

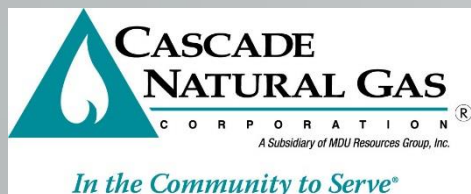
# Cascade Natural Gas Corporation

## 2018 Integrated Resource Plan Technical Advisory Group Meeting #5

September 18<sup>th</sup>, 2018

Seattle-Tacoma International Airport

Seattle, WA



# Agenda

- **Introductions**
- **Safety Moment**
- **TAG 4 Recap**
- **Summary of Alternative Resources**
- **Components and Ranking of Candidate Portfolios**
- **New Stochastic Methodology**
- **Scenario and Sensitivity Results**
- **Preliminary Two-Year Action Plan**
- **2018 IRP Remaining Schedule**
- **Questions**

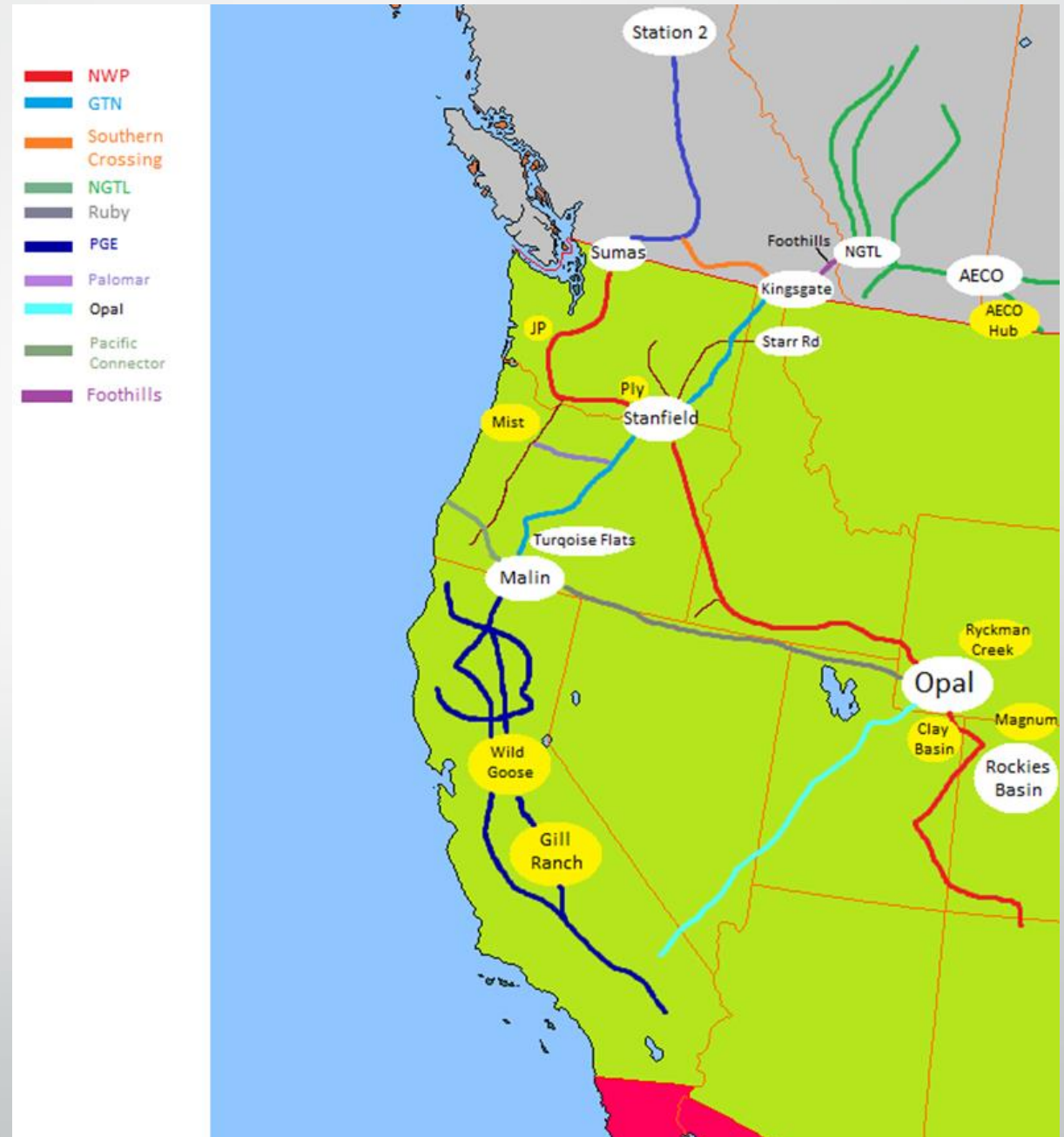
# TAG 4 Recap

- Cascade values and appreciates the feedback received from stakeholders.
- Responses to stakeholder questions were sent out with the slide deck.
- Additional questions?

# Summary of Additional Resources

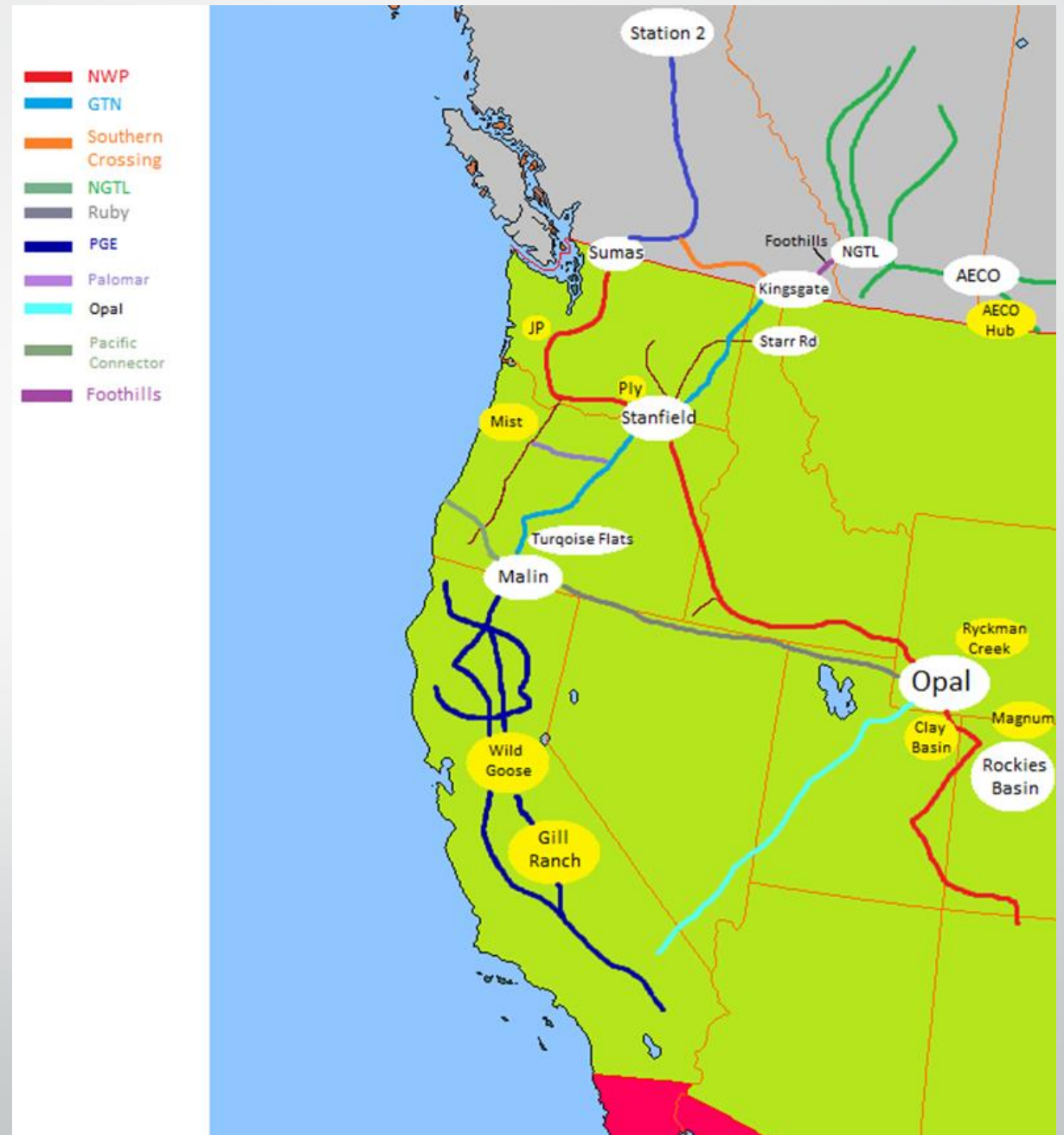
# Additional Potential Resources

- Incremental Transport – North to South
- Incremental Transport – Northwest Pipeline
- Incremental Transport – South to North
- Incremental Transport – Bilateral



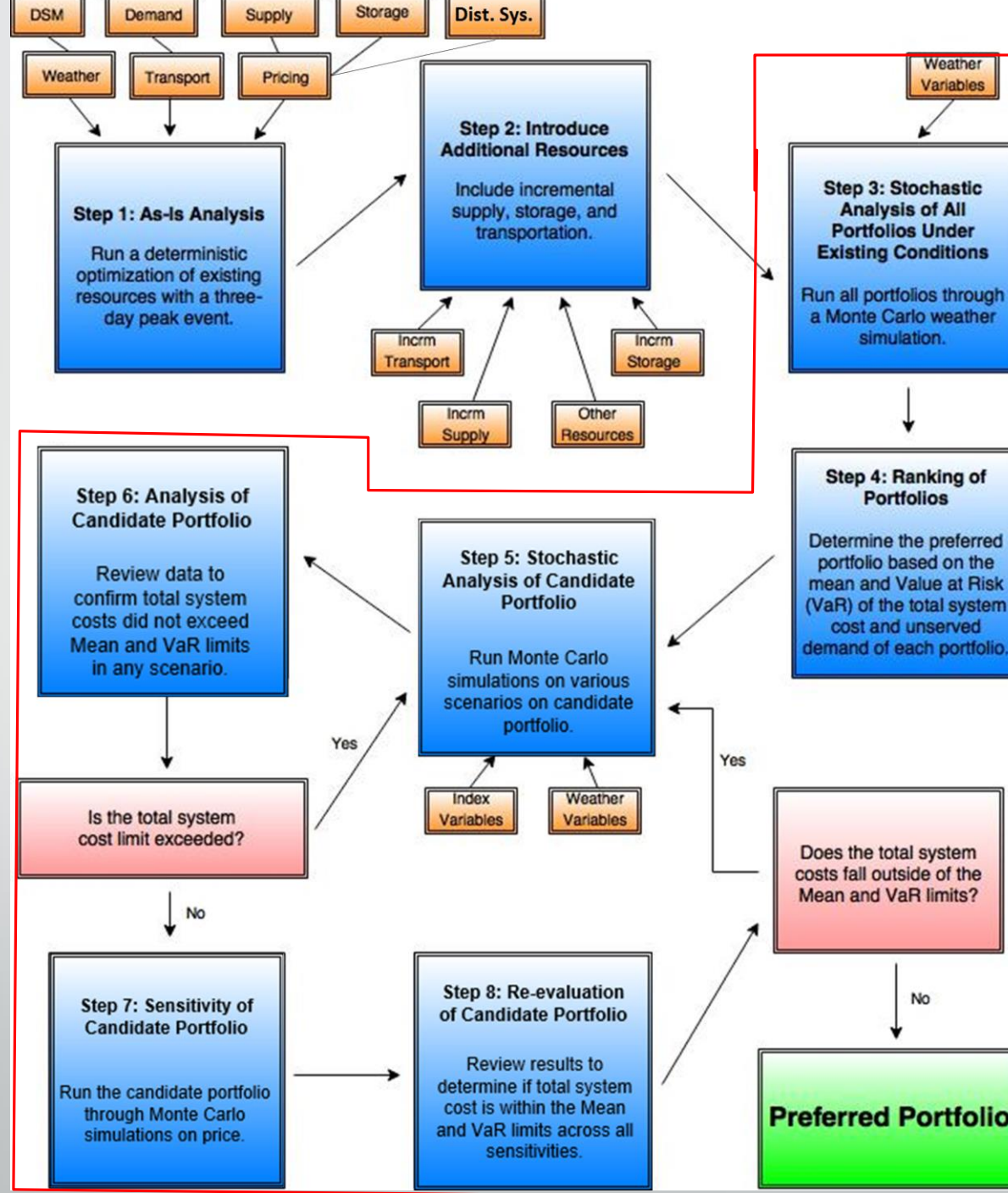
# Additional Potential Resources

- Incremental Storage - North and East
- Incremental Storage - South and West
- Renewable Natural Gas



# Components of Candidate Portfolios





Supply Resource Optimization Process Flow Chart



# Recap – As-Is Shortfalls (Dth)

Zone GTN	<b>2023</b>	<b>2024</b>	<b>2025</b>	<b>2026</b>	<b>2027</b>	<b>2028</b>	<b>2029</b>	<b>2030</b>
	577	1,478	2,934	5,150	6,640	8,136	9,624	10,327
	<b>2031</b>	<b>2032</b>	<b>2033</b>	<b>2034</b>	<b>2035</b>	<b>2036</b>	<b>2037</b>	<b>2038</b>
	11,836	14,004	15,511	17,020	18,532	19,273	21,755	23,413

# List of Candidate Portfolios

- All-In Portfolio
- GTN Only Portfolio
- GTN Plus Storage Portfolio
- NWP Only Portfolio
- NWP Plus Storage Portfolio
- Storage Only Portfolio

# All-In Portfolio

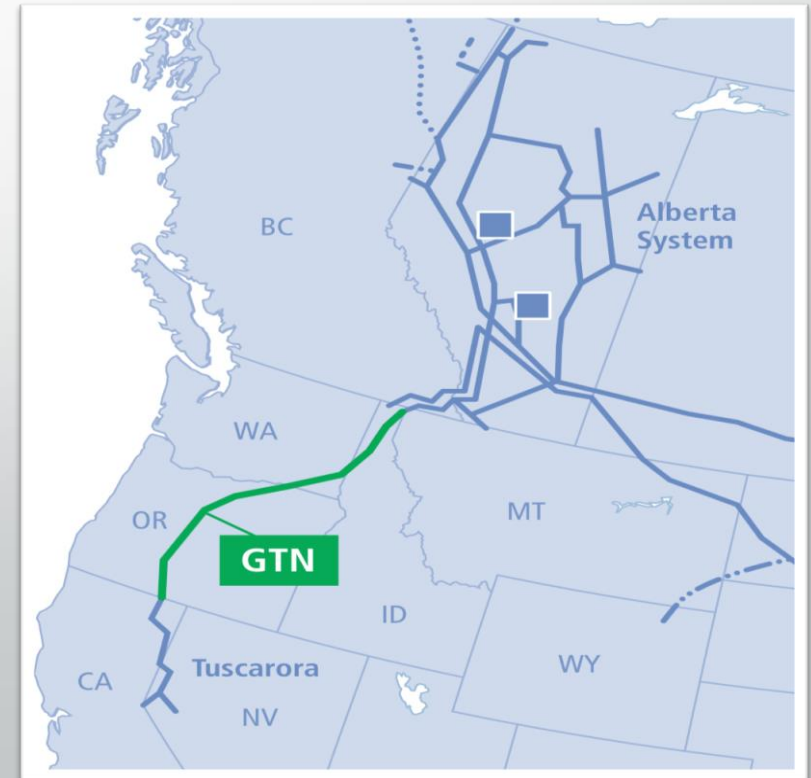
- Best deterministic mix of all alternative resources considered:
  - Incremental Transport – North to South
  - Incremental Transport – Northwest Pipeline
  - Incremental Transport – South to North
  - Incremental Transport – Bilateral
  - Incremental Storage – North and East
  - Incremental Storage – South and West

# All-In Portfolio – SENDOUT® Suggested Resource Mix

- Bremerton Shelton Realignment
- Incremental GTN Capacity From Stanfield – 8,369 Dth by 2028, 22,533 dth by 2038
- Incremental GTN Capacity From Kingsgate – 1,291 Dth by 2038
- Monitor Incremental Nova
- Spire (Formerly Ryckman Creek) Storage – 1,000 Dth in 2019

# GTN Only Portfolio

- Best deterministic mix of all potential resources available on GTN:
  - Incremental Transport – North to South
  - Incremental Transport – South to North
  - Incremental Transport – Bilateral via Southern Crossing



# GTN Only Portfolio – SENDOUT® Suggested Resource Mix

- Incremental GTN Capacity From Stanfield – 8,369 Dth by 2028, 12,115 dth by 2038
- Incremental GTN Capacity From Kingsgate – 3,380 Dth by 2038
- Incremental Nova – 11,710 Dth by 2038



# GTN Plus Storage Portfolio

- Best deterministic mix of all potential resource available on GTN plus storage:
  - Incremental Transport – North to South on GTN
  - Incremental Transport – South to North on GTN
  - Incremental Transport – Bilateral via Southern Crossing
  - Incremental Storage – North and East
  - Incremental Storage – South and West

# GTN Plus Storage Portfolio – SENDOUT® Suggested Resource Mix

- Incremental GTN Capacity From Stanfield – 8,369 Dth by 2028, 12,115 dth by 2038
- Incremental GTN Capacity From Kingsgate – 3,380 Dth by 2038
- Incremental Nova – 11,710 Dth by 2038
- Spire Storage – 1,000 Dth in 2019

# NWP Only Portfolio

- Best deterministic mix of all potential resources available on NWP:
  - Incremental Transport – North to South
  - Incremental Transport – Northwest Pipeline
  - Incremental Transport – Bilateral via Trail West

# NWP Only Portfolio – SENDOUT® Suggested Resource Mix

- Bremerton Shelton Realignment

# NWP Plus Storage Portfolio

- Best deterministic mix of all potential resources available on NWP plus Storage:
  - Incremental Transport – North to South
  - Incremental Transport – Northwest Pipeline
  - Incremental Transport – Bilateral via Trail West
  - Incremental Storage – North and East
  - Incremental Storage – South and West

# NWP Plus Storage Portfolio – SENDOUT® Suggested Resource Mix

- Bremerton Shelton Realignment
- Spire Storage – 1,000 Dth in 2019



# Storage Only Portfolio

- Best deterministic mix of all potential storage resources available:
  - Incremental Storage – North and East
  - Incremental Storage – South and West

# Storage Only Portfolio – SENDOUT®

## Suggested Resource Mix

- Spire Storage – 1,000 Dth in 2019

# Summary of – SENDOUT® Suggested Resources by Portfolio

	All-In	NWP Only	NWP + Storage	GTN	GTN + Storage	Storage Only
Incremental NGTL	Green	Red	Red	Green	Green	Red
Incremental Foothills	Yellow	Red	Red	Yellow	Yellow	Red
Incremental GTN N/S	Green	Red	Red	Green	Green	Red
I-5 Mainline Exp.	Yellow	Red	Red	Red	Red	Red
Wenatchee Lateral Exp.	Yellow	Red	Red	Red	Red	Red
Spokane Lateral Exp.	Yellow	Red	Red	Red	Red	Red
Eastern OR Mainline Exp.	Yellow	Red	Red	Red	Red	Red
Incremental Opal	Yellow	Red	Red	Yellow	Yellow	Red
Incremental GTN S/N	Yellow	Red	Red	Yellow	Yellow	Red
Incremental Ruby	Yellow	Red	Red	Yellow	Yellow	Red
T-South Southern Crossing	Yellow	Red	Red	Yellow	Yellow	Red
Trail West	Yellow	Red	Red	Yellow	Yellow	Red
Pacific Connector	Yellow	Red	Red	Yellow	Yellow	Red
Spire Storage	Green	Red	Green	Red	Green	Green
AECO Hub Storage	Yellow	Red	Yellow	Red	Yellow	Yellow
Clay Basin Storage	Yellow	Red	Yellow	Red	Yellow	Yellow
Gill Ranch Storage	Yellow	Red	Yellow	Red	Yellow	Yellow
Wild Goose Storage	Yellow	Red	Yellow	Red	Yellow	Yellow
Mist Storage	Yellow	Red	Yellow	Red	Yellow	Yellow

Legend	
Green	Selected resource for the portfolio
Yellow	Considered but not selected resource
Red	Not considered for the portfolio

# Methodology Behind Ranking of Portfolios

- New to the 2018 WA IRP, Cascade will be using deterministic results to identify the intrinsic value of a portfolio, and Value at Risk (VaR) analysis to capture the extrinsic value.
- Additionally, portfolios will be ranked primarily on their peak day unserved demand, and secondarily on their total system costs.
- Deterministic results are given 75% weight, and stochastic results 25% weight.

# Final Ranking of Portfolios

Portfolio	Deterministic		Stochastic		Risk Adjusted Results	
	Unserved Demand (MDT)	Total System Cost (\$000)	Unserved Demand (MDT)	Total System Cost (\$000)	Risk Adjusted Unserved Demand (MDT)	Risk Adjusted Total System Cost (\$000)
All Resources	-	4,812,330	-	4,875,788	-	4,828,195
GTN Only + Storage	-	4,818,349	-	4,872,369	-	4,831,854
GTN Only	-	4,820,946	-	4,875,284	-	4,834,530
NWP Only + Storage	190	4,837,394	10	4,913,766	145	4,856,487
Storage Only	190	4,837,422	10	4,913,790	145	4,856,514
NWP Only	190	4,838,756	10	4,915,119	145	4,857,847

# Top Ranked Candidate Portfolio Components

- Bremerton Shelton Realignment
- Incremental GTN Capacity From Stanfield – 8,369 Dth by 2028, 22,533 dth by 2038
- Incremental GTN Capacity From Kingsgate – 1,291 Dth by 2038
- Monitor Incremental Nova



# New Stochastic Methodology

# 2016 IRP Methodology

- In previous IRPs, Cascade used the Monte Carlo functionality within SENDOUT® to run its stochastic analyses.
- SENDOUT® has computational limitations related to the number of draws it can perform, and the time it takes to complete those draws.
- For the 2018 IRP, Cascade has enhanced its methodology to allow for a more robust Monte Carlo simulation.

# Cascade's New Methodology

- This year, Cascade will be performing a 10,000 draw Monte Carlo Simulation of weather and price using Excel and R.
- For each weather location Cascade records daily mean temperatures, standard deviations, and the largest 1 day jump to have historically occurred in that month.
- Cascade also records the correlations on a monthly level of each weather station to each other. This data is all loaded into R.

# Cascade's New Methodology

- First, Cascade runs 1 draw of its Monte Carlo simulation for its first weather location.
- The normal random seed used each day for that draw is then run through a Cholesky decomposition matrix, which uses the correlations between each location to correlate the random variables for that first draw across all weather locations.
- This process is repeated 10,000 times, with the calculated HDDs from each draw stored in a separate matrix.

# Cholesky Decomposition Matrix - January

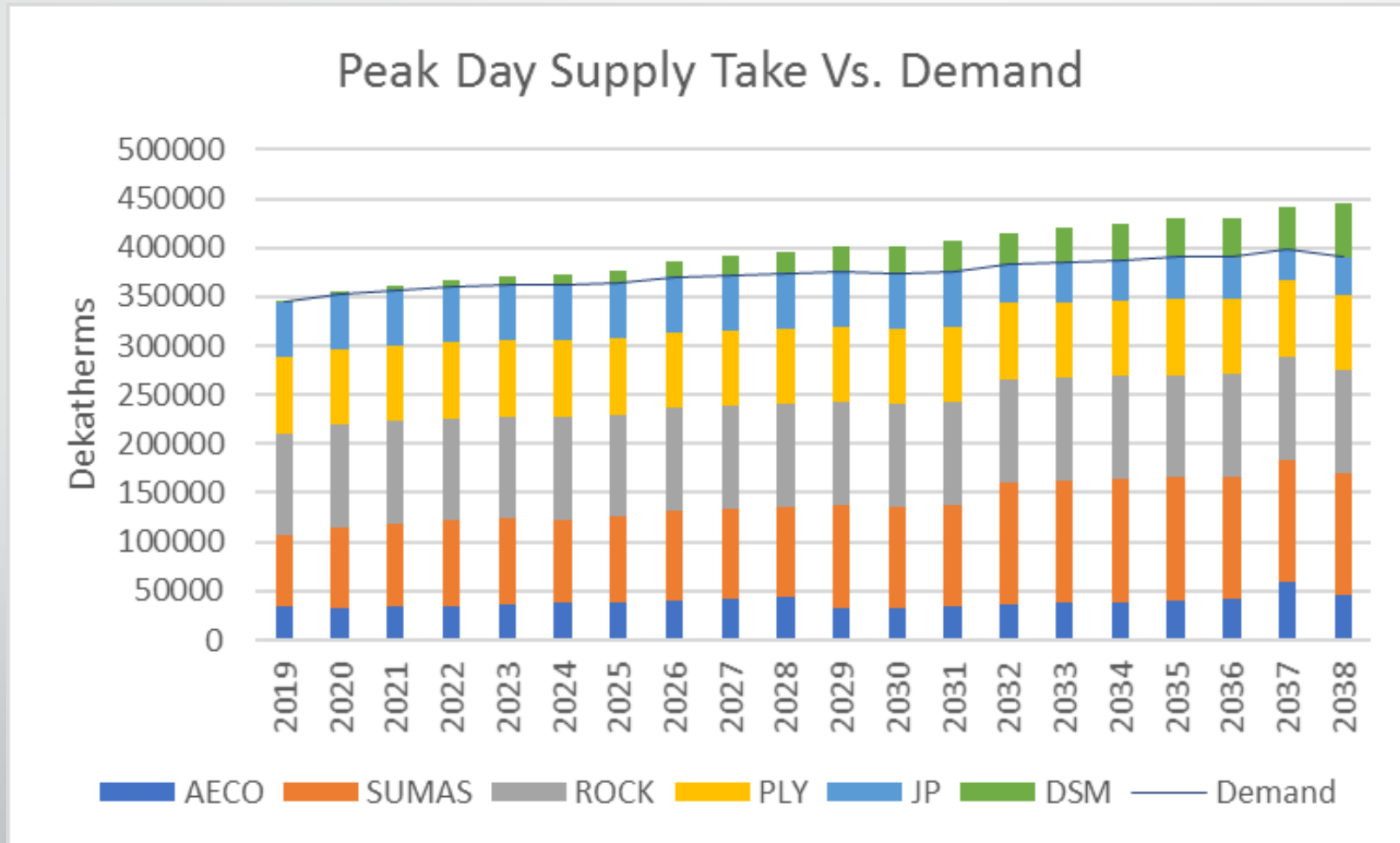
	Baker City	Bellingham	Bremerton	Pendleton	Redmond	Walla Walla	Yakima
Baker City	1						
Bellingham	0.6338301	0.7734723					
Bremerton	0.6584770	0.5837664	0.4749998				
Pendleton	0.7024465	0.3681832	0.0469737	0.6072920			
Redmond	0.7173640	0.3985243	0.1196151	0.2324631	0.5081539		
Walla Walla	0.7105065	0.3561187	0.0338146	0.5396395	0.0173972	0.2751418	
Yakima	0.6697351	0.3483110	0.0817184	0.3160165	-0.0036761	0.1685445	0.5432948

# Cascade's New Methodology

- Cascade calculates a system weighted HDD for each draw, identifying the draw that results in the 99<sup>th</sup> percentile of stochastic weather.
- The daily HDDs of each weather location in this draw are then loaded into SENDOUT<sup>®</sup>, which allows the Company to capture the costs and unserved demand of a given portfolio under extreme conditions.
- A similar process is undertaken for Monte Carlo simulations on price.

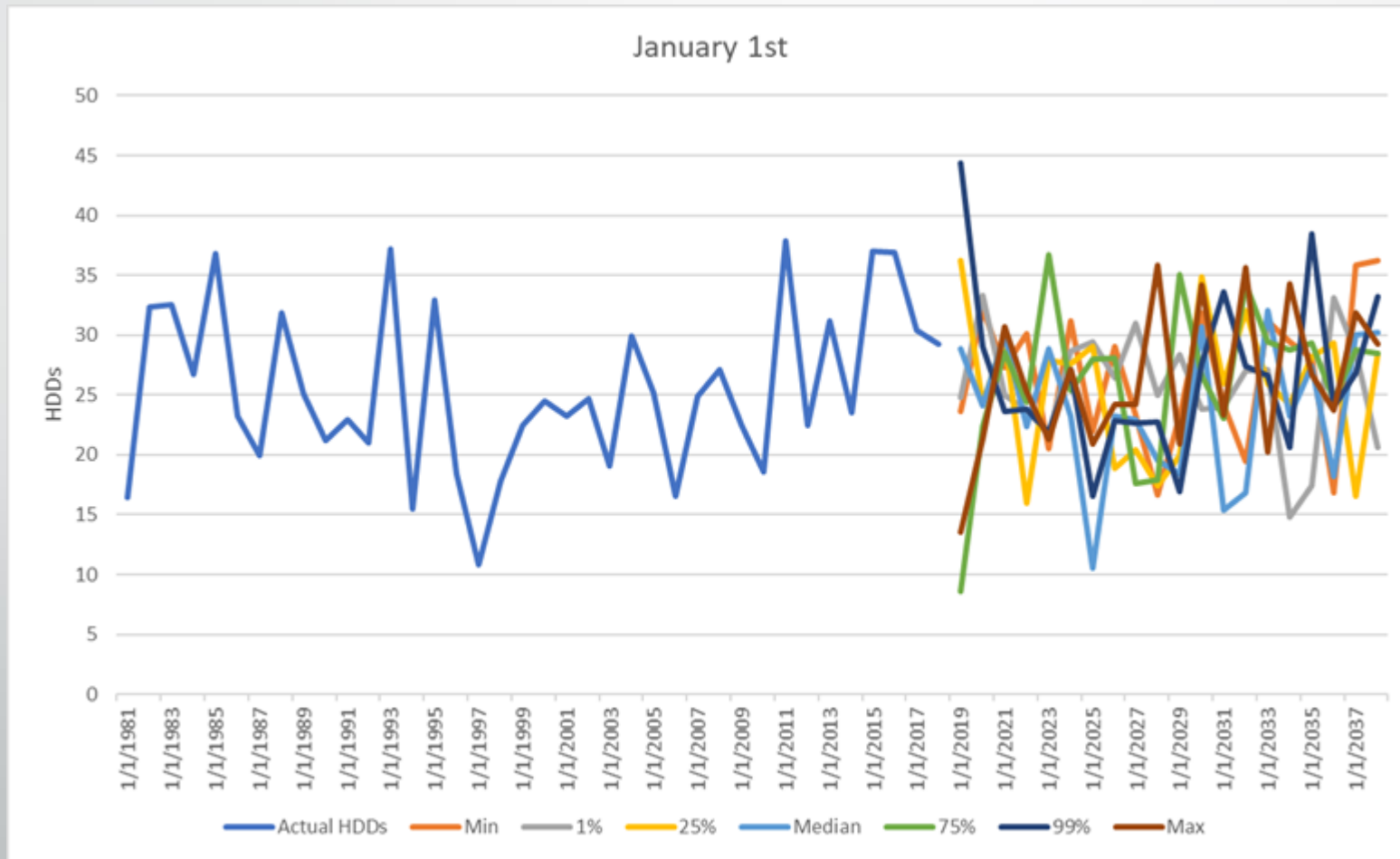
# Scenario and Sensitivity Results

# Peak Day Take Vs. Demand

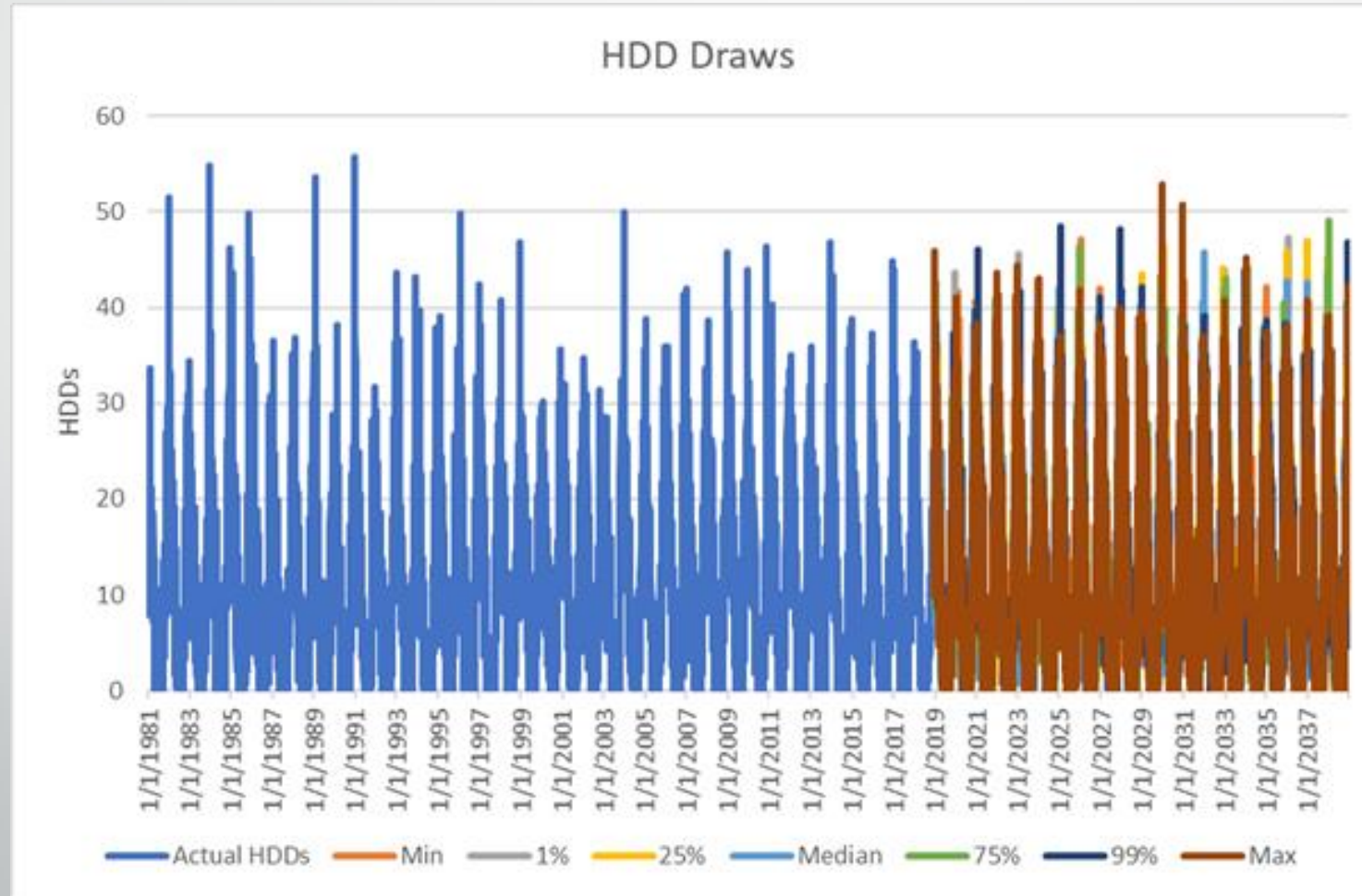




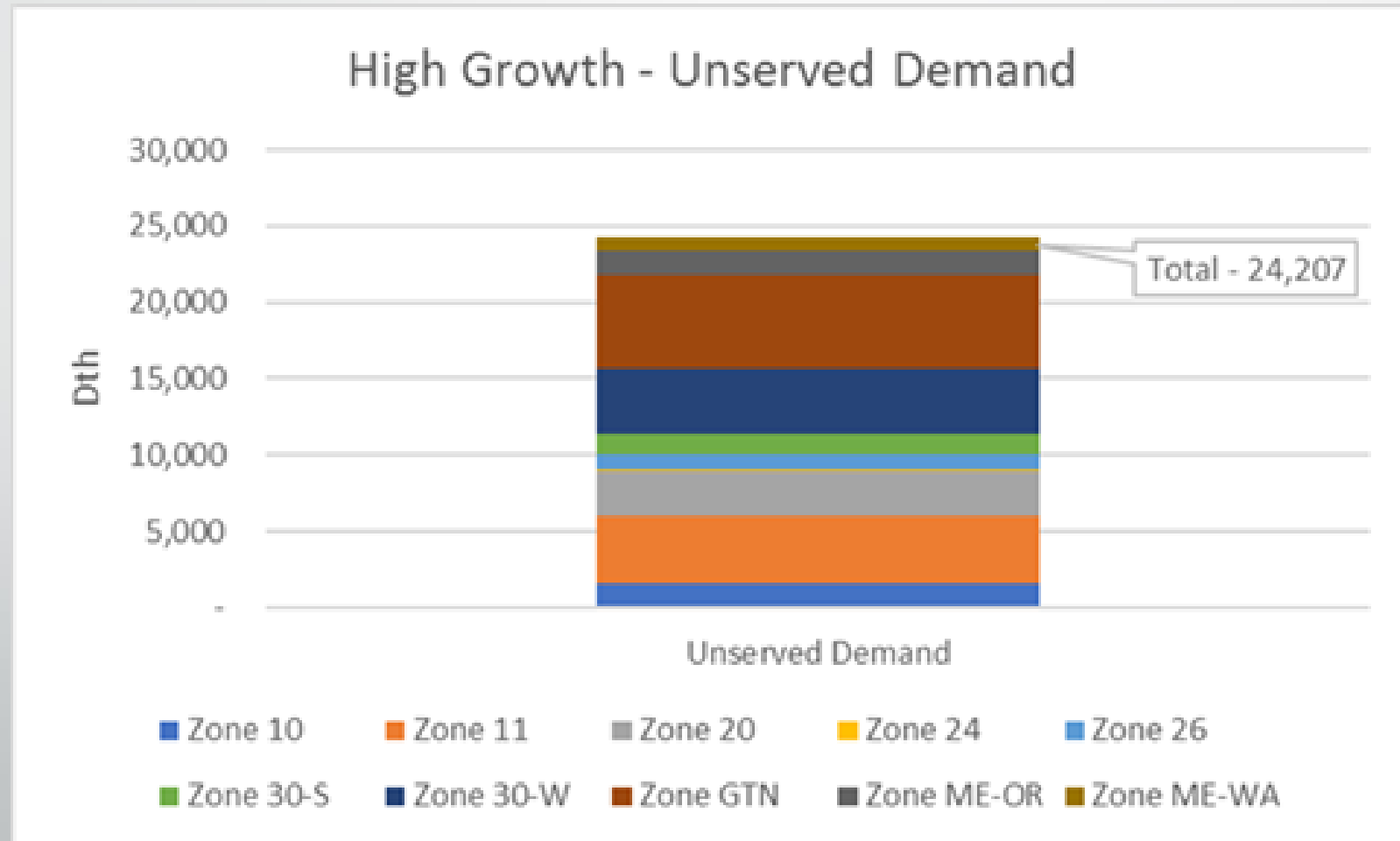
# HDD Draw Graph – January 1<sup>st</sup>



# HDD Draw Graph – All Days



# High Growth – Peak Day Unserved Demand



# High Growth – Discussion

- In this scenario, the Company identifies minor potential shortfalls across its service area in 2038 under stochastic conditions.
- This does not invalidate the top ranked candidate portfolio, but provides a point of reference if weather and growth are unexpectedly high.
- Total system cost for this scenario was \$5.23B, which does not exceed the VaR limit.

# Carbon Sensitivity Discussion

- Cascade will include an analysis of three carbon sensitivities in its IRP, as discussed in TAG 4
  - I-1631 Ballot Initiative
  - SB 6203 – Inslee/Carlyle Carbon Tax
  - House of Representatives Market Choice
- Cascade’s modeling has determined that its conservation programs are robust and comprehensive enough to meet projected DSM savings even at a lower than expected carbon future.

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# Carbon Sensitivity Discussion

- **Residential**: Under all scenarios, there is a 5% decline in potential energy savings over the cumulative forecasts as well as in the short term with minimal differences between scenarios.
- **Commercial**: Under all scenarios, there was a 1-3% cumulative decline to potential energy savings and 3-6% in the short term. Commercial programs lost cost-effectiveness amongst all of the miscellaneous category of end uses, which include pool heaters.
- **Industrial**: All alternative carbon scenarios yielded the same results, reflecting an 8% decline in potential over the cumulative forecast and ~2% short term.

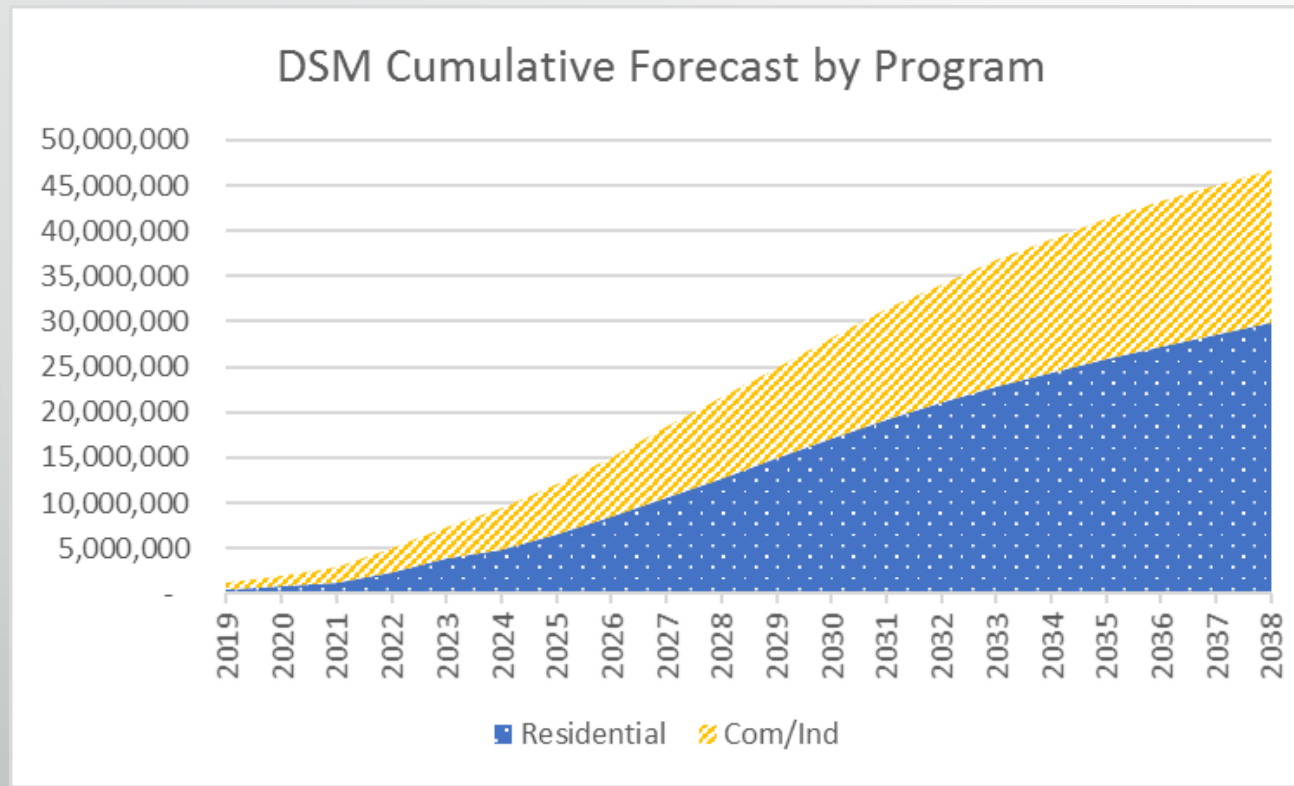
# Changes to DSM forecast

The final DSM forecast reflects additional research into the feasibility of introducing new measures to the programs. This research will continue ahead of tariff filings. Other changes were made in consult with AEG. Below is a brief summary of the final DSM forecast by program:

<i>Year</i>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2026</b>	<b>2032</b>	<b>2038</b>
<b>Residential</b>	304,184	351,427	448,491	1,974,430	2,116,658	1,582,432
<b>Com/Ind</b>	370,587	437,271	513,429	1,122,763	1,082,389	884,551
<b>Total</b>	674,771	788,698	961,920	3,097,193	3,199,047	2,466,982



# DSM Cumulative Forecast by Program



# Scenario/Sensitivities versus Cost Limit

Scenario	TSC (\$000)
<b>VaR Limit</b>	<b>6,035,244</b>
High Growth	5,255,008
Environmental Adder 30%	5,143,146
Environmental Adder 20%	5,060,205
No Alberta Supply	4,992,369
Price Forecast - High	4,978,170
Price Forecast - Low	4,873,367
No Rockies Supply	4,834,441
Expected Conditions	4,828,195
Environmental Adder 0%	4,765,309
Price Volatility - High	4,749,418
Low Growth	4,654,014
No BC Supply*	4,647,060

# Conclusion

- Cascade has identified potential shortfalls at the gates served by GTN in Oregon, starting in 2023.
- The top ranking candidate portfolio included the Bremerton Shelton realignment, incremental capacity on GTN from both Kingsgate and Stanfield, and monitoring opportunities for incremental Nova capacity.
- Under expected conditions, this portfolio would eliminate the potential GTN.
- Additionally, this portfolio passes all scenario and sensitivity testing. It is Cascade's Preferred Portfolio.

# Proposed Two-Year Action Plan

# Environmental Policy

- Participate in City of Bellingham Climate Action Plan discussions.
- Participate on City of Bend Climate Action Steering Committee.
- Monitor service areas for potential GHG reduction goal development relating to energy delivery and supply.
- Monitor carbon pricing and policy developments nationally and statewide (i.e., WA ballot measure, WA CAR litigation, 2019 carbon tax or cap and trade bills, Market Choice, etc.).
- Monitor federal and state GHG regulation development for energy industry.
- Continuation of our current emission reduction and monitoring endeavors (i.e., Methane Challenge Program, Renewable Natural Gas studies).

# DSM

- Perform continual technical review of new measures identified by the Applied Energy Group Conservation Potential Assessment as well as through participation in the Gas Technology Institute Emerging Technology workgroup for inclusion into the Energy Efficiency program portfolio.
  - This will allow the Company to determine whether the technology is available to installers within the CNGC service territory as well as enabling updates to incremental/install costs as applicable.
- Review and revise ramp rates within the LoadMAP model in compliance with best practices as recommended from the NWPCC and AEG, to align with measure maturity.
- Extend Northwest Energy Efficiency Alliance membership into cycle 6 (2020-2024) and elevate CNGC's participation to equal status with electric and dual fuel utilities on the Board of Directors allowing regional natural gas market transformation efforts to grow.
  - Fully engage in NEEA's Next Step Homes program starting in 2019 to support our expanding residential builder outreach efforts and participation.

# DSM (Continued)

- Expand Commercial/Industrial program outreach and customer engagement.
- Enhanced Trade Ally engagement:
  - Drive commercial Trade Ally participation through the commercial program with the primary objective being to make the incentive program a simple part of the install process for all Trade Allies in our network installing in commercial/industrial properties and second, to increase the network where gaps exist.
  - Provide CNGC Sponsored TA training for underperforming measures including air sealing and potential duct sealing if added to the portfolio.
  - Expand a Point of Sale offering to residential Trade Allies to remove upfront cost barriers for customers to install higher-efficiency upgrades.
- Explore geographic pilots and efforts for specific offerings to underperforming areas within the service territory – for example in Zone 2 (Aberdeen, Longview, etc.).

# Gas Supply

- Cascade will continue working with Gelber & Associates on a Hedging plan that will comply with the Docket UG-132019.
- By year end 2018, make a recommendation to GSOC regarding the volume and timing of acquiring incremental GTN capacity.



# Avoided Cost

- Implement a risk premium, if appropriate, based on guidance from WUTC and from the UM 1893/ AR 621 rulemaking in Oregon.

# Distribution System Planning

- Cascade has identified engineering projects to be put into the IRP. The projects as well as the costs will be provided in the draft IRP under confidential treatment.

# Remaining Schedule

Date	Process Element	Location
Friday, October 5, 2018	Draft of 2018 IRP distributed	
Friday, November 2, 2018	Comments due on draft from all stakeholders	
Wednesday, November 14, 2018	TAG 6, if needed	WebEx Only
Friday, December 14, 2018	IRP filing in Washington	

# ADDITIONAL QUESTIONS?

Mark Sellers-Vaughn – Manager, Resource Planning: (509) 734-4589  
[mark.sellers-vaughn@cngc.com](mailto:mark.sellers-vaughn@cngc.com)

Brian Robertson – Senior Resource Planning Analyst: (509) 734-4546  
[brian.robertson@cngc.com](mailto:brian.robertson@cngc.com)

Devin McGreal – Resource Planning Analyst II: (509) 734-4681  
[devin.mcgreal@cngc.com](mailto:devin.mcgreal@cngc.com)

Ashton Davis – Resource Planning Analyst I: (509) 734-4520  
[ashton.davis@cngc.com](mailto:ashton.davis@cngc.com)

Bruce Folsom - Consultant

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