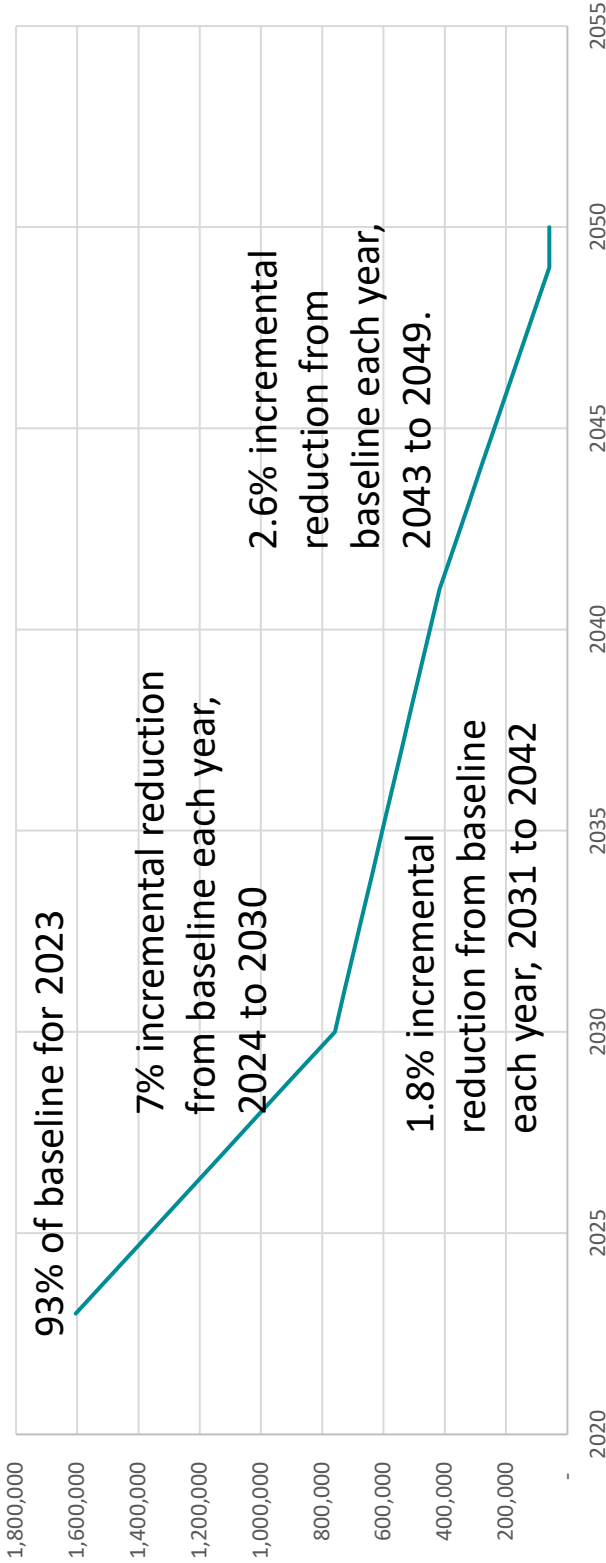
Ecology distributes no-cost allowances to Natural Gas Suppliers each October for the following year.

Natural gas utilities may use a portion of those allowances directly for compliance.

A large portion must be “consigned” at auction each year.

Consignment proceeds are used to benefit customers, through oversight of the Commission.

Cascade's Projected Trajectory of No Cost Allowance Allocations
(Metric Tons)



Climate Commitment Act

Rule Requirements Commenced on January 1, 2023

4 Year Compliance Periods

- 2023-2026, 2027-2030, 2031-2034, ...

Compliance Demonstrations

- Full compliance demonstrations required by Nov 1 of the year following the end of a 4-year compliance period
- Interim compliance period demonstrations by Nov 1 annually of 30% of prior year's emissions.
- First interim compliance demonstration is November 1, 2024.

CCA Compliance Options

Allowances

- Allowances are equal to one ton of CO₂e emissions

Energy Efficiency and Conservation/Demand-side Management

- Therm energy savings

Renewable Natural Gas

- One for one replacement of fossil gas emissions through renewable thermal credits

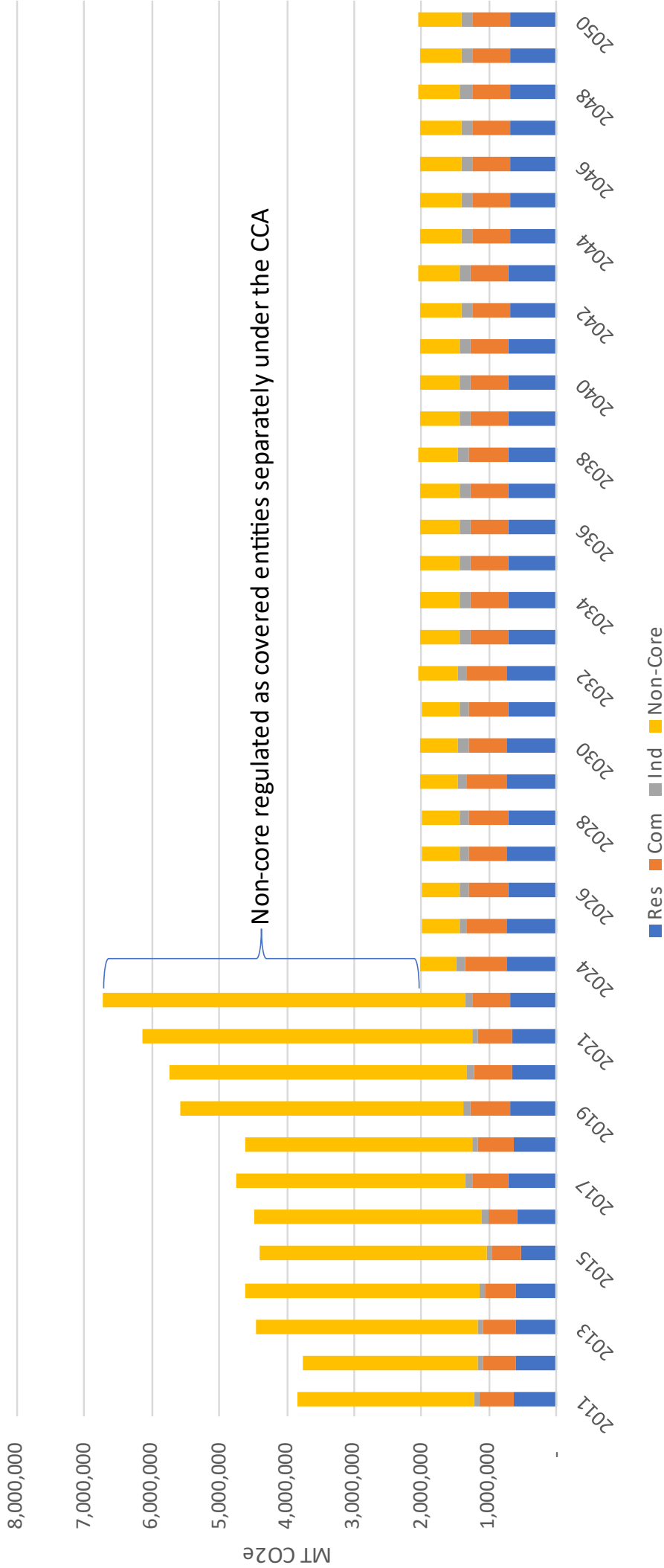
Offsets

- Limit use to 8% of compliance obligation in first compliance period (3% from tribal), 6% thereafter.

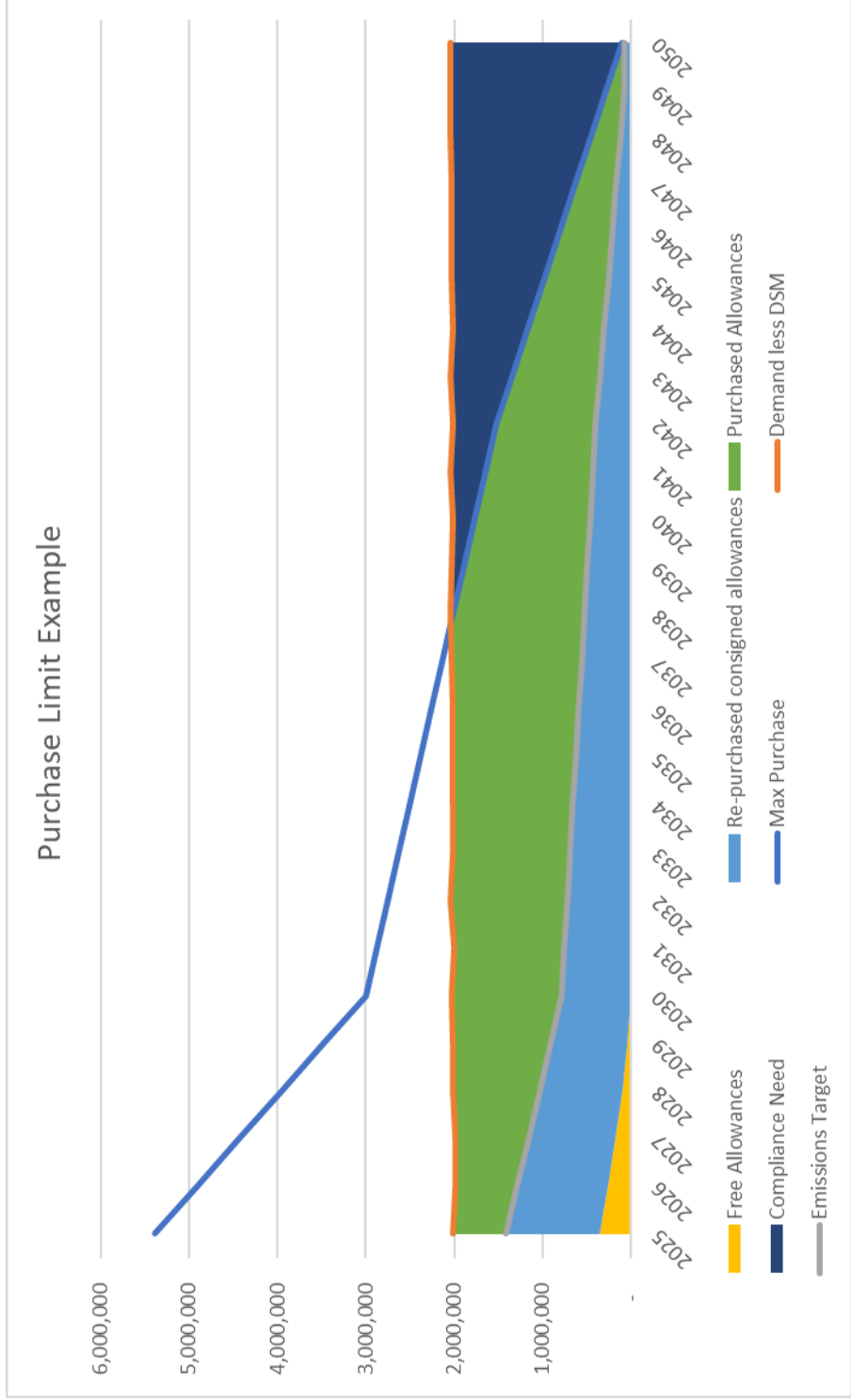
Other

- Carbon Capture, Synthetic methane, etc.

Projected Baseline Emissions



- Considering current purchase limit of up to 10% of available allowances at auction.
- If allowances remain cost-effective, Cascade would be held to the auction purchase limit.
- In addition, allowances are available on the secondary market.



Building and Energy Code

Washington

- WA IA 2066 could have a large impact on the WA State Energy Codes (WSEC). If passed in November, there will likely be a review and/or rewrite of the current WSEC.

Oregon

- ODOE's Buildings Working Group is currently informing model(s) for the development of Oregon's Energy Strategy. Cascade will continue to monitor.

Local and Regional Initiatives (WA)

- Initiative 2117 seeks to repeal the 2021 Climate Commitment Act. It would eliminate the cap-and-trade system put in place by the law and prevent state agencies from implementing any new carbon tax or cap-and-trade policies.
- Initiative 2066 would prohibit state and local governments from restricting or discouraging the use of natural gas in buildings. It would prevent authorities from passing regulations that phase out natural gas in favor of electrification. Additionally, it mandates that gas utilities provide natural gas to any customer within their service area, even if other energy sources are available.

Local and Regional Initiatives (OR)

- City of Bend Environmental and Climate Committee (ECC) continues to convene:

2024

- **August-Sept**- ECC meeting, results of analysis on gas pathways, ECC to develop recommendations
- **October**- Council check-in
- **Nov-Dec**- ECC to define resource needs and implementation plan for short term actions to be included in council goal setting for GY 25-27 & determine stakeholder engagement group and process

2025

- **Jan-April**- Deep dive analysis on prioritized policies
- **May-July**- Stakeholder meeting and developing recommendations
- **August** - Council check in- analysis, results and recommendations to council

Thermal Energy Networks (TENS) Law

- Allows utilities to “own, control, operate or manage any thermal energy network” in Washington
- Focus is on non-combustible fluids transferring heat to eliminate on-site GHG for heating, cooling, domestic hot water and refrigeration; and/or improving energy efficiency
- To maintain priority for developing TENS pilots in their service territories, gas companies have 12 months from effective date of June 6 to announce written intent to WUTC to deploy a project in a specific location
 - Pilot project must be deployed within 30 months of effective date to maintain this priority w/ possibility for extension
- A gas company may receive Commerce grant funding to offset difference between LDC’s lowest reasonable cost resources and the costs of building /operating TENS pilot project.
 - Difference is determined by WUTC and provides the dollar amount for the purposes of making the grant
- Each gas company receiving grant for TENS pilots must coordinate with other awardees, WUTC, the Commerce, and consultants with expertise on successful thermal energy networks

TENs Exploration and Next Steps

- Cascade has received internal approvals to actively pursue potential TENs opportunities, beginning with focus on Washington pilot efforts
 - Company is hiring a manager to lead TENs development efforts
 - Preliminary meetings taking place with potential vendors and project leads
 - May contract with third-party to support project origination and help design Cascade-focused TENs potential assessment, similar to Company's DSM assessment
 - Will be seeking clarification from regulators on finer points of TENs law to ensure ability to meet requirements
- Company has been approached in Oregon to consider future TENs laws

National Focus

- EPA finalized Subpart W updates that increase the methane emission sources local distribution system utilities must report annually. The new reporting requirements are effective in RY 2025.
- EPA released a request for information on the “Use of Advanced and Emerging Technologies for Quantification of Annual Facility Methane Emissions under the GHGRP”. We anticipate EPA to consider these methods in a future Subpart W future rulemaking to allow company-specific emissions quantification. Comments are due November 27.
- EPA released the electric generation unit GHG rule on April 25, 2024, requiring new high operation natural gas combustion turbines to install pollution controls equivalent to carbon capture. Also, existing coal units not installing controls would retire before 2032, opt to co-fire with natural gas and retire before 2039, or install carbon capture to operate past 2039. Some states and industry have challenged the rule, and no stay has been issued by a court. EPA is currently exploring GHG standards for existing natural gas combustion turbines.
- SEC finalized the GHG and Climate Disclosure Rule in March 2024, establishing a framework that require publicly traded companies to disclosure of scope 1 and scope 2 GHG emissions and certain impacts starting in 2026. Businesses filed legal challenges and the SEC voluntarily stayed the rule pending resolution of the legal challenges.
- Federally funded regional Clean Hydrogen Hubs (H2Hubs) were initiated to help accelerate and support the production, storage, delivery, and end-use of clean hydrogen.

Conservation Potential Assessment

IRP 2025 UPDATE

2025 IRP CPA Scenario Updates

<u>Reference 2025 IRP</u>	<u>Low Growth</u>	<u>High Growth</u>
2025 IRP Base Demand Forecast	2025 IRP Low Demand Forecast	2025 IRP High Demand Forecast
All scenarios updated with new avoided costs, HDDs, updated inflation rate and distribution system loss		

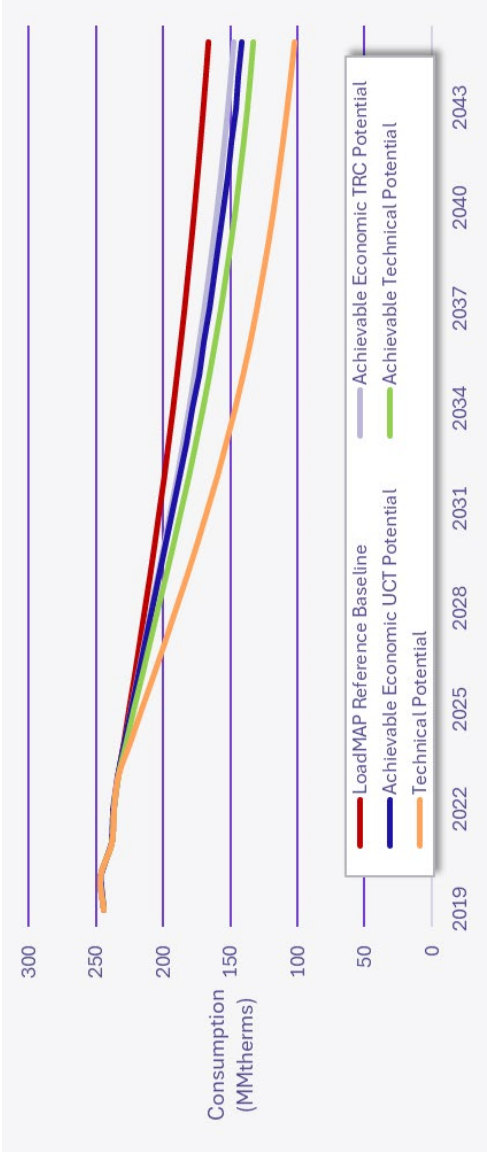
Cumulative Energy Savings of Achievable Economic UCT Potential (mTherms)

Scenario	Group	Sector	Sum of 2025	Sum of 2030	Sum of 2035	Sum of 2040	Sum of 2045
2023 Original	Regular Income	Residential	341.4	1,863.5	4,264.8	6,520.1	8,036.8
	Moderate Income	Residential	595.2	2,784.3	5,248.5	7,137.4	7,962.4
	Low Income	Residential	33.2	193.6	457.5	688.8	826.5
	Commercial	Commercial	670.3	3,128.5	5,099.4	5,979.6	6,128.6
	Industrial	Industrial	142.1	614.2	1,057.7	1,326.2	1,429.9
2023 Original Total			1,782.2	8,584.1	16,127.9	21,652.0	24,384.3
Reference - 2025 IRP	Regular Income	Residential	347.5	1,863.1	4,071.9	6,122.2	7,425.5
	Moderate Income	Residential	592.1	2,736.1	4,924.3	6,623.0	7,264.2
	Low Income	Residential	41.0	218.7	466.1	689.5	780.9
	Commercial	Commercial	733.0	3,219.1	5,005.3	5,728.6	5,747.3
	Industrial	Industrial	141.3	663.1	1,127.8	1,409.9	1,523.4
Reference - 2025 IRP Total			1,854.9	8,700.1	15,595.4	20,573.1	22,741.4
Low Growth	Regular Income	Residential	346.3	1,833.6	3,987.9	5,968.7	7,196.6
	Moderate Income	Residential	589.5	2,690.8	4,824.1	6,459.6	7,054.0
	Low Income	Residential	48.3	255.6	554.4	811.8	951.6
	Commercial	Commercial	734.6	3,259.2	5,057.3	5,753.5	5,748.6
	Industrial	Industrial	141.5	600.6	1,011.0	1,253.3	1,341.2
Low Growth Total			1,860.2	8,639.9	15,434.6	20,246.9	22,291.9
High Growth	Regular Income	Residential	347.5	1,895.0	4,183.0	6,337.4	7,761.7
	Moderate Income	Residential	592.1	2,781.2	5,049.1	6,842.0	7,573.7
	Low Income	Residential	48.5	263.4	580.2	860.5	1,025.0
	Commercial	Commercial	734.5	3,303.7	5,184.0	5,961.8	6,018.8
	Industrial	Industrial	141.3	663.1	1,127.8	1,409.9	1,523.4
High Growth Total			1,864.0	8,906.4	16,124.2	21,411.5	23,902.7

Scenario Summary

2023 Original

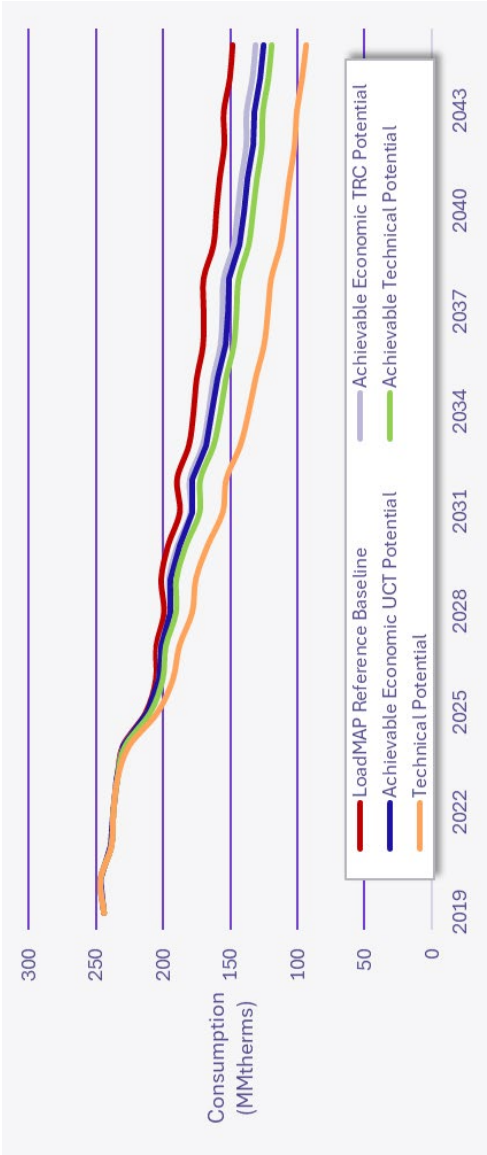
Projected Consumption



Projected Savings



2025 Reference



2023 Original

Appendix A
IRP Process

2025 High Growth

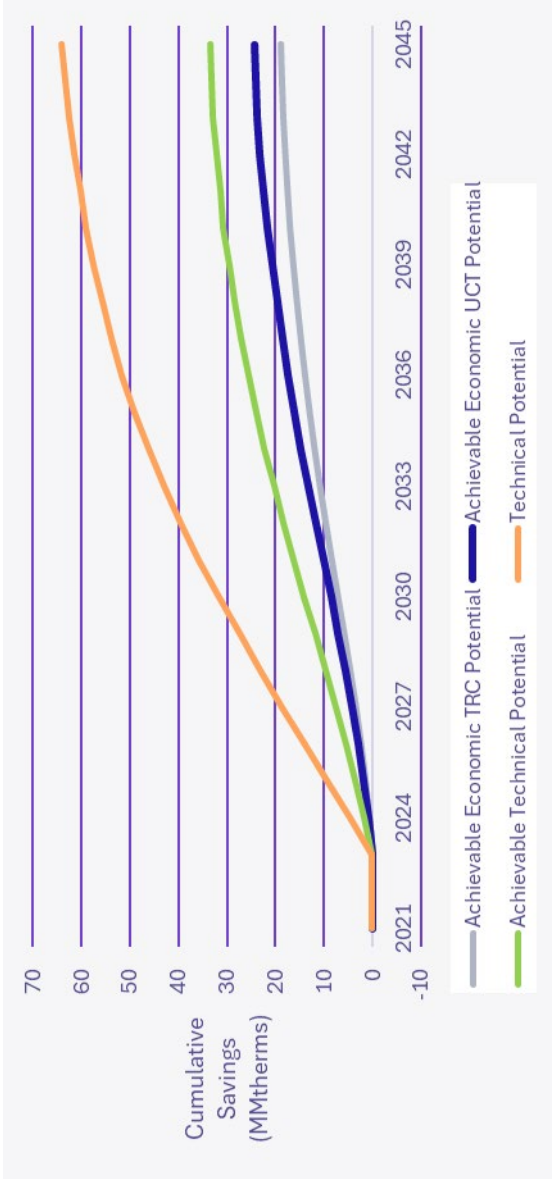
2025 CNGC IRP

Page 157

Projected Consumption



Projected Savings



A Subsidiary of MDU Resources Group, Inc.

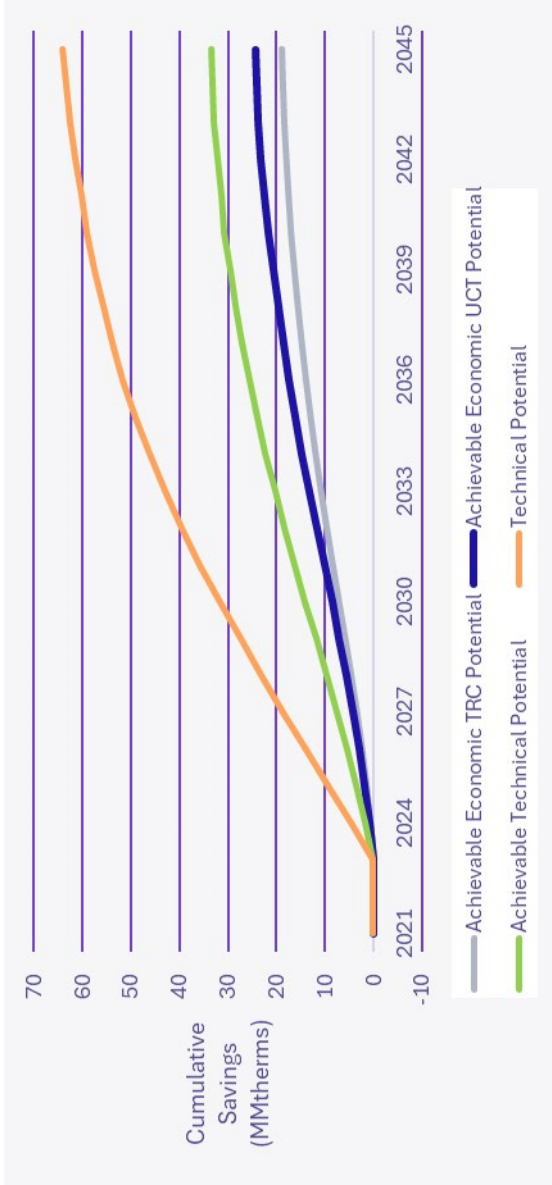
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2023 Original

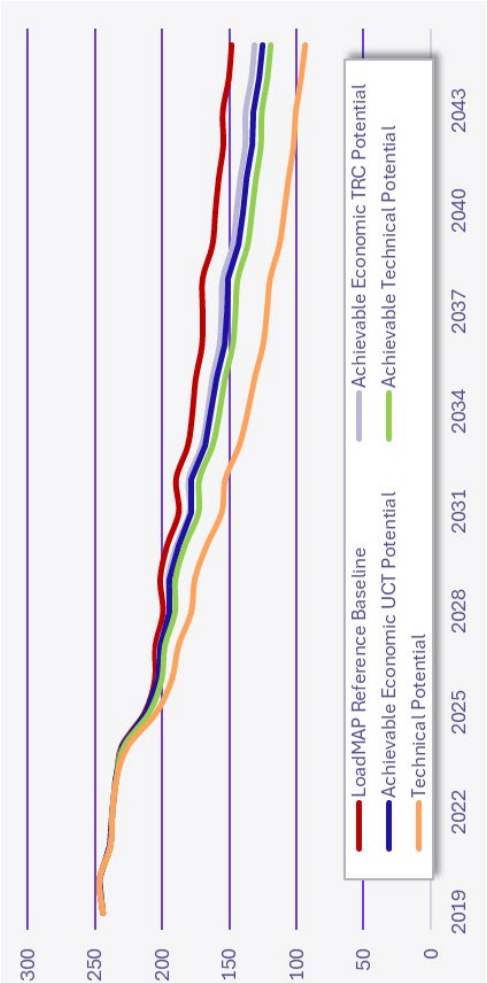
Projected Consumption



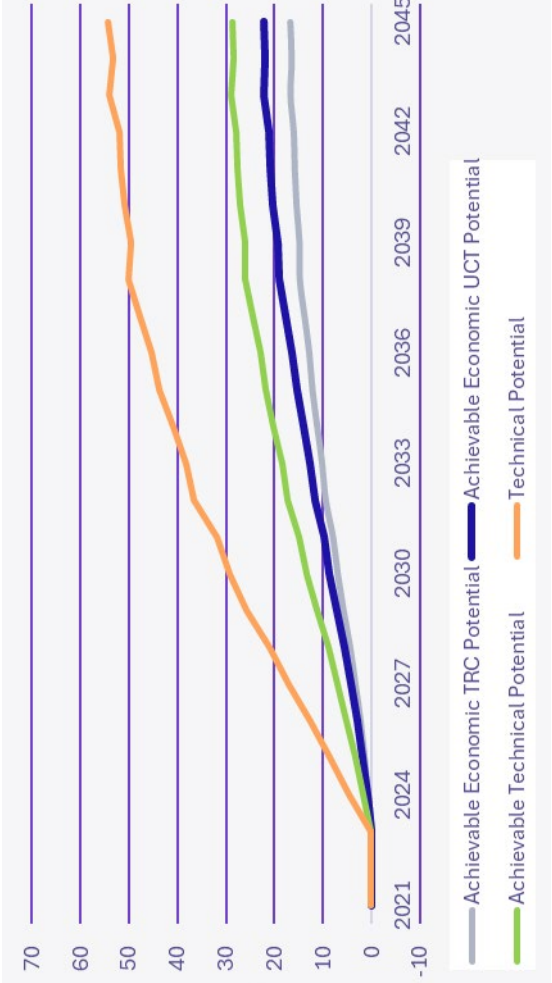
Projected Savings



Consumption (MMtherms)



Cumulative Savings (MMtherms)



Overall Change in Savings by 2045

Percent Change of Cumulative Energy Savings by 2045 in Comparison to 2023 CPA

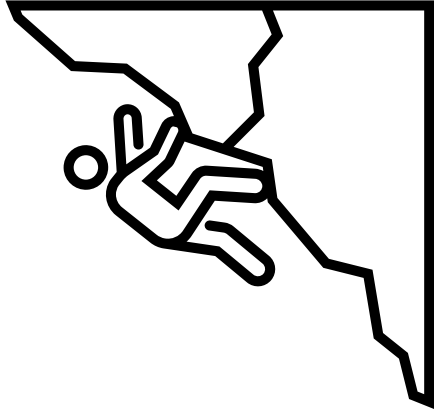
Sector	2025 IRP Reference	High Growth	Low Growth
Regular Income- Residential	-7.6%	-3.4%	-10.5%
Moderate Income- Residential	-8.8%	-4.9%	-11.4%
Low Income- Residential	18.7%	24.0%	15.1%
Commercial	-6.2%	-1.8%	-6.2%
Industrial	6.5%	6.5%	-6.2%
Overall	-5.9%	-2.0%	-8.6%

Top 20 Measures

Total Cumulative Savings in all Sectors by 2045 (mTherms)

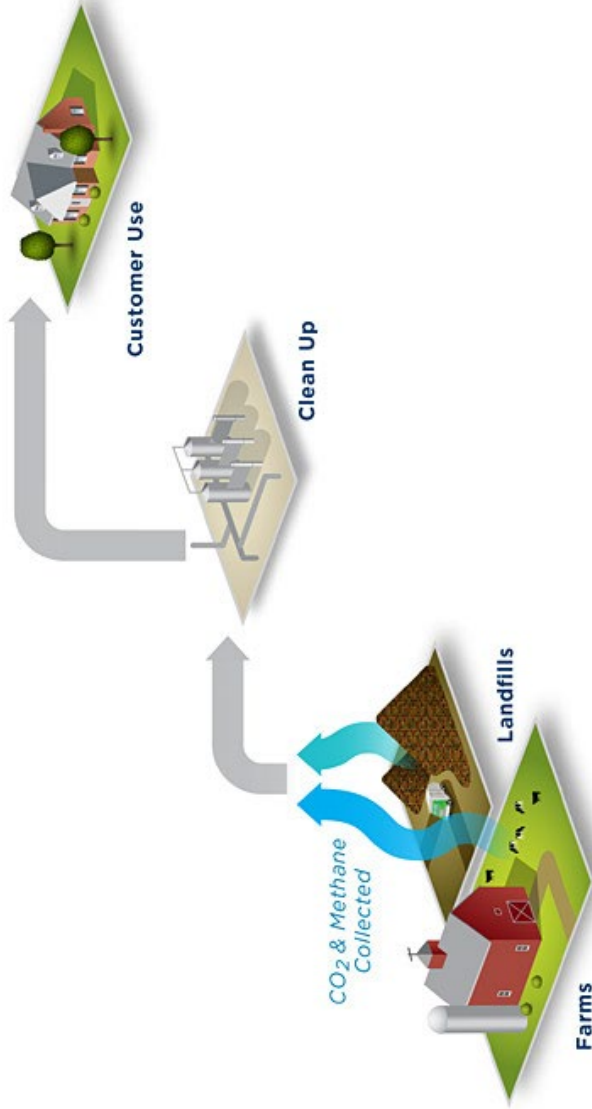
Top Measures	2023 Original	Reference - 2025 IRP	High Growth	Low Growth
Furnace - Direct Fuel	5,414	4,449	4,774	4,236
Water Heater <= 55 gal.	2,157	2,414	2,414	2,414
Insulation - Ceiling, Upgrade	2,163	1,824	1,824	1,824
Fireplace	922	1,270	1,565	1,066
Insulation - Roof/Ceiling	1,312	1,155	1,155	1,132
Insulation - Basement Sidewall	1,221	1,004	1,004	1,004
Unit Heater	1,139	967	1,016	897
Insulation - Wall Cavity, Installation	779	995	995	995
Insulation - Wall Cavity	840	739	739	739
Insulation - Ceiling, Installation	748	618	618	618
Ducting - Repair and Sealing	642	527	527	527
Insulation - Ducting	504	414	414	414
Gas Boiler - Insulate Hot Water Lines	428	408	408	386
Boiler	260	399	399	393
Strategic Energy Management	320	349	349	306
ENERGY STAR Connected Thermostat	262	330	330	330
Water Heater - Pipe Insulation	289	283	283	283
Gas Boiler - Hot Water Reset	273	245	245	237
Furnace	278	239	239	238
Doors - Storm and Thermal	272	232	235	230

Alternative Resources



What is Renewable Natural Gas (RNG)?

RNG is pipeline quality natural gas produced from various biomass sources through biochemical processes such as anaerobic digestion or gasification.¹

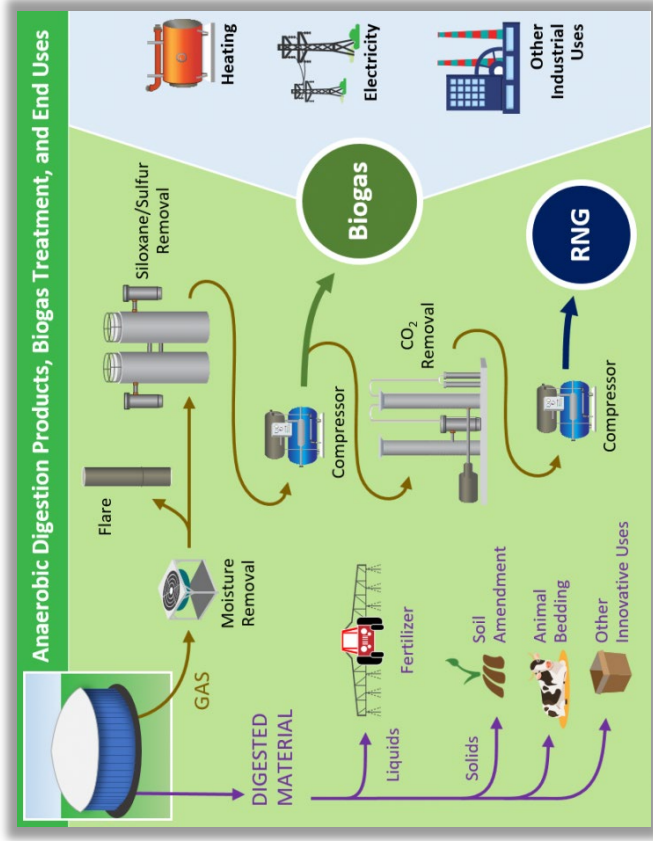


¹ U.S. Department of Energy, Alternative Fuels Data Center, Renewable Natural Gas

Renewable Natural Gas

Examples:

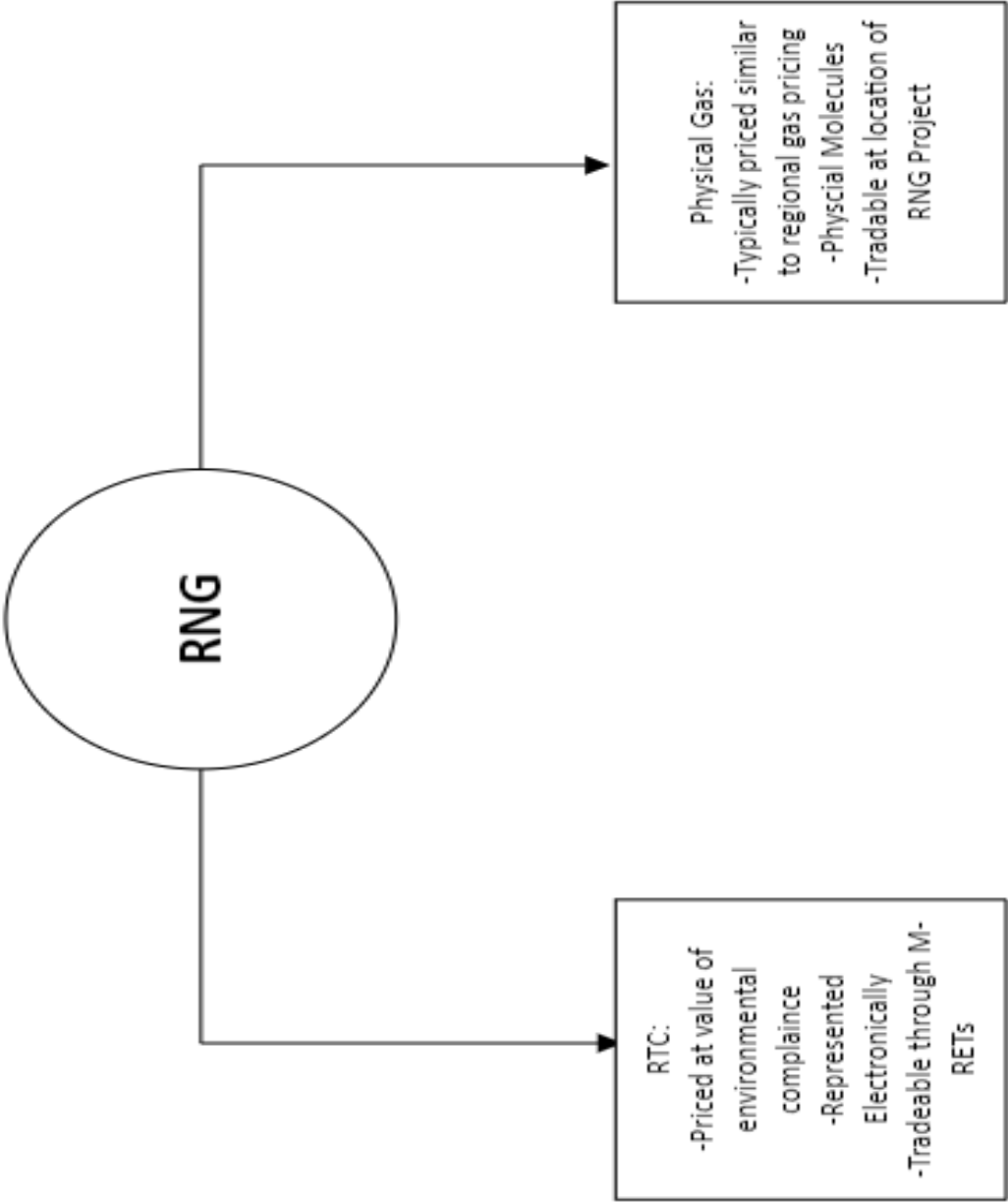
- Biogas from Landfills
 - Collect waste from residential, industrial, and commercial entities.
 - Digestion process takes place in the ground, rather than in a digester.
- Biogas from Livestock Operations
 - Collects animal manure and delivers to anaerobic digester.
- Biogas from Wastewater Treatment
 - Produced during digestion of solids that are removed during the wastewater treatment process.
- Other sources include organic waste from food manufacturers and wholesalers, supermarkets, restaurants, hospitals, and more.¹



¹ U.S. Department of Energy, Alternative Fuels Data Center, Renewable Natural Gas

RNG potential

- ▶ RNG can be broken into two components
 - RTC – Renewable Thermal Certificate
 - Physical Gas
- ▶ RNG projects
 - Horn Rapids/Lamb Weston
 - Deschutes Landfill
- ▶ Compliance – Supporting documentation needed for OR reporting
 - Feedstock
 - Location
 - Carbon Intensity
- ▶ Restrictions:
 - Book and Claim
 - Carbon Intensity
- ▶ Opportunities
 - Peak Day On System Resources
 - Emissions Reduction Resource



Renewable Thermal Certificate

A Renewable Thermal Certificate (RTC) is a market-based instrument designed to incentivize the use of renewable energy sources for heating and cooling purposes. While renewable energy credits (RECs) have traditionally focused on electricity generation from renewable sources like wind or solar, RTCs specifically target the use of renewable energy for thermal applications, such as space heating, water heating, and industrial processes.

The mechanism works by assigning a certain value or credit to each unit of renewable thermal energy produced or consumed. These credits can then be traded or sold on the market, allowing entities that generate excess renewable thermal energy to sell their credits to those who need them to meet regulatory requirements or sustainability goals.

RTC programs vary by region and may be implemented at the state or regional level, often as part of broader renewable energy or greenhouse gas reduction initiatives. By creating a market for renewable thermal energy, RTCs help drive investment in renewable heating and cooling technologies and promote the transition to a more sustainable energy system.

Principles of RNG Cost-Effectiveness Evaluation

On the surface, RNG appears to not be cost effective when compared to traditional natural gas, but a number of factors can level the playing field

- Potential hedge value of RNG
- Value of environmental attributes
- Cost savings related to building vs. buying

RNG is a critical resource in Cascade’s projected compliance resource stack related to the CPP and CCA, but must be acquired prudently

When not deemed cost effective, RNG acquisition may still be desired under certain regulatory exceptions (Oregon SB 98)

Cascade’s Cost Effectiveness Formula

$$C_{RNG} = I_{RNG} - AC_U - AC_D + \sum_{T=1}^{365} (P_{RNG} + VC - CIF) * Q$$

$$C_{Conventional} = \sum_{T=1}^{365} (P_{Conventional} + VC) * Q$$

Where

C_{RNG} = The all-inclusive annual cost of a proposed RNG project

I_{RNG} = The annual required investment to procure a proposed RNG resource. If Cascade is simply buying the gas and/or environmental attributes, this value is zero.

AC_U = Avoided upstream costs

AC_D = Avoided distribution system costs

P = Daily price of gas being evaluated

Q = Daily quantity of gas being evaluated

VC = Variable cost to move one dekatherm of gas to Cascade’s distribution system.

This value can be zero if a project connects directly to the Company’s system.

CIF = Carbon Intensity Factor. This is calculated by multiplying the Company’s expected carbon compliance cost by 1 minus the ratio of a proposed projects carbon intensity to conventional gas’ carbon intensity.

$C_{Conventional}$ = The all-inclusive annual cost of conventional natural gas.

If $C_{Conventional} \geq C_{RNG}$, a project can be considered cost effective, and should be acquired. If not, the project may still be considered under the regulatory exceptions

Key Inputs

- Case/RIN Selector
- State Jurisdiction
- Project Terms (yrs)
- Project Output Volumes (dth)
- Project Output Percentage (Obligated)
- Supply Price (annualized)
- Project Investment Percentage
- Project Investment
- Carbon Treatment
- RINs Risk Rating
- Inflation Escalator?
- RNG Revenue Increase / (Decrease)
- RNG Percentage Change
- Voluntary RNG Price Adder (\$/therm)
- Potential Market Value (Enterprise Value)

D5	
WA	
15	200,000
100.0%	
\$1.45	
100.0%	
\$3,000,000	
Landfill CNG	
Avg	
CPI	

\$1,471,938

0.51%

\$0.91107

-\$21,432,726

Purchase Vs. Build?

Cascade utilizes different models based on whether the Company is evaluating the purchase of RNG or the building and ownership of an RNG generating facility

While philosophically the same, build model provides a more detailed breakdown of items related to ownership

Purchase model considers revenue that the Company would earn from transportation agreements of volumes of RNG that Cascade would not own

Build opportunities typically allow for a cheaper cost/RTC, but may contain risks related to uncertainty around capital investment costs.

Future Considerations

Include Risk Reduction value from avoided cost as RNG benefit?

Stochastic analysis of key inputs

Modification of CIF factor to use IRP marginal carbon compliance cost?

The State of Hydrogen

RNG and Hydrogen will be critical in meeting the dual goals of decarbonizing energy pipelines while maintaining the benefits of reliability and resiliency provided by our distribution system

Hydrogen Shot [Hydrogen Shot | Department of Energy](#)

- 111 Goal: reduce the cost of clean hydrogen by 80% to \$1 per 1 Kg in 1 decade

H2Hubs

- Release of NOI to fund Bipartisan Infrastructure Law's \$8 billion program
- Develop regional hubs across the country
- Hubs will include production, processing, delivery, storage, and end-use of hydrogen
- FOA in Sept/Oct 2022

Hydrogen Research

Sister company investment in GTI and LCRI

LCRI [Low-Carbon Resources Initiative \(epri.com\)](https://www.epri.com)

- 5-year collaborative supported by electric and gas utilities
- Advance the technologies needed for deep decarbonization within the next decade so they can be deployed in the 2030 to 2050 timeframe

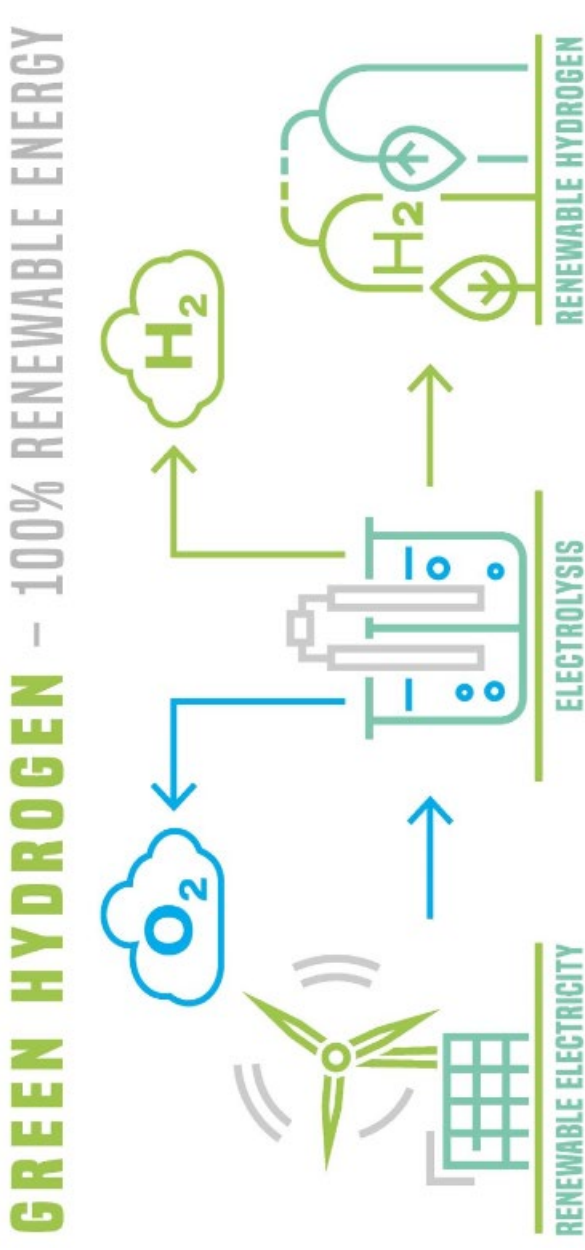
GTI Hydrogen Technology Center [Hydrogen Technology Center • GTI Energy](#)

- Cross-cutting research, product development, and demonstration projects, focused on clean hydrogen production, storage, delivery, and use

Hydrogen

Examples:

- Blue
 - Steam methane reforming with carbon sequestration
- Turquoise
 - Reforming methane into hydrogen gas and a solid carbon byproduct
- Green
 - Utilizing electrolysis from renewables to split the molecule into hydrogen and oxygen
- Pink
 - Similar to green, but utilizes electricity from nuclear power
- Gold
 - Microbe conversion of residual hydrocarbons from depleted, abandoned oil wells



Photo/Innovation News Network

¹ U.S. Department of Energy, Alternative Fuels Data Center, Renewable Natural Gas

Hydrogen Research – examples

H2@SCALE IN TEXAS AND BEYOND



ASSESSING H2 COMPATIBILITY IN NATURAL GAS INFRASTRUCTURE



Synthetic Methane

Green and pink hydrogen made through electrolysis can be combined with waste CO₂ to produce synthetic methane using chemical or biological processes. This process known as methanation entails incremental cost to the production of green and pink hydrogen.

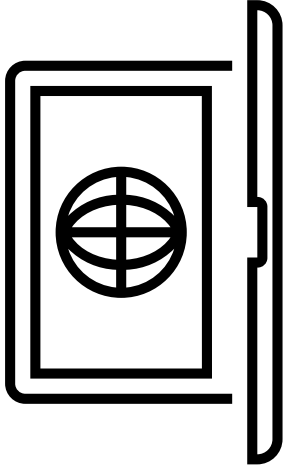
Carbon Capture

Carbon Capture and storage is a process in which a relatively pure stream of carbon dioxide from industrial sources is separated, treated and transported to a long-term storage location.

Cascade is looking at Carbon Capture for large industrial customers.

Carbon Capture is not currently eligible for Oregon or Washington compliance programs, these projects could provide a way to offset carbon.

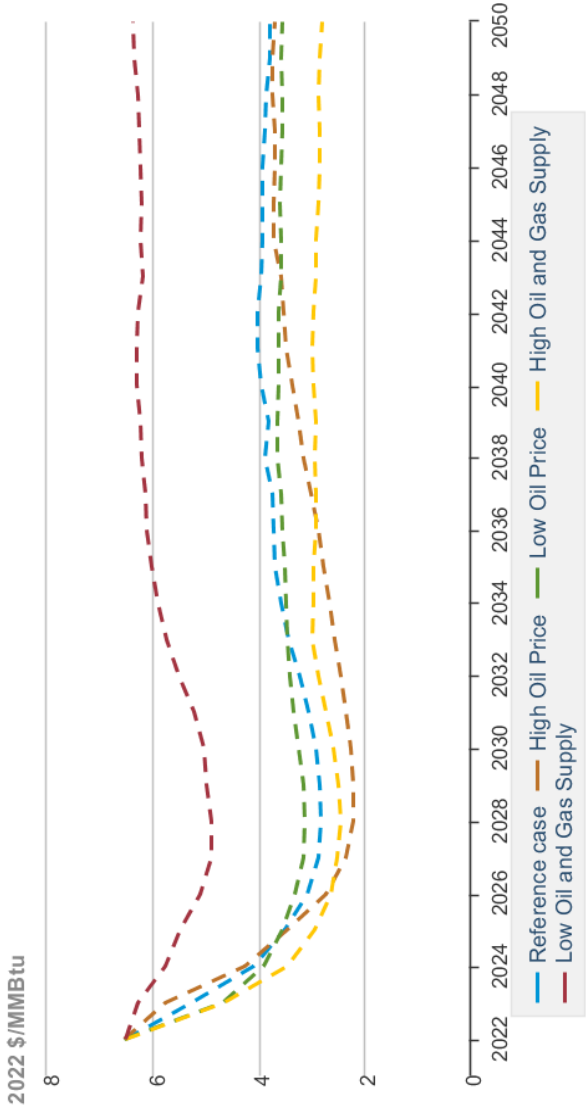
Price Forecast



Long Range Market Outlook

Domestic natural gas consumption for electric generation is projected to decrease by 2050, while industrial natural gas consumption is projected to increase. Natural gas production is projected to increase across all cases due in part to large increases in LNG export demand. Taking these factors into consideration, EIA projects that the Henry Hub price will remain at or below \$4/MMBtu through the projection period in most cases.¹

Total Energy: Real Prices: Gas Price at Henry Hub



Data source: U.S. Energy Information Administration

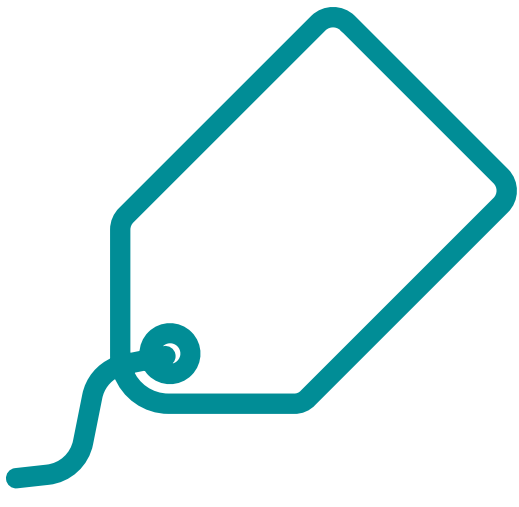
Long Range Price Forecast - Sources

Cascade's long-term planning price forecast is based on a blend of current market pricing along with long-term fundamental price forecasts.

The fundamental forecasts consider sources such as Wood Mackenzie, EIA, the Northwest Power and Conservation Council (NWPCC), S&P Global, the Intercontinental Exchange (ICE), and various third-party long-term price forecasts.

While not a guarantee of where the market will ultimately finish, Henry Hub NYMEX is the most current information that provides some direction as to future market prices.

Wood Mackenzie's long-term forecast is at a monthly level by basin. Cascade uses this to help shape the forecast's monthly basis pricing.



Sources Continued



THE COMPANY ALSO RELIES ON EIA’S FORECAST; HOWEVER, IT HAS ITS LIMITATIONS SINCE IT IS NOT ALWAYS AS CURRENT AS THE MOST RECENT MARKET ACTIVITY. FURTHER, THE EIA FORECAST PROVIDES MONTHLY BREAKDOWNS IN THE SHORT-TERM, BUT LONGER-TERM FORECASTS ARE ONLY BY YEAR.



CNGC ASSIGNS A WEIGHT TO EACH SOURCE TO DEVELOP THE MONTHLY HENRY HUB PRICE FORECAST FOR THE 20-YEAR PLANNING HORIZON.



ALTHOUGH IT IS IMPOSSIBLE TO ACCURATELY ESTIMATE THE FUTURE, FOR TRADING PURPOSES THE MOST RECENT PERIOD HAS BEEN THE BEST INDICATOR OF THE DIRECTION OF THE MARKET. HOWEVER, CASCADE ALSO CONSIDERS OTHER FACTORS (HISTORICAL CONSTRAINTS) WHICH CAN LEAD TO MINOR ADJUSTMENTS TO THE FINAL LONG-RANGE FORECAST.

Price Forecast Weights

Considerations in weight assignments:

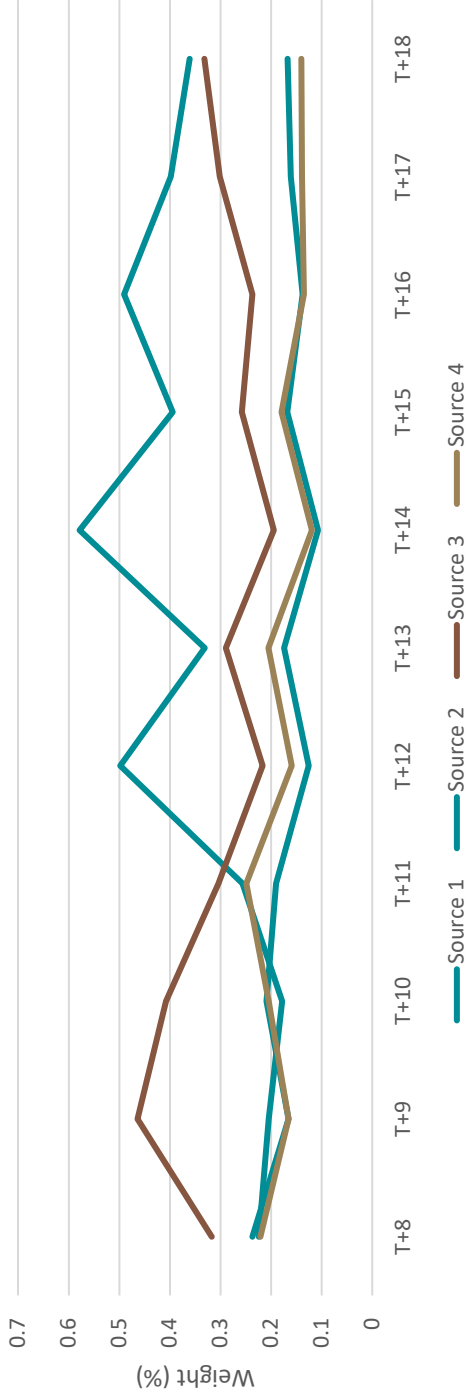
- Cascade produces a weighting system based on an analysis of the symmetric mean absolute percentage error (SMAPE) of its sources since 2010;

$$\text{SMAPE} = |(\text{Actual} - \text{Forecast}) / ((\text{Actual} + \text{Forecast}) / 2)|$$

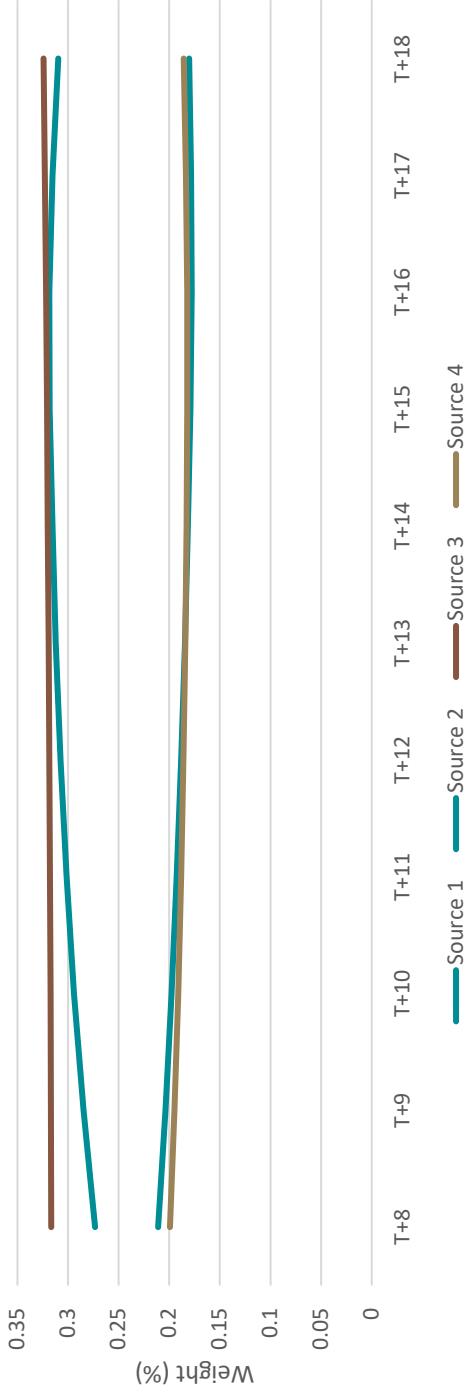
Cascade calculates the weight of the inverse of the SMAPEs of each source, which are then smoothed using Holt-Winters smoothing.

- Some sources produce forecasts daily, while others are far less frequent.
 - Cascade uses an age dampening mechanism to account for this in its price forecast, reducing the impact of forecasts that do not account for more current market information.

Unsmoothed Weights by Source



Smoothed Weights by Source



Example of Unsmoothed and Smoothed Weight Calculations by Source

Price Forecast Weight Adjustments

In Months T+1 to T+12, Cascade uses NYMEX Forward pricing for all locations exclusively;

- For short term forecasting, the marketplace is ideal because forward prices should reflect all current events that impact the forecast (weather, storage, etc.)
- Long term forecasting is more concerned about the fundamental market intelligence, which is reflected in the analysis of Cascade's sources.

Months T+13 to T+48 are used to interpolate the weights from exclusively NYMEX to the weights calculated from each source's SMAPE.

Months T+49 onward use the age dampened (if applicable) weights of each source.

Example Weights For Price Forecast

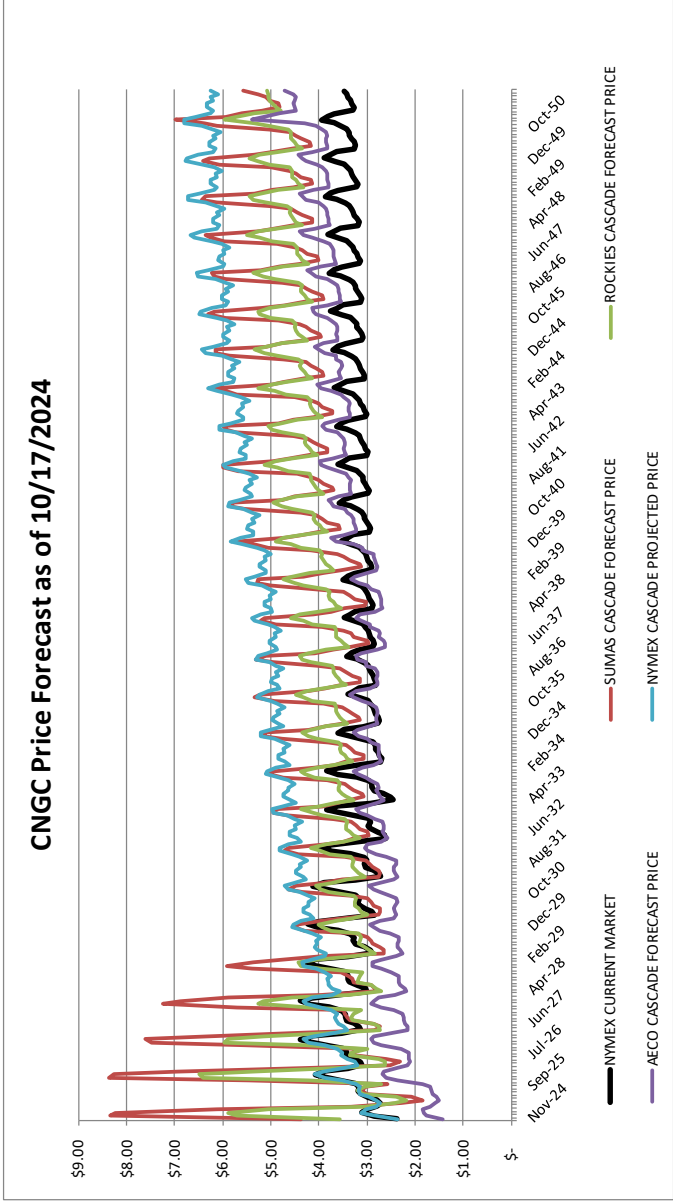
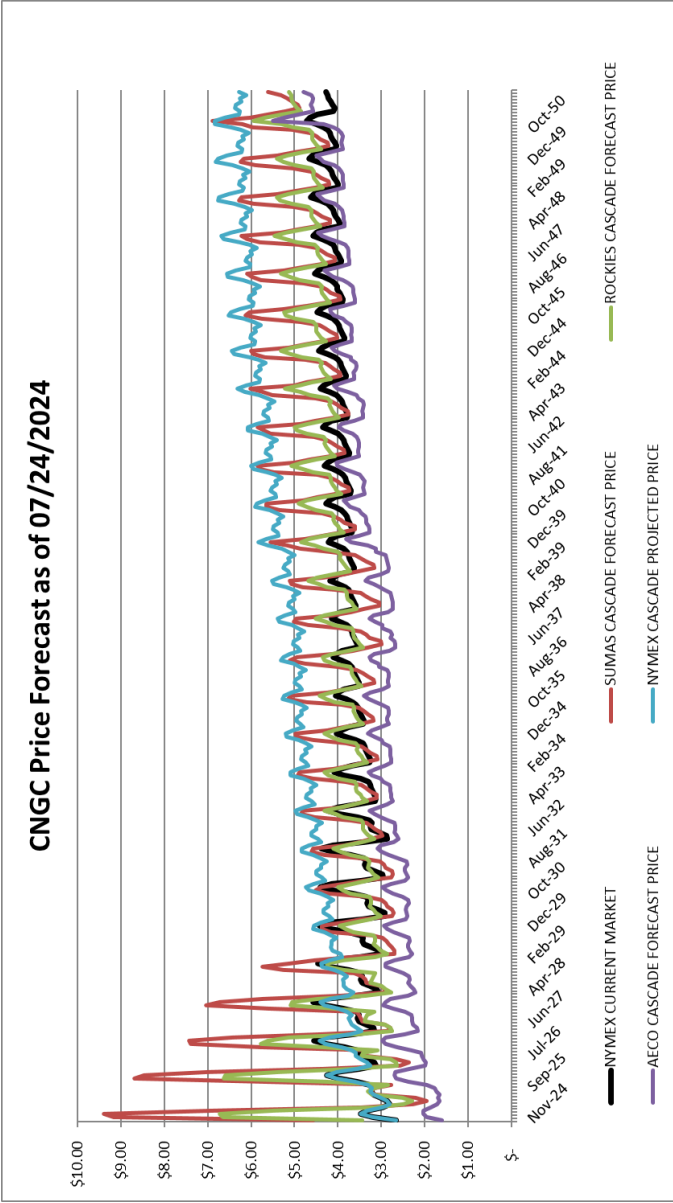
NOT INTERPOLATED

	Source 1	Source 2	Source 3	Source 4
Oct-25	100.000%	0.000%	0.000%	0.000%
Nov-25	20.326%	28.635%	28.147%	22.892%
Dec-25	20.019%	29.098%	28.057%	22.826%
Jan-26	19.760%	29.431%	28.038%	22.771%
Feb-26	19.525%	29.678%	28.079%	22.718%
Mar-26	19.278%	29.901%	28.161%	22.661%
Apr-26	19.021%	30.089%	28.289%	22.600%
May-26	18.761%	30.230%	28.470%	22.538%
Jun-26	18.501%	30.313%	28.709%	22.477%
Jul-26	18.244%	30.325%	29.012%	22.419%
Aug-26	17.996%	30.254%	29.384%	22.366%
Sep-26	17.756%	30.105%	29.823%	22.316%

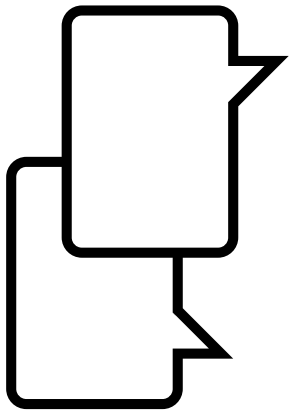
INTERPOLATED

	Source 1	Source 2	Source 3	Source 4
Oct-25	100.000%	0.000%	0.000%	0.000%
Nov-25	97.917%	0.749%	0.736%	0.599%
Dec-25	95.833%	1.516%	1.462%	1.189%
Jan-26	93.750%	2.292%	2.184%	1.774%
Feb-26	91.667%	3.073%	2.908%	2.353%
Mar-26	89.583%	3.859%	3.634%	2.924%
Apr-26	87.500%	4.645%	4.367%	3.489%
May-26	85.417%	5.427%	5.111%	4.046%
Jun-26	83.333%	6.199%	5.871%	4.597%
Jul-26	81.250%	6.955%	6.654%	5.142%
Aug-26	79.167%	7.686%	7.465%	5.682%
Sep-26	77.083%	8.389%	8.310%	6.218%

Price Forecast



Feedback for Cascade





Questions/Next Steps



Review Plans for TAG 3 Discussion

- Respond to TAG 2 Feedback
- Distribution System Planning
- Final Integration Results
- Finalization of Planned Components
- Proposed new 2- to 4-year action plan
- TAG 2 is Thursday, October 24

2025 WA IRP Schedule

Process Item	Date	Process Element
Receive feedback on TAG 2	Friday, November 8, 2024	
First Draft	Friday, December 6, 2024	
Comments Due	Friday, January 10, 2025	
		Respond to TAG 2 feedback, Distribution System Planning, Final Integration Results, finalization of plan components, Proposed new 2- to 4-year Action Plan
TAG 3	Wednesday, February 5, 2025	
Final Draft	Tuesday, March 4, 2025	
Comments Due	Tuesday, April 15, 2025	
TAG 4 (if needed)	Thursday, May 1, 2025	
Final Complete By	Friday, May 16, 2025	
File	Friday, May 23, 2025	



In the Community to Serve®

Integrated Resource Plan Technical Advisory Group Meeting #2

OCTOBER 24, 2024

MICROSOFT TEAMS/TELECONFERENCE



In the Community to Serve®



In the Community to Serve®

Targeted TAG #2 – TAG Meeting

Date & time: 02/15/2024, 9:00 AM to 10:30 AM

Location: Microsoft Teams Meeting

Presenters: Brian Robertson, Jenny DeBoer, Bailey Steeves

In attendance: Abbie Krebsbach, Alessandra De La Torre, Bailey Steeves, Brian Robertson, Bruce Folsom, Byron Harmon, Caleb Reimer, Carolyn Stone, Chris Robbins, Devin McGreal, Eric Shierman, Eric Wood, Heather Moline, Jaclynn Simmons, Jenny DeBoer, John Garrett, Joshua Dennis, Kary Burin, Kathleen Campbell, Kim Herb, Kyle Griffiths, Mahon Walsh, Mark Chiles, Mark Sellers-Vaughn, Matt Steele, Matthew Doyle, Michael Freels, Michael Parvinen, Paul Barrager, Quinn Weber, Rachel Preece, Rebecca Eaton, Renie Sorensen, Samantha Christenson, Sofya Atitsogbe, Ted Drennan, Tom Pardee, Wesley Franks, Will Gehrke, Zachary Soward

Brian Robertson, Supervisor of Resource Planning, opened the meeting by welcoming and thanking stakeholders for participating in Cascade's IRP Process. Brian reminded folks that we wouldn't be doing introductions at the beginning of the meeting but asked if/when people interjected throughout the meeting to please introduce themselves. Brian also mentioned that Cascade will be responding to questions it received prior to the meeting by WUTC throughout the presentation. Responses to those can be found in the Feedback Report on the Company's webpage.

Presentation Topic #1 – Safety Moment (Jenny DeBoer)

- Jenny provided a presentation on walking safely on snow and ice.

Presentation Topic #2 – Avoided Cost Methodology (Bailey Steeves)

- Bailey began the presentation with a quick overview of what the avoided cost model is.
- Bailey then went through the formula at a high level before jumping into deeper detail for each variable in the next slides.
- There was some discussion around the geometric Brownian motion and how Cascade does its Monte Carlo simulations for price. More information can be found in the Feedback Report on the Company's webpage.
- There was another question regarding a decline in customer count and how that would impact the storage element of the avoided cost. Cascade responded that prices are generally cheaper in the summer than the winter, so storage has a price arbitrage element that is a net positive and wouldn't make sense to avoid.
- There was another question regarding integrity vs growth when it comes to distribution system modeling. Cascade stated there is some language in the IRP regarding that but will provide further clarification if needed.
- Bailey continued to presentation and brought up a question Cascade has for stakeholders; RCW80.28.395 requires the use of the Social Cost of Carbon (SCC) to value the cost of greenhouse gas emissions. Cascade stated that with the passing of the Climate Commitment Act that the marginal compliance cost should be considered over the SCC. Cascade opened this up

for discussion. WUTC Staff stated that they viewed the SCC as an externalized cost of carbon upon the public and the CCA is more about a market pressure in order to kind of put a cost on emissions in order to guide the reduction in emissions. Cascade opened it up to others where NWN had stated they use the maximum of the SCC and the CCA marginal cost. Staff then reiterated that there isn't guidance from the Commission on this topic, so whichever direction Cascade chooses to make sure it's fully explained in the IRP.

- Bailey then proceeded to provide an example of how distribution system costs are incorporated into the avoided cost model.
- Staff had another question regarding a risk regarding system instability related to both the housing or building code statutes on book and how declining customers may create an exponential increase in bills for those who remain on the system. Staff's question is whether there is an avoided cost by keeping customers on the system. Cascade thought this was an interesting idea but did not have a response as the Company needed time to consider the assumptions and how to quantify the calculation. Cascade also asked Staff to provide thoughts on how this may be quantified, in which Staff agreed to provide thoughts within a week.
- Staff had asked another question regarding the avoided cost model and how it generally assumes growth "if the were to go up and then down, could this be used as a measurement for the cost of stranded assets and anticipating whether assets would be stranded?" Cascade told Staff that Cascade would take that back and consider it for inclusion in the avoided cost model.
- Staff asked about a price floor when it came to modeling Monte Carlo simulations with price. Cascade stated that although it is unlikely, it is possible for gas prices to drop below 0. These mainly happen in rare instances where suppliers need to move gas when there is very little to no demand.
- Bailey then finished up with a discussion around normal vs lognormal distributions, stochastic pricing, and the risk-adjusted risk premium final calculation. Bailey also mentioned that we'll continue to use the 10% environmental adder.
- Brian presented the upstream emission rate. During this presentation Brian clarified what was in the remaining 6.6% of natural gas makeup and that the upstream emission loss factor included cascade's distribution system loss rate. Staff was curious if the Company could provide an analysis of purchases vs actual use, which Cascade agreed to looking into.

Presentation Topic #3 – Feedback for Cascade (Brian Robertson)

- Brian opened it up again for feedback and reminded everyone that Cascade is happy to get feedback even after the meeting.

Presentation Topic #4 – 2025 IRP Timeline (Brian Robertson)

- Brian reminded stakeholders that the Targeted TAG for Distribution System Modeling and Customer/Load forecast would be flipped. The April 25th Targeted TAG meeting is being moved to May 7th. Finally, the May 31st meeting will be held on Thursday, May 30th.

Presentation Topic #5 – Next Steps (Brian Robertson)

- The next Targeted TAG meeting will discuss Energy Efficiency and be held on Wednesday, March 6th.

The Meeting was Adjourned

Per Cascade Commitment #8 (Stakeholder Engagement Design Document, 2/22,2022: "Provide TAG minutes that include the action items from bullet #7 as well as any upcoming deadlines for feedback on the IRP"), here are additional action items to track, coming out of the Targeted TAG 2 meeting:

1. Cascade will consider risk around the instability of declining customer growth in the avoided cost model.

2. Cascade will provide detail in the IRP as to how it handles SCC and marginal compliance costs from the CCA.
3. Cascade will consider how declining customer growth could be used to measure the cost of a stranded asset.
4. Cascade will analyze the demand vs purchased supply to compare vs the loss rate used in the upstream emissions calculation.



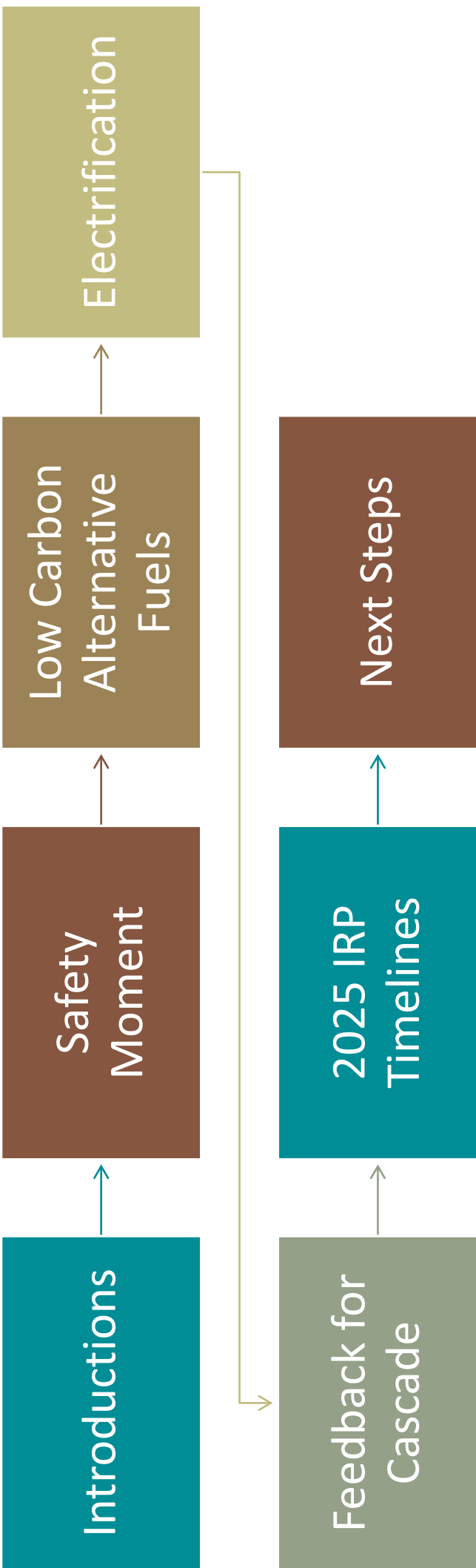
In the Community to Serve®

Integrated Resource Plan Technical Advisory Group Meeting #3

JANUARY 8, 2025

MICROSOFT TEAMS/TELECONFERENCE

Agenda



Safety Moment

Safeguard Your Hearing

Sound is everywhere and can harm your hearing when it is too loud or are exposed to it for long periods of time.

When your hearing is gone, it's gone for good.

The louder the sound, the faster your hearing can be damaged. Around 40 million adults (aged 20-69) have noise-induced hearing loss. The good news is that noise-induced hearing loss can be prevented by following three easy steps:

1. Lower the Volume.
2. Move Away from the Noise.
3. Wear hearing protection based on the level of sound you are exposed to.

Low Carbon Alternative Fuels

Alternative Fuel Price Inputs

MODEL RESTRICTION

- Cascade does not anticipate doing carbon capture in the near future
- Cascade is considering removing low carbon alternative fuels from the model that are lower than current market prices

CAPITAL COSTS

- Equipment
- Pipeline Costs
- Installation and Owners Costs

O&M – FIXED AND VARIABLE

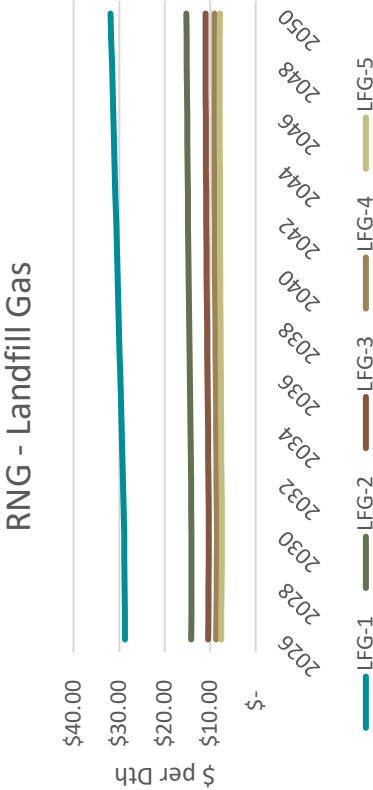
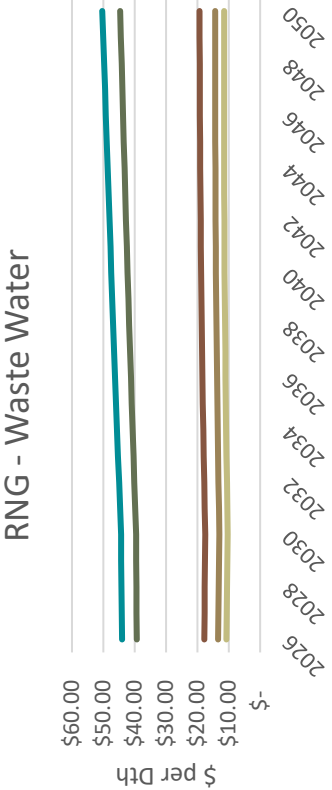
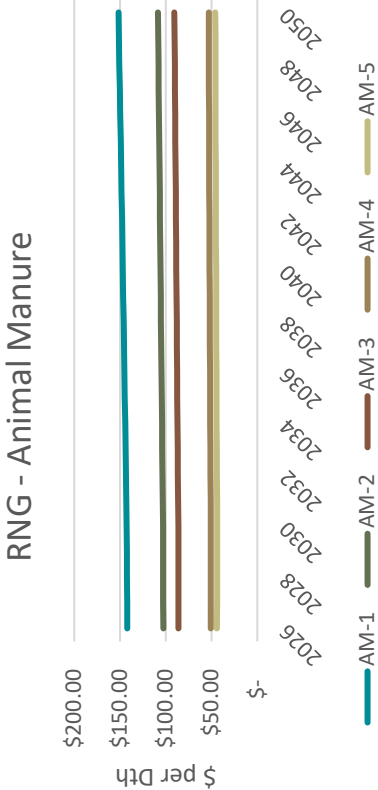
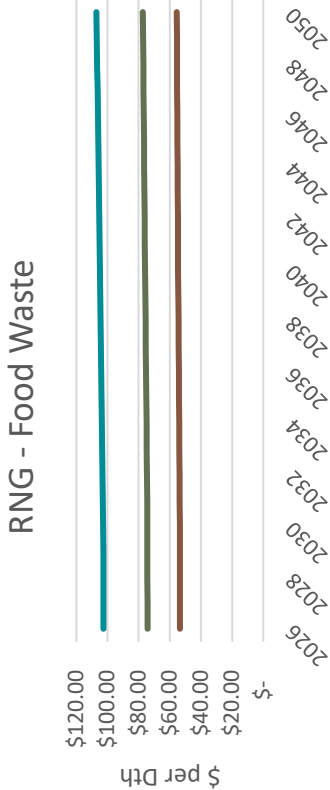
- Electricity Rates
- Gas Rates

Prices

- Expected prices are broken down between Northwest and National technical potential (ICF)
 - Prices are averaged between Northwest and National to reduce model inputs
 - Prices consider Inflation Reduction Act (IRA) incentives where applicable
 - All low carbon alternative fuels except Carbon Capture will be evaluated as off-system

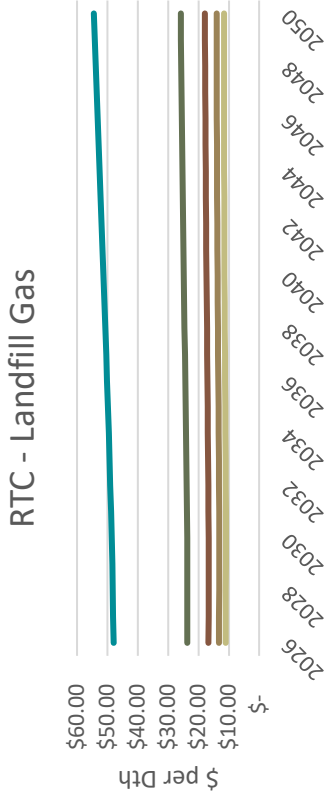
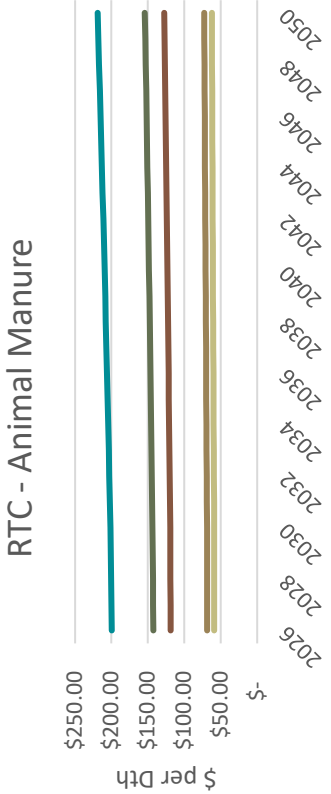
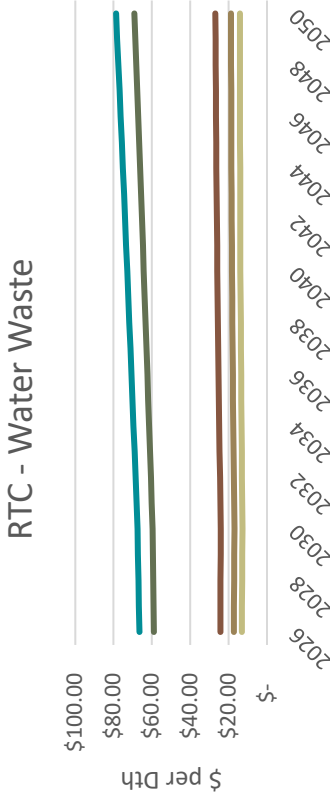
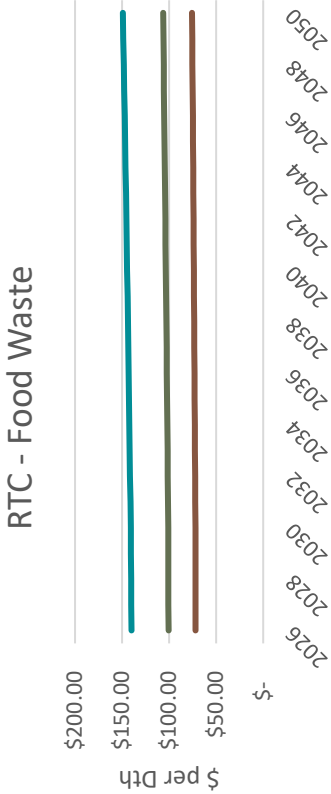
Renewable Natural Gas Prices

- Green attribute RNG cost
- Categorized by RNG source
- Provided by facility size. Smaller numbers indicate smaller facilities.
- Landfill and Waste Water currently most feasible

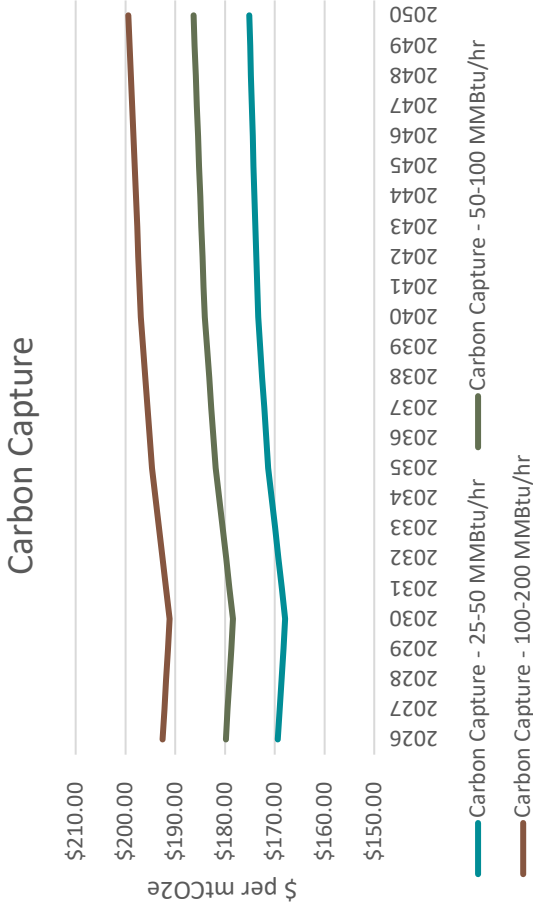


Renewable Thermal Credit Prices

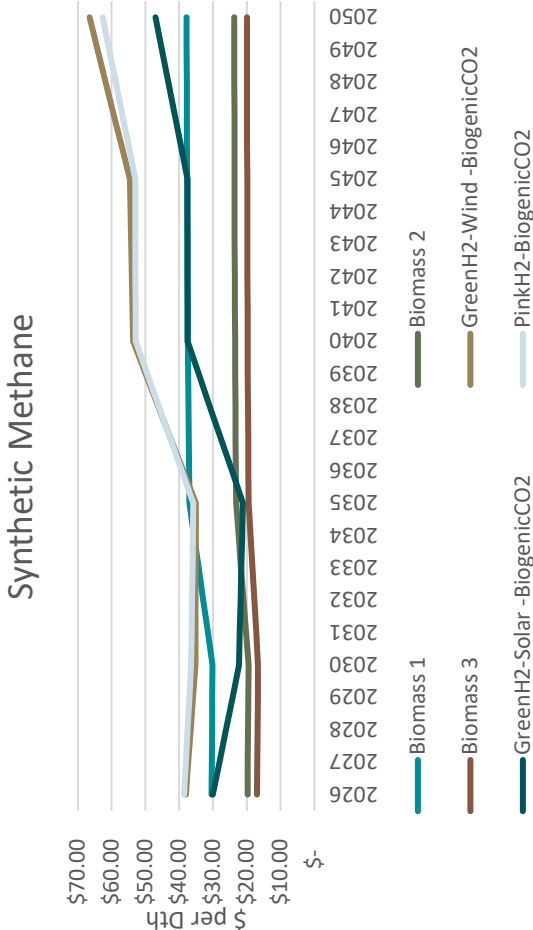
- Green attribute cost
- Categorized by RTC source
- Provided by facility size. Smaller numbers indicate smaller facilities.
- Landfill and Waste Water currently most feasible



Carbon Capture and Synthetic Methane Prices



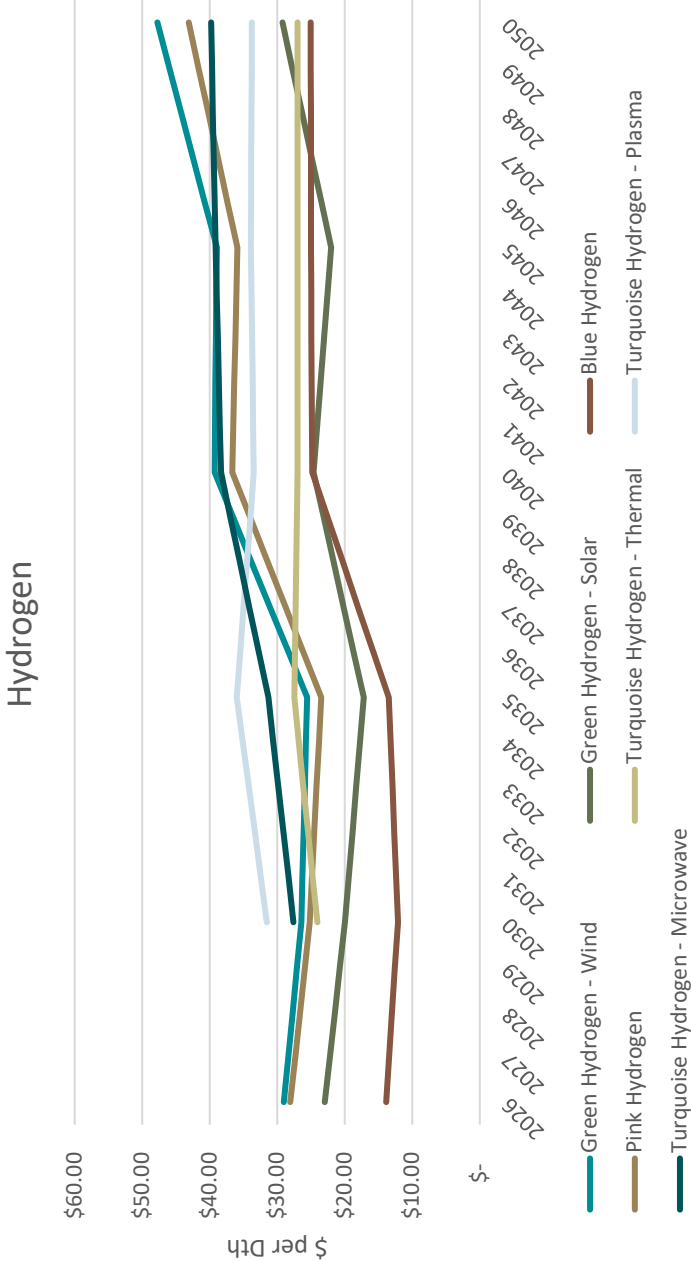
- Provided by facility size.
- Not in consideration by Cascade prior to 2030



- Provided by Synthetic Methane source
- Large Biomass facility and Solar most feasible

Hydrogen Prices

- Provided by hydrogen source
- Blue Hydrogen and Solar Green Hydrogen currently most feasible



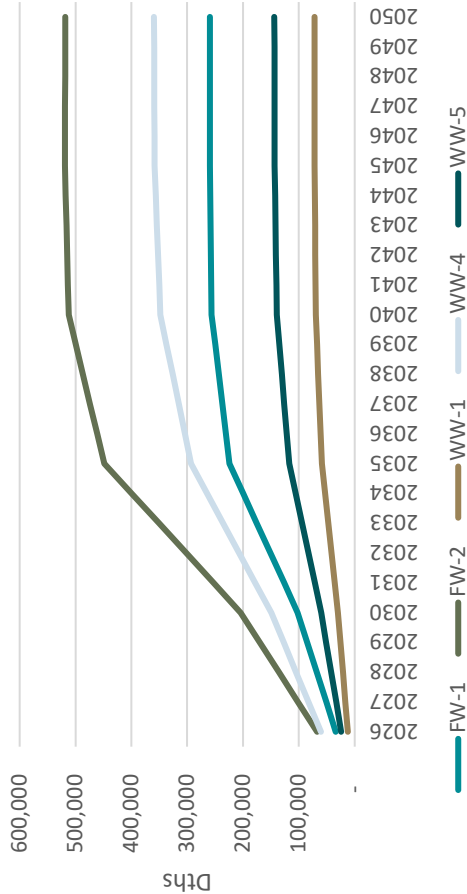
Volumes

- Expected technical potential volumes are broken down between northwest and national
- These are weighted by US population for states where some form of climate policy is in place or expected
- Cascade had a weighted share of 13% of the Northwest
 - The allocation was based on the number of LDC meters in Washington and Oregon in 2023

Company	Sum of Meters	Percent Share
AVA	379,223	15.83%
CNGC	316,929	13.23%
NWN	799,250	33.37%
PSE	900,000	37.57%
NW Total	2,395,402	100.00%

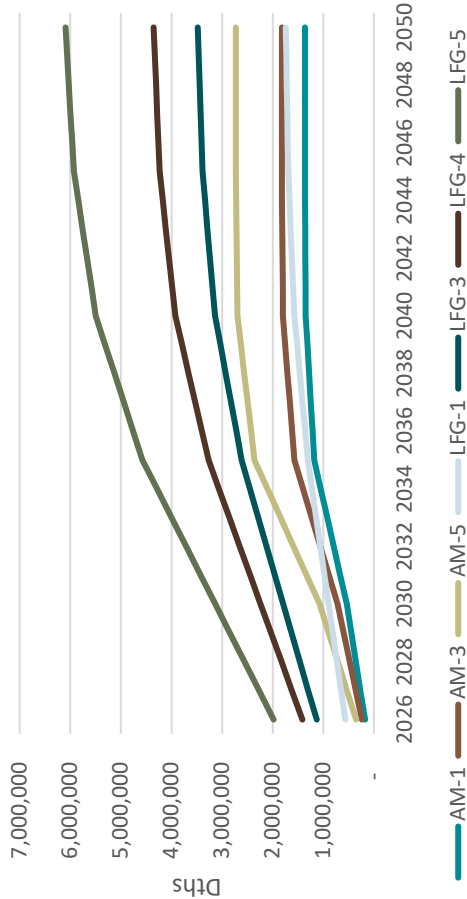
Renewable Natural Gas Volumes

RNG - Food Waste and Waste Water



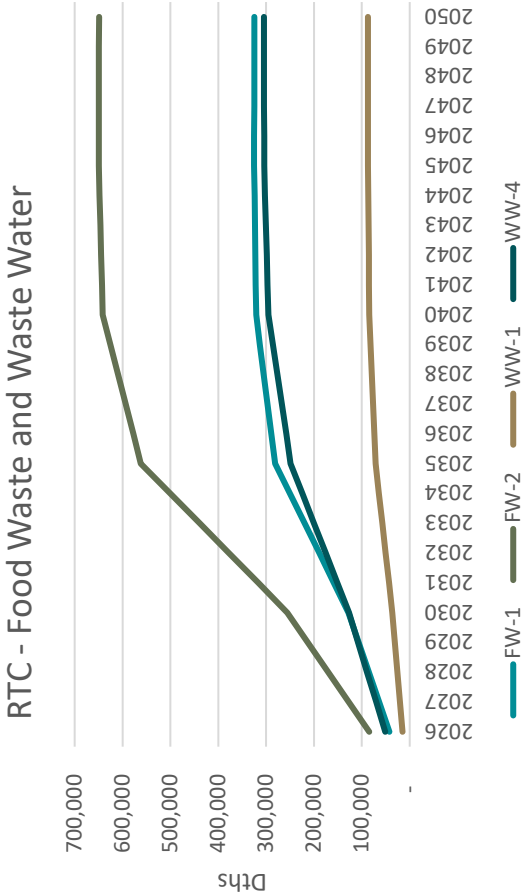
- Categorized by RNG source
- Provided by facility size. Smaller numbers indicate smaller facilities.

RNG - Animal Manure and Landfill Gas

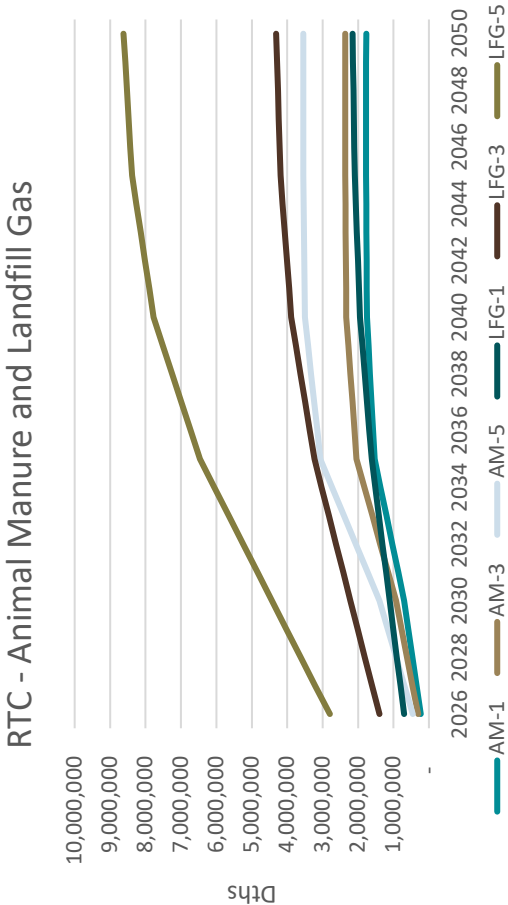


- Largest volumes available in Landfill gas

Renewable Thermal Credit Volumes

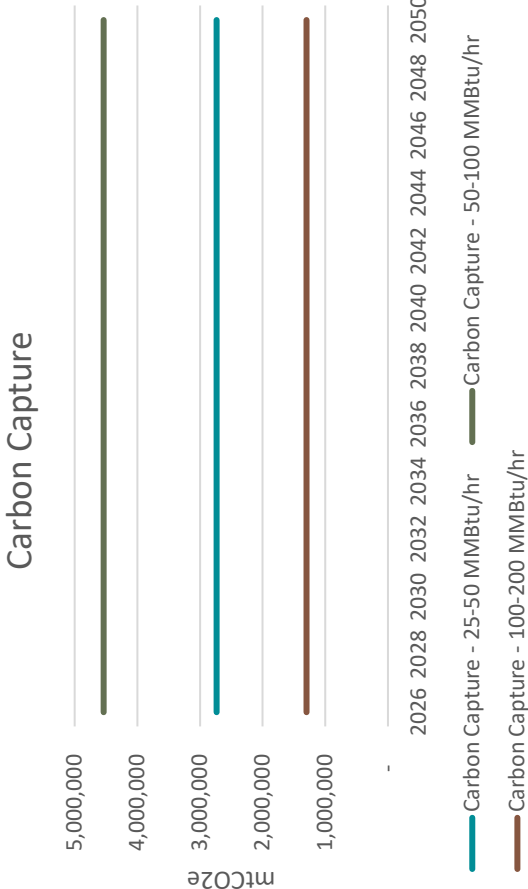


- Categorized by RTC source
- Provided by facility size. Smaller numbers indicate smaller facilities.

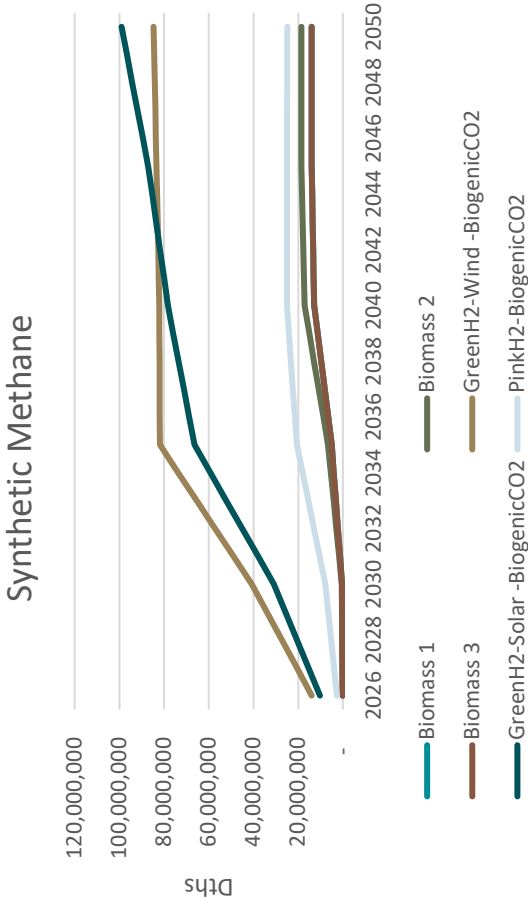


- Largest volumes available in Landfill gas and Animal Manure

Carbon Capture and Synthetic Methane Volumes



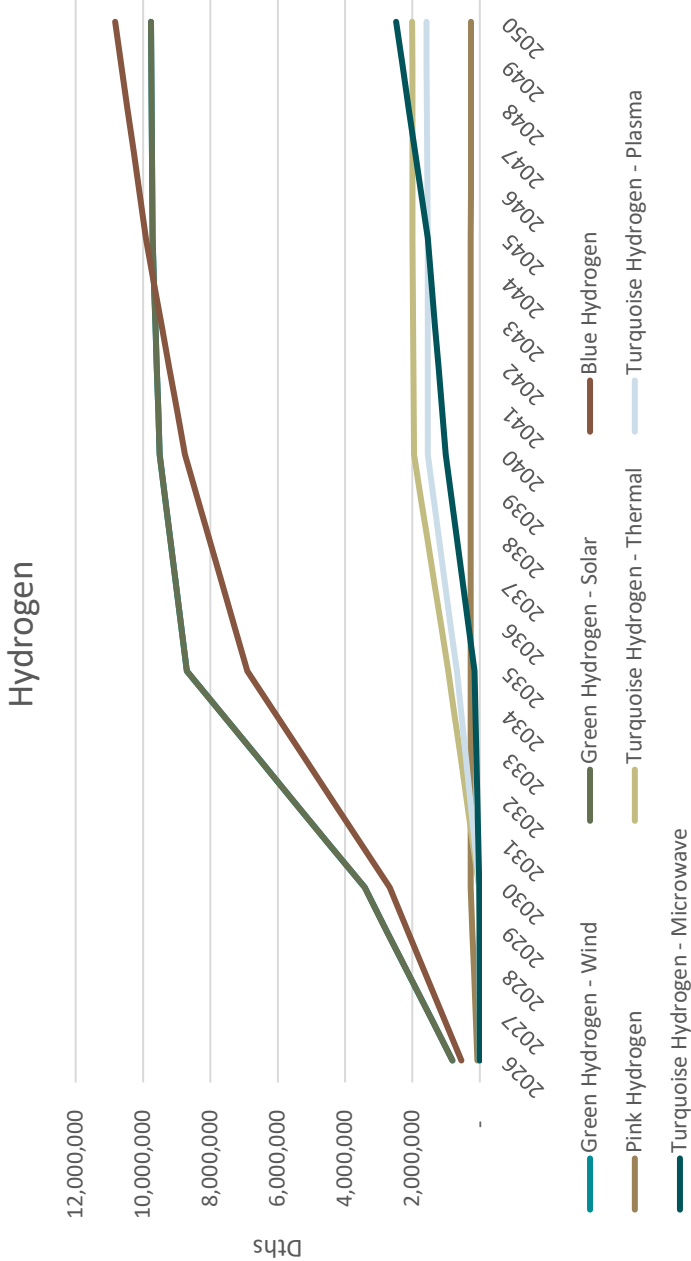
- Provided by facility size
- Not in consideration by Cascade prior to 2030



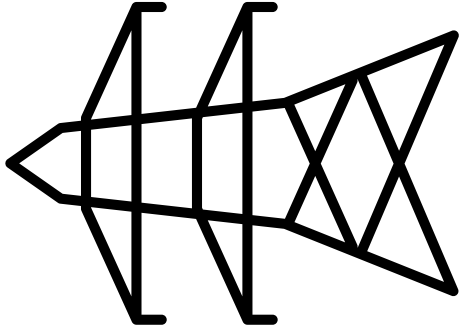
- Provided by Synthetic Methane source
- Largest volumes available in Solar and Wind Green Hydrogen

Hydrogen Volumes

- Provided by hydrogen source
- Largest volumes available in Blue Hydrogen and Solar Green Hydrogen



Electrification



Key Inputs

- Heat Pump Performance Specs at varying temperatures.
- Size and Efficiency of Home
- Climate Zone
- Natural Gas Equipment Efficiency
- Gas and Electric Rates
- Install Costs with IRA Rebates and Incentives

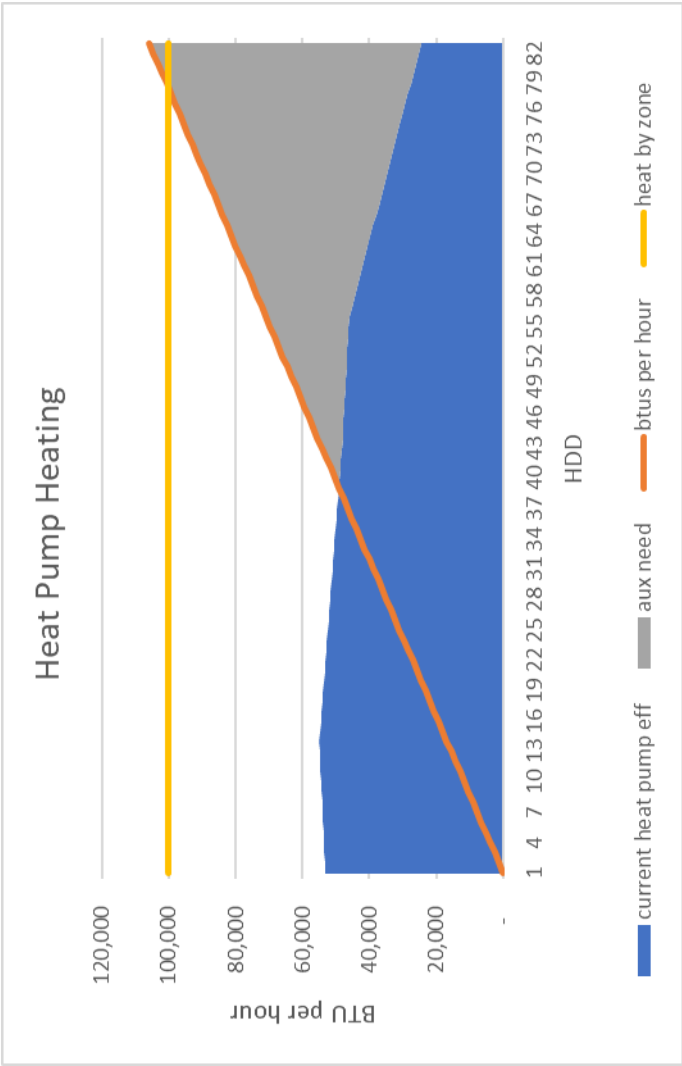
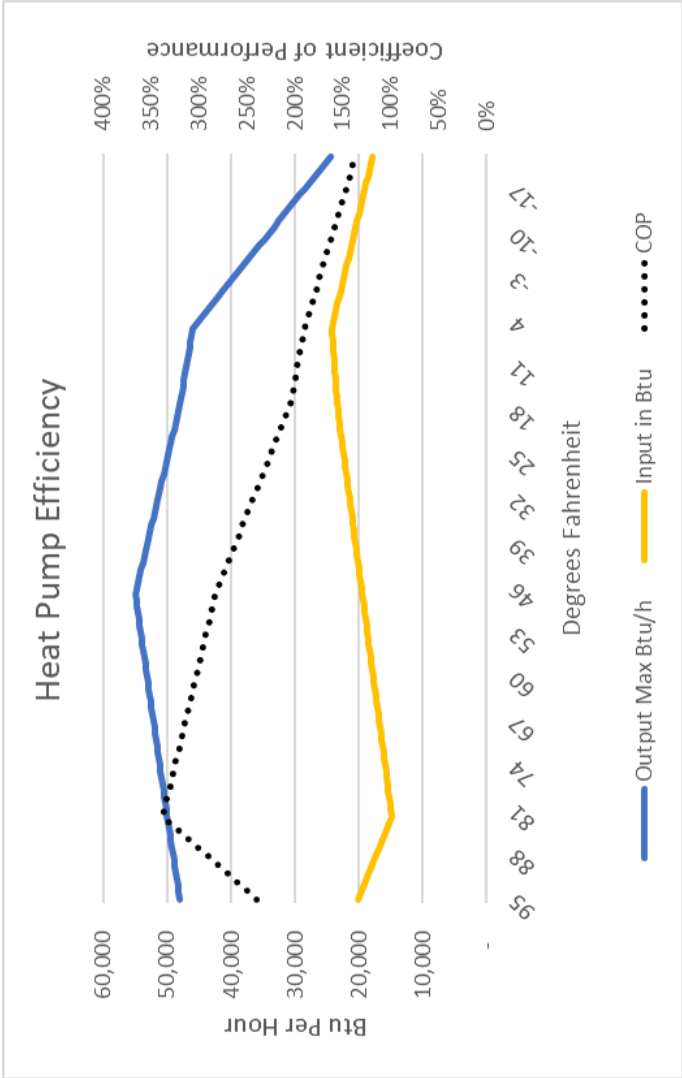
Heat Pump

- There are several hundred air-source heat pump models. Cascade must reduce this for modeling purposes.

	Output Max Btu/h	COP	Input kW
@95 deg F	48,000	240%	5.87
@82 deg F	50,000	338%	4.34
@47 deg F	55,000	283%	5.7
@17 deg F	48,000	205%	6.86
@5 deg F	46,000	190%	7.1
@-22 deg F	24,500	137%	5.24

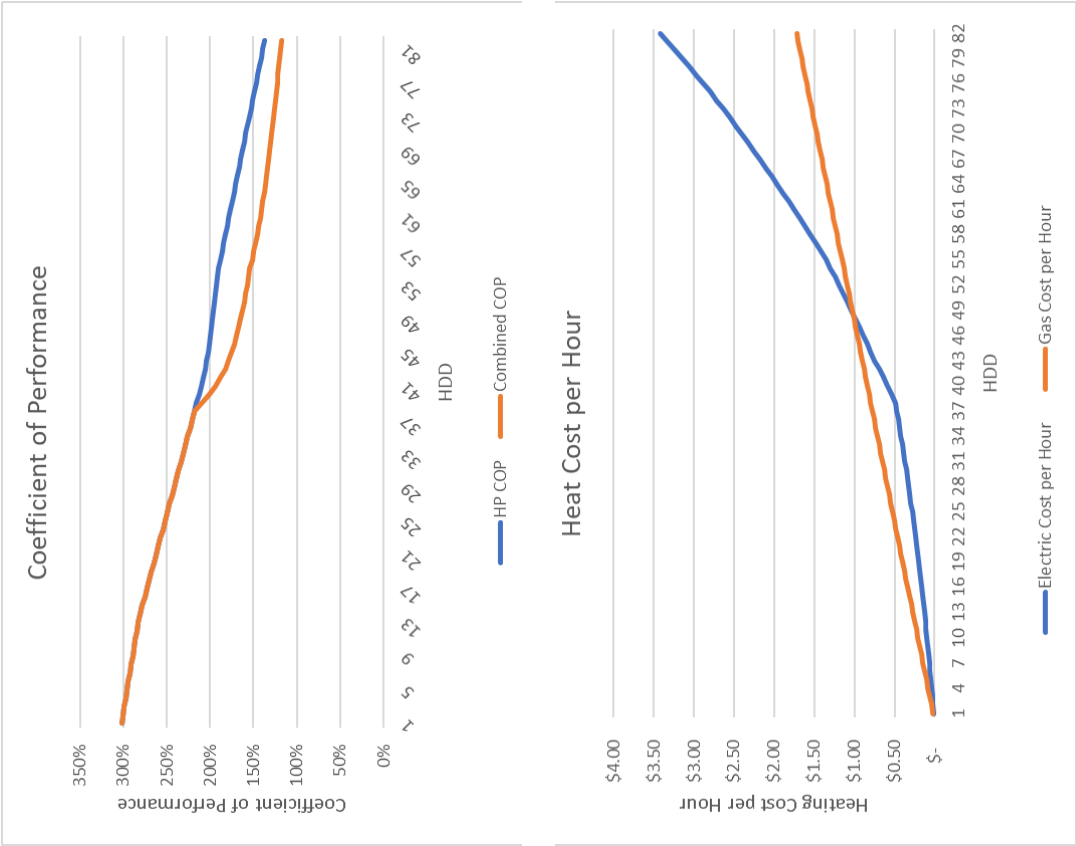
Coefficient of Performance

- Heat Pump Efficiency measures the amount of output produced given the amount of input received at different temperatures.
- Heat Pump Heating measures the amount of heat produced vs the amount of heat needed by zone, showing when auxiliary heat is needed.



Coefficient of Performance and Cost

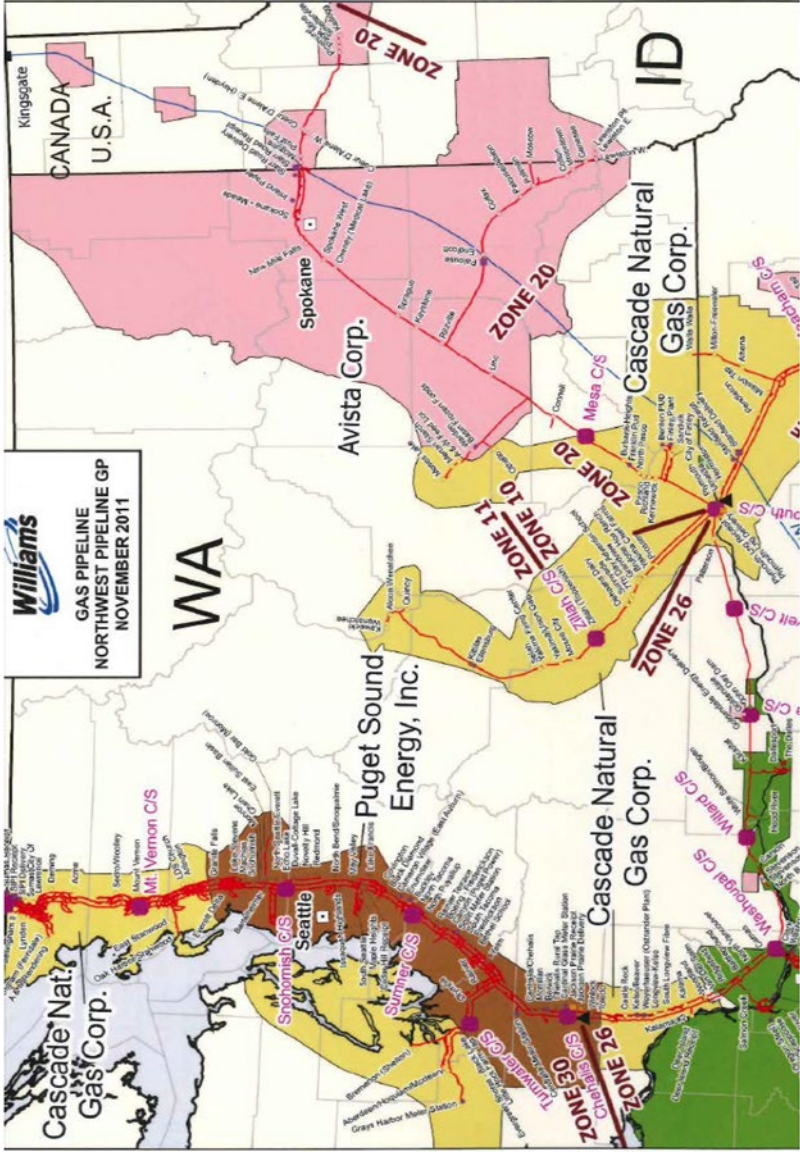
- Coefficient of Performance (COP) measures the ratio of useful heating or cooling provided to the energy required to produce heating or cooling, broken out by heat pump only COP and heat pump and auxiliary heat combined COP.
- Heating Cost per Hour measures the cost to operate the heating system for electric vs gas at varying HDD levels.



- Total Square Footage multiplied by climate zone BTU per sq ft value¹



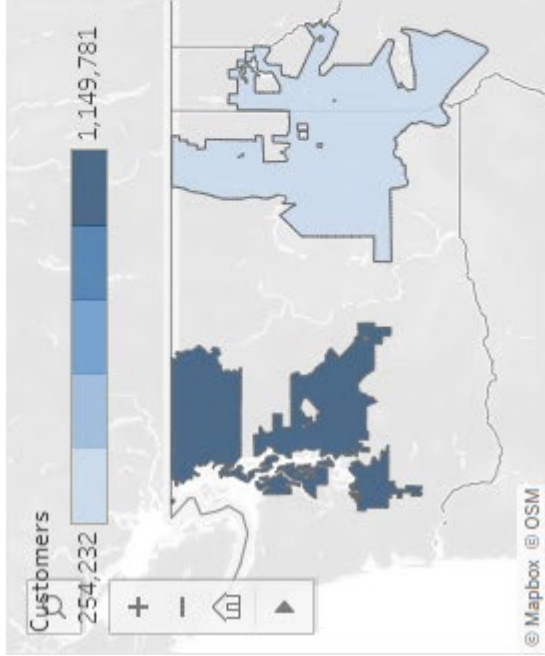
Cascade WA Service Territory



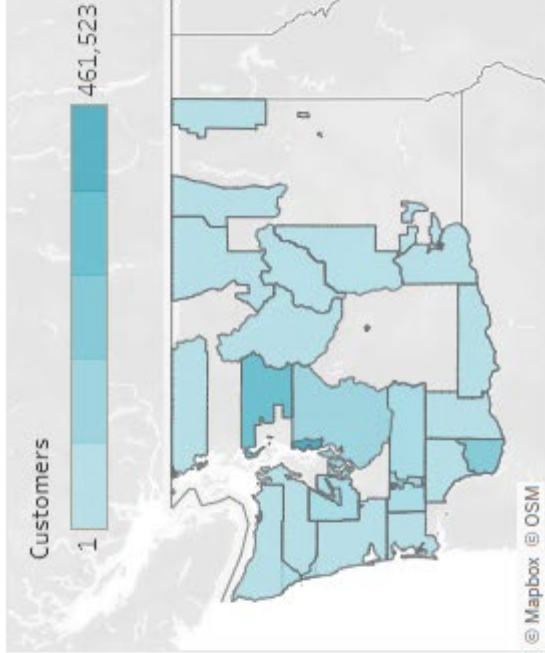
Electric Service Territory

- Between WA and OR, Cascade shares service territories with twenty-five IOU's, Municipalities and PUDs, and Cooperative Utilities.¹
- Cascade pulled current residential and commercial rates for each and weighted them by customer counts for each pipeline zone.

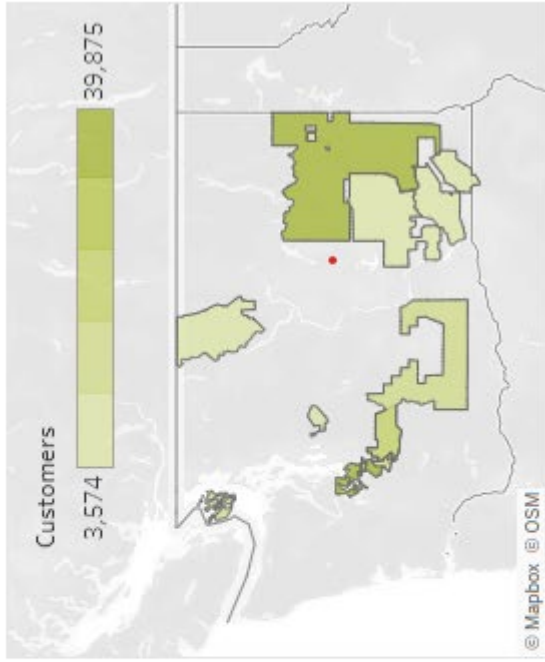
Investor-owned Utilities



Municipal Utilities and PUDs



Cooperative Utilities



Install Costs with IRA Rebates and Incentives

- Install Costs gathered from American Council for an Energy-Efficient Economy report.¹
- Modeled in three separate income groups; 1. Below 80% median household income, 2. Between 80% and 150% median household income, 3. Above 150% median household income.
- Assuming a lognormal distribution with a standard deviation of 1, 41.3%, 24.6%, and 34% of people would fall under the first, second, and third threshold from the above bullet, respectively.
- Washington State has or will receive a total of just over \$165 million from the Inflation Reduction Act for its Home Energy Rebate programs.²
- Install Costs are broken out by Space Heat, Water Heat, and Other. Install Costs also have a payback period assuming a loan.

¹ [HTTPS://WWW.ACEEE.ORG/PRESS-RELEASE/2024/05/REPORT-ELECTRIFYING-US-HOMES-CAN-
SAVE-96-BILLION-ENERGY-COSTS-IF-DONE](https://www.aceee.org/press-release/2024/05/report-electrifying-us-homes-can-save-96-billion-energy-costs-if-done)

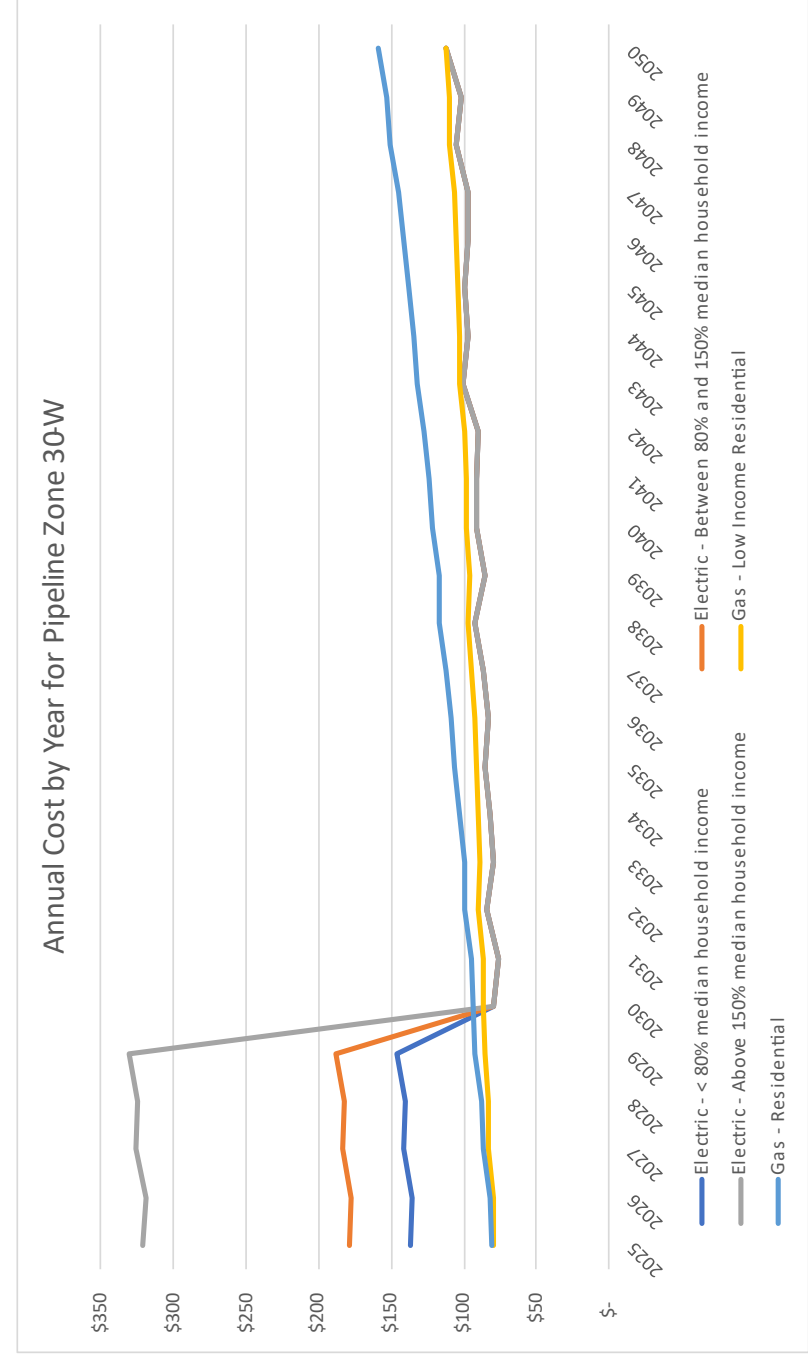
² [DOE CONFIRMS WA REQUEST FOR HIGHER IRA HOME REBATES – WASHINGTON STATE](https://www.doe.gov/press-release/2024/05/doe-confirms-wa-request-for-higher-ira-home-rebates-washington-state)
DEPARTMENT OF COMMERCE

IRA Rules

Program	Eligibility	Rebate/Tax Credit Amount	Details
HEEHRA - Electrification Rebates	Low- and moderate-income households	Up to \$14,000	Covers high-efficiency electric equipment and appliances. Low-income households can receive up to 100% of project costs; moderate-income households up to 50%. ¹
HEEHRA - Efficiency Rebates (HOMES)	Low- and moderate-income households	Varies by energy savings	Provides rebates for whole-house energy-saving retrofits. Amount depends on the percentage of energy savings achieved. ¹
IRA Tax Incentives - Energy Efficiency Improvements	All households and businesses	Up to 30% of project costs	Tax credits for energy-efficient improvements like heat pumps, solar panels, and insulation. Average tax credit ranges from \$2,000 to \$5,000. ¹
IRA Tax Incentives - Renewable Energy	All households and businesses	Up to 30% of project costs	Tax credits for renewable energy installations, such as solar panels and wind turbines. ¹

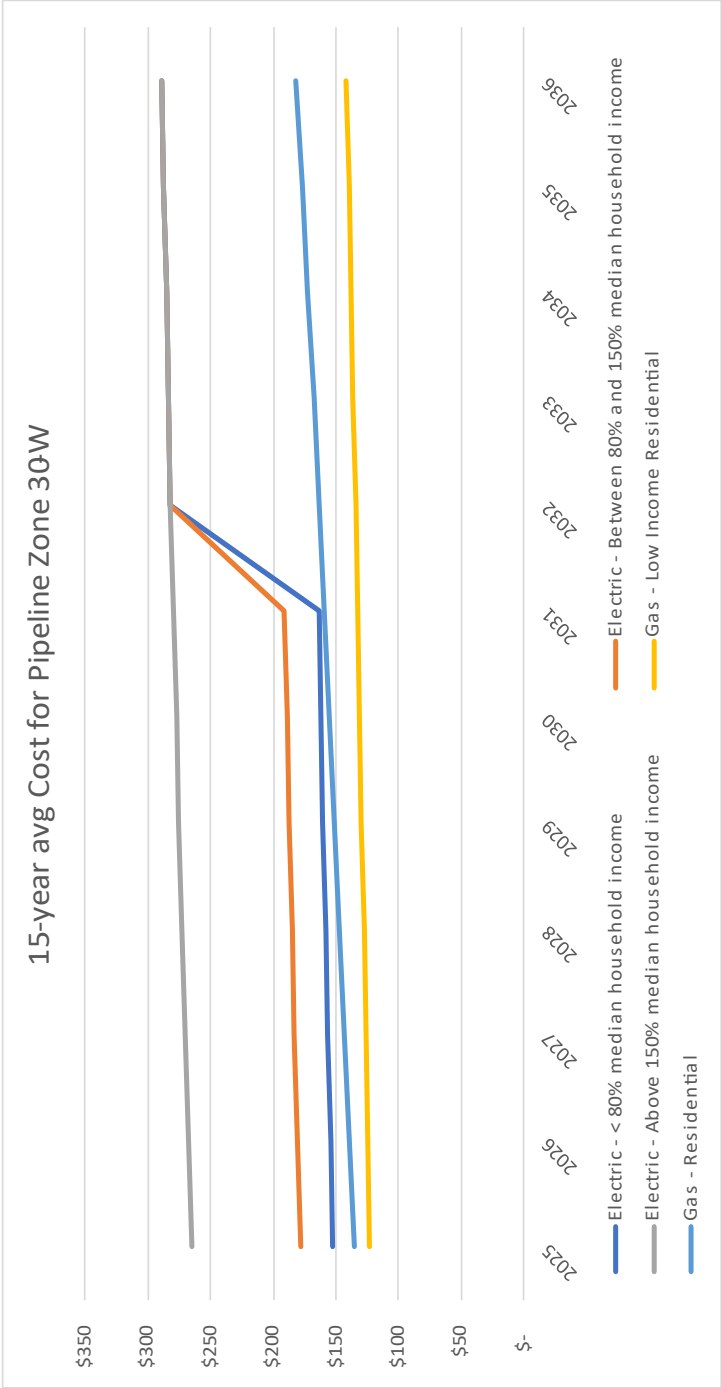
¹ [HTTPS://WWW.COMMERCE.WA.GOV/ENERGY-INCENTIVES/IRA-HOME-ENERGY-REBATES/](https://www.commerce.wa.gov/energy-incentives/ira-home-energy-rebates/)

Annual Cost Preliminary Results (Whole Home)



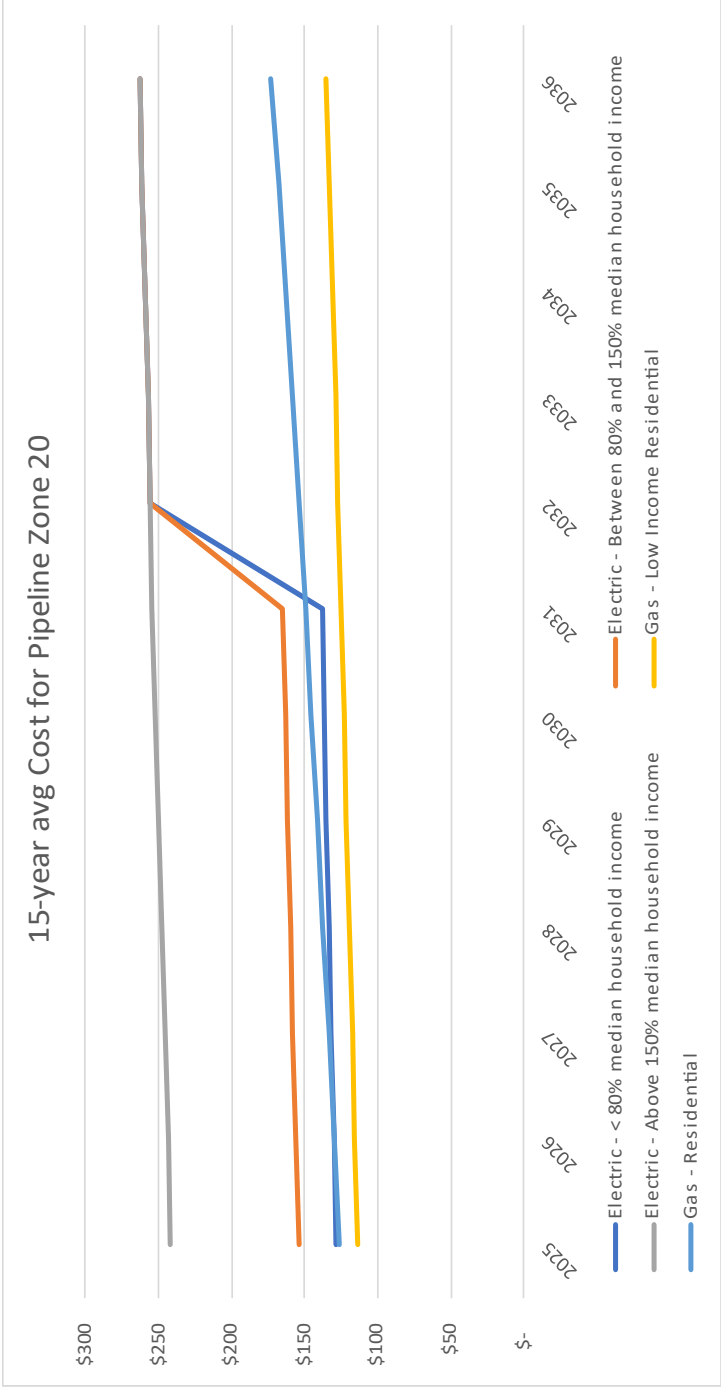
- Annual Costs, including installation cost and cost of service.
- Includes different install costs based on IRA incentive.
- Includes costs to electrify vs remaining as a gas customer.

Levelized Cost Preliminary Results (Whole Home)



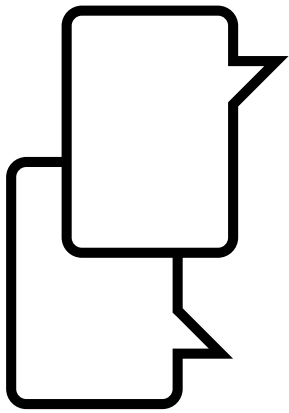
- Levelized costs over 15 years, including installation cost and cost of service.
- Includes different install costs based on IRA incentive.
- Includes costs to electrify vs remaining as a gas customer.
- Projects done after 2031 do not include IRA incentives.

Levelized Cost Preliminary Results (Whole Home)



- Levelized costs over 15 years, including installation cost and cost of service.
- Includes different install costs based on IRA incentive.
- Includes costs to electrify vs remaining as a gas customer.
- Projects done after 2031 do not include IRA incentives.
- Cascade will produce results for all ten pipeline zones.

Feedback for Cascade





Questions/Next Steps



Review Plans for TAG 3 Discussion

- Respond to TAG 3 Feedback
- Distribution System Planning
- Final Integration Results
- Finalization of Planned Components
- Proposed new 2- to 4-year action plan
- TAG 4 is Wednesday, February 5

Process Item	Date	Process Element
Comments Due	Friday, January 10, 2025	
		Respond to TAG 3 feedback, Distribution System Planning, Final Integration Results, finalization of plan components, Proposed new 2- to 4-year Action Plan
TAG 4	Wednesday, February 5, 2025	
Final Draft	Tuesday, March 4, 2025	
Comments Due	Tuesday, April 15, 2025	
TAG 5 (if needed)	Thursday, May 1, 2025	
Final Complete By	Friday, May 16, 2025	
File	Friday, May 23, 2025	

2025 WA IRP Schedule



In the Community to Serve®

Integrated Resource Plan Technical Advisory Group Meeting #3

JANUARY 8, 2025

MICROSOFT TEAMS/TELECONFERENCE



In the Community to Serve®



2025 IRP TAG #3 Meeting

Date & time: 1/8/2025, 9:00 AM to 12:00 PM

Location: Microsoft Teams Meeting

Presenters: Brian Robertson, Jenny De Boer.

In attendance: Abbie Krebsbach, Alessandra de la Torre, Alondra Regalado, Bailey Steeves, Brenda Montanez, Brian Robertson, Bruce Folsom, Byron Harmon, Caleb Reimer, Carolyn Stone, Carra Sahler, Chris Robbins, Darcy Neigum, Devin McGreal, Eric Shierman, Eric Wood, Garret Senger, Jeff Higgins, Jenny De Boer, Jodie Albert, Kary Burin, Kathleen Campbell, Mark Sellers-Vaughn, Matt Steele, Matthew Doyle, Megan Koelzer, Michael Meyers, Michael Parvinen, Patrick Darras, Patrick Hanks, Quinn Weber, Ryan Denton, Tom Pardee, Vigilija Klima, Will Gehrke, Zachary Sowards

Brian Robertson, Supervisor of Resource Planning, opened the meeting by welcoming and thanking stakeholders for participating in Cascade's IRP Process. Brian briefly covers the overall agenda and allows for everyone to introduce themselves.

Presentation #1 – Safety Moment (Brian Robertson)

- Brian covers some statistics related to, and tips to protect, one's hearing. Some tips include reducing volume, moving away from noise, or wearing appropriate hearing protection.

Presentation #2 – Low Carbon Alternative Fuels (Jenny DeBoer)

- Jenny talks about the study from ICF that Cascade uses to help guide analysis and decisions around low carbon alternative fuels.
- She goes over some model restrictions (e.g. Cascade not anticipating participating in carbon capture prior to 2030), capital costs, and O&M fixed and variable costs.
- She talks about prices and how they are broken down between Northwest and Nationals technical potential. Also included: how prices are averaged to reduce model inputs, IRA incentives where applicable, and that all low carbon alternative fuels (except carbon capture) will be evaluated off-system. Further, she mentions how prices are not only

taken from the ICF study, but how the Company also considers current market prices and information from low alternative fuel brokers and developers.

- Jenny then covers renewable natural gas (RNG) prices specifically, presenting graphs on the different types under consideration (e.g. food waste, waste water, animal manure, landfill gas). Mentioning how the landfill and waste water options are currently the most feasible. The graphs show different forecasted pricing within each RNG type by facility size (highlighting lower costs for larger facilities).
- Jenny then shows a similar set of graphs and analysis, but for renewable thermal credit (RTC) prices. She talks about how currently carbon intensity is not represented in these RTCs yet, but the Company is keeping an eye out for any changes on this (as well as any market linkage that may occur).
- Jenny goes over carbon capture and synthetic methane, presenting graphs of forecasted prices. She mentions how carbon capture is likely not feasible prior to 2030 before briefly explaining what synthetic methane is and the associated graph.
- Jenny presents forecasted prices for the different types of hydrogen sources (e.g. blue, green), explaining the associated graph. She highlights that blue and solar green hydrogen are currently the most feasible options.
- Jenny explains how the technical potential volumes for the alternative fuels are broken down between the Northwest and National (i.e. the Nation excluding the Northwest), how they are weighted, and that Cascade's weighted share is about 13%.
- She then covers what the volumes are forecasted to be for the different RNG types, presenting graphs that show these projections. She highlights that landfill gas is expected to have the largest volumes. Afterwards she continues to show the same analysis and graphs for RTC volumes, this time highlighting that the largest volumes available will be in landfill gas and animal manure.

Question (Quinn Weber): Quinn asks if the RTC volumes are scaled by Cascade's 13% share.

Answer (Brian Robertson): Brian states that these volumes are indeed scaled in that way.

Question (Quinn Weber): Quinn then asks if, given this share amount, there will be enough for the company to fully decarbonize by using just RNG and RTCs.

Answer (Brian Robertson): Brian clarifies that the models are still being ran and thus the Company is waiting for those results, but that he anticipates the volumes will be sufficient to fully decarbonize. He then highlights the large role that associated costs play in such decision making.

- Jenny continues and covers the volumes associated with carbon capture and synthetic methane, noting that carbon capture not being considered by Cascade prior to 2030 and the largest volumes for synthetic methane are in solar green and wind green hydrogen.

Question (Carra Sahler): Carra asks if Cascade is expecting that RTCs will be available regionally, and if not in which states Cascade expects the RTCs to come from.

Answer (Brian Robertson): Brian clarifies that the ICF study does not specify where the RTCs come from exactly. He then asks Devin what he is currently seeing in the market.

Answer (Devin McGreal): Devin the how the RTCs are geographically diverse when referencing the current market, but that he mainly sees projects in the Northwest and Midwest.

Question (Will Gehrke): Will asks if the green and pink hydrogen (under the synthetic methane category) potential volumes is off-system resources, such as a “book and claim” approach, or on-system.

Answer (Brian Robertson): Brian states that currently the Company is looking at off-system (book and claim) but is also considering on-system, though not soon enough to be included in the current IRP.

- Jenny then covers the same analysis for hydrogen volumes, highlighting that the largest volumes available are in blue hydrogen and solar green hydrogen.

Question (Carra Sahler): Carra seeks to clarify the definition of blue hydrogen being used in the presentation and IRP. Asking if the production of this type of hydrogen is methane based with carbon capture.

Answer (Devin McGreal): Devin clarifies that this is indeed the description of blue hydrogen that aligns with the Company’s description.

Brian Robertson mentions that the Company has some information for pink hydrogen but is not currently modeling it.

Question (Carra Sahler): Carra asks if study that is being cited for the alternative fuels analysis will be provided.

Answer (Brian Robertson): Brian ensures that it will be provided in the appendix of the IRP when it is finalized.

Presentation #3 – Electrification (Brian Robertson)

- Brian covers the key inputs in the electrification analysis (e.g. heat pump specs, home size, climate zone). He then mentions that there are many different types of heat pumps and that the Company had to select one for the analysis. He goes over some brief performance specs, explaining them as well as some assumptions that were made.
- Brian goes over the coefficient of performance (COP) efficiency metric. This is the amount of output produced given the amount of input received. He talks about how temperature influences this metric, presents accompanying graphs, and associated costs per hour depending on whether gas or electric is used and based on the temperature. He also states that a rate increase of 3% is the current assumption on the electric side.

Question (Jeff Higgins): Jeff asks what the units on the vertical axis of the cost graphs are.

Answer (Brian Robertson): Brian states the units are \$/MMBtu and that he will double-check that and get back to Jeff just to be sure.

- Brian moves on to show a graph showing the different climate zones used in this analysis. He also mentions how the climate zone goes into the BTUs needed calculation.

Question (Quinn Weber): Quinn asks Brian to clarify what is meant by “total square footage” in terms of BTUs needed, service territory, and climate zone.

Answer (Brian Robertson): Brian clarifies that this is in reference to home size.

- Brian explains how the Company shares service territories with twenty-five different electric utilities. He talks about how Cascade pulled the residential and commercial rates for each of them and weighted them by customer counts.
- He then goes over how electrification installation costs were gathered, the different IRA rebates and incentives, how different income groups were impacted, and how the different install costs are separated (e.g. space heat, water heat, other). He comments that the estimated installation costs seem low.

Question (Quinn Weber): Quinn asks if a similar analysis will be done with funds related to the CCA.

Answer (Brian Robertson): Brian comments that the Company is not currently doing that but invites Quinn to send him any information about the CCA and associated funds for electrification so that he can look at working that into the analysis.

- Brian presents the different IRA rules and incentives (e.g. HEEHRA, and different tax incentives). This covers eligibility, rebate/tax credit amount, and some details about each one.
- He then presents a graph showing preliminary results of what average monthly costs per year for a whole home may be. These costs include installation cost and cost of service, while factoring in the different potential incentives. These projections compare the cost to electrify vs staying a gas customer for the various different service territory zones. He then presents a graph to show what these costs may look like when levelized over 15 years (noting that the IRA is set to expire in 2032, thus the associated incentives will no longer be available). He highlights that all these results are preliminary and there is more adjustments that will be made.

Question (Eric Shierman): Eric gives feedback on how including state-funded dollars may be of use.

Answer (Brian Robertson): Brian agrees and ensures that the Company is keeping an eye on such information to use in the analysis.

Question (Eric Shierman): Eric asks if these costs are for load forecasting or for the program participant portion of the total resource cost test for an electrification measure.

Answer (Brian Robertson): Brian clarifies that this is looking at an estimate of how much it would cost a customer to electrify their home, which is then compared to the costs of remaining a gas customer.

Question (Eric Shierman): Eric asks if this is a sort of sensitivity analysis.

Answer (Brian Robertson): Brian explains that the Company is looking at this in two ways. Both to see if it is cost-effective for the company to electrify those customers and to use the information to better understand consumer behavior (what they may do on their own). These can indeed influence the load forecast and are considered.

Question (Carra Sahler): Carra asks how does the Company assesses the cost of remaining as a gas customer and what does it include?

Answer (Brian Robertson): Brian explains that the Plexos model will provide insight as to what alternative fuel is needed, and the costs associate with that, to meet demand. From there the Company can perform bill impact analysis.

Question (Carra Sahler): Carra asks if this includes the cost to replace equipment for both the electric and gas options.

Answer (Brian Robertson): Brian clarifies that only the costs to replace gas equipment with electric equipment is included in these slides. Noting that here we are looking at it from the view of what it would cost the utility, but also notes that when looking at it from a customer behavior view that including the marginal costs for both the gas and electric equipment replacement costs would be beneficial.

Question (Carra Sahler): Carra then asks if the Company is considering the cost to Cascade customers over time if some customers are electrifying. How are rates impacted by this change?

Answer (Brian Robertson): Brian mentions that the Company does have different scenarios that are involved in the IRP, including different customer count changes over time, to try and capture those types of potential dynamics.

Question (Byron Harmon): Byron asks if the graph showing the levelized costs are showing amortized costs of heat pump installation and electric service over time.

Answer (Brian Robertson): Brian confirms this understanding.

Question (Byron Harmon): Byron asks about the gap in heat cost per hour between gas and electric (slide 20). Byron asks if these costs include the levelized costs of equipment replacement for both gas and electric.

Answer (Brian Robertson): Brian clarifies that slide 20 is showing comparisons based only on cost of service.

Question (Byron Harmon): Byron seeks to clarify if the following observation sounds correct: with all the costs included, the cost projections do not even intersect (slide 27), implying that electric does not appear to be cost-competitive in this forecast.

Answer (Brian Robertson): Brian confirms this interpretation of the graph but mentions that the graph on slide 27 is a specific zone and that these forecasts are different for each of the service territory zones. Thus, the interpretation of electric vs gas cost-competitiveness may vary.

Question (Byron Harmon): Byron asks if the costs on the gas side include things such as CCA compliance also.

Answer (Brian Robertson): Brian clarifies that this is indeed the goal of this analysis, once again noting that these results are not finalized and hence the results may change in the future.

Question (Byron Harmon): Byron comments that all the assumptions going into this analysis being stated in the IRP would be beneficial.

Answer (Brian Robertson): Brian agrees and mentions that is indeed his intent for the IRP narrative.

Question (Patrick Hanks): Patrick asks what causes the big jump in the graph for electric costs around the year 2031.

Answer (Brian Robertson): Brian stats that this is from the IRA set to expire in 2031, so those incentives will not be available to help offset the transition costs anymore.

Post Presentations –

Brian opens it up for questions and feedback then shares the 2025 Washington IRP schedule.

Question (Byron Harmon): Byron asks if the volumes for RTCs and RNG are of Cascades share in the region or totals for the region.

Answer (Brian Robertson): Brian states these are of Cascades share.

Question (Byron Harmon): Byron asks if Cascade were to get all the forecasted alternative fuels available, if it would be enough to fully decarbonize.

Answer (Brian Robertson): Brian asks if Byron is including allowances or not in this scenario.

Question (Byron Harmon): Byron mentions that the question is in regard to state compliance goals, so can demand be fully met using just these alternative fuel options, while the Company is satisfying the carbon compliance goals.

Answer (Brian Robertson): Brian clarifies that the models are still be ran, but that he anticipates that the volumes would indeed be high enough to do that.

The Meeting was Adjourned.

Per Cascade Commitment #8 (Stakeholder Engagement Design Document, 2/22,2022: “Provide TAG minutes that include the action items from bullet #7 as well as any upcoming deadlines for feedback on the IRP”), here are additional action items to track, coming out of the TAG meeting:

1. Chapters 2-7 have been provided for edit, Cascade requests any feedback on these by 1/10/2025.
2. Cascade will include narrative around assumptions regarding electrification modeling in the IRP.



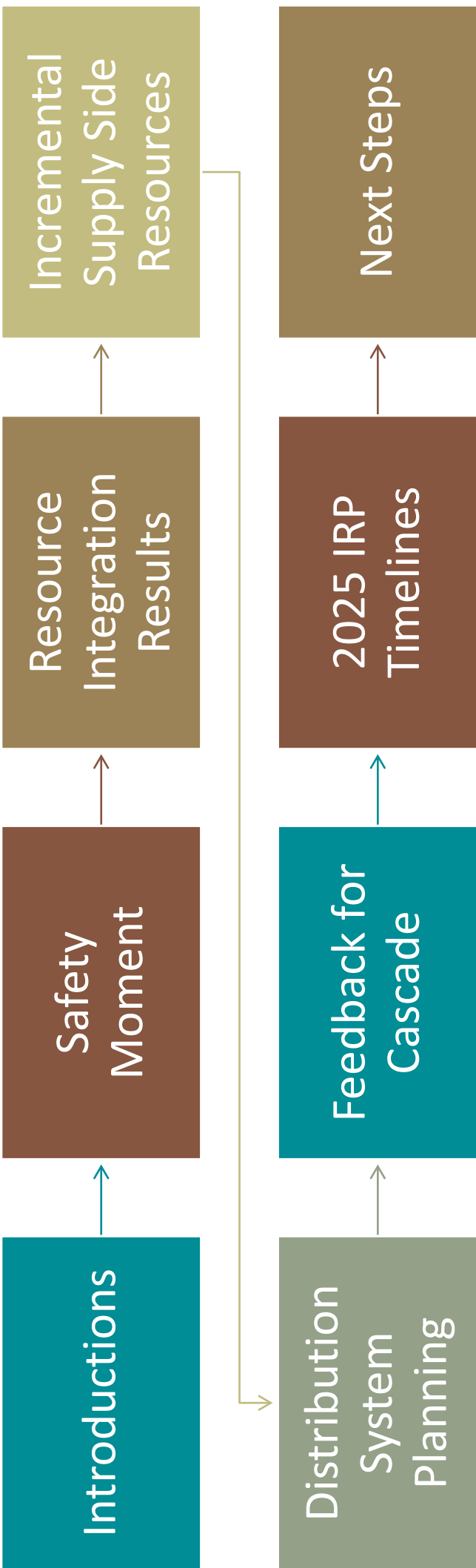
In the Community to Serve®

Integrated Resource Plan Technical Advisory Group Meeting #4

FEBRUARY 5, 2025

MICROSOFT TEAMS/TELECONFERENCE

Agenda



Safety Moment

AVOID BEING DISTRACTED FROM WHAT IS OUTSIDE YOUR CAR BY WHAT IS ON THE INSIDE

The easiest way to be an attentive driver is to:

- Program GPS/Mapping before driving
- Turn off/silence cell phones
- Close laptops or turn off tablet screens
- Set radio stations
- DO NOT interact with in-vehicle technology while on the road
- Avoid eating and drinking
- Complete all personal hygiene steps before driving



What, Who, How?

Information on Cascade’s IRP can be found on the Company’s webpage.

Stakeholder Engagement Design Document

Pre- and Post-IRP Feedback Report

IRP Timeline

Previous IRPs



Cascade Home » Rates & Services » Rates & Tariffs » Washington Integrated Resource Plan

WASHINGTON | CASCADE NATURAL GAS | NATURAL GAS – INTEGRATED RESOURCE PLAN

The What: Cascade’s Integrated Resource Plan describes the two- to four-year and twenty-year expectation of how Cascade expects to safely serve customers’ energy needs at the lowest reasonable and safe cost. The analyses in this 12–18-month process includes existing and potential new pipelines and natural gas supply contracts (among others) as well as benefits of energy efficiency to customers. The IRP provides comprehensive and transparent insight into how Cascade plans for customers’ energy future. To view what an IRP looks like, please see Previous Years’ IRP at the bottom of the page. The Executive Summary and Key Points are designed to provide a quick, but descriptive, explanation of the process and plan.

The Who: Customers and the general public are invited to participate in a series of meetings on the variety of topics contained in the IRP, including energy efficiency and carbon emission reductions. Together, customers and the general public participating in the IRP process are called Stakeholders. Stakeholders also include the professional analytical staffs of the state utility commissions and groups representing residential and industrial customers. Community-based organizations and independent experts also attend the series of meetings.

How it works: The IRP process begins with a kick-off meeting to lay out the 12-18 month schedule of four to six meetings as well as provide an overview of what issues will be covered. These meetings are called Technical Advisory Group meetings or TAGs. Links are available to the TAG presentations, minutes, and written responses to Stakeholder’s requests and comments.

What to expect: Expectations of participants and tips for the best way for Stakeholders (including customers and the general public) are described in Cascade’s Stakeholder Engagement Design Document. This is a “living document” and suggestions for improvement are welcome.

Sign up! Join Cascade’s distribution list. You may participate in multiple ways, ranging from attending the TAG meetings (either in-person or remotely) and receiving the agendas/presentations to opportunity to comment. Do so by contacting the Supervisor of Resource Planning, Brian Robertson at either Brian.Robertson@cngc.com or (509) 221-9808. You may also contact the Company’s IRP email address at irp@cngc.com. Cascade uses MStTeams as its means to connect participants remotely. MStTeams is a free application to be used by Stakeholders including customers and the general public.

Accommodations: As shown as point #1 on page 2 of the Stakeholder Engagement Design Document, Cascade will provide reasonable accommodations for people with disabilities. Additionally, the Company will reasonably accommodate items such as requests for meeting locations, audio and visual capabilities, and other items requested by external stakeholders. If you have a request for accommodations, please reach out to one of the contacts listed above and the Company will gladly coordinate any reasonable requests for accommodations.

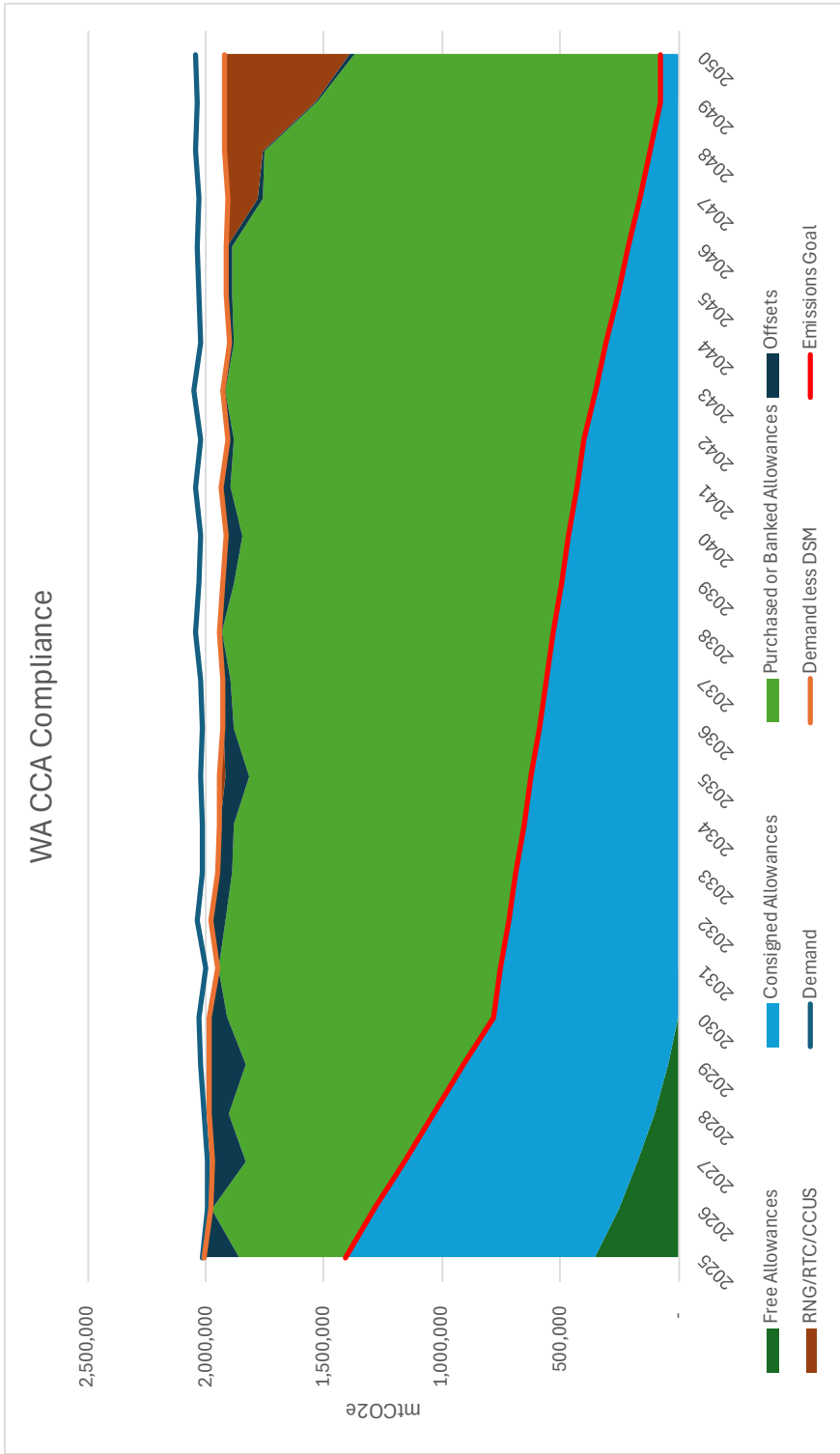
Pre- and Post-IRP feedback report:

[Washington Integrated Resource Plan - Cascade Natural Gas Corporation \(cngc.com\)](https://www.cngc.com/washington-integrated-resource-plan)

Resource Integration Results

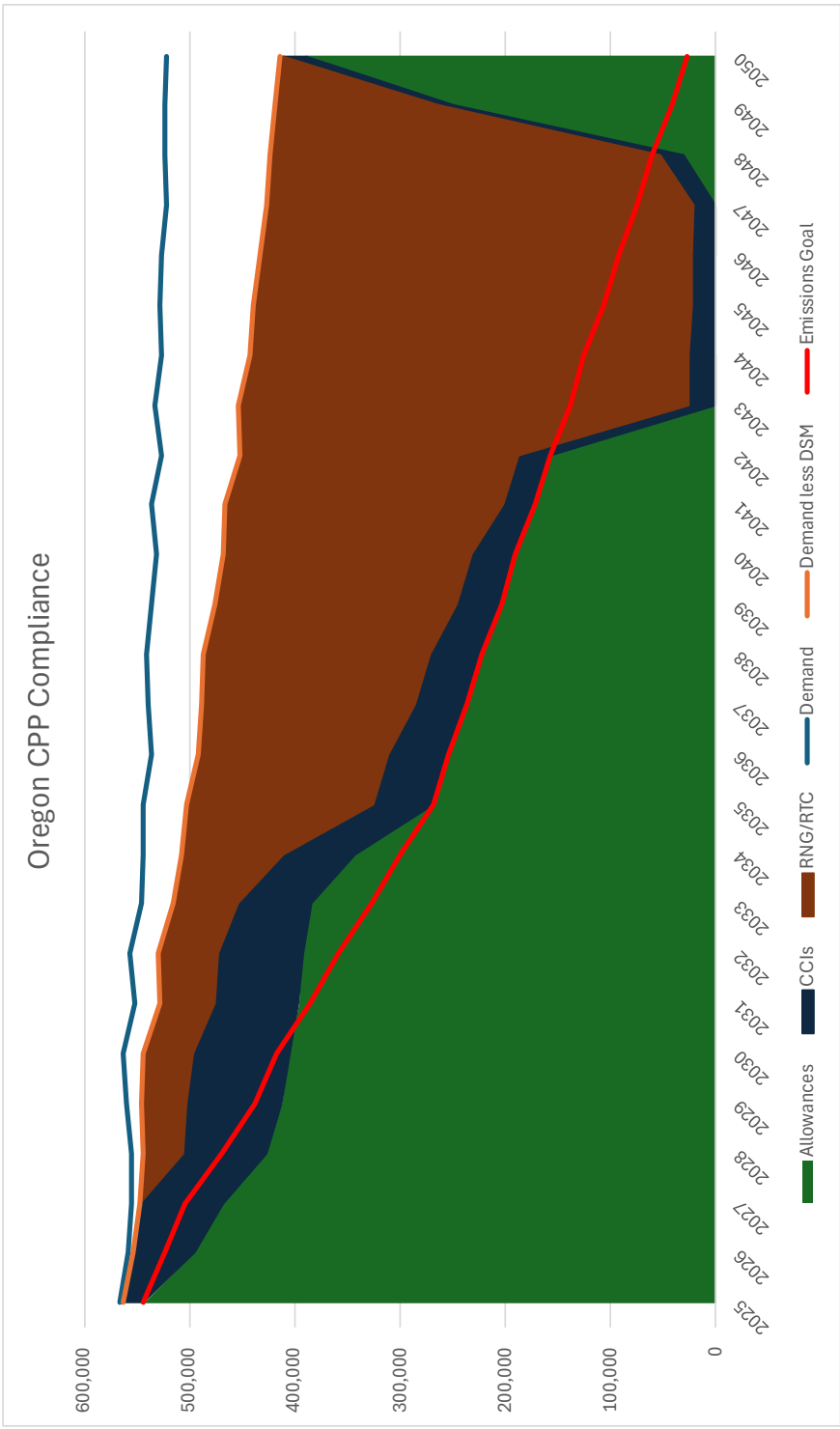
Washington Climate Commitment Act Compliance

- Cascade expects to meet reference case emission targets with free allowances, repurchased allowances, consigned allowances, offsets, carbon capture and RTCs.
- RTCs are needed in future years, but allowances remain the cheaper option.



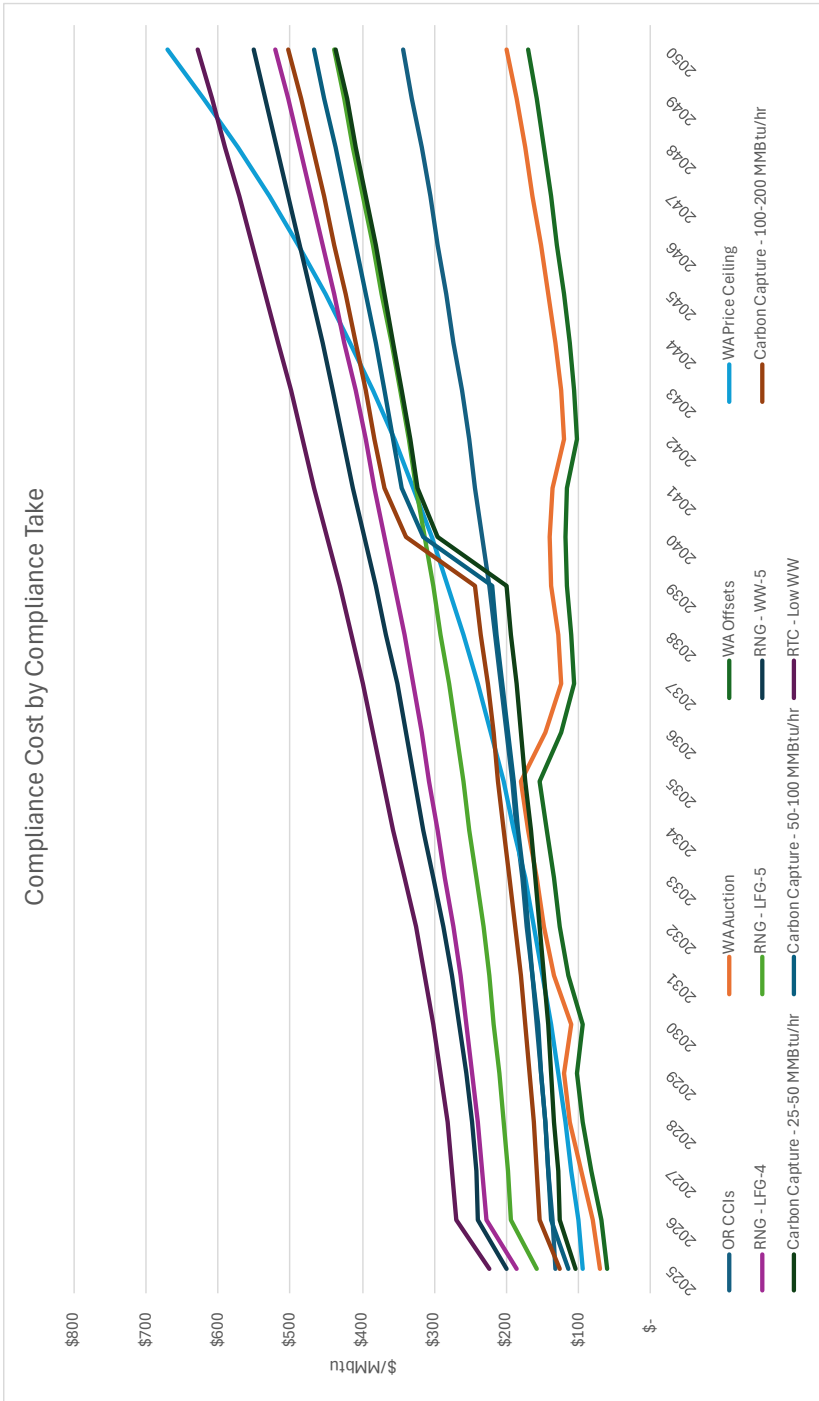
Oregon Climate Protection Program Compliance

- Cascade expects to meet reference case emission targets with allowances, CCLs, and RTCs.
- Plexos recommends utilizing RTCs earlier than needed in order to bank allowances for future use in order to minimize costs in future years when pricing is higher.
- Cascade would need to utilize RTCs earlier if CCLs are not available.



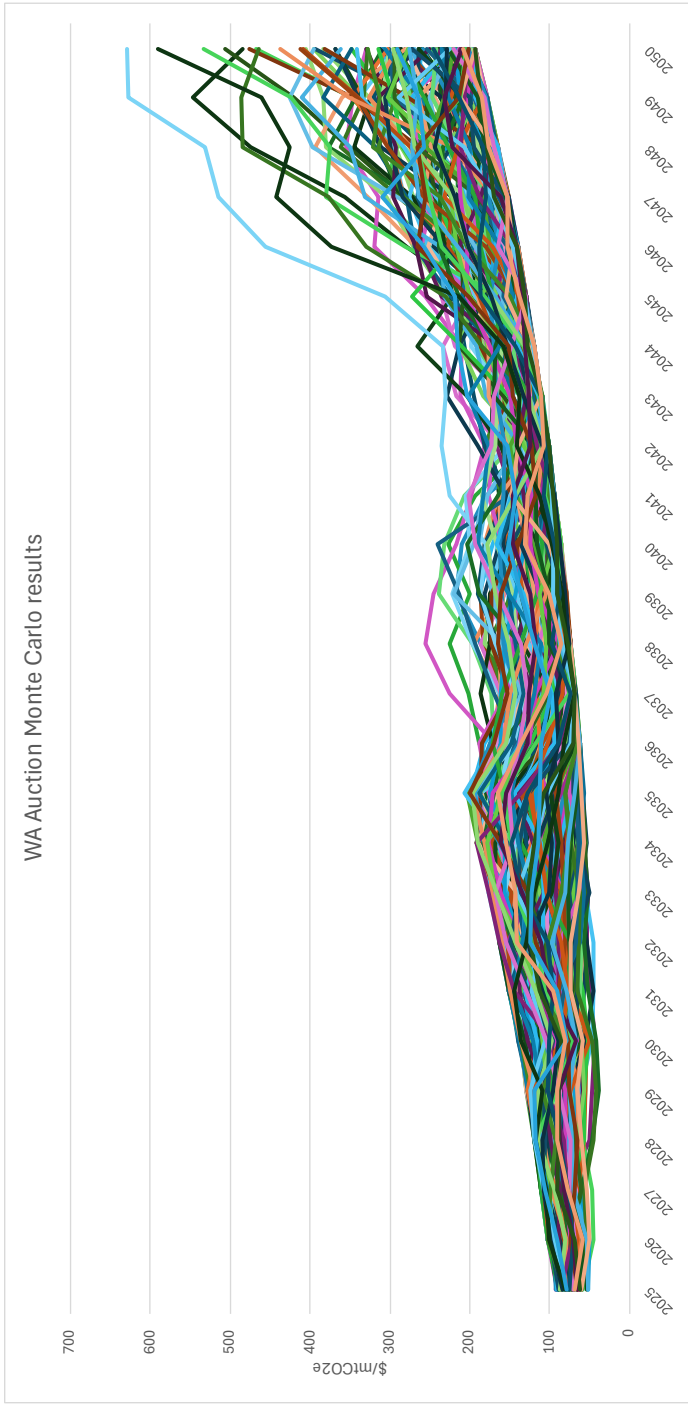
Price by Compliance Take (WA and OR)

- In Washington, the lowest cost option for meeting compliance targets is offsets, and allowances.
- Price ceiling allowances begin as the third lowest cost, but the highest cost by 2050.
- WA Allowances forecast is provided by a third-party consultant.



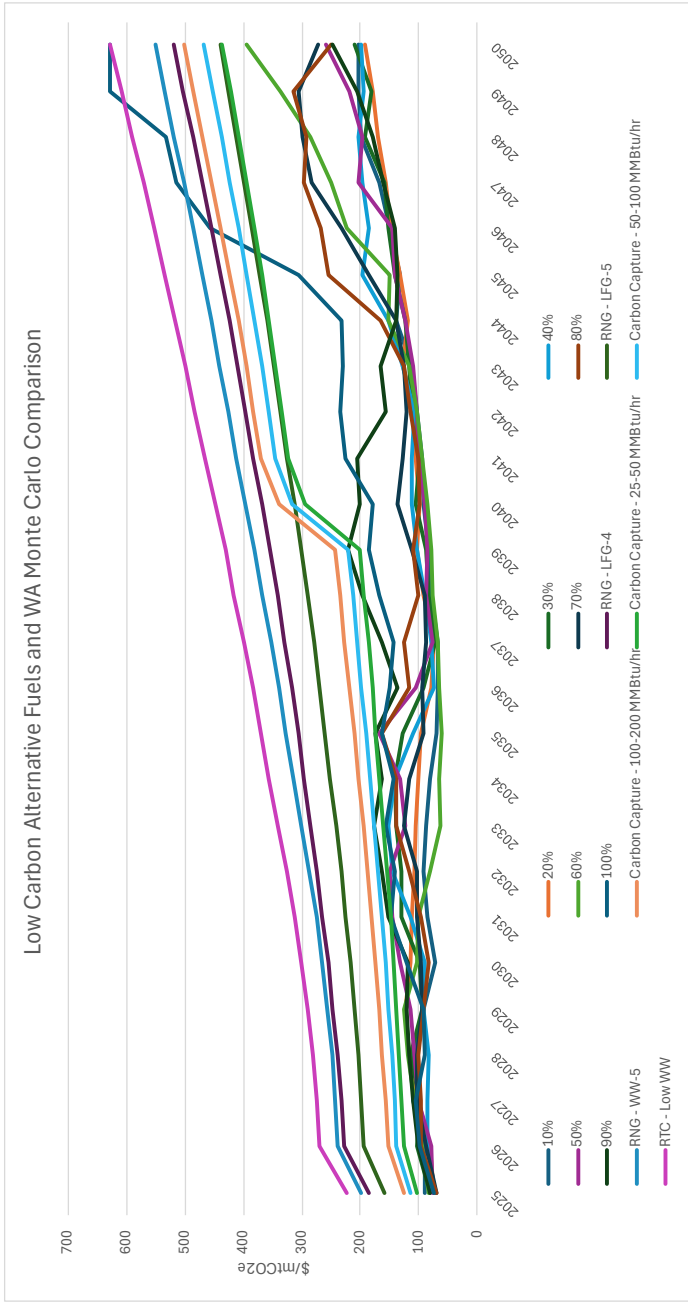
WA Allowance Monte Carlo Results

- Cascade ran 200 monte carlo simulations in order to analyze ranges of allowance cost futures.
- Cascade utilized returns (quarter over quarter percentage changes) from the California/Quebec auction as a proxy for standard deviation.



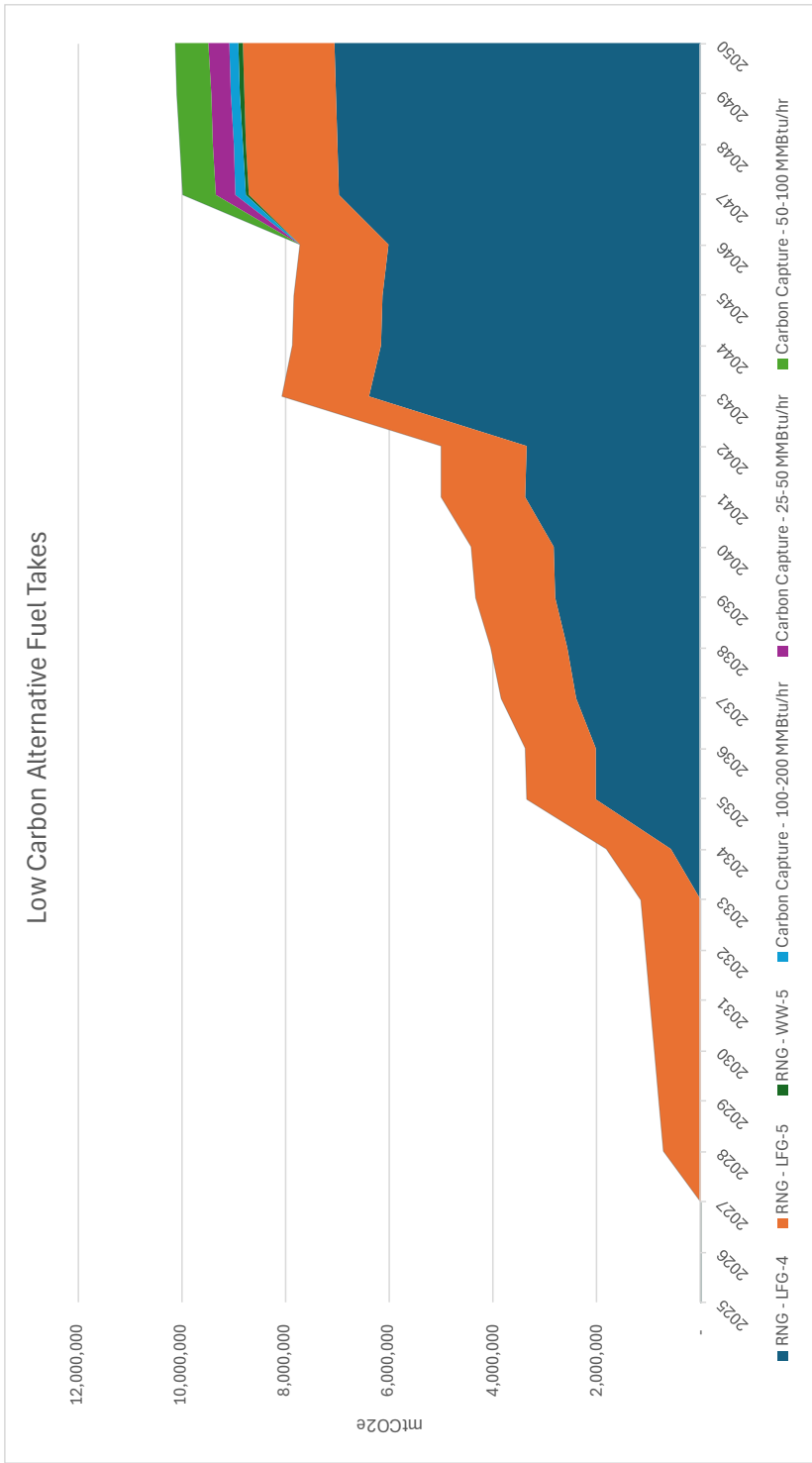
WA Allowance Monte Carlo Results and Low Carbon Alternative Fuel Price Comparison

- Under higher allowance cost scenarios, carbon capture may become cost effective earlier
- In early years, allowance prices expect to hover near the price ceiling cost.
- In some instances, allowance prices increase above low carbon alternative fuels, making those the least cost option.



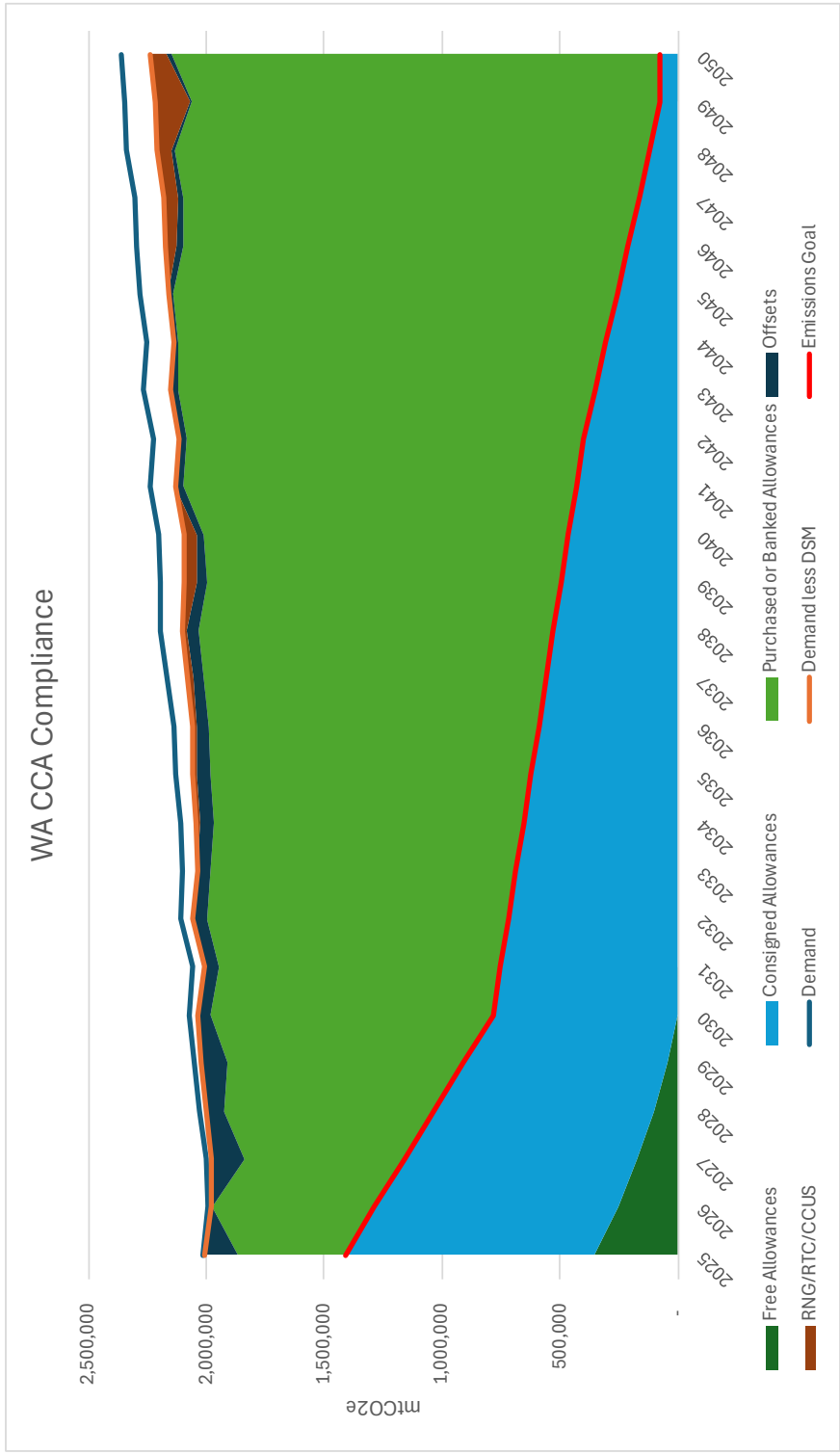
Low Carbon Alternative Fuel Take by Compliance (WA and OR)

- Cascade maximized the amount of RNG – LFG-5, RNG – LFG-4, RNG – WW-5, and carbon capture that was available by 2050.
- RNG/RTC is utilized earlier as needed in Oregon.
- Carbon capture is utilized in the later years when it is needed in Washington.



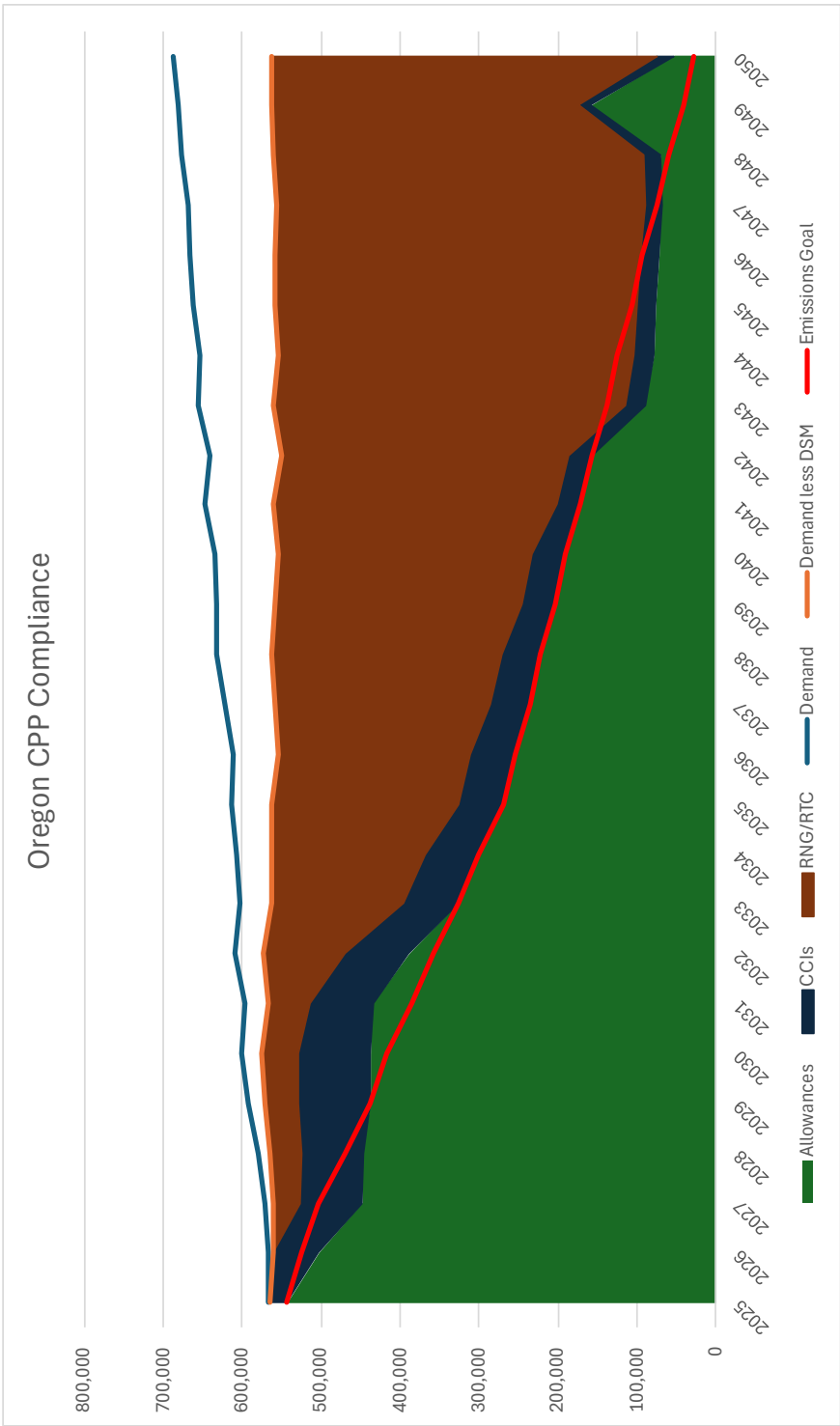
Washington Climate Commitment Act Compliance (High Customer Growth)

- Cascade expects to meet high case emission targets with free allowances, repurchased consigned allowances, offsets, carbon capture.
- More RTCs are needed in future years, but allowances remain the cheaper option.



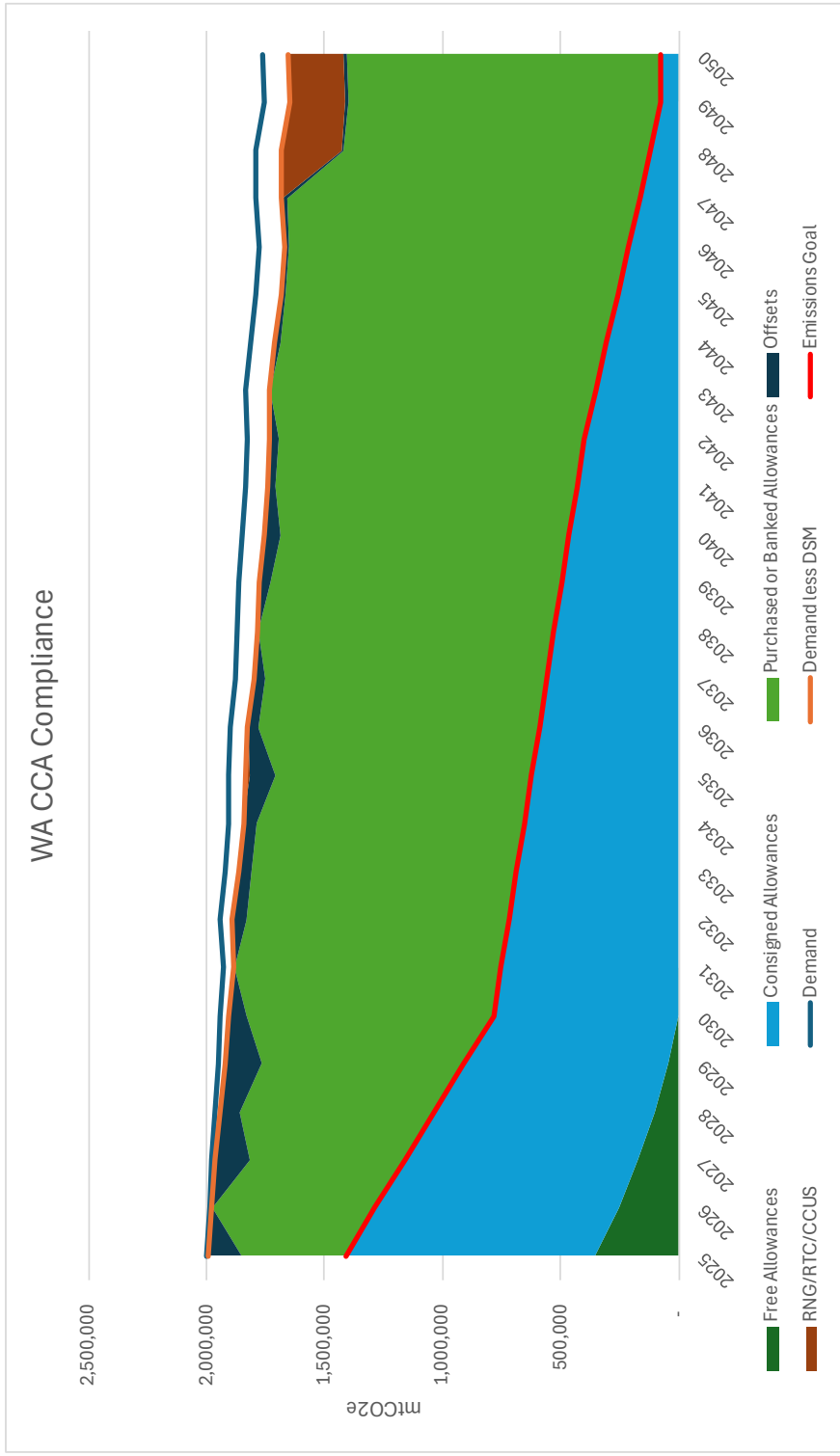
Oregon Climate Protection Program Compliance (High Customer Growth)

- Cascade expects to meet high case emission targets with allowances, CCIs, and RTCs.
- Similar to the reference case, Plexos recommends utilizing RTCs earlier than needed in order to bank allowances for future use in order to minimize costs in future years when pricing is higher.



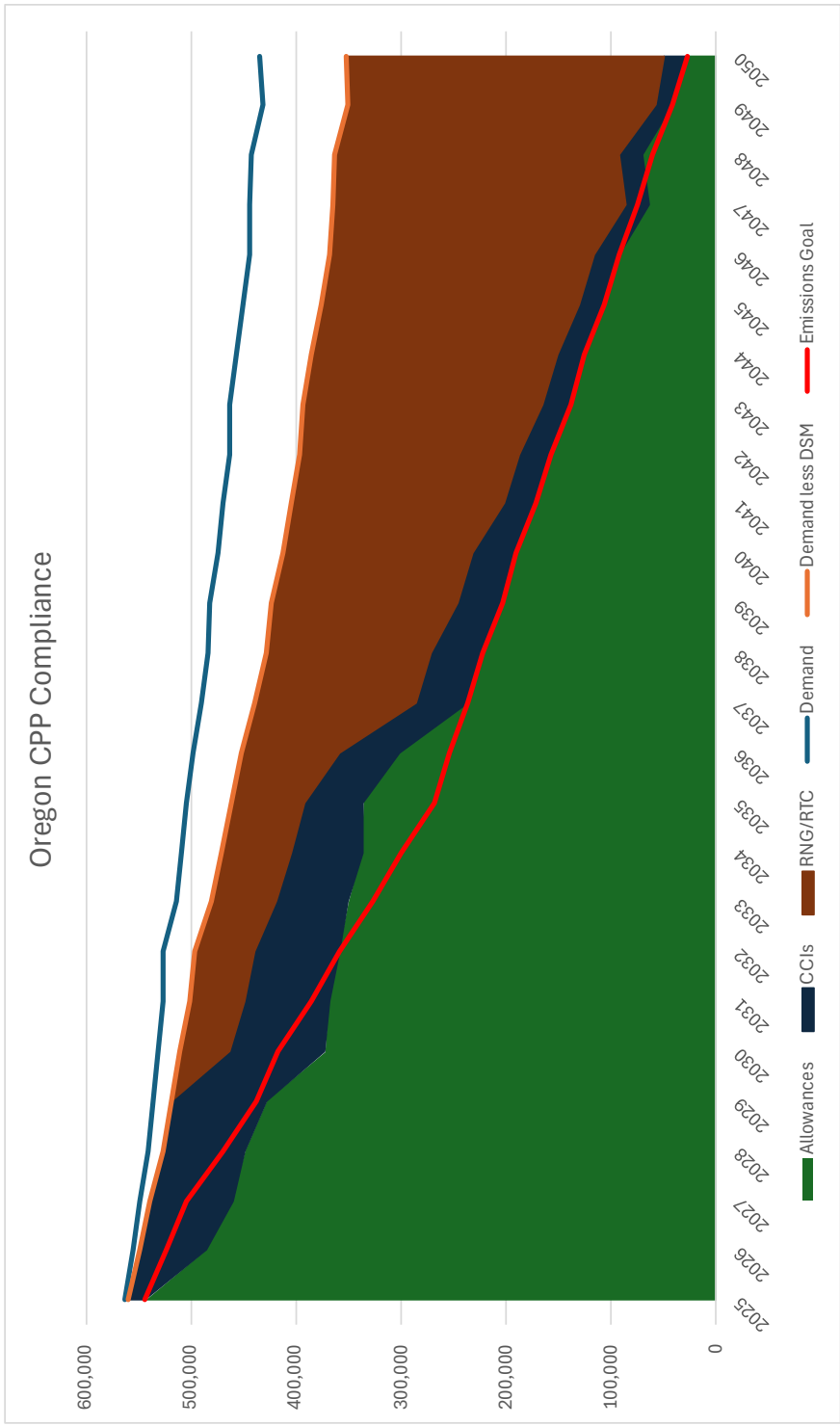
Washington Climate Commitment Act Compliance (Low Customer Growth)

- Cascade expects to meet low case emission targets with free allowances, repurchased consigned allowances, offsets, and carbon capture.
- More RTC and RNG is utilized in the low case because lower cost RNG and RTCs are available in future years.



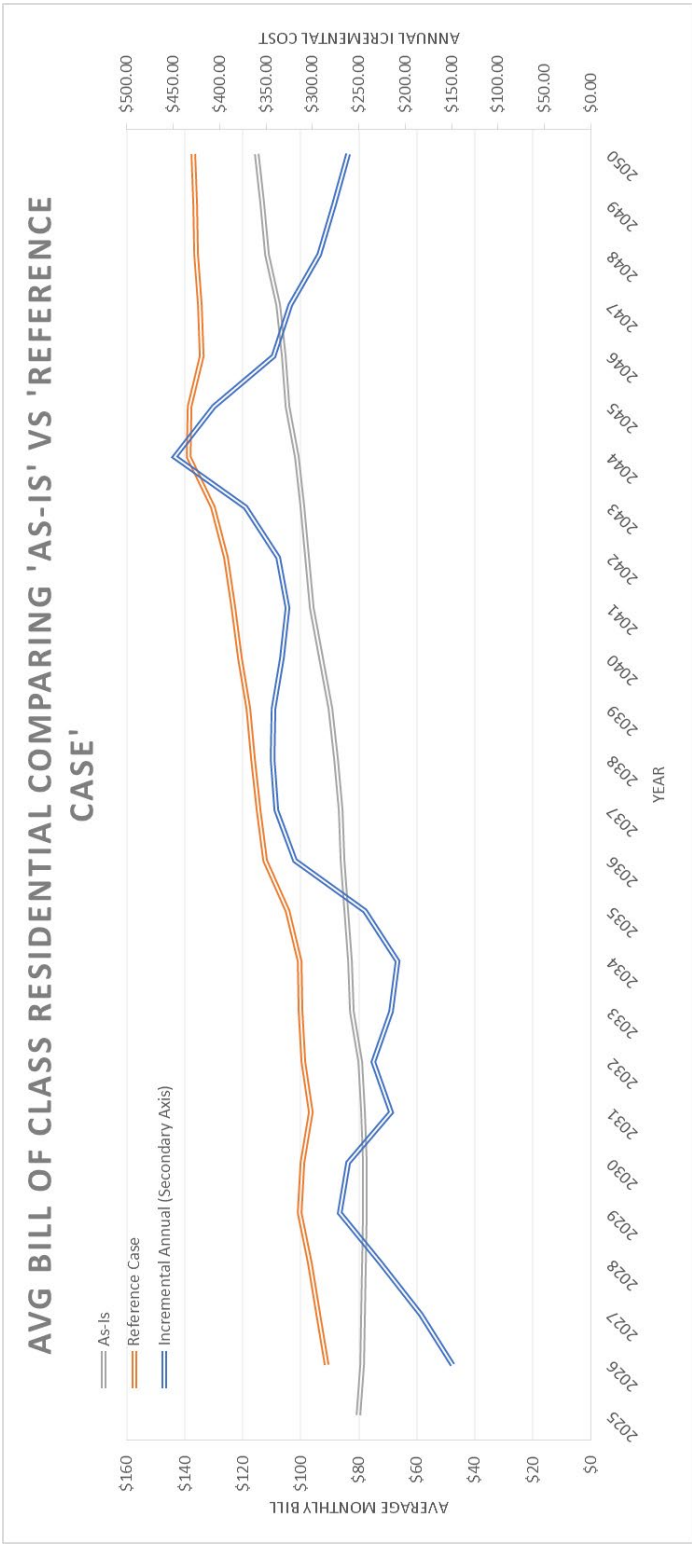
Oregon Climate Protection Program Compliance (Low Customer Growth)

- Cascade expects to meet low case emission targets with allowances, CCIs, and RTCs.
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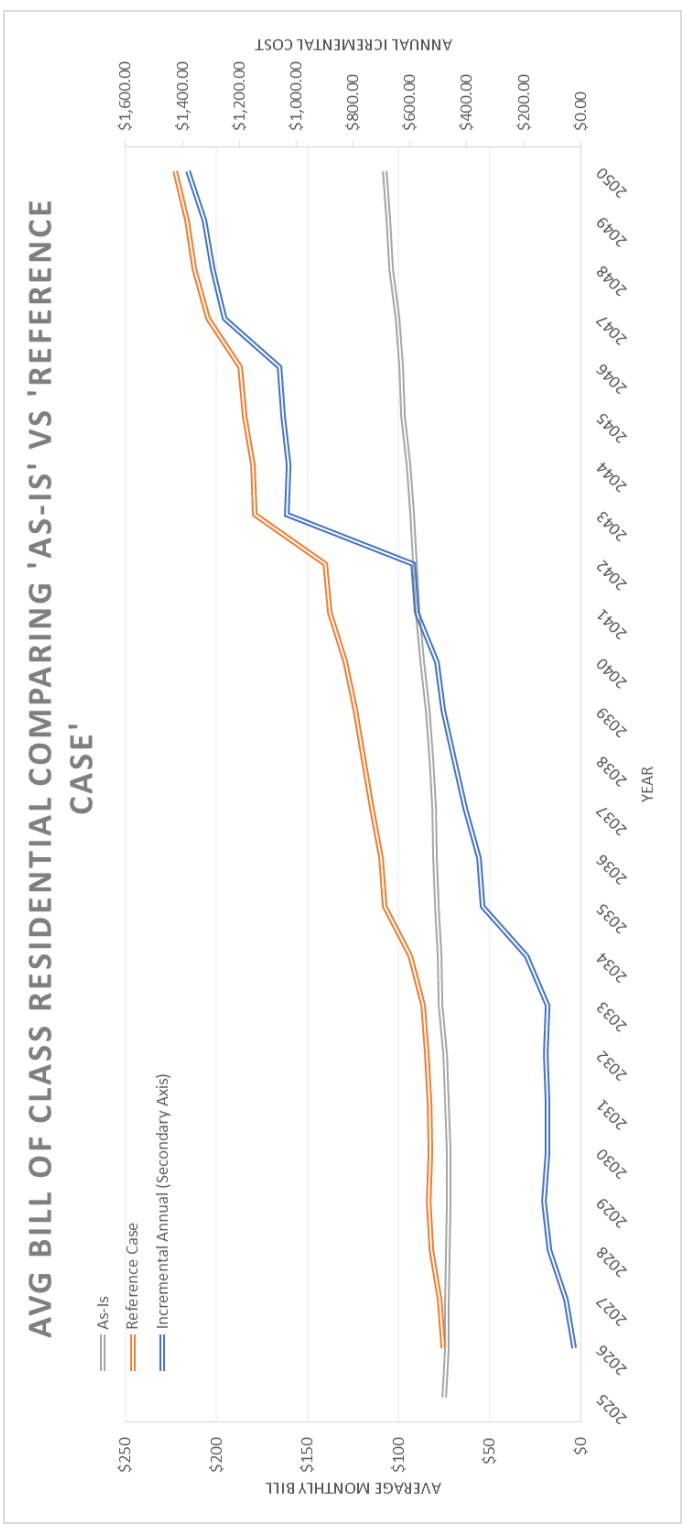
Washington Residential Bill Impacts

- The difference between as-is and expected is compliance costs.
- Cascade expects average bills to nearly double from 2025 to 2050 under the reference case.
- The per therm values will be used in the electrification model.



Oregon Residential Bill Impacts

- The difference between as-is and expected is compliance costs.
- Cascade expects average bills to increase from ~\$75 per month to ~\$225 per month from 2025 to 2050 under the reference case.
- The per therm values will be used in the electrification model.



Low Carbon Alternative Fuels Monte Carlo Pricing

- Renewable Natural Gas from Landfill Gas ranges from \$156 to \$627 per mtCO2e in 2025.
- Renewable Natural Gas from Wastewater ranges from \$196 to \$854 per mtCO2e in 2025.
- The range between the minimum and maximum expands by 2050.
- Plexos optimizes 200 samples to determine the least cost for each sample.
- Cascade will provide the remaining Monte Carlo inputs in the IRP appendices.

RNG: Landfill Gas (\$/mtCO2e)			
Year	Min		Max
2025	\$	156	\$ 627
2030	\$	211	\$ 898
2035	\$	251	\$ 1,104
2040	\$	299	\$ 1,363
2045	\$	354	\$ 1,680
2050	\$	413	\$ 2,065

RNG: Wastewater (\$/mtCO2e)			
Year	Min		Max
2025	\$	196	\$ 854
2030	\$	262	\$ 1,230
2035	\$	320	\$ 1,539
2040	\$	385	\$ 1,924
2045	\$	453	\$ 2,394
2050	\$	525	\$ 2,971

Low Carbon Alternative Fuels Monte Carlo Pricing

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2035	\$	251	\$ 1,104
2040	\$	299	\$ 1,363
2045	\$	354	\$ 1,680
2050	\$	413	\$ 2,065

RNG: Wastewater (\$/mtCO2e)			
Year	Min		Max
2025	\$	196	\$ 854
2030	\$	262	\$ 1,230
2035	\$	320	\$ 1,539
2040	\$	385	\$ 1,924
2045	\$	453	\$ 2,394
2050	\$	525	\$ 2,971

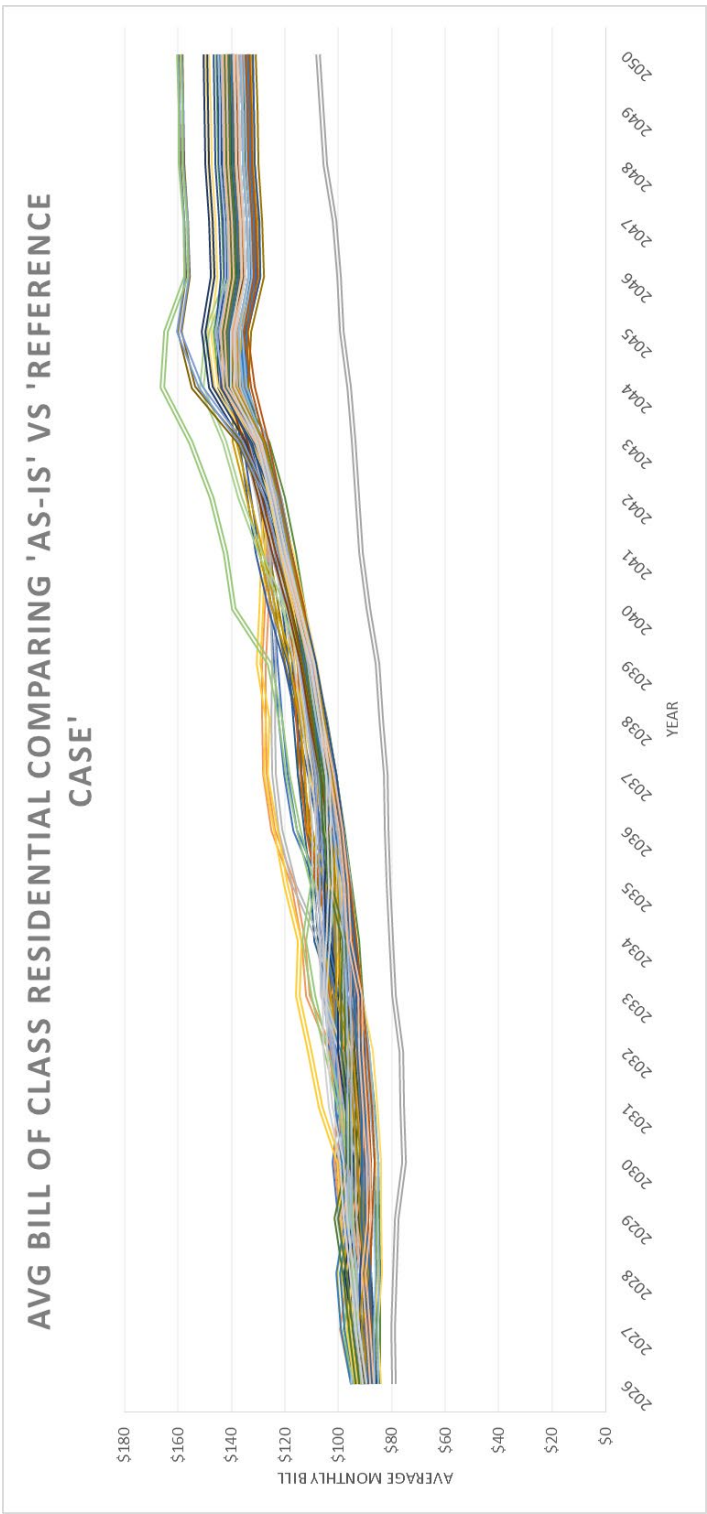
Low Carbon Alternative Fuels Monte Carlo Takes

- This table identifies the first year a compliance option was taken
- LFG-5 was the earliest option taken as it is the lowest cost option.
- Carbon Capture for the smaller facilities range from beginning in 2032 to 2047.
- These results only include 50 Monte Carlo samples.
- Cascade will provide the remaining Monte Carlo inputs in the IRP appendices.

First Year Takes	
Fuel Type	Year
LFG-3	2050
LFG-4	2034-2037
LFG-5	2028-2030
Blue Hydrogen	2030-2035
2032-2036	2032-2036
Carbon Capture: 25-50 MMBtu/hr	2032-2047
Carbon Capture: 50-100 MMBtu/hr	2047
Carbon Capture: 100-200 MMBtu/hr	2047
RTC: WW - Low	2048-2050

Washington Residential Bill Impacts

- Cascade will be computing the bill impacts for all 200 samples. Pictured here is only 50 samples.
- The 50 samples resulted in a ~\$20-\$40 range impact to average monthly bills.
- Cascade will provide all rate schedule impacts in the IRP appendices for WA and OR.



Incremental Supply Side Resources

New Storage Opportunity



Current Leased Storage Accounts

- **Jackson Prairie**
 - 4 accounts with 1,235,593 Dth of Capacity
- **Plymouth**
 - 2 accounts with 662,200 Dth of Capacity
- **Mist**
 - 1 account with 1,640,000 Dth of Capacity

New Storage Contract

Cascade has signed a new storage contract which is expected to begin service in mid-2029 with a 25-year term. This contract is not recallable, meaning that Cascade will have access to this contract for the full 25-year term and has also secured extension rights.

Expected Storage Volumes

- Maximum Daily Injection Quantity (MDIQ): ~8,000 Dth/day
- Maximum Daily Withdrawal Quantity (MDWQ): ~20,000 Dth/day
- Maximum Storage Capacity (MSC): ~800,000 Dth

Further contractual details, including the negotiated rates, are bound by confidentiality agreements at this time, but will be available at a future date.

Cascade Needs More Storage

Cascade continues to lag our regional peers in storage availability and flexibility

- Other regional LDCs have between ~2.5 and ~ 7 times the amount of storage capability compared to Cascade
- Other regional LDCs have more than twice the working inventory vs annual load requirements than Cascade
- Other regional LDCs have approximately twice the number of customers served per dth of peak day load as compared to Cascade

Missed opportunities for price arbitrage

As we look at potential for declining traditional pipeline transport, increased flexibility of storage is going to be necessary to deal with winter peaks and other critical operational challenges

Expectedly supply challenges with the increased British Columbia because of Woodfibre LNG, declining Rockies basins, and potential Westcoast expansion projects.

Distribution System Planning

ZACHARY SOWARDS— SENIOR ENGINEER



Presentation will cover:

1. Distribution system modeling process
2. Identification of system deficits/constraints
3. Distribution enhancements/reinforcements options to address deficits
4. Enhancement review and selection process to capital budget
5. Enhancement/reinforcements identified in 2025-2029 capital budget
6. Iterative process of IRP

System Dynamics:

Piping:

- Diameter – ½” to 20”
- Material – Polyethylene and Steel
- Operating Pressure – 20 psi to 900 psi
- Washington – approx. 5,083 miles of distribution & 170 miles of transmission
- Oregon – approx. 1,768 miles of distribution & 107 miles of transmission

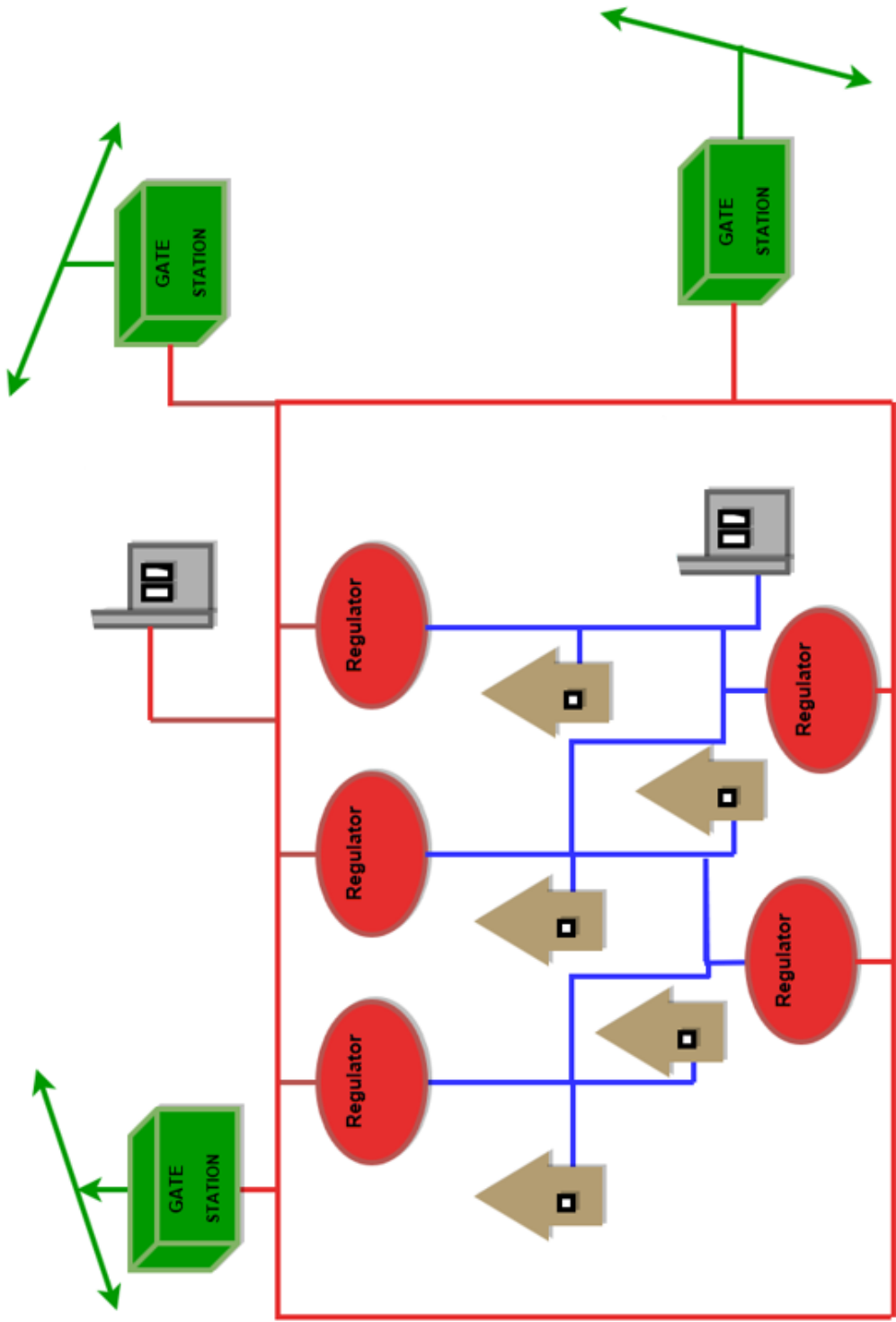
System Dynamic's Cont.

Facilities:

- Regulator stations – Over 700
- Valves – Over 1,600
- Other equipment such as heaters, odorizer and compressors



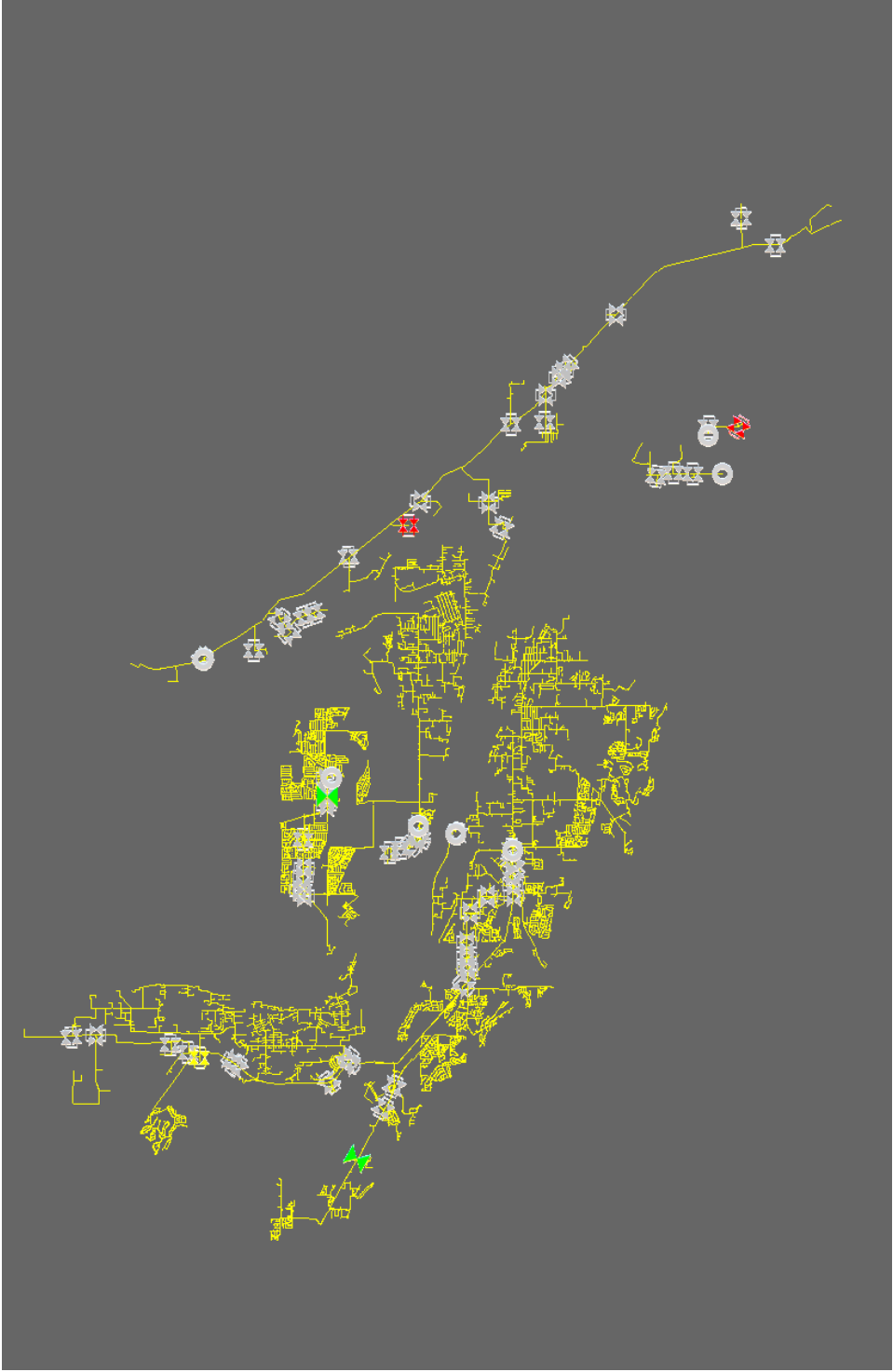
System Design



Synergi Gas Modeling

- To evaluate our systems for growth and potential future deficits we use our gas modeling software, Synergi Gas
- Synergi Gas is distributed and supported by DNV
- Synergi Gas models incorporate:
 - Total customer loads
 - Existing pipe and system configurations
- Synergi gas is a hydraulic modeling software that allows us to predict flows and pressures on our system based on gas demands predicted during a peak weather event.
- Synergi models are updated every three years and maintained between rebuilds

Synergi Model Example



Model Building Process

Synergi models are completely rebuilt every three years and maintained/updated between rebuilds

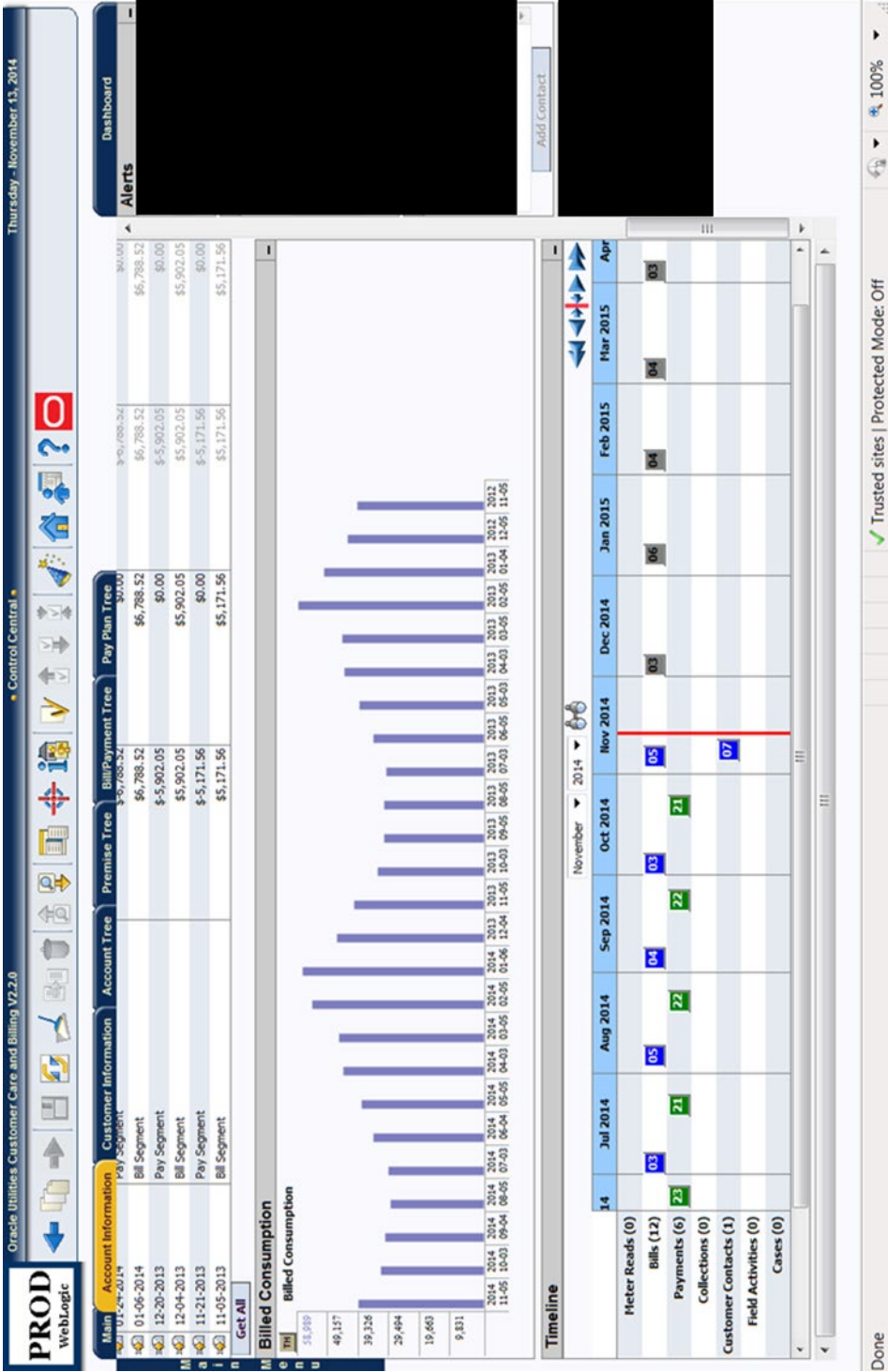
When models are rebuilt

- We export current GIS data to build spatial model
- We export current CC&B billing data to CMM to create an updated demands file
- We validate and calibrate each district model to a recent low-pressure event using existing data (ERXs/pressure charts/SCADA/metertek/LV usage)
- We create a design day model based on the updated heating degree day determined by gas supply (determined by trending historical weather events)

CNG models were rebuilt in 2024

Data Gathering

CC&B (Customer Billing Data)



Data Gathering

MDU SCADA View

Pressures

Usage

Odorizers

Other Systems

IGC

CNGC

Northwest Washington

Central Washington

Southwest Washington

Oregon

MDU

Data Legend

CNGC Southwest Washington Usage

The data on this page is automatically refreshed every 5 minutes. Reloading the page before the timer expires will not necessarily result in newer data.

Data View Mode

ListGridA-Z

Generated: 09/01/2016 04:41:40 PM PDT

Refreshed: 09/01/2016 03:48:06 PM PDT

Next Refresh: 00:04:57

Monitored Area	Flow Rate (MCF/HR)	Previous Hour (DekaTherms)	Current Gas Day (DekaTherms)	Previous Gas Day (DekaTherms)
Puget Sound NS Run1	56.5	61	538	1652
Bremerton Gate Run1	90.5	99	906	2454
Shelton Gate Total	232.1	259	2399	5829
Mc Cleary Gate Run1	207.7	216	1837	4884
South Longview Gate Total	1620.9	1569	11624	21984
Kelso Gate Total	787.1	816	6508	15172
Kalama Gate Total	199.8	225	1914	5435
Co Gen Run1	0.0	0	0	0
Fibre Mill Run1	448.4	475	4271	7952
Mint Farm Run1	1912.2	1923	13754	28647

SCADA Data

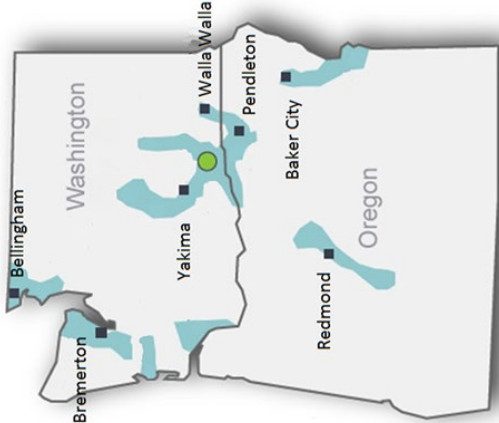
Real time and historical flow characteristics at specific locations in the system

Data Gathering

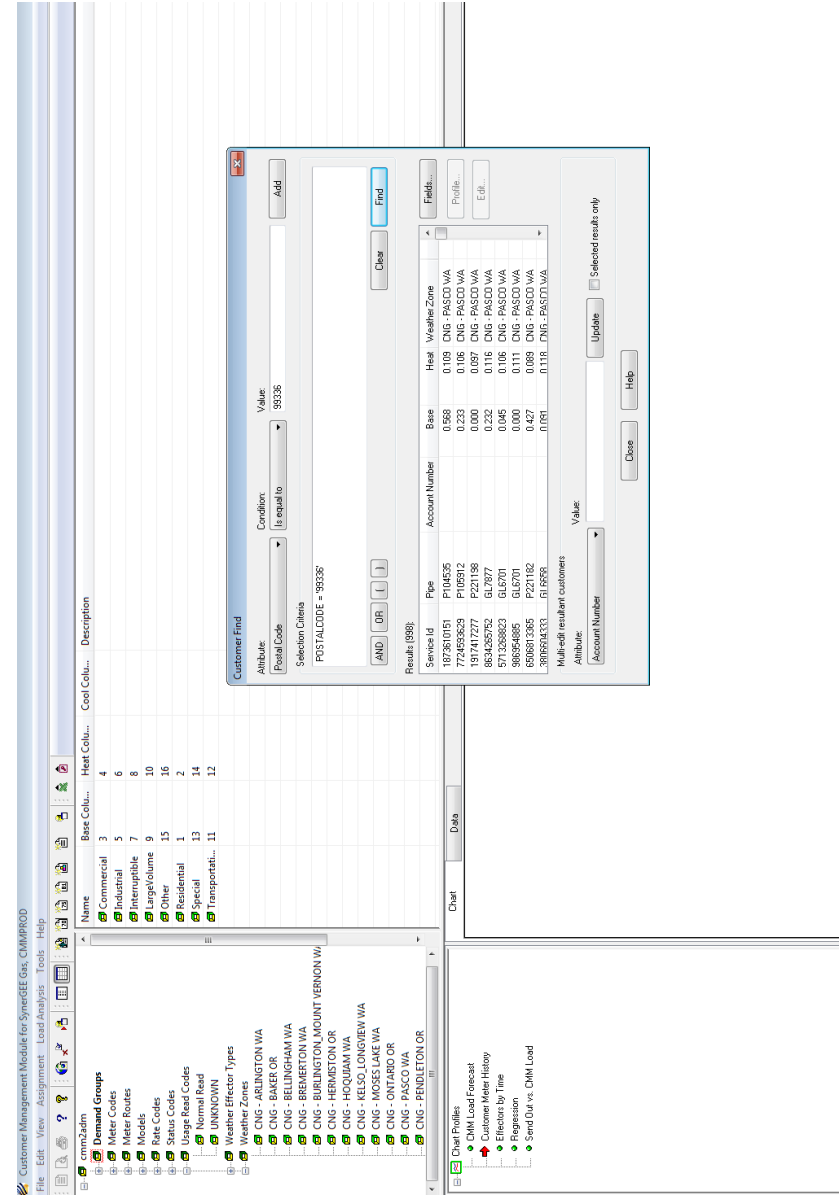
District	HDD	Avg Daily Temperature (°F)
Aberdeen	46	14
Bellingham	47	13
Bend	71	-11
Bremerton	46	14
Eastern Oregon	73	-13
Kennewick	65	-5
Longview	46	14
Mt Vernon	47	13
Pendleton	67	-7
Walla Walla	66	-6
Wenatchee	65	-5
Yakima	65	-5

Peak Heating Degree Day (HDD) modeled by CNG based on historical weather data

Peak HDD = 60 – Average Daily Temp



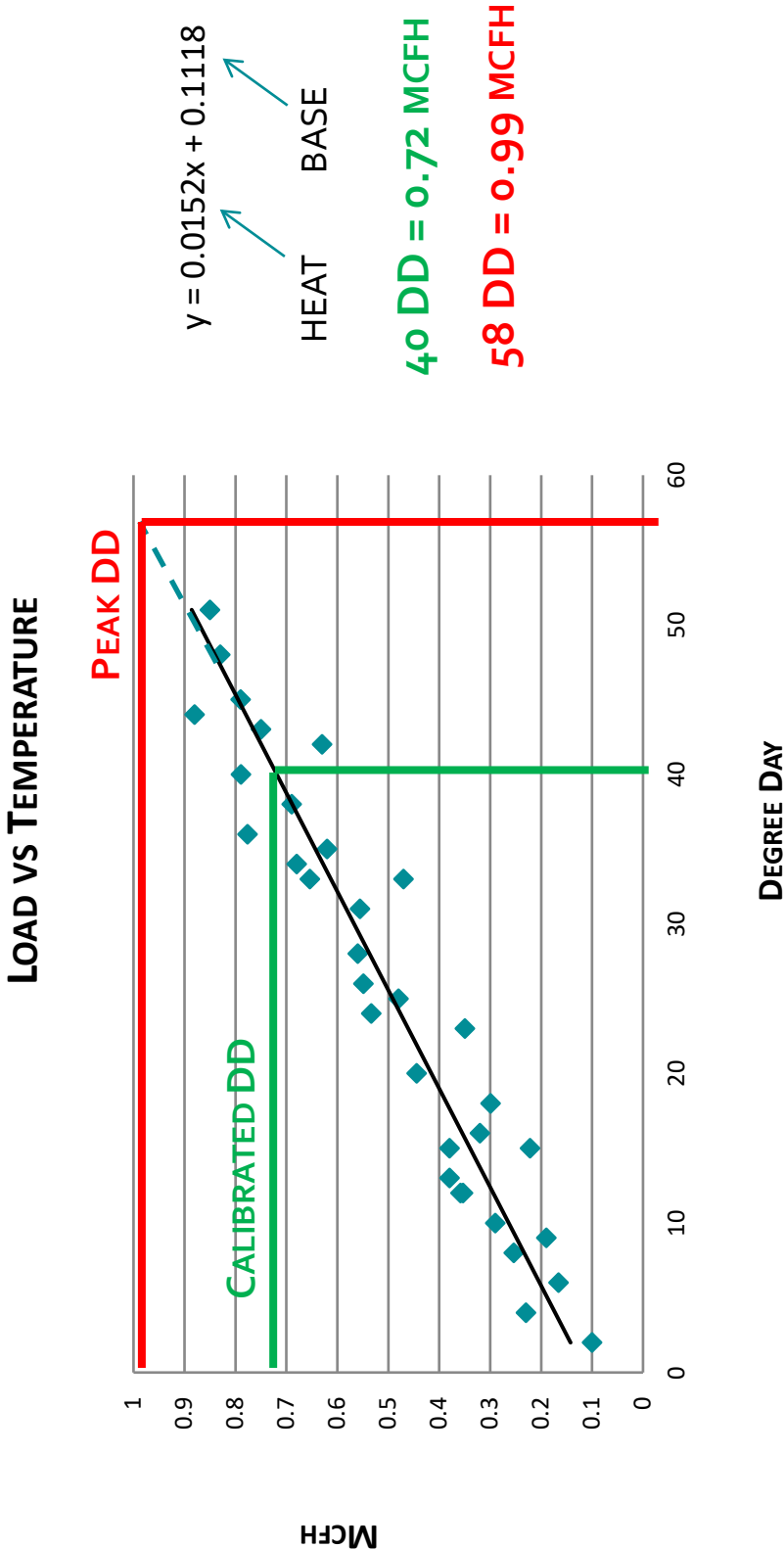
Customer Management Module (CMM)



Brings CC&B customer data into Synergi as demands file

Demand file applies load spatially in the model.

Calibrated vs Peak Degree Day



Identification of system deficits/constraints

Synergi Modeling Capabilities:

- Review Large Volume Customer requests
- Model RNG
- Supports design/sizing of pipe and pipeline components (regulator stations, compressors)
- Future planning
- Model IRP predicted growth
- Identify deficiencies
- Determine system reliability
- Optimize distribution enhancement options

What is a capacity deficit?

A deficit is defined as a critical system that is at or limiting capacity.

Critical system examples include:

- Pipeline bottlenecks
- Minimum inlet pressure to a regulator station or HP system
- Not meeting a required customer delivery pressure
- Component limiting capacity

Distribution System Modeling Process to ensure we can meet IRP growth predictions

As part of the IRP process, we complete a comprehensive review of all of our distribution system models every two years to ensure that we can maintain reliable service to our customers during peak low temperature events.

With our capital budget cycle, we also complete system reviews on an annual basis.

If a deficit is predicted the system is evaluated and a reinforcement/enhancement is proposed and selected based on alternative analysis considerations and placed into the capital budget based on timing needs of the predicted deficit.

Distribution Enhancement/Reinforcement Options to Address Deficits

Enhancement Options

Pipeline:

- Replacements
- Reinforcements
- Loops & Back feeds
- Pressure Increases
- Upgrades

Facility Upgrades

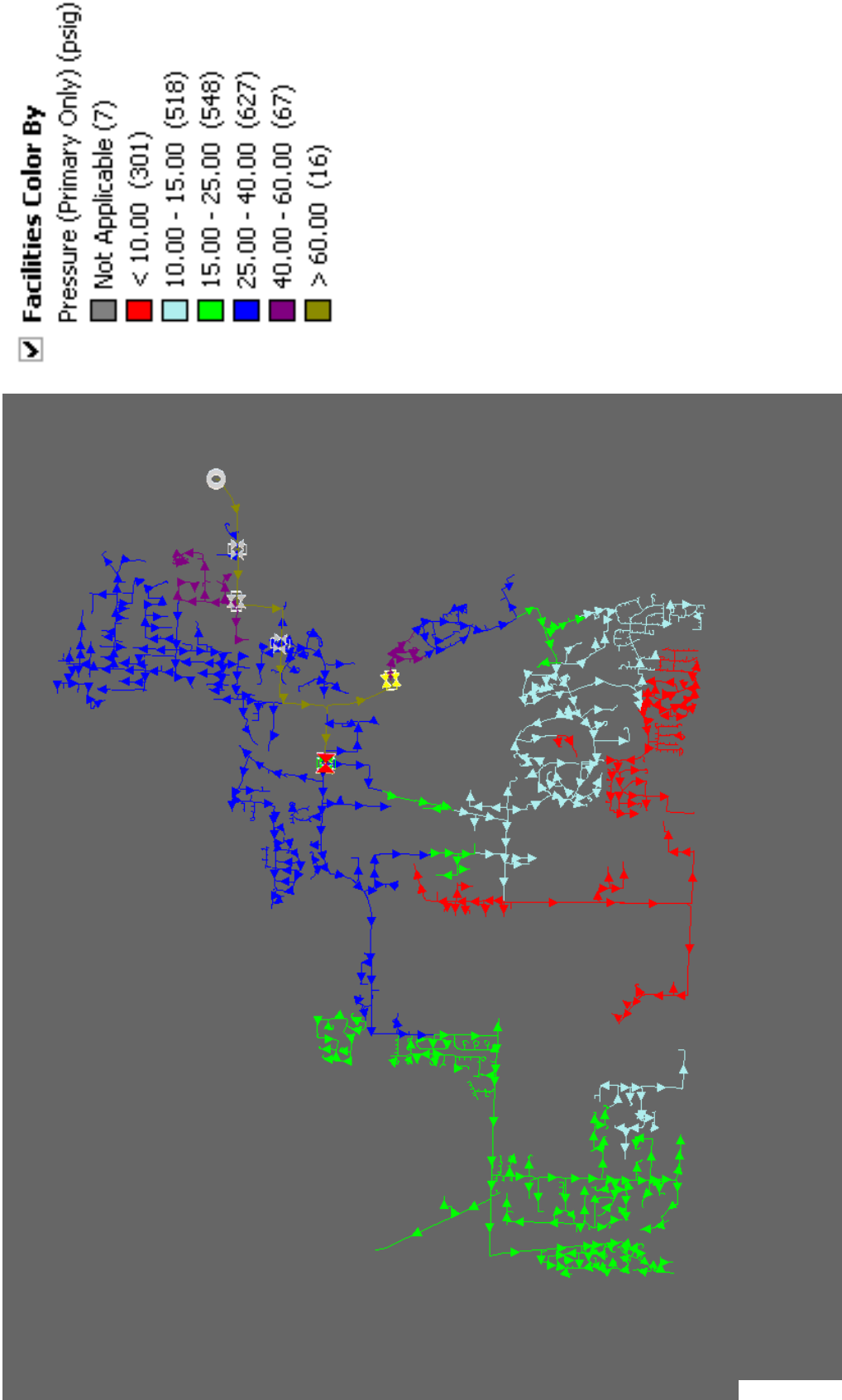
Additional Regulator Stations feeding the distribution system

New Strategically placed Gate Stations

Compressor Stations

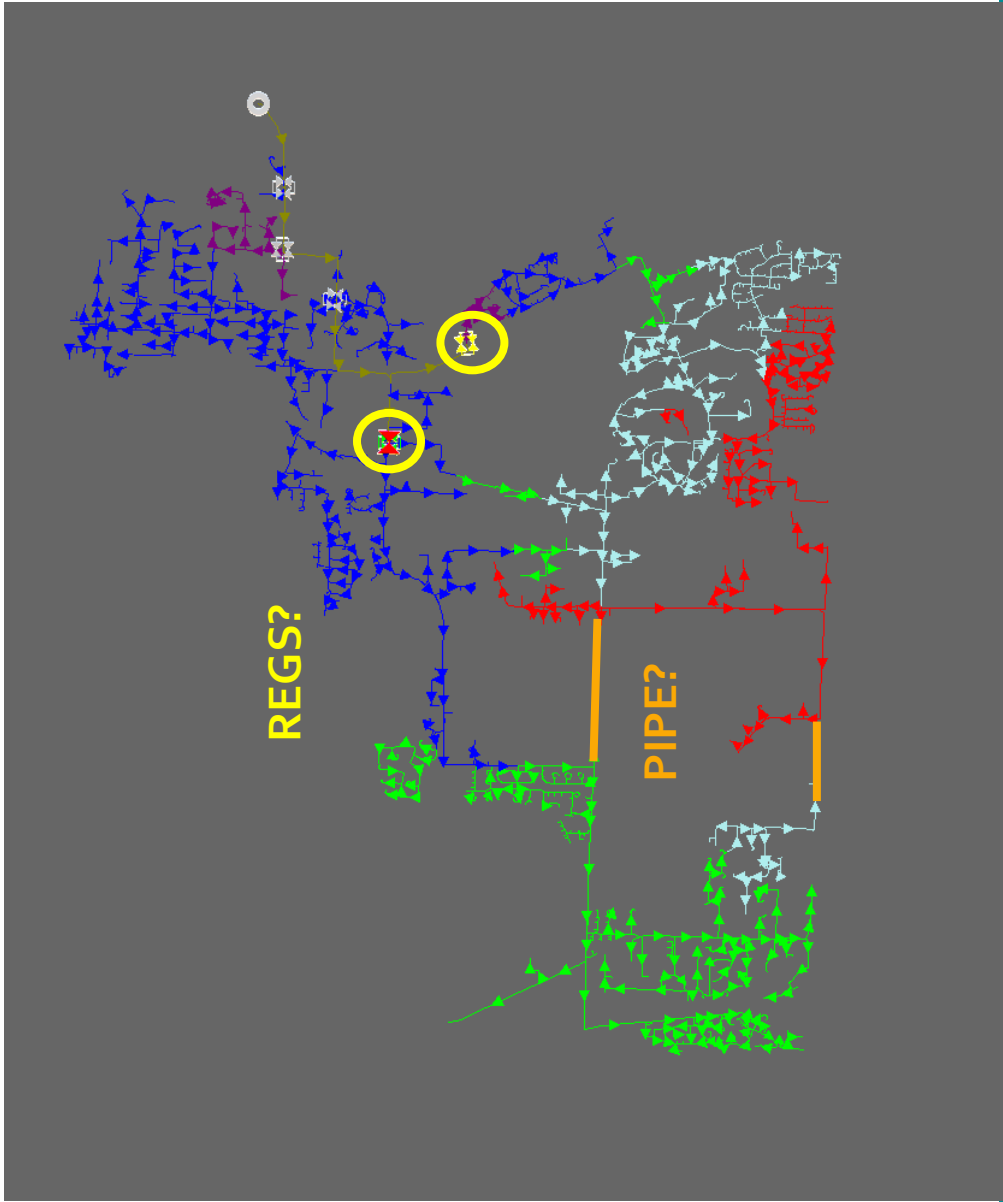
Distribution Enhancement Example

Theoretical low-pressure scenario



Distribution Enhancement Options

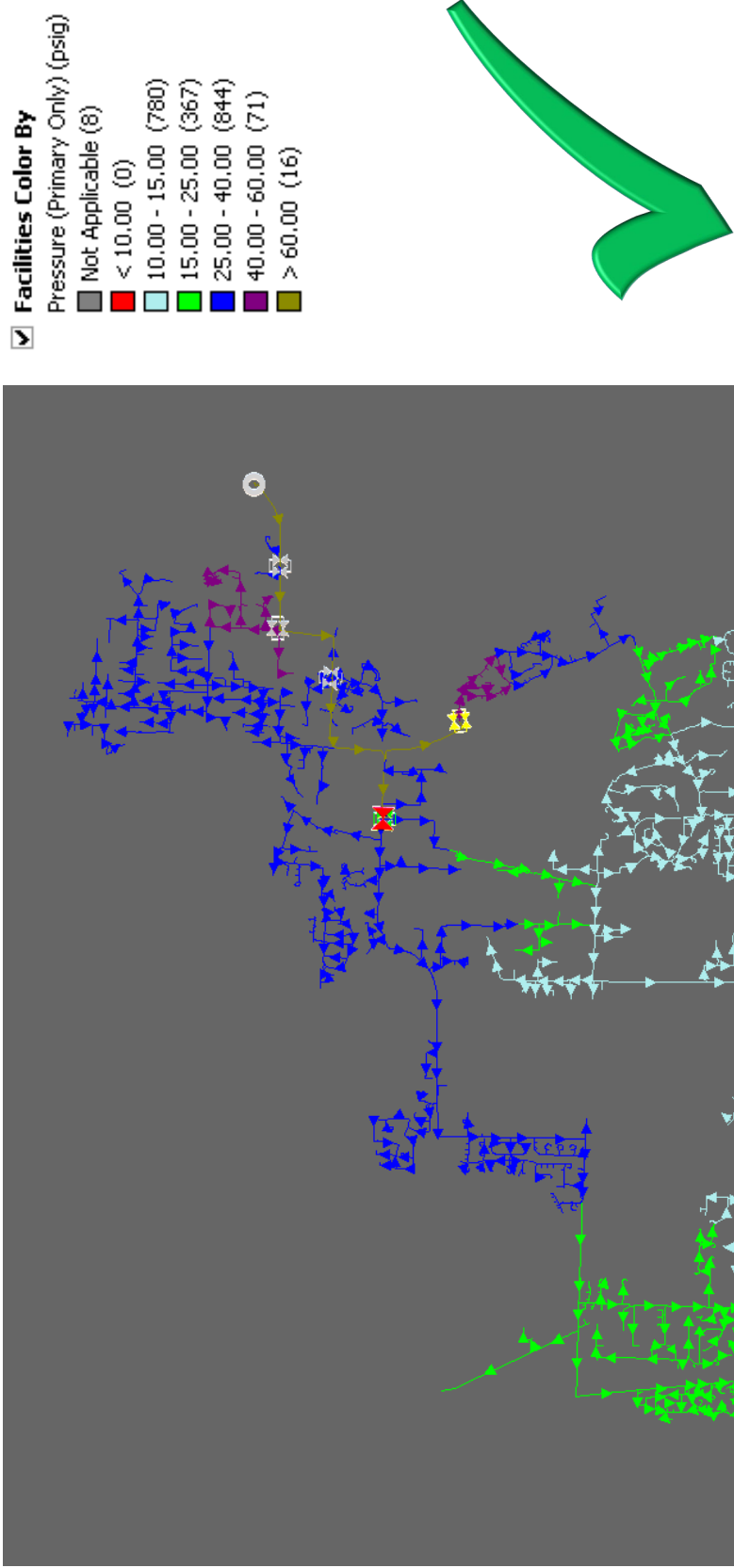
Low pressure scenario



- Compressor station infeasible
- Other Solutions?

Distribution Enhancement Options

Reinforcement option #2



Enhancements Considerations

Scope

Cost

Capacity Increase

Timing

System Benefits

Alternative Analysis

Enhancement Review and Selection Process to Capital Budget

Enhancement Selection Guidelines:

Shortest segment of pipe that addresses deficiency

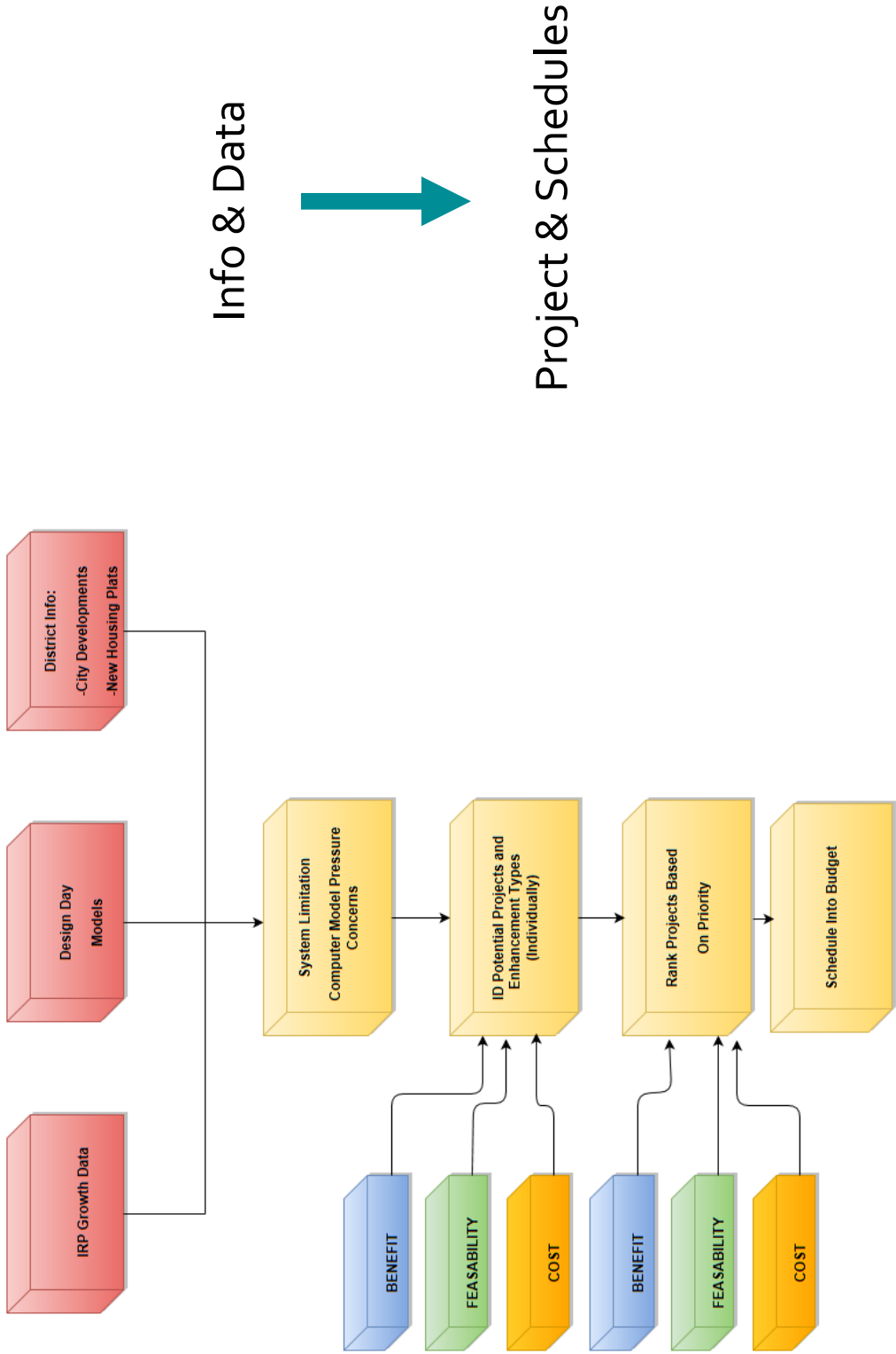
Segment of pipe with the most favorable construction conditions

Segment of pipe that minimizes environmental concerns and impacts to the community

Segment of pipe that provides opportunity to add additional customers

Total construction cost including restoration

Enhancement Selection Process:



Enhancements/Reinforcements Identified in 2025-2029 Capital Budget

2025-2029 WA Distribution Enhancements:

- Kitsap Phase V Pipeline Reinforcement
- Aberdeen 8-inch HP – Wishkah Rd
- Richland HP Reinforcements
- Pasco 6-inch HP Reinforcement
- Burlington South Feed Reinforcement
- Elma Gate

Kitsap Phase V Pipeline Reinforcement

Scope: 4 miles of 12-inch HP

Cost: \$690k in 2026 and \$6.9M in 2027

Timing:

- 2026 Design and Permitting
- 2027 Construction

Benefits: Completes 12-inch Loop from Shelton to Bremerton on 8-inch Kitsap Transmission Line (installed in 1963)

Alternative Considered: Supports long term system planning, ties into Phase IV and Phase III

Aberdeen 8-inch HP - Wishkah Rd

Scope: 9,000 ft of 8-inch HP

Cost: \$540k from 2023-2024 & \$7.1M in 2025

Timing: 2023-2024 Design/Permitting & 2025 Construction

Benefits: Provides capacity for continued growth in Aberdeen

Alternatives Considered: Uprating/reinforcing an existing HP system in addition to a gate station rebuild.

Richland HP Reinforcements

RICHLAND 12-INCH HP PHASE 2

RICHLAND Y GATE UPGRADE

Scope: 3.75 miles of 12-inch HP

Scope: Gate Upgrade

Cost: \$9.56M in 2025

Cost:

- CNG
- \$2.05M in 2025
- NWP
- \$4.53M in 2025

Timing: 2025 Construction

Timing: 2025 Construction

Benefits: Solves capacity deficit in Richland and provides a back feed to Richland HP

Alternatives Considered: Upgrading the Kennewick gate and replacing the 6-inch Richland HP lateral on Clearwater and Columbia Center

Pasco 6-inch HP Reinforcement

Scope: 5 miles of 6-inch HP

Cost: \$5.8M in 2025

Timing:

- 2025 Construction

Benefits: Addresses high pressure capacity deficit in Pasco

Alternatives Considered: Upgrade North Pasco gate and reinforce HP out of gate

Burlington South Feed Reinforcement

Scope: 15,000 ft of 6-inch PE and Reg Station

Cost: \$500k between 2022-2024 & \$1.1M in 2025

Timing:

- 2022-2024 Design and Permitting
- 2025 Construction

Benefits: Addresses low pressure issues in Burlington, loops system

Alternatives Considered: HP extension with a new reg station, no equivalent DP loops

Elma Gate Station

Scope: Second supply source to the Greys Harbor Lateral

Cost:

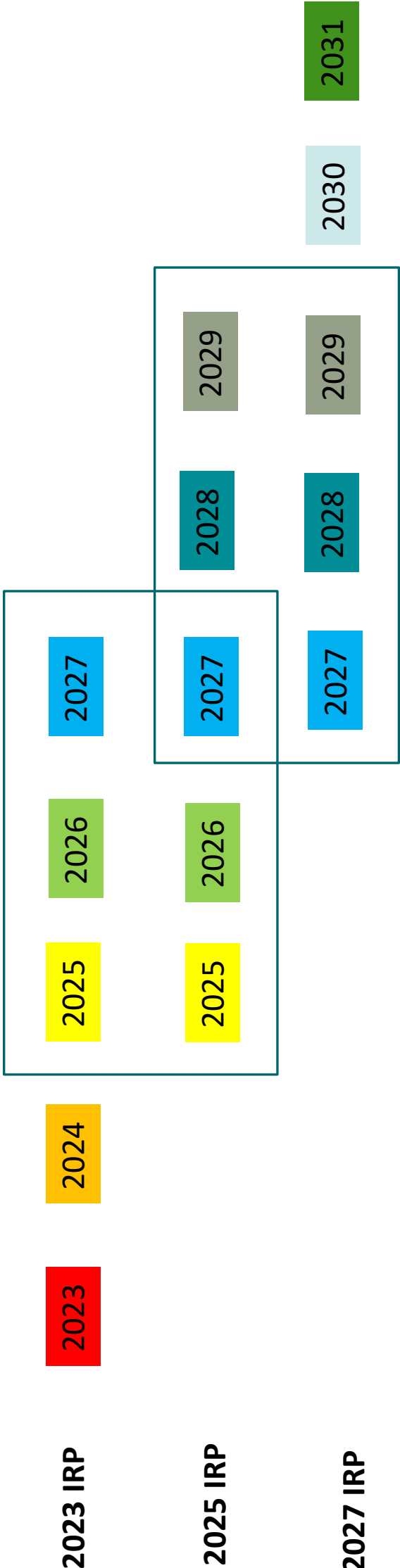
- CNG
- \$259k in 2027 & \$1.8M in 2028
- NWP
- \$520k in 2027 & \$3.7M in 2028

Timing: 2027 Design/Permitting & 2028 Construction

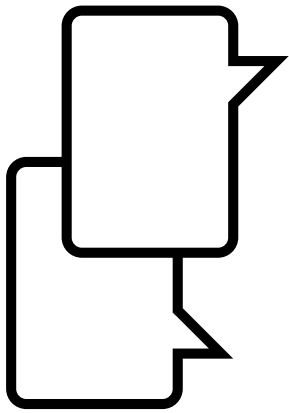
Benefits: Addresses high pressure issues in Aberdeen and provides redundancy to McCleary Gate

Alternatives Considered: Reinforce and or replace Greys Harbor Lateral

Iterative Process of IRP



Feedback for Cascade



2025 WA IRP Schedule

Process Item	Date	Process Element
Final Draft	Tuesday, March 4, 2025	
Comments Due	Tuesday, April 15, 2025	
TAG 5 (if needed)	Thursday, May 1, 2025	
Final Complete By	Friday, May 16, 2025	
File	Friday, May 23, 2025	



In the Community to Serve®

Integrated Resource Plan Technical Advisory Group Meeting #4

FEBRUARY 5, 2025

MICROSOFT TEAMS/TELECONFERENCE



In the Community to Serve®



2025 IRP TAG #4 Meeting

Date & time: 2/5/2025, 9:00 AM to 12:00 PM

Location: Microsoft Teams Meeting

Presenters: Brian Robertson, Chris Robbins, Zachary Sowards.

In attendance: Abbie Krebsbach, Alondra Regaldo, Bailey Steeves, Brian Robertson, Bruce Folsom, Byron Harmon, Caleb Reimer, Carolyn Stone, Carra Sahler, Chris Robbins, Dan Kirschner, Darcy Neigum, Devin McGreal, Eric Shierman, Eric Wood, Will Gehrke, Jennifer De Boer, Jodie Albert, Kim Herb, Mark Sellers-Vaughn, Matt Steele, Megan Koelzer, Michael Freels, Michael Meyers, Michael Parvinen, Noemi Ortiz, Patrick Darras, Patrick Hanks, Quinn Weber, Russ Nishikawa, Ryan Denton, Ryan Kern, Samantha Christenson, Shawna Nieraeth, Vigilija Klima, Zachary Sowards

Brian Robertson, Supervisor of Resource Planning, opened the meeting by welcoming and thanking stakeholders for participating in Cascade's IRP Process. He gave a brief overview of the meeting agenda before proceeding.

Presentation #1 – Safety Moment (Brian Robertson)

- Brian presented a safety moment, covering distracted driving. Tips include programming GPS before driving, turning off or silencing phones, and avoid eating/drinking while driving.

Presentation #2 – Resource Integration Results (Brian Robertson)

- Brian presents analysis and results of the different compliance options for Oregon and Washington. Included are graphs that show which types of compliance options are chosen by the optimization process (using PLEXOS).
- In Washington, reference case emission targets will be met with different types of allowances, offsets, carbon capture, and RTCs.
- Brian comments on the interplay of certain compliance options between Oregon and Washington.
- In Oregon, Cascade expects to meet reference case emission targets with allowances, CCIs, and RTCs. Brian comments on how the Company will likely take a more balanced

approach than what is suggested by PLEXOS since the CCA and CPP will likely continue past the end of the period that is considered in the optimization model, this is one example of how Cascade must take the suggestions from PLEXOS while also adapting where needed.

- Brian then covers the price by compliance take for the various options, providing a graphical representation of the option pricing over the planning period, noting that the lowest cost options in Washington are offsets and allowances.

Question (Quinn Weber): Quinn asks why there is a dip in auction prices around the year 2035.

Answer (Brian Robertson): Brian mentions that there are many compliance targets that have certain goals in 2035 that are contributing to the drop in price around this time. He also mentions that linkage could contribute to this price change also.

Question (Quinn Weber): Quinn asks if this comes from entities dropping out and thus lowers the prices.

Answer (Brian Robertson): Brian clarifies that they may not necessarily drop out, but not need as many.

- Brian continues to cover the Washington allowance price Monte Carlo results and the accompanying graph. The 200 simulations allow Cascade to better analyze and understand the ranges of potential allowance cost in the future.
- Brian then covers how those Monte Carlo results of allowance prices compare to the low carbon alternative fuel prices, noting that the allowance pricing is generally lower than these alternatives except in some cases for years toward the end of the planning period.

Question (Carra Sahler): “Can you talk a little bit about the cost of RTCs you used in Plexos that results in purchasing those RTCs now and banking allowances under the CPP? And are the RTCs just those associated with biomethane? Or are there RTCs you're including from other alternative fuels?”

Answer (Brian Robertson): Brian mentions that Landfill Gas (LFG) – 5 is what is being purchased early in these slides, noting the risks associated with these types of projects while also highlighting the cost effectiveness of them.

- Brian continues, covering which of the low carbon alternative fuels are taken, presenting a graph that shows the amounts and times in which the different types are taken. He also highlights that the presented analysis is not a “set it and forget it” type plan and that the company is constantly keeping tabs on current trends and changes in the industry, adjusting when opportunities arise.

Question (Quinn Weber): Quinn mentions that during the last TAG meeting it was mentioned that no carbon capture would come on by 2030 and asks if this is still the case.

Answer (Brian Robertson): Brian confirms that this is still the case as of now. He notes this is from conversations the Company has had, where currently there is uncertainty around this option. He reiterates that the Company is constantly keeping a finger on the pulse of all these options and will adjust accordingly if changes arise.

Question (Quinn Weber): Quinn then asks about thermal energy networks (TENS) and where they are in this mix.

Answer (Brian Robertson): Brian clarifies that since TENS is so new, it is hard to explicitly model this option due to the uncertainty around it and the lack of information on it.

Question (Quinn Weber): Quinn asks if it would be possible to model it as a more generic resource option.

Answer (Brian Robertson): Brian states that the Company could with information such as costs.

- Brian continues, covering the different customer growth scenarios (high customer growth and low customer growth) and how that impacts the various types of compliance options that are taken. He provides a graphical representation of these.

Question (Quinn Weber): Quinn notes the “demand” curve and the “demand less DSM” curve start at the same value but diverge more and more over time, asking what the assumption is behind this.

Answer (Brian Robertson): This is due to DSM being cumulative. An energy efficiency project today won’t just have savings potential for just today, but it will have savings potential for the lifetime of the appliance. Each year through the planning horizon Cascade anticipates adding more and more DSM projects so each year will have savings from prior years as well as the savings from the current year.

Question (Carra Sahler): Carra seeks to clarify that if there is high customer growth, the model is buying RTCs earlier so that the Company can bank more allowances for future use, and if the cost being minimized is the RTC pricing.

Answer (Brian Robertson): Brian confirms that it is the RTC price in the future that is being minimized. He also reiterates that the Company will likely adjust what the model suggests by smoothing the amount of banking of allowances to take a more balanced approach.

Question (Carra Sahler): Carra asks if the forecasted pricing of the RTCs comes from the ICF study.

Answer (Brian Robertson): Brian confirms that the pricing forecast does come from the ICF study.

- Brian continues, covering the residential bill impacts for Oregon and Washington. He also provides a graphical representation to show the forecasted changes in the average monthly bill and the annual incremental cost. The graph includes a curve for an “as-is” case (no carbon compliance obligations), a reference case (to show the impacts of meeting the carbon compliance obligations), and annual incremental cost. He also talks about how these are integrated into the electrification modeling process as well.

Question (Will Gehrke): Will asks about rate base growth outside of just increases due to carbon compliance and if that is accounted for in these graphs.

Answer (Brian Robertson): Brian clarifies that the graphs shown are of reference case scenarios (which include costs such as O&M).

Question (Kim Herb): Kim asks if these graphs reflect any reduction in customers scenarios.

Answer (Brian Robertson): Brian reiterates that these graphs show the reference case, which is different from the low customer growth scenario that the Company also analyzes and plans for, mentioning that those graphs are not available, but the goal is to have them ready for the March draft filing.

- Brian continues, covering the low carbon alternative fuels Monte Carlo pricing. He goes over the minimum price and the maximum price for years in from 2025-2050 in five-year increments. He shows two types in the slides and highlights both the wide range between the minimum and the maximum and how this range increases over time due to increased uncertainty. He mentions that the Company received 1,000 different draws from ICF but chose only 200 of them due to constraints.

Question (Quinn Weber): Quinn asks how the 200 that were used were chosen.

Answer (Brian Robertson): Brian clarifies that the Company used the first 200 draws that were provided. He further comments that other methods were explored and more methods for choosing 200 draws will be explored further. He also mentions that all this type of information will be provided in the IRP appendices.

- Brian continues, presenting a table that shows different alternative fuel types and which years they were first chosen over the 50 Monte Carlo simulations that have so far been ran. This highlights the variability in when certain fuel types can be chosen in the model.
- Brian then covers Monte Carlo simulations around Washington and Oregon residential impacts. The 50 samples ran resulted in a range of about \$20-\$40 in terms of average monthly bill impacts.

Presentation #3 – Incremental Supply Side Resources (Chris Robbins)

- Chris covers the current storage accounts (Jackson, Plymouth, and Mist) and the capacity of them. He then covers a new storage contract, which should begin service in mid-2029 with a 25-year term. He also covers the expected storage volumes for this new contract.
- Chris explains the logic behind why Cascade needs more storage capacity. This includes price arbitrage opportunities and the flexibility it provides during winter peaks.

Question (Carra Sahler): Carra asks for an update on Cascade's contract with GTN Xpress.

Answer (Chris Robbins): Chris clarifies that is in full service.

Question (Kim Herb): Kim asks what signal the Company gets to indicate that something different needs to happen in terms of storage.

Answer (Chris Robbins): Chris explains that the main pipelines in the service area are maxed out and fully contracted, thus there is little ability to operate outside of normal conditions, thus any negative

shock can throw the entire system off. Having storage helps mitigate those risks and helps avoid penalties, which help shield customers.

Question (Byron Harmon): Byron asks how the idea of needing more storage aligns with the IRP reference case of a gradual downward trend in demand.

Answer (Chris Robbins): Chris talks about how more storage is different from additional pipeline capacity to serve more, the storage allows for more of a cushion for the customers. Thus, even with less customers or demand the storage still provides the intended cushion against price spikes.

Question (Byron Harmon): Byron asks if increasing storage for the stated intended purposes is something that PLEXOS can do.

Answer (Brian Robertson): Brian states that it can optimize for that. Brian then mentions the issues that PLEXOS faces, such as not handling OFO orders well or certain flow restrictions that may arise. He also mentions that when the Company ran Monte Carlo with and without storage expansion, it showed a total lower system cost with the storage.

Question (Carra Sahler): Carra asks about the Company's historical approach to storage and why this wasn't done earlier.

Answer (Chris Robbins): Chris talks about how the Company has been looking for storage for a long time and how opportunities in California haven't made sense from a cost and operation viewpoint. He also mentions how all the storage in the area is utilized and thus the only opportunity for more storage comes from new projects.

Presentation #4 – Distribution System Planning (Zachary Sowards)

- Zachary covers system dynamics, including the various traits of piping and how much of it is in Washington and Oregon. He also covers facilities, and system design. He explains how the company uses Synergy Gas modeling software to analyze the various variables involved in the distribution system before providing an example.
- Zachary explains that the Synergy models used are rebuilt every three years and are maintained/updated between the rebuilds. He also explains the variables that go into the modeling process, how the data is gathered, and how the data is used.

Question (Byron Harmon): Byron asks what assumptions are made when modeling individual customers.

Answer (Zachary Sowards): Zachary explains that the modeling is done on a per customer basis. The Customer Management Module (CMM) uses historical building data and historical weather data to build linear regressions. He then explains the linear regressions.

Question (Byron Harmon): Byron asks about the standard deviation of residential customer gas consumption.

Answer (Zachary Sowards): Zachary explains that such statistics are produced with each model, and he can get that to Byron.

Presentation #5 – Identification of System Deficits/Constraints (Zachary Sowards)

- Zachary explains the capabilities of the Synergy modeling software and what it is used to model, including but not limited to RNG, large volume customer requests, system reliability, and IRP predicted growth.
- Zachary explains what a capacity deficit is and the distribution system modeling process.

Presentation #6 – Distribution Enhancement/Reinforcement Options to Address Deficits (Zachary Sowards)

- Zachary covers some of the enhancement options, including but not limited to pipeline replacements or reinforcements, facility upgrades, and compressor stations. He then goes over an example of what an engineer may go through when modeling a situation using the Synergy software. He also covers what considerations must be considered when evaluating different enhancement or reinforcement options and the selection guidelines that are used to decide.

Question (Byron Harmon): Byron asks about the environmental concerns and impacts that are considered in this process and how they align with the cost benefit and engineering goals.

Answer (Zachary Sowards): Zachary explains that the engineering works with the environmental group in the selection process previously covered, using those types of inputs in the process.

Presentation #7 – Enhancements/Reinforcements Identified in 2025-2029 Capital Budget (Zachary Sowards)

- Zachary covers the various enhancement projects that have been identified over the next 5 years. He then dives into more detail about projects, including information such as cost, timing, benefits, and alternatives that were considered. He also covers an addition gate station to take place and the iterative process of the IRP.

Post Presentations –

- Brian Robertson opens the meeting up for any questions or feedback.

Question (Carra Sahler): Carra asked if non-pipeline alternatives were considered in the distribution system planning analysis.

Answer (Zachary Sowards): Zachary explains that many of these projects are supporting projects of other projects that have been completed before. Zachary also mentioned that many of these projects

are projects that are identified to be needed immediately and may not have enough time for non-pipe alternatives.

Question (Carra Sahler): Carra asked if there is a way to manage DSM analysis in a way that allows for consideration of a variety of alternatives so that it is not an immediate need that results in a pipeline solution.

Answer (Brian Robertson): Brian explains that distribution system costs are included in the avoided cost, so future projected pipeline costs are included in the DSM model. He also explains that DSM needs more time but that the Company is still considering various approaches.

- Brian Robertson goes over the 2025 Washington IRP schedule, requesting feedback as soon as possible, and no later than April 15th, to allow time for the Company to incorporate feedback into the IRP.

The Meeting was Adjourned

Per Cascade Commitment #8 (Stakeholder Engagement Design Document, 2/22,2022: “Provide TAG minutes that include the action items from bullet #7 as well as any upcoming deadlines for feedback on the IRP”), here are additional action items to track, coming out of the TAG meeting:

1. Cascade will consider adding graphs to show the dynamics before and after reinforcements for each of the reinforcements over the next 5 years that visually show the justification for them.
2. Cascade will continue to consider ways to identify potential capacity and distribution system deficits earlier than when they become an immediate need.



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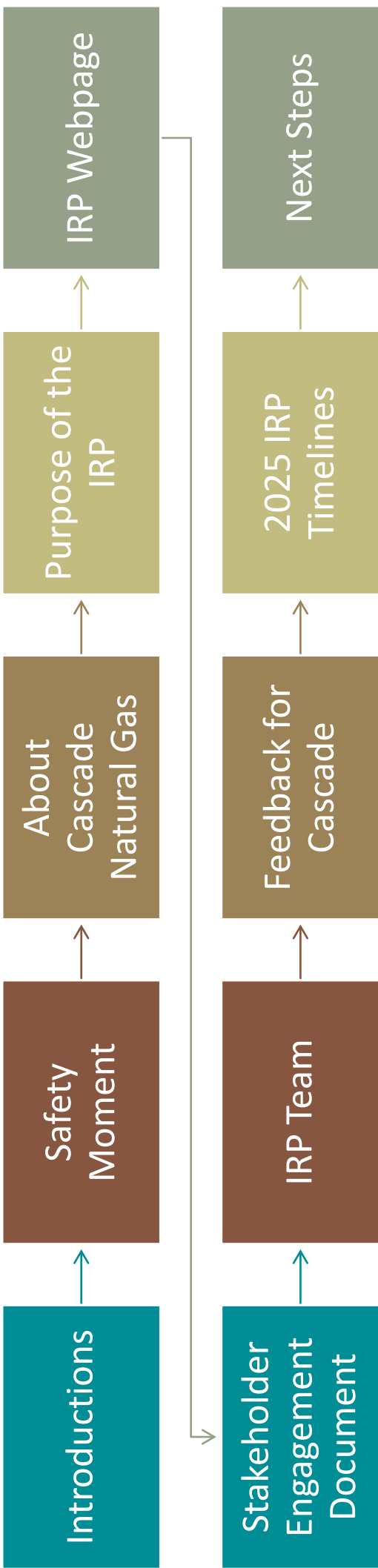
Integrated Resource Plan Targeted Technical Advisory Group Meeting #1

JANUARY 25, 2024

MICROSOFT TEAMS/TELECONFERENCE



Agenda

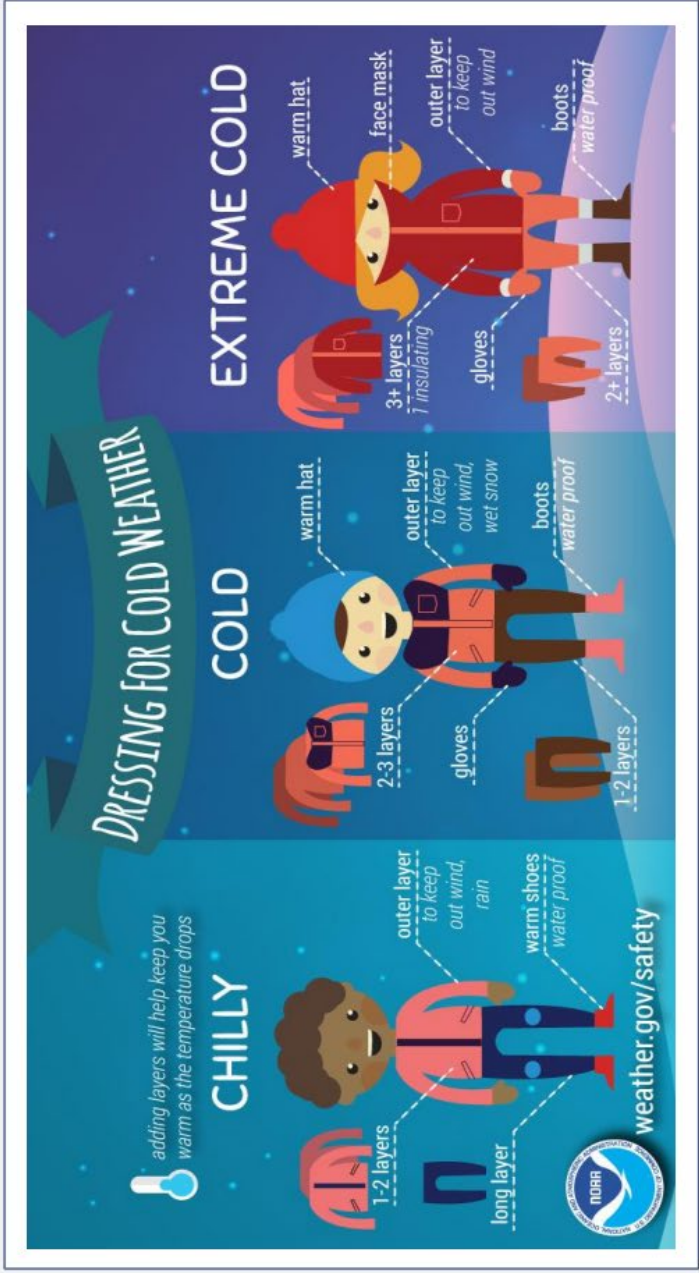


Safety Moment

Winter Safety – Protecting Yourself from the Cold

What you wear in winter can make the difference in protecting yourself from the cold and preventing frostbite and hypothermia.

- Keep your head warm with a hat
- Cover mouth with face mask or scarf to protect your lungs
- Outer coat should be tightly woven and water repellant
- Wear several loose-fitting, lightweight warm layers
- Wear mittens; they are warmer than gloves
- Wool socks and waterproof boots keep feet warm



A Little History Lesson...

- Prior to 1955, natural gas was virtually unheard-of in the Pacific Northwest. Seeing an opportunity, Lester Pettit, Spencer Clark, and Stewart Matthews led a group of associates to form a company that would rise to the challenge. Cascade Natural Gas Corporation was incorporated January 2, 1953.
- In July 2007, Cascade was acquired by MDU Resources headquartered in Bismarck, ND.
 - Founded in 1924 as an electric utility.
 - Core businesses are gas & electric utilities, and pipeline.
 - Approximately 11,000 employees, operating in 43 states.
 - Operates four utilities across eight states:
 - Montana-Dakota Utilities Co.
 - Great Plains Natural Gas Co.
 - Cascade Natural Gas Corporation
 - Intermountain Gas Co.



Today We Are...

Cascade serves more than 316,350 customers in 95 communities – 67 of which are in Washington and 28 in Oregon. Cascade’s service areas are concentrated in western and central Washington and central and eastern Oregon.

Cascade serves a diverse territory covering more than 32,000 square miles and 700 highway miles from one end of the system to the other. Interstate pipelines transmit Cascade’s natural gas from production areas in the Rocky Mountains and western Canada.



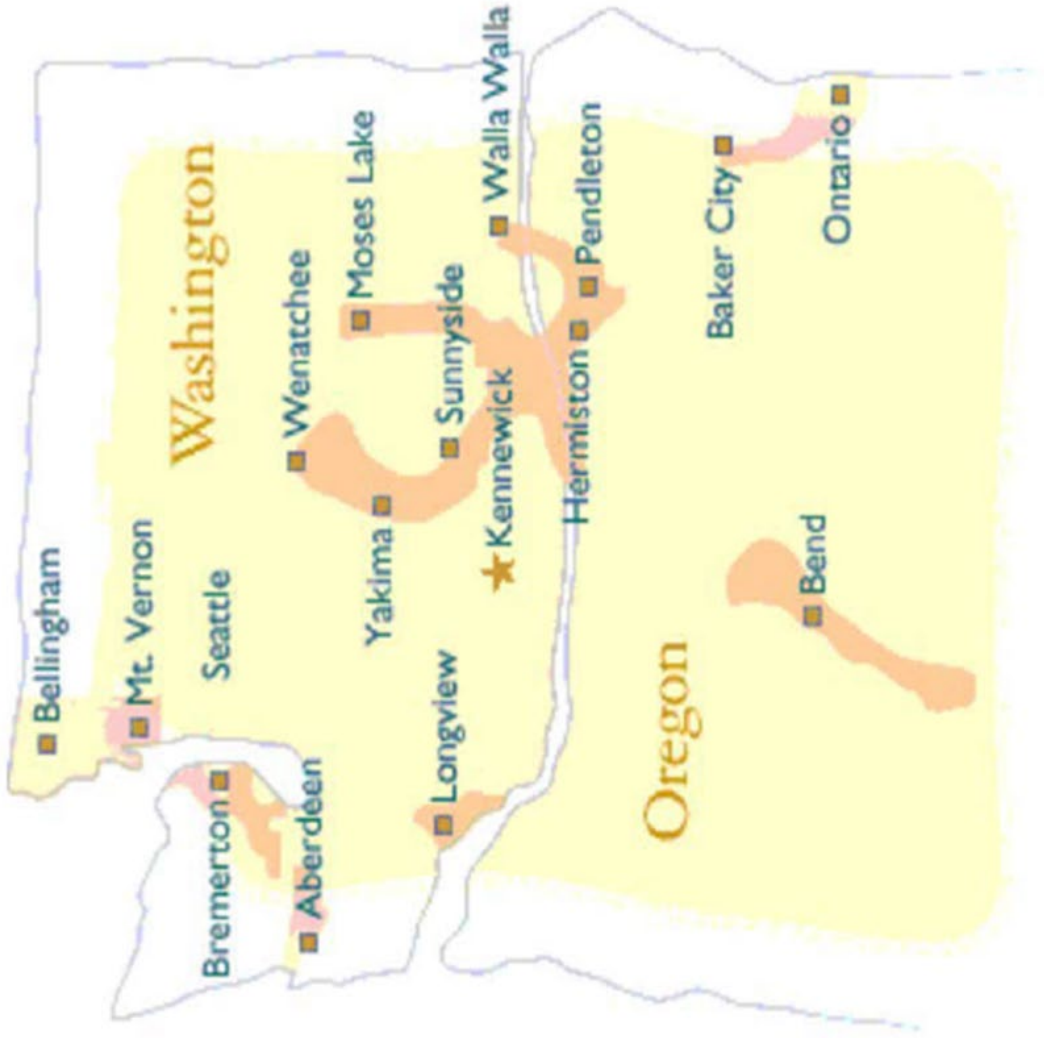
CASCADE

NATURAL GAS

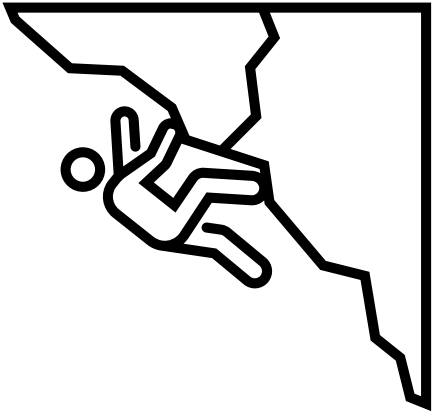
C O R P O R A T I O N

A Subsidiary of MDU Resources Group, Inc.

In the Community to Serve®



Purpose of IRP



IRP Guidelines and Content



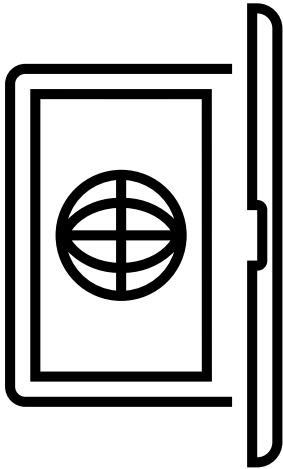
Washington

- IRP Guidelines from WUTC WAC 480-90-238.

Cascade’s Basic Philosophy

- Primary purpose of Cascade’s long-term resource planning process has been, and continues to be, to inform and guide the Company’s resource acquisition process, consistent with state regulatory requirements.
- Input and feedback from the Company’s Technical Advisory Group (TAG) is an important resource to help ensure that CNGC’s IRP is developed from a broader perspective than Cascade could have on its own.
- As the scope of the IRP continues to expand, Cascade is committed to securing and supporting the appropriate internal and external resources necessary to work with all stakeholders to produce an Integrated Resource Plan that meets the requirements of Washington and Oregon.

IRP Webpage





Cascade Home » Rates & Services » Rates & Tariffs » Washington Integrated Resource Plan

WASHINGTON | CASCADE NATURAL GAS | NATURAL GAS – INTEGRATED RESOURCE PLAN

The What: Cascade's Integrated Resource Plan describes the two- to four-year and twenty-year expectation of how Cascade expects to safely serve customers' energy needs at the lowest reasonable and safe cost. The analyses in this 12–18-month process includes existing and potential new pipelines and natural gas supply contracts (among others) as well as benefits of energy efficiency to customers. The IRP provides comprehensive and transparent insight into how Cascade plans for customers' energy future. To view what an IRP looks like, please see Previous Years' IRP at the bottom of the page. The Executive Summary and Key Points are designed to provide a quick, but descriptive, explanation of the process and plan.

The Who: Customers and the general public are invited to participate in a series of meetings on the variety of topics contained in the IRP, including energy efficiency and carbon emission reductions. Together, customers and the general public participating in the IRP process are called Stakeholders. Stakeholders also include the professional analytical staffs of the state utility commissions and groups representing residential and industrial customers. Community-based organizations and independent experts also attend the series of meetings.

How it works: The IRP process begins with a kick-off meeting to lay out the 12-18 month schedule of four to six meetings as well as provide an overview of what issues will be covered. These meetings are called Technical Advisory Group meetings or TAGs. Links are available to the TAG presentations, minutes, and written responses to Stakeholder's requests and comments.

What to expect: Expectations of participants and tips for the best way for Stakeholders (including customers and the general public) are described in Cascade's Stakeholder Engagement Design Document. This is a "living document" and suggestions for improvement are welcome.

Sign up! Join Cascade's distribution list. You may participate in multiple ways, ranging from attending the TAG meetings (either in-person or remotely) and receiving the agendas/presentations to opportunity to comment. Do so by contacting the Supervisor of Resource Planning, Brian Robertson at either Brian.Robertson@cngc.com or (509) 221-9808. You may also contact the Company's IRP email address at irp@cngc.com. Cascade uses MTeams as its means to connect participants remotely. MTeams is a free application to be used by Stakeholders including customers and the general public.

Accommodations: As shown as point #1 on page 2 of the Stakeholder Engagement Design Document, Cascade will provide reasonable accommodations for people with disabilities. Additionally, the Company will reasonably accommodate items such as requests for meeting locations, audio and visual capabilities, and other items requested by external stakeholders. If you have a request for accommodations, please reach out to one of the contacts listed above and the Company will gladly coordinate any reasonable requests for accommodations.

Pre- and Post-IRP feedback report:

[Washington Integrated Resource Plan - Cascade Natural Gas Corporation \(cngc.com\)](https://www.cngc.com/washington-integrated-resource-plan)

What, Who, How?
Information on Cascade's IRP can be found on the Company's webpage.

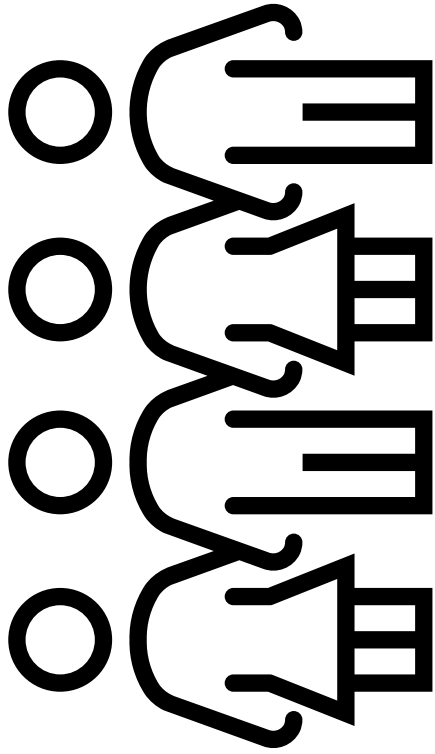
Stakeholder Engagement Design Document

Pre- and Post-IRP Feedback Report

IRP Timeline

Previous IRPs





Stakeholder Engagement Document

“Cascade seeks to employ best industry practices and recognizes external participation can add incremental improvements.

Cascade recognizes stakeholders have a multitude of projects before them. This Design Document is intended to assist in optimizing participation by interested parties to yield a solid IRP to the benefit of customers and the Company.”



In the Community to Serve®

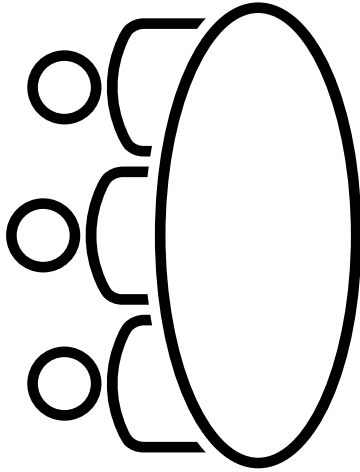
CASCADE NATURAL GAS STAKEHOLDER ENGAGEMENT DESIGN DOCUMENT

Abstract

This document contains the rational, assumptions, and explanation behind the Stakeholder Engagement process of Cascade’s IRP Process



In the Community to Serve®



IRP Team

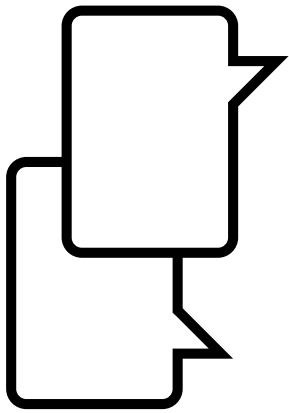
INTERNAL TEAM MEMBERS OF CNGC’S INTEGRATED RESOURCE PLAN

LAST NAME	FIRST NAME	TITLE	COMPANY
Blattner	Lori	Director, Regulatory Affairs	Cascade/Intermountain
Burin	Kary	Supervisor, Conservation	Cascade
Campbell	Kathleen	Senior Engineer	MDU
Chiles	Mark	Vice President, Customer Service and Regulatory Affairs	Intermountain
Darras	Patrick	Vice President, Engineer & Operations Services	MDU
De Boer	Jenny	Resource Planning Economist I	Cascade
Folsom	Bruce	Consultant	Bruce W Folsom Consulting LLC
Forrester	Gabe	Manager, Environmental Compliance and Sustainability	Cascade
Goodman	Chad	Enterprise Endpoint Administrator, Associate	MDU
Hodges	Becky	Financial Analyst IV	Cascade
Hoyle	Brian	Financial Analyst II	Cascade
Krebsbach	Abbie	Director, Environmental	MDU
Madison	Scott	Executive Vice President, Business Development and Gas Supply	MDU
Marek	Chanda	Director, Business Development and Energy Services	Cascade

INTERNAL TEAM MEMBERS OF CNGC’S INTEGRATED RESOURCE PLAN

LAST NAME	FIRST NAME	TITLE	COMPANY
McGreal	Devin	Renewable Resources Manager	Cascade
Nishikawa	Russ	Manager, Engineering Services	MDU
Nygard	Tammy	Controller	MDU
Ortiz	Noemi	Manager Energy Efficiency Programs	Cascade
Parvinen	Mike	Manager, Regulatory Affairs II	Cascade
Reimer	Caleb	Manager Energy Efficiency Programs	Cascade
Robbins	Chris	Director, Gas Supply	Cascade/ Intermountain
Robertson	Brian	Manager, Supply Resource Planning	Cascade
Sellers-Vaughn	Mark	Upstream Resources & Special Projects Manager	Cascade
Senger	Garret	Chief Utilities Officer	MDU
Sowards	Zachary	Engineer III	MDU
Spector	Alyn	Manager, External Affairs	Cascade
Steeves	Bailey	Resource Planning Economist I	Cascade
Stone	Carolyn	Gas Supply Analyst III	Cascade
Wood	Eric	Manager, Gas Supply	Cascade/ Intermountain

Feedback for Cascade



How can Cascade make IRPs more accessible?

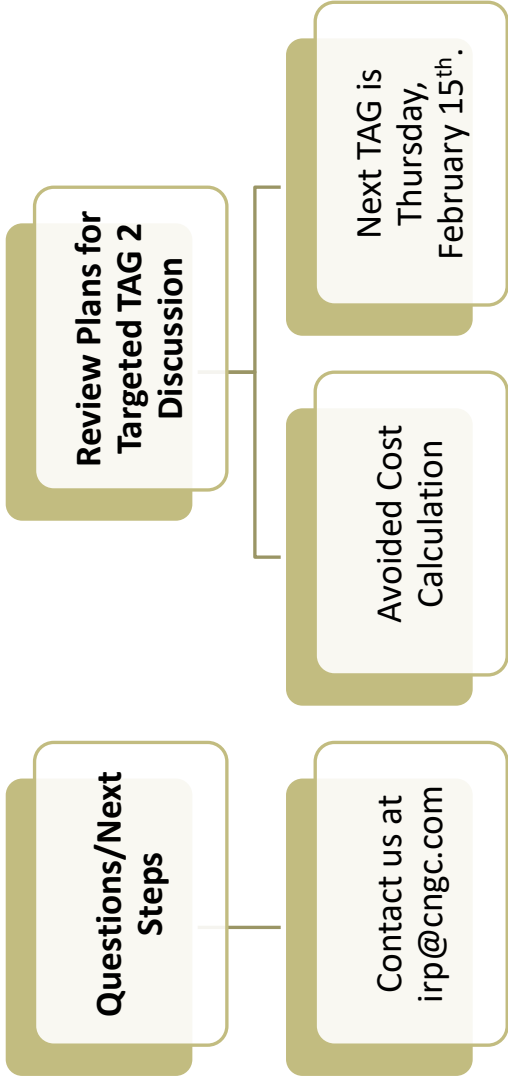
What are the barriers for people to join TAG meetings?

What are the barriers for people to participate in the IRP Process?



2025 CNGC IRP Process Item	Date	Process Element
Targeted-TAG	Thursday, January 25, 2024	What is an IRP and how to get involved
Targeted-TAG	Thursday, February 15, 2024	Avoided Cost
Targeted-TAG	Wednesday, March 6, 2024	Energy Efficiency
Targeted-TAG	Thursday, March 28, 2024	Equity in the IRP
Targeted-TAG	Thursday, April 11, 2024	Distribution System Planning
Targeted-TAG	Thursday, April 25, 2024	CCA/Compliance Modeling
Targeted-TAG	Thursday, May 16, 2024	Customer/Load Forecast
Targeted-TAG	Friday, May 31, 2024	Resource Integration
		Process, Key Points, IRP Team, Timeline, Regional Market Outlook, Planned Scenarios and Sensitivities, Stakeholder Engagement, Demand and Customer Forecast and Non-Core Outlook, Drilling down into segments of demand forecast.
TAG 1	Thursday, June 13, 2024	Upstream Pipeline presentation.
Receive feedback on TAG 1	Friday, June 28, 2024	
		Respond to TAG 1 Feedback, Distribution System Planning, Alternative Resources, Price Forecast, Avoided Costs, Current Supply Resources, Transport Issues, Carbon Impacts, Energy Efficiency, Bio-Natural Gas, Preliminary Resource Integration Results.
TAG 2	Thursday, July 25, 2024	
Receive feedback on TAG 2	Friday, August 9, 2024	
First Draft	Friday, September 6, 2024	
Comments Due	Friday, October 4, 2024	
		Respond to TAG 2 feedback, Final Integration Results, finalization of plan components, Proposed new 2- to 4-year Action Plan
TAG 3	Wednesday, October 30, 2024	
Final Draft	Tuesday, December 3, 2024	
Comments Due	Tuesday, January 14, 2025	
TAG 4 (if needed)	Thursday, January 30, 2025	
Final Complete By	Friday, February 14, 2025	
File	Monday, February 24, 2025	

2025 WA IRP Schedule





In the Community to Serve®

Integrated Resource Plan Targeted Technical Advisory Group Meeting #1

JANUARY 25, 2024

MICROSOFT TEAMS/TELECONFERENCE



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Targeted TAG #1 – TAG Meeting

Date & time: 01/25/2024, 9:00 AM to 10:00 AM

Location: Microsoft Teams Meeting

Presenters: Brian Robertson

In attendance: Abbie Krebsbach, Abdallah Abe, Alessandra De La Torre, Bailey Steeves, Brian Robertson, Bruce Folsom, Caleb Reimer, Carolyn Stone, Chris Robbins, Devin McGreal, Eric Wood, Freels Michael, Jeff Endler, Jennifer DeBoer, Kary Burin, Kathleen Campbell, Lori Blattner, Mahon Walsh, Mark Chiles, Mark Sellers-Vaughn, Megan Koelzer, Michael Parvinen, Patrick Darras, Paul Barrager, Quinn Weber, Rachel Preece, Renie Sorensen, Russ Nishikawa, Samuel Crawford, Scott Madison, Shawna Nieraeth, Singh Nicole, Travis Hey, Will Gehrke

Brian Robertson, Supervisor of Resource Planning, opened the meeting by welcoming and thanking stakeholders for participating in Cascade's IRP Process. Brian then proceeded with introductions.

Question: Will Gehrke asked if the meetings are being recorded.

Answer: Devin McGreal responded over chat that he believes they will be to those who are unable to attend. Brian also responded that the recording will also be posted on Cascade's webpage.

Presentation #1 – Safety Moment (Brian Robertson)

- Brian Robertson gave a quick safety moment on winter safety.

Presentation #2 – About Cascade Natural Gas (Brian Robertson)

- Brian presented a brief history and overview of Cascade including Cascade's founding, acquisition by MDU Resources, and current service territory.

Presentation #3 – Purpose of the IRP (Brian Robertson)

- Brian described the purpose of the IRP, being to inform and guide the Company's resource acquisition process consistent with state regulatory requirements. Cascade plans to use feedback from TAG meetings to improve the IRP.

Presentation #4 – IRP Webpage (Brian Robertson)

- Brian opened Cascade's website and directed the group on how to find the IRP webpage. The IRP describes the two- to four-year and 20-year expectation of how cascade expects to safely serve customers energy needs at the lowest reasonable and safe cost. He emphasized the importance of public participation during these TAG meetings. He also explained how Cascade plans to address the feedback given. The full TAG meeting schedule is available on Cascade's website as well as links to previous IRPs. Appendices may also be made available upon request.

Question: Quinn Weber asked to post the link to the stakeholder engagement document.

Answer: Brian sent the link via meeting chatroom.

Presentation #5 – Stakeholder Engagement Design Document (Brian Robertson)

- Brian explained the importance of the stakeholder engagement design document in that it is for aligning perspectives for maximizing the effectiveness, influence, and amount of contributions from stakeholders. It's important to ask methodology and technical questions early in the process to allow Cascade time to make any changes. The desired result is to be confident in the quality of the draft IRP with feedback from external stakeholders to ensure the final draft exceeds expectations.
- Brian asked if Bruce Folsom had anything he'd like to add.
- Bruce explained how cascade has tried to make it as easy as possible for the public to give input and encouraged the public to reach out to any member of the Resource Planning team if there are any questions.

Presentation #6 – IRP Team (Brian Robertson)

- Brian quickly showed the list of those involved with the IRP process, including those who will be presenting during TAG meetings.

Presentation #7 – Feedback for Cascade (Brian Robertson)

- Brian allowed a moment for feedback.

Question: Abe Abdallah explained the need for analysts to see data before the filing of the IRP. He asked what Brian's view is on sharing data pre-filing.

Answer: Brian responded that is something Cascade will consider.

Question: Quinn Weber asked what amount of the documents that come out of this process will be available in other languages.

Answer: Brian explained that he doesn't believe there will be any documents necessarily, but it is currently under consideration. The equity advisory group has emphasized the importance of this accessibility. He showed how that on the website there is a button in the bottom left corner of the webpages to change the page language.

Answer: Bruce Folsom mentioned, in response to Abe's question, we are moving the draft up earlier to give people quicker access to data before the filing of the final draft.

Question: Rachel Preece asked if it's expected that the meetings with continue at the same time during later dates since she is located on the east coast and earlier meetings are more convenient.

Answer: Brian responded that they would try their best to be accommodating to varies time schedules and added that Cascade is open to feedback on the time of meetings.

Presentation #8 – 2025 IRP Timeline (Brian Robertson)

- Brian explained that the Customer Load Forecast Targeted TAG meeting date will be switched with the Distribution System Planning meeting.
- The Resource Integration TAG meeting will now be Thursday, May 30th, not Friday, May 31st.
- There is an option for a TAG 4 meeting if there are more questions.

Post Presentations – No comments or questions were made by external stakeholders.

The Meeting was Adjourned

Per Cascade Commitment #8 (Stakeholder Engagement Design Document, 12/4, 2023: "Provide TAG minutes that include the action items from bullet #7 as well as any upcoming deadlines for feedback on the IRP"), here are additional action items to track, coming out of the TAG2 meeting:

1. Cascade will consider continuing having TAG meetings early in the day to accommodate those on the East Coast.
2. Cascade will look into improving accessibility in offering materials in other languages.
3. Cascade requests feedback from first TAG meeting no later than Friday, June 28th.



In the Community to Serve®

Integrated Resource Plan

Targeted Technical Advisory Group

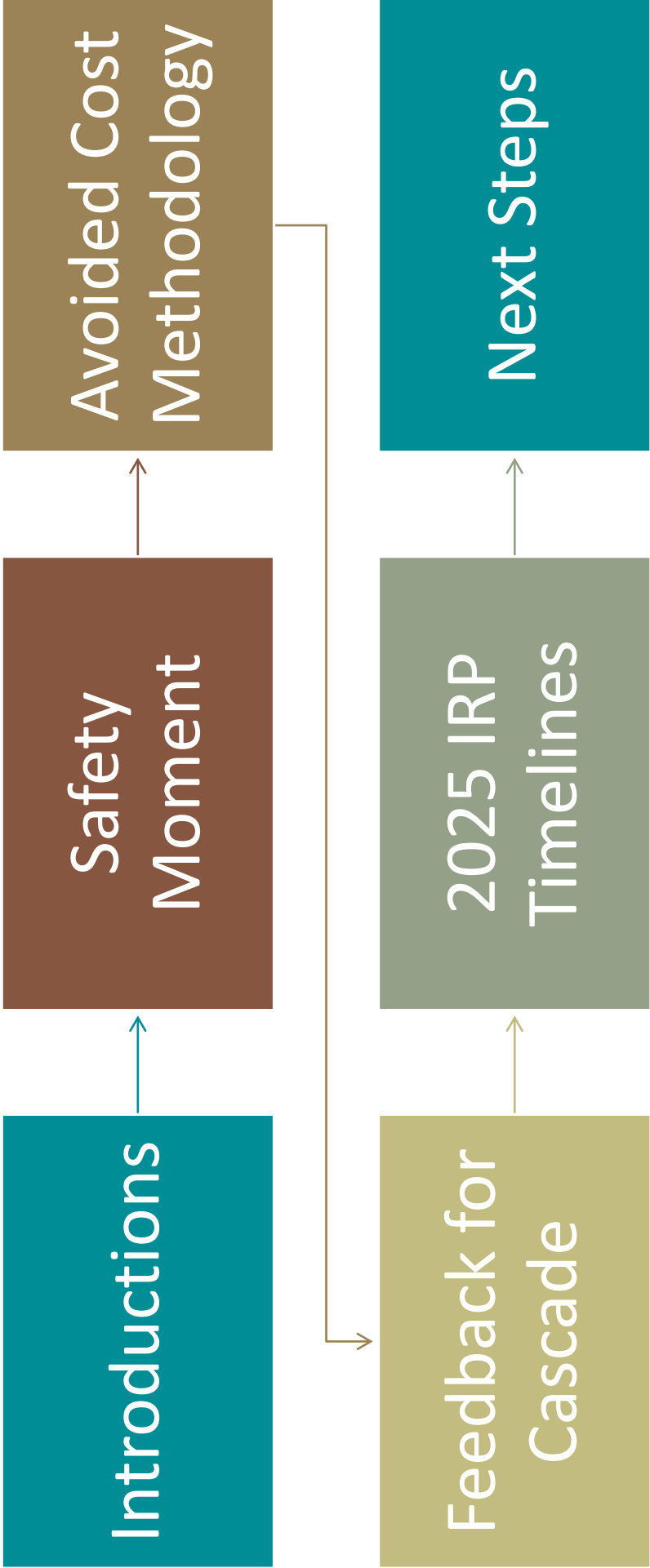
Meeting #2

FEBRUARY 15, 2024

MICROSOFT TEAMS/TELECONFERENCE



Agenda



Safety Moment

Follow these tips and tread safely this winter:

- Walk like a penguin
 - Arms extended to the side, feet pointed slightly forward
 - Make small shuffle steps
- Proper footwear
 - Wear Slip-resistant soles with good tread
 - Carry dress shoes with you
- Walk on clear and salted walkways
- Watch where you're stepping and plan ahead
- Adjust your pace to surface conditions
- Report safety concerns and icy areas immediately



Walking Safely on Ice & Snow

Avoided Cost Methodology and Calculation

Avoided Cost Overview

As part of the IRP process, Cascade produces a 27-year price forecast and 45 years of avoided costs.

The avoided cost is an estimated cost to serve the next unit of demand with a supply side resource option at a point in time. This incremental cost to serve represents the cost, including environmental impacts, that could be avoided through energy conservation.

The avoided cost forecast can be used as a guideline for comparing energy conservation with the cost of environmental impacts, acquiring, and transporting natural gas to meet demand.

For the 2025 IRP, Cascade will continue to use the information learned from prior IRPs to create a transparent and intuitive final avoided cost.

The various elements of the avoided cost will need to be reconsidered with regards to emissions reductions goals.

The Company produces an expected avoided cost case based on peak day and, in the case of distribution system costs, peak hour.

Avoided Cost Overview

Avoided Cost Formula



The components that go into Cascade’s avoided cost calculation are as follows:

$$AC_{nominal} = (TC_v + TC_F + SC_v + CC + E_{Comp} + DSC + RP) * E_{adder}$$

Where:

$AC_{nominal}$ = The nominal avoided cost for a given year. To put this into real dollars you must apply the following: Avoided Cost/(1+Discount Rate)^Years from the reference year.

TC_v = Variable Transportation Costs

TC_F = Fixed Transportation Costs (When Avoidable)

SC_v = Variable Storage Costs

CC = Commodity Costs

E_{Comp} = Environmental Compliance Costs

DSC = Distribution System Costs

RP = Risk Premium

E_{adder} = Environmental Adder, as recommended by the Northwest Power and Conservation Council

Avoided Cost Methodology

Variable Transportation costs are pulled directly from the major pipelines that Cascade utilizes (NWP, GTN, Enbridge, Ruby, Nova Gas Transmission (NGTL) and Foothills).

Fixed Transportation are only included when avoidable (i.e.. potential to offset upstream capacity acquisition)

Storage costs are only captured if there is an avoidable future storage cost (i.e.. On system storage).

Commodity Costs are taken from Cascade’s 27-year price forecast.

Cascade will be requesting feedback regarding its methodology related to environmental compliance costs

The Company’s distribution system cost calculation looks at forecasted capital expenses related ONLY to growth, and uses the company’s load growth forecast to translate these costs to a per therm basis.

Risk premium is calculated as the delta from deterministic and stochastic pricing

Environmental adder still applies to all elements of the avoided cost, still 10% as per NWPCC guidance

Transportation Costs

- Upstream transportation costs can be broken out into two elements: fixed costs and variable costs.
 - Fixed costs or reservation costs are what Cascade pays to the upstream pipelines regardless of whether gas flows on the pipeline. These are not avoidable for existing contracts.
 - Variable costs are paid when gas flows on the upstream pipeline. These are avoidable costs.
 - Different upstream pipelines charge different rates for their variable costs. Since the avoided costs is concerned with the marginal cost of the next therm that flows, Cascade takes an average of these pipelines variable rates. Since it's not known which pipeline that therm will flow on.
 - Fixed costs on proposed incremental upstream transportation are considered an avoidable cost and can be part of the final calculation.

Storage Costs

- Storage costs are only captured if there is an avoidable future storage.
 - o An example of this would be an on-system storage facility that is utilized to serve peak day demand.
 - o For Cascade's system, all storage is off-system and provides a net-positive benefit to customers, so it does not qualify as an avoided cost.

Commodity Costs

- Commodity Costs are taken from Cascade's 27-year price forecast.
- During the 2023 IRP TAG process, there were questions about whether this represented Cascade's marginal commodity cost. Some stakeholders brought up the idea of RNG being a more accurate representation of Cascade's marginal commodity cost.
 - o When evaluating the cost of RNG, it is important to separate the physical gas molecules from the environmental attributes.
 - o The avoided cost from the environmental attributes, is already captured in the environment compliance cost element of the avoided cost. Including it here would be double counting this cost.
 - o The physical gas molecules are typically valued at the basis price of one of the basins Cascade purchases gas from, which aligns with Cascade's current methodology of using its price forecast to capture avoided commodity costs.

Environmental Compliance Costs

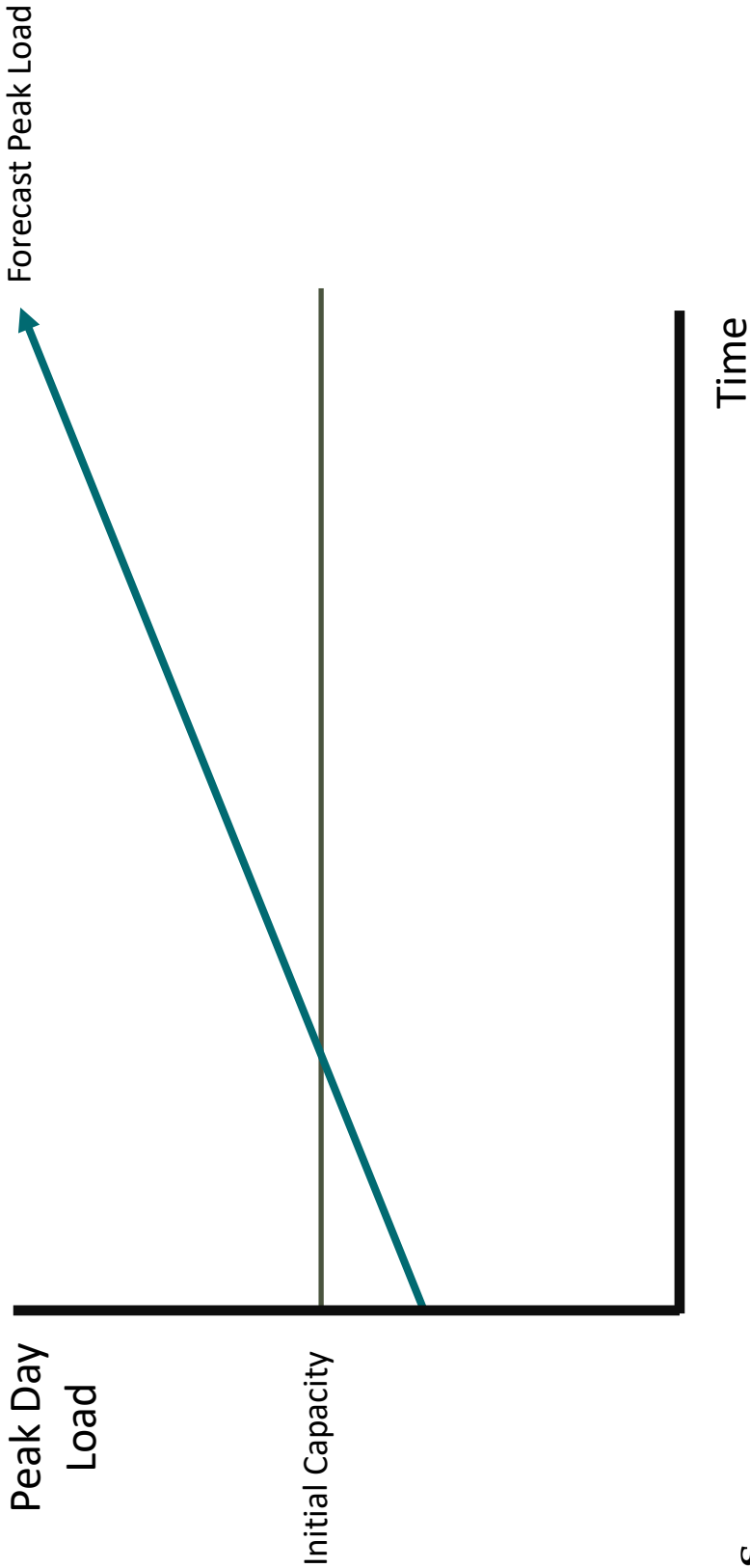
- In the 2023 IRP, Cascade utilized the Social Cost of Carbon with a 2.5% discount rate, adjusted to real 2021 dollars.
 - o This is done in accordance with RCW80.28.395 which requires the use of the Social Cost of Carbon to value cost of greenhouse gas emissions resulting from the use of natural gas.
- With the passing of the Climate Commitment Act, Cascade believes it may be more accurate to utilize the company's marginal compliance cost associated with this rule.
 - o For example, projected cost of CCA allowances.

Cascade requests feedback from this TAG as to how stakeholders believe the company should calculate its environmental compliance costs.

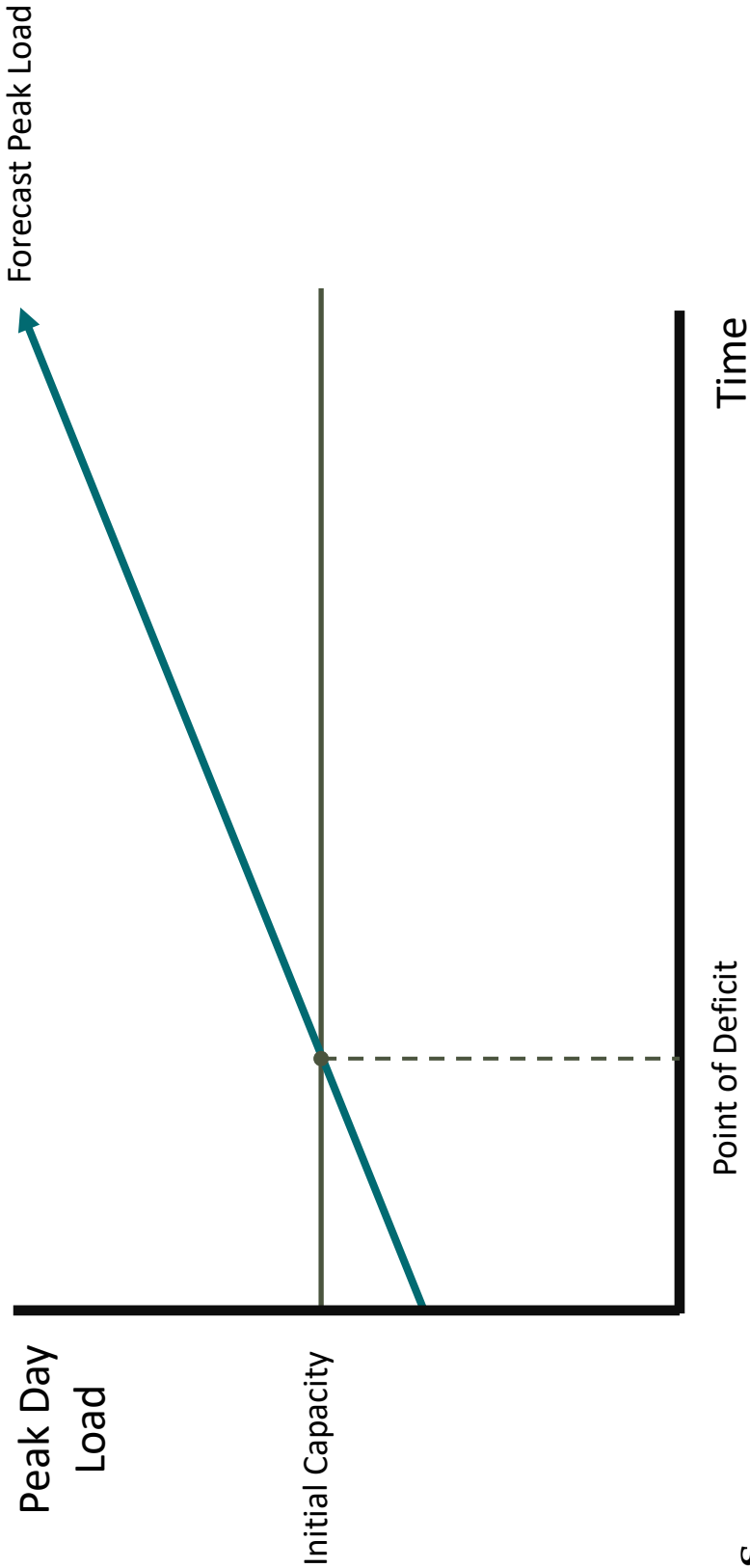
Methodology – Distribution System Costs

- In the 2023 IRP, Cascade moved away from deriving distribution system costs from margin.
- The Company's new distribution system cost calculation looks at forecasted capital expenses related ONLY to growth, and uses the company's load growth forecast to translate these costs to a per therm basis.
- Additionally, it's important to recognize that while energy efficiency may not be able to fully eliminate the need for a distribution system enhancement, it can defer the need for these enhancements to a later year. Because of the economic principle of the time value of money, this deferral has value, and that value is the avoided distribution system cost
- Since Avoided Cost is based on peak day, this deferral value is then multiplied by the ratio of peak day demand to an average day's demand to get the impact on peak day.
- Distribution system analysis is concerned with the pressure during peak hour, so the daily number must then be multiplied by the ratio of peak hour demand to that day's total demand.

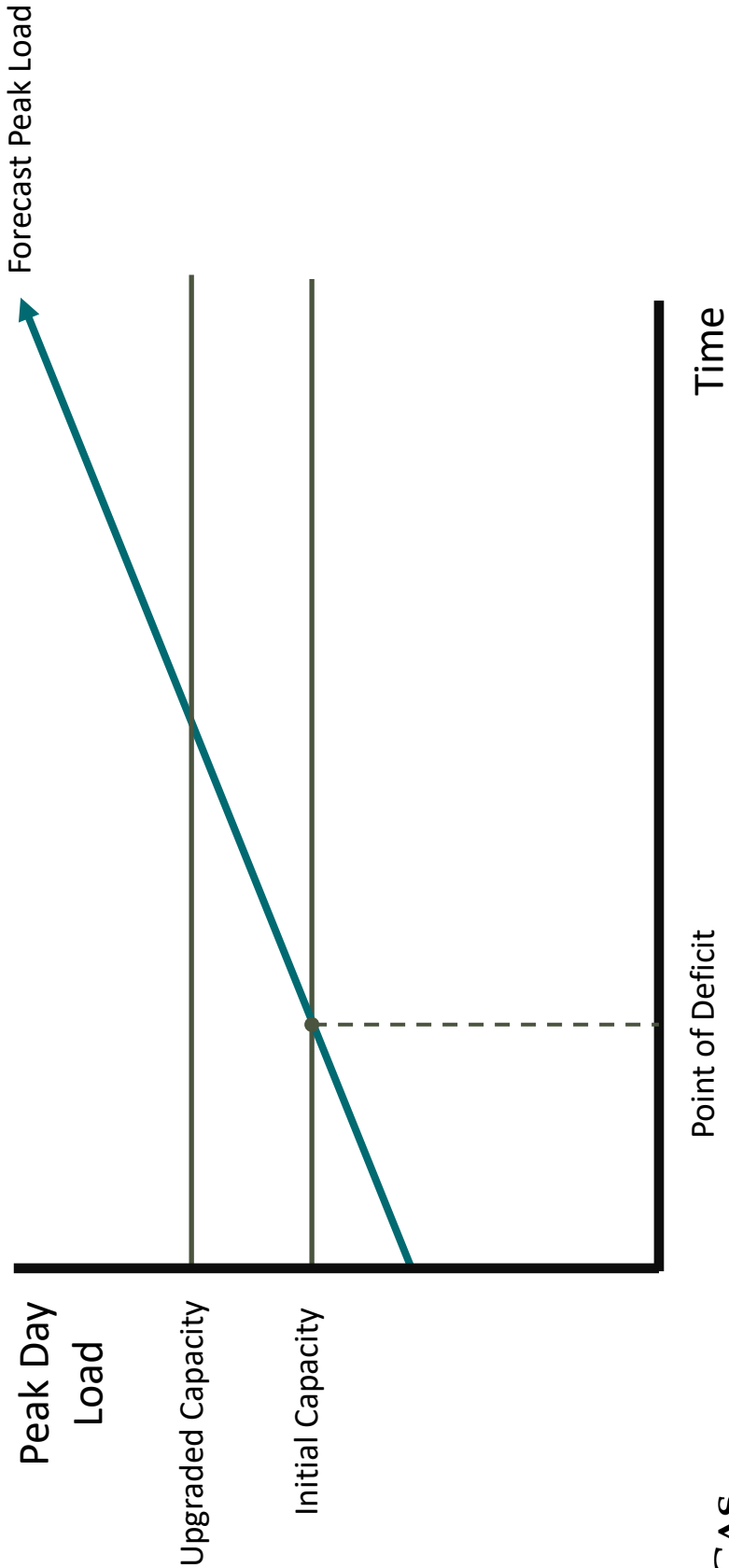
Capacity Modeling



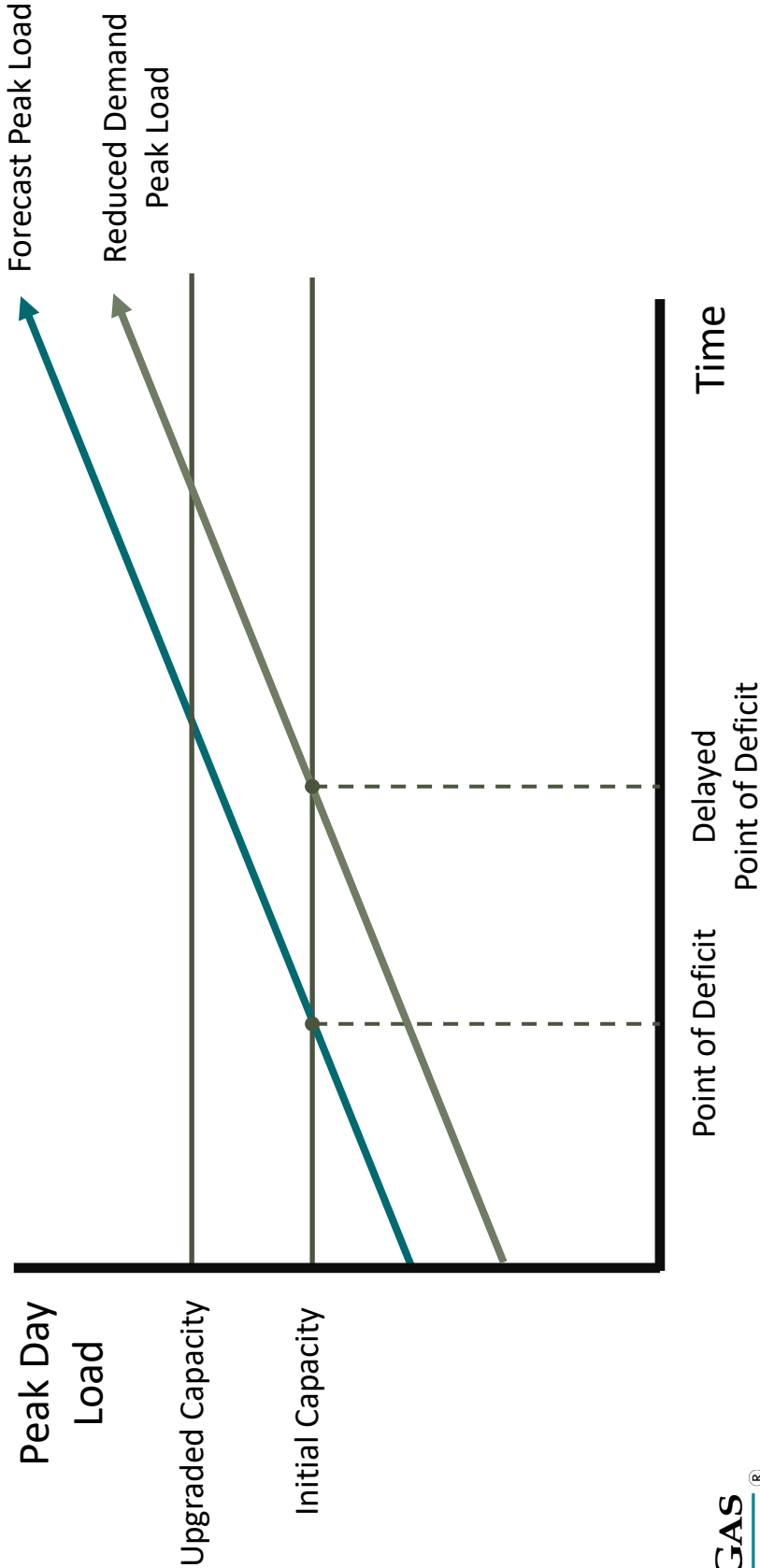
Capacity Modeling



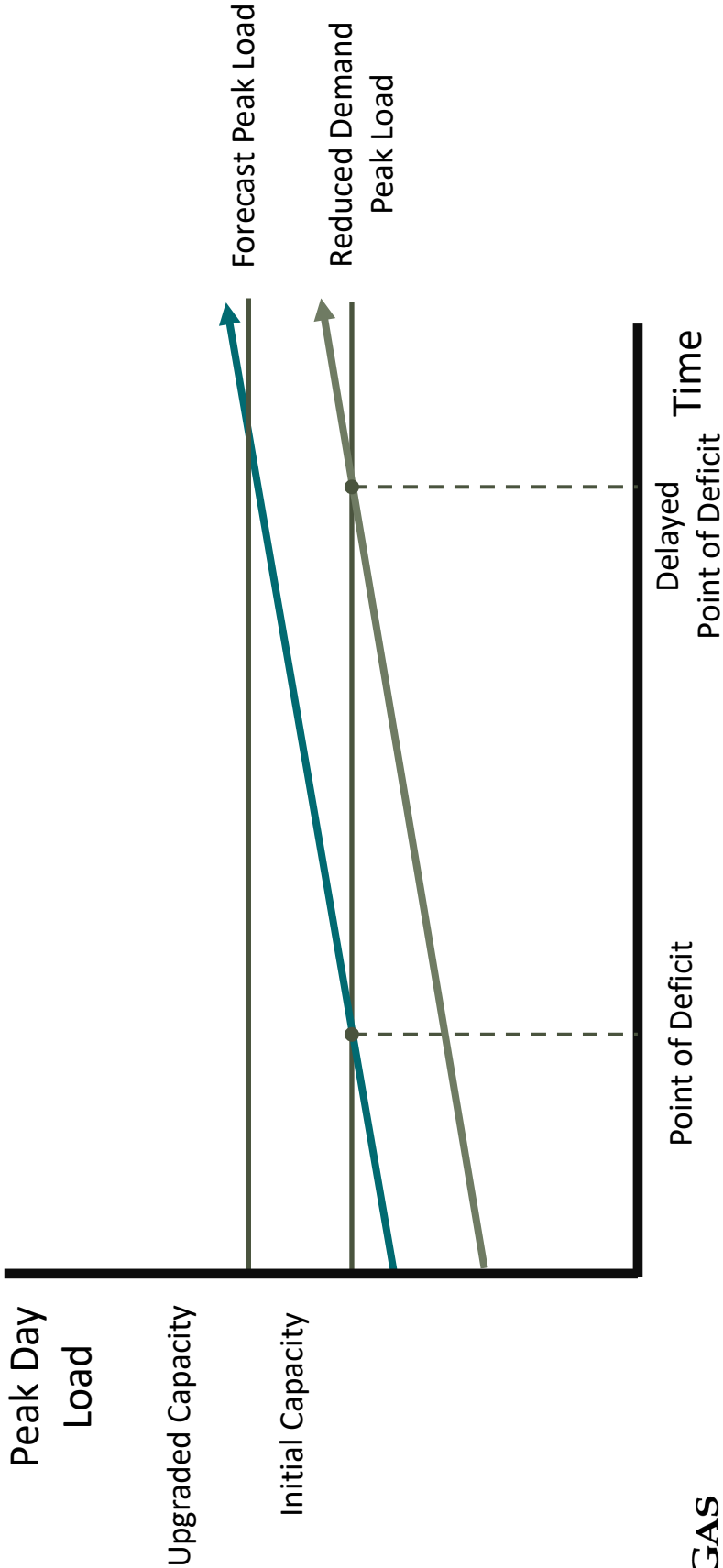
Capacity Modeling



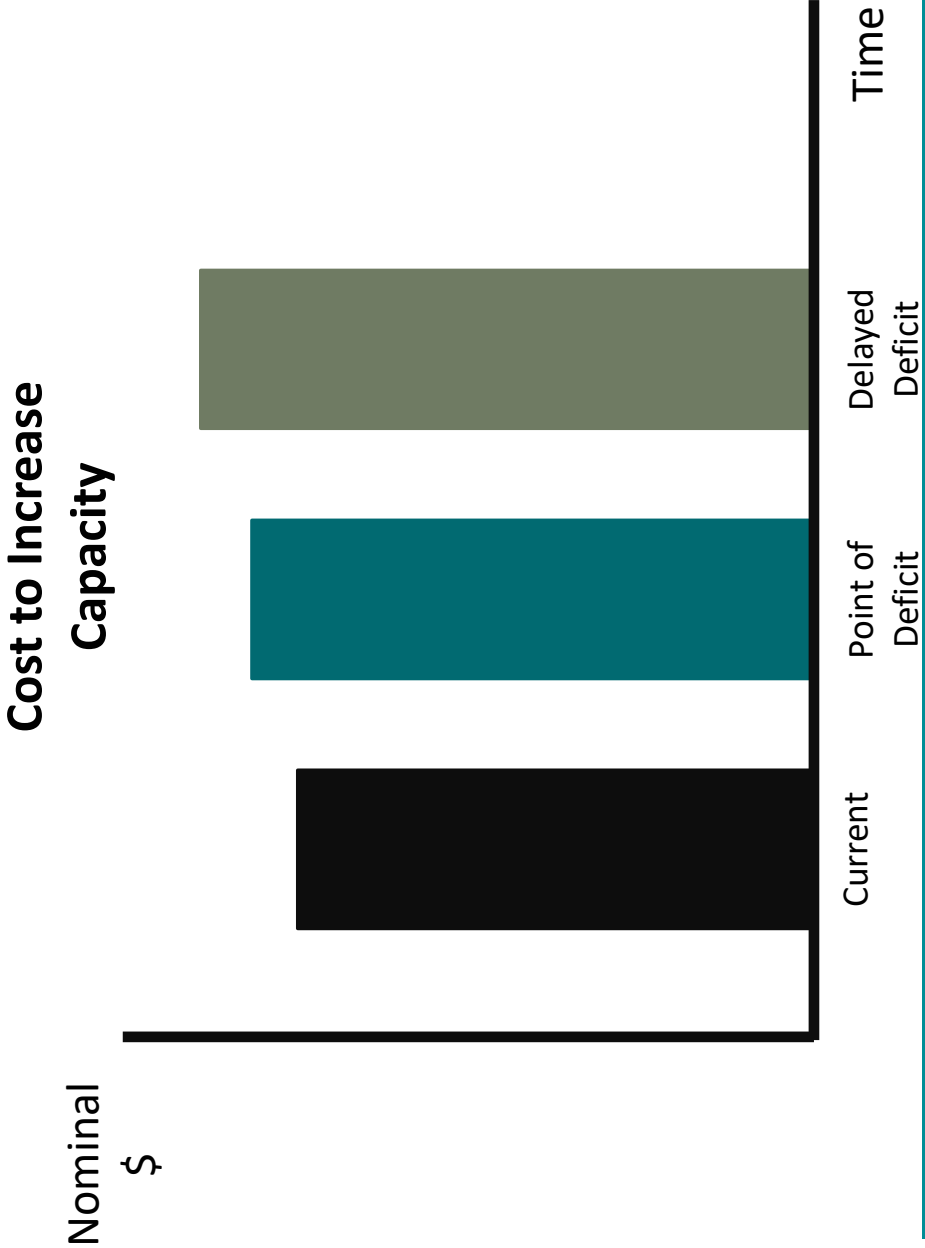
Capacity Modeling



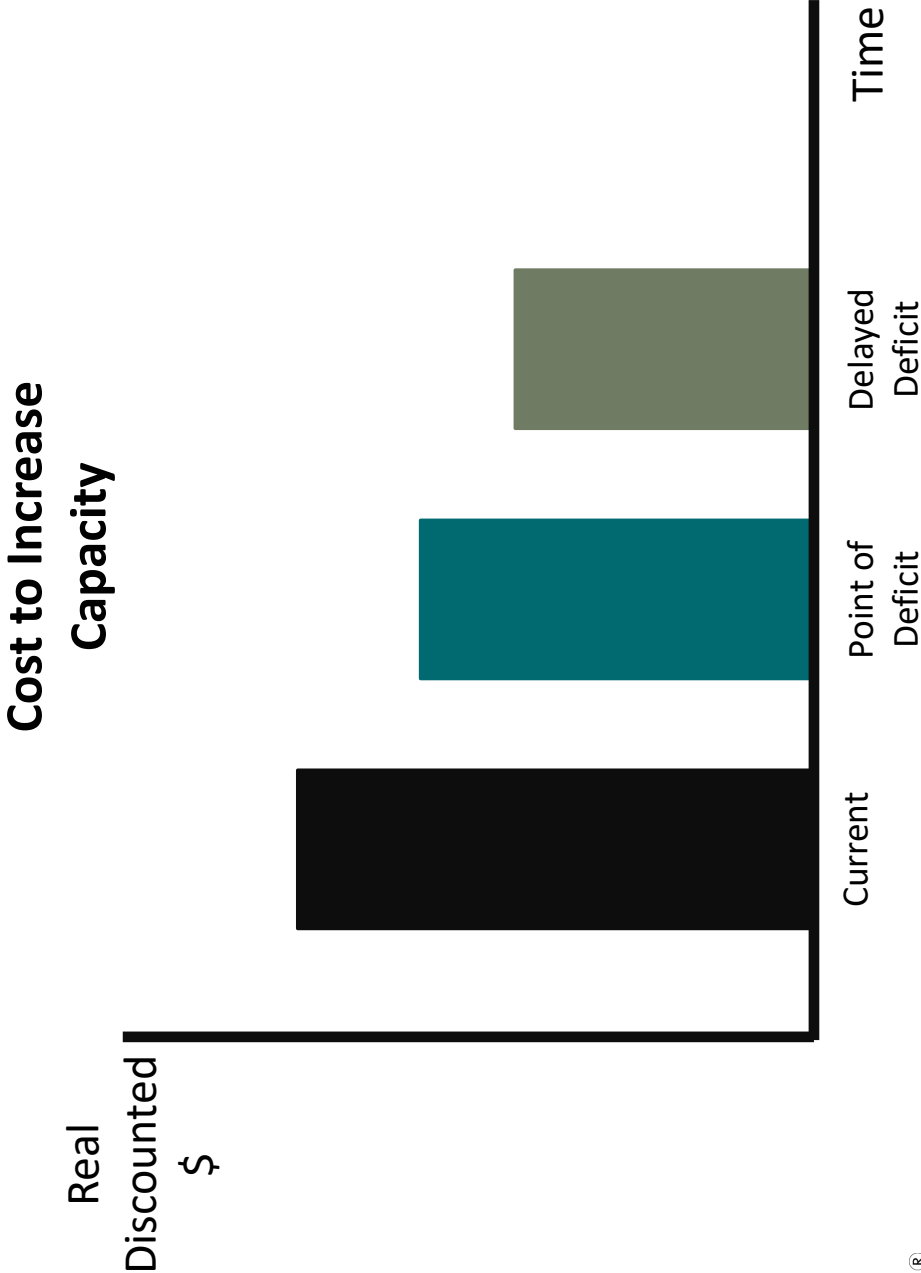
Capacity Modeling



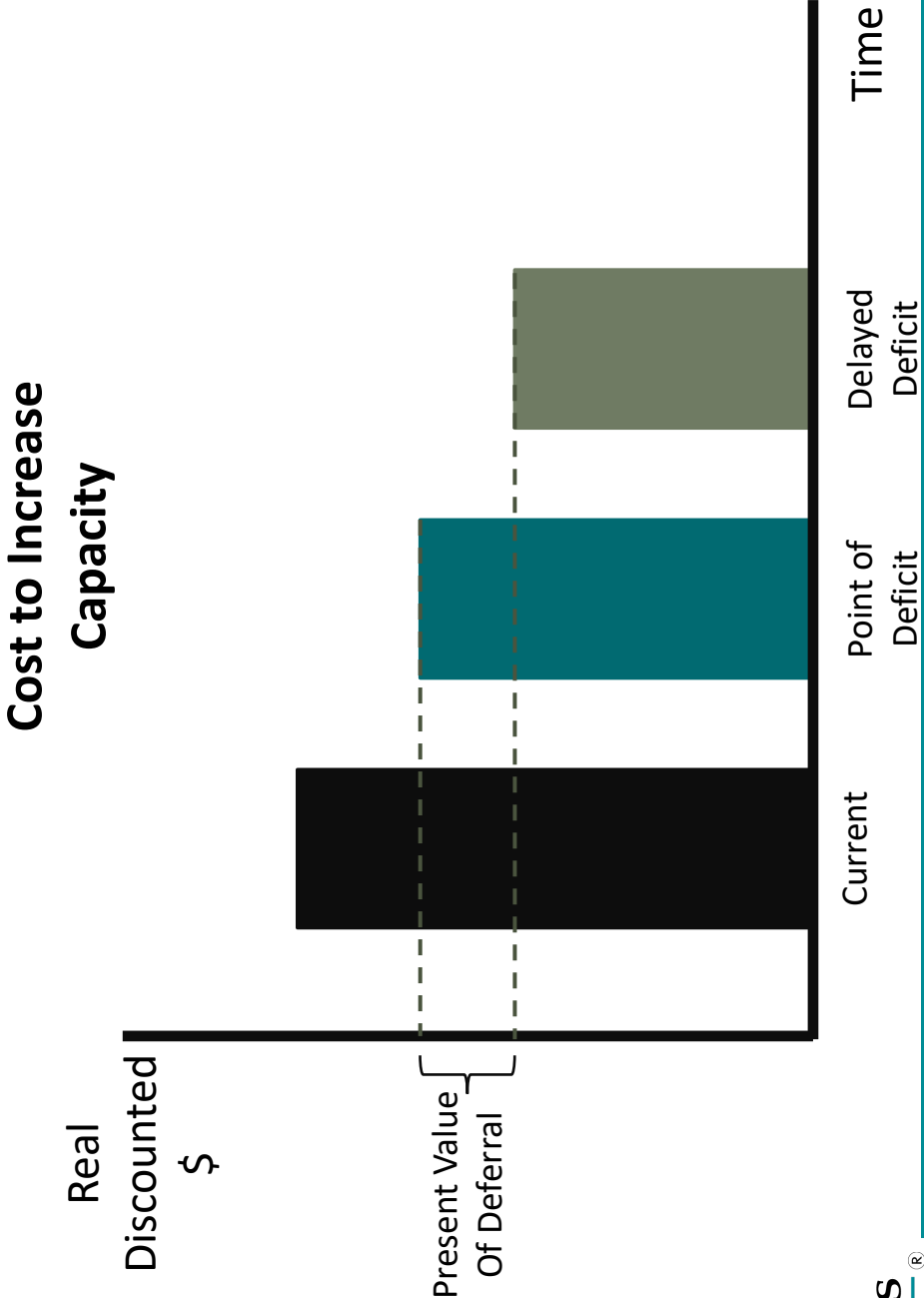
Cost of Capacity Enhancement



Deferral Valuation



Deferral Valuation

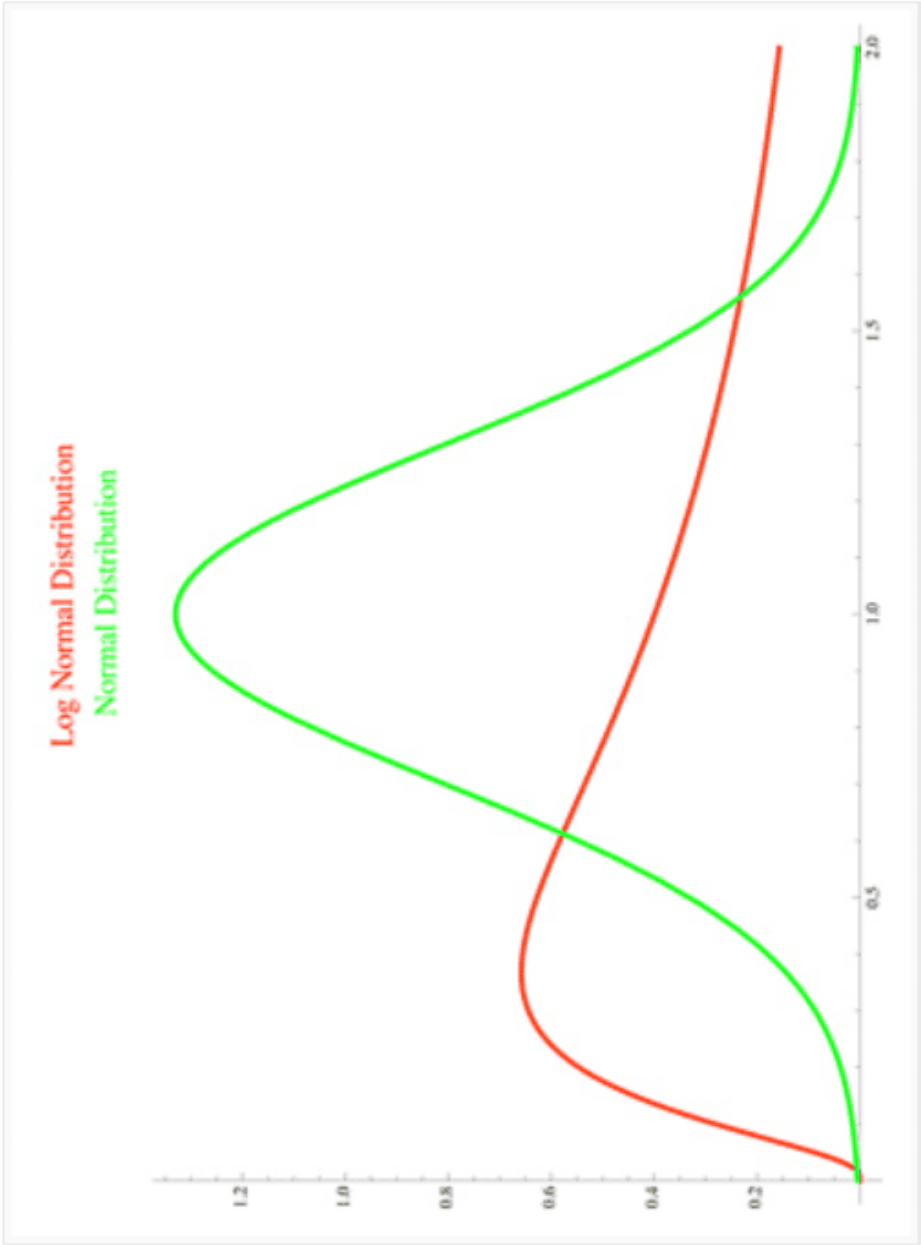


Methodology – Risk Premium

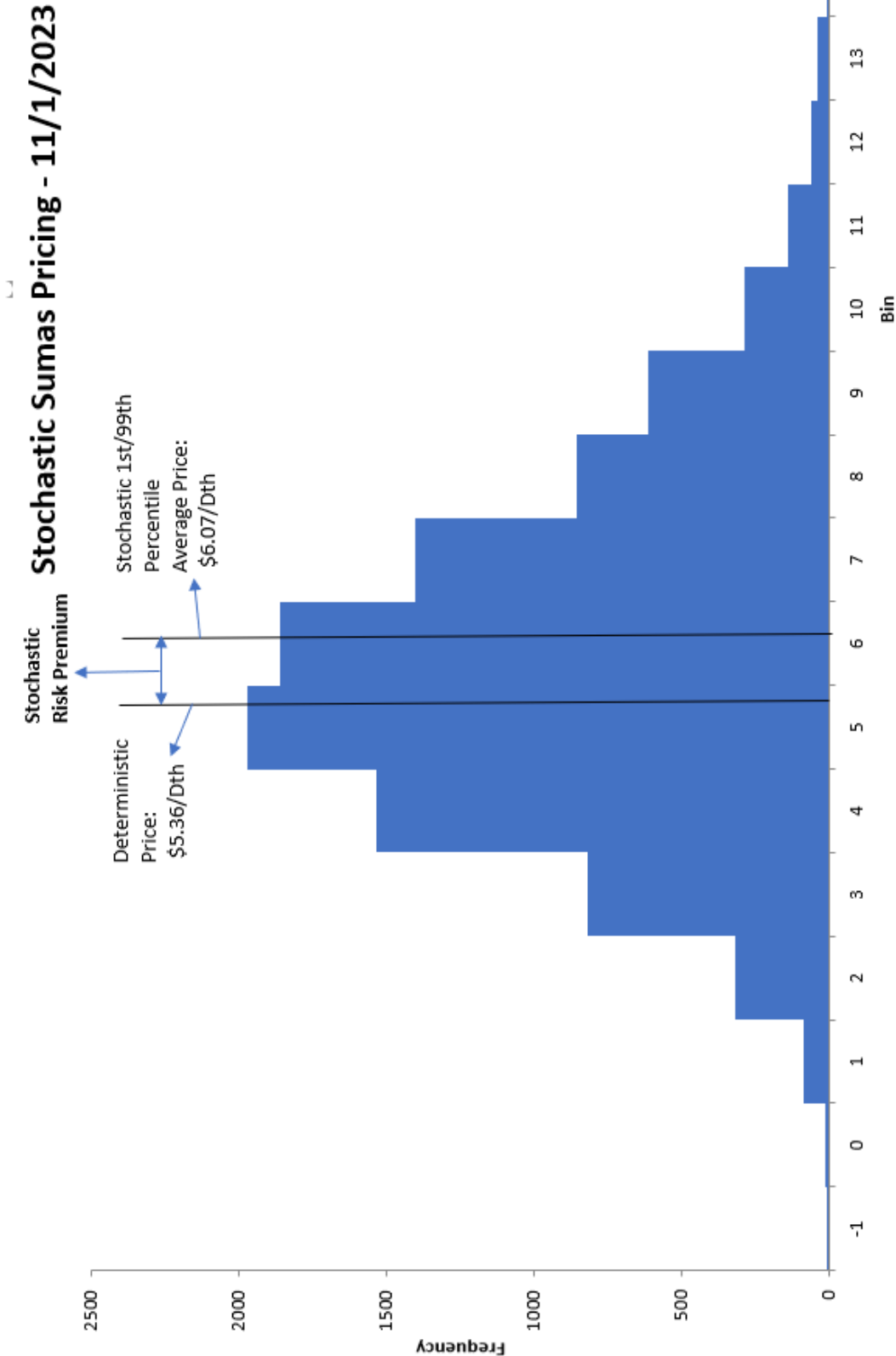
Cascade defines risk premium as the difference between the impacts of a potential extreme upward price movement versus that of an extreme downward price movement.

Due to the lognormal nature of stochastic gas prices, the risk presented from rising prices will typically exceed that of falling prices.

This analysis is used in a risk-adjusted price calculation, where the stochastic risk premium is compared to an annualized deterministic price to calculate the final risk premium.



A Quick Visual: Normal vs. Lognormal Distributions



Risk-Adjusted Risk Premium Final Calculation

$$(\text{Deterministic Price} * .75 + (((99\text{th Percentile Stochastic Price} + 1\text{st Percentile Stochastic Price}) / 2) * .25)) - \text{Deterministic Price}$$

- Captures the difference between expected pricing and a blend of deterministic and stochastic pricing
- This methodology is consistent with other risk-adjusted processes in Cascade's IRP, and informed by the calculations performed by other regional LDCs
- Accurately captures the increasing uncertainty around pricing, as nominal risk premium generally increases over time

2023 IRP Avoided Cost Risk Premium

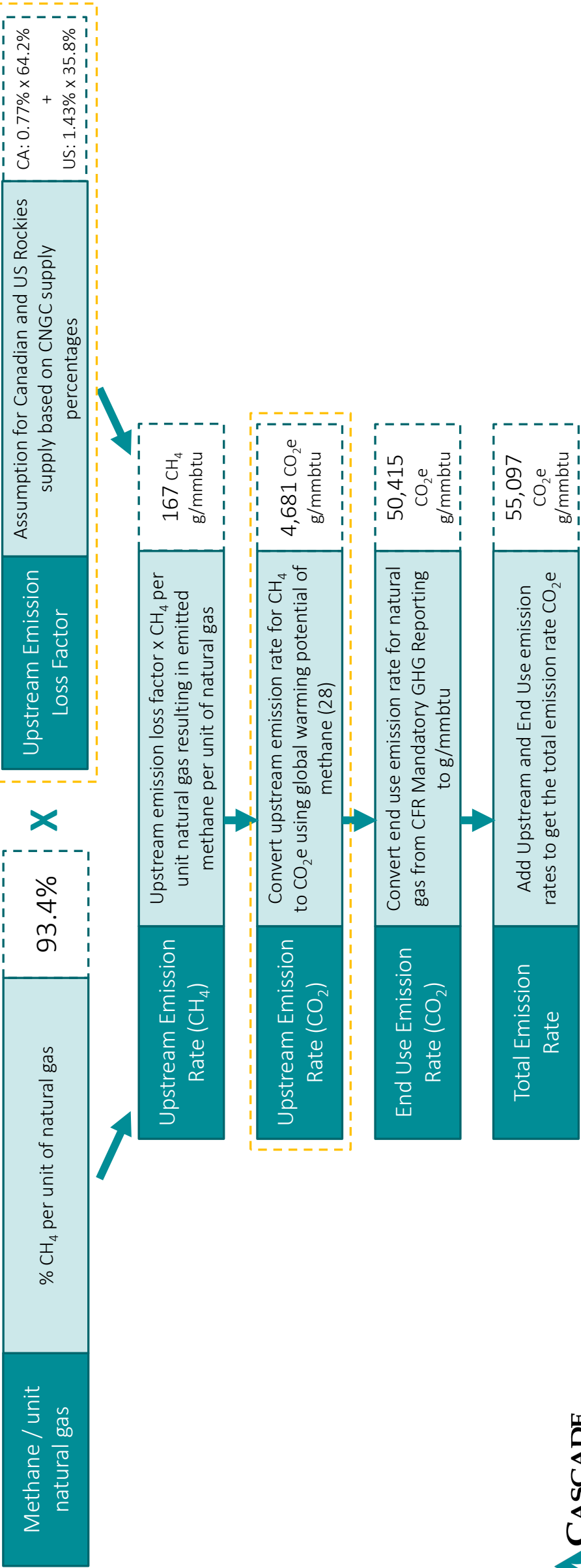
Year #	Calendar Year	Risk Reduction Value (\$/Dth)
1	2023	-\$0.010
2	2024	-\$0.011
3	2025	-\$0.018
4	2026	-\$0.013
5	2027	\$0.001
6	2028	\$0.014
7	2029	\$0.046
8	2030	\$0.077
9	2031	\$0.175
10	2032	\$0.239
11	2033	\$0.204
12	2034	\$0.146
13	2035	\$0.125
14	2036	\$0.256
15	2037	\$0.235
16	2038	\$0.168
17	2039	\$0.225
18	2040	\$0.263
19	2041	\$0.296
20	2042	\$0.296

Environmental Adder

- Environmental adder still applies to all elements of the avoided cost, as per WUTC Staff guidance, still 10% as per NWPCC guidance.

Cascade’s Upstream Emission Rate Methodology

Equation: $Emission\ Rate_{Total} = Upstream\ Emission\ Rate_{CO_2e} + Customer\ Emission\ Rate_{CO_2e}$



Avoided Cost - Conclusion

Cascade appreciates any feedback related to any element of the avoided cost calculation, especially feedback related to the environmental compliance cost element.

Cascade's resource planning team plans to provide its avoided cost figures to the Company's energy efficiency team around July; they will be sending back a conservation potential assessment based on these inputs.

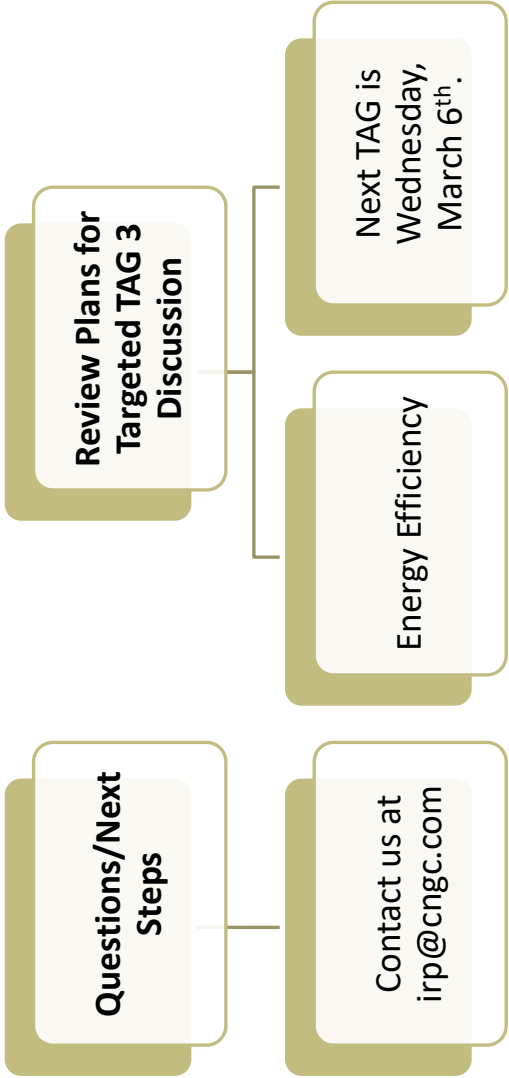
Feedback for Cascade?

Any other changes or ideas that Cascade should consider for calculating the Avoided Cost?



2025 WA IRP Schedule

2025 CNGC-IRP Process Item	Date	Process Element
Targeted-TAG	Thursday, January 25, 2024	What is an IRP and how to get involved
Targeted-TAG	Thursday, February 15, 2024	Avoided Cost
Targeted-TAG	Wednesday, March 6, 2024	Energy Efficiency
Targeted-TAG	Thursday, March 28, 2024	Equity in the IRP
Targeted-TAG	Thursday, April 11, 2024	Distribution System Planning
Targeted-TAG	Thursday, April 25, 2024	CCA/Compliance Modeling
Targeted-TAG	Thursday, May 16, 2024	Customer/Load Forecast
Targeted-TAG	Friday, May 31, 2024	Resource Integration
TAG 1	Thursday, June 13, 2024	Process, Key Points, IRP Team, Timeline, Regional Market Outlook, Planned Scenarios and Sensitivities, Stakeholder Engagement, Demand and Customer Forecast and Non-Core Outlook, Drilling down into segments of demand forecast.
		Upstream Pipeline presentation.
Receive feedback on TAG 1	Friday, June 28, 2024	
TAG 2	Thursday, July 25, 2024	Respond to TAG 1 Feedback, Distribution System Planning, Alternative Resources, Price Forecast, Avoided Costs, Current Supply Resources, Transport Issues, Carbon Impacts, Energy Efficiency, Bio-Natural Gas, Preliminary Resource Integration Results.
Receive feedback on TAG 2	Friday, August 9, 2024	
First Draft	Friday, September 6, 2024	
Comments Due	Friday, October 4, 2024	
TAG 3	Wednesday, October 30, 2024	Respond to TAG 2 feedback, Final Integration Results, finalization of plan components, Proposed new 2- to 4-year Action Plan
Final Draft	Tuesday, December 3, 2024	
Comments Due	Tuesday, January 14, 2025	
TAG 4 (if needed)	Thursday, January 30, 2025	
Final Complete By	Friday, February 14, 2025	
File	Monday, February 24, 2025	





In the Community to Serve®

Integrated Resource Plan Targeted Technical Advisory Group Meeting #2

FEBRUARY 15, 2024

MICROSOFT TEAMS/TELECONFERENCE



In the Community to Serve®



In the Community to Serve®

Targeted TAG #2 – TAG Meeting

Date & time: 02/15/2024, 9:00 AM to 10:30 AM

Location: Microsoft Teams Meeting

Presenters: Brian Robertson, Jenny DeBoer, Bailey Steeves

In attendance: Abbie Krebsbach, Alessandra De La Torre, Bailey Steeves, Brian Robertson, Bruce Folsom, Byron Harmon, Caleb Reimer, Carolyn Stone, Chris Robbins, Devin McGreal, Eric Shierman, Eric Wood, Heather Moline, Jaclynn Simmons, Jenny DeBoer, John Garrett, Joshua Dennis, Kary Burin, Kathleen Campbell, Kim Herb, Kyle Griffiths, Mahon Walsh, Mark Chiles, Mark Sellers-Vaughn, Matt Steele, Matthew Doyle, Michael Freels, Michael Parvinen, Paul Barrager, Quinn Weber, Rachel Preece, Rebecca Eaton, Renie Sorensen, Samantha Christenson, Sofya Atitsogbe, Ted Drennan, Tom Pardee, Wesley Franks, Will Gehrke, Zachary Soward

Brian Robertson, Supervisor of Resource Planning, opened the meeting by welcoming and thanking stakeholders for participating in Cascade's IRP Process. Brian reminded folks that we wouldn't be doing introductions at the beginning of the meeting but asked if/when people interjected throughout the meeting to please introduce themselves. Brian also mentioned that Cascade will be responding to questions it received prior to the meeting by WUTC throughout the presentation. Responses to those can be found in the Feedback Report on the Company's webpage.

Presentation Topic #1 – Safety Moment (Jenny DeBoer)

- Jenny provided a presentation on walking safely on snow and ice.

Presentation Topic #2 – Avoided Cost Methodology (Bailey Steeves)

- Bailey began the presentation with a quick overview of what the avoided cost model is.
- Bailey then went through the formula at a high level before jumping into deeper detail for each variable in the next slides.
- There was some discussion around the geometric Brownian motion and how Cascade does its Monte Carlo simulations for price. More information can be found in the Feedback Report on the Company's webpage.
- There was another question regarding a decline in customer count and how that would impact the storage element of the avoided cost. Cascade responded that prices are generally cheaper in the summer than the winter, so storage has a price arbitrage element that is a net positive and wouldn't make sense to avoid.
- There was another question regarding integrity vs growth when it comes to distribution system modeling. Cascade stated there is some language in the IRP regarding that but will provide further clarification if needed.
- Bailey continued to presentation and brought up a question Cascade has for stakeholders; RCW80.28.395 requires the use of the Social Cost of Carbon (SCC) to value the cost of greenhouse gas emissions. Cascade stated that with the passing of the Climate Commitment Act that the marginal compliance cost should be considered over the SCC. Cascade opened this up

for discussion. WUTC Staff stated that they viewed the SCC as an externalized cost of carbon upon the public and the CCA is more about a market pressure in order to kind of put a cost on emissions in order to guide the reduction in emissions. Cascade opened it up to others where NWN had stated they use the maximum of the SCC and the CCA marginal cost. Staff then reiterated that there isn't guidance from the Commission on this topic, so whichever direction Cascade chooses to make sure it's fully explained in the IRP.

- Bailey then proceeded to provide an example of how distribution system costs are incorporated into the avoided cost model.
- Staff had another question regarding a risk regarding system instability related to both the housing or building code statutes on book and how declining customers may create an exponential increase in bills for those who remain on the system. Staff's question is whether there is an avoided cost by keeping customers on the system. Cascade thought this was an interesting idea but did not have a response as the Company needed time to consider the assumptions and how to quantify the calculation. Cascade also asked Staff to provide thoughts on how this may be quantified, in which Staff agreed to provide thoughts within a week.
- Staff had asked another question regarding the avoided cost model and how it generally assumes growth "if the were to go up and then down, could this be used as a measurement for the cost of stranded assets and anticipating whether assets would be stranded?" Cascade told Staff that Cascade would take that back and consider it for inclusion in the avoided cost model.
- Staff asked about a price floor when it came to modeling Monte Carlo simulations with price. Cascade stated that although it is unlikely, it is possible for gas prices to drop below 0. These mainly happen in rare instances where suppliers need to move gas when there is very little to no demand.
- Bailey then finished up with a discussion around normal vs lognormal distributions, stochastic pricing, and the risk-adjusted risk premium final calculation. Bailey also mentioned that we'll continue to use the 10% environmental adder.
- Brian presented the upstream emission rate. During this presentation Brian clarified what was in the remaining 6.6% of natural gas makeup and that the upstream emission loss factor included cascade's distribution system loss rate. Staff was curious if the Company could provide an analysis of purchases vs actual use, which Cascade agreed to looking into.

Presentation Topic #3 – Feedback for Cascade (Brian Robertson)

- Brian opened it up again for feedback and reminded everyone that Cascade is happy to get feedback even after the meeting.

Presentation Topic #4 – 2025 IRP Timeline (Brian Robertson)

- Brian reminded stakeholders that the Targeted TAG for Distribution System Modeling and Customer/Load forecast would be flipped. The April 25th Targeted TAG meeting is being moved to May 7th. Finally, the May 31st meeting will be held on Thursday, May 30th.

Presentation Topic #5 – Next Steps (Brian Robertson)

- The next Targeted TAG meeting will discuss Energy Efficiency and be held on Wednesday, March 6th.

The Meeting was Adjourned

Per Cascade Commitment #8 (Stakeholder Engagement Design Document, 2/22,2022: "Provide TAG minutes that include the action items from bullet #7 as well as any upcoming deadlines for feedback on the IRP"), here are additional action items to track, coming out of the Targeted TAG 2 meeting:

1. Cascade will consider risk around the instability of declining customer growth in the avoided cost model.

2. Cascade will provide detail in the IRP as to how it handles SCC and marginal compliance costs from the CCA.
3. Cascade will consider how declining customer growth could be used to measure the cost of a stranded asset.
4. Cascade will analyze the demand vs purchased supply to compare vs the loss rate used in the upstream emissions calculation.



In the Community to Serve®

Integrated Resource Plan Targeted Technical Advisory Group Meeting #3

MARCH 6, 2024

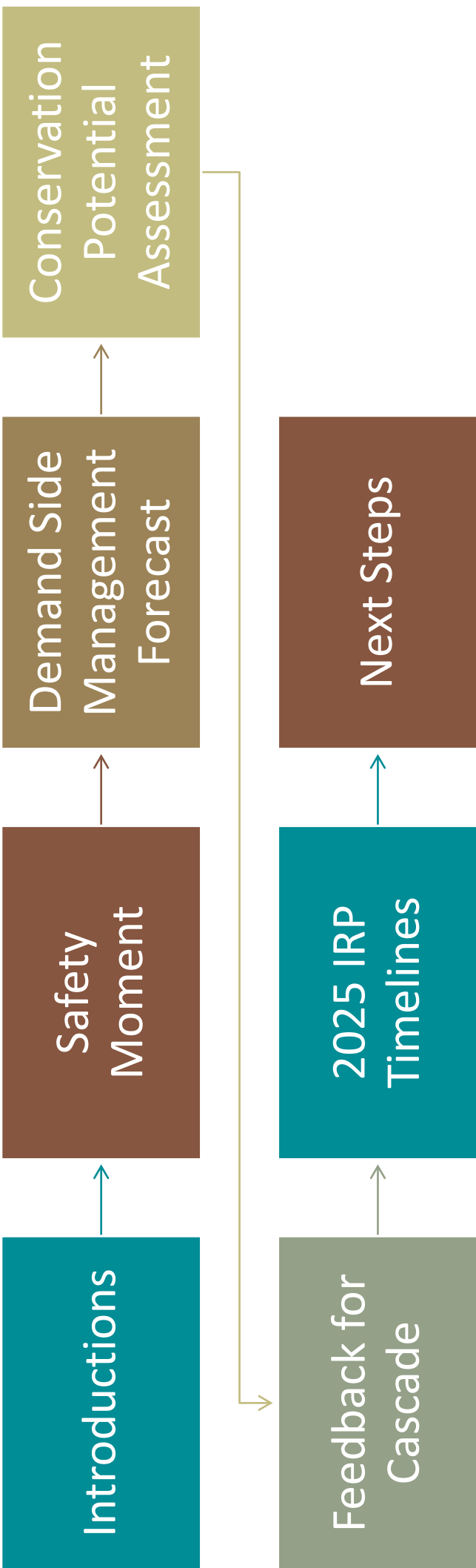
MICROSOFT TEAMS/TELECONFERENCE



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In the Community to Serve®

Agenda



Safety Moment

Coping with Stress

Everyone reacts differently to stressful situations. Here are just some ways that help to reduce or deal with stress:

- Take breaks from reading, watching, or listening to news stories, and social media.
- Take care of your mind and body:
 - Take deep breaths, meditate, or stretch.
 - Eat healthy, well-balanced meals.
 - Get plenty of sleep.
 - Take time to exercise regularly.
 - Avoid alcohol and drugs.
- Take time to unwind.
- Find and participate in some activities you enjoy.
- Connect with others by talking with people you trust about your concerns and share your feelings.



Demand Side Management Forecast, 2025 IRP

Caleb Reimer
March 6, 2024

DSM Topics

Overview

- Program Performance
- Conservation Potential Assessment

Energy Efficiency Forecast

Energy Efficiency Programs

- Commercial and Industrial
- Residential
- Portfolio

Overview

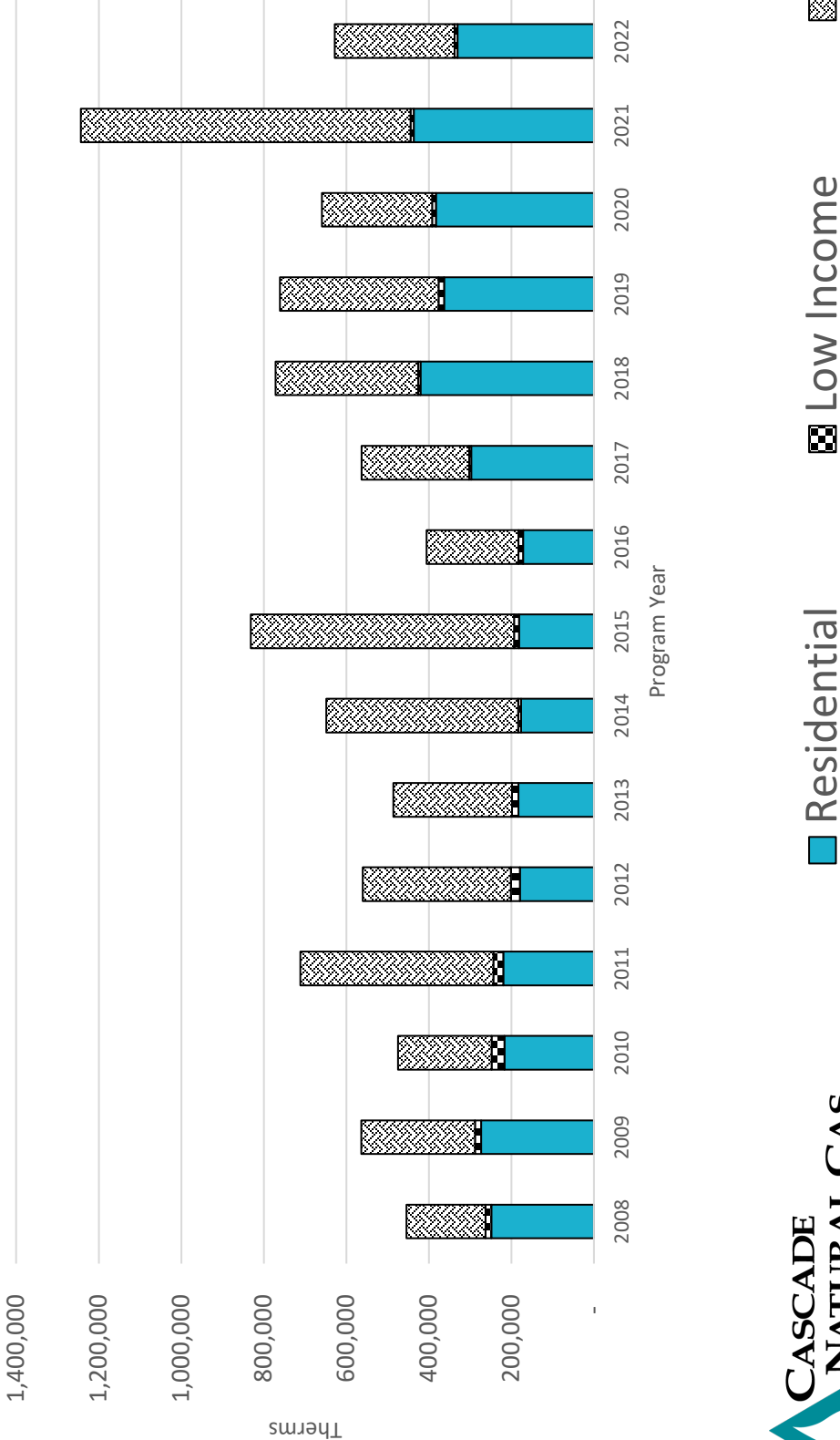
Preliminary 2023 Savings

Program	Therm Savings
Residential	604,132
Commercial	429,519
Low-Income	15,612

2023: Residential energy savings record

- 39% more than previous record in 2021
- Record incentive dispersion– \$6.1 Million
- 99% of biennial residential therm savings goal met

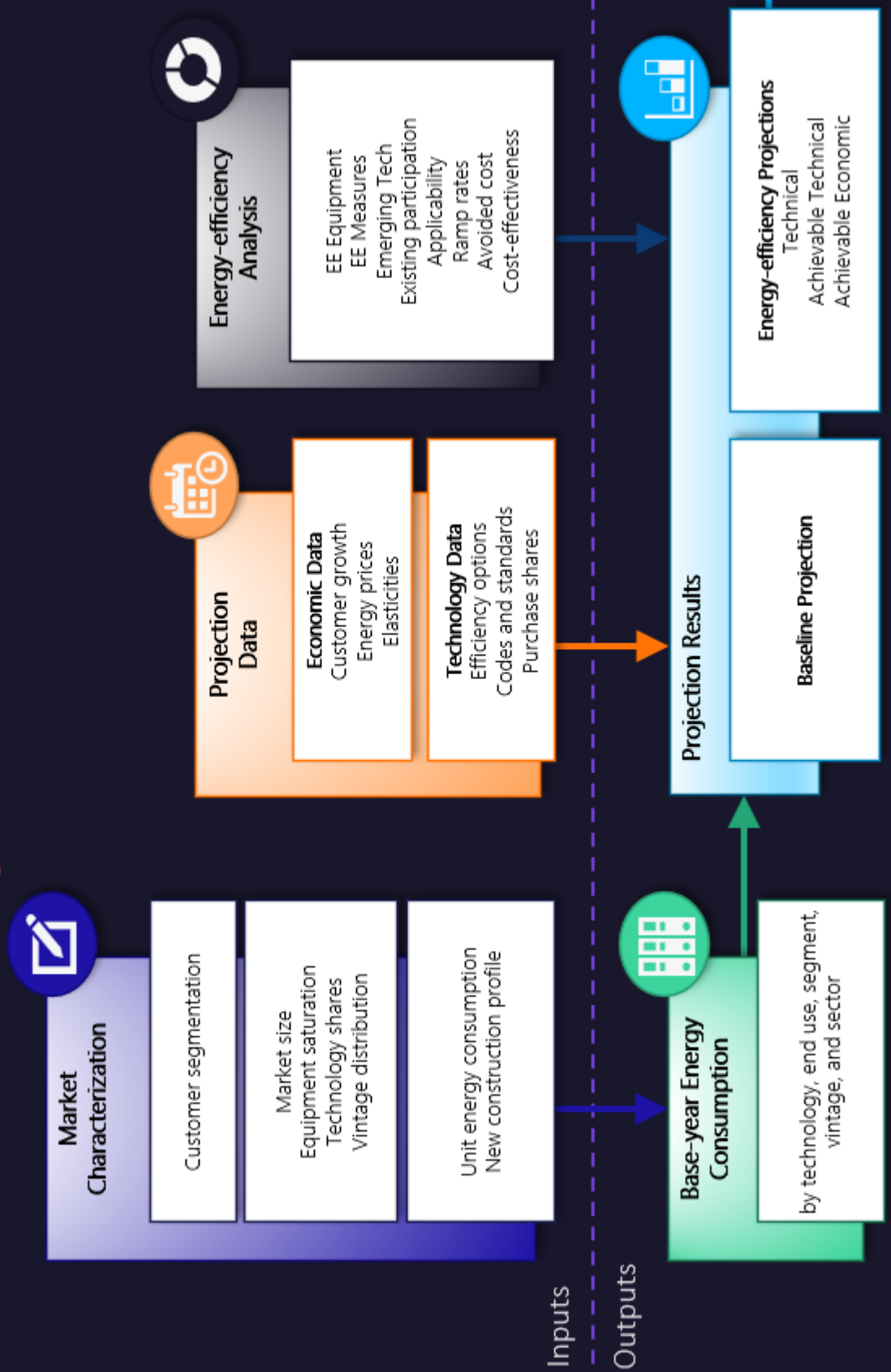
EE Annual Savings 2008-Present



Conservation Potential Assessment

LoadMAP Analysis Framework

Appendix A
IRP Process

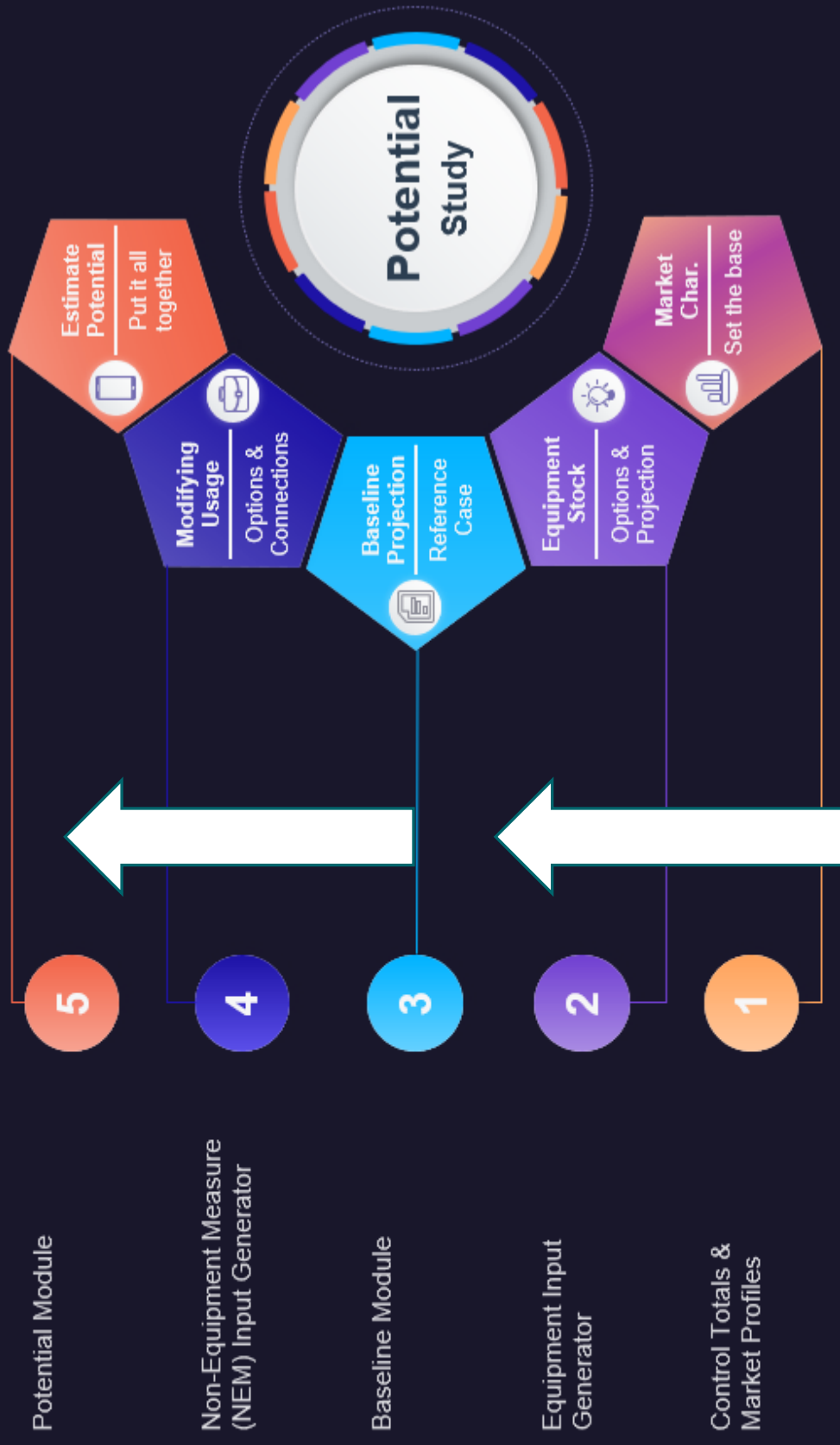


LoadMAP Analysis Framework

2025 ONGC IRP

Appendix A
IRP Process

Page 369



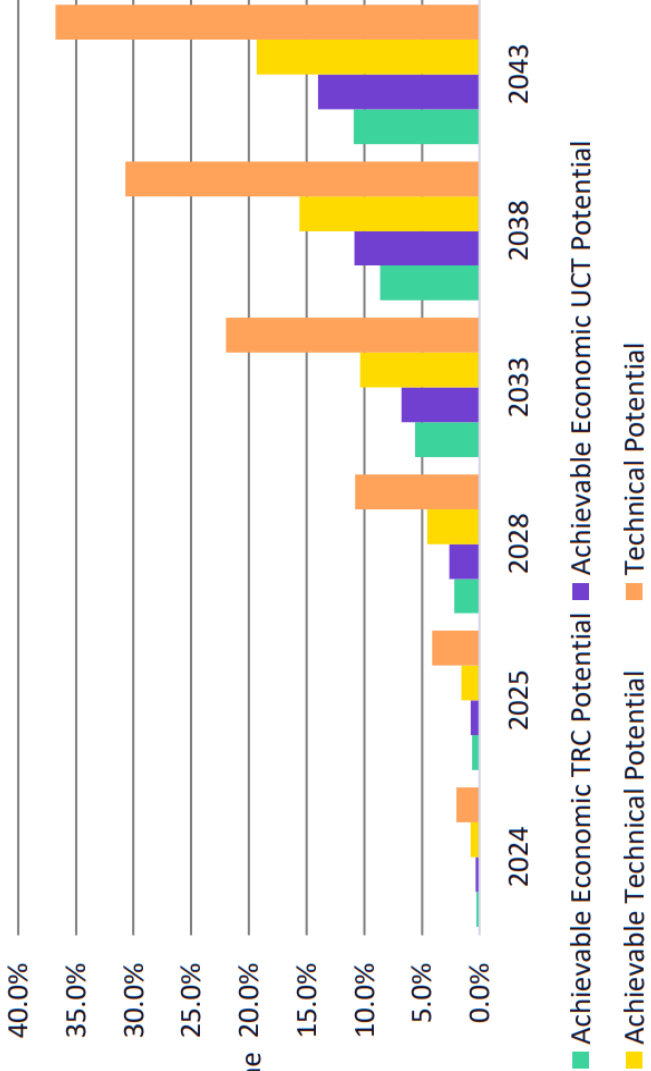


Portfolio Energy Efficiency Potential

Scenario	2024	2025	2028	2033	2038	2043
Baseline Projection (thousand therms)	229,381	225,522	213,715	195,878	181,440	169,938
Cumulative Savings (thousand therms)						
UCT Achievable Economic Potential	815	1,782	5,544	13,241	19,672	23,777
TRC Achievable Economic Potential	669	1,475	4,648	10,899	15,660	18,490
Achievable Technical Potential	1,685	3,540	9,674	20,333	28,372	32,828
Technical Potential	4,621	9,288	23,102	42,998	55,754	62,474

Cumulative Savings (% of Baseline)						
UCT Achievable Economic Potential	0.4%	0.8%	2.6%	6.8%	10.8%	14.0%
TRC Achievable Economic Potential	0.3%	0.7%	2.2%	5.6%	8.6%	10.9%
Achievable Technical Potential	0.7%	1.6%	4.5%	10.4%	15.6%	19.3%
Technical Potential	2.0%	4.1%	10.8%	22.0%	30.7%	36.8%

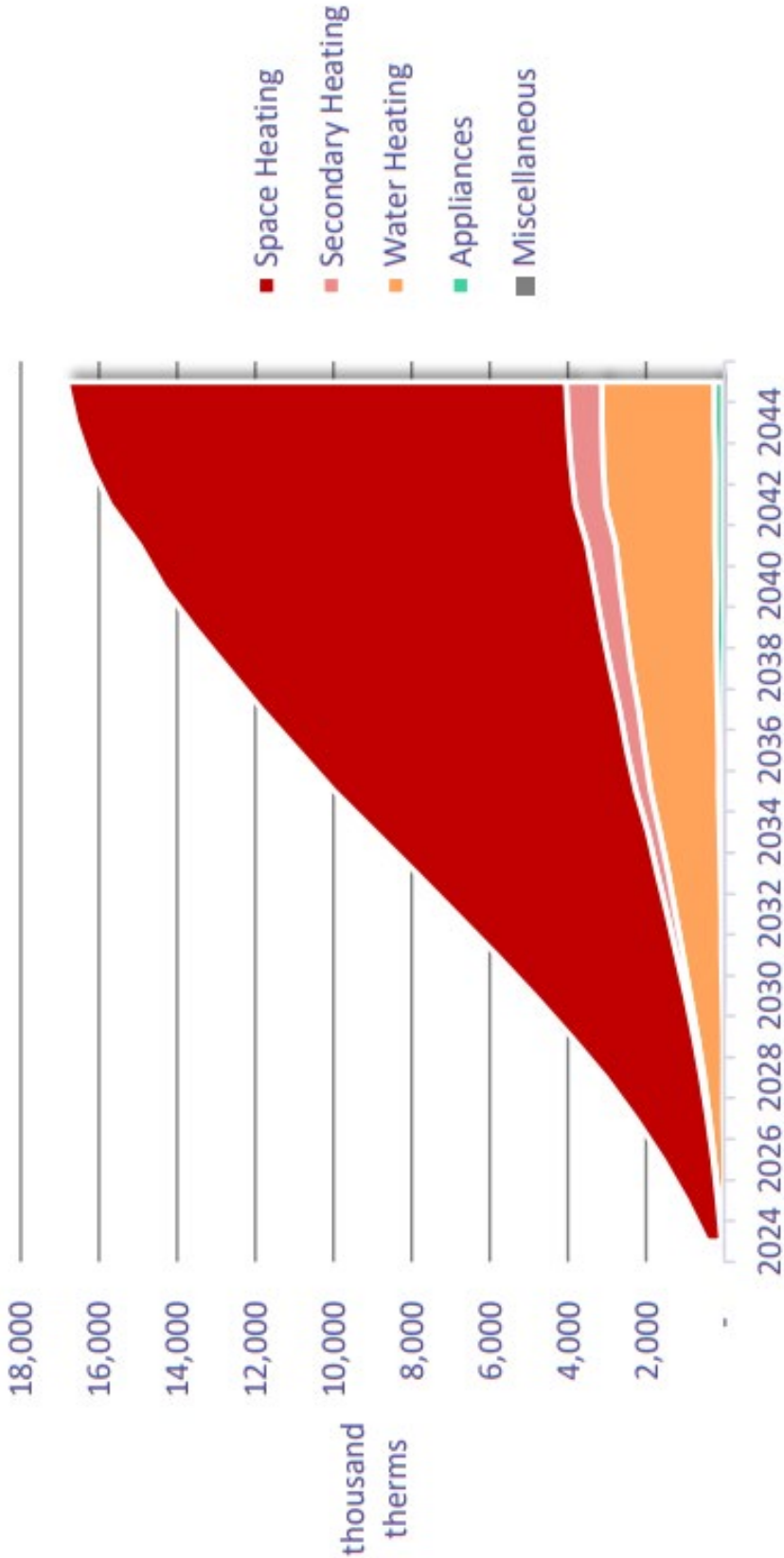
Summary of Energy Efficiency Potential as % of Baseline Projection (thousand therms)



RESIDENTIAL

Energy Efficiency 2045

Cumulative UCT Achievable Potential Forecast



RESIDENTIAL FORECAST SUMMARY

Scenario	2024	2025	2028	2033	2038	2043
Baseline Forecast (thousand therms)	123,075	121,020	115,263	106,878	99,641	93,064
Cumulative Savings (thousand therms)						
Achievable Economic UCT Potential	446	970	3,048	7,884	12,712	16,244
Achievable Economic TRC Potential	299	646	2,017	5,204	8,415	10,782
Achievable Technical Potential	563	1,218	3,824	9,981	16,059	20,148
Technical Potential	3,082	6,133	15,032	28,879	39,108	45,067
Energy Savings (% of Baseline)						
Achievable Economic UCT Potential	0.4%	0.8%	2.6%	7.4%	12.8%	17.5%
Achievable Economic TRC Potential	0.2%	0.5%	1.7%	4.9%	8.4%	11.6%
Achievable Technical Potential	0.5%	1.0%	3.3%	9.3%	16.1%	21.6%
Technical Potential	2.5%	5.1%	13.0%	27.0%	39.2%	48.4%

Residential Top Ten Measures

Rank	Measure / Technology	2024 Cumulative Savings (thousand therms)	% of Total	2025 Cumulative Savings (thousand therms)	% of Total
1	Insulation - Ceiling, Upgrade - R-49 to R-60 depending on space	115	25.9%	233	24.0%
2	Furnace - Direct Fuel - AFUE 97% (CEE Tier 3)	110	24.6%	241	24.8%
3	Insulation - Wall Cavity, Installation - R-14 to R-21 depending on space	46	10.3%	92	9.5%
4	Insulation - Ceiling, Installation - R-49 to R-60 depending on space	42	9.5%	85	8.8%
5	Water Heater <= 55 gal. - UEF 0.95 (Instantaneous, ENERGY STAR 5.0)	33	7.4%	79	8.2%
6	Ducting - Repair and Sealing - 50% reduction in duct leakage	14	3.1%	35	3.6%
7	Insulation - Basement Sidewall - R-15	13	3.0%	34	3.5%
8	ENERGY STAR Clothes Washers - ENERGY STAR unit	12	2.6%	23	2.4%
9	Water Heater - Pipe Insulation - Insulated 5' of pipe between unit and conditioned space	8	1.7%	19	2.0%
10	Fireplace - Tier 2 (77%+ FE Rating)	7	1.6%	17	1.8%

COMMERCIAL & INDUSTRIAL

COMMERCIAL FORECAST SUMMARY

Scenario	2024	2025	2028	2033	2038	2043
Baseline Forecast (thousand therms)	85,692	83,581	76,682	66,254	57,956	51,866
Cumulative Savings (thousand therms)						
Achievable Economic UCT Potential	301	670	2,084	4,457	5,722	6,104
Achievable Economic TRC Potential	304	690	2,224	4,796	6,016	6,294
Achievable Technical Potential	1,045	2,162	5,388	9,350	10,941	11,104
Technical Potential	1,445	2,959	7,509	12,916	15,019	15,548
Energy Savings (% of Baseline)						
Achievable Economic UCT Potential	0.4%	0.8%	2.7%	6.7%	9.9%	11.8%
Achievable Economic TRC Potential	0.4%	0.8%	2.9%	7.2%	10.4%	12.1%
Achievable Technical Potential	1.2%	2.6%	7.0%	14.1%	18.9%	21.4%
Technical Potential	1.7%	3.5%	9.8%	19.5%	25.9%	30.0%

Commercial Top Ten Measures

Rank	Measure / Technology	2024 Cumulative Potential Savings (thousand therms)	% of Total	2025 Cumulative Potential Savings (thousand therms)	% of Total
1	Insulation - Roof/Ceiling - R-38	48	15.9%	120	17.9%
2	Insulation - Wall Cavity - R-21	44	14.6%	109	16.3%
3	Gas Boiler - Insulate Hot Water Lines - Insulated water lines	22	7.2%	42	6.3%
4	Gas Boiler - Stack Economizer - Economizer installed	20	6.7%	39	5.9%
5	Gas Boiler - Hot Water Reset - Reset control installed	19	6.3%	40	6.0%
6	Water Heater - TE 94% (ENERGY STAR 2.0)	16	5.4%	34	5.1%
7	Water Heater - Ozone Laundry - Ozone laundry system	12	3.9%	23	3.4%
8	Boiler - TE 98%	12	3.8%	24	3.5%
9	Furnace - AFUE 96%	11	3.8%	26	3.9%
10	Gas Boiler - High Turndown - Turndown control installed	10	3.3%	19	2.9%

INDUSTRIAL FORECAST SUMMARY

Scenario	2024	2025	2028	2033	2038	2043
Baseline Forecast (thousand therms)	20,614	20,920	21,770	22,747	23,843	25,008
Cumulative Savings (thousand therms)						
Achievable Economic UCT Potential	68	142	412	900	1,238	1,429
Achievable Economic TRC Potential	67	139	407	899	1,229	1,413
Achievable Technical Potential	77	160	461	1,002	1,372	1,576
Technical Potential	94	195	561	1,203	1,627	1,859
Energy Savings (% of Baseline)						
Achievable Economic UCT Potential	0.3%	0.7%	1.9%	4.0%	5.2%	5.7%
Achievable Economic TRC Potential	0.3%	0.7%	1.9%	4.0%	5.2%	5.7%
Achievable Technical Potential	0.4%	0.8%	2.1%	4.4%	5.8%	6.3%
Technical Potential	0.5%	0.9%	2.6%	5.3%	6.8%	7.4%

Industrial Top Ten Measures

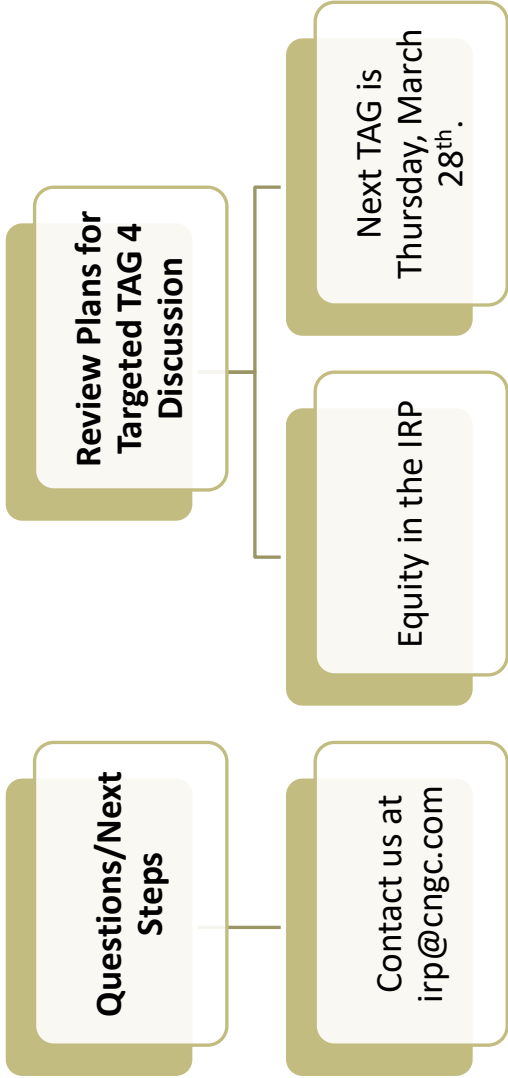
Rank	Measure / Technology	2024 Cumulative Potential Savings (thousand therms)	% of Total	2025 Cumulative Potential Savings (thousand therms)	% of Total
1	Strategic Energy Management - Energy management system installed and programmed	17	24.9%	34	23.9%
2	Process - Insulate Heated Process Fluids - Insulated process fluid lines	10	14.5%	20	14.0%
3	Gas Boiler - Insulate Hot Water Lines - Insulated water lines	8	12.0%	16	11.5%
4	Gas Boiler - Stack Economizer - Economizer installed	8	11.7%	16	11.2%
5	Insulation - Roof/Ceiling - R-38	5	7.8%	14	10.2%
6	Process Heat Recovery - HR system installed	4	6.6%	9	6.3%
7	Gas Boiler - Insulate Steam Lines/Condensate Tank - Lines and condensate tank insulated	4	5.5%	8	5.3%
8	Gas Boiler - High Turndown - Turndown control installed	3	4.4%	6	4.2%
9	Gas Boiler - Maintenance - General cleaning and maintenance	3	4.3%	5	3.5%
10	Gas Boiler - Hot Water Reset - Reset control installed	3	4.1%	6	4.5%

Feedback for Cascade?

Any other changes or ideas that Cascade should consider for Energy Efficiency Modeling?

Process Item	Date	Process Element	Appendix A
Targeted-IRP TAG	Thursday, January 25, 2024	What is an IRP and how to get involved in the process	Appendix A
Targeted-TAG	Thursday, February 15, 2024	Avoided Cost	
Targeted-TAG	Wednesday, March 6, 2024	Energy Efficiency	
Targeted-TAG	Thursday, March 28, 2024	Equity in the IRP	
Targeted-TAG	Thursday, April 11, 2024	Customer/Load Forecast	
Targeted-TAG	Tuesday, May 7, 2024	CCA/Compliance Modeling	
Targeted-TAG	Thursday, May 16, 2024	Distribution System Planning	
Targeted-TAG	Thursday, May 30, 2024	Resource Integration	
		Process, Key Points, IRP Team, Timeline, Regional Market Outlook, Planned Scenarios and Sensitivities, Stakeholder Engagement, Demand and Customer Forecast and Non-Core Outlook, Drilling down into segments of demand forecast.	
TAG 1	Thursday, June 13, 2024	Upstream Pipeline presentation.	
Receive feedback on TAG 1	Friday, June 28, 2024		
		Respond to TAG 1 Feedback, Distribution System Planning, Alternative Resources, Price Forecast, Avoided Costs, Current Supply Resources, Transport Issues, Carbon Impacts, Energy Efficiency, Bio-Natural Gas, Preliminary Resource Integration Results.	
TAG 2	Thursday, July 25, 2024		
Receive feedback on TAG 2	Friday, August 9, 2024		
First Draft	Friday, September 6, 2024		
Comments Due	Friday, October 4, 2024		
		Respond to TAG 2 feedback, Final Integration Results, finalization of plan components, Proposed new 2- to 4-year Action Plan	
TAG 3	Wednesday, October 30, 2024		
Final Draft	Tuesday, December 3, 2024		
Comments Due	Tuesday, January 14, 2025		
TAG 4 (if needed)	Thursday, January 30, 2025		
Final Complete By	Friday, February 14, 2025		
File	Monday, February 24, 2025		

2025 WA IRP Schedule





In the Community to Serve®

Integrated Resource Plan Targeted Technical Advisory Group Meeting #3

MARCH 6, 2024

MICROSOFT TEAMS/TELECONFERENCE



In the Community to Serve®



In the Community to Serve®

Targeted TAG #2 – TAG Meeting

Date & time: 01/25/2024, 9:00 AM to 10:00 AM

Location: Microsoft Teams Meeting

Presenters: Caleb Reimer, Brian Robertson, Jenny De Boer

In attendance: Abe Abdallah, Alessandra de la Torre, Jacinda Ashby, Desiree Bickmore, Lori Blattner, Kary Burin, Debra Campbell, Mark Chiles, Corey Dahl, Patrick Darras, Jenny De Boer, Rebecca Eaton, Bruce Folsom, Michael Freels, John Garrett, Will Gehrke, Byron Harmon, Kim Herb, Abbie Krebsbach, Joseph Lennan, Scott Madison, Devin McGreal, Heather Moline, Russ Nishikawa, Noemi Ortiz, Michael Parvinen, Caleb Reimer, Brian Robertson, Carra Sahler, Eric Shierman, Zachary Sowards, Matt Steele, Bailey Steeves, Carolyn Stone, Claire Valentine-Fossum, Mahon Walsh, Quinn Weber, Kathy Wold

Brian Robertson, Supervisor of Resource Planning, opened the meeting by welcoming and thanking stakeholders for participating in Cascade's IRP Process. Brian reminded folks that we wouldn't be doing introductions at the beginning of the meeting but asked if/when people interjected throughout the meeting to please introduce themselves.

Presentation #1 – Safety Moment (Jenny De Boer)

- Jenny gave a quick safety moment on stress.

Presentation #2 – Demand Side Management Forecast (Caleb Reimer)

- Caleb Reimer, the manager for Cascade's Energy Efficiency Program in Washington, presented on the demand-side management forecast for the Washington IRP. He discussed the program's focus and highlighted key points, including an overview of the program's performance historically and in 2023. Caleb also talked about the conservation potential assessment (CPA) and methodologies behind it, as well as energy efficiency forecasts and programs. He noted that the residential program had a record year in 2023, with over 100 projects completed, and discussed savings in terms of therms for residential, commercial, and low-income programs. Caleb congratulated the teams for their achievements and encouraged questions throughout the presentation.
- Energy Efficiency Preliminary 2023 Savings
 - Residential—604,132 (new record by a lot)
 - Commercial—429,519
 - Low-Income—15,612

Question: Byron Harmon praised the “impressive” work done in the last year and asked whether this level of achievement could be sustained as a growing trend or if it was more of a temporary dip in an otherwise upward trend.

Answer: Caleb responded that while they aim for a continuing upward trend, achieving over 600,000 therms in savings, as they did in the past year, would be exceptional. He mentioned that their goal for 2024 is around 450,000 therms, but they are currently ahead of that pace. Caleb expressed that hitting 600,000 therms again would be a fantastic result.

Presentation #3 – Conservation Potential Assessment (Caleb Reimer)

- Caleb Reimer continued his presentation by discussing the conservation potential assessment (CPA) and its complexity. He explained that the CPA is a collaborative effort that takes about nine months to produce, working with Applied Energy Group (AEG). Caleb highlighted two slides that outline the process and framework of the CPA. He emphasized the importance of understanding what the model does and does not do, noting that it produces new outputs based on inputs but does not create new inputs. Caleb then detailed the three categories of market characterization: customer segmentation, market size, and equipment saturation, tech shares, and vintage distribution. He explained how data is collected from internal historical records and assessments provided by organizations like NIA. Caleb also discussed unit energy consumption and new construction profiles, focusing on forecasting market trends and available energy-efficient equipment.
- He then described the process of producing a baseline projection, which serves as a reference case for total energy usage if there were no energy efficiency programs. He explained how the model modifies usage based on various factors such as income group, type of home, home turnovers, and type of commercial business. Caleb concluded by mentioning the potential module, which estimates the potential based on the baseline, technical potential, achievable technical potential, and achievable economic potential.
- LoadMAP Analysis Framework
 - Inputs
 - Market Characterization
 - Projection Data
 - Energy-efficiency Analysis
 - Outputs
 - Base-year Energy Consumption
 - Projection Results

Question: Byron from UTC asked Caleb and Brian about the process of integrating the conservation potential assessment (CPA) into the IRP model. He inquired whether a new CPA would be created for the IRP or if the 2023 CPA would be used for the 2025 IRP.

Answer: Caleb responded that, most likely, the 2023 CPA would be plugged into the upcoming IRP. However, they have the ability to run alternative scenario analysis if the IRP team wants to experiment with ideas not considered in the last CPA. Caleb also mentioned that they are starting the upcoming CPA earlier than in the past, planning to kick it off late in the summer, allowing them to incorporate new ideas or scenarios into the CPA if desired.

Question: Quinn from UTC asked Caleb about how they are incorporating provisions from the Infrastructure Investment and Jobs Act (IIJA) and the Inflation Reduction Act (IRA) into their economic analysis.

Answer: Caleb responded that their company is reviewing these acts from a broader company perspective, not just focusing on energy efficiency. He mentioned that the emphasis of these acts seems to be more on electric or electricity conversion, which has not yet had a significant impact on their energy efficiency analysis. However, Caleb expressed openness to input from the Conservation

Advisory Group meetings, the Commission, or any other parties to help incorporate these provisions into their upcoming CPA analysis.

Question: Claire Valentine-Fossum from the Oregon PUC asked if there is a process in place to learn from past examples or collaborate with other utilities when developing the framework for gas planning, especially since many entities, including AEG, work for multiple utilities.

Answer: Caleb Reimer explained that AEG produces CPAs for various entities, including Cascades, NW Natural, and Avista. He mentioned that there is collaboration and sharing of assumptions and knowledge among these entities, which helps in understanding emerging market trends, technological advancements, and rule changes. He emphasized the value of starting from a common source and being in line with assumptions from other utilities.

Question: Quinn Weber asked about equity analysis and levels of participation among low-income communities in the gas planning framework.

Answer: Caleb Reimer explained that they do consider equity, with a separate analysis for low-income weatherization programs. They segment customers into low, moderate, and regular income groups, as well as by climate zones and housing types, to account for different energy usage rates. Noemi Ortiz summarized the equity considerations in their low-income weatherization program, which prioritizes services for the elderly, persons with disabilities, households with children, high residential energy users, households with high energy burden, and Native American households. The program provides energy efficiency measures, health and safety repairs, and is funded by the Department of Commerce, offering services at no cost to qualified households.

Question: Heather Moline sought clarification on some terminology. She asked about the term "generator" in the context of the non-equipment measure input generator in the load MAP.

Answer: Caleb Reimer explained that it refers to a tool that creates something, in this case, information that informs the potential model of the CPA. Heather also asked about "ramp rates," and Caleb explained that they are part of the equipment stock and modifying usage, impacting different equipment items' lifespans and segmented by income style. These rates are influenced by the Northwest Power Conservation Council and then modified by AEG for relevance to the natural gas market.

Presentation #4 – Portfolio (Caleb Reimer)

- Caleb Reimer discussed the results of the 2023 CPA, focusing on the breakdown by portfolio, which includes residential, commercial, and industrial segments. He mentioned having half a dozen slides showing the results and explained that the energy efficiency potential is presented in thousands of therms, with a baseline projection and savings calculated based on usage. He also touched on ramp rates and how they impact equipment stock and usage modification. Caleb highlighted the UCT achievable economic potential, which is used for cost-effectiveness and savings assumptions, and mentioned that the program works on a biennium timeline. He concluded by discussing the cumulative savings as a percentage of baseline and how the technical potential decreases to achievable use potential and achievable economic potential. Caleb also provided a breakdown of the residential sector, showing the forecasted potential for space heating, insulation, furnaces, thermostats, and other heating measures.

Question: John Garrett from Oregon CUB asked about the impact of air conditioning on potential savings and how insulation, which is valuable for space heating, might also benefit air conditioning.

Answer: Caleb Reimer explained that since they don't incentivize gas use for air conditioning, it falls under a non-energy impact or benefit, typically represented as a 10% adder in their UCT forecast to incorporate unquantifiable factors. He mentioned that utilities like PSE, which provide both gas and electric services, can claim savings from decreased electric usage for air conditioning with insulation, but as a gas utility, they can't directly incorporate those savings. Caleb also hinted at future potential for fuel switching and indicated that they might explore this further in their 2025 CPA.

Presentation #5 – Residential (Caleb Reimer)

- Caleb Reimer presented a table showing the baseline forecast for energy usage, indicating a decrease in gas usage over time. He highlighted the achievable economic UCT potential in 2025, which informs their biennial savings goal, set at 970,000 therms. He noted that the top 10 residential measures according to the CPA include insulation, furnaces, water heaters, and duct sealing, which align with their current program focus. Caleb mentioned their hope to increase the number of insulation installations in the future and praised their trade ally coordinator, Stephanie, for her work in getting new contractors involved in the program.
 - Residential Forecast
 - Baseline Savings Projection (thousand therms) for 2024: 229,381
 - Cumulative Savings Projection (thousand therms) for 2024:
 - Achievable Econ UCT Potential 446
 - Achievable Econ TRC Potential 299
 - Achievable Technical Potential 563
 - Technical Potential 3,082
 - Residential Top Measures and Cumulative 2024 Savings Projection
 - Insulation – ceiling upgrade R-49 to R-60 – 115 thousand therms
 - Furnace – direct fuel AFUE 97% – 110 thousand therms
 - Insulation – wall cavity R-14 to R-21 – 46 thousand therms

Question: Heather Moline asked about the distinction between what's technically and economically available versus what Cascade will pursue or what people are actually doing.

Answer: Caleb Reimer explained that the slide was a forecast from the CPA for 2024 and 2025, indicating what they expect to see to reach their therm number goals. He mentioned that if there were a huge disconnect between the forecast and actual data, it would indicate a problem with their analysis or assumptions. However, since the forecast aligns with what they're seeing, it gives them confidence in their methods and suggests they won't need to change much for the next iteration.

Presentation #6 – Commercial & Industrial (Caleb Reimer)

- Caleb Reimer discussed the forecasted gas usage for 2024 and 2025, highlighting the achievable economic UCT potential. He mentioned a large project on a Navy base coming up in 2024 and 2025 that would contribute to savings. Reimer expressed confidence in meeting the savings goals. He briefly shared the top ten measures for commercial and industrial sectors, mentioning common equipment replacements like installations, gas boilers, and water heaters. He noted that the CPA assumptions for equipment replacement seem reasonable and accurate. Reimer also touched on the industrial forecast, noting a slight increase in usage driven by average usage per industrial application and customer counts. He mentioned that factors like strategic energy management, a custom approach to energy efficiency, are being piloted and could contribute to future savings.
 - Commercial Forecast
 - Baseline Savings Projection (thousand therms) for 2024: 85,692
 - Cumulative Savings Projection (thousand therms) for 2024:

- Achievable Econ UCT Potential 301
- Achievable Econ TRC Potential 304
- Achievable Technical Potential 1,045
- Technical Potential 1,445
- Commercial Top Measures and Cumulative 2024 Savings Projection
 - Insulation – roof/ceiling R-38 – 48 thousand therms
 - Insulation – wall cavity R-21 – 44 thousand therms
 - Gas Boiler – insulate water lines – 22 thousand therms
- Industrial Forecast
 - Baseline Savings Projection (thousand therms) for 2024: 20,614
 - Cumulative Savings Projection (thousand therms) for 2024:
 - Achievable Econ UCT Potential 68
 - Achievable Econ TRC Potential 67
 - Achievable Technical Potential 77
 - Technical Potential 94
- Industrial Top Measures and Cumulative 2024 Savings Projection
 - Strategic Energy Management – energy management system – 17 thousand therms
 - Process – insulate process fluid lines – 10 thousand therms
 - Gas Boiler – insulate water lines – 8 thousand therms

Question: Claire Valentine-Fossum from PUC asked about the strategic energy management program, specifically whether it is conducted by the company itself or by a third party.

Answer: Caleb Reimer explained that the program is currently being run by their commercial partner, TRC (previously Lockheed Martin), as a pilot offering. This program involves conducting audits and walkthroughs of industrial and commercial buildings to ensure proper usage and sizing of equipment, as well as providing recommendations for efficiency improvements. Reimer clarified that TRC is doing the assessments in-house, and the information gathered will be available to the companies regardless of whether they choose to implement the recommendations.

Presentation #7 – Feedback for Cascade? (Caleb Reimer)

- Heather Moline from UTC provided feedback on the meeting, noting that while she appreciated the information provided, she suggested that the pace could be slowed down a bit and that more space could be left between slides to allow attendees to digest the information. She felt that the meeting moved a little fast, even for someone with four years of experience.
- Brian Robertson acknowledged the feedback and thanked her for it.

Presentation #8 – 2025 WA IRP Schedule (Brian Robertson)

- Brian outlined the upcoming meetings and timeline for the IRP process. The energy efficiency meeting took place at the end of March, followed by an equity in the IRP meeting in April, a customer and load forecast meeting in May, and a series of meetings in June, including discussions on CCA compliance, modeling, distribution, and resource integration. In June, there will also be a longer presentation to discuss methodology changes and results from different methodologies, with the aim of locking in numbers for the next steps. Feedback is expected at the end of June, with a second tag meeting at the end of July to discuss feedback and file a draft. A third tag meeting will be held to discuss final results, with the possibility of a fourth tag meeting in January if needed, before filing the final draft in February.
- Brian announced that the next meeting would focus on equity in the IRP and would be held on Thursday, March 28th. He also provided a website for comments, feedback, and questions. Afterward, he opened the floor for any additional questions or thoughts from the attendees.

Post Presentations –

- Carra Sahler asked about the industrial forecast summary, confirming if it was all about Washington with no mention of Oregon. Lori Blattner confirmed this, stating that all the numbers discussed were specific to Washington. Carra then inquired about plans for Oregon, to which Brian Robertson clarified that the IRP process being discussed was for Washington specifically. Carra apologized for the questions about Oregon and expressed appreciation for the information, noting the importance of informing the Commissioners about their plans. Brian acknowledged the feedback and mentioned that while the focus was on Washington, some information would be used for the Oregon IRP update. Carra thanked them for clarifying and suggested that the information about Washington be clearly indicated in future communications. Brian agreed and welcomed any additional questions or feedback.

The Meeting was Adjourned

Per Cascade Commitment #8 (Stakeholder Engagement Design Document, 2/22,2022: “Provide TAG minutes that include the action items from bullet #7 as well as any upcoming deadlines for feedback on the IRP”), here are additional action items to track, coming out of the TAG2 meeting:

1. Cascade will model scenarios around the Avoided Cost and CPA.
2. Cascade is investigating the impact of the IIJA and IRA for energy efficiency.
3. Cascade will make an effort to slow the pace of the meetings and to make it clear that this IRP process is for the Washington IRP filing.



In the Community to Serve®

Washington Integrated Resource Plan Targeted Technical Advisory Group Meeting #4

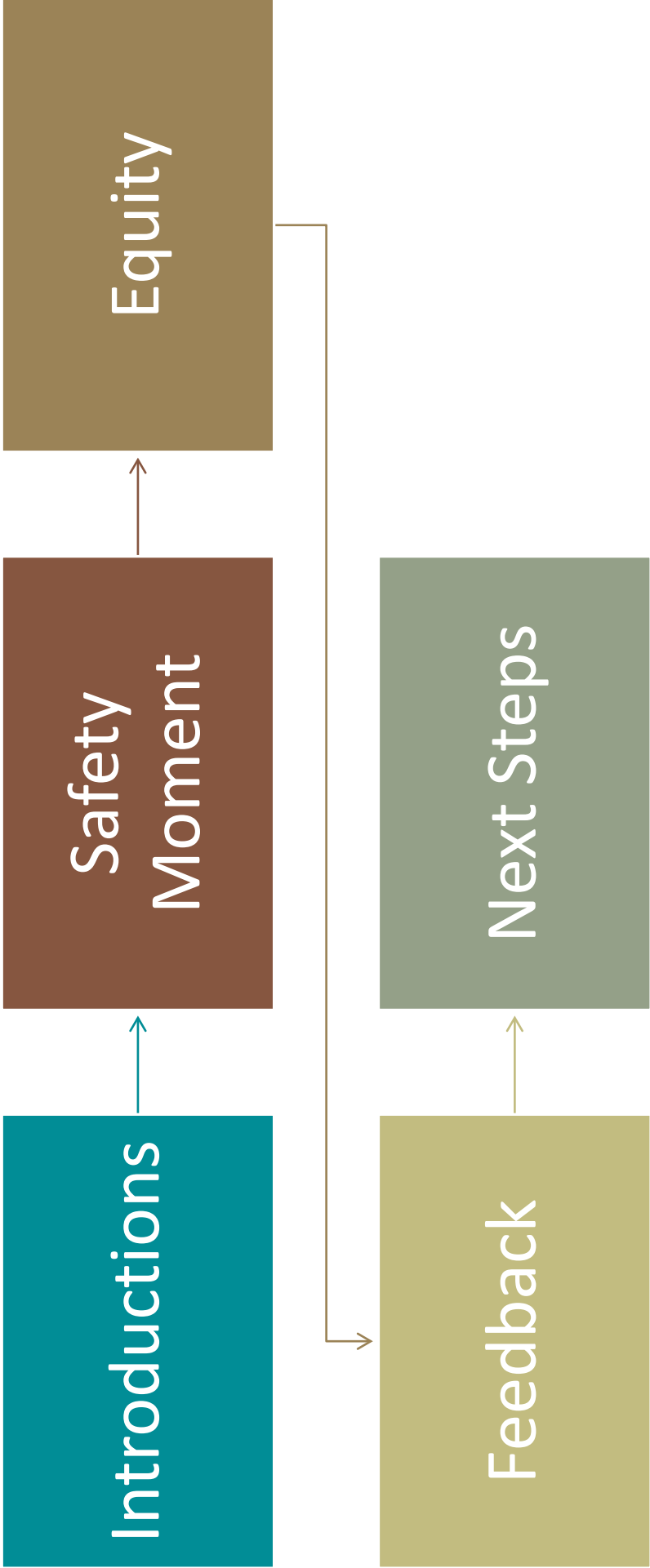
MARCH 28, 2024

MICROSOFT TEAMS/TELECONFERENCE



In the Community to Serve®

Agenda



Safety Moment

Careful Cleaning

Keeping our homes and workspaces clean and tidy can come with hazards. Staying safe while keeping your spaces clean can be done by following a few simple steps:



Equity

What is Equity?

Equity in the energy sector tries to achieve energy justice by:

- Addressing disparities so that everyone has a fair opportunity to benefit from natural gas service or utility programs
- Remediating social, economic, and health burdens faced by marginalized communities
- Including affected communities in the decision-making process for energy policies, project and infrastructure

Rate Case Order 09 in UG-210755

The Legislature established the Washington Office of equity, which set out the following principle of equity:

- Equity requires developing, strengthening, and supporting policies and procedures that distribute and prioritize resources to those who have been historically and currently marginalized, including tribes;
- Equity requires the elimination of systemic barriers that have been deeply entrenched in systems of inequality and oppression; and
- Equity achieves procedural and outcome fairness, promoting dignity, honor, and respect for all people

What is Energy Justice?

The four tenets of Energy Justice are:

- Recognition Justice
- Procedural Justice
- Distributional Justice
- Restorative Justice



Specific Examples of Energy Justice

Procedural Justice

- Post IRP meetings, materials, and recordings online
- Cascade is working towards having all posted pdfs translated into Spanish



<https://www.cngc.com/rates-services/rates-tariffs/washington-integrated-resource-plan/>



WASHINGTON | CASCADE NATURAL GAS | NATURAL GAS – INTEGRATED RESOURCE PLAN

The What: Cascade's Integrated Resource Plan describes the two- to four-year and twenty-year expectation of how Cascade expects to safely serve customer energy needs at the lowest reasonable and safe cost. The analysis in this 12- to 18-month process includes existing and potential new pipelines and natural gas supply contracts (among others) as well as benefits of energy efficiency to customers. The IRP provides comprehensive and transparent insight into how Cascade plans for customers' energy future. To view what an IRP looks like, please see Previous Years' IRP at the bottom of the page. The Executive Summary and Key Points are designed to provide a quick, but descriptive, explanation of the process and plan.

The Who: Customers and the general public are invited to participate in a series of meetings on the variety of topics contained in the IRP including energy efficiency and carbon emission reductions. Together, customers and the general public participating in the IRP process are called Stakeholders. Stakeholders also include the professional analytical staffs of the state utility commissions and groups representing residential and industrial customers. Community-based organizations and independent experts also attend the series of meetings.

How it works: The IRP process begins with a kick-off meeting to lay out the 12-18 month schedule of four to six meetings as well as provide an overview of what issues will be covered. These meetings are called Technical Advisory Group meetings or TAGs. Links are available to the TAG presentations, minutes, and written responses to Stakeholder's requests and comments.

What to expect: Expectations of participants and tips for the best way for Stakeholders (including customers and the general public) are described in Cascade's [Stakeholder Engagement Design Document](#). This is a "living document" and suggestions for improvement are welcome.

Sign up: Join Cascade's distribution list. You may participate in multiple ways, ranging from attending the TAG meetings (either in-person or remotely) and receiving the agendas/presentations to opportunity to comment. Do so by contacting the Supervisor of Resource Planning, Brian Robertson at either Brian.Robertson@cngc.com or (509) 221-9808. You may also contact the Company's IRP email address at irp@cngc.com. Cascade uses MS Teams as its means to connect participants remotely. MS Teams is a free application to be used by Stakeholders including customers and the general public.

Accommodations: As shown as point #1 on page 2 of the Stakeholder Engagement Design Document, Cascade will provide reasonable accommodations for people with disabilities. Additionally, the Company will reasonably accommodate items such as requests for meeting locations, audio and visual capabilities, and other items requested by external stakeholders. If you have a request for accommodations, please reach out to one of the contacts listed above and the Company will gladly coordinate any reasonable requests for accommodations.

Pre- and Post-IRP Feedback report

IRP Public Process Timeline
2025 IRP Targeted TAG #1s: Thursday, January 25, 2024
Microsoft Teams Only - 9 AM PST to 10 AM PST
What is an IRP and how to get involved

- Targeted TAG 1 Presentation
- Targeted TAG 1 Minutes
- Targeted TAG 1 Video Recording



2025 IRP Targeted-TAG #2 - Thursday, February 15, 2024
Microsoft Teams Only - 9 AM PST to 10 AM PST
Avoided Cost

- Targeted TAG 2 Presentation
- Targeted TAG 2 Minutes
- Targeted TAG 2 Video Recording

Specific Examples of Energy Justice

Procedural Justice

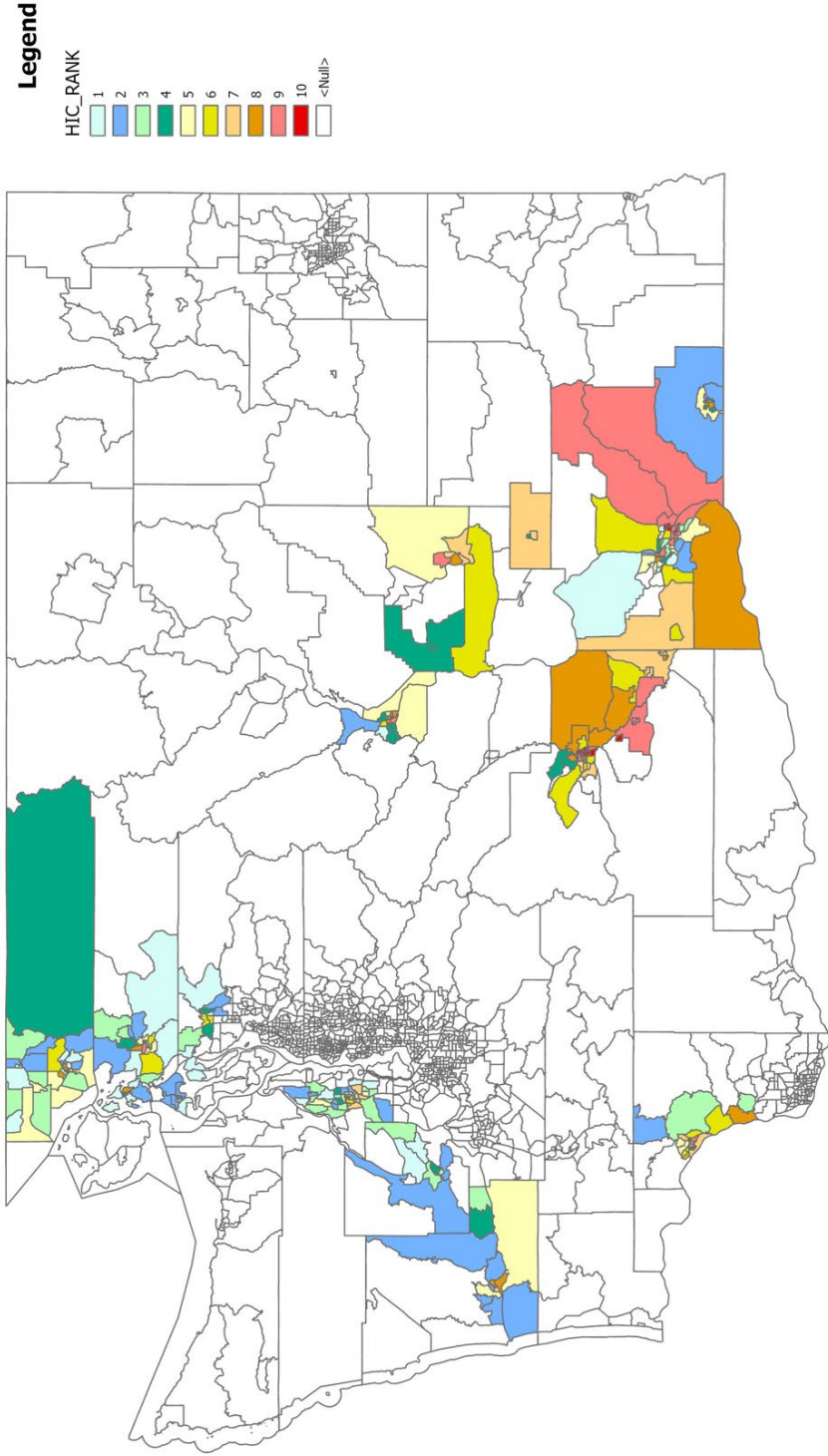
- Customer communications on the IRP Process will be through multiple communication channels and in multiple languages
 - As recommended by Equity Advisory Group
- Hold a meeting(s) in the community
 - Based on feedback the from Equity Advisory Group, Cascade may partner with other scheduled community meetings
- Cascade will provide childcare and food, and will have a Spanish translator present at the meeting



Specific Examples of Energy Justice

Recognition Justice

- Map highly impacted communities

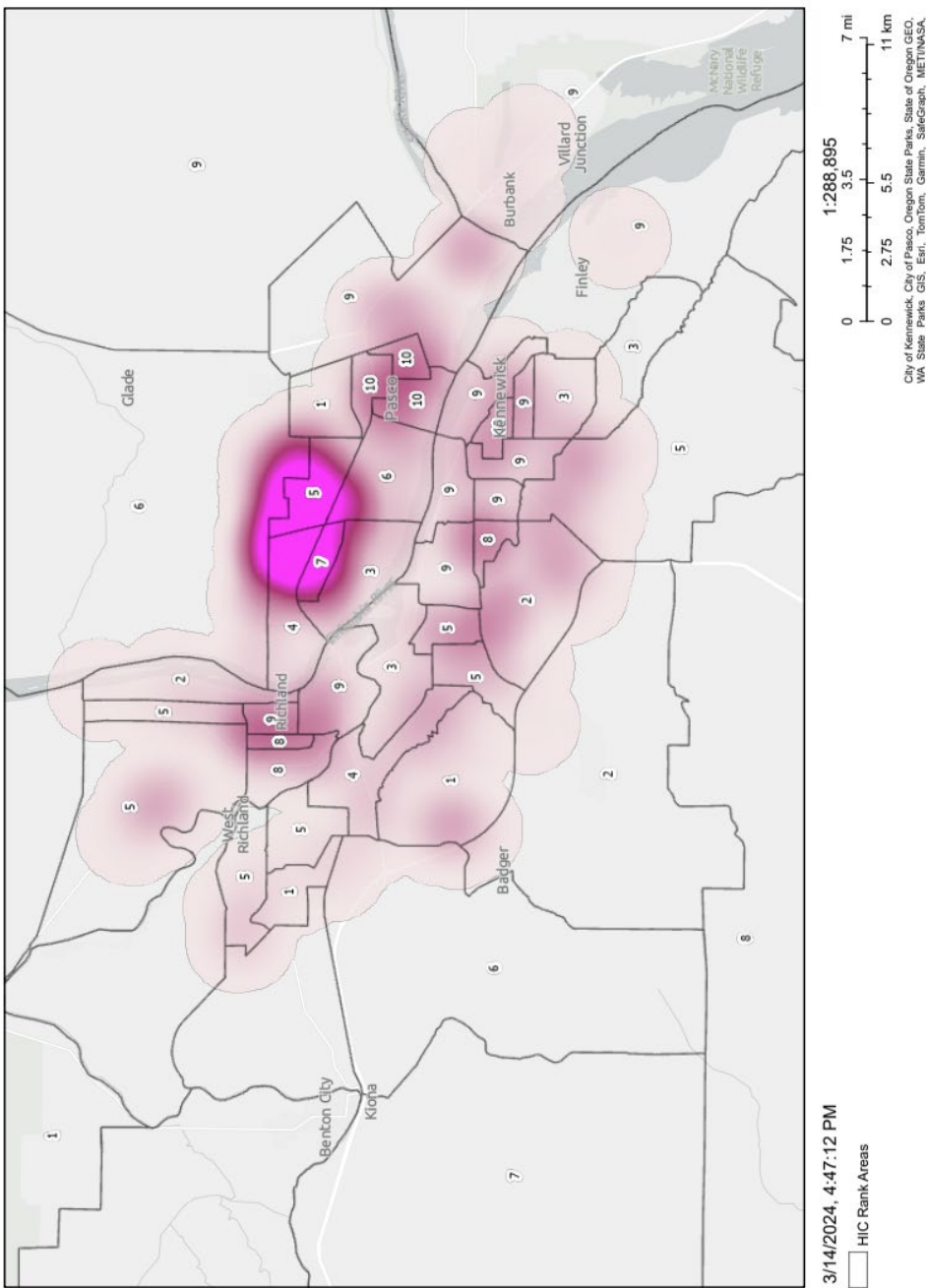


Specific Examples of Energy Justice

Recognition Justice

- Merge highly impacted community data with billing data (arrearages, program participation, disconnection for nonpayment, etc.)

Tri-Cities Late Pay Heat Map

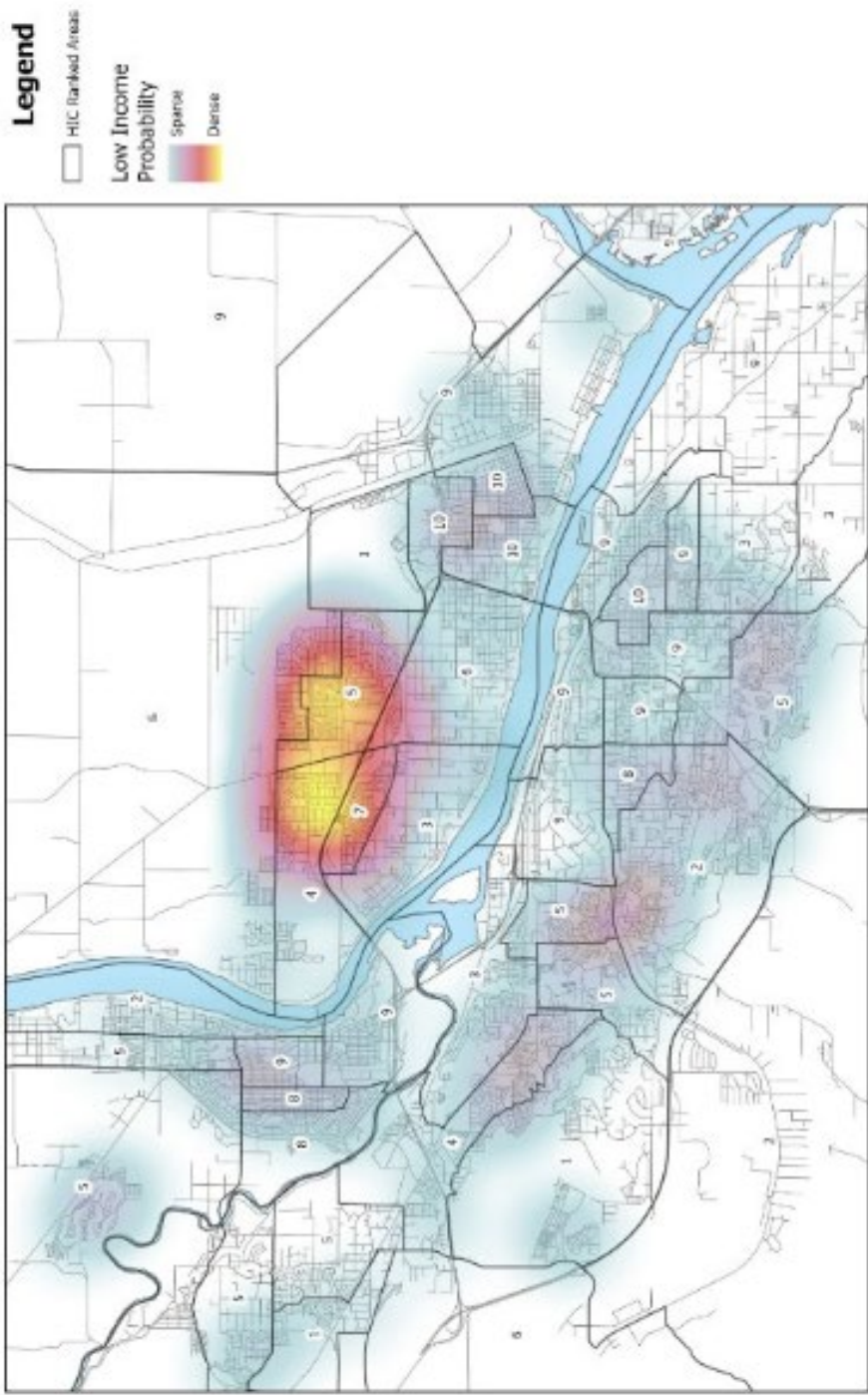


Specific Examples of Energy Justice

Recognition Justice

- Map the areas most likely to have low-income residents based on Cascade's Low-Income Propensity Model

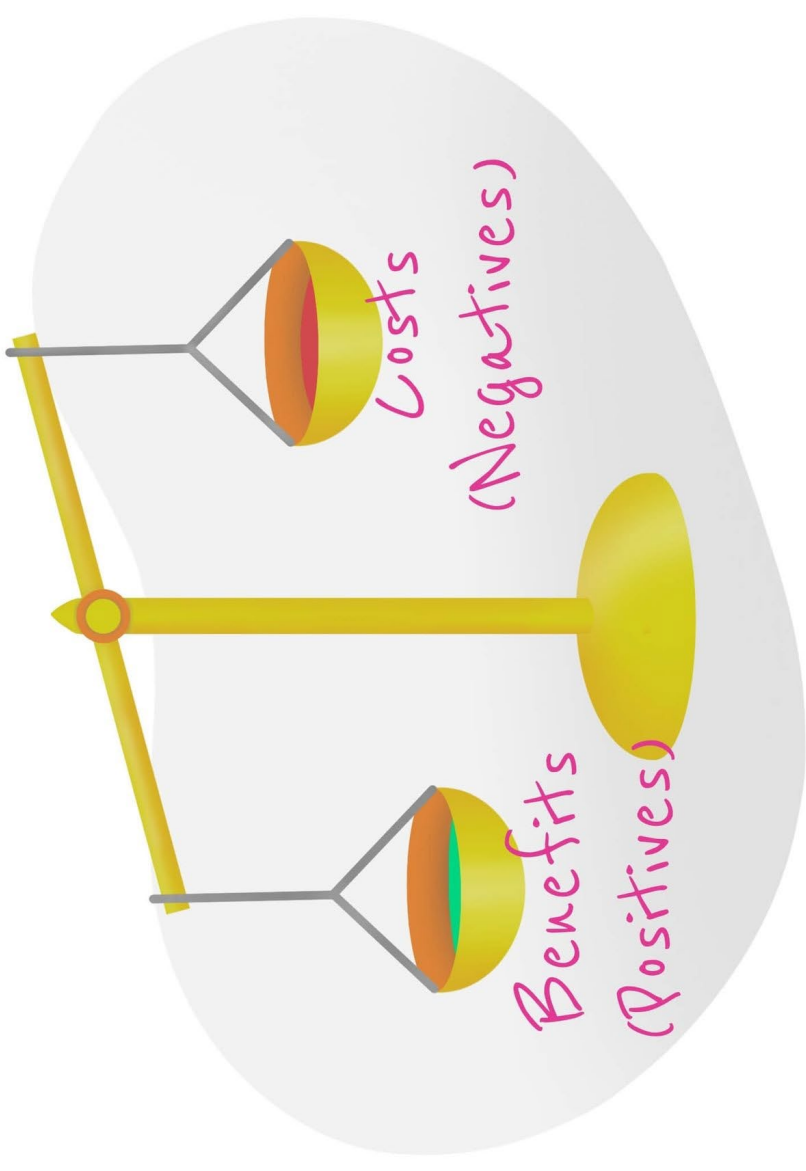
TRI-CITY LOW INCOME PROBABILITY DENSITY MAP - FEB 15 2024



Specific Examples of Energy Justice

Distributional Justice

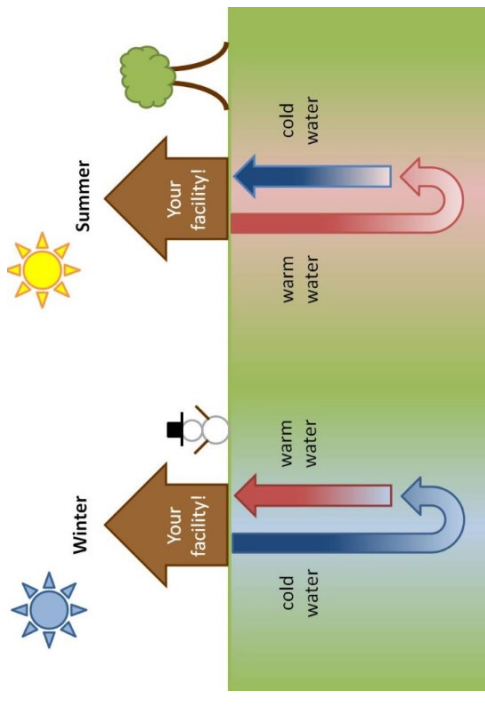
- Develop cost benefit analyses for projects measuring costs and benefits for highly impacted communities



Specific Examples of Energy Justice

Restorative Justice

- The Cascade Arrearage Relief and Energy Savings program (CARES) alleviates energy burden for low-income customers
- Enhanced targeted conservation programs
- Pilot decarbonization programs that would encourage businesses to stay in the communities for jobs and economic health
- Pilot projects such as community geothermal projects for residential heating and cooling or residential and commercial hybrid heating systems



What has Cascade done to make Energy Justice part of its daily operations?

2022

- Procured a low income needs assessment study
- Hired a full-time employee to oversee equity

Cascade Natural Gas Corporation: Low-Income Rate Analysis for Washington

Prepared for:
Cascade Natural Gas Corporation

Prepared by:
*Forefront Economics Inc
H. Gil Peach & Associates, LLC*

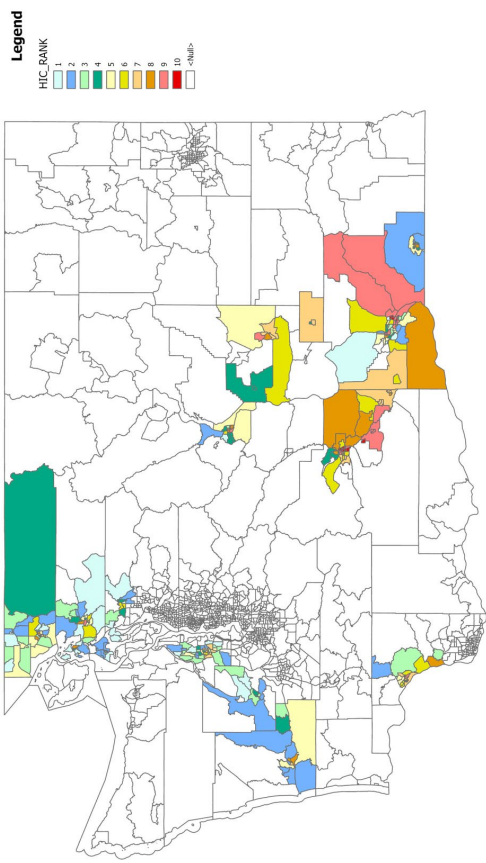
with contributions from:
*Mark E. Thompson
H. Gil Peach*

May 31, 2022

What has Cascade done to make Energy Justice part of its daily operations?

2023

- Mapped Cascade’s Highly Impacted Communities
- Merged Highly Impacted Community data with billing data to identify correlations and trends which may point to inequities
- Mapped the census tracts most apt to be low-income per our Low-Income Propensity Model



What has Cascade done to make Energy Justice part of its daily operations?

2023

- Established an Equity Advisory Group
- Comprised of seven members living in and representing different vulnerable populations
- Monthly meetings on regulatory proceedings, filings, Company outreach, and planning

What has Cascade done to make Energy Justice part of its daily operations?

2023

- Improved accessibility of customer communications for linguistically isolated customers
- Access to customer communications in multiple languages
- Improved readability of translations
- Working on providing all pdfs posted on cngc.com in both English and Spanish



What has Cascade done to make Energy Justice part of its daily operations?

2023

- Improved bill pay assistance by offering a bill discount and arrearage relief program (CARES)
- CARES program designed in collaboration with the Company's Advisory Group
- Piloting the use of community-based organization for outreach to hard-to reach populations



What will Cascade be doing to make Energy Justice part of its daily operations?

2024

- A Vice President equity sponsor will oversee the integration of equity
- Create a benefit cost analysis template for projects
 - Collaborate with the Equity Advisory Group on its development
 - Integrate use of the benefit cost analysis template for company projects

What will Cascade be doing to make Energy Justice part of its daily operations?

2024

- Continue engagement with the Washington Equity Advisory Group
 - Discuss the multi-year rate plan, IRP, Climate Commitment Act, potential pilot projects
- Establish the Oregon Equity Advisory Group
 - Identify vulnerable populations
 - Solicit then choose community representatives
 - Establish regular meetings to begin collaboration

What will Cascade be doing to make Energy Justice part of its daily operations?

2024

- Continued engagement
 - Technical Advisory Group
 - CARES Advisory Group
 - Conservation Advisory Group



When will we be done?

- Adopting an equity lens is an ongoing process
- The process requires ongoing collaboration

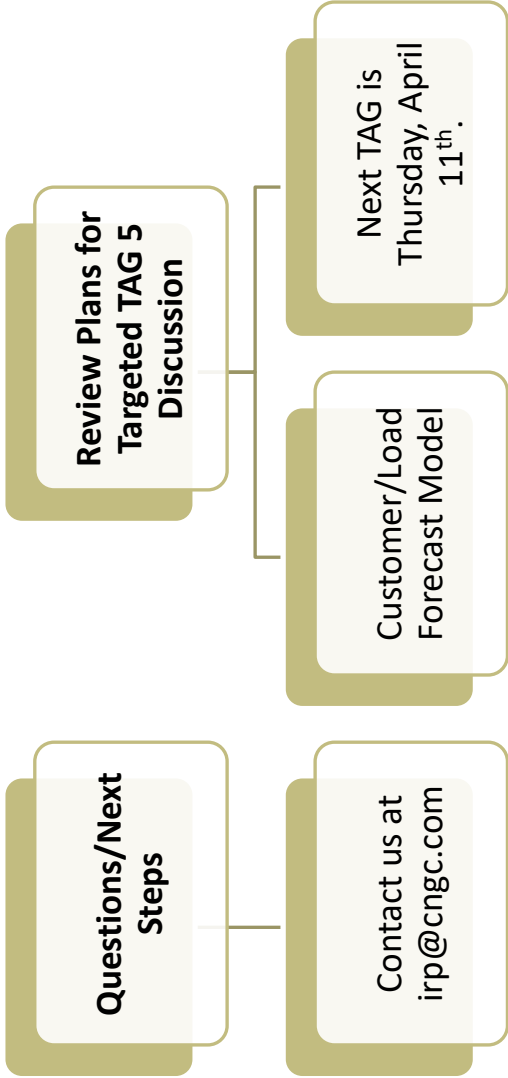


Feedback for Cascade?

Do you have comments or ideas that Cascade should consider regarding Equity?

Process Item	Date	Process Element	Appendix A
Targeted-IRP TAG	Thursday, January 25, 2024	What is an IRP and how to get involved in the process	Appendix A
Targeted-TAG	Thursday, February 15, 2024	Avoided Cost	
Targeted-TAG	Wednesday, March 6, 2024	Energy Efficiency	
Targeted-TAG	Thursday, March 28, 2024	Equity in the IRP	
Targeted-TAG	Thursday, April 11, 2024	Customer/Load Forecast	
Targeted-TAG	Tuesday, May 7, 2024	CCA/Compliance Modeling	
Targeted-TAG	Thursday, May 16, 2024	Distribution System Planning	
Targeted-TAG	Thursday, May 30, 2024	Resource Integration	
		Process, Key Points, IRP Team, Timeline, Regional Market Outlook, Planned Scenarios and Sensitivities, Stakeholder Engagement, Demand and Customer Forecast and Non-Core Outlook, Drilling down into segments of demand forecast.	
TAG 1	Thursday, June 13, 2024	Upstream Pipeline presentation.	
Receive feedback on TAG 1	Friday, June 28, 2024		
		Respond to TAG 1 Feedback, Distribution System Planning, Alternative Resources, Price Forecast, Avoided Costs, Current Supply Resources, Transport Issues, Carbon Impacts, Energy Efficiency, Bio-Natural Gas, Preliminary Resource Integration Results.	
TAG 2	Thursday, July 25, 2024		
Receive feedback on TAG 2	Friday, August 9, 2024		
First Draft	Friday, September 6, 2024		
Comments Due	Friday, October 4, 2024		
		Respond to TAG 2 feedback, Final Integration Results, finalization of plan components, Proposed new 2- to 4-year Action Plan	
TAG 3	Wednesday, October 30, 2024		
Final Draft	Tuesday, December 3, 2024		
Comments Due	Tuesday, January 14, 2025		
TAG 4 (if needed)	Thursday, January 30, 2025		
Final Complete By	Friday, February 14, 2025		
File	Monday, February 24, 2025		

2025 WA IRP Schedule





In the Community to Serve®

Washington Integrated Resource Plan Targeted Technical Advisory Group Meeting #4

MARCH 28, 2024

MICROSOFT TEAMS/TELECONFERENCE



In the Community to Serve®



Targeted TAG #4 – TAG Meeting

Date & time: 03/28/2024, 9:00 AM to 10:00 AM

Location: Microsoft Teams Meeting

Presenters: Noemi Ortiz, Brian Robertson

In attendance: Brian Robertson, Abe Abdallah, Bruce Folsom, Byron Harmon, Kathleen Campbell, Mark Chiles, Eric Shierman, Becky Hodges, Abbie Krebsbach, Scott Madison, Michael Freels, Noemi Ortiz, Rachel Preece, Alyn Spector, Tom Pardee, Quinn Weber, Matthew Doyle, Nick Sayen, Garret Senger, Dan Kirschner, Tim Dorpinghaus, Vincent Morales, Bailey Steeves, Ashley Stowkowy, Lori Blattner, Brian Stewart, Kary Burin, Debra Campbell, Caroline Moore, Carra Sahler, Chad Stokes, CNGC IRP, Corey Dahl, Damon McEnaney, Danielle Vitoff, Patrick Darras, Jennifer DeBoer, Ed Finklea, Heather Moline, Travis Hey, Brian Hoyle, Jeff Endler, Jim Griffith, JP Batmale, Kacia Brockman, Kim Herb, Laura Feinstein, Mahon Walsh, Marty Saldivar, Matt Steele, Devin McGreal, Mike Meyers, Nicole Singh, Russ Nishikawa, Tammy Nygard, Mike Paruszkiewicz, Michael Parvinen, Pat Delaquil, Phillip Popoff, Rebecca Eaton, Caleb Reimer, Chris Robbins, Rose Monahan, Samantha Christenson, Samuel Crawford, Kathi Scanlan, Sebastian Weber, Mark Sellers-Vaughn, Renie Sorensen, Zachary Sowards, Carolyn Stone, Tamy Linver, Timolin A., Tommy Brooks, Nathan Tyssen, Eric Wood, Jennifer Gross, Gabe Forrester, Melissa Martin, Cecelia Tanaka, Joshua Dennis, Jennifer Coulson, Daniel Tillis, Pete Marinace, Linda McFadden, Bobbi Morago, Chinelle Carrington, Domenica Frausto, Algie Au

Brian Robertson, Supervisor of Resource Planning, opened the meeting by welcoming and thanking stakeholders for participating in Cascade's IRP Process. Brian reminded folks that we wouldn't be doing introductions at the beginning of the meeting but asked if/when people interjected throughout the meeting to please introduce themselves.

Presentation #1 – Safety Moment

- Brian Robertson gave a quick safety moment on careful cleaning.

Presentation #2 – What is Equity?

- Noemi Ortiz, the energy efficiency manager who also oversees the equity advisory groups in Oregon and Washington and also within Cascade, introduced herself. She explains that equity in the energy sector aims to achieve energy justice by addressing disparities among customers, ensuring fair access to natural gas services, energy efficiency, and bill pay assistance. She emphasizes that energy justice also involves remedying social, economic, and health burdens faced by marginalized communities and including them in decision-making processes for energy policies and projects. Noemi references guidance from the Washington Legislature's office of equity, which emphasizes distributing and prioritizing resources to marginalized groups, eliminating systemic barriers, and promoting fairness and respect for all people.

Presentation #3 – What is Energy Justice?

- Noemi discussed the concept of equity in the energy sector, focusing on energy justice and its four tenets. She explained that equity aims to achieve energy justice by addressing disparities among customers, ensuring fair access to natural gas services, energy efficiency, and bill pay

assistance. She emphasized the importance of remedying social, economic, and health burdens faced by marginalized communities and including them in decision-making processes for energy policies and projects. She also mentioned that the Washington Legislature's office of equity provided guidance emphasizing the distribution and prioritization of resources to marginalized groups, the elimination of systemic barriers, and the promotion of fairness and respect for all people.

Question: Byron asked if the team would be looking at the distributional breakdown, how customers might respond to various market signals and elasticities, and if the team intends to look at demographic data to understand the impacts of electrification scenarios on different customer groups.

Answer: Jennifer Gross responded that much of the cost benefit analysis is still being explored, and Cascade is developing the process at the executive team level. They are not far enough along to share specific details but plan to discuss the analysis in future meetings. Regarding Byron's question, Brian mentioned that they are collecting data and considering various options, including a macro perspective model with case studies to deal with smaller datasets.

Question: Quinn asked if Cascade would be developing cost benefit analyses to look at projects post hoc as a way of informing restorative justice strategies.

Answer: Noemi responded that the cost benefit analysis process is still being developed, and they are working with their equity advisory group on it. They plan to use it as a decision-making tool for projects such as pipeline upgrades.

Question: Byron asked if there were more details available on the pilots and enhanced targeted conservation programs mentioned earlier, or if that information would be provided later.

Answer: Noemi responded that more details would be provided later. Cascade expects to consider more proposals for restorative justice, but the company understands that restorative justice is the last step in the process of applying the equity lens. They still need to collect and analyze data and observe trends for the restorative proposals. Noemi mentioned that it's a collaborative process that they will go through with the Equity Advisory Group (EAG) tag and the Cares Advisory Group for this IRP. At this early stage, the company cannot speak on what the proposals or outcomes will be.

Presentation #4 – What Has Cascade Done to Make Energy Justice Part of its Daily Operations?

- Noemi outlined the actions Cascade has taken to incorporate energy justice into its operations. In 2022, Cascade conducted a low-income needs assessment study and hired Noemi to oversee equity, ensuring equity is integrated into decision-making processes. In 2023, Cascade mapped its low-income customers and merged this data with billing data to identify trends. It also mapped census tracts likely to be low income. Cascade established an Equity Advisory Group in 2023, comprised of members who represent vulnerable populations, with monthly meetings to discuss regulatory proceedings and outreach. In response to feedback from the Equity Advisory Group, Cascade improved the accessibility of its customer communications for linguistically isolated customers, offering support in over 240 languages and translating its website into multiple languages. Cascade also launched the CARES program in 2023, implementing bill discounts and arrearage relief, designed in collaboration with the Cares advisory group. Additionally, Cascade is piloting the use of community-based organizations for outreach to hard-to-serve customers.

Presentation #5 – What Will Cascade Be Doing to Make Energy Justice Part of its Daily Operations?

- Noemi mentioned that a vice president equity sponsor will be responsible for training executives for top-down integration of equity. She also discussed Cascade's plans to create a benefit-cost analysis template for projects, collaborating with the EAG on its development and integrating its use for company projects. Additionally, Cascade will continue engagement with the Washington Equity Advisory Group and expects discussions on the multi-year rate plan, the IRP, and the Climate Commitment Act. They are also working to establish the Oregon Advisory Group and have identified vulnerable populations in the state to solicit community representatives for collaboration. Cascade will also continue engagement with the technical advisory group on the development of the IRP and work with the Cares Advisory Group on low-income assistance and the Conservation Advisory Group on energy efficiency programs.

Presentation #6 – When Will We Be Done?

- Noemi Ortiz discussed the ongoing process of incorporating energy justice into Cascade's daily operations. She emphasized that adopting an equity lens is an iterative process that will take time. Noemi highlighted the need to continue adjusting perceptions of what they are doing, how they are doing it, and how it affects others. She stressed that applying an equity lens is an ongoing collaborative process and requested help, grace, and patience from others as Cascade makes this paradigm shift. Noemi expressed the company's commitment to remaining open and engaging and asked others to do the same.

Presentation #7 – Feedback for Cascade

- Byron expressed appreciation for the hard work the team has put in, acknowledging that they have been asked to move mountains and recognizing their efforts. He wanted to ensure that the team knows their work is appreciated and acknowledged.

Question: Quinn asked if the Equity Advisory Group (EAG) meetings are open to the public.

Answer: Noemi responded that currently, the EAG meetings are not open to the public. Only the members, public council, and staff are allowed to attend. She mentioned that opening the meetings to the public has not been considered yet. Quinn thanked her for the clarification.

Presentation #8 – 2025 WA IRP Schedule

- Brian outlined the schedule for upcoming meetings, including discussions on customer load forecast, CCA compliance modeling, and resource integration. He emphasized the importance of feedback and stated that slides would be provided a week in advance of meetings. Brian also mentioned the transition from targeted tags to regular tag meetings, where they would discuss changes and recommendations for the IRP. He highlighted the need for feedback, especially for additional changes, and outlined the timeline for filing the IRP. Brian concluded by reminding participants of the next meeting on customer load forecast and encouraged them to reach out with any questions or feedback.

The Meeting was Adjourned

Per Cascade Commitment #8 (Stakeholder Engagement Design Document, 2/22,2022: “Provide TAG minutes that include the action items from bullet #7 as well as any upcoming deadlines for feedback on the IRP”), here are additional action items to track, coming out of the Targeted TAG 4 meeting:

1. Cascade will look into the EJScreen: Environmental Justice Screening and Mapping Tool that was provided by WUTC.



In the Community to Serve®

Washington Integrated Resource Plan Targeted Technical Advisory Group Meeting #5

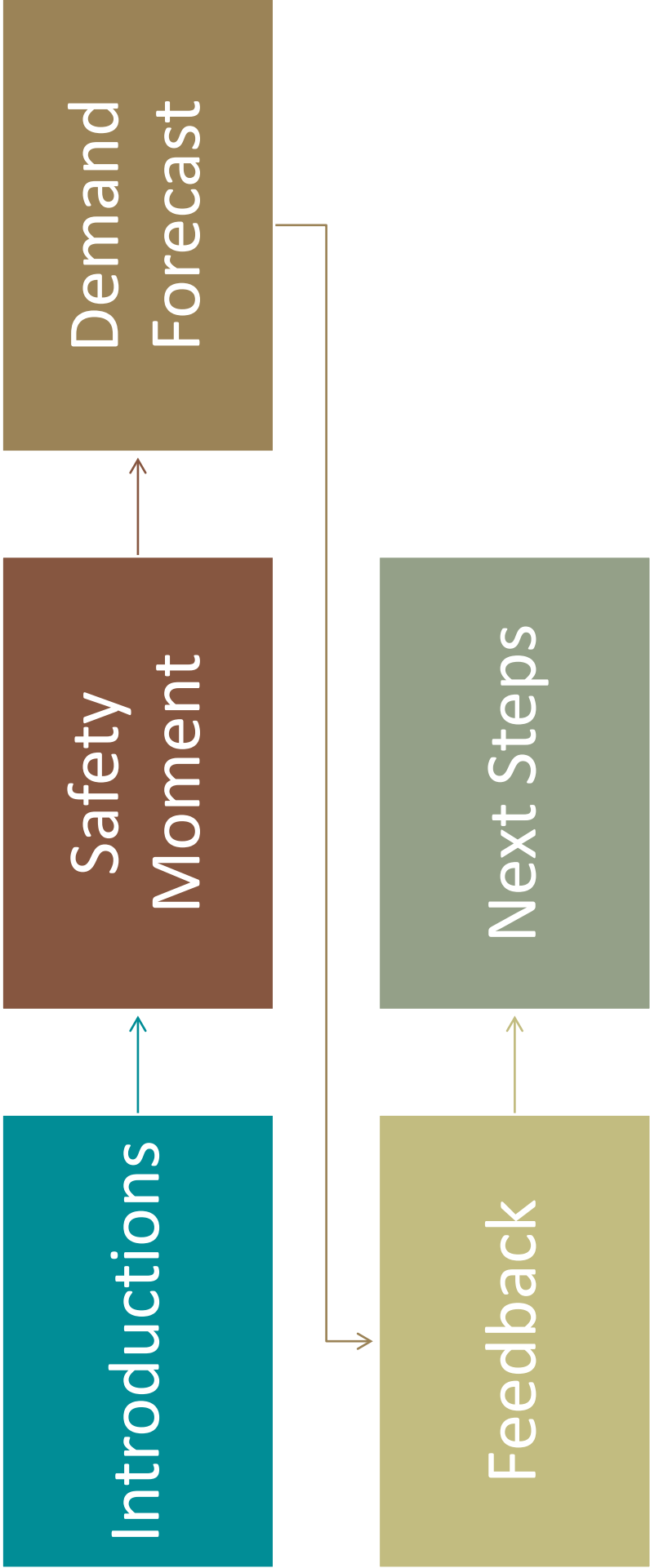
APRIL 11, 2024

MICROSOFT TEAMS/TELECONFERENCE



In the Community to Serve®

Agenda



Safety Moment

While hunting, fishing, camping, and enjoying all of the activities the great outdoors has to offer following the tips below are some ways to stay safe:

- Obey applicable hunting laws and make yourself visible to other hunters.
- Watch your footing while traversing through rough terrain and wilderness to avoid sprains and strains.
- Make sure camp fires are fully extinguished before leaving camp sites.
- Wear sunscreen to protect your skin from sunburns.
- Protect yourself from insect bites and stings by using insect repellent methods.
- Drive safety on the road and off-the-road if you plan to use UTV's, ATV's, etc.

Enjoying the Great Outdoors Safely



Demand Forecast

Demand Forecast

- The Cascade demand forecast developed for the IRP is a forecast of core customers and their usage, including peak demand, for the next 20+ years.
- Demand is forecasted at:
 - the pipeline zone level;
 - the rate schedule level;
 - the daily level; and
 - forecasted out to 2050 for decarbonization planning.

Key Definitions

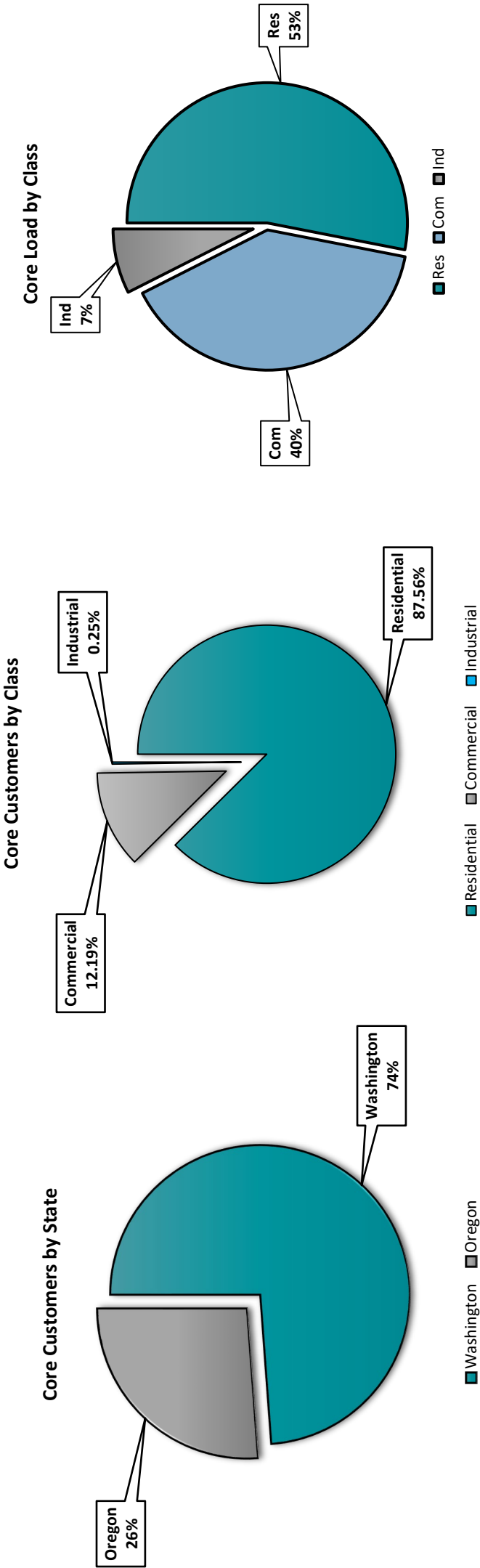
- AIC: The Akaike information criterion (AIC)
 - A measure of the relative quality of statistical models for a given set of data. Given a collection of models for the data, AIC estimates the quality of each model, relative to each of the other models. Hence, AIC provides a means for model selection.
- ARIMA: Auto-Regressive Integrated Moving Average
 - Type of model that is fitted to time series data.
 - When doing regressions using time series variables, it is common for the errors (or residuals) to have a time series structure. This could mean there is a predictable structure to the errors, meaning they can also be modeled. This is where the ARIMA term comes in.
- Fourier Terms
 - The decomposition of a time series into a set of sine-waves (or cosine-waves) with differing amplitudes, frequencies, and phase angles. Essentially, these terms help find seasonalities within a time series that wasn't accounted for by regressors.
- Weather in terms of HDDs (Heating Degree Day).
- Wind is average daily wind speed.

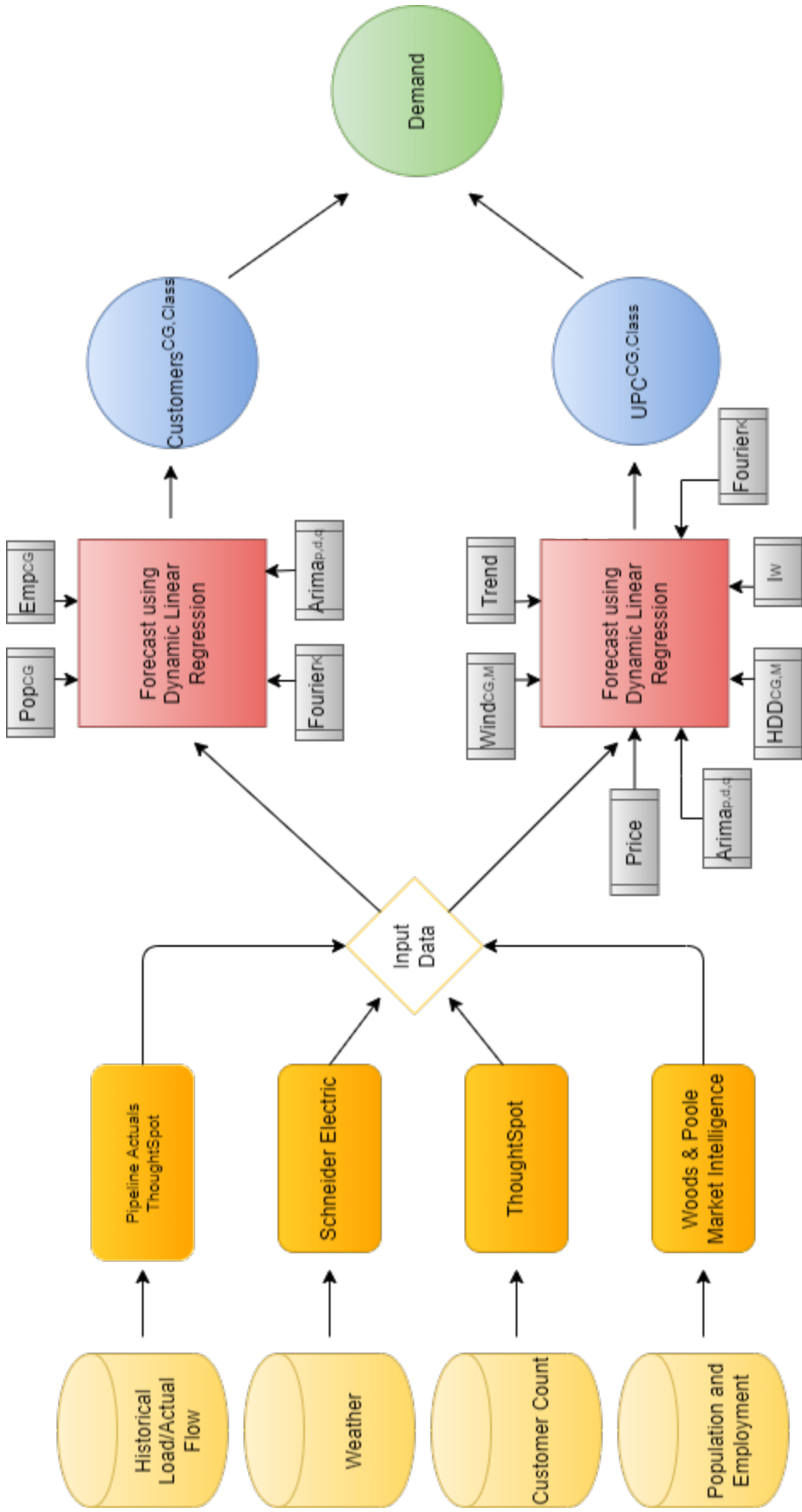
Weather Stations

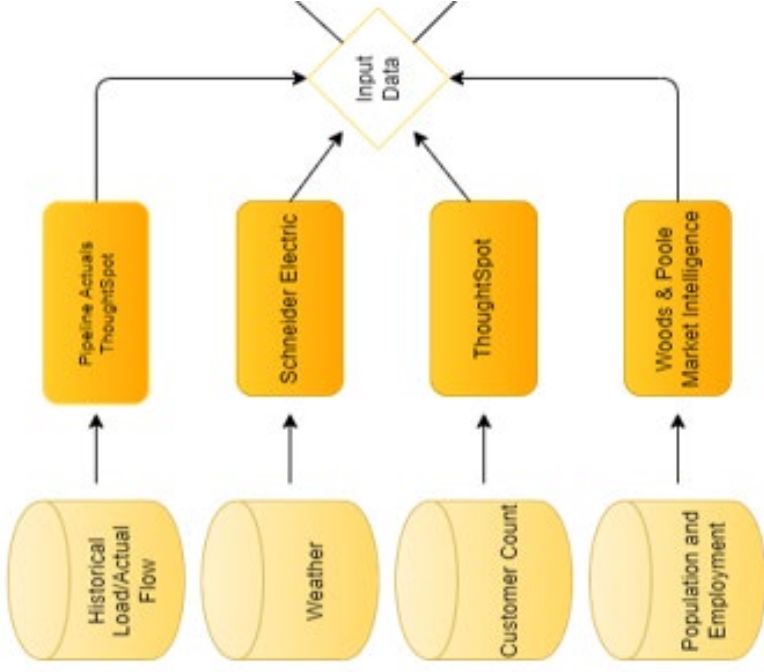


- The seven weather stations are shown on the map.
- Cascade’s service territory is shaded in aqua.
- Each citygate and loop is assigned to a weather station.

Core Customers/Load Breakdown - 2021

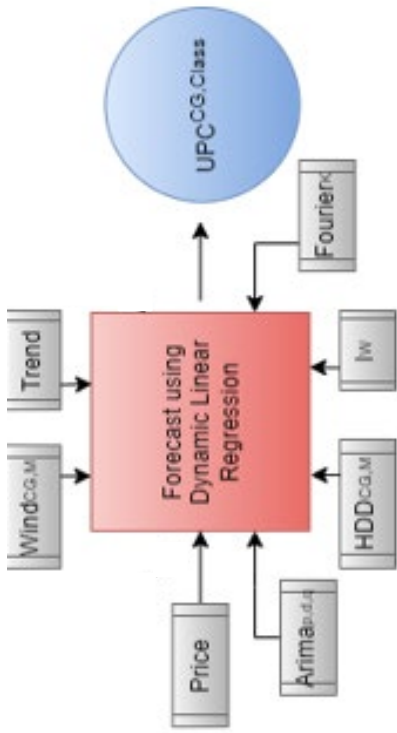






Inputs

- Cascade uses data from various sources:
 - Pipeline actuals at daily/Citygate level.
 - Woods & Poole at county level.
 - ThoughtSpot citygate/monthly allocations
- Market intelligence monthly.
- Unifying inputs is an important part of the forecasting process.



Use Per Customer Forecast

$$\text{Therms}/C^Z_{\text{Class}} = \alpha_0 + \alpha_1 \text{HDD}^{Z,M} + \alpha_2 I_w + \alpha_3 \text{WIND}^{Z,M} + \alpha_4 \text{Retail Price} + \text{Trend} + \text{Fourier}(k) + \text{ARIMA} \in (p,d,q)$$

Model Notes:

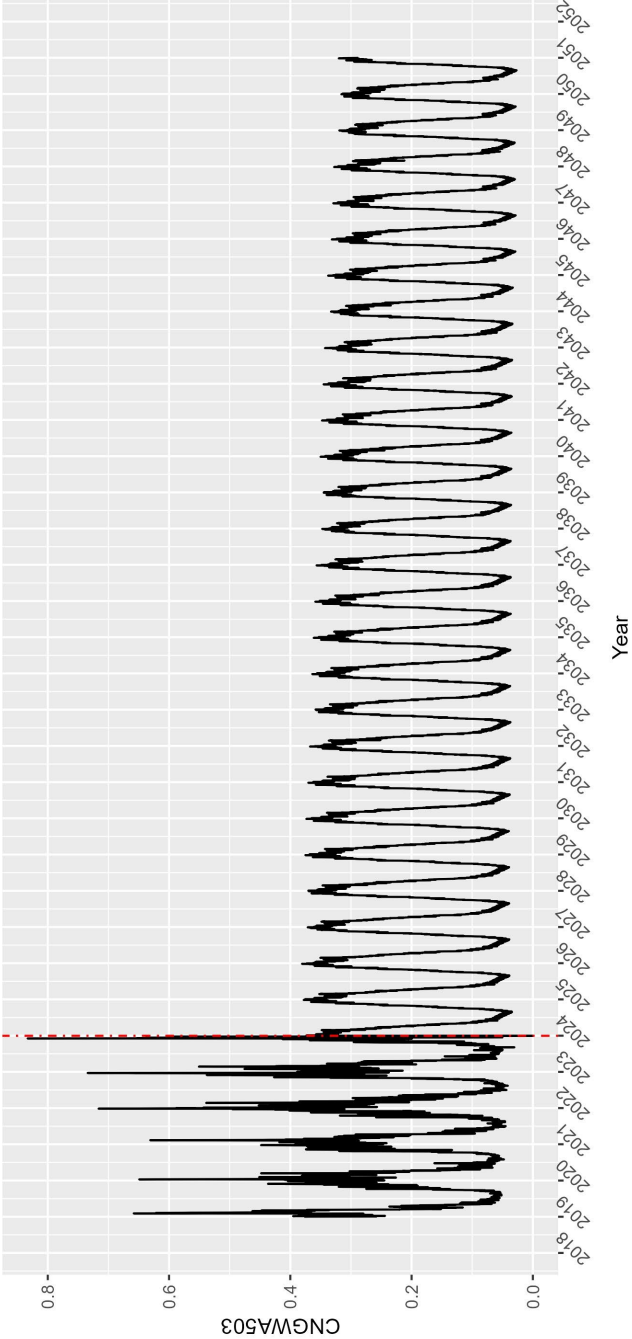
- Therms/C = Therms per customer; Z = Zone; Class = Residential, Commercial, Industrial, or Interruptible; HDD = Heating Degree Days; M= Month; I_w = Indicator Variable set to 1 if it is a weekend; T = Trend Variable increasing by 1 for each day forecasted; WIND = Daily average wind speed; Retail Price = Price customers see on their bill.

UPC Forecast Results

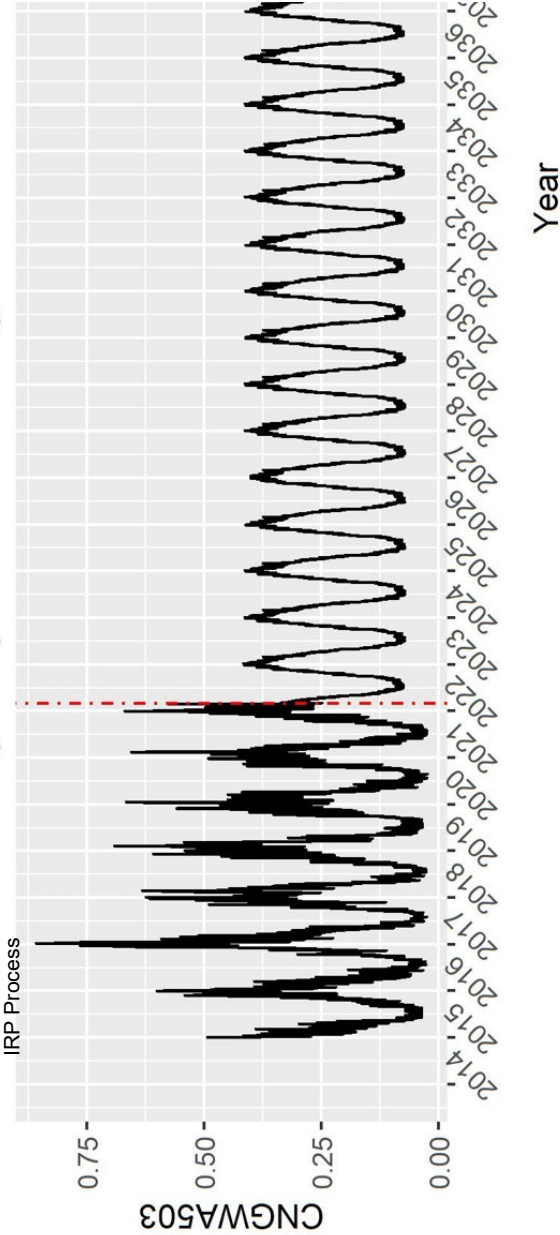
ar1	ar2	ar3	ar4	ma1	ma2	intercept	weekend	jan.hdd	feb.hdd	mar.hdd	apr.hdd	may.hdd	jun.hdd	jul.hdd	aug.hdd	sep.hdd	oct.hdd	nov.hdd	dec.hdd
1.747599	-1.33344	0.234089	0.144633	-1.34185	0.8385	0.111747	-0.01118	0.01015	0.010387	0.009336	0.008269	0.006909	0.00508	0.006081	0.002623	0.005692	0.007417	0.009028	0.009976

jan.wind	feb.wind	mar.wind	apr.wind	may.wind	jun.wind	jul.wind	aug.wind	sep.wind	oct.wind	nov.wind	dec.wind	p.503	S1-365	C1-365	S2-365	C2-365	S3-365	C3-365
0.003843	0.003158	0.003516	0.003493	0.001329	6.95E-05	-0.00039	6.65E-05	0.001291	0.001669	0.002995	0.002938	-0.19039	0.006442	0.037943	-0.00564	0.008639	-0.00488	-0.00791

Z30W.CNGWA503.upc: Dynamic Linear Regression Model

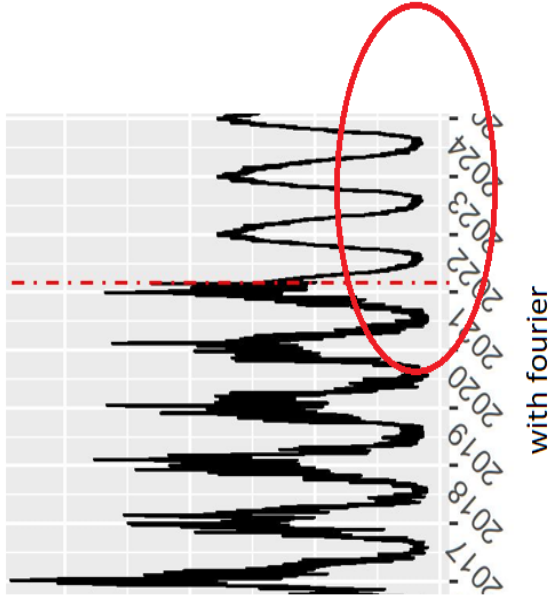
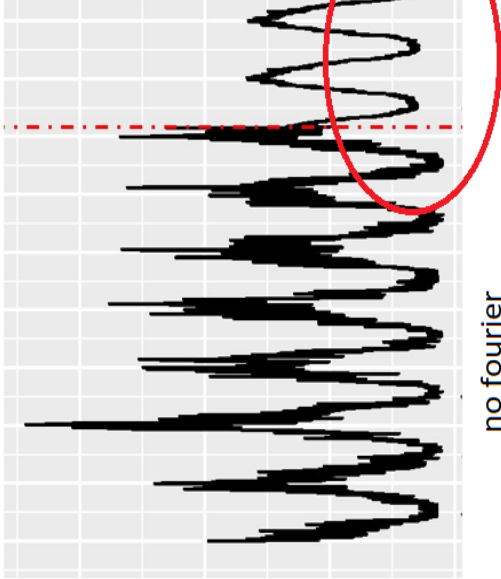


acme.CNGWA503.upc: Dynamic Linear Regression Model



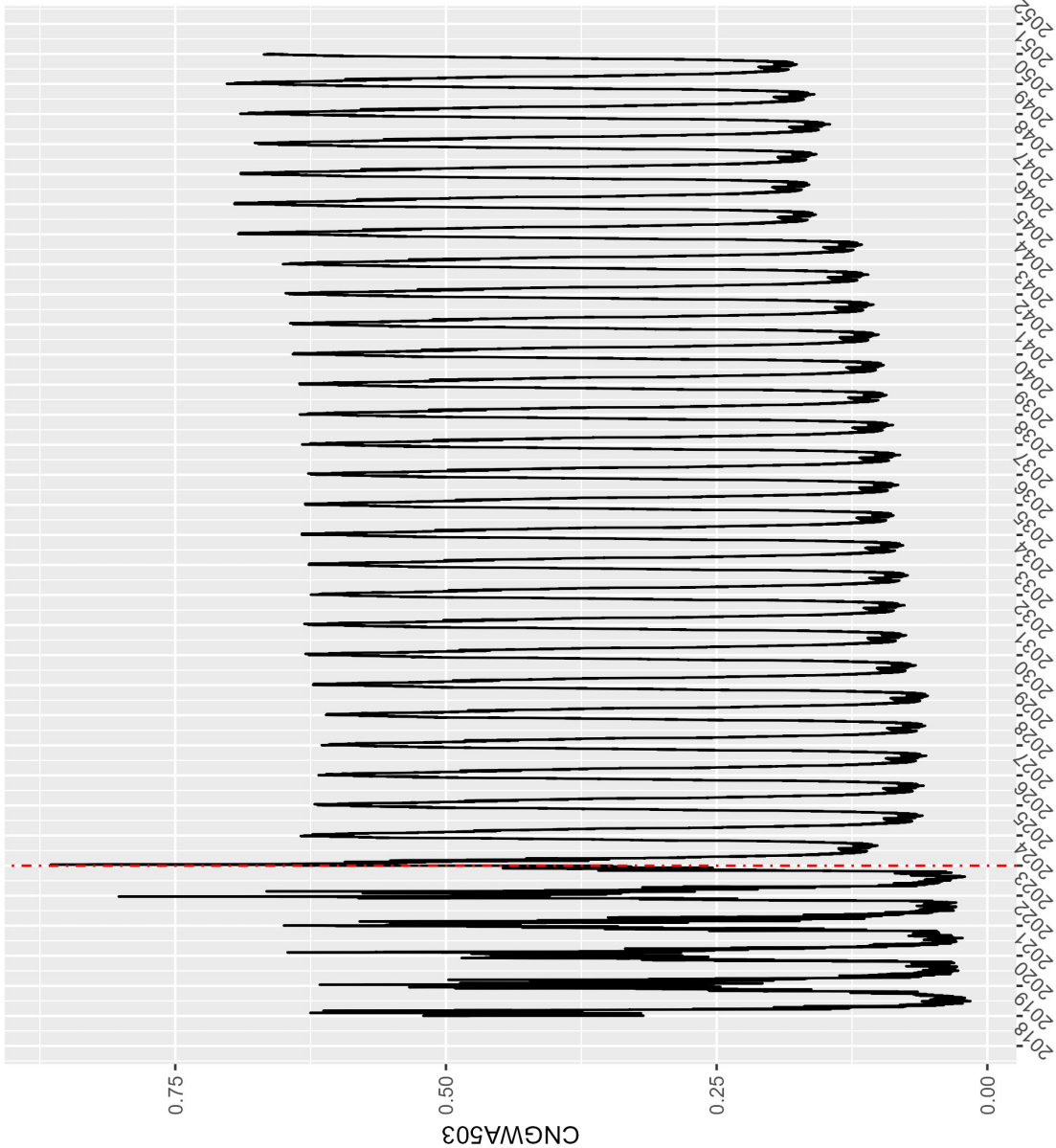
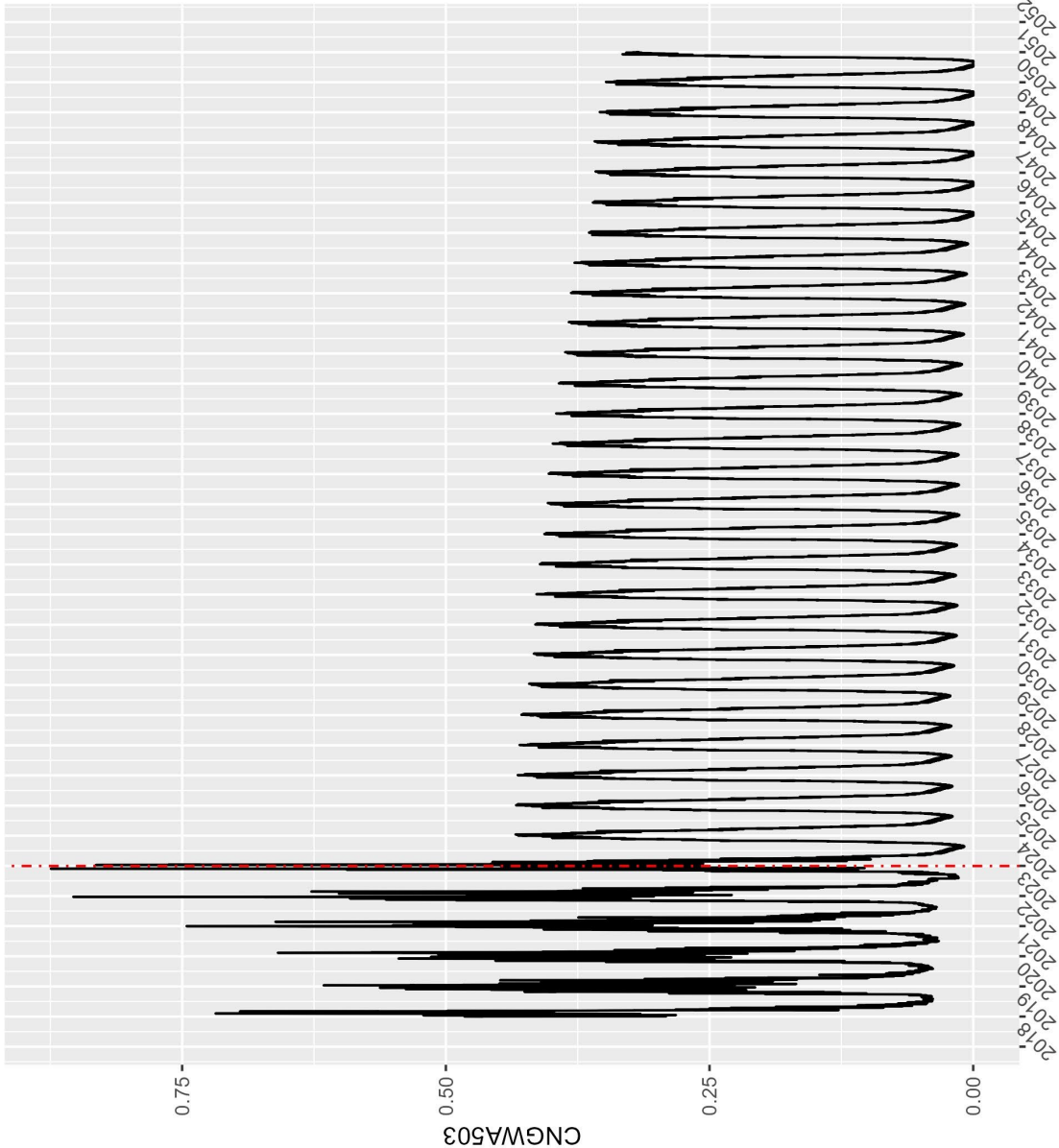
Fourier terms

What do they do exactly?

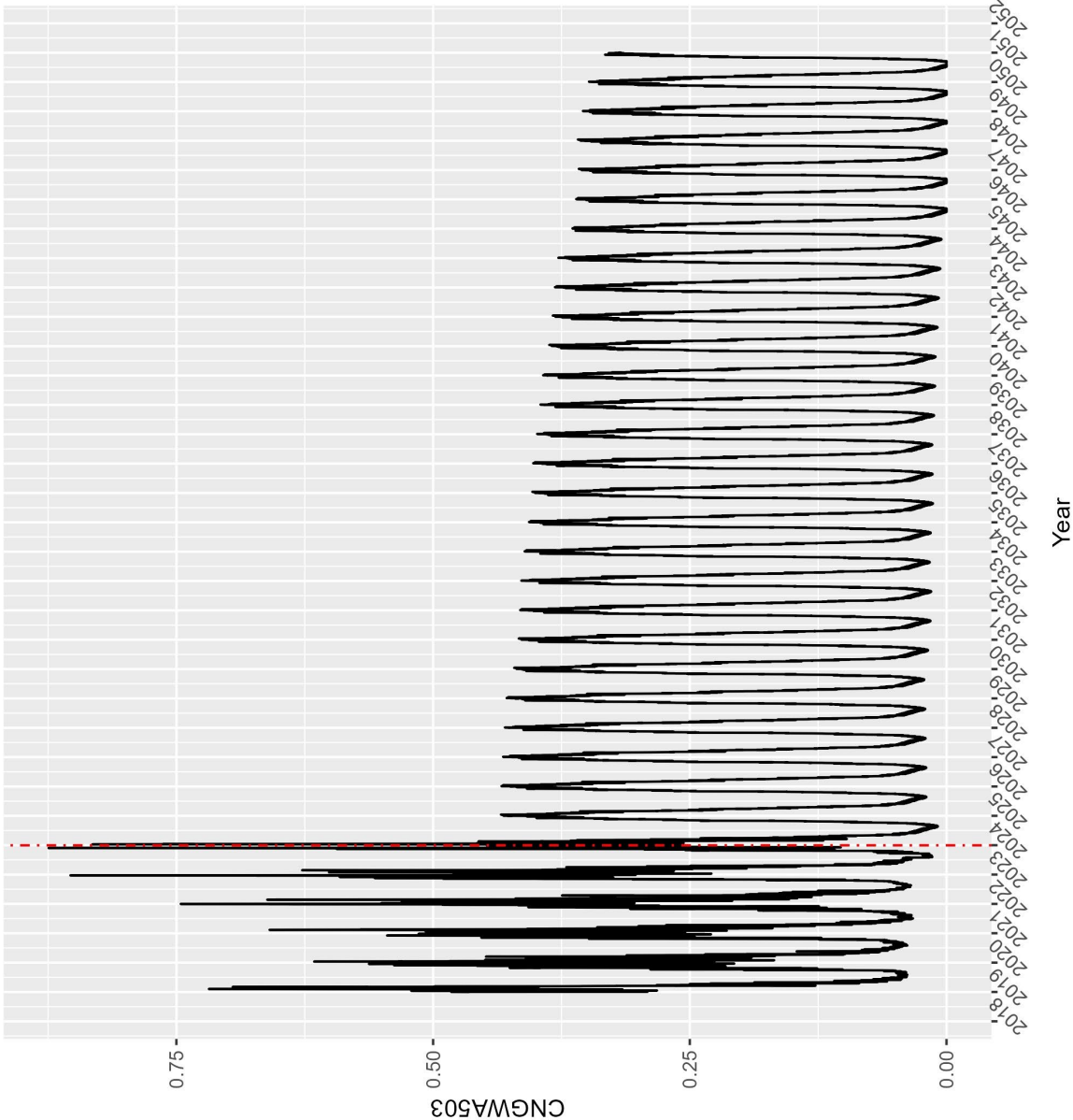


MEWA503.upc: Dynamic Linear Regression Model

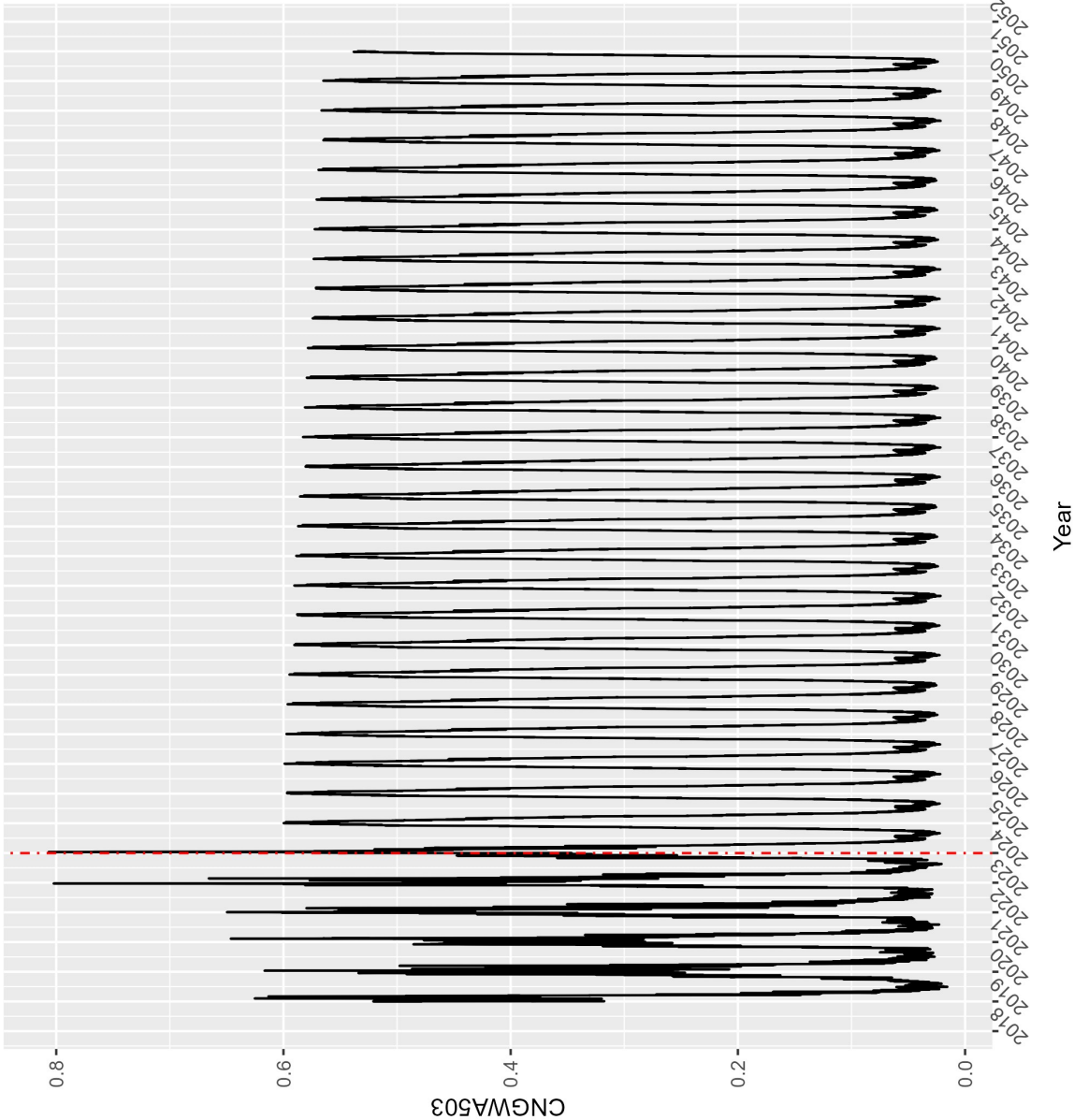
Z10.CNGWA503.upc: Dynamic Linear Regression Model



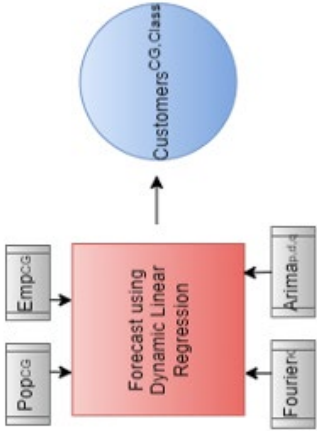
MEWA503.upc: Dynamic Linear Regression Model



Z10.CNGWA503.upc: Dynamic Linear Regression Model



Customer Forecast



Customer Forecast

$$C^{Z,Class} = \alpha_0 + \alpha_1 HH^Z + \alpha_2 Emp^Z + \alpha_3 Retail\ Price + \alpha_4 Income + Fourier(k) + ARIMA \in (p,d,q)$$

Model Notes:

- C = Customers; Z = Zone; Class = Residential, Commercial, Industrial, or Interruptible; ARIMA ∈ (p,d,q) = Indicates that the model has p autoregressive terms, d difference terms, and q moving average terms; HH = Households; Emp = Employment; Retail Price = Price customers see on their bill; Income = Average income at the zonal level; Fourier(k) = Captures seasonality of k number of seasons.

Start with Linear Model

Some are Naïve models

Tests for any collinearity

Customer Forecast Regime Change

Building Code Impacts (Cont'd)

- Under RCW 19.27A.020(2)(a), the SBCC is directed to “...help achieve the broader goal...” of zero emission homes/buildings. Note that this is a goal, not a mandate. Conversely, RCW 19.27A.160 is an explicit direction to the SBCC to move towards a 70% reduction in annual net energy consumption by 2031. This is a mandate and is clear that the goal is a “net” energy.
- Since RCW 19.27A.020(2)(a), the enacting legislation resulted from 2009 SB 5854. Therefore, the 2012, 2015, 2018, and 2021 code cycles were all likely impacted by the legislation. This chart provides an explanation of how the SBCC has addressed the more explicit legislative direction of RCW 19.27A.160.

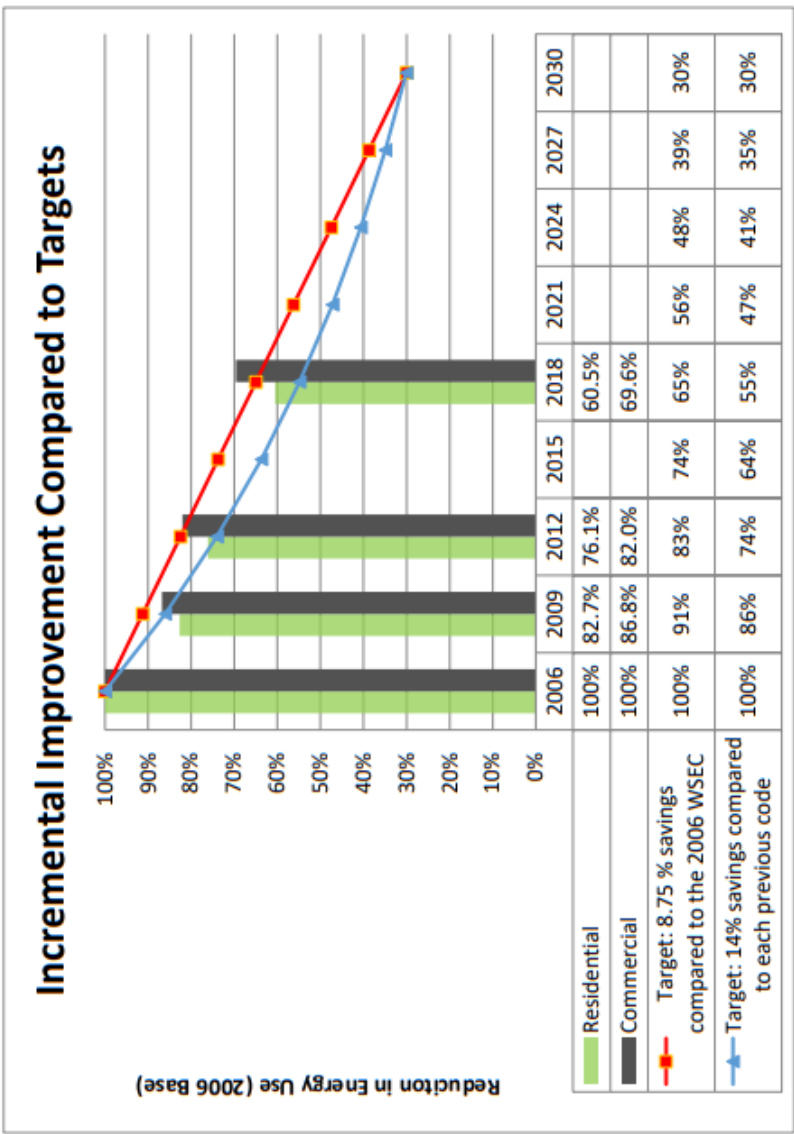


Chart Source: Final Cost Benefit Analysis for the 2021 WSEC-R

WA State Building Codes

Effective March 15, 2024, the 2021 Washington State Energy Codes¹ went into effect.

Each new dwelling unit in a residential building must comply to the WSEC. Each dwelling must meet the required number of credits (ex. Small dwellings must have 5 credits).

The new building codes have made it impractical for new residential and commercial buildings to use natural gas.

1 [HTTPS://SBCC.WA.GOV/STATE-CODES-REGULATIONS-GUIDELINES/STATE-BUILDING-CODE/ENERGY-CODE](https://sbcc.wa.gov/state-codes-regulations-guidelines/state-building-code/energy-code)

TABLE R406.2
ENERGY EQUALIZATION CREDITS

System Type	Description of Primary Heating Source	Credits	
		All Other	Group R-2 ^a
1	For combustion heating equipment meeting minimum federal efficiency standards for the equipment listed in Table C403.3.2(5) or C403.3.2(6)	0	0
2	For an initial heating system using a heat pump that meets federal standards for the equipment listed in Table C403.3.2(2) and supplemental heating provided by electric resistance or a combustion furnace meeting minimum standards listed in Table C403.3.2(5) ^b	1.5	0
3	For heating system based on electric resistance only (either forced air or Zonal)	0.5	-0.5
4 ^c	For heating system using a heat pump that meets federal standards for the equipment listed in Table C403.3.2(2) or C403.3.2(9) or Air to water heat pump units that are configured to provide both heating and cooling and are rated in accordance with AHRI 550/590	3.0	2.0
5	For heating system based on electric resistance with: 1. Inverter-driven ductless mini-split heat pump system installed in the largest zone in the dwelling, or 2. With 2kW or less total installed heating capacity per dwelling	2.0	0

Oregon Customer Count Impacts

- Oregon has signed on with eight other States to create a Nine States Pledge Joint Action to Accelerate Transition to Clean Buildings¹.
- Under the MOU, these states have set a shared goal for heat pumps to meet at least 65% of residential-scale heating, air conditioning and water heating shipments by 2030 and 90% by 2040 across the participating states.
- The MOU is not legally binding, but it does send a signal that these states have strong targets to increase heat pump and electric space and water heating, effectively reducing the use of Natural Gas.

Weather Normals and Climate Change Impacts

Weather Normals and Climate Change Impact

- Weather Normals have historically been the average HDDs over the past 30 years. Cascade is looking at utilizing a 15-year or 20-year normal instead to capture more recent trends.
- Cascade utilized a conservative approach in the previous IRP where the Company used the RCP4.5. The conservative approach was to avoid under planning for other carbon compliance mitigating options.
- For the 2025 IRP, Cascade has contracted with ICF.
 - ICF will provide projections that represent daily HDD time series data for the planning horizon.
 - HDD projections will use newly released Coupled Model Intercomparison Project Phase 6 (CMIP6) Localized Constructed Analogs version 2 (LOCA2) statistically downscaled global climate models.
 - Projections will use an ensemble of 20+ climate models and two future greenhouse gas emissions scenarios (e.g., Shared Socioeconomic Pathways 2-4.5 and 3-7.0 representing heavily mitigated and largely unabated emissions, respectively) to characterize future climate change uncertainty and facilitate Monte Carlo sampling for Cascade's forecasts or other methods.
- ICF will also provide a Cold Weather Review Relevant to Peak Forecasts.

Non-Core Outlook

Non-Core Outlook

- Cascade forecasts the non-core out to 2050.
- Unlike the core, non-core (or transportation) customers are customers who schedule and purchase their own gas, generally through a marketer, to get gas to the citygate. The customer then uses Cascade's distribution system to receive the gas.
- Cascade's transportation customers include all types of industrial customers. It includes farms that may not use any gas during the winter to food manufacturers that average 800,000 therms per month throughout the year.
- Cascade also serves six electric generation customers in Washington and one in Oregon. Those six customers project to use approximately 602,000,000 therms in 2025.

Transportation Customers

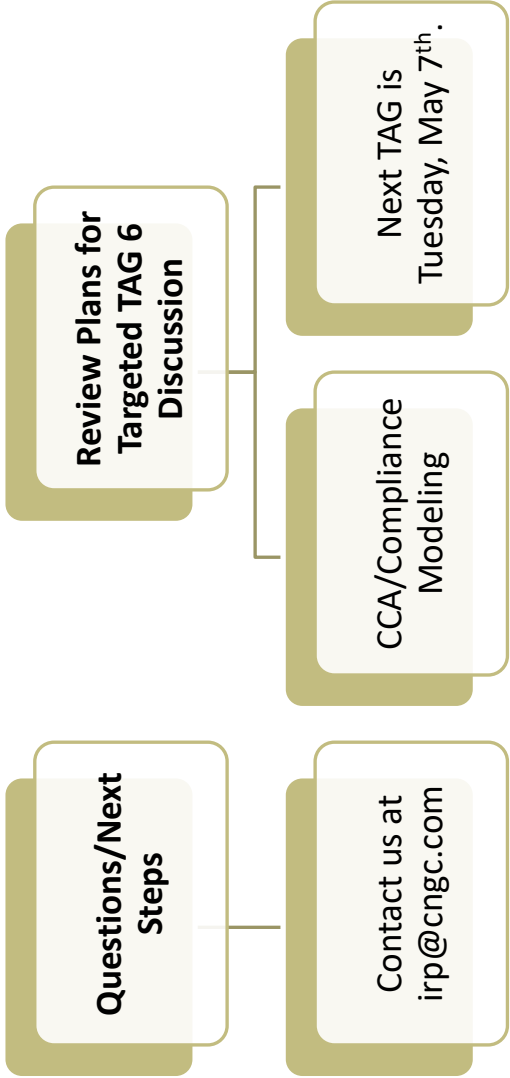
- Cascade’s transportation customer forecast decreased from the previous forecast. The current forecast projects the customer count to be 241 in 2025. Cascade’s industrial managers are working closely with potential industrial customers.
- Cascade projects the transportation customers in Washington and Oregon to consume approximately 513 million therms in 2025.
- Cascade is communicating with the transportation customers on CCA impacts, but it is too early to determine the impact CCA will have on these transport customers.

Feedback for Cascade?

Do you have comments or ideas that Cascade should consider regarding the Customer and Demand Forecast?

Process Item	Date	Process Element	Appendix A
Targeted-IRP TAG	Thursday, January 25, 2024	What is an IRP and how to get involved in the process	Appendix A
Targeted-TAG	Thursday, February 15, 2024	Avoided Cost	
Targeted-TAG	Wednesday, March 6, 2024	Energy Efficiency	
Targeted-TAG	Thursday, March 28, 2024	Equity in the IRP	
Targeted-TAG	Thursday, April 11, 2024	Customer/Load Forecast	
Targeted-TAG	Tuesday, May 7, 2024	CCA/Compliance Modeling	
Targeted-TAG	Thursday, May 16, 2024	Distribution System Planning	
Targeted-TAG	Thursday, May 30, 2024	Resource Integration	
		Process, Key Points, IRP Team, Timeline, Regional Market Outlook, Planned Scenarios and Sensitivities, Stakeholder Engagement, Demand and Customer Forecast and Non-Core Outlook, Drilling down into segments of demand forecast. Upstream Pipeline presentation.	
TAG 1	Thursday, June 13, 2024		
Receive feedback on TAG 1	Friday, June 28, 2024		
		Respond to TAG 1 Feedback, Distribution System Planning, Alternative Resources, Price Forecast, Avoided Costs, Current Supply Resources, Transport Issues, Carbon Impacts, Energy Efficiency, Bio-Natural Gas, Preliminary Resource Integration Results.	
TAG 2	Thursday, July 25, 2024		
Receive feedback on TAG 2	Friday, August 9, 2024		
First Draft	Friday, September 6, 2024		
Comments Due	Friday, October 4, 2024		
		Respond to TAG 2 feedback, Final Integration Results, finalization of plan components, Proposed new 2- to 4-year Action Plan	
TAG 3	Wednesday, October 30, 2024		
Final Draft	Tuesday, December 3, 2024		
Comments Due	Tuesday, January 14, 2025		
TAG 4 (if needed)	Thursday, January 30, 2025		
Final Complete By	Friday, February 14, 2025		
File	Monday, February 24, 2025		

2025 WA IRP Schedule





In the Community to Serve®

Washington Integrated Resource Plan Targeted Technical Advisory Group Meeting #5

APRIL 11, 2024

MICROSOFT TEAMS/TELECONFERENCE



In the Community to Serve®



Targeted TAG #5 – TAG Meeting

Date & time: 04/11/2024, 9:00 AM to 10:00 AM

Location: Microsoft Teams Meeting

Presenters: Brian Robertson, Jenny De Boer

In attendance: Abbie Krebsbach, Abe Abdallah, Alessandra de la Torre, Bailey Steeves, Becky Hodges, Brian Robertson, Byron Harmon, Caleb Reimer, Carolyn Stone, Chris Robbins, Corey Dahl, Debra Campbell, Eric Shierman, Eric Wood, Folsom Bruce, Gabe Forrester, Isaac Kort-Meade, Jennifer DeBoer, Kathleen Campbell, Kim Herb, Kyle Putnam, Lori Blattner, Mark Sellers-Vaughn, Matt Steele, Matthew Doyle, Michael Freels, Michael Parvinen, Molly Brewer, Noemi Ortiz, Quinn Weber, Russ Nishikawa, Scott Madison, Sofya Atitsogbe, Tom Pardee, Wesley Franks, Will Gehrke, Zachary Sowards

Brian Robertson, Supervisor of Resource Planning, opened the meeting by welcoming and thanking stakeholders for participating in Cascade's IRP Process. Brian reminded folks that we wouldn't be doing introductions at the beginning of the meeting but asked if/when people interjected throughout the meeting to please introduce themselves.

Robertson explains how to access various information on Cascade's website, such as older TAG information, stakeholder engagement documents, contact information, presentations, meeting minutes, and the remaining schedule for IRP meetings. He also mentions that the meeting recording will be posted on the website soon.

Presentation #1 – Safety Moment

- Jenny De Boer gives a quick safety moment on safety precautions for outdoor activities, including hunting, fishing, camping, and general outdoor enjoyment.

Presentation #2 – Demand Forecast

- Brian Robertson presented an overview of the demand forecast process, emphasizing its importance for understanding future gas usage. The forecast considers energy efficiency, transportation modeling, distribution system planning, and carbon compliance. The forecast is developed over the next 20+ years, going as far as 2050 for decarbonization modeling. The presentation discussed consolidating models to the pipeline zone level for efficiency. It also covered the use of weather data, heating degree days (HDD), and wind in the forecasting models. Fourier terms and auto regressive integrated moving average (ARIMA) models are used for time series analysis. A question was raised regarding the covariance of Fourier terms and HDD, which the team plans to investigate further. The presentation also touched on the software used for statistical computing and the process flow of the customer forecast model. There was a discussion about disaggregating customer classes by income quartiles for more precise analysis, which would require additional data and model adjustments. The presentation concluded with insights on the use per customer forecast results, including the impact of retail rates and Fourier terms on the models.

Question: Byron asked a question during Brian Robertson's presentation on the demand forecast process. Byron inquired about the potential covariance between Fourier terms and heating degree days (HDD) in the forecasting models. This question prompted a discussion within the team, indicating that further investigation into this relationship may be necessary for refining the forecasting models.

Answer: Brian responded by acknowledging Byron's question and indicating that it was a good point to consider. He mentioned that the team would need to examine the covariance between Fourier terms and HDD to understand if there is a significant relationship that could improve the forecasting models. Brian suggested that this investigation could lead to adjustments in the modeling approach to better capture the nuances of the data.

Presentation #3 – Customer Forecast

- Brian discussed the customer forecast model, which includes baseline alpha, coefficients for households and employment, retail price, and income. The model starts with a linear model and checks for collinearity. Some areas may have naive models, such as areas with consistent customer counts. The inputs include household, employment, and income data at the county level, actual customer counts from ThoughtSpot data matched with pipeline data. The model also uses four E terms and ARIMA models. Different combinations of variables are tested for the customer forecast, and collinear variables are removed. Retail price is considered per therm and is not multiplied by therms to avoid high correlation. The future customer bill impact includes carbon compliance costs.

Question: Byron Harmon asked about how retail prices are considered in the model and how they relate to customer counts.

Answer: Brian explained that retail prices are considered per therm and are matched with historical data to build relationships. Changes in retail prices may affect customer counts, but the correlation is tested along with other variables to avoid collinearity.

Question: Byron inquired about the impact of new building codes on the number of households and employment data. He asked if these factors would have a declining influence on future customer forecasts.

Answer: Brian acknowledged the point and mentioned that while he hadn't finalized adjusting the data for new building codes, it does make sense to flatten the numbers out. He noted that the number of households may not decrease but the number of households that can be served by the company may decrease.

Question: Byron asked about building stock attrition and its potential impact once customer growth due to building codes stops.

Answer: Brian mentioned that building stock attrition is around 1.4% but will look into this further. Caleb added that the attrition rate is around 2% on average, depending on the type of building, and is factored into the energy efficiency model.

Question: Corey Dahl asked for clarification on the inputs and assumptions built into the building stock attrition rate, specifically regarding conversions to electric.

Answer: Caleb Reimer explained that the attrition rate is complex and includes inputs from commercial and residential building stock assessments, as well as data from billing databases and the National Inventory of Assessments (NIA).

Presentation #4 – Customer Forecast Regime Change

- Brian discussed the impact of new building codes on customer forecasts. He explained that the Washington State Building Code requires compliance with the Washington State Energy Code, which has stringent requirements for energy use in new buildings. This includes zero

credits for combustion heating equipment, making it impractical for builders to use natural gas appliances for heating. Similar changes are expected for water heating, although details for commercial buildings are still being finalized. Brian also mentioned the Oregon Joint Action Plan, which aims to transition to clean buildings, reducing the use of natural gas. He noted the challenges in modeling these changes, especially in distinguishing usage data by appliance.

Question: Byron asked if Cascade has seen changes in actual customer accounts or the rate of change over time, considering the impact of building codes and compliance costs.

Answer: Brian noted a general slowdown in growth, which could be attributed to building codes or compliance costs. This data is included in the modeling process to build relationships between coefficients.

Question: Byron inquired about the prioritization of pre-2023 historical data versus newer data impacted by building codes and compliance costs.

Answer: Brian explained that they use seasonal decomposition to separate trend and seasonality. The seasonality piece, which shows no trend, is used to model the impacts of building code changes.

Answer: Kathleen Campbell from engineering services mentioned that some builders are still using natural gas for non-space or water heating purposes, like stoves and BBQs, which could affect usage per customer. She highlighted the need to consider how these changes might impact demand profiles and usage patterns.

Question: Byron asked if Cascade has reason to believe that the State Building Code Council is pursuing the zero fossil fuel emission goal with the same directness as the mandate.

Answer: Brian stated he does not have any insight into the Council's pursuit of the goal and cannot speak for the entire company.

Presentation #5 – Weather Normals and Climate Change Impacts

- Brian discussed the approach to weather normals and climate change impacts. Previously, Cascade used a 30-year historical period and calculated average heating degree days (HDDs). They are now considering using a shorter period for calculations. They contracted with ICF to provide projections using the CMIP6 model and SSP 2-4.5 and 3-7.0 scenarios, which represent heavily mitigated and largely unabated emissions. ICF will also review cold weather peak forecasts to assess how climate change may impact peak numbers. Brian opened the floor for questions.

Question: Byron highlighted the risks associated with both a hotter and a colder future. He mentioned that a colder future would impose harder HDDs, potentially accelerating customer flight if gas service became noncompetitive with electric. He also noted that a warmer future would mean less fuel consumption, posing risks for both scenarios. He asked if Cascade is considering these risks.

Answer: Brian acknowledged the risks and stated that Cascade plans to run scenarios using 20 different climate models and both SSP 2-4.5 and 3-7.0 scenarios. He emphasized the importance of the IRPs being updated every two years to reduce long-term risks.

Question: Byron asked if Cascade would be willing to run a scenario that aligns with the Northwest Power and Conservation Council's standard of RCP 8.5.

Answer: Brian noted that RCP 8.5 is from the CMIP5 study and mentioned the need to confirm with ICF how the SSPs compare to the RCPs and if they can run a scenario that aligns with that standard.

Presentation #6 – Non-Core Outlook

- Brian discussed the outlook for non-core customers, who schedule and purchase their own gas, generally through a marketer, and use Cascade's system to receive the gas. These customers include various industrial customers, such as farms, breweries, and food manufacturers, averaging 800,000 therms per month throughout the year. Cascade also serves six electric generation customers in Washington and one in Oregon, projected to use approximately 602,000 therms in 2025. The number of transportation customers has slightly decreased, with 241 customers projected for 2025. Industrial managers are communicating with potential industrial customers about the CCA impacts, but it's still early to determine the impact on transportation customers, who are projected to consume approximately 513,000,000 therms in 2025.

Presentation #7 – Feedback for Cascade?

- No feedback was given.

Presentation #8 – 2025 WA IRP Schedule

- Brian outlined the remaining schedule for the IRP, including the Environmental Compliance Cost Adjustment (ECCA) modeling on May 7th, distribution system planning on May 16th, and resource integration on May 30th. The tags will be kicked off in June through October with different draft dates, and the final draft will be circulated on December 3rd for comments. The goal is to wrap it up by February 14th for filing on February 24th. The next tag meeting will be on Tuesday, May 7th, and participants can contact IRP@cngc.com for questions or feedback. Brian thanked everyone for their participation and feedback, noting that updates will be made to the load forecast model.



In the Community to Serve®

Washington Integrated Resource Plan Targeted Technical Advisory Group Meeting #6

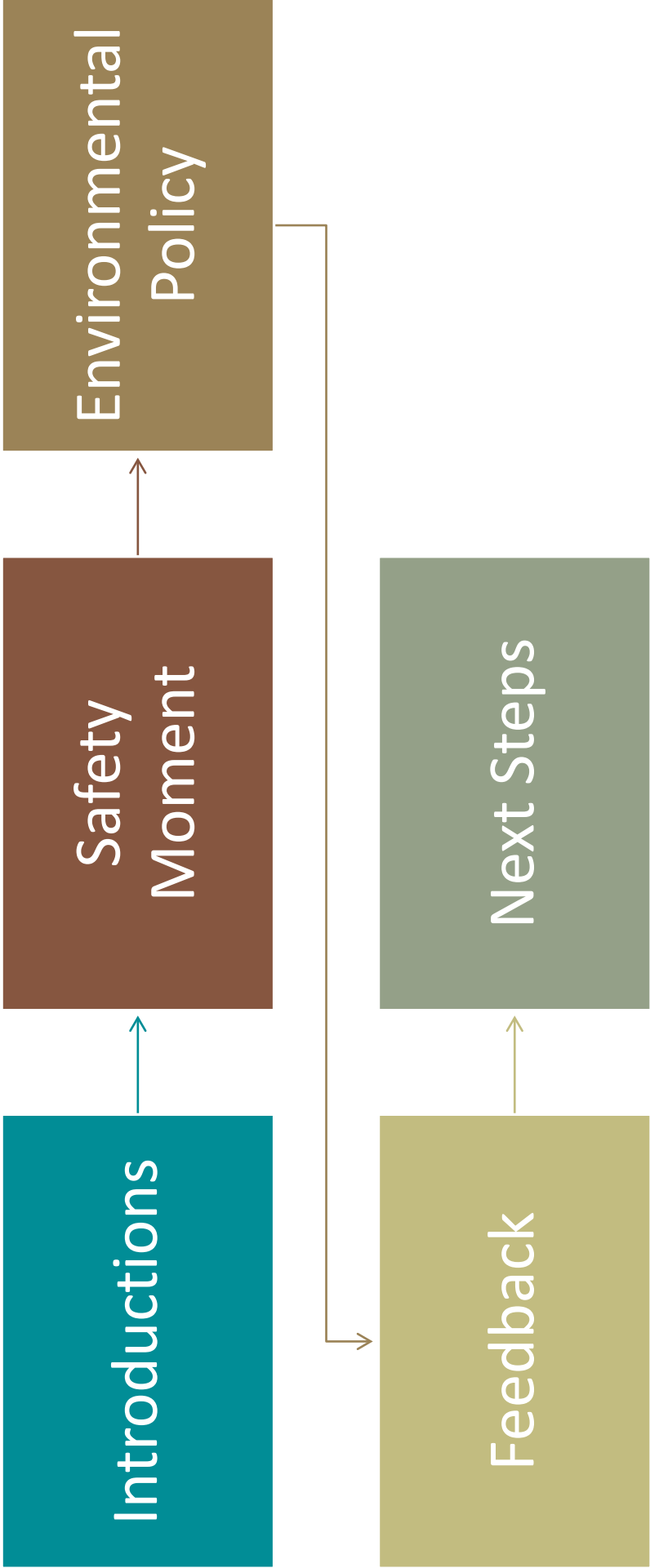
MAY 7, 2024

MICROSOFT TEAMS/TELECONFERENCE



In the Community to Serve®

Agenda



Safety Moment

Be cautious around power lines

- Keep workers and equipment at least 10 feet away from overhead power lines.
- Never touch anything in contact with a power line.
- Always assume downed lines are dangerous.
- Don't step in water near a downed line.



Cascade's commitment to reducing emissions

As an energy provider proudly serving Washington and Oregon, Cascade Natural Gas has an important role to play in securing a lower carbon future for the Pacific Northwest. This means keeping Cascade's system reliable and affordable for customers while helping communities meet their GHG emission reduction targets.

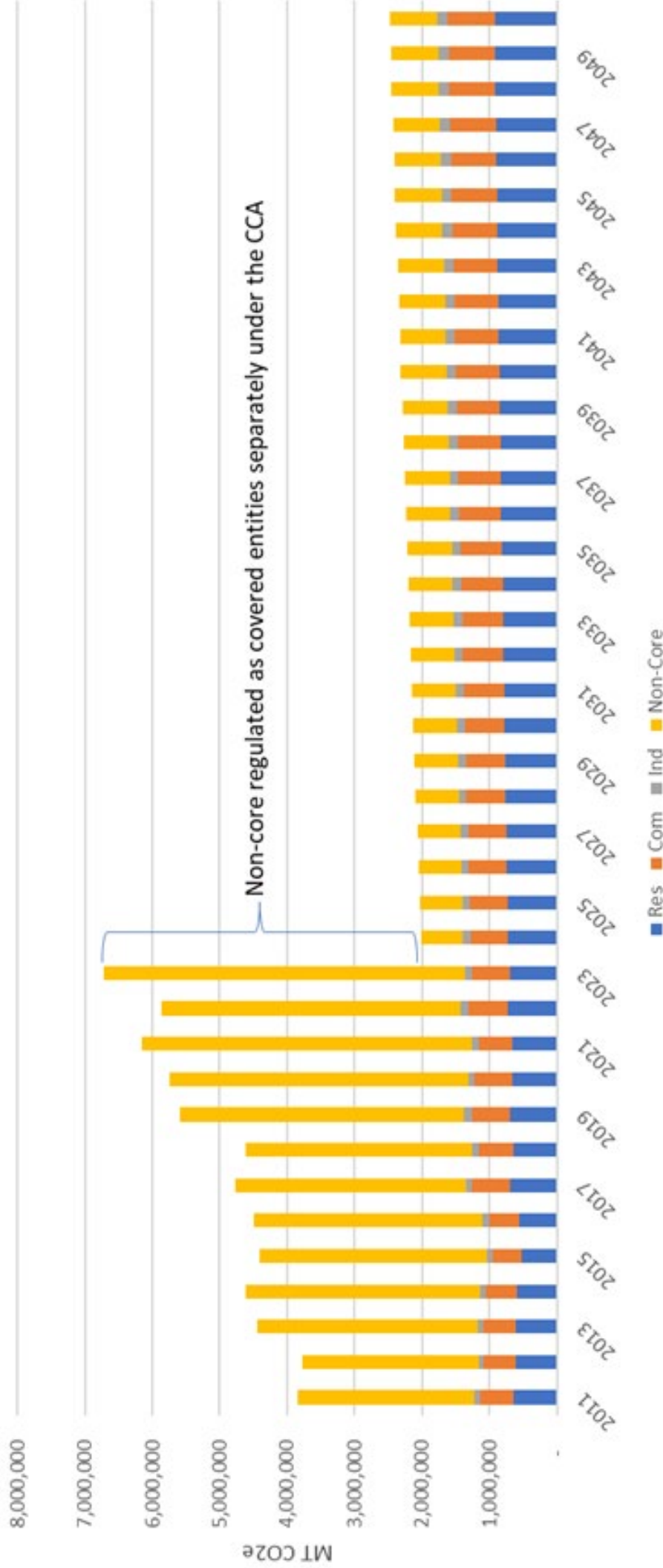
Cascade Natural Gas, along with MDU Resources Group's other natural gas companies, established a methane emissions reduction target of 30% by 2035 compared to 2022 levels.

Environmental Policy:

The Company will operate efficiently to meet the needs of the present without compromising the ability of future generations to meet their own needs. Our environmental goals are:

- *To minimize waste and maximize resources;*
- *To be a good steward of the environment while providing high quality and reasonably priced products and services; and*
- *To comply with or surpass all applicable environmental laws, regulations and permit requirements*

Projected Baseline Emissions



Reducing Customer Emissions

Energy Efficiency and Conservation/DSM

- Maximizing cost-effective therm savings for Residential, Commercial, and Industrial Customers
- Adaptive management for changing codes, standards, and forecasts

Low-Income Weatherization Offerings

- Targeted outreach, increased participation in LI EE programs
- Funding 100% project cost

Annual EE and Conservation/ DSM Savings	WA		OR	
	therms	MT CO2e	therms	MT CO2e
2019	760,956	4,038	499,135	2,648
2020	659,176	3,498	427,060	2,266
2021	1,243,223	6,597	525,372	2,788

Emissions from Natural Gas Distribution Operations

Cascade's methane emissions from pipeline infrastructure and GHG emissions from combustion equipment

- Distribution system methane emissions and compressor station emissions reported to the Dept of Ecology equals about 27,000 metric tons of CO₂e.
- EPA announced amendments to Subpart W reporting in 2023, proposing emission factor updates and reporting of “other large release events” starting in reporting year 2025. EPA defines the release events as releases of ≥250 MT CO₂e (~500,000 scf of pipeline quality natural gas).
- With other operational emissions added to our inventory, we expect total annual emissions between 35,000 to 48,000 metric tons of CO₂e.
- Cascade's 2023 methane emissions rate is 0.047%(% of volume of methane emitted per total methane throughput volume).

Reducing Operations Emissions

Cascade is committed to methane emissions reductions

- Created a more robust inventory of GHG emissions in all operational areas for 2022 and ongoing
- Joined One Future Coalition and will be operating with entities nation-wide to reduce methane intensities and improve distribution operations.
- Cascade mitigates methane leaks and has adopted a program to quickly address even small leaks that are not considered a public safety concern.
- Exploring more ways to reduce emissions in normal operations, including the use of methane capture technology for pipeline blowdowns.
- Piloting an emission survey using Picarro and Advanced Mobile Leak Detection technology in 2024.

Reducing Operations Emissions

System Integrity Projects

- Since 2019, Cascade has replaced over 42 miles of early vintage steel pipe with new steel or polyethylene pipe in Washington.
- Cascade is better positioned than most US utilities as it has no unprotected steel pipeline and no cast iron pipe.

Climate Commitment Act

Program establishing a declining cap on GHG emissions from covered entities consistent with the limits established in RCW 70A.45.020, and a program to track, verify, and enforce compliance with the cap through the use of compliance instruments.

Anthropogenic GHG Emissions Reductions:

- Achieve 1990 levels (90.5 million metric tons) by 2020
- 45% below 1990 levels (50 million MT) by 2030
- 70% below 1990 levels (27 million metric tons) by 2040
- 95% below 1990 levels (5 million metric tons) by 2050

Covered Entities:

- Fuel suppliers, natural gas distribution, electric utilities, and large facilities.
- Landfills and certain emissions intensive and trade exposed (EITE) entities are added in during 2nd and 3rd compliance periods.

Climate Commitment Act

Cascade's regulated emissions:

- Customer Emissions – about 1.9 million metric tons CO₂e in 2023
 - All core customers
 - Non-core customers that are not covered entities under the CCA (= / < 25,000), and excludes customers that may "opt-in" to program individually or that may petition to be emissions-intensive and trade exposed (EITE).
- Operations Emissions – 26,922 metric tons CO₂e
 - Methane leakage
 - Fuel combustion from >5 mmbtu sources (e.g. compressor stations)

Climate Commitment Act

Baseline

- 2015-2019 average

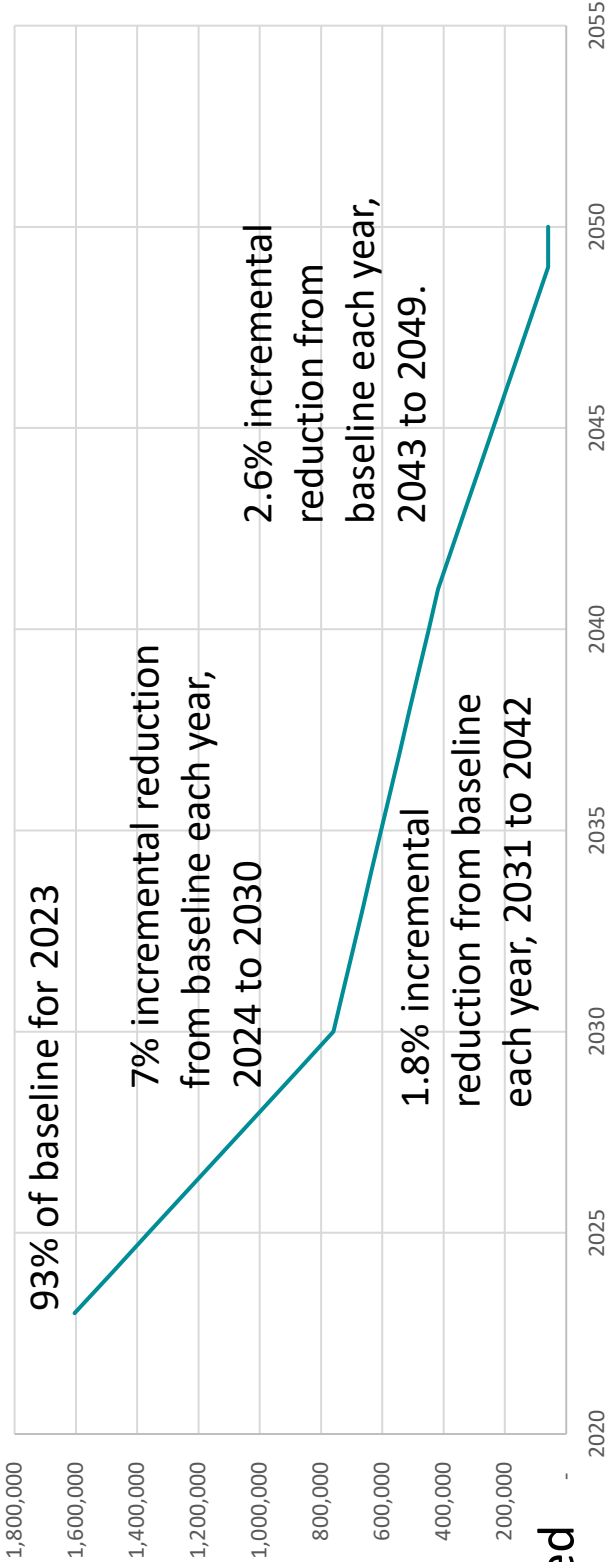
No Cost Allowances for Natural Gas Suppliers

- See chart

Allocation of No Cost Allowances

- 2024 and thereafter, allocations made in October of prior year
- Specific auction allocations decided 3 months prior to auction

Cascade's Projected Trajectory of No Cost Allowance Allocations (Metric Tons)



Climate Commitment Act

Rule Requirements Commence on January 1, 2023

4 Year Compliance Periods

- 2023-2026, 2027-2030, 2031-2034, ...

Compliance Demonstrations

- Full compliance demonstrations required by Nov 1 of the year following the end of a 4-year compliance period
- Interim compliance period demonstrations by Nov 1 annually of 30% of prior year's emissions.

CCA Compliance Options

Allowances

- Allowances are equal to one ton of CO₂e emissions

Energy Efficiency and Conservation/Demand-side Management

Renewable Natural Gas

- One for one replacement of fossil gas emissions through renewable thermal credits

Offsets

- Limit use to 8% of compliance obligation in first compliance period (3% from tribal), 6% thereafter.

Other

- Hydrogen, Carbon Capture, Synthetic methane, etc.

Thermal Energy Networks (TENS)

- TENS bill passed into law in 2024; takes effect June 6
- Identifies pathways for utilities to invest in networked thermal energy and associated pilot activities
- Funds will be available from Commerce to invest in qualified pilot projects
- LDCs have 12 months to identify available projects in writing to Commission and 30 months to deploy with potential option for extension at discretion of UTC
- Law also allows LDC obligation to serve to be met through networked thermal energy at request of LDC and with approval of UTC.

Thermal Energy Networks (TENs)

- Networked thermal energy can come from multiple sources including geothermal, ground source heat, waste heat, etc.
- Cascade will explore a range of opportunities for integration of this technology as part of our ongoing decarbonization compliance planning efforts.
- Cascade will continue to participate in the Utility Networked Geothermal Collaborative and monitor emerging best practices for this promising combustion fuel alternative .
- Targeted pilots will help Cascade determine the scalability of different TENs technologies and applications to support future modeling.

City of Bellingham

Bellingham City Council passed an ordinance on Feb 7, 2022, which requires electric space and water heating equipment for new commercial and large (4+ story multifamily buildings) buildings. It also requires incremental improvements in EE (building envelope, lighting, insulation) and solar installation or readiness in new buildings.

The electric-only mandate for space and water heating does not apply to single family construction, detached houses, duplexes, townhomes or row houses.

The ordinance takes effect August 7, 2022.

The City of Bellingham continues to work on the design of a Climate Action Fund. Preliminary drafts indicate that this would be treated as a property tax and would direct funds towards electrification, among other efforts. Following the City Council and Mayor expressing reservations about the design and timing of the plan it was announced they will delay putting the measure on the November ballot.

Whatcom County

On July 27th, 2021, Whatcom County voted to ban the construction of new refineries, coal-fired power plants and other fossil fuel-related infrastructure.

This does not constitute a gas ban but may have impacts on distribution system enhance projects if needed in Whatcom County.

City of Bend

Aspirational goal to reduce GHG by 40% by 2030 based on 4 areas of focus:

- Energy Supply
- Transportation
- Energy in Buildings
- Waste and Materials

There isn't a specific carve-out for what Cascade is required to do for this action plan. However, Cascade's representative on the original Climate Action Steering Committee (CASC) helped identify pathways for gas to support the City goals through development of an offset program and a biodigester plant. Regulatory is working on offset programs and Cascade was awarded Bend landfill RFP.

The City's current Environment and Climate Committee is having ongoing discussions about the role of gaseous fuels as part of a decarbonized future. Cascade intends to share information on its emerging RNG efforts and overall renewable gas potential as appropriate.

National Focus

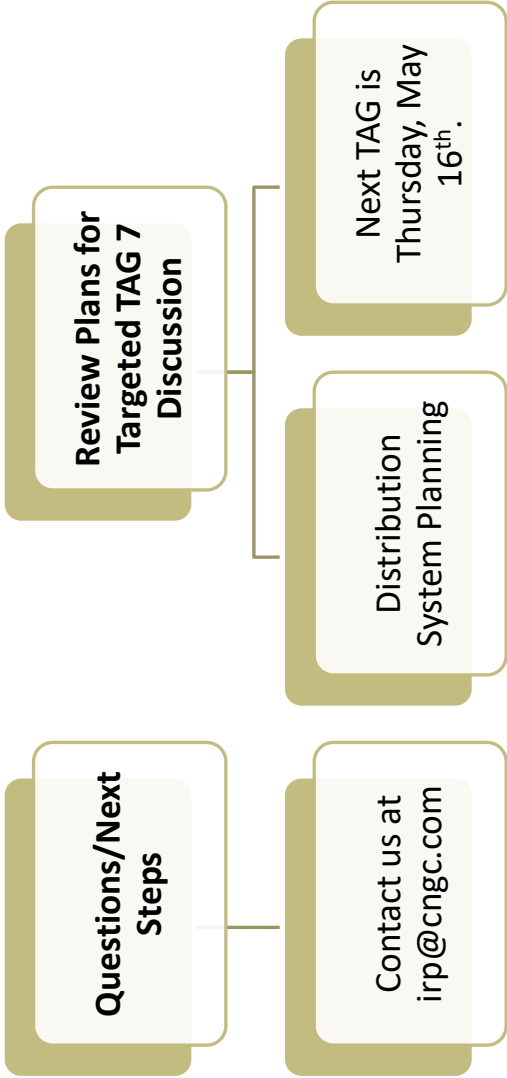
- The US Department of Energy published a final rule, 89 Fed. Reg. 24,340 in April '24, revising coverage determination rulemakings; the process for developing energy conservation standards; test procedures; and ASHRAE equipment. Cascade will continue to monitor for impacts to our programs in future.
- DOE recently published a Federal Register notice of Direct Final Rule (DFR) pertaining to energy conservation standards for consumer clothes dryers along with its previously updated residential water heater efficiency standards which would apply to new water heater models starting in 2029. Cascade's energy efficiency team will continue to assess impacts to baseline equipment used to determine the Company's Energy Efficiency portfolio.
- EPA has proposed adjusting standards for ENERGY STAR natural gas furnaces to AFUE 97%+ and is considering ENERGY STAR qualification for hybrid HP technologies. Cascade's energy efficiency team will continue to monitor these developments and potential EE program impacts/opportunities.
- The US Dept of Energy has also launched a notice of intent for funding opportunities for Clean Hydrogen Programs associated with the Bipartisan Infrastructure Law. Cascade is monitoring opportunities for partnerships in this sector across the states we serve.
- The Regional Clean Hydrogen Hubs (H2Hubs) will help accelerate and support the production, storage, delivery, and end-use of clean hydrogen.
 - Currently in the infancy of planning and funding. Cascade continues to monitor this future opportunity and researching results of ongoing pilot s nationwide.
- EPA recently announced amendments to Subpart W (O&G segment) operational GHG emissions reporting, proposing emission factor updates and additional reporting of "other large release events". These changes are proposed to be effective starting in reporting year 2025.
- EPA finalized a GHG regulation on April 25, 2024, requiring new high operation natural gas combustion turbines to install pollution controls equivalent to carbon capture. Also, existing coal units not installing controls would retire before 2032, opt to co-fire with natural gas and retire before 2039, or install carbon capture to operate past 2039. EPA is exploring GHG standards for existing natural gas combustion turbines.
- US Senate Bill - Inflation Reduction Act of 2022 was released in late July, which includes climate change investments to promote decarbonizing the economy. The company continues to evaluate opportunities and impact from the BIL/IIJA and IRA.

Feedback for Cascade?

Do you have comments or ideas that Cascade should consider regarding Environmental Policy?

Process Item	Date	Process Element	Appendix A
2025 WA IRP TAG 0	Thursday, January 25, 2024	What is an IRP and how to get involved	Appendix A
Targeted-TAG	Thursday, February 15, 2024	Avoided Cost	
Targeted-TAG	Wednesday, March 6, 2024	Energy Efficiency	
Targeted-TAG	Thursday, March 28, 2024	Equity in the IRP	
Targeted-TAG	Thursday, April 11, 2024	Customer/Load Forecast	
Targeted-TAG	Tuesday, May 7, 2024	CCA/Compliance Modeling	
Targeted-TAG	Thursday, May 16, 2024	Distribution System Planning	
Targeted-TAG	Thursday, May 30, 2024	Resource Integration	
TAG 1	Thursday, June 13, 2024	Process, Key Points, IRP Team, Timeline, Regional Market Outlook, Planned Scenarios and Sensitivities, Stakeholder Engagement, Demand and Customer Forecast and Non-Core Outlook, Drilling down into segments of demand forecast. Upstream Pipeline presentation.	
Receive feedback on TAG 1	Friday, June 28, 2024		
TAG 2	Thursday, July 25, 2024	Respond to TAG 1 Feedback, Distribution System Planning, Alternative Resources, Price Forecast, Avoided Costs, Current Supply Resources, Transport Issues, Carbon Impacts, Energy Efficiency, Bio-Natural Gas, Preliminary Resource Integration Results.	
Receive feedback on TAG 2	Friday, August 9, 2024		
First Draft	Friday, September 6, 2024		
Comments Due	Friday, October 4, 2024		
TAG 3	Wednesday, October 30, 2024	Respond to TAG 2 feedback, Final Integration Results, finalization of plan components, Proposed new 2- to 4-year Action Plan	
Final Draft	Tuesday, December 3, 2024		
Comments Due	Tuesday, January 14, 2025		
TAG 4 (if needed)	Thursday, January 30, 2025		
Final Complete By	Friday, February 14, 2025		
File	Monday, February 24, 2025		

2025 WA IRP Schedule





In the Community to Serve®

Washington Integrated Resource Plan Targeted Technical Advisory Group Meeting #6

MAY 7, 2024

MICROSOFT TEAMS/TELECONFERENCE



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Targeted TAG #6 – CCA/CCP Compliance Modeling TAG Meeting

Date & time: 5/7/2024, 9:00 AM to 10:00 AM

Location: Microsoft Teams Meeting

Presenters: Gabe Forrester, Alyn Spector, Shaun Henson

In attendance: Abbie Krebsbach, Abe Abdallah, Alyn Spector, Becky Hodges, Bradley Mullins, Brian Robertson, Bruce Folsom, Byron Harmon, Caleb Reimer, Carolyn Stone, Carra Sahler, Chad Stokes, Chris Robbins, Debra Campbell, Devin McGreal, Eric Shierman, Eric Wood, Gabe Forrester, Heather Moline, Jennifer De Boer, Jodie Albert, Kary Burin, Kathleen Campbell, Kim Herb, Konstantine Geranios, Lori Blattner, Mahon Walsh, Matthew Doyle, Michael Brutocao, Michael Freels, Michael Parvinen, Noemi Ortiz, Patrick Darras, Quinn Weber, Rachel Preece, Rebecca Eaton, Russ Nishikawa, Shaun Henson, Tamy Linver, Tom Pardee, Travis Hey, Zachary Sowards

Brian Robertson, Supervisor of Resource Planning, opened the meeting by welcoming and thanking stakeholders for participating in Cascade's IRP Process. Brian reminded folks that we wouldn't be doing introductions at the beginning of the meeting but asked if/when people interjected throughout the meeting to please introduce themselves.

Presentation #1 – Safety Moment (Jenny De Boer)

- Safety Moment on power lines

Presentation #2 – Cascade's commitment to reducing emissions (Gabe Forrester)

- Cascade established a Company pipeline emission reduction target of 30% by 2035 compared to 2022 levels.
- Cascade reducing customer emissions through Energy Efficiency and Conservation/ Demand Side Management
- Cascade's 2023 methane emissions rate is 0.047% (percent of volume of methane emitted per total methane throughput volume)
- Cascade piloting emission survey using Picarro and Advanced Mobile Leak Detection technology in 2024
- System integrity: since 2019, Cascade has replaced over 42 miles of early vintage steel pipe with new steel or polyethylene pipe in Washington
- Cascade's Regulated Emissions
 - Customer Emissions: 1.9 million metric tons of CO₂e
 - Operations Emissions: 26,922 metric tons of CO₂e
- CCA Compliance Options: Allowances, Energy Efficiency and Conservation/Demand Side Management, Renewable Natural Gas, Offsets, Other (Hydrogen, Carbon Capture, Synthetic Methane, etc.)

Quinn Weber, UTC: When was that policy started (30% reduction by 2035)?

Abbie: I do not know the exact date, we can get back to you on that. Multiple years

Byron Harmon, UTC: Do you plan to pursue that emissions reduction target regardless of state regulation?

Gabe: Yes

Byron Harmon, UTC: Will these assumptions be put into plexos even if it isn't the most cost-effective pathway?

Brian: If the CCA is redacted, allowances won't exist and we will need to update some inputs into PLEXOS such as avoided cost and cost of carbon. We look forward to having conversations with you if it gets to that point, we would likely need commission support if we are not taking the most cost effective path.

Quinn Weber, UTC: I see on the graph baseline emissions for residential customers keeps increasing, would you explain what underlies that assumption?

Brian: This (graph on slide 5) is from last year's IRP, we have not yet locked in the customer forecast. We had the customer load forecast targeted TAG not long ago and received a lot of good information, so we are still working on updating the customer forecast. I wouldn't read into the baseline numbers here too much, the purpose of this graph was to show the general customer allocation between residential, commercial, industrial, and non-core emissions.

Abbie Krebsbach, CNGC: Thinking of Byron's question before, the 30% reduction of operational emissions by 2035 is the goal.

Byron: Thank you for the clarification, so these are distribution and transportation emissions not residential emissions, correct?

Abbie: Correct, the 30% was for operational measurements.

Carra Sahler, GEI: What kinds of customers are those "non-core" regulated customers. Are we talking large industrial sources mostly?

Abbie: Correct those are large industrial sources I don't know if we talk about any of those particular customers in our slides, but those could be in an EITE category but would still have to have their emissions regulated through us because they don't emit more than 25,000 ton category themselves.

Carra Sahler: Can we go back to the slide with the graph? (slide 5) So this chunk is all transport customers some of them will be the small Safeway that makes decisions year-to-year about its gas use, maybe some are going to be big industrial sources, some of them are going to be for electricity.

Abbie: Correct. Also, in a few cases they might not be transport customers, they might be other exempt customers like a military base.

Byron Harmon, UTC: In the previous draft of the slides sent out, this slide (9) used to say 318 miles. Is there a reason why it was dramatically decreased down to 42?

Gabe: 318 included all pipe not just replacing old pipe. So peeling that back, replacing older pipe was 42 miles of that. Kathleen: I just wanted to add that Cascade has been doing pipe replacement before 2019 as well, I think we started around 2012.

Carra Sahler, GEI: So, you will have a compliance period in November of this year, as an interim demonstration? How do you expect that will look for last year's emissions? On track?

Abbie: We are in the process of having submitted out compliance. There are emissions reports for this year, end of March and we still have to go through a verification period which has to be completed, I believe by August 1st of this year. So truly, we won't exactly know everything until that point but we are projecting that we would be able to comply by November with our compliance plan.

Quinn Weber, UTC: How is Cascade starting to model these resources (slide 11)?

Brian: We will do something similar to the last IRP, we are still finalizing these low carbon numbers and how we are going to get them so we plan on discussing this a little more at the final Targeted TAG and how we are going to incorporate it into our modeling. We'll be using these, they will be in our PLEXOS model and there will be more to come in the last Targeted TAG.

Presentation #3 – Thermal Energy Networks (TENs) (Alyn Spector)

- Bill takes effect June 6 that identifies pathways for utilities to invest in networked thermal energy and associated pilot activities
- Thermal Energy Networks: networked thermal energy can come from geothermal, ground source heat, waste heat, etc.
- Targeted pilots will help cascade determine the scalability of different TENs technologies

Carra Sahler, GEI: Have you talked to City officials about the possibility of TENS there?

Alyn: We are having internal discussions on a suite of options available including TENs. I think reaching out to City officials on TENs may make sense in the future. Once we have a better sense of viable options we'll begin to have conversations if/where there's potential viability.

Presentation #4 – City of Bellingham/Whatcom County (Shaun Henson)

- City passed ordinance in 2022 which requires electric space water heating equipment for new commercial and large buildings, also requires incremental improvements in EE and solar installation or readiness in new buildings
- County voted in 2021 to ban construction of new refineries, coal-fired power plants and other fossil fuel related infrastructure, this doesn't constitute a gas ban but may have impacts on distribution system enhancement projects

Quinn Weber, UTC: Will this have any specific impacts on your distribution system in Whatcom County?

Brian: we have not seen any impacts on our distribution side in Whatcom County so far, we still have commercial and residential growth but are keeping an eye on it

Kathleen: I agree with Brian, we actually checked in with the district this morning and that was the report

Presentation #5 – City of Bend (Alyn Spector)

- Aspirational goal to reduce GHG by 40% by 2030 based on 4 areas: energy supply, transportation, energy in buildings, waste and materials

Carra Sahler, GEI: Have you talked to City officials about the possibility of TENS there?

Alyn: We are having internal discussions on a suite of options available including TENs. I think reaching out to City officials on TENs may make sense in the future. Once we have a better sense of viable options we'll begin to have conversations if/where there's potential viability.

Carra: With the amount of growth they are going to experience there, this seems like a great opportunity. I see you are thinking of maybe waiting but I would encourage you not to wait. You don't always have to have all the answers before you start getting people excited about that as a possibility. I just think it could be really exciting.

Alyn: I don't disagree with you, I think it is something we certainly have to think about. Since we are having those broader discussions, we are still kind of formulating what the overall suite of opportunities might be. It is probably appropriate to have some discussions, but I wanted to make it clear that there's nothing firm yet. The difference between Washington and Oregon is that in Washington state, this fantastic law passed that provides the opportunity both to seek recovery and to have some formalization of TENs pathways. This isn't to say we wouldn't be interested in something similar in the state of Oregon, there just aren't similar pathways.

Carra: I think that is correct that having the legislative driver is helpful. At the risk of putting something out there, I would love to explore that as a possibility here in Oregon.

Alyn: From the policy side of the shop I would say do feel free to reach out.

Presentation #6 – National Focus (Gabe Forrester)

- USDA published rule 89 revision coverage determination rulemakings
- EPA proposed adjusting standards for ENERGY STAR natural gas furnaces to AFUE 97%+

Post Presentations –

Heather Moline, UTC: I am looking for more information on how you all are interpreting thermal energy network bill. (slide 16) Rulemaking says piped non-combustible fluids so this is not anything connected to natural gas or renewable fuel pipelines, correct?

Alyn: Correct we would be using the waste heat of the non combustible fluid flowing through the pipe. This is also our current understanding and not an authoritative stance, this is a starting point of our best understanding of the law.

Abe Abdallah, PUC: Are these thermal networks like they use in Europe that use waste heat for space heating?

Alyn: That is my understanding, but the ultimate interpretations are going to be developed in conjunction with our regulators.

The Meeting was Adjourned

Per Cascade Commitment #8 (Stakeholder Engagement Design Document, 2/22,2022: "Provide TAG minutes that include the action items from bullet #7 as well as any upcoming deadlines for feedback on the IRP"), here are additional action items to track, coming out of the TAG 6 meeting:

1. Cascade stated that the Company would get back to WUTC on the question of when the Company's Environmental Policy was put in place. Cascade can confirm that policy was in place when CNG was acquired on July 2, 2007.



In the Community to Serve®

Washington Integrated Resource Plan Targeted Technical Advisory Group Meeting #7

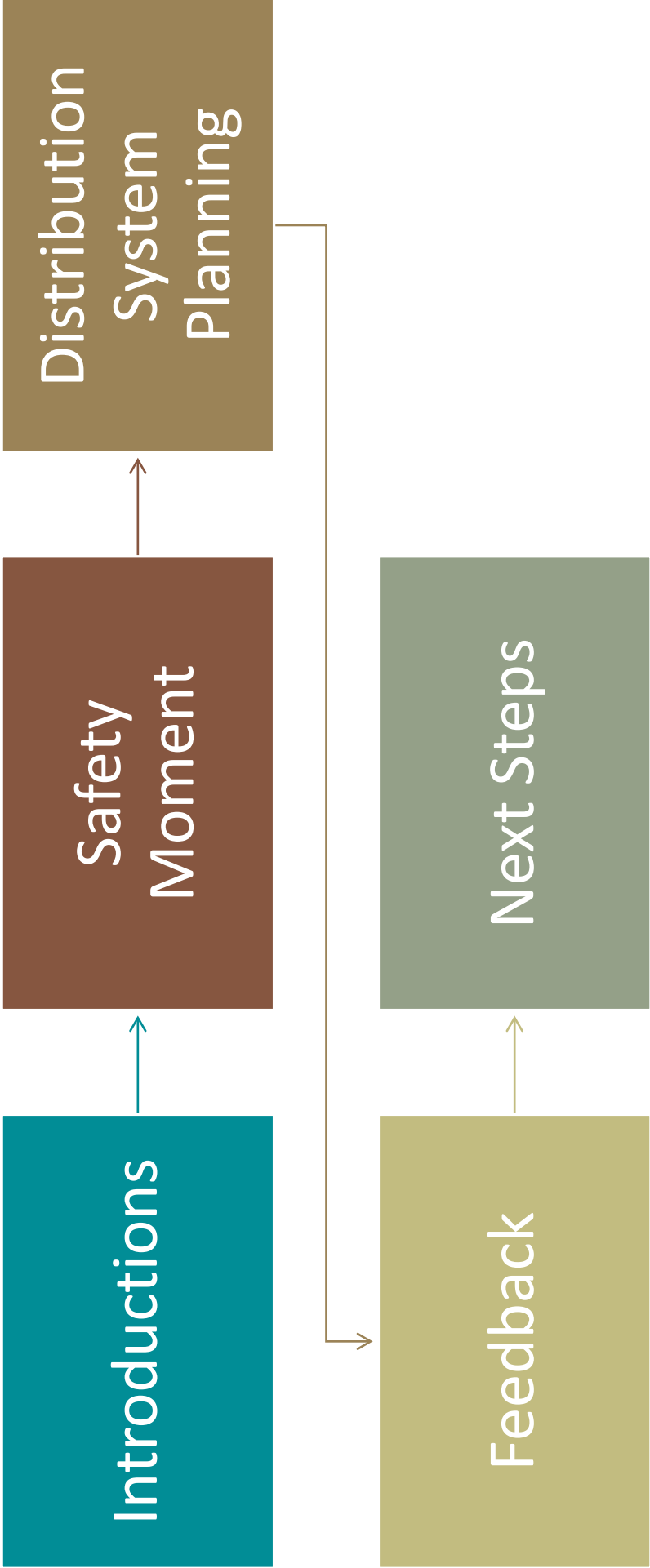
MAY 16, 2024

MICROSOFT TEAMS/TELECONFERENCE



In the Community to Serve®

Agenda



Safety Moment

Hot Weather Safety Tips:

- ❖ **Stay hydrated** – Drink plenty of fluids. Drink at least 15 ounces before starting work outside, and then 5-7 ounces more every 15-20 minutes.
- ❖ **Avoid dehydrating liquids** – Drinks such as alcohol, coffee, tea, and caffeinated beverages can cause dehydration.
- ❖ **Wear protective clothing** – Clothing that is lightweight, light-colored, and loose-fitting help protect against the heat.
- ❖ **Pace yourself** – Work at a slower even pace and know your limits and abilities, especially when working outdoors.
- ❖ **Schedule frequent breaks** – Take time to drink water and rest in a cool, shaded location, preferably with air conditioning.
- ❖ **Avoid getting sunburn** – Wear sunscreen and a hat.
- ❖ **Be alert to signs of heat-related illness** – Know what to look for and check on other workers for signs of heat stress.
- ❖ **Avoid direct sun** – Find shade or block out the sun if possible.
- ❖ **Eat smaller meals** – Eat fruits high in fiber and natural juices. Avoid eating meals that are high in protein.

The More You Know....		
Heat Stroke	Heat Exhaustion	Heat Cramps
Lack of Sweating, Dry, reddish, hot Skin High Body Temperature Rapid pulse Chills Slurred speech	Excessive Sweating Weakness or tiredness Clammy skin Muscle Cramps Dizziness and/or confusion	Pain in legs, arms, or abdomen Muscle spasms in legs, arms, or abdomen

Distribution System Planning

KATHLEEN CAMPBELL, PE – SENIOR ENGINEER



Presentation will cover:

1. Distribution system modeling process
2. Identification of system deficits/constraints
3. Distribution enhancements/reinforcements options to address deficits
4. Enhancement review and selection process to capital budget
5. Utility Discussion on meeting energy needs

Distribution System Modeling

System Dynamics:

Piping:

- Diameter – ½” to 20”
- Material – Polyethylene and Steel
- Operating Pressure – 20 psi to 900 psi
- Washington – approx. 4,893 miles of distribution & 170 miles of transmission
- Oregon – approx. 1,710 miles of distribution & 107 miles of transmission

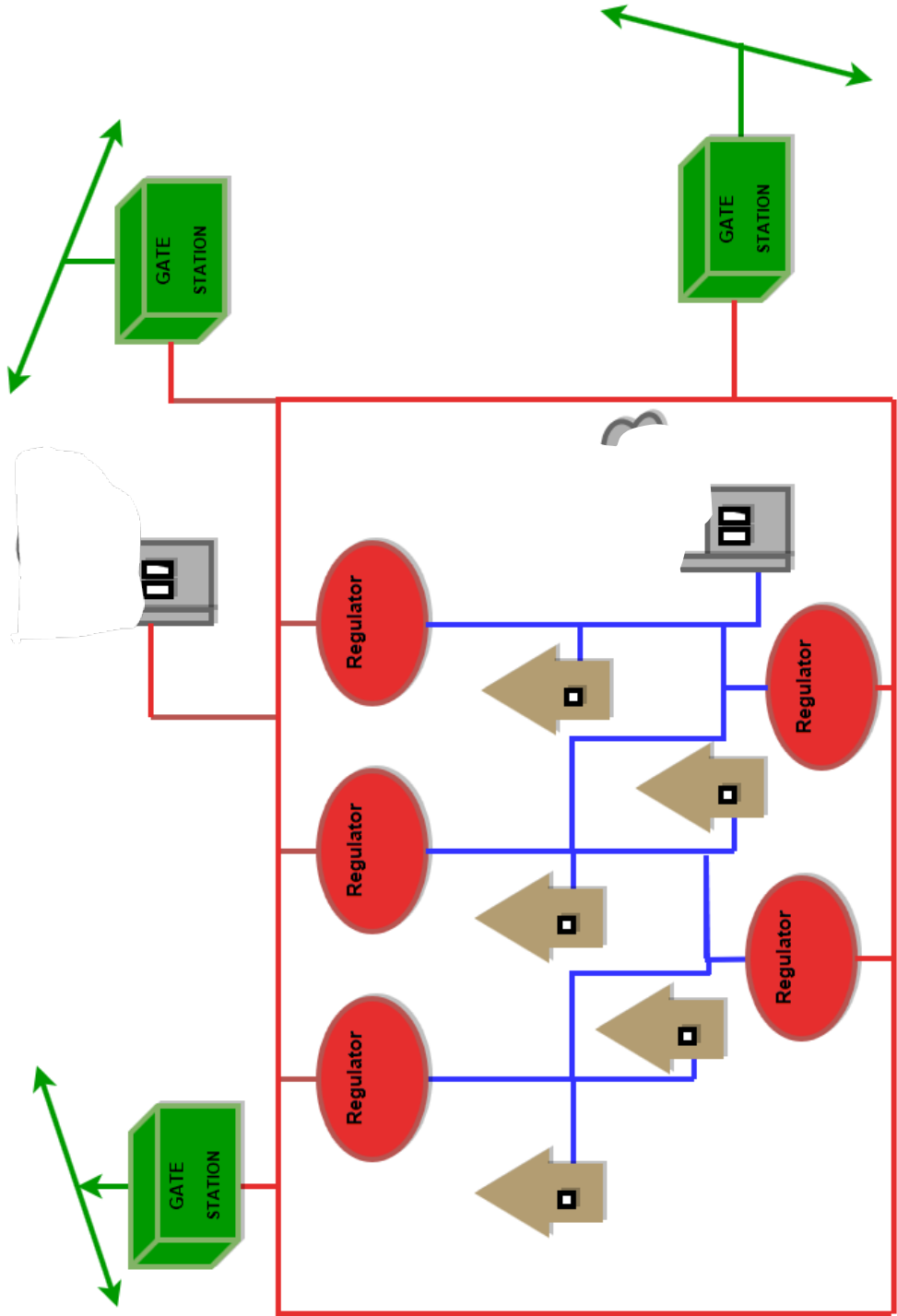
System Dynamic's Cont.

Facilities:

- Regulator stations – Over 700
- Valves – Over 1,600
- Other equipment such as heaters, odorizer and compressors



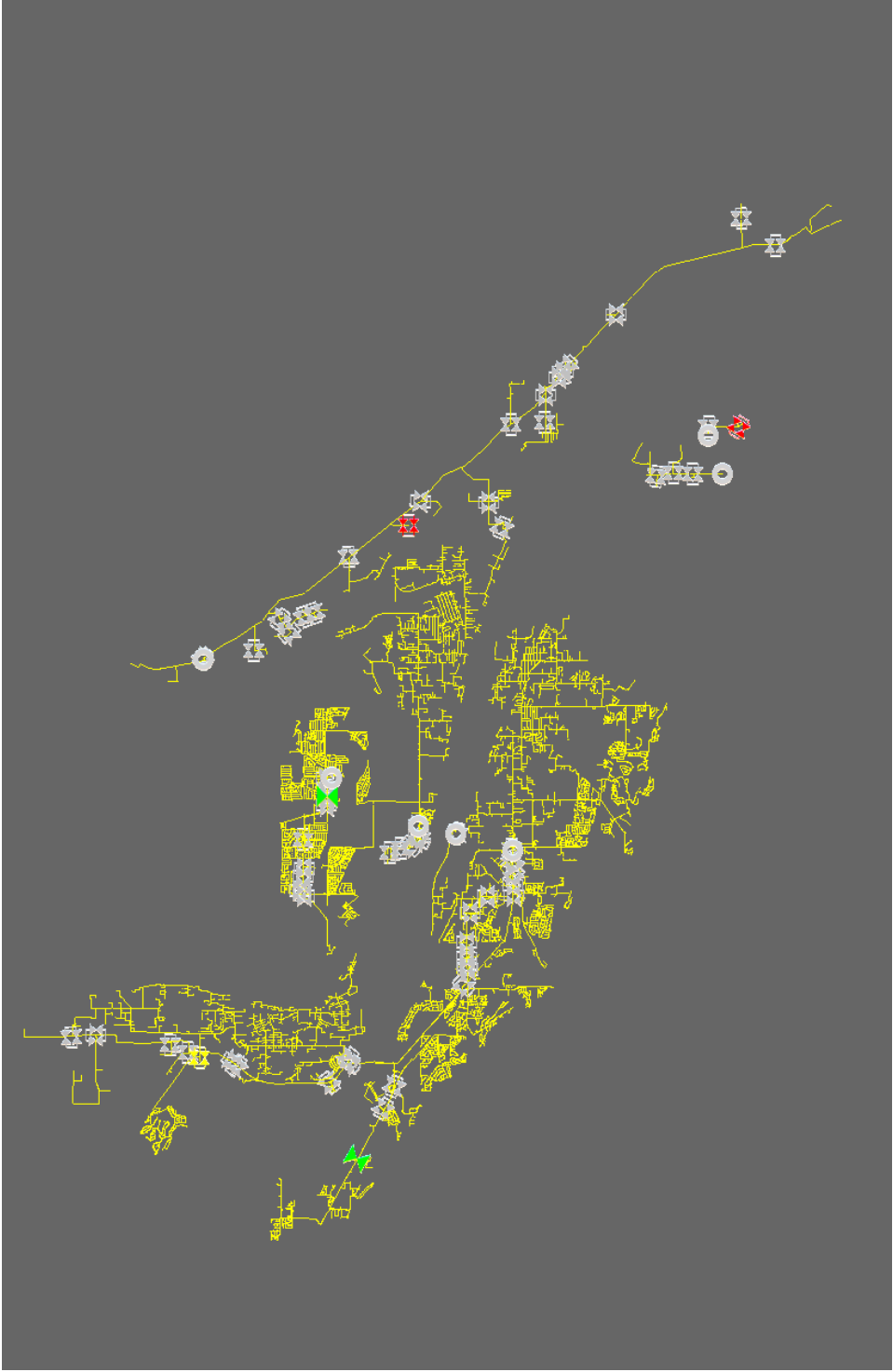
System Design



Synergi Gas Modeling

- Synergi gas is distributed and supported by DNV
- Synergi Gas models incorporates:
 - Total customer loads
 - Existing pipe and system configurations
- Synergi gas is an industry used hydraulic modeling software that allows us to predict flows and pressures on our system based on gas demands predicted during a peak weather event.
- Synergi models are rebuilt and validated every three years and maintained between rebuilds

Synergi Model Example



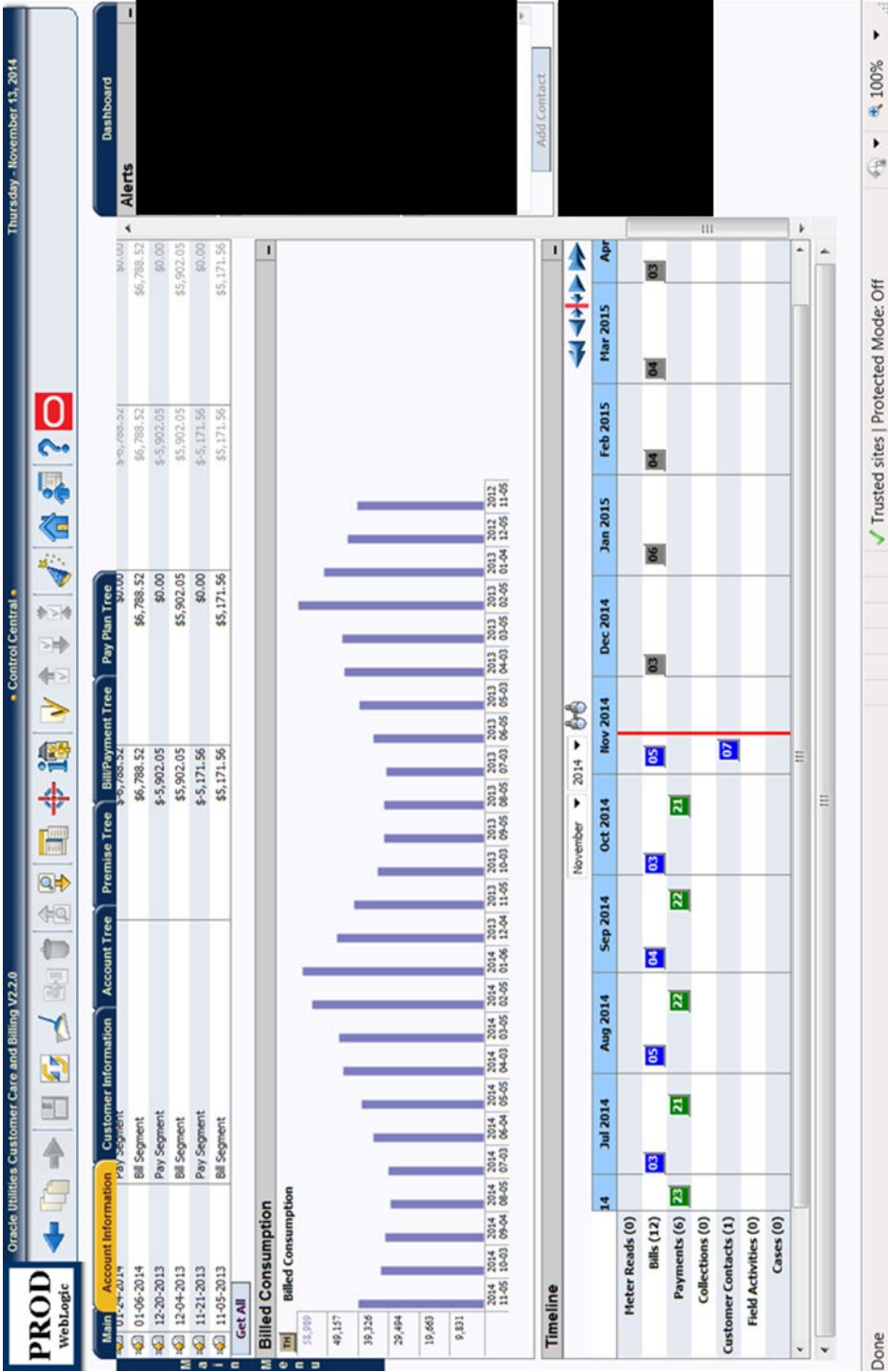
Model Building Process

When models are rebuilt

- We export current GIS data to build spatial model
- We export current CC&B billing data to CMM to create an updated demands file
- We validate and calibrate each district model to a recent low-pressure event using existing data (ERXs/pressure charts/SCADA/metertek/LV usage)
- We create a design day model based on the updated heating degree day determined by gas supply (determined by trending historical weather events)

Data Gathering

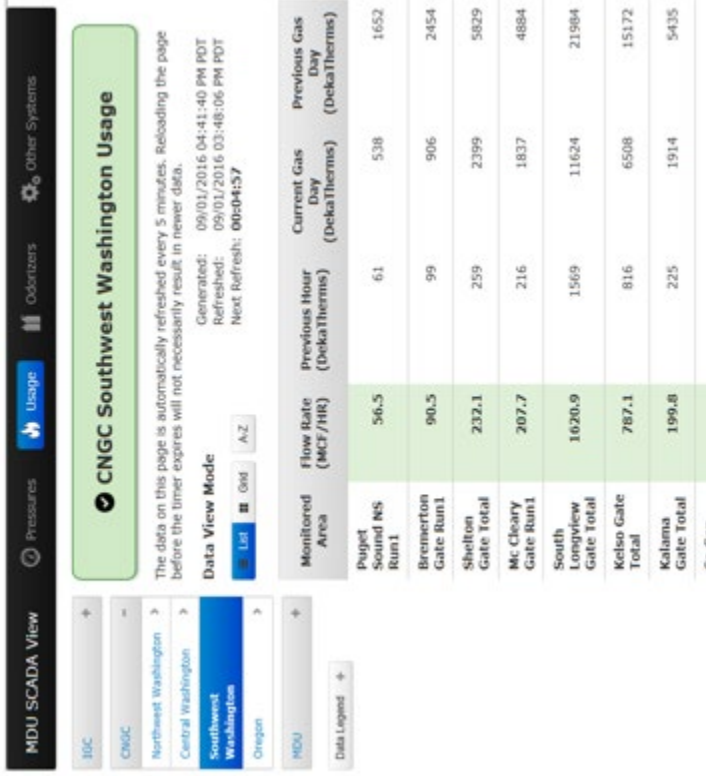
CC&B (Customer Billing Data)



Data Gathering

SCADA Data

Real time and historical flow characteristics at specific locations in the system

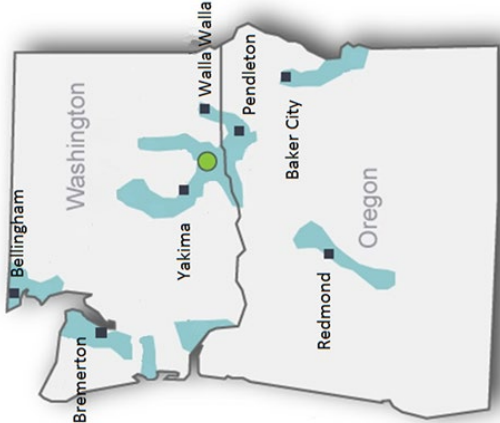


Data Gathering

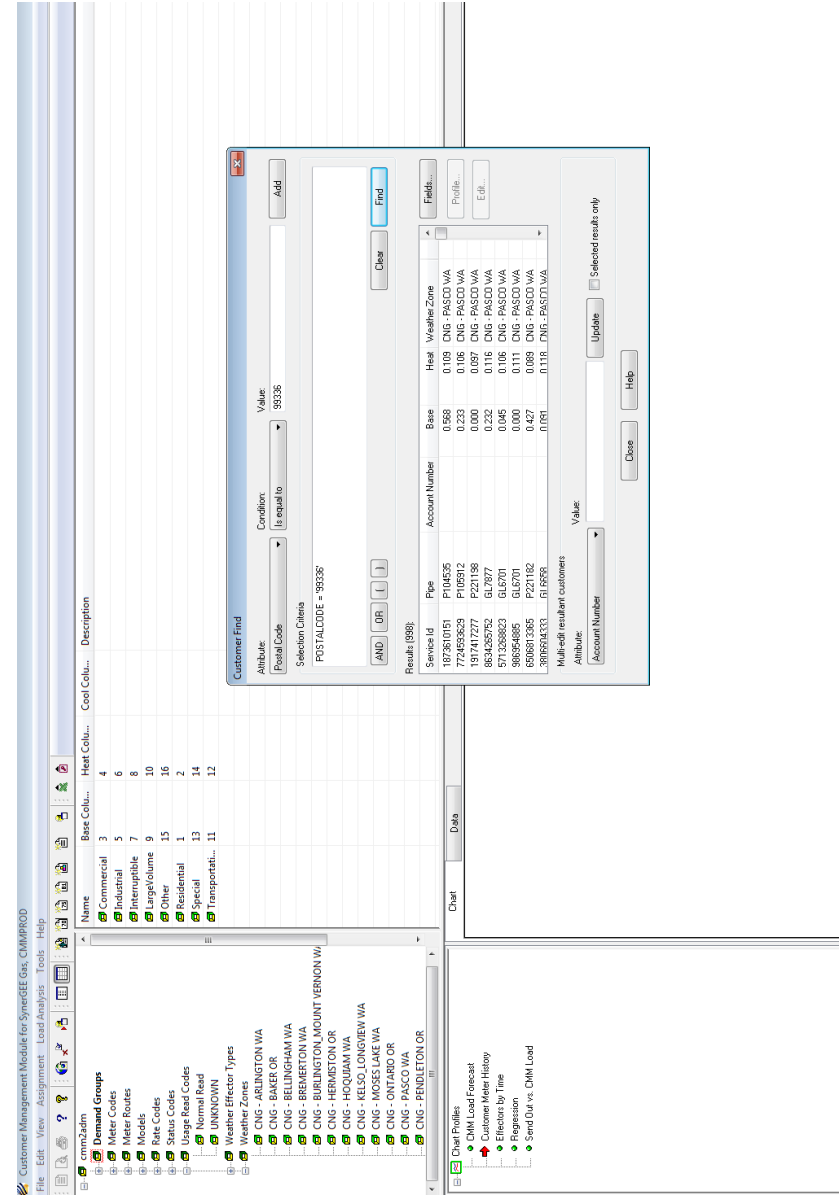
District	HDD	Avg Daily Temperature (°F)
Aberdeen	46	14
Bellingham	47	13
Bend	71	-11
Bremerton	46	14
Eastern Oregon	73	-13
Kennewick	65	-5
Longview	46	14
Mt Vernon	47	13
Pendleton	67	-7
Walla Walla	66	-6
Wenatchee	65	-5
Yakima	65	-5

Peak Heating Degree Day (HDD) modeled by CNG based on historical weather data

Peak HDD = 60 – Average Daily Temp



Customer Management Module (CMM)

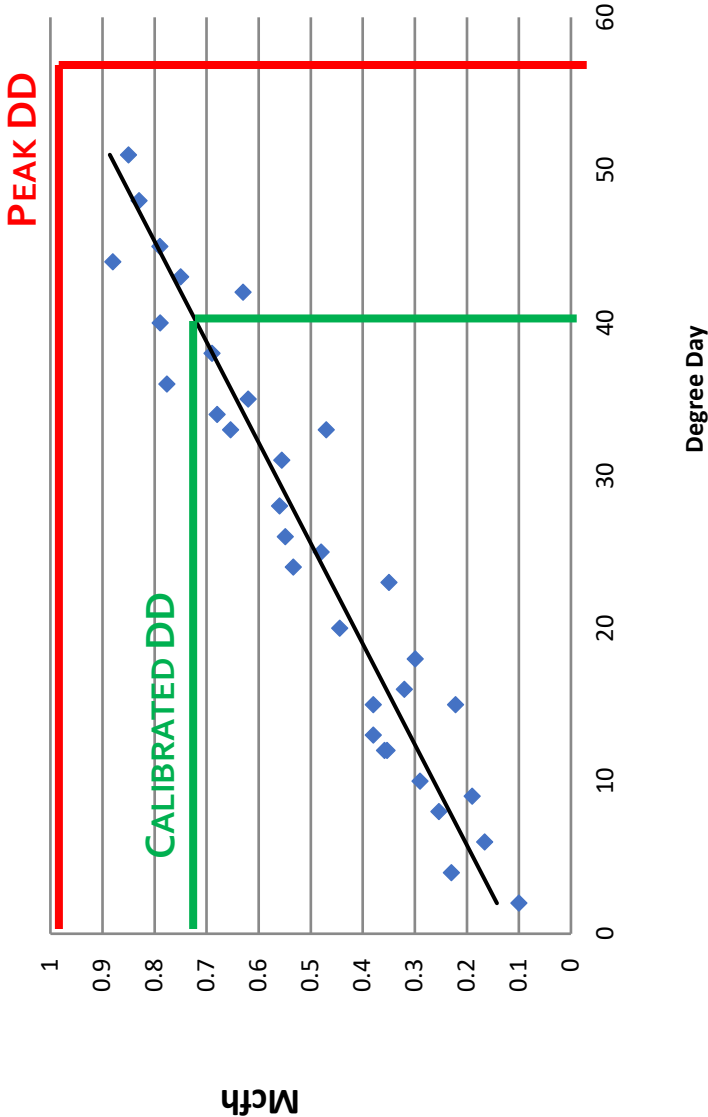


Brings CC&B customer data
into Synergi as demands
file

Demand file applies load
spatially in the model.

Calibrated vs Peak Degree Day

Load vs Temperature



$y = 0.0152x + 0.1118$

HEAT

BASE

40 DD = 0.72 MCFH

58 DD = 0.99 MCFH

Synergi Modeling Capabilities:

- Review Large Volume Customer requests
- Model RNG
- Supports design/sizing of pipe and pipeline components (regulator stations, compressors)
- Future planning
- Model IRP predicted growth
- Identify deficiencies
- Determine system reliability
- Optimize distribution enhancement options

Demand Side Management

- Built into our 5-year growth predictions
- Past demand side management efforts have been incorporated into updated CMM/CC&B data used on the 2023 model rebuild.
- Could be considered as an alternative to address a deficit

Renewable Natural Gas (RNG)

Modeling Update

- Cascade now has RNG flowing onto our system from the Horn Rapids Landfill and Lamb Weston RNG (both in Richland, WA).
- Still seeing significant interest from RNG developers in Cascade's service territory.
- Additional RNG will be coming online in 2024.
- Cascade currently models RNG at 1/100 of contract demand in design day models.

Identification of System Deficits/Constraints

What is a Capacity Deficit?

A deficit is defined as a critical system that has reached a limiting capacity.

Critical system examples include:

- Pipeline bottlenecks
- Minimum inlet pressure to a regulator station or HP system
- Not meeting a required customer delivery pressure
- Component limiting capacity
- Velocity

Growth Modeling

- Model out 5-year growth predicted in the IRP to determine if or when a capacity deficit exists.
- Iterative process to determine deficit timing.
- We want to make sure that our systems can support growth and maintain reliable service during peak demand.

System reviews to avoid deficits

- Complete a comprehensive review of each distribution system model every two years to ensure that we can maintain reliable service to our customers during peak low temperature events.
- With our capital budget cycle, we also complete system reviews on an annual basis.
- If a deficit is predicted the system is evaluated and a reinforcement/enhancement is proposed and selected based on alternative analysis considerations and placed into the capital budget based on timing needs of the predicted deficit.

Distribution Enhancement/Reinforcement Options to Address Deficits

Enhancement Options

Pipeline:

- Replacements
- Reinforcements
- Loops & Back feeds
- Pressure Increases
- Upgrades

Facility Upgrades

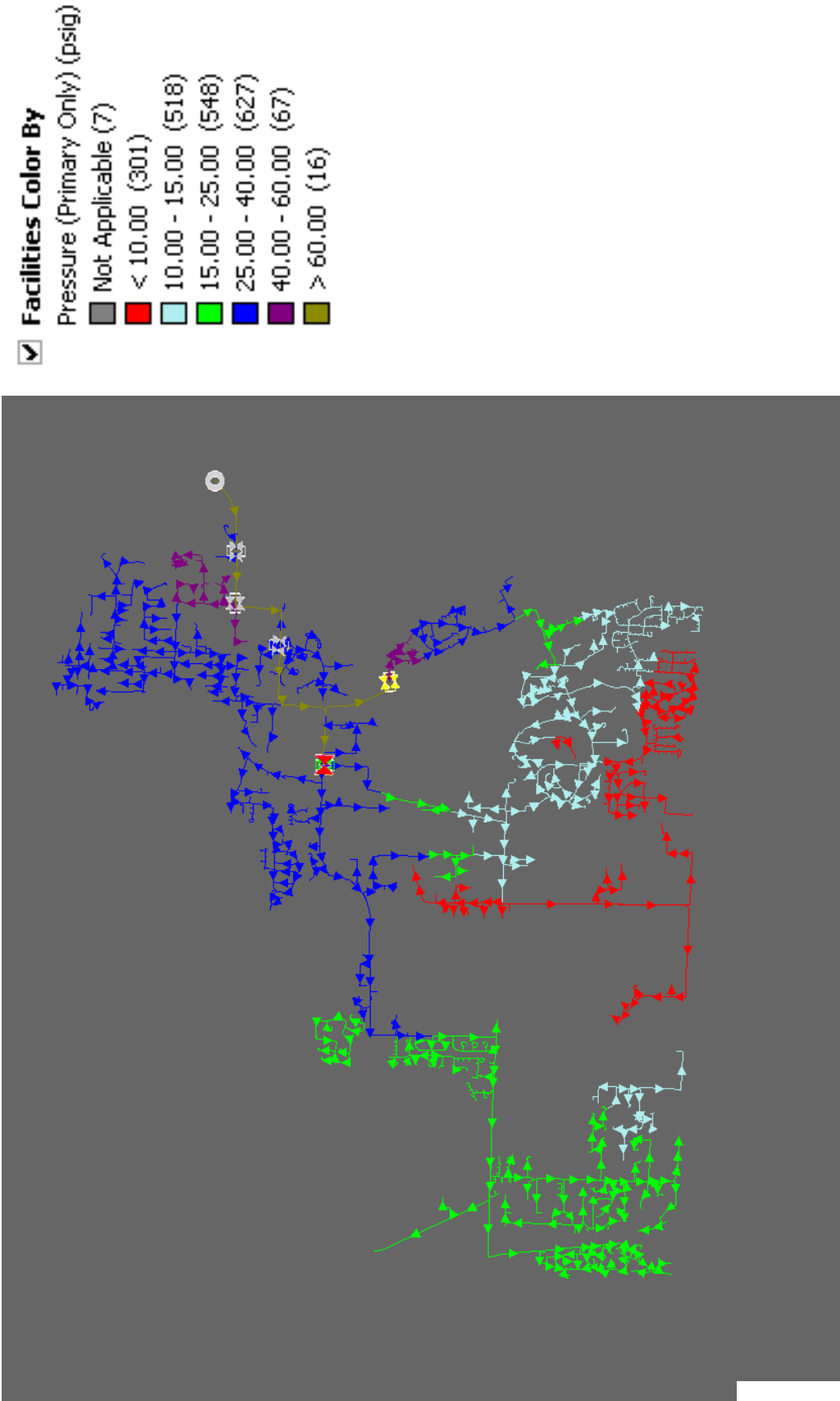
Additional Regulator Stations feeding the distribution system

New Strategically placed Gate Stations

Compressor Stations

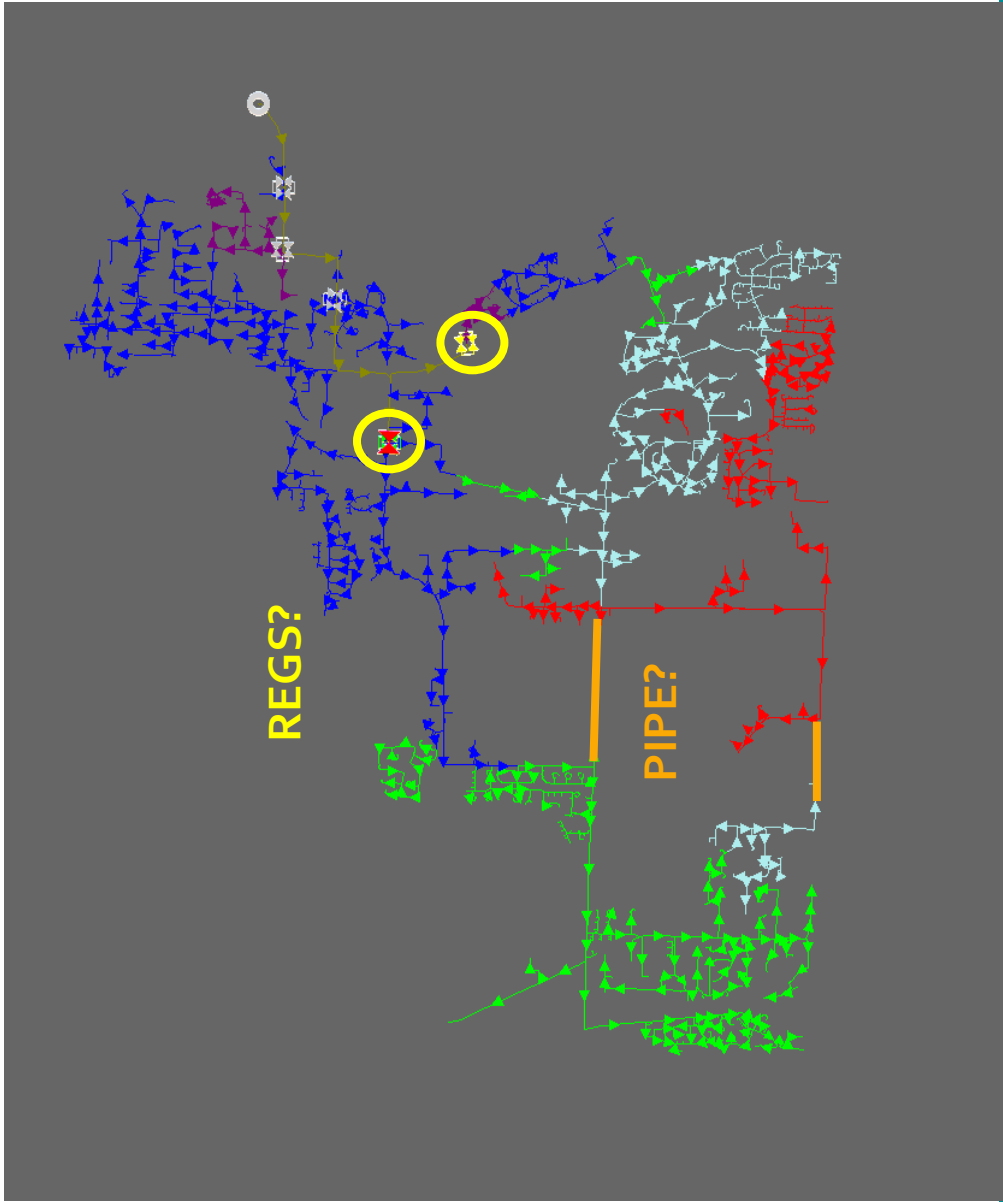
Distribution Enhancement Example

Theoretical low-pressure scenario



Distribution Enhancement Options

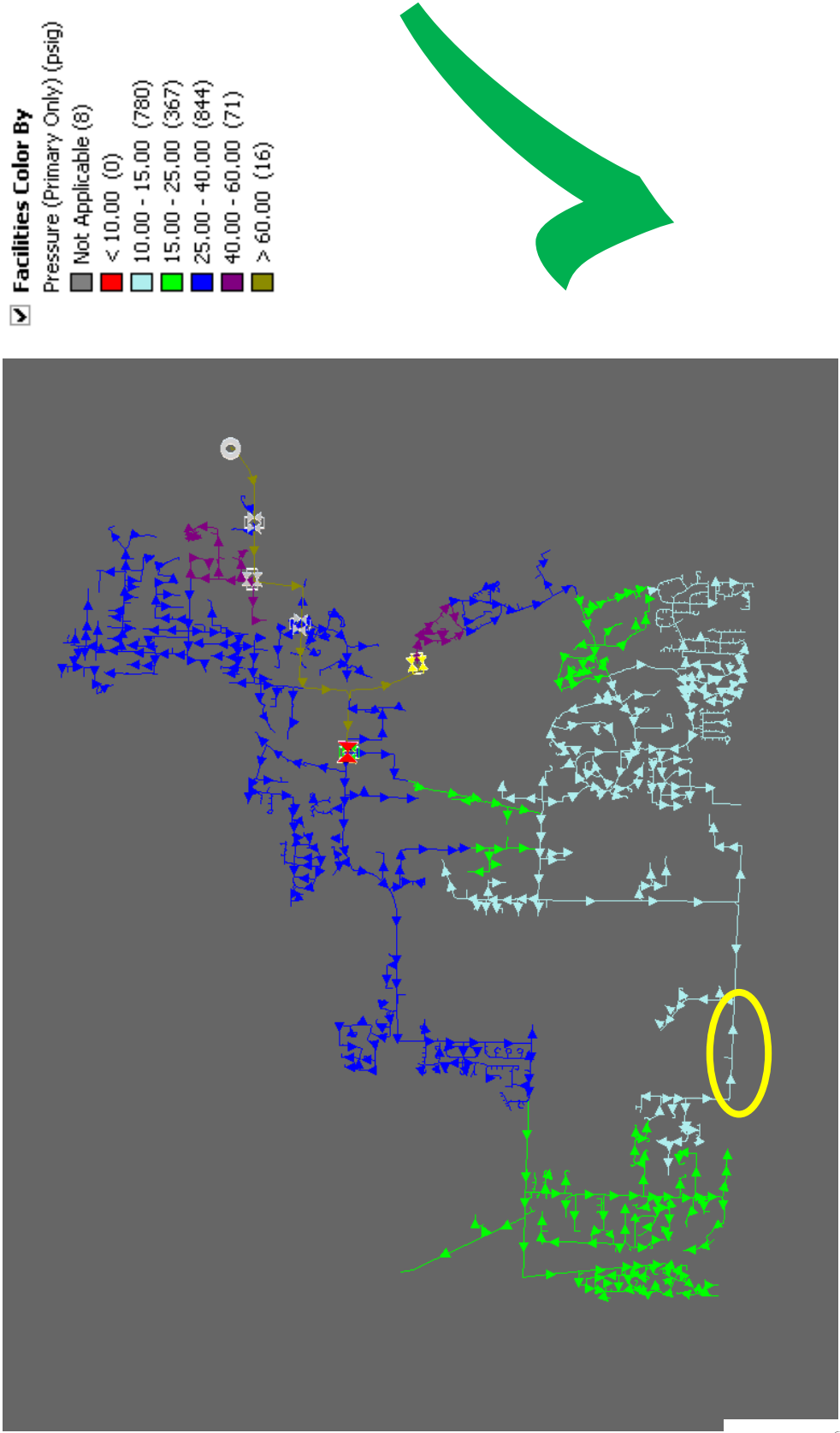
Low pressure scenario



- Compressor station infeasible
- Other Solutions?

Distribution Enhancement Options

Reinforcement option #2



Enhancements Considerations:

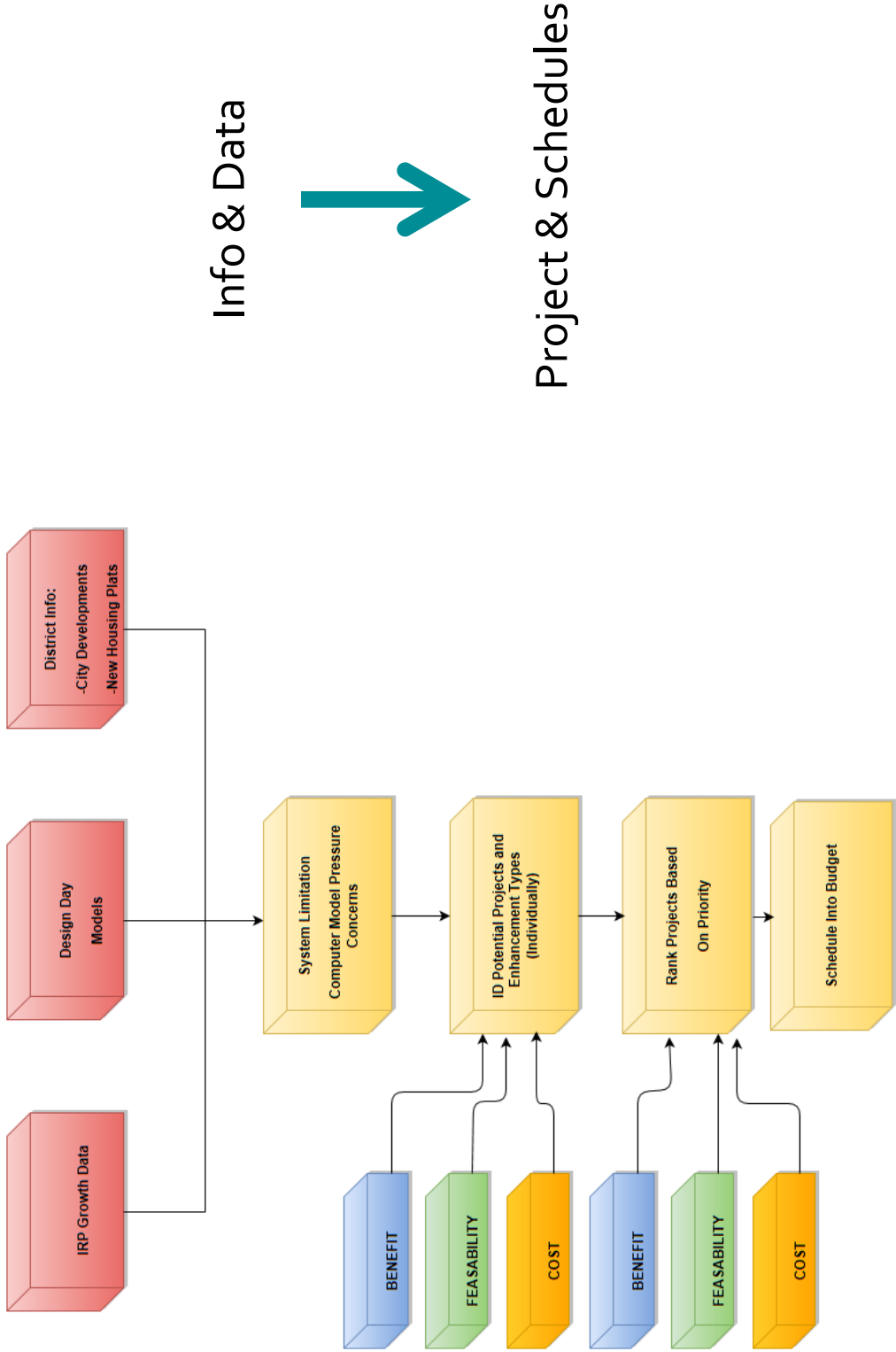
- Scope
- Cost
- Capacity Increase
- Timing
- System Benefits
- Alternative Analysis
- Environmental Impact

Enhancement Review and Selection Process to Capital Budget

Enhancement Selection Guidelines:

- Shortest segment of pipe that addresses deficiency
- Segment of pipe with the most favorable construction conditions
- Segment of pipe that minimizes environmental concerns and impacts to the community
- Segment of pipe that provides opportunity to add additional customers
- Total construction cost including restoration

Enhancement Selection Process:



Ongoing Steps/Process to review/identify IRP projects

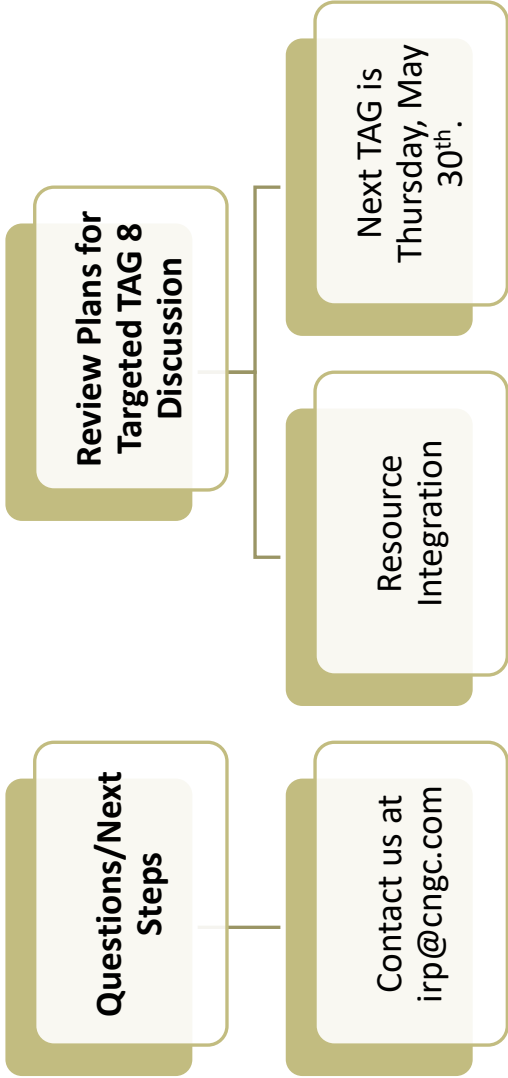
- Assess our systems and identify deficits caused by 5-year growth modeling
- Propose and evaluate alternatives to address deficits
- Discuss deficits and alternatives with management
- Work through alternative analysis process
- Budget projects needed to meet 5-year core growth

Feedback for Cascade?

Do you have comments or ideas that Cascade should consider regarding Distribution System Planning?

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Targeted-TAG	Thursday, April 11, 2024	Customer/Load Forecast	
Targeted-TAG	Tuesday, May 7, 2024	CCA/Compliance Modeling	
Targeted-TAG	Thursday, May 16, 2024	Distribution System Planning	
Targeted-TAG	Thursday, May 30, 2024	Resource Integration	
TAG 1	Thursday, June 13, 2024	Process, Key Points, IRP Team, Timeline, Regional Market Outlook, Planned Scenarios and Sensitivities, Stakeholder Engagement, Demand and Customer Forecast and Non-Core Outlook, Drilling down into segments of demand forecast. Upstream Pipeline presentation.	
Receive feedback on TAG 1	Friday, June 28, 2024		
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Final Draft	Tuesday, December 3, 2024		
Comments Due	Tuesday, January 14, 2025		
TAG 4 (if needed)	Thursday, January 30, 2025		
Final Complete By	Friday, February 14, 2025		
File	Monday, February 24, 2025		

2025 WA IRP Schedule





In the Community to Serve®

Washington Integrated Resource Plan Targeted Technical Advisory Group Meeting #7

MAY 16, 2024

MICROSOFT TEAMS/TELECONFERENCE



In the Community to Serve®



Targeted TAG #7 – TAG Meeting

Date & time: 05/17/2024, 9:00 AM to 10:00 AM

Location: Microsoft Teams Meeting

Presenters: Kathleen Campbell, Brian Robertson

In attendance: Abbie Krebsbach, Abe Abdallah, Bailey Steeves, Brian Robertson, Bruce Folsom, Byron Harmon, Caleb Reimer, Carolyn Stone, Corey Dahl, Daniel Kizer, Debra Campbell, Eric Shierman, Gabe Forrester, Jennifer De Boer, Jodie Albert, Kathleen Campbell, Matthew Doyle, Michael Freels, Michael Meyers, Michael Parvinen, Patrick Darras, Quinn Weber, Russ Nishikawa, Scott Madison, Tamy Linver, Tom Pardee, Travis Hey, Will Gehrke, Zachary Sowards

Presentation #1 – Safety Moment

- Brian Robertson gave a quick safety presentation on staying safe in warm weather.

Presentation #2 – Distribution System Modeling

- Kathleen Campbell, a senior engineer in the engineering service group at Cascade Natural Gas, provided a detailed presentation on distribution system planning. She explained the key aspects of the process, including system dynamics, the use of the Synergi Gas modeling tool, and demand forecasting. Campbell highlighted the importance of accurate data collection and model validation, which is done every three years, to ensure reliability. She also discussed the methodology for developing peak day models to predict demand under extreme weather conditions and noted that the company is now incorporating renewable natural gas (RNG) into its system with new sites in Richland, WA. RNG modeling is initially conservative due to reliability concerns but may be adjusted based on future performance. Campbell emphasized the diverse range of piping and facilities within Cascade Gas's distribution system and the significant efforts invested in maintaining accurate models for effective planning and operation.

Question: Byron Harmon from UTC asked if Cascade has looked at other possible historical analogs, such as heating oil, to gain insights into future trends.

Answer: Brian Robertson acknowledged that while some preliminary research has been done, a thorough investigation into heating oil analogs has not yet been completed. He plans to look into it further.

Question: Byron inquired about the investigation of hydrogen embrittlement with polyethylene pipes.

Answer: Kathleen responded that no thorough evaluation has been conducted yet. The assessment would depend on the specific system into which hydrogen is introduced, and although polyethylene generally hasn't shown issues, each case would need individual evaluation.

Question: Byron asked if any assessment has been made about increasing line pressure to maintain product quality with hydrogen blended fuel.

Answer: Kathleen explained that while some high-level discussions have occurred, the need for increased pressure or larger lines would depend on system dynamics. Each system would need evaluation to determine feasibility.

Question: Byron queried about scenario planning for collateral costs of introducing hydrogen into the system.

Answer: Kathleen noted that specific hydrogen projects are not currently in progress, but the concept would involve creating a hydrogen hub with multiple businesses committing to it. No such opportunities have arisen in their territory yet.

Question: Byron asked if Cascade is considering hydrogen as a parallel system or blending it into the existing system.

Answer: Kathleen clarified that hydrogen could be blended into the existing system, depending on system evaluation and supportability.

Question: Byron asked about the resolution of Cascade's customer data.

Answer: Kathleen confirmed that the data is detailed down to each household or customer's meter.

Question: Byron asked about Cascade's peak day standard.

Answer: Kathleen stated that the peak day standard is based on the coldest average daily temperature over the last 30 years.

Question: Byron asked if the peak day design methodology aligns with the IRP portfolio design.

Answer: Kathleen explained that the peak degree day models are used along with growth projections to forecast for the IRP, ensuring alignment with portfolio design.

Question: Byron inquired about changes in Cascade's 5-year growth prediction since the previous IRP.

Answer: Brian mentioned that the predictions include different scenarios, such as negative growth due to building codes and potential increases if customer counts rise.

Question: Byron asked if the growth predictions are based on historical data.

Answer: Brian confirmed that while historical data is used, the predictions also consider forward-looking factors like regulations and future trends.

Question: Will from UTC asked if Cascade has any bare steel or coal tar wrapped pipes in the system.

Answer: Kathleen responded that there is no bare steel, but some pre-Cascade cold tar wrapped pipes remain, with ongoing replacement projects.

Question: Byron asked about modeling renewable natural gas (RNG).

Answer: Kathleen explained that RNG is currently modeled conservatively due to initial reliability concerns, but this approach may be adjusted based on future performance.

Presentation #3 – Identification of System Deficits/Constraints

- Kathleen continued her presentation by explaining the process of identifying capacity deficits and constraints within the distribution system. She described capacity deficits as critical points where the system has reached its limiting capacity, which could include pipeline bottlenecks, minimum pressure issues, or physical component limitations such as compressors and regulators. Kathleen provided an example to illustrate how pressure deficits could affect the system's ability to deliver gas. She also discussed the importance of growth modeling in predicting capacity deficits,

explaining how five-year growth predictions are added to design day models to assess when and where deficits might occur. The discussion included the challenges of no growth or negative growth in certain areas and the iterative process of adjusting growth models to ensure reliable service during peak demand events. The session concluded with an emphasis on regular system reviews and the integration of reinforcement and enhancement options into the capital budget to address predicted deficits.

Question: Byron asked about converting some lengths of pipe over to telecommunications infrastructure.

Answer: Brian answered that this idea has been discussed within the gas supply group to understand stranded assets better, but there is no immediate experience or plan to implement it quickly.

Question: Byron asked if Synergi analysis can evaluate scenarios like system pruning to minimize fixed costs in deep growth scenarios.

Answer: Kathleen answered that engineers use Synergi for various assessments, including taking pipes out of service or abandoning them for relocations, and it could potentially evaluate system pruning scenarios.

Question: Byron expressed interest in understanding the capabilities of Synergi analysis for deep growth or negative growth scenarios.

Answer: Kathleen explained that Synergi is used to assess system modifications, such as eliminating loops or temporary service interruptions, and is a valuable tool for planning and operational decisions.

Question: Byron noted the unfamiliar territory of negative growth scenarios and looked forward to seeing the analysis Cascade's team could provide.

Answer: Kathleen appreciated the interest and explained the iterative process of growth modeling, predicting deficit timing, and ensuring reliable service during peak demand events. She emphasized the importance of regular system reviews and timely reinforcements.

Presentation #4 – Distribution Enhancement/Reinforcement Options to Address Deficits

- Kathleen continued her presentation by discussing the various options and processes involved in addressing capacity deficits in the distribution system. She explained that solutions might include reinforcements, replacements, loops, backfeeds, pressure increases, or facility upgrades. Kathleen highlighted the importance of considering the practical constructability of proposed solutions, using a theoretical example to illustrate how engineers might choose the best option based on both model simulations and real-world feasibility. She emphasized the need to avoid overbuilding and to select the least costly alternative that meets design goals. Kathleen then described the criteria used in alternative analysis, such as scope, cost, capacity increase, timing, system benefits, long-term planning, and environmental impacts. She also touched on the importance of weighing the pros and cons of each enhancement option.

Presentation #5 – Enhancement Review and Selection Process to Capital Budget

- Kathleen explained how projects get into Cascade's capital budget through a detailed process involving alternative analysis and collaborative decision-making. The goal is to select the shortest, lowest-cost pipeline segments with favorable construction conditions and minimal environmental impact. Equity considerations are also factored in, such as the impact on communities regardless of demographics, ensuring adherence to permitting requirements and addressing noise and sound concerns. Long-term planning and new opportunities for customer service are also considered. Construction costs, city developments, and new housing or

commercial areas are integrated into the growth modeling process. Information from district engineers and city developments is combined to identify system limitations. Projects are then collaboratively selected and ranked by engineers, managers, and directors based on benefits, feasibility, cost, and timing. This process is iterative, allowing adjustments based on new information. The initial budget round occurs in June, with the final budget typically finalized by the end of November. The IRP process involves ongoing steps of growth modeling, alternative evaluation, and budget adjustments as needed.

Question: Byron asked if Cascade has started looking at developing equity enhancement considerations, such as the demographics of impacted communities, property owners, and environmental impacts on historically marginalized communities.

Answer: Kathleen answered that while equity considerations have been discussed, more discussions and strategies are needed to fully address this aspect. Brian added that they would follow up on the progress made in terms of equity in distribution system planning.

Presentation #6 – Feedback for Cascade?

Question: Abe from Oregon Public Utility Commission asked if the five-year process is sufficient for alternatives and if Cascade keeps things on the radar for longer periods. He also asked about the possibility of curtailing load during peak times, particularly for industrial customers, to reduce demand instead of increasing infrastructure.

Answer: Kathleen answered that while they have discussed extending the process to ten years, it is challenging due to regulations and predicting growth even within five years. A ten-year model would require more time and resources. She acknowledged that longer-term planning could help identify alternative solutions earlier. Kathleen also mentioned that curtailment is included in their planning and contracts, especially for interruptible customers in Oregon, and that they have processes in place to monitor and enforce curtailment.

Question: Byron asked about the potential path dependency issues if planning doesn't extend far enough into the future, particularly concerning system updates needed for hydrogen integration and the increasing costs on customers due to regulations like the CCA in Washington.

Answer: Kathleen answered that while some systems might be favorable for hydrogen integration, the challenge lies in projecting long-term impacts due to regulatory and cost uncertainties. She recognized the importance of planning for potential systemic instabilities and suggested that even rudimentary long-term simulations could help mitigate undesirable outcomes for both the company and customers.

Question: Abe asked about the success rate of curtailing interruptible customers and whether it is part of the contract agreement. He also inquired about penalties for customers who do not comply with curtailment requests.

Answer: Kathleen explained that curtailment is enforced through contract terms, and there are penalties for non-compliance. They have systems in place to monitor and ensure compliance, including the ability to shut off meters if necessary. She emphasized that curtailment is a mandatory aspect of their contracts with interruptible customers in Oregon.

Question: Abe expressed concern about relying on solutions like curtailment and asked if there are more firm measures that can be planned and relied upon rather than case-by-case enforcement.

Answer: Kathleen responded that while curtailment is mandatory and enforced through contracts, they also have physical measures in place to ensure compliance if customers do not voluntarily curtail. These measures include sending service personnel to close valves if needed.

Presentation #7 – 2025 WA IRP Schedule

- Brian reminded attendees about the final targeted TAG meeting scheduled in two weeks, where they will discuss resource integration. He mentioned that they are still determining how to handle electrification and whether an extension for the IRP will be necessary. He promised to provide updated options for the remaining IRP schedule at the next meeting. Brian shared the contact information for the IRP team and encouraged attendees to reach out with any questions or concerns. He concluded by confirming the date of the next meeting on Thursday, May 30th.

The Meeting was Adjourned

Per Cascade Commitment #8 (Stakeholder Engagement Design Document, 2/22,2022: “Provide TAG minutes that include the action items from bullet #7 as well as any upcoming deadlines for feedback on the IRP”), here are additional action items to track, coming out of the TAG 6 meeting:

1. Cascade will provide more information on equity impacts to distribution planning in the future.



In the Community to Serve®

Washington Integrated Resource Plan Targeted Technical Advisory Group Meeting #8

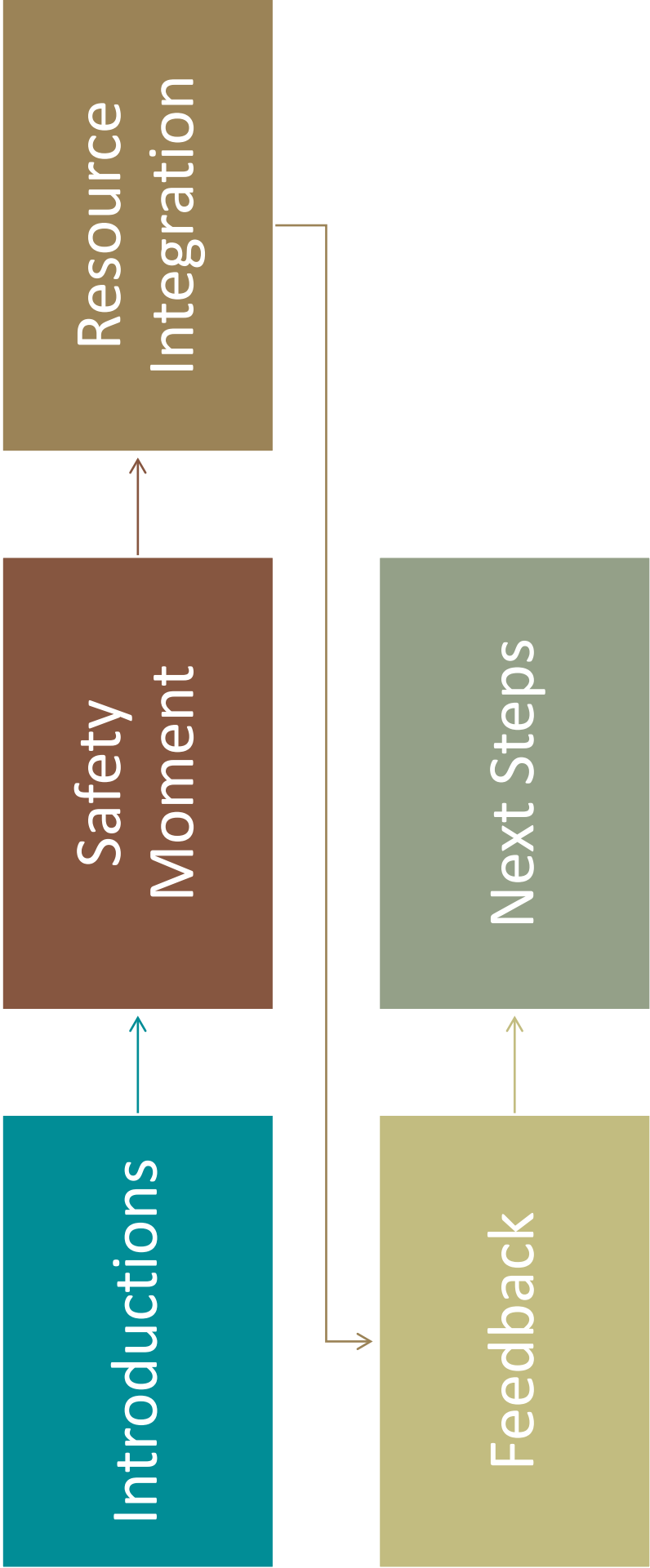
MAY 30, 2024

MICROSOFT TEAMS/TELECONFERENCE



In the Community to Serve®

Agenda



Safety Moment



Image by: [Skitterphoto at pixabay.com](https://www.pixabay.com/)

Be Prepared to Respond – Without Your Smartphone

Commit important numbers to memory

- ✓ Work
- ✓ Personal
- ✓ Local Emergency Providers

Create a card/list of numbers and keep in your wallet

- ✓ Include health related information if applicable
- ✓ Place a copy inside phone case

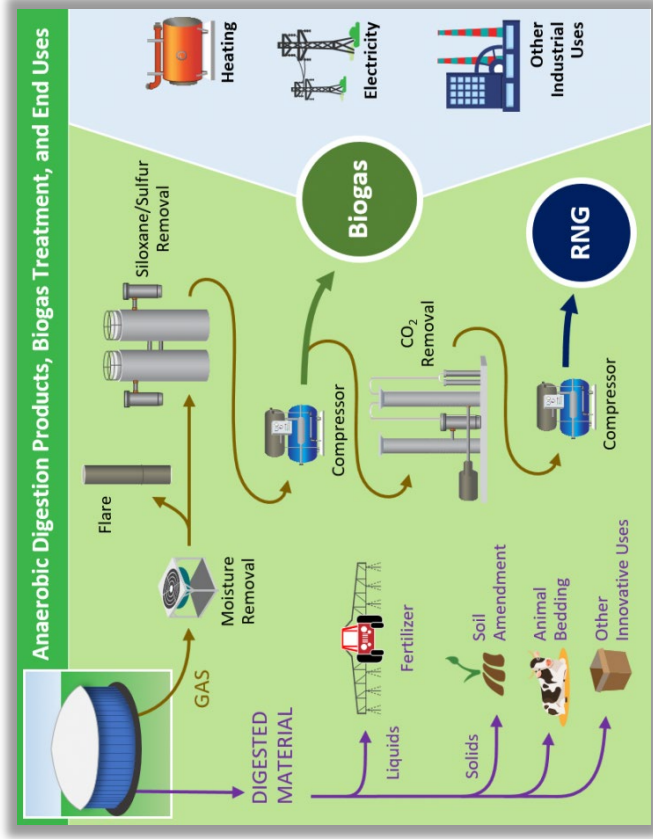
Create Emergency Contact List for a locked phone

Low Carbon Alternative Fuels

Renewable Natural Gas

Examples:

- Biogas from Landfills
 - Collect waste from residential, industrial, and commercial entities.
 - Digestion process takes place in the ground, rather than in a digester.
- Biogas from Livestock Operations
 - Collects animal manure and delivers to anaerobic digester.
- Biogas from Wastewater Treatment
 - Produced during digestion of solids that are removed during the wastewater treatment process.
- Other sources include organic waste from food manufacturers and wholesalers, supermarkets, restaurants, hospitals, and more.¹



¹ U.S. Department of Energy, Alternative Fuels Data Center, Renewable Natural Gas

Benefits

Fuel diversity benefits – Use of RNG increases and diversifies domestic energy production. RNG can be used as a baseload fuel source with high availability rates. It leverages existing infrastructure such as pipelines and heavy-duty vehicles. Biogas feedstocks for RNG are generated continuously from a variety of sources.

Economic benefits – The development of RNG projects can benefit the local economy through the construction of RNG processing and fueling station infrastructure and sale of natural gas-powered vehicles. National, state and local incentives may be available depending on the end use, such as credits for production of RNG used for vehicle fuel. These financial incentives can provide additional economic drivers for project development.

Benefits

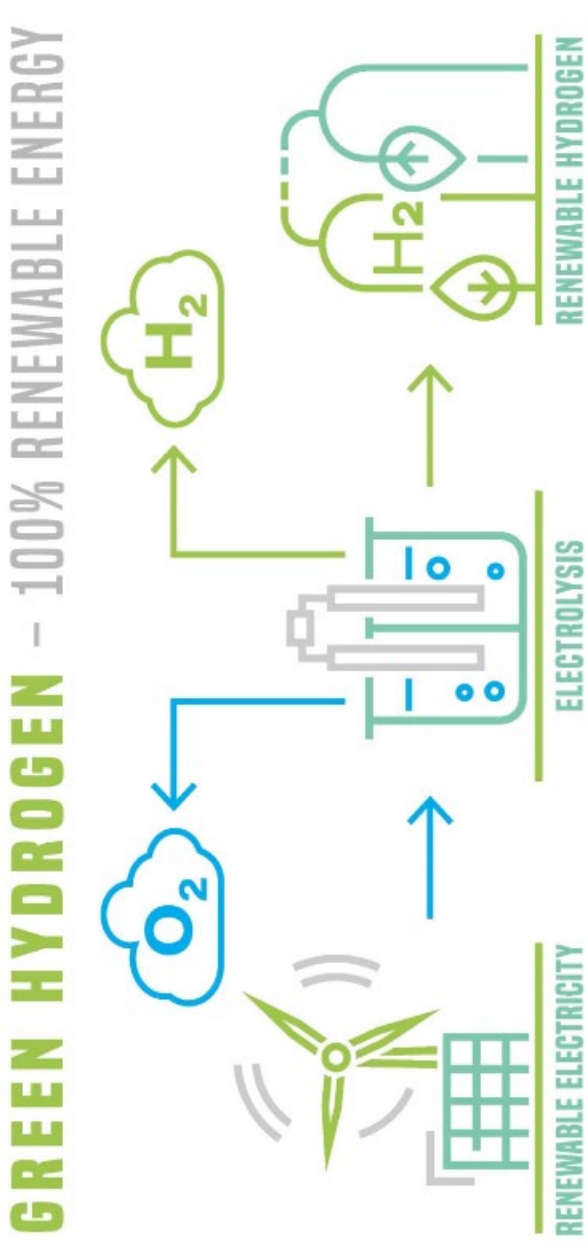
Local air quality benefits – Replacing traditional diesel or gasoline with RNG can significantly reduce emissions of nitrogen oxides and particulate matter, resulting in local air quality benefits. RNG is comprised primarily of methane; compared to fossil natural gas, RNG contains zero to very low levels of constituents, such as ethane, propane, butane, pentane or other trace hydrocarbons.

Greenhouse gas emission reductions – RNG projects capture and recover methane produced at a landfill or anaerobic digestion (AD) facility. Methane has a global warming potential more than 25 times greater than CO₂ and a relatively short (12-year) atmospheric life, so reducing these emissions can achieve near-term beneficial impacts in mitigating global climate change. For facilities that are not already required to mitigate such emissions, an RNG project can reduce methane emissions significantly.

Hydrogen

Examples:

- Blue
 - Steam methane reforming with carbon sequestration
- Turquoise
 - Reforming methane into hydrogen gas and a solid carbon byproduct
- Green
 - Utilizing electrolysis from renewables to split the molecule into hydrogen and oxygen
- Pink
 - Similar to green, but utilizes electricity from nuclear power
- Gold
 - Microbe conversion of residual hydrocarbons from depleted, abandoned oil wells



Photo/Innovation News Network

¹ U.S. Department of Energy, Alternative Fuels Data Center, Renewable Natural Gas

Synthetic Methane

Green and pink hydrogen made through electrolysis can be combined with waste CO₂ to produce synthetic methane using chemical or biological processes. This process known as methanation entails incremental cost to the production of green and pink hydrogen.

Carbon Capture

Carbon Capture and storage is a process in which a relatively pure stream of carbon dioxide from industrial sources is separated, treated and transported to a long-term storage location.

Cascade is looking at Carbon Capture for all customers.

Carbon Capture is not currently eligible for Oregon or Washington compliance programs, these projects could provide a way to offset carbon.

Renewable Thermal Certificate

A Renewable Thermal Credit (RTC) is a market-based instrument designed to incentivize the use of renewable energy sources for heating and cooling purposes. While renewable energy credits (RECs) have traditionally focused on electricity generation from renewable sources like wind or solar, RTCs specifically target the use of renewable energy for thermal applications, such as space heating, water heating, and industrial processes.

The mechanism works by assigning a certain value or credit to each unit of renewable thermal energy produced or consumed. These credits can then be traded or sold on the market, allowing entities that generate excess renewable thermal energy to sell their credits to those who need them to meet regulatory requirements or sustainability goals.

RTC programs vary by region and may be implemented at the state or regional level, often as part of broader renewable energy or greenhouse gas reduction initiatives. By creating a market for renewable thermal energy, RTCs help drive investment in renewable heating and cooling technologies, reduce greenhouse gas emissions, and promote the transition to a more sustainable energy system.

Resource Information

- Reference Case
 - Levelized Costs
 - Technical Potential
 - Resource Life
 - Carbon Intensity
- Monte Carlo Simulations
 - Levelized Costs
 - Technical Potential
 - Resource Life and Carbon Intensity will be held constant
 - Correlation shocks across time and fuel resources where appropriate

Electrification

Electrification

How should electrification be modeled?

Cascade's preference is to model electrification as an alternative resource that is modeled in Plexos. Cascade is still in the process of gathering data.

Information needed:

- Technical potential -- leverage equipment burn out as point of transition (uniform distribution)
- Electricity cost by area
- Electrification data such as gas to electric conversion rates and efficiencies
- Others?

Scenario modeling

- Expected
- Low

Plexos Optimization Modeling

Plexos Model

Cascade utilizes Plexos for resource optimization.

This model permits the Company to develop and analyze a variety of resource portfolios to help determine the type, size, and timing of resources best matched to forecast requirements.

Plexos is very powerful and complex. It operates by combining a series of existing and potential demand side and supply side resources and optimizes their utilization at the lowest net present cost over the entire planning period for a given demand forecast and emissions constraints.

Plexos is a unified energy modeling and forecasting software platform. Its powerful simulation engine analyzes zonal and nodal energy models ranging from long-term investment planning to medium-term operational planning and down to short-term, hourly, and intra-hourly market simulations.¹

It is important to recognize that Plexos provides helpful but not perfect information to guide decisions.

Modeling Challenges

Supply needs to get gas to the citygate.

Many of Cascade’s transport agreements were entered into decades ago, based on demand projections at that point in time.

Sum of receipt quantity and aggregated delivery quantity can help identify resource deficiency depending on how rights are allocated.

The aggregated look can mask individual citygate issues for looped sections, and the disaggregated look can create deficiencies where they don’t exist.

In many cases operational capacity is greater than contracted.

Supply, storage, and upstream transportation focuses on the core, but non-core must be included for emissions modeling.

Plexos has perfect knowledge.

Base Case Plexos Inputs

- Demand
- Supply
- Price Forecast
- Storage
- Transportation
- Constraints
- Emissions

Cascade System 6-6-2022 - IRP		Page 549
System	Simulation	
System		
Electric		
Emissions		
Gas		
Gas Fields		
Gas Pipelines		
Gas Nodes		
Gas Storages		
Gas Demands		
Gas DSM Programs		
Gas Zones		
Gas Contracts		
Universal		
Markets		
Generic		
Constraints		
Data		
Data Files		
Variables		
Scenarios		

Resource Integration

Resource Integration

Scenarios:

- Customer Growth
 - Washington State Building Code Council rules w/ flat customer growth
 - Washington State Building Code Council rules w/ 1.5% decay in building stock attrition
 - Washington State Building Code Council repealed after 2 years, return to normal growth after
- Climate Regulation
 - Climate Commitment Act/Climate Protection Plan
 - Social Cost of Carbon
- Electrification
 - Expected Costs
 - Low Costs
- Weather
 - SSP 2-4.5
 - SSP 3-7.0
- Low Carbon Alternative Fuels
 - Monte Carlo Simulations (100+ draws)

Resource Integration Cont'd

Reference Case:

- Washington State Building Code Council rules w/ flat customer growth
- Climate Commitment Act/Climate Protection Plan
- Electrification – Expected Costs
- SSP 3-7.0 Climate Model
- Low Carbon Alternative Fuels – Reference Case

Stochastic Scenario Modeling:

- Cascade plans to run the combination of growth policies, climate policies, electrification costs, climate models, and low carbon alternative fuels.
- The combination of the three growth policies, two climate policies, and two electrification costs results in twelve scenarios.
- These scenarios will be modeled under both climate models and all 100+ draws of the low carbon alternative fuels.
- This will result in 2400+ draws.

Resource Integration Cont'd

Cascade will utilize the reference case, as well as the stochastic scenario that matches the reference case, to build out the 2- to 4-year action plan. The short-term plan will have a preferred portfolio that is based on shortfalls and the risk adjusted total system cost.

For the long-term plan, Cascade will utilize the stochastic scenario modeling to provide future potential portfolios, providing results on incremental or offtake transportation, storage, total system cost, demand shortages, and overall risk to ratepayers.

For the long-term plan, Cascade will not have a preferred portfolio, but rather an understanding of potential future outcomes. However, Cascade will analyze the lowest reasonable cost options of twelve scenario combinations.

Feedback for Cascade?

Do you have comments or ideas that Cascade should consider regarding Resource Integration?

Process Item	Date	Process Element	Appendix A
2025 Targeted-IRP TAG	Thursday, January 25, 2024	What is an IRP and how to get involved in the process	Appendix A
Targeted-TAG	Thursday, February 15, 2024	Avoided Cost	
Targeted-TAG	Wednesday, March 6, 2024	Energy Efficiency	
Targeted-TAG	Thursday, March 28, 2024	Equity in the IRP	
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Receive feedback on TAG 1	Friday, June 28, 2024		
		Respond to TAG 1 Feedback, Distribution System Planning, Alternative Resources, Price Forecast, Avoided Costs, Current Supply Resources, Transport Issues, Carbon Impacts, Energy Efficiency, Bio-Natural Gas, Preliminary Resource Integration Results.	
TAG 2	Thursday, July 25, 2024		
Receive feedback on TAG 2	Friday, August 9, 2024		
First Draft	Friday, September 6, 2024		
Comments Due	Friday, October 4, 2024		
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TAG 3	Wednesday, October 30, 2024		
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Comments Due	Tuesday, January 14, 2025		
TAG 4 (if needed)	Thursday, January 30, 2025		
Final Complete By	Friday, February 14, 2025		
File	Monday, February 24, 2025		

2025 WA IRP Schedule

Proposed Updated 2025 WA IRP Schedule

Process Item	Date	Process Element
TAG 1	Thursday, September 12, 2024	Process, Key Points, IRP Team, Timeline, Regional Market Outlook, Avoided Costs, Planned Scenarios and Sensitivities, Stakeholder Engagement, Demand and Customer Forecast and Non-Core Outlook, Drilling down into segments of demand forecast. Upstream Pipeline presentation.
Receive feedback on TAG 1	Friday, September 27, 2024	
TAG 2	Thursday, October 24, 2024	Respond to TAG 1 Feedback, Alternative Resources, Price Forecast, Current Supply Resources, Transport Issues, Carbon Impacts, Energy Efficiency, Bio-Natural Gas, Preliminary Resource Integration Results.
Receive feedback on TAG 2	Friday, November 8, 2024	
First Draft	Friday, December 6, 2024	
Comments Due	Friday, January 10, 2025	
TAG 3	Wednesday, February 5, 2025	Respond to TAG 2 feedback, Distribution System Planning, Final Integration Results, finalization of plan components, Proposed new 2- to 4-year Action Plan
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Comments Due	Tuesday, April 15, 2025	
TAG 4 (if needed)	Thursday, May 1, 2025	
Final Complete By	Friday, May 16, 2025	
File	Friday, May 23, 2025	



Questions/Next Steps

Contact us at
irp@cngc.com





In the Community to Serve®

Washington Integrated Resource Plan Targeted Technical Advisory Group Meeting #8

MAY 30, 2024

MICROSOFT TEAMS/TELECONFERENCE



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Targeted TAG #8 –TAG Meeting

Date & time: 05/30/2024, 9:00 AM to 10:00 AM

Location: Microsoft Teams Meeting

Presenters: Jenny De Boer, Brian Robertson

In attendance: Abbie Krebsbach, Abe Abdallah, Alessandra de la Torre, Bailey Steeves, Becky Hodges, Brian Robertson, Bruce Folsom, Byron Harmon, Caleb Reimer, Carolyn Stone, Devin McGreal, Eric Shierman, Eric Wood, Gabe Forrester, Jennifer De Boer, Jodie Albert, Kathleen Campbell, Kim Herb, Lori Blattner, Matthew Doyle, Michael Freels, Michael Meyers, Michael Parvinen, Noemi Ortiz, Quinn Weber, Rachel Preece, Tom Pardee, Will Gehrke, Zachary Sowards

Presentation #1 – Safety Moment

- Jenny De Boer gave a quick safety presentation on alternative ways to keep important contact information in the case you have lost or broken your cell phone.

Presentation #2 – Low Carbon Alternative Fuels

- Jenny provided an in-depth overview of various low-carbon alternative fuels, including renewable natural gas (RNG), hydrogen (green and pink), carbon capture, and renewable thermal certificates (RTCs). She delved into the production processes, highlighting RNG's derivation from biogas sourced from landfills, livestock operations, wastewater treatment, and organic waste. Jennifer explained the refinement process for RNG and its economic and environmental benefits, such as fuel diversity and reduced emissions. Additionally, she discussed the challenges and opportunities associated with hydrogen production, carbon capture, and RTCs, emphasizing their potential contributions to Cascade's sustainability goals. Jenny concluded by outlining the incorporation of these fuels into Cascade's modeling process, including third-party consultations and Monte Carlo simulations to assess their feasibility and impact on operations and compliance.

Question: Will Gehrke asked if RTCs will be eligible for CCA compliance in Washington.

Answer: Brian confirmed that RTCs are indeed eligible for CCA compliance in Washington, based on his understanding of the final rulemaking.

Question: Byron Harmon from the Washington UTC asked about the availability of RNG, considering past discussions on its scarcity and uncertainty.

Answer: Devin explained that while there may have been past uncertainties, currently, they haven't faced difficulties in procuring RNG projects. However, this statement is more qualitative than quantitative, and future studies will provide more clarity on this matter.

Question: Quinn Webber from the Washington Utilities and Transportation Commission inquired about the development of RNG for vehicle fuel.

Answer: Brian clarified that while there's theoretical potential for RNG use in vehicle fueling stations, Cascade Natural Gas isn't actively pursuing this option due to associated risks. However, it's an avenue that could be explored in the future.

Question: Byron asked whether customers signing up for the voluntary RNG program would expect local air quality benefits.

Answer: Jenny explained that while RNG contributes to societal benefits like improved air quality, it's challenging to trace specific molecules to individual customers due to the nature of the gas distribution system.

Question: Byron inquired about equity analysis regarding RNG contracting and whether Cascade has conducted such analysis.

Answer: Noemi Ortiz responded that they are working on incorporating equity analysis into their cost-benefit analysis to ensure fair distribution among minority, women-owned, and small businesses.

Presentation #3 – Electrification

- Brian discussed Cascade's approach to modeling electrification and how they plan to incorporate it into their resource planning. Unlike previous IRPs, where electrification was simply modeled to occur at a certain rate, Cascade aims to gather more data on the costs associated with electrification and model it as an alternative resource. Brian outlined factors to consider, such as technical potential, customer decision-making, and electricity costs by area. He also mentioned ongoing efforts to gather information from electric utilities in their service territory.

Question: Will Gehrke suggested working directly with PSE for information on electrification due to legislative changes.

Answer: Brian acknowledged the suggestion and emphasized his intent to coordinate with PSE, despite their current busyness. He expressed gratitude for the feedback and reiterated his willingness to work with PSE on the matter.

Question: Will also recommended considering dual-fuel heat pump scenarios for customers.

Answer: Brian appreciated the suggestion and expressed interest in exploring dual-fuel heat pump scenarios as part of their electrification modeling. He noted that gathering results on such scenarios would be valuable for their planning efforts.

Question: Will proposed a more granular approach to electricity costs, considering variations across Cascade's service territory.

Answer: Brian acknowledged the importance of granular electricity cost data and agreed that it would be beneficial for their modeling. He recognized the need to account for variations in electricity costs across different regions served by Cascade.

Question: Byron requested more information on how the Plexos optimization model will make decisions regarding electrification as a resource.

Answer: Brian suggested deferring the explanation of the Plexos optimization model's decision-making logic until the resource integration segment of the discussion, indicating that he would provide more details at that time.

Presentation #4 – Plexos Optimization Modeling

- Brian provided an overview of Cascade's resource optimization model, Plexos, which integrates various factors such as load forecasts, demand side management (DSM), traditional and alternative fuels, transportation contracts, and storage contracts. Plexos aims to develop and

analyze resource portfolios to determine the most suitable resources in terms of type, size, and timing, considering factors like carbon compliance goals. Brian emphasized Plexos's complexity and power, capable of conducting long-term investments as well as short-term operational planning and market simulations. He highlighted the importance of evaluating transportation and storage contracts periodically to ensure alignment with current customer needs and usage. Quinn Weber from the UTC raised questions about fuel loss in transportation and the renegotiation periods of transportation agreements, to which Brian clarified the incorporation of fuel loss in contracts and discussed the lack of renegotiation periods but mentioned opportunities for capacity release. Carolyn Stone added insights into the types of transportation contracts, including Evergreen contracts and those with expiration dates subject to renegotiation. Brian concluded by inviting further inquiries about Plexos and expressing readiness to delve deeper into its workings during subsequent meetings.

Question: Quinn Weber from the UTC asked about Plexos's modeling of fuel loss in transportation.

Answer: Brian explained that fuel loss is incorporated into transportation contracts within Plexos, requiring the purchase of additional gas to compensate for the loss during transportation. He clarified that not all contracts include fuel loss provisions, but those that do are accounted for in the modeling.

Question: Quinn also inquired about the renegotiation periods of transportation agreements and whether they are fixed or flexible.

Answer: Brian indicated that transportation agreements typically do not have renegotiation periods and are generally fixed. However, he mentioned opportunities for capacity release or offloading contracts to others, although some contracts may be subject to renegotiation before expiration.

Question: Carolyn Stone added insights into the nature of transportation contracts, mentioning Evergreen contracts and those with expiration dates subject to renegotiation.

Answer: Brian thanked Carolyn for her input and acknowledged the existence of different types of transportation contracts, including Evergreen contracts that renew automatically and others with expiration dates requiring renegotiation before renewal.

Presentation #5 – Resource Integration

- Brian Robertson provided an overview of Cascade's approach to resource integration in the Integrated Resource Plan (IRP). He emphasized the challenge of modeling an infinite number of possible future outcomes and highlighted the need to identify the most likely and extreme scenarios. The focus was on creating reasonable high, medium, and low growth scenarios:
 - Customer Growth Scenarios:
 - Flat Growth: Considering minimal building stock attrition and increased renovation over demolition.
 - 1.5% Decay in Building Stock Attrition: Capturing various consumer behaviors impacting growth rates.
 - Repealed Washington State Building Codes: Assuming customers might return to using natural gas appliances if the codes are repealed.
 - Climate Regulation Scenarios:
 - Climate Commitment Act and Climate Protection Plan: Modeling these policies based on the current understanding.
 - Social Cost of Carbon: Considering this scenario if the aforementioned policies are overturned.
 - Electrification Costs:
 - Expected Costs and Low Costs: Depending on available information.
 - Low Carbon Alternative Fuels:

- Monte Carlo Simulations: Evaluating various fuels with multiple draws to capture different possible futures.

Brian also discussed the use of the PLEXOS optimization model to develop and analyze resource portfolios, ensuring supply meets demand while considering carbon compliance goals. He emphasized the importance of accurately modeling all transportation and storage contracts to ensure operational feasibility.

Question: Byron asked about the feasibility of maintaining statistical significance while reducing the number of draws in the modeling process.

Answer: Brian confirmed the bottleneck and mentioned plans to test for optimal draw numbers while considering the balance between scenario breadth and computational feasibility. He also noted opportunities to use core hours more efficiently to run more scenarios.

Question: Byron inquired about the methodology change in the building stock attrition rate from 2% to 1.5%. How did Brian clarify this?

Answer: Brian explained that the 2% was not strictly a building stock attrition rate but related to new building identification in the AEG model. He emphasized ongoing efforts to get more accurate data on customer retirements and building stock attrition.

Question: Byron asked if Cascade would model a plausible worst-case scenario where multiple negative factors occur simultaneously.

Answer: Brian agreed on the importance of considering such scenarios but noted the challenge of modeling without reliable data from the electric side. He emphasized the iterative nature of IRPs, with regular updates to incorporate new data and insights.

Question: Kim from PUC raised concerns about not having a preferred portfolio and the difficulty for Commission staff to understand long-term investment plans.

Answer: Brian explained the intent to understand various risks and potential outcomes rather than creating a singular future policy. He acknowledged the need for flexibility and responsiveness in planning and expressed openness to further discussions on this approach.

Question: Byron asked about the number of draws and statistical significance.

Answer: Brian confirmed that they are testing the optimal number of draws to maintain statistical significance. He mentioned the potential to use core hours more efficiently to run more scenarios.

Question: Byron raised the issue of the building stock attrition rate and its significant impact over time and asked how Brian addresses that issue.

Answer: Brian clarified that the current 1.5% rate is based on ongoing analysis and efforts to obtain more accurate data. He emphasized the importance of iterative IRPs to update and refine plans continuously.

Question: Byron discussed the implications of various growth and decline scenarios on the gas and electric sides and asked for Brian's response.

Answer: Brian acknowledged the need to consider the electric side's costs and the impact of customer flight on both gas and electric systems. He emphasized the importance of running scenarios every two years to update and refine planning based on the latest data and insights.

Presentation #6 – Feedback for Cascade?

Question: Alessandra de la Torre from Northwest Energy Coalition asked about Cascade's consideration of water usage in its resource plan, especially regarding water-intensive alternative fuels.

Answer: Brian acknowledged the importance of water usage in resource planning. He mentioned that while he didn't have specific answers at the moment, Cascade will be considering water volume and costs, particularly in relation to hydrogen production. He committed to further exploring the impacts of water usage in various energy systems and promised to provide more detailed information later.

Presentation #7 – 2025 WA IRP Schedule

- Brian Robertson discussed the proposed new plan for Cascade's Integrated Resource Plan (IRP). He emphasized the need for more time to gather information from electric companies, research building stock attrition rates, and address equity considerations before finalizing any numbers. The proposed extension would push back the first meeting to September 12th, with subsequent meetings and milestones. Brian sought feedback on this proposed schedule and mentioned the possibility of targeted meetings if significant breakthroughs on topics like electrification costs occur before the scheduled meetings. He reiterated the importance of incorporating feedback into the IRP and using the additional time to refine the plan.