Cascade Natural Gas Corporation

2020 Integrated Resource Plan

Technical Advisory Group Meeting #3

Wednesday, June 24th, 2020

Microsoft Teams Meeting

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Agenda

- Introductions
- Distribution System Planning
- Cascade Gas Supply Overview
- Planned Scenarios and Sensitivities
- Alternative Resources
- Price Forecast Results
- Avoided Cost Methodology and Calculation
- 2020 IRP Remaining Schedule

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Distribution System Planning

Linda Offerdahl, PE – Engineer II

Technical Advisory Group

June 24th, 2020

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Summary

- System Overview
- Software Tools
- Data Gathering
- Synergi System Model
- Distribution Enhancement Options
- Project Process Flow
- Future Projects

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System Overview

Pipelines:

- Diameter – ½" to 20"
- Material – Polyethylene and Steel
- Operating Pressure – 20 psi to 900 psi
- Washington – approx. 4,744 miles of distribution main
- Oregon – approx. 1,604 miles of distribution main

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System Overview

Facilities:

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

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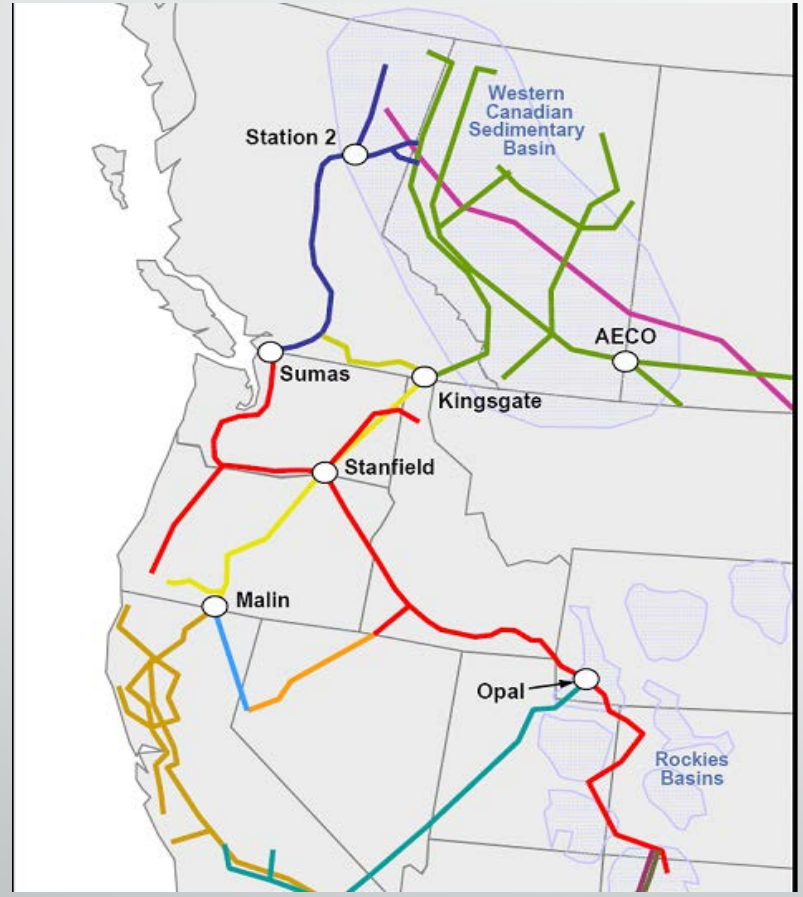
Where do we get our gas?



- Many interstate pipeline companies
- Williams Northwest Pipeline (red)
- TransCanada Pipelines (yellow)

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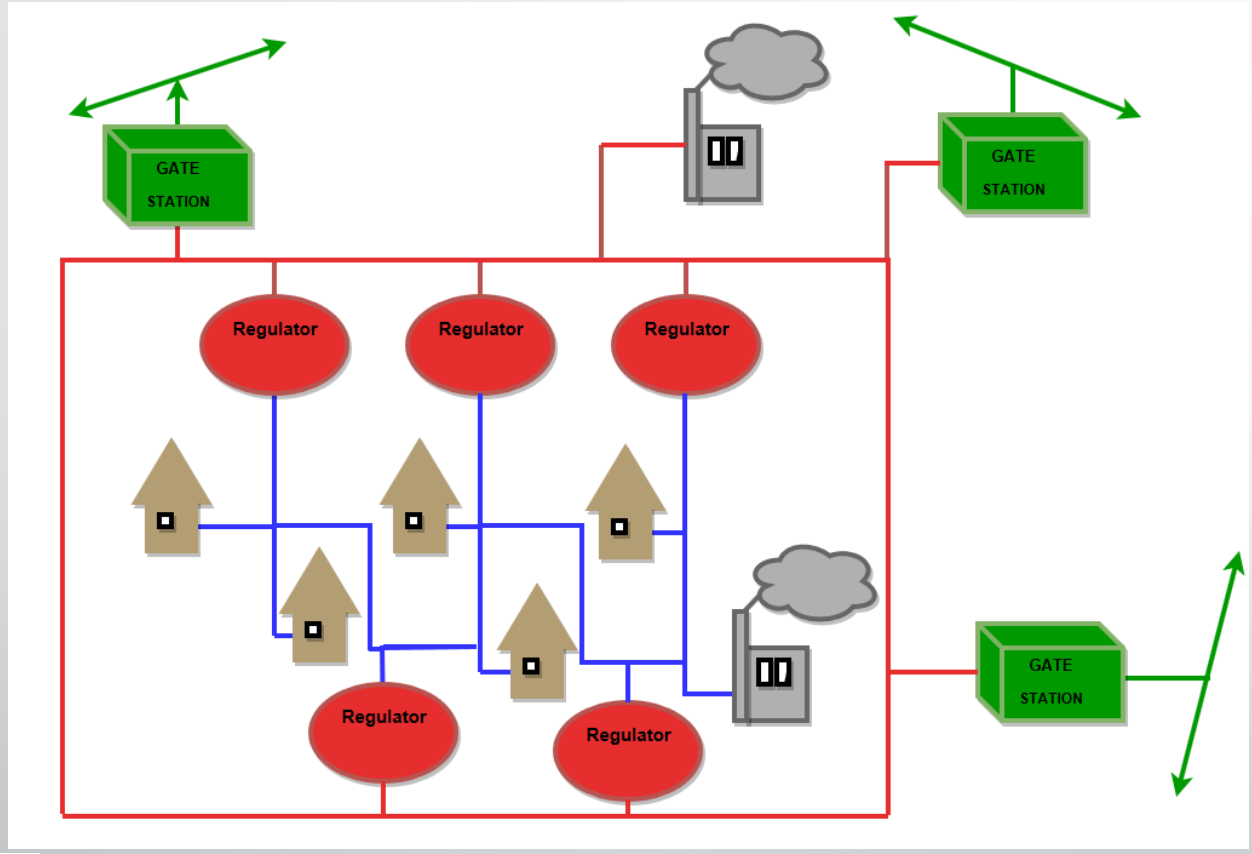
Network Design Fundamentals



Keys:

- Gate station capacity
- Reg station placement
- Pipe size and grid

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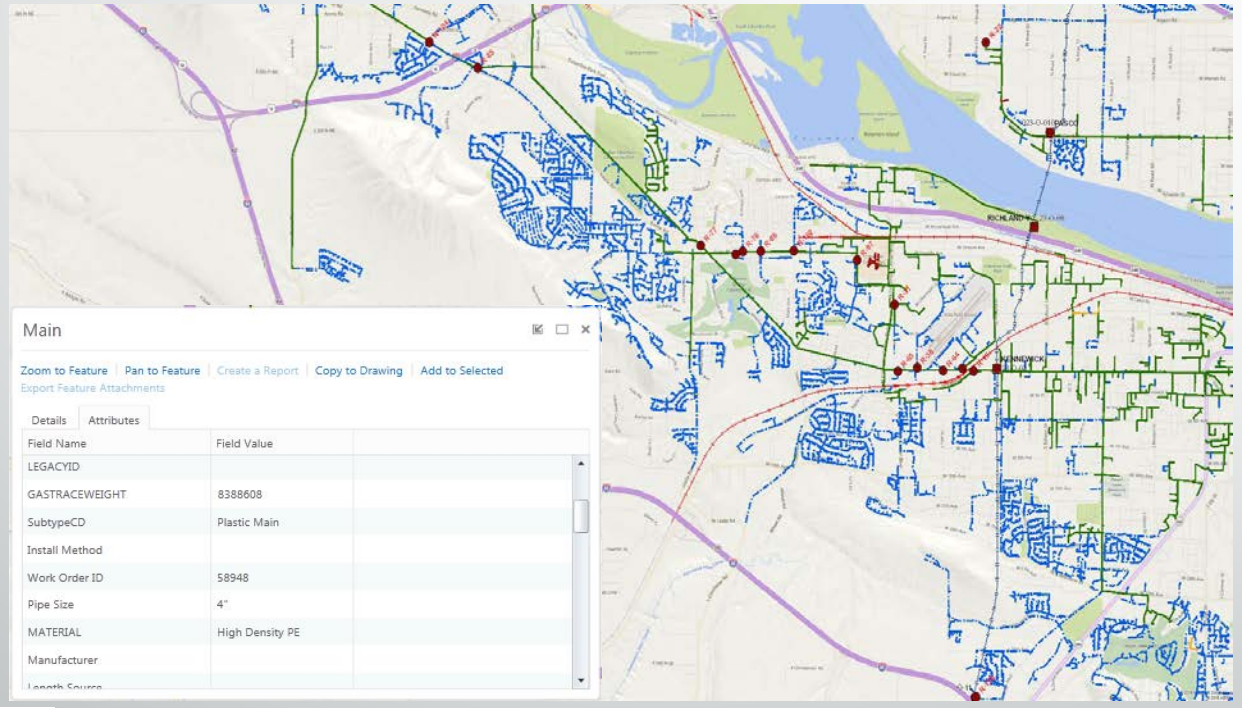
GIS – Geographic Information System

- GIS System keeps an up to date record of pipe and facilities complete with all system attributes.



- Pipe Size
- Material
- Date of Install
- Operating Pressure
- Work Order

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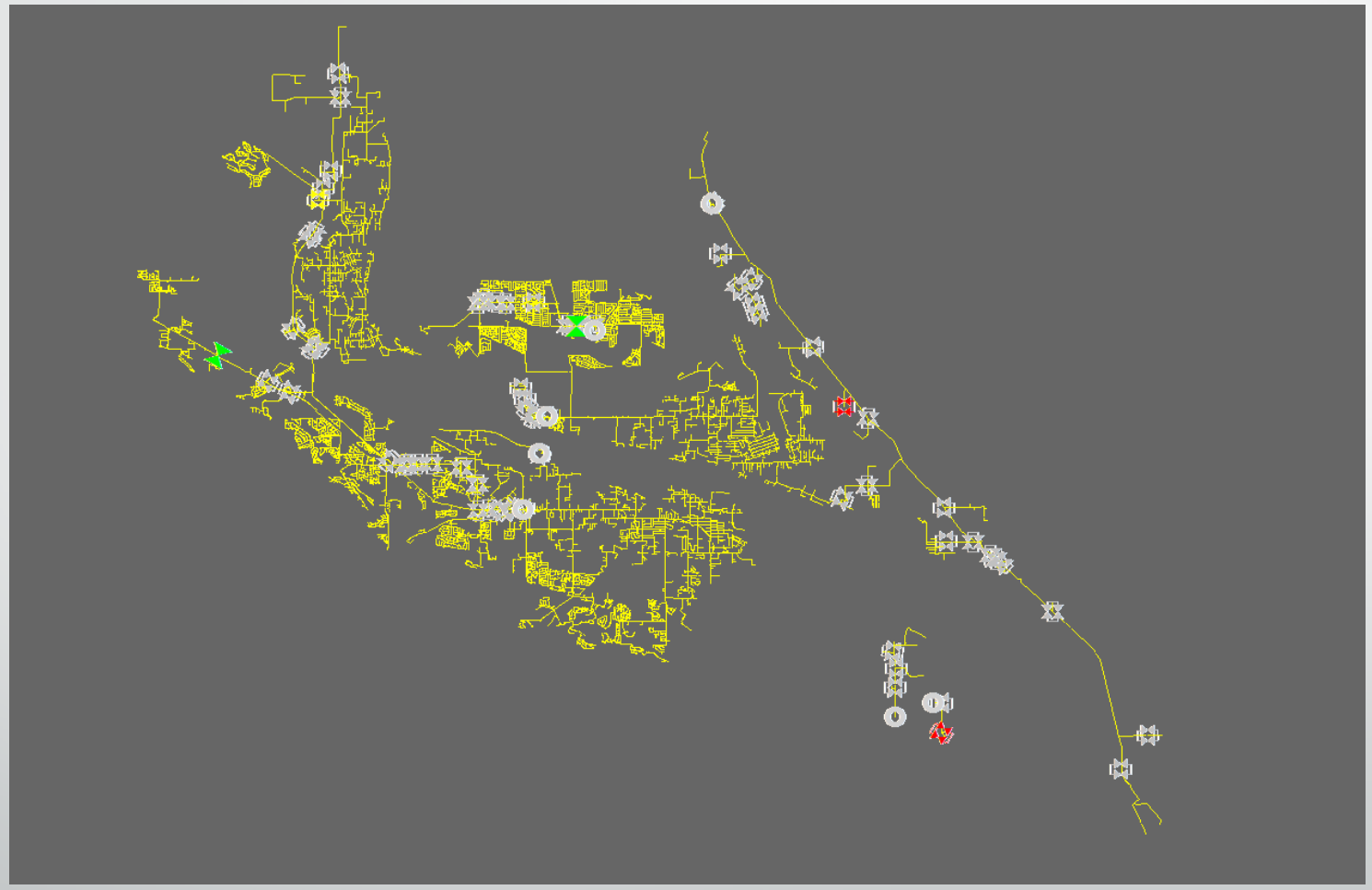
System Modeling

- Using internal GIS environment and other input data, CNG is able to create system models through the software – Synergi.

What is Synergi?

- Software to model piping and facilities to represent current pressure and flow conditions while also predicting future events and growth.

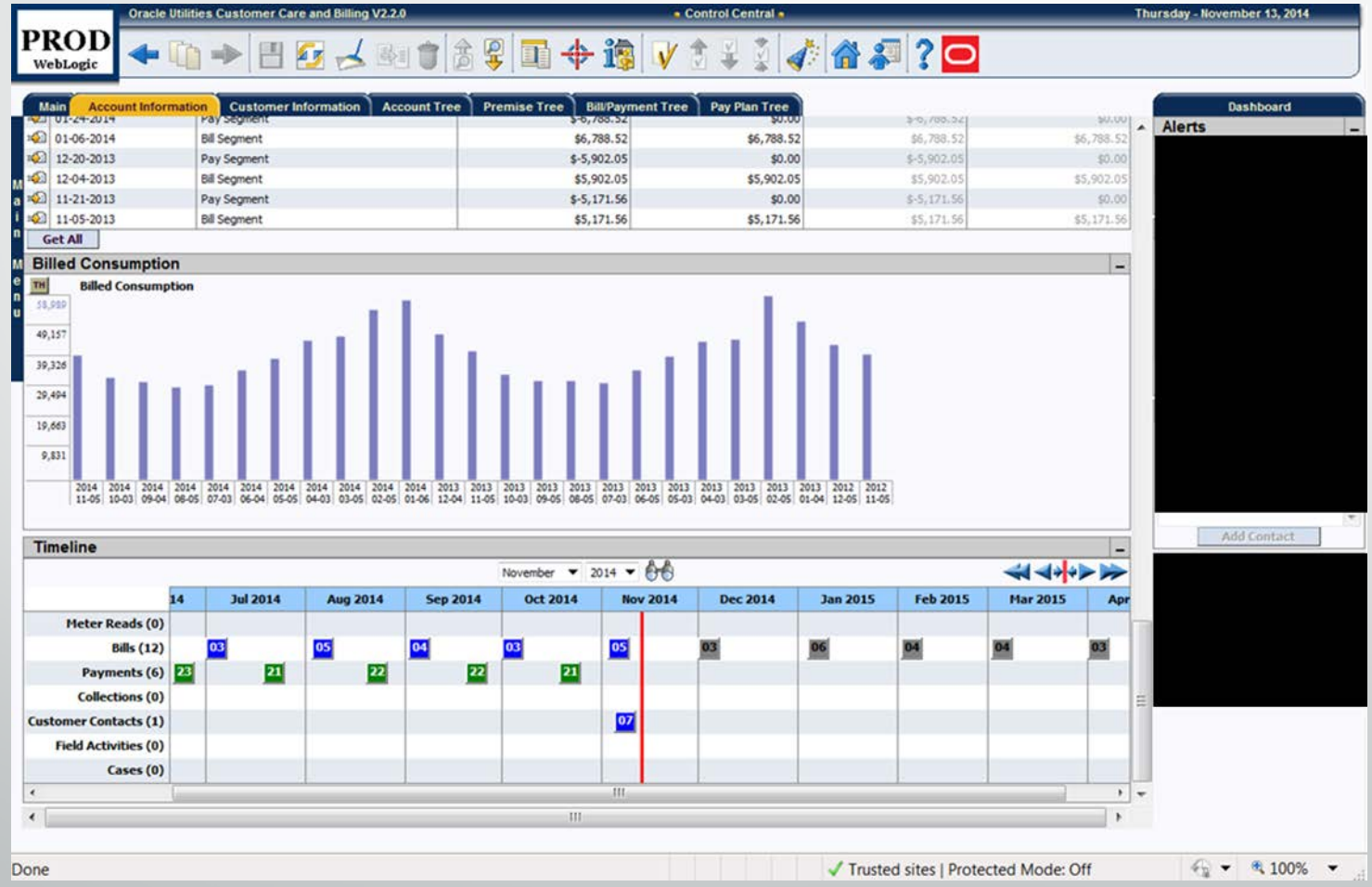
Synergi Model Example



- How do we make this model accurate?

Data Gathering

- CC&B (Customer Billing Data)



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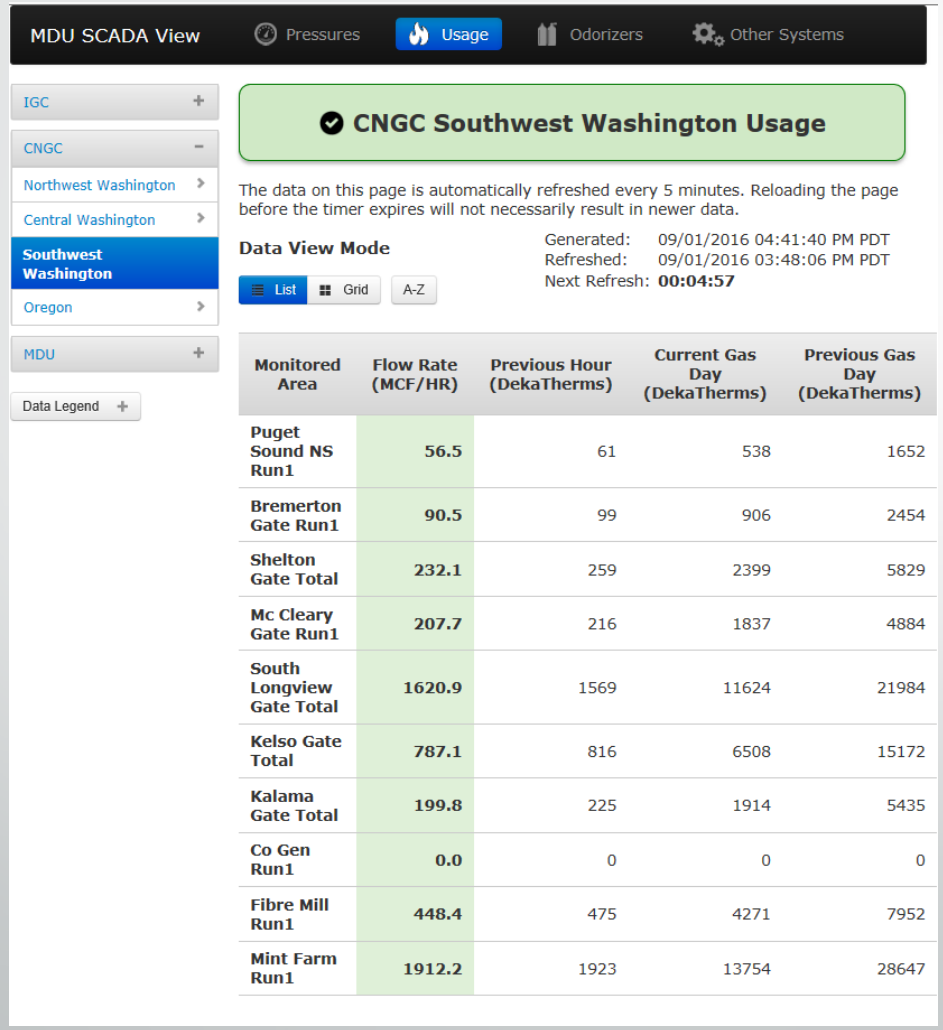
Data Gathering



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

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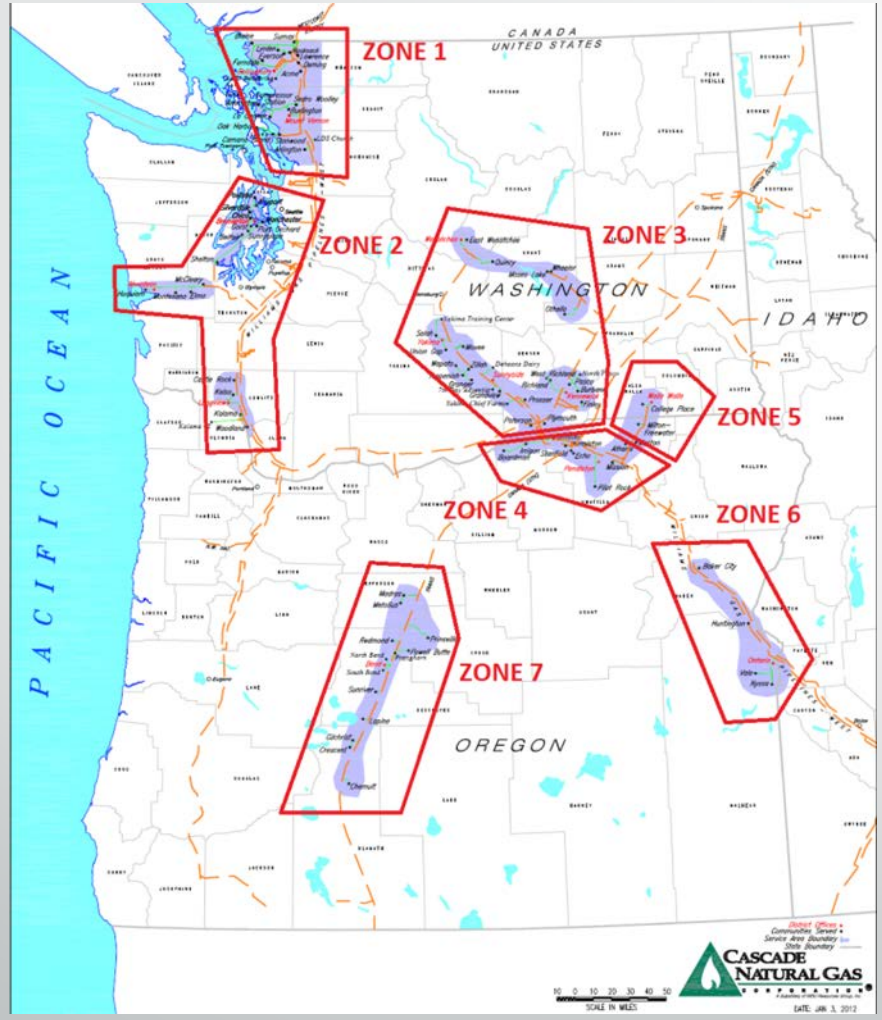
Data Gathering

- IRP Customer Growth

	Burbankheights Loop		Kennewick Loop		Longviewsouth Loop	
	Customers	Growth	Customers	Growth	Customers	Growth
2020	12,503		18,984		2,981	
2021	12,873	2.95%	19,396	2.17%	3,051	2.35%
2022	13,240	2.86%	19,815	2.16%	3,120	2.27%
2023	13,572	2.51%	20,215	2.02%	3,190	2.24%
2024	13,901	2.42%	20,619	2.00%	3,260	2.20%
2025	14,227	2.35%	21,031	2.00%	3,330	2.15%
2026	14,558	2.33%	21,449	1.98%	3,399	2.08%
2027	14,877	2.19%	21,866	1.94%	3,469	2.05%
2028	15,186	2.08%	22,283	1.91%	3,539	2.02%
2029	15,491	2.01%	22,701	1.88%	3,609	1.98%
2030	15,789	1.92%	23,123	1.86%	3,678	1.91%

Data Gathering



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

  Peak HDD = 60 – Average Daily Temp

System Peak Day	12/21/90
System Peak HDD	56
Zone 1	46
Zone 2	46
Zone 3	58
Zone 4	67
Zone 5	65
Zone 6	70.5
Zone 7	70.5

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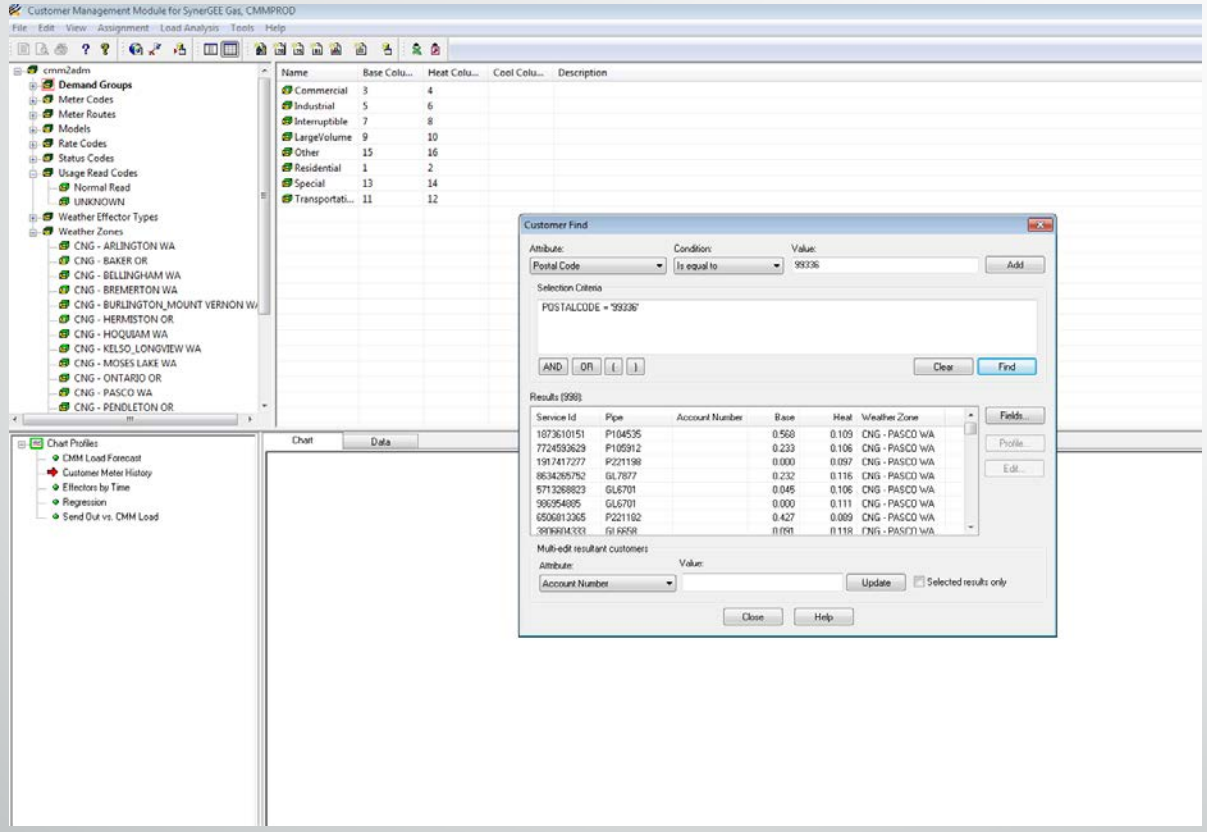
Customer Management Module (CMM)



- Software that compiles data from CC&B and HDD to manage customer loads
- Works directly with Synergi to input customer data and represent pressures and flows in the model

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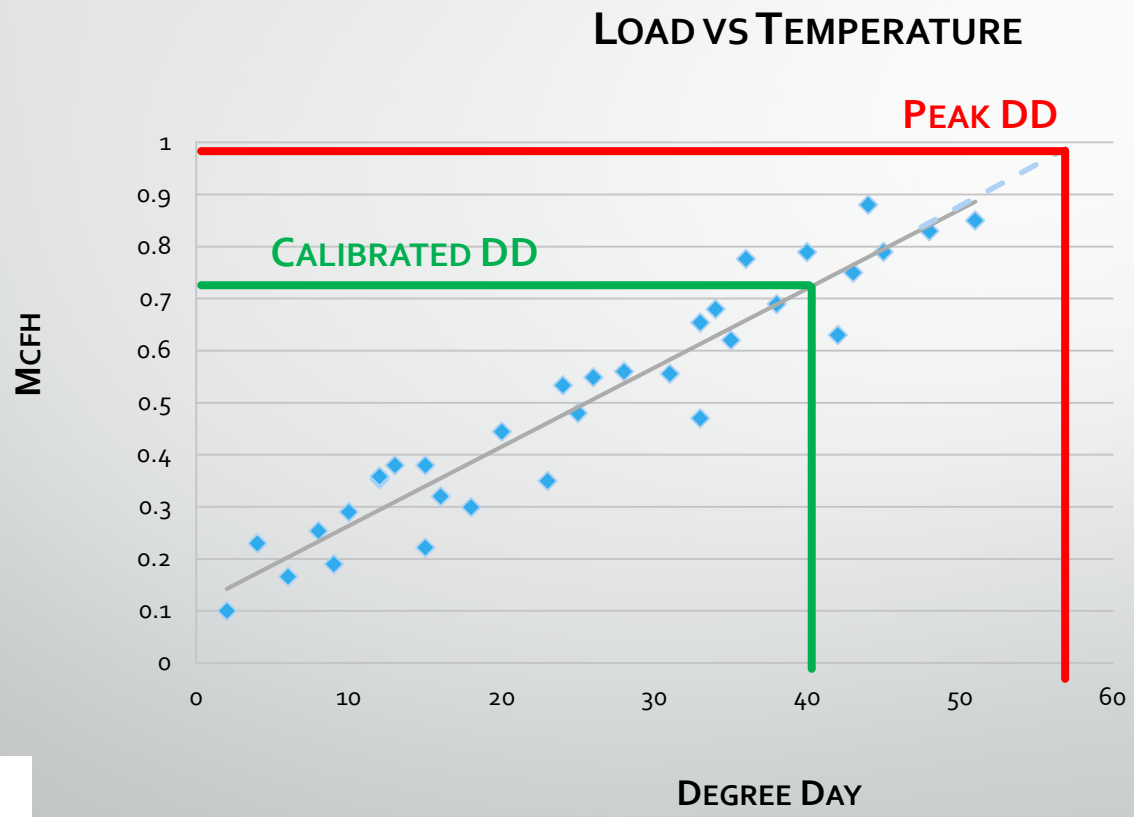
CMM → Synergi System Model

- Conversion can result in 3 model types:
  - Calibrated Model – Model to represent a specific date and time.
  - Design Day Model – Uses the peak HDD for selected areas to simulate a cold weather event (worst case scenario).
  - Growth Model – Uses design day model along with growth data to predict future projects.

Calibrated vs Peak Degree Day

- Different loads will be applied to each customer



y = 0.0152x + 0.1118

HEAT BASE

40 DD = 0.72 MCFH

58 DD = 0.99 MCFH

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Synergi System Model

- All customers are loaded based upon base and heat trend.
- Growth model – works with design day model and customer growth numbers to simulate pressures and flows in the future.
- Benefits of the models:
    - Customer requests
    - Future planning
    - System reliability
    - Optimizing distribution enhancement options

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Distribution Enhancement Options

- Pipeline:
  - Replacements
  - Reinforcements
  - Loops
- Regulator Stations
- Compressors

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Pipeline Enhancements

Pros

- Reliable capacity
- Low maintenance
- Permanent

Cons

- Can be expensive
- Potential land acquisition and/or permitting issues

Reg Station Upgrades/Installs

Pros

- Adds source pressure to alternate system location
- Increases flow control
- Increases pressure control

Cons

- Long term regulator and valve maintenance
- High installation/fabrication costs
- Potential land acquisition issues

Compressor Stations

Pros

- Adding capacity at lower initial cost
- Less land required
- Situational operation

Cons

- Continuous maintenance/training
- Cost of fuel consumption
- Emissions/permitting
- Beneficial only on transmission/HP lines

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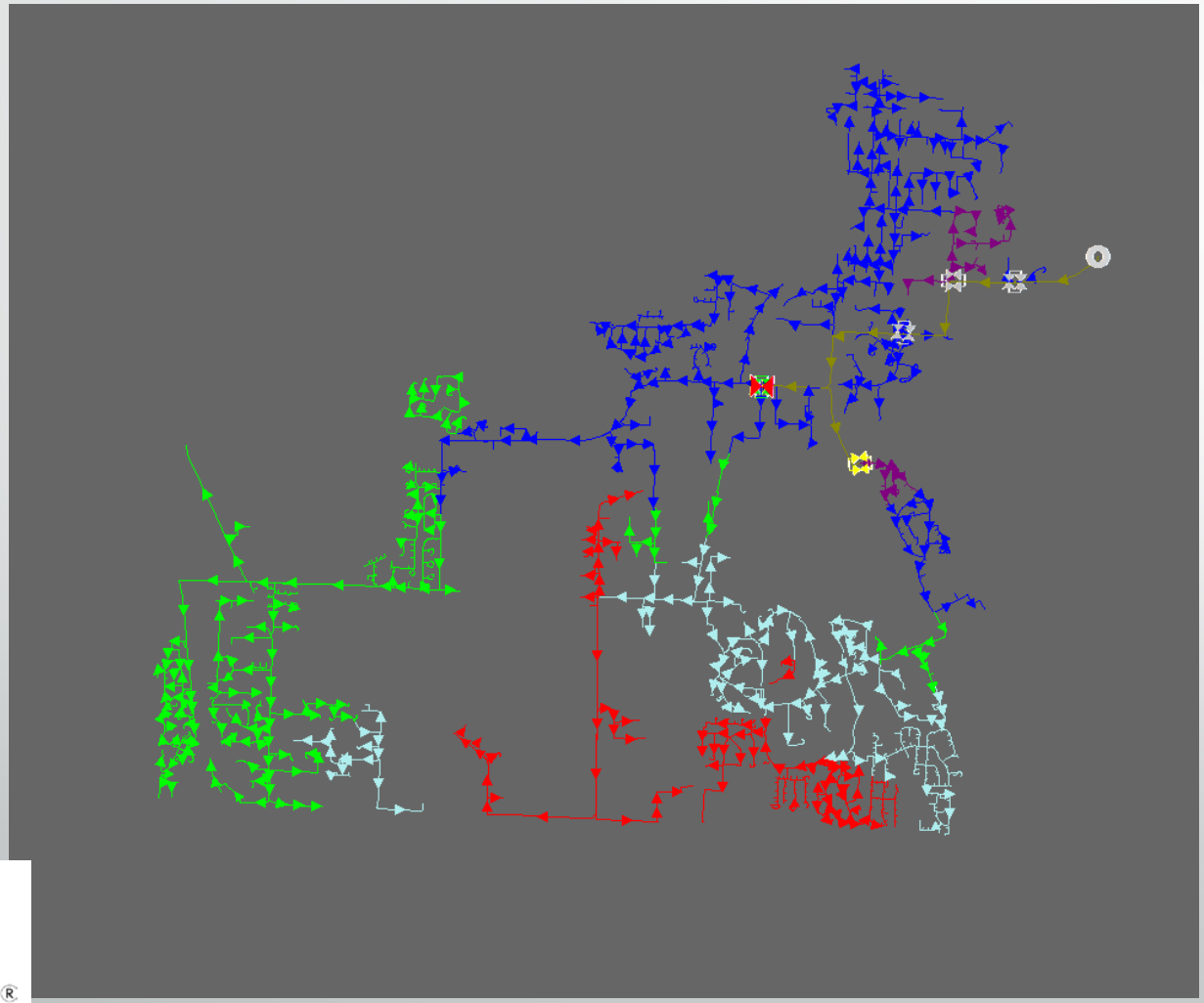
Distribution Enhancement Options

- Theoretical low pressure scenario



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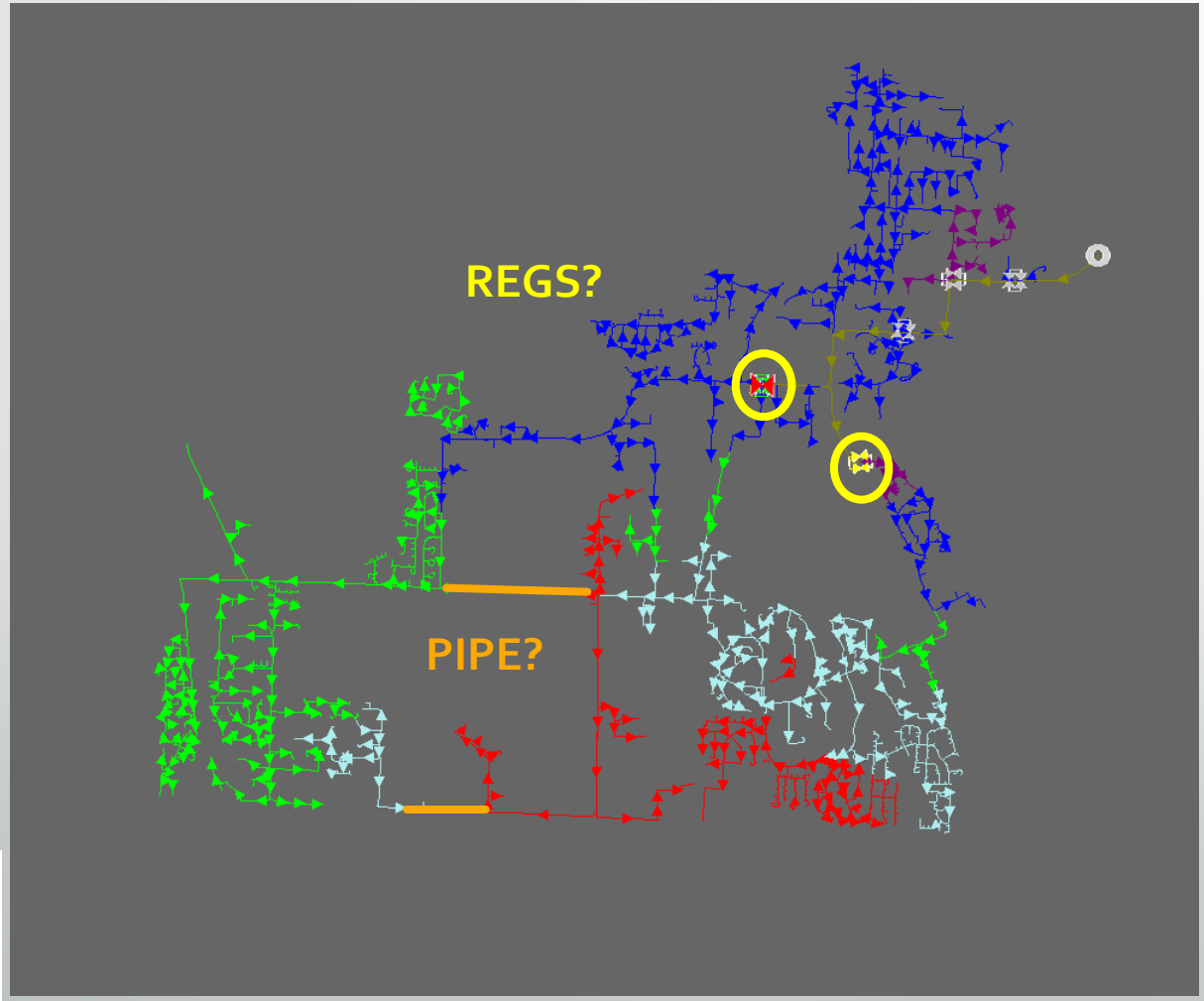
Distribution Enhancement Options

- Low pressure scenario

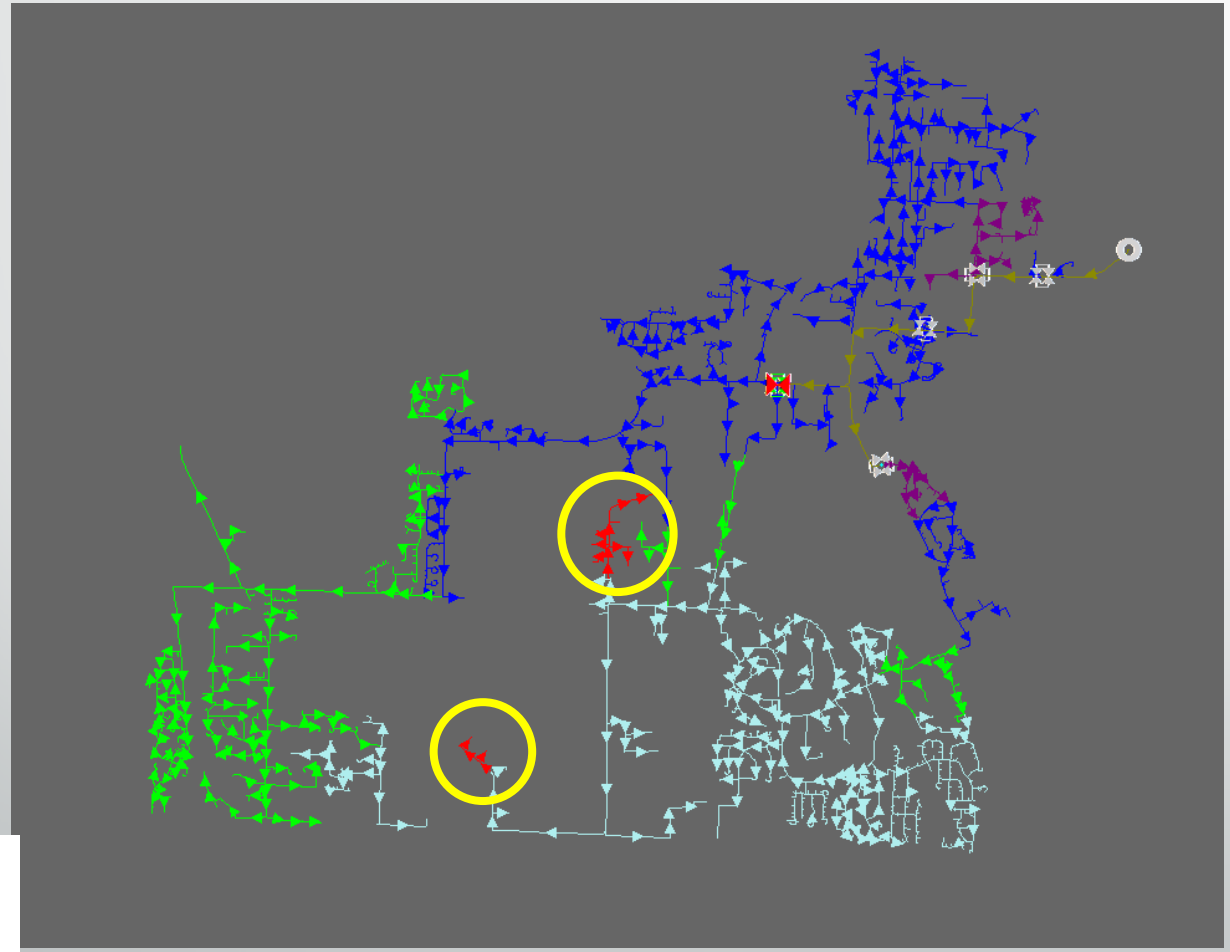


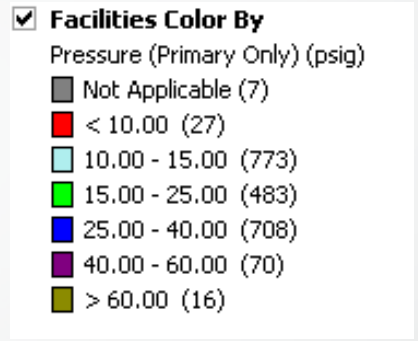
Facilities Color By
Pressure (Primary Only) (psig)
- Not Applicable (7)
- < 10.00 (301)
- 10.00 - 15.00 (518)
- 15.00 - 25.00 (548)
- 25.00 - 40.00 (627)
- 40.00 - 60.00 (67)
- > 60.00 (16)

- Compressor station infeasible
- Other Solutions?

Distribution Enhancement Options

- Possible solutions – raising reg station set points





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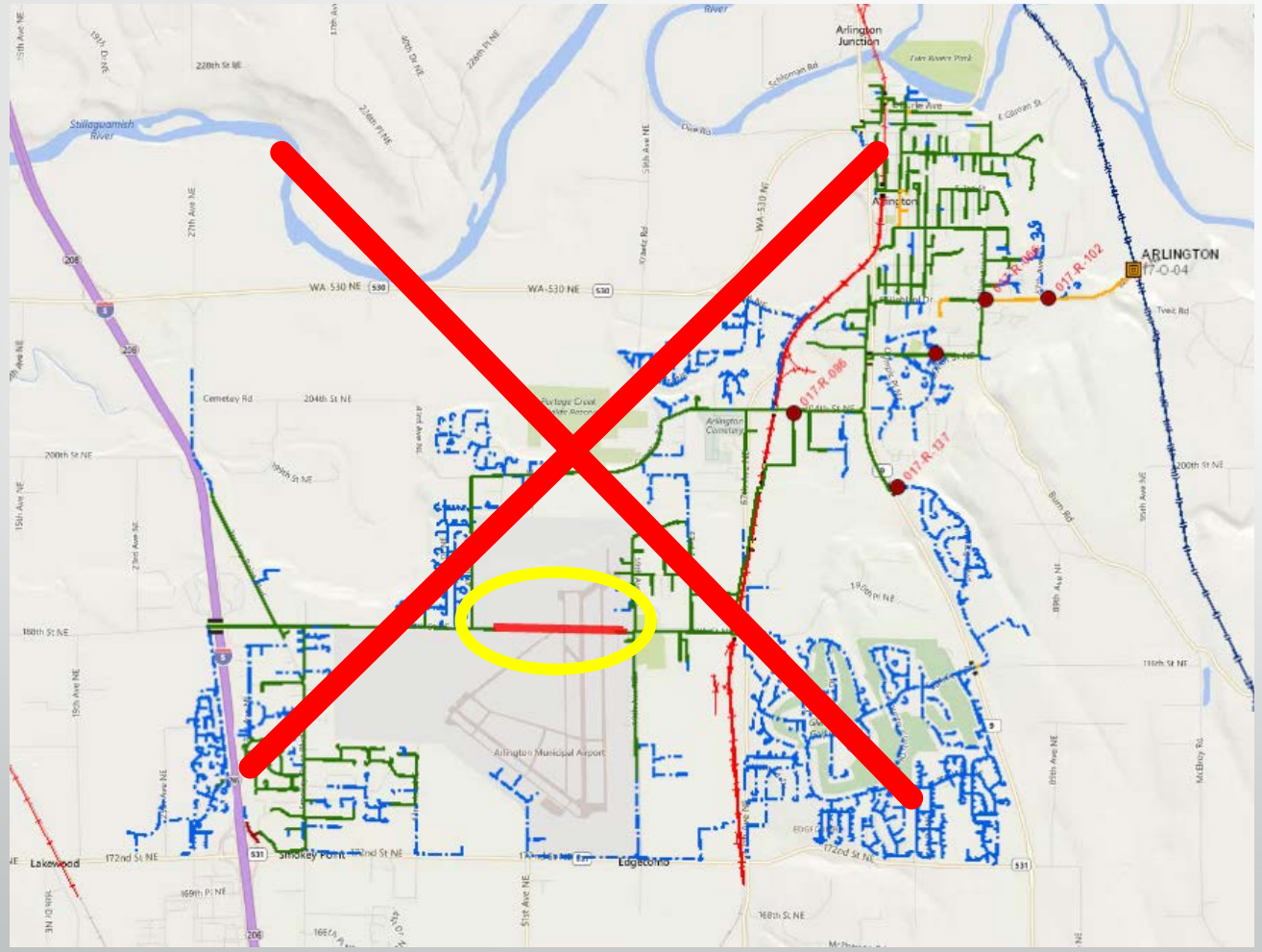
Distribution Enhancement Options

- Reinforcement option #1



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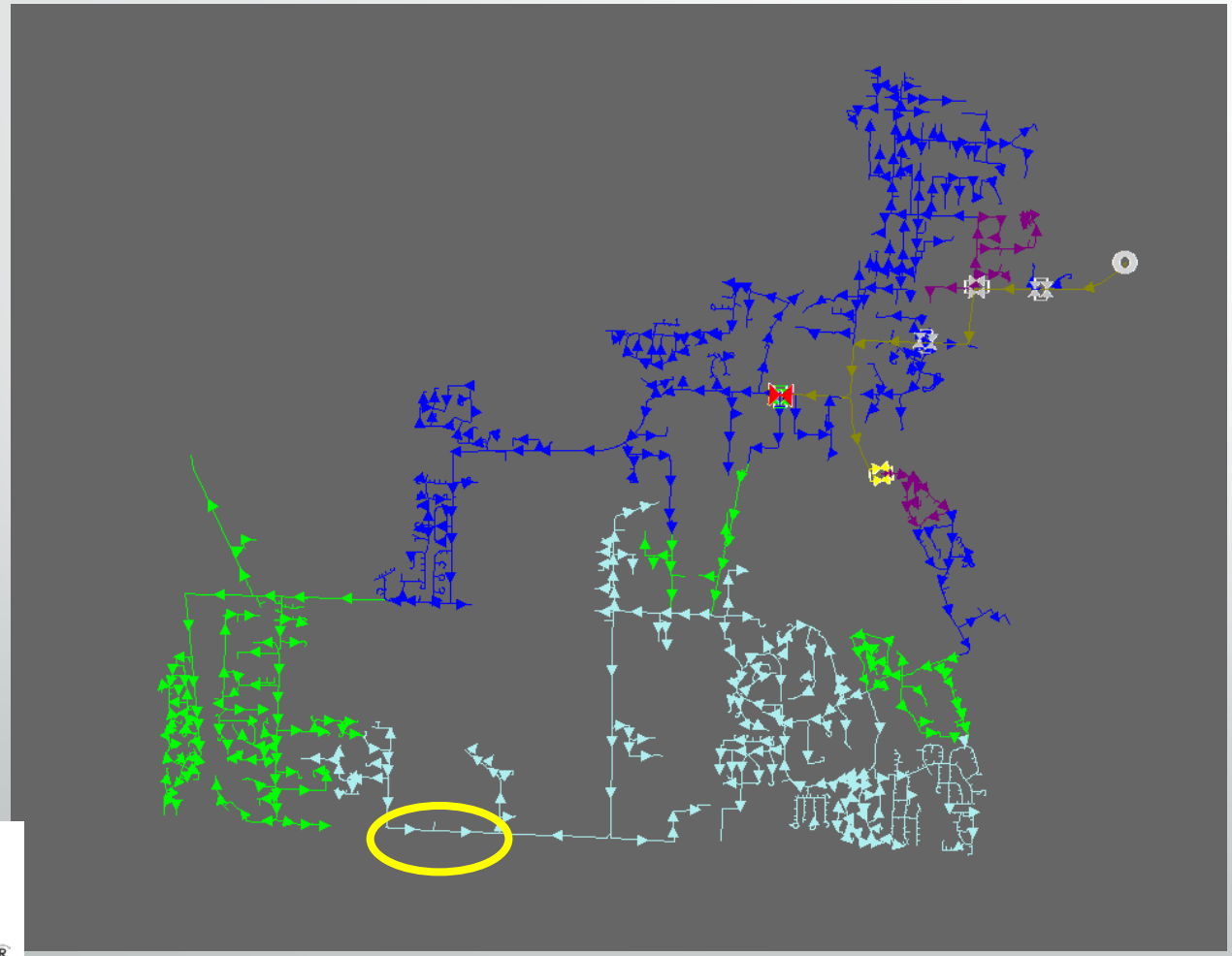
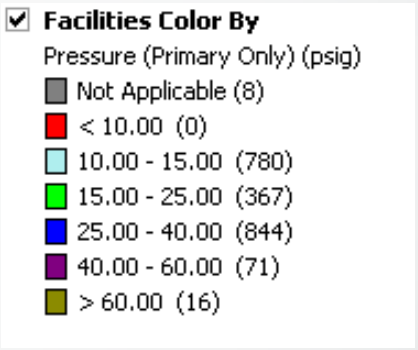
Distribution Enhancement Options

- Reinforcement option #2





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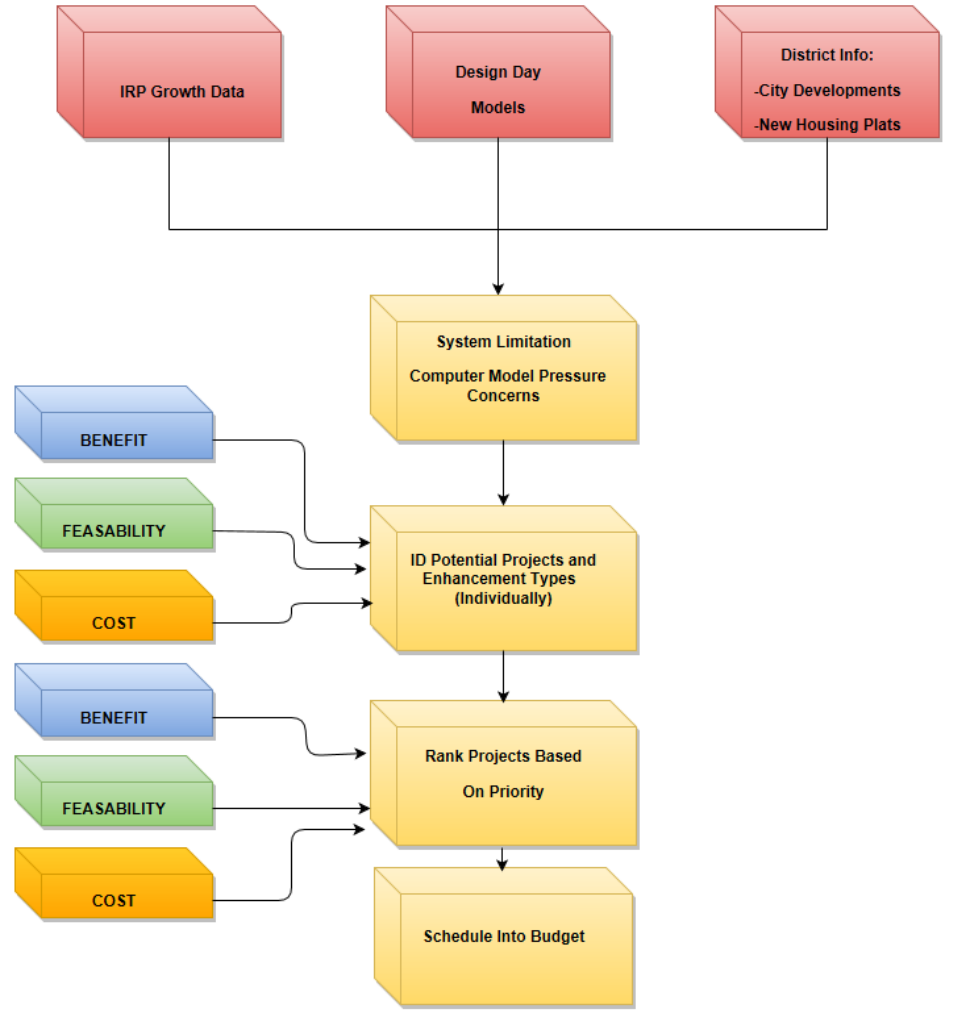
Project Process Flow



Info & Data

Project & Schedules

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Future Projects

Planned distribution enhancement projects in Washington for next 4 years:

- South Kennewick Gate Station
- Elma Gate Station
- South Longview Gate Station Rebuild
- Aberdeen Pipeline Reinforcement
- Kitsap Pipeline Reinforcement
- Arlington, Anacortes, Sedro Woolley, & Oak Harbor Pipeline Reinforcements
- Bellingham Pipeline Reinforcement
- Yakima Pipeline Reinforcement
- Richland & Kennewick Pipeline Reinforcements
- Walla Walla Pipeline Reinforcements

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Conclusion

- CNG strives to use technology to gather data, analyze, plan, and design a reliable, safe, and economical distribution system.

Questions ?

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Cascade Gas Supply Overview

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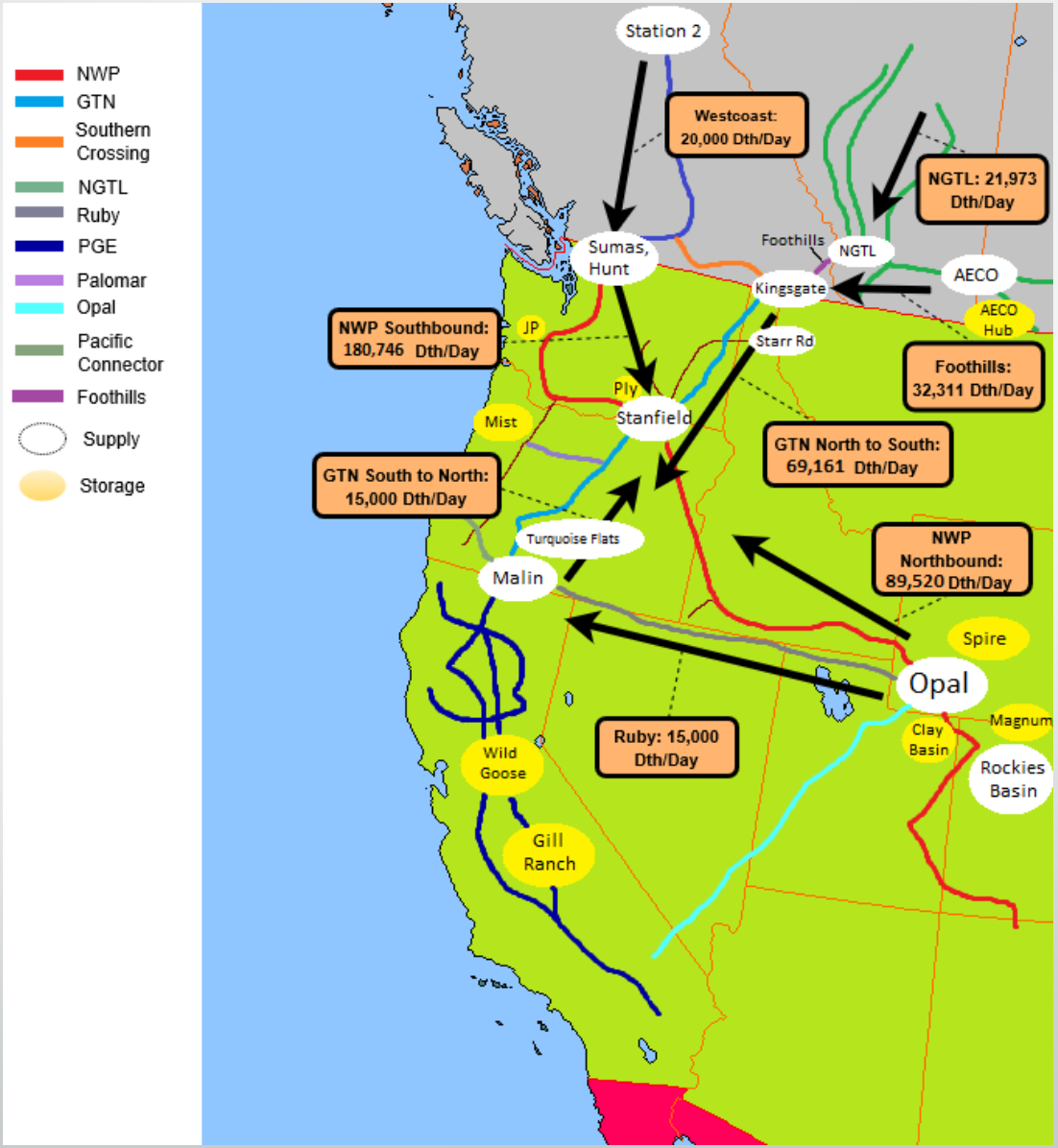
Pipeline transport flow



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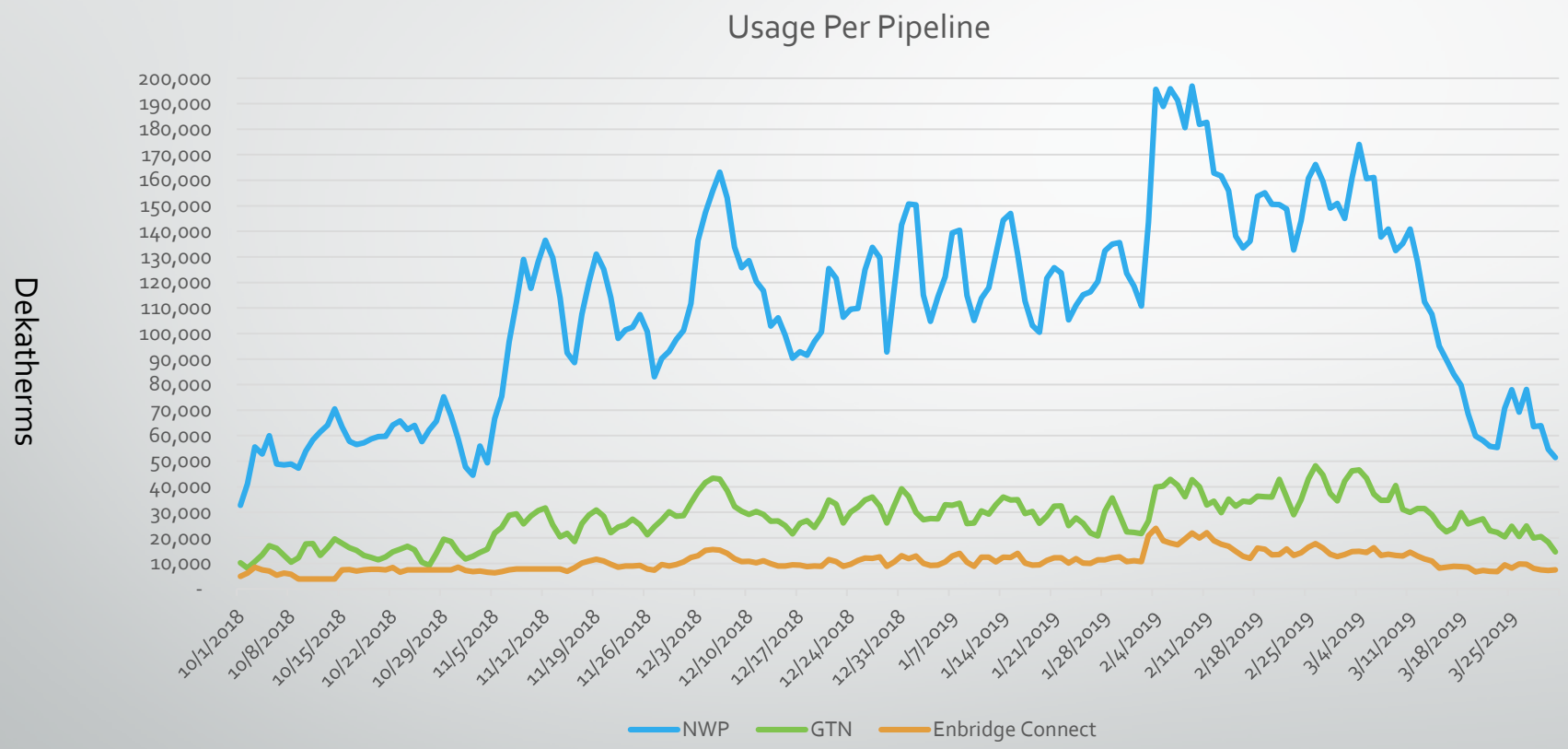
Winter Usage



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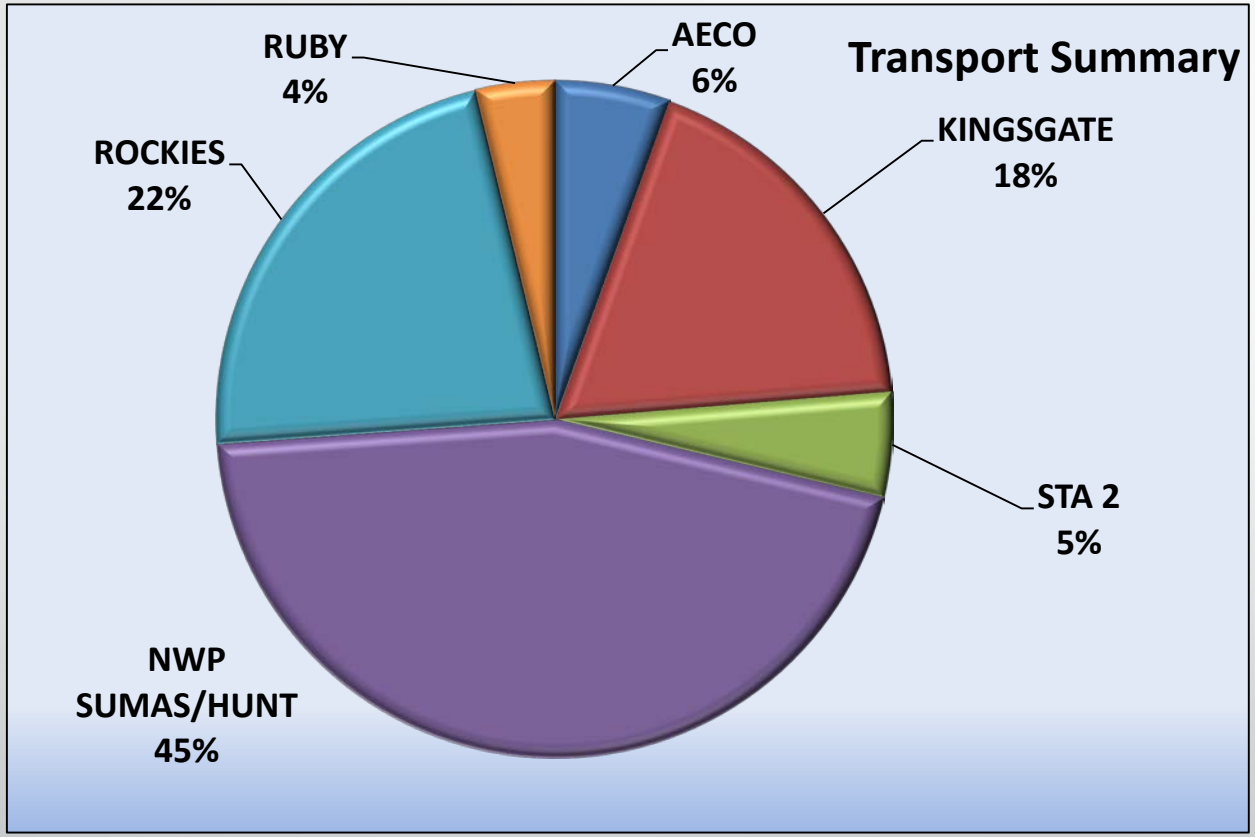
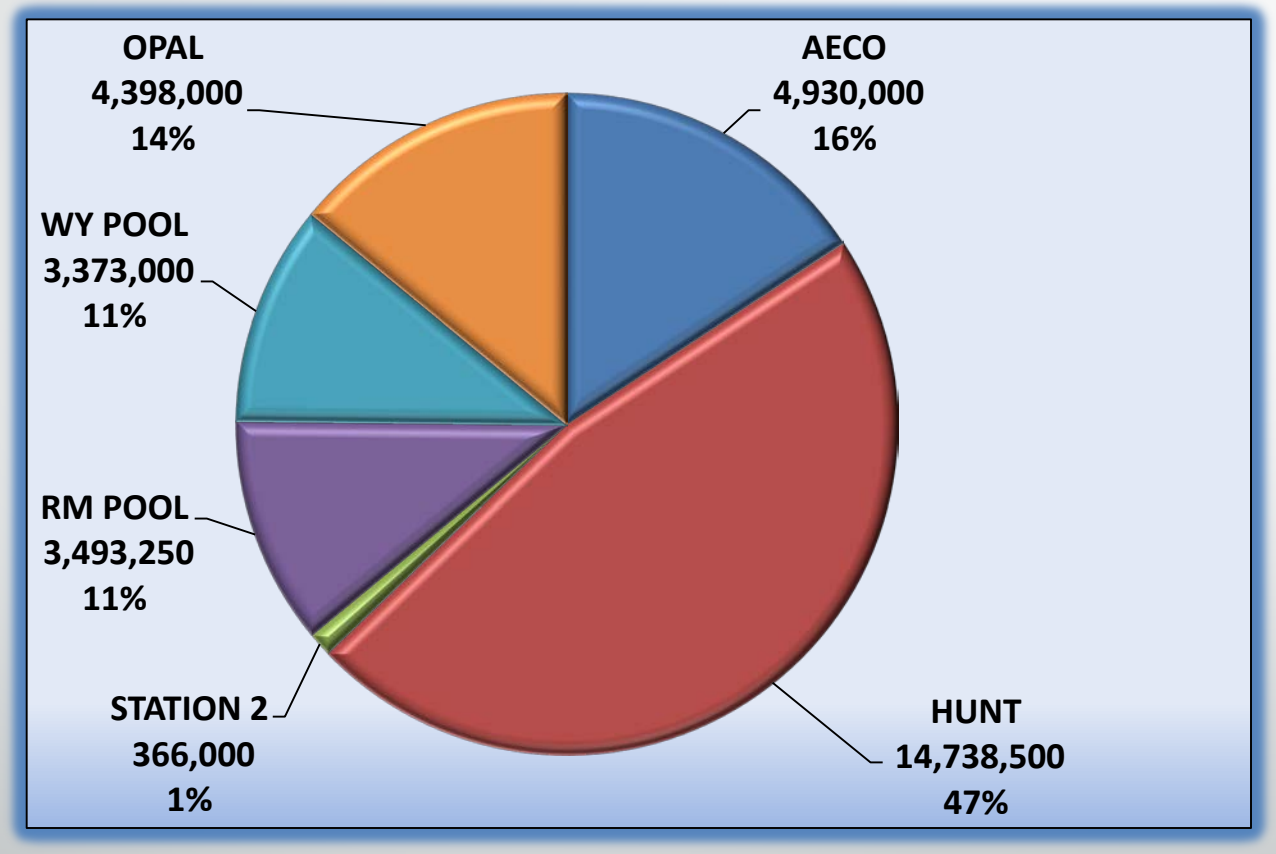
Transport Summary



Supply Summary By Location



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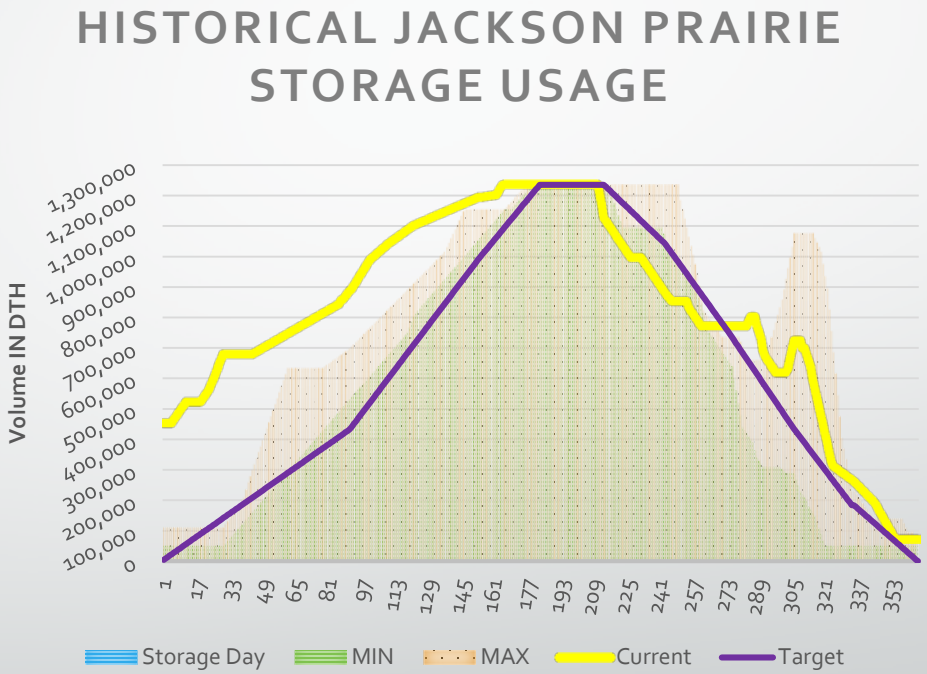
Storage Resources

- Jackson Prairie
  - 4 accounts with 1,235,593 dth capacity, 56,366 dth of demand
  - CNGC cycled approximately 95% of Jackson Prairie storage over the past winter season
  - CNGC targets cycling Jackson Prairie
- 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
  - 600,000 dth of capacity, 30,000 dth of demand

2019/2020 JP Storage Utilization



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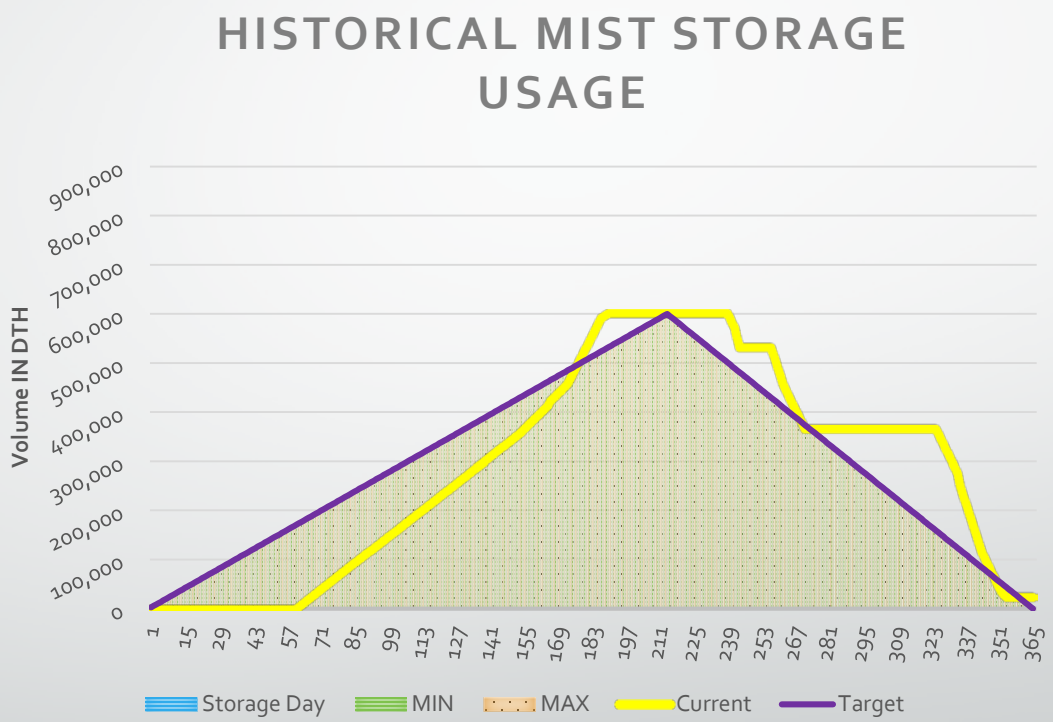
2019/2020 MIST Storage Utilization



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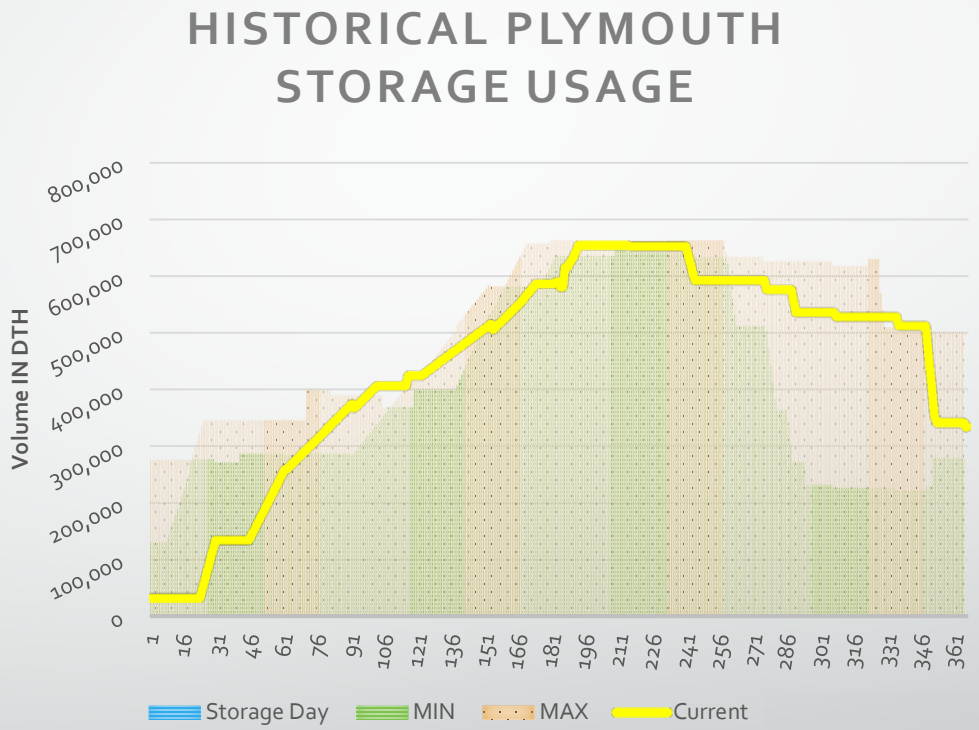
2019/2020 Plymouth Storage Utilization



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HIGHLIGHTS FOR THE 2020 PORTFOLIO DESIGN

- PORTFOLIO PROCUREMENT DESIGN BASED ON A DECLINING PERCENTAGE EACH YEAR, ACCORDINGLY: Year 1: Approximately 80% of annual requirements; Year 2: 60%, Year 3: 20%.
  - 80% allows more flexibility operationally.
  - Allows us to be in the market monthly through FOM purchase or Day Gas purchases.
- Hedged Percentages (fixed-price physical) Currently max 50% of annual requirements. Second year max is set at 30%, and 10% hedged volumes for year three.
  - Cascade's hedging program is flexible and can be adjusted in response to changes in market conditions.
- 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 34,000,000 dths, consistent with recent load history.

Hedge Calculation Table

	Year 1	Year 2	Year 3
Contracted Base Supply Target	80%	60%	20%
Hedge Target	50%	30%	10%
(Volumes in Dth)			
Forecast Annual Usage	34,493,326	34,991,857	35,484,895
Needed Base Supply to Contract	27,594,661	20,995,114	7,096,979
Hedge Target	17,246,663	10,497,557	3,548,490
Current Hedged	10,110,000	5,592,000	-
Current Indexed	4,712,000	-	-
Remaining to Hedge	7,136,663	4,905,557	3,548,490
Remaining Indexed Supply Needed	5,635,998	10,497,557	3,548,490

***Forecast**	The Forecast is based on the IRP 20 year forecast
***Contracted Base Supply**	Base Supply is the overall amount of the contracted supply wether indexed or hedged. CNG uses 80% of the forecast 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

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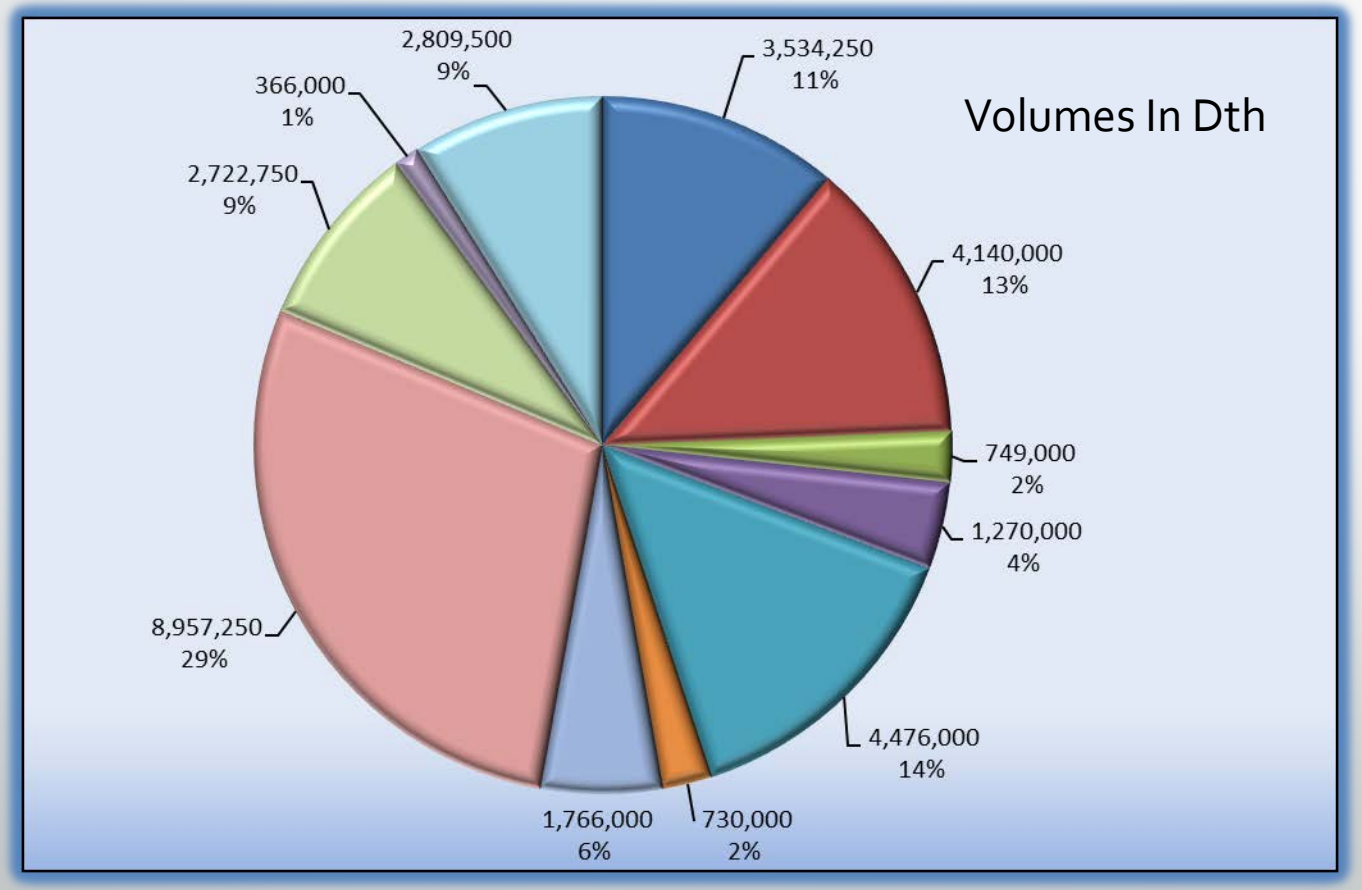
Current Supply Percentage by Supplier



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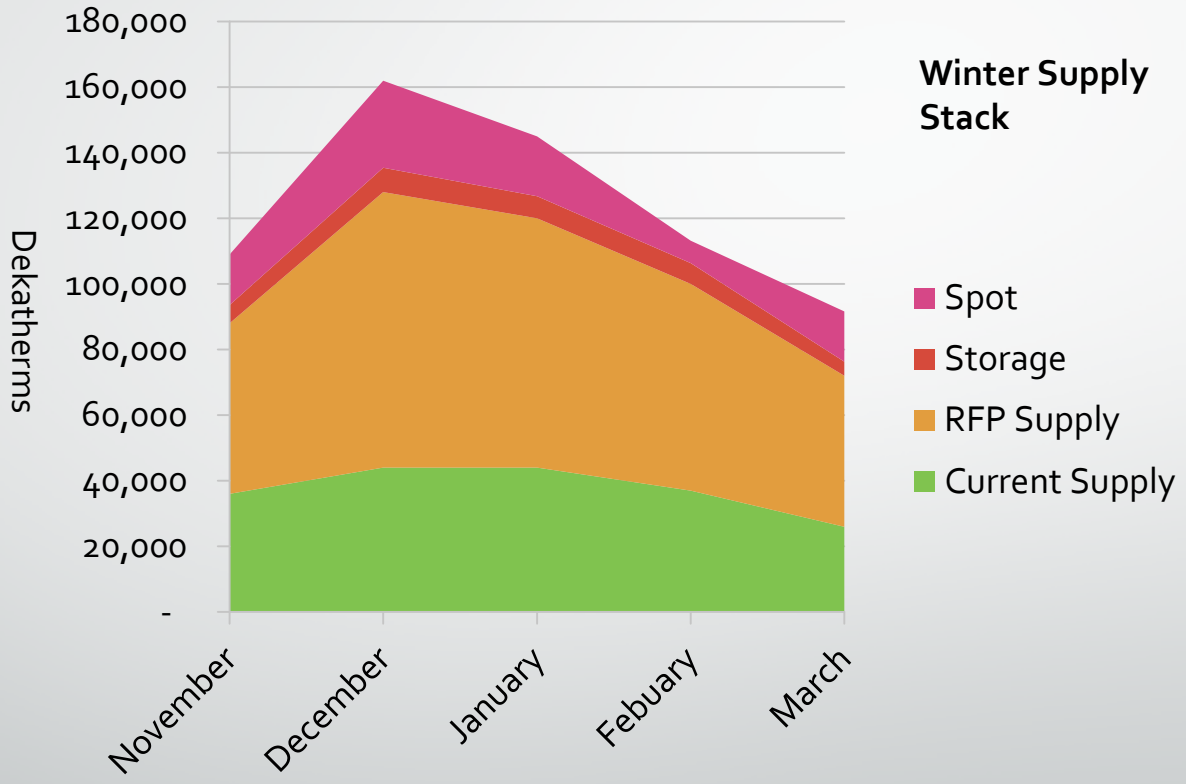
Winter Supply Stack



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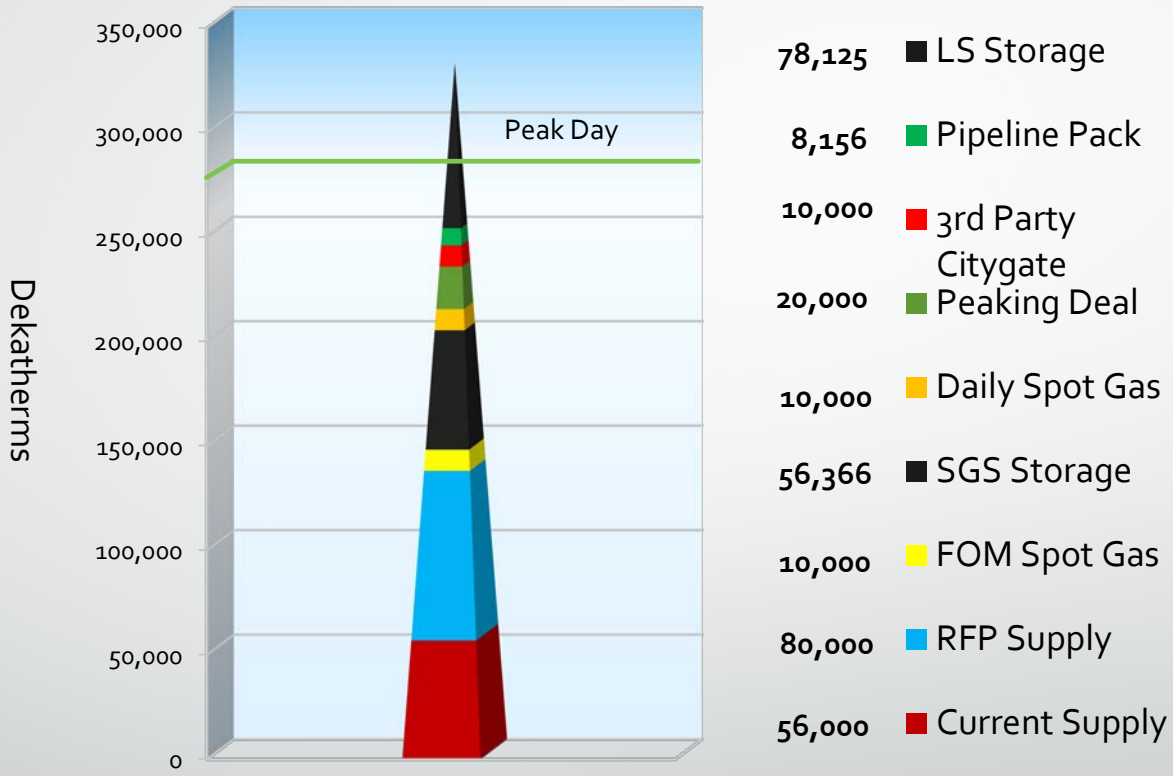
Peak Day Stack Example



78,125	LS Storage
8,156	Pipeline Pack
10,000	3rd Party Citygate
20,000	Peaking Deal
10,000	Daily Spot Gas
56,366	SGS Storage
10,000	FOM Spot Gas
80,000	RFP Supply
56,000	Current Supply

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Planned Scenarios and Sensitivities

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SENDOUT® Model

- Cascade utilizes SENDOUT® 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.
- SENDOUT® 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.

SENDOUT® Model Cont'd

- SENDOUT® utilizes a linear programming approach.
- The model knows the exact load and price for every day of the planning period based on the analyst's input and can therefore minimize costs in a way that would not be possible in the real world.
- Therefore, it is important to acknowledge that linear programming analysis provides helpful but not perfect information to guide decisions.

Modeling Challenges

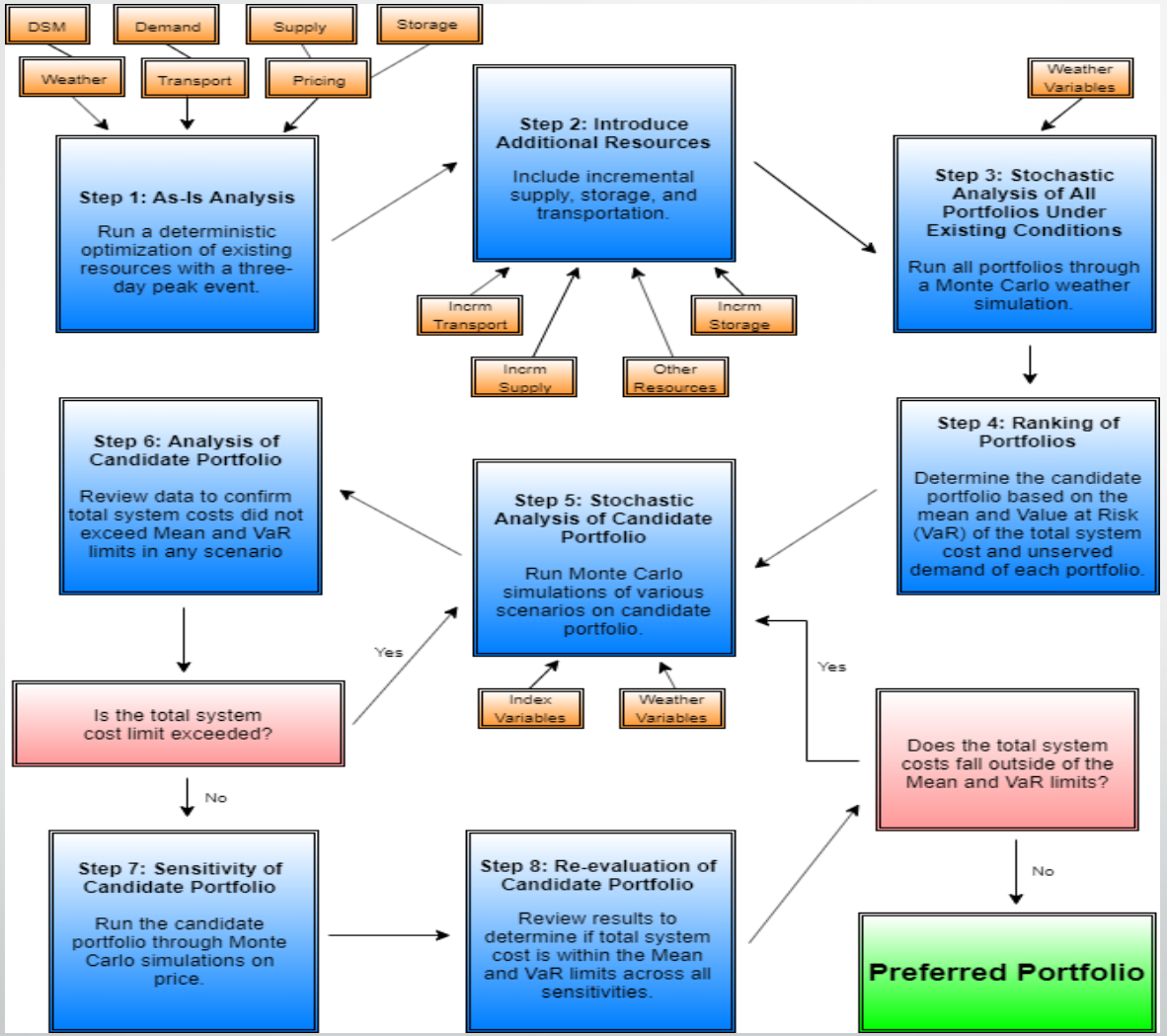
- Supply needs to get gas to the citygate.
- Many of Cascade's transport agreements were entered into decades ago, based on demand projections at that point in time.
- Sum of receipt quantity and aggregated delivery quantity can help identify resource deficiency depending on how rights are allocated.
- 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.
- SENDOUT® has perfect knowledge.

Supply Resource Optimization Process

- **Step 1: As-Is Analysis**
  - Run a deterministic optimization of existing resources with a three-day peak event to uncover timing and quantity of resource deficiencies.
- **Step 2: Introduce Additional Resources**
  - Include incremental supply, storage, and transportation to derive a deterministic optimal portfolio, additional portfolios.
- **Step 3: Stochastic Analysis of All Portfolios Under Existing Conditions**
  - Run all portfolios through a Monte Carlo weather simulation, using expected growth, supply and storage accessibility. Record the probability distributions of total system costs for each portfolio.
- **Step 4: Ranking of Portfolios**
  - Determine the preferred portfolio based on the mean and Value at Risk (VaR) of the total system cost and unserved demand of each portfolio. This resource mix will be the best combination of cost and risk for Cascade and its customers.

Supply Resource Optimization Process (Cont'd)

- **Step 5: Stochastic Analysis of Preferred Portfolio**
  - Run Monte Carlo simulations of various scenarios on preferred portfolio; comparing Mean and VaR to a managerial limit.
- **Step 6: Analysis of Preferred Portfolio**
  - Review data to confirm total system costs did not exceed Mean and VaR limits in any scenario. If limit is exceeded, repeat step 5 with next highest ranked portfolio.
- **Step 7: Sensitivity of Preferred Portfolio**
  - Run the preferred portfolio through Monte Carlo simulations on price. Review results to determine if total system cost is within the Mean and VaR limits across all sensitivities.
- **Step 8: Re-evaluation of Preferred Portfolio**
  - If the total system costs fall outside of the Mean and VaR limits in sensitivity analysis, select the next most optimal portfolio to run scenario and sensitivity analysis on. Repeat as needed.



Supply Resource Optimization Process Flow Chart

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Additional Preferred Portfolio Considerations

- Does it get supply to the citygate?
- Is it reliable?
- Does it have a long lead time?
- How much does it cost?
- New build vs. depreciated cost
- The rate pancake
- Is it a base load or peaking resource?
- How many dekatherms are needed?
- What is the "shape" of resource?
- Is it tried and true technology, new technology, or yet to be discovered?
- Who else will be competing for the resource?

Scenarios and Sensitivities

- Scenario:
  - Change in projected demand
  - Change in availability of existing resources to serve demand
  - Change in availability of supply
- Sensitivity:
  - Change in price forecast
  - Change in environmental adder
  - Change in carbon forecast

Both carry the same importance, failure to pass either of them can lead to a portfolio being rejected

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All In Case

KEY ELEMENTS IN SENDOUT SCENARIO		
Medium Load Growth, Stochastic Pricing, Stochastic Weather, Carbon Forecast. No new elements considered. All items in RED mean those elements were excluded from the scenario		
KEY ELEMENTS IN SENDOUT SCENARIO		
Current Station2	JP1	AECO Base/Fixed, Winter, Day W/S, Peak
Current NOVA	JP2	SUMAS Base/Fixed, Winter, Day W/S, Peak
Current GTN	JP3	ROCKIES Base/Fixed, Winter, Day W/S, Peak
Current NWP	JP4	HUNT Base/Fixed, Winter, Day W/S
Current Foothills	PLY-1	KINGSGATE BASE
Current Ruby	PLY-2	OPAL BASE
	MIST	KERN WINTER
		STAT2 BASE
Incremental NGTL *Incremental GTN N-S* *NWP I-5 Mainline EXP* *Incremental Ruby* *NWP Wen lateral EXP* *Incremental Foothills* *NWP Z20 lateral EXP* *T-South-So Crossing* *Bremerton/Shelton* *Trails West (Palomar)* *NWP East OR Mainline EXP* *Incremental GTN S-N* *Incremental Enbridge* *Pacific Connector*	*Spire Storage* *Gill Ranch Storage* *Wild Goose Storage* *Aeco Hub Storage* *Magnum Storage* *Clay Basin Storage*	*Opal Incrm Supply* *Renewable Natural Gas* *Resource Mix - 3 Basins* *DSM*

The All In Case run allows the Company to see what the model would select if all current and probable resources are available.

Low Growth and High Growth

KEY ELEMENTS IN SENDOUT SCENARIO		
Low Load Growth, Stochastic Pricing, Stochastic Weather, Carbon Forecast. No new elements considered. All items in RED mean those elements were excluded from the scenario		
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Incremental Foothills	*Clay Basin Storage*	
NWP Z20 lateral EXP		
T-South-So Crossing		
Bremerton/Shelton		
Trails West (Palomar)		
NWP East OR Mainline EXP		
Incremental GTN S-N		
Incremental Enbridge		
Pacific Connector		

KEY ELEMENTS IN SENDOUT SCENARIO		
High Load Growth, Stochastic Pricing, Stochastic Weather, Carbon Forecast. No new elements considered. All items in RED mean those elements were excluded from the scenario		
KEY ELEMENTS IN SENDOUT SCENARIO		
Current Station2	JP1	AECO Base/Fixed, Winter, Day W/S, Peak
Current NOVA	JP2	SUMAS Base/Fixed, Winter, Day W/S, Peak
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Current NWP	JP4	HUNT Base/Fixed, Winter, Day W/S
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Incremental Enbridge		
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Limit BC and Limit Alberta

KEY ELEMENTS IN SENDOUT SCENARIO		
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Limit Canada and Limit Rockies

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Limit JP and Limit Ply Storage

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Limit Both Storage and No JP

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No Ply Storage and No Storage

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Sensitivities Analyses

Sensitivities		Assumpitons
Price	High	Medium Load Growth, Average Weather with Peak Event, High Gas Price Environment
	Low	Medium Load Growth, Average Weather with Peak Event, Low Gas Price Environment
Env. Adder	0%	Medium Load Growth, Average Weather with Peak Event, Medium Gas Price Environment with No Adder for Unknown Regulatory Impacts
	20%	Medium Load Growth, Average Weather with Peak Event, Medium Gas Price Environment with 20% Adder for Unknown Regulatory Impacts
	30%	Medium Load Growth, Average Weather with Peak Event, Medium Gas Price Environment with 30% Adder for Unknown Regulatory Impacts
Carbon Adder	Various	Medium Load Growth, Average Weather with Peak Event, Medium Gas Price Environment with Various Potential Carbon Futures Modeled

Alternative Resources

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Major resource issues on the horizon

- Once a deficiency is identified, Cascade must analyze potential solutions to ensure service over the planning horizon.
- Conversations with partners at various pipelines, storage facilities, new supply sources.
- SENDOUT® is used to ultimately derive the optimal mix of resources, referred to as the "preferred portfolio."

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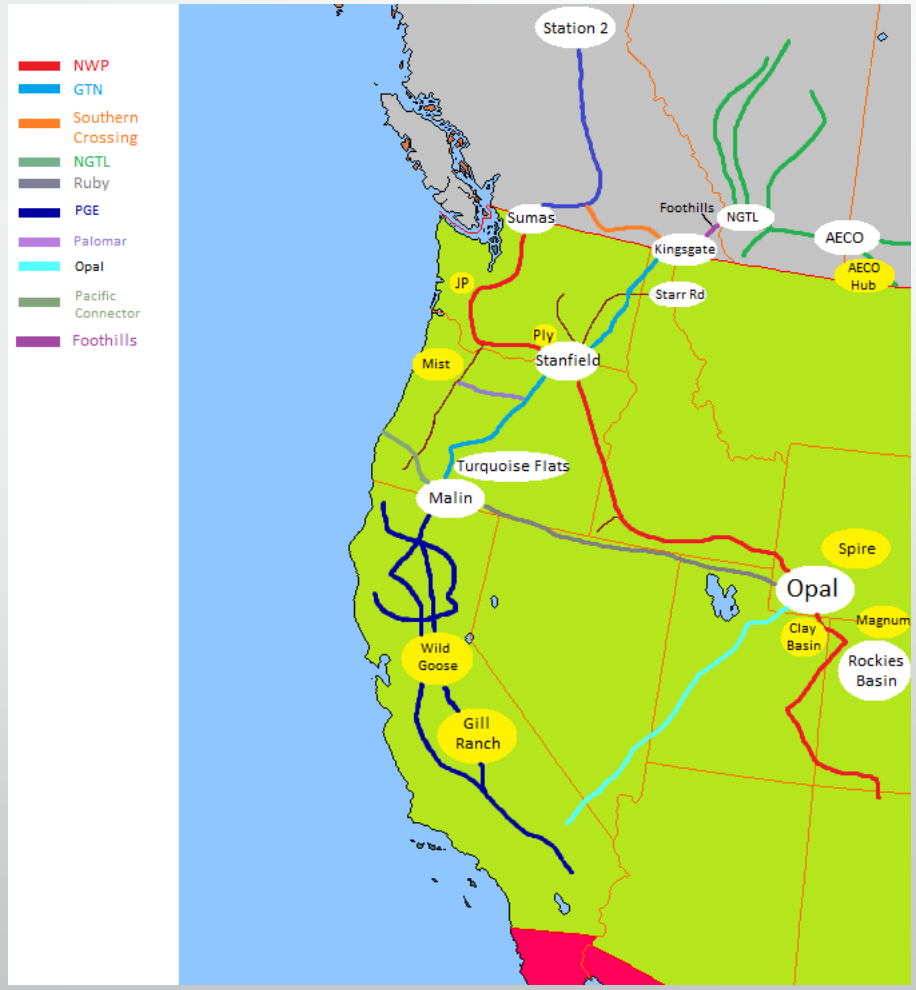
Location of Current & Alternative Resources



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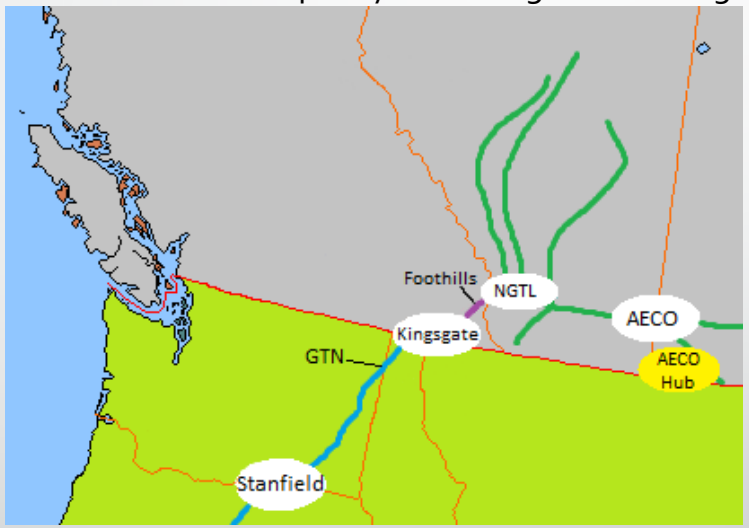
Incremental Transport – North to South

- Incremental NGTL – Additional capacity to move gas from AECO basin to Alberta/BC border
- Incremental Foothills – Additional capacity to move gas from Alberta/BC border to Kingsgate
- Incremental GTN N/S – Additional capacity to move gas from Kingsgate to various citygates along GTN



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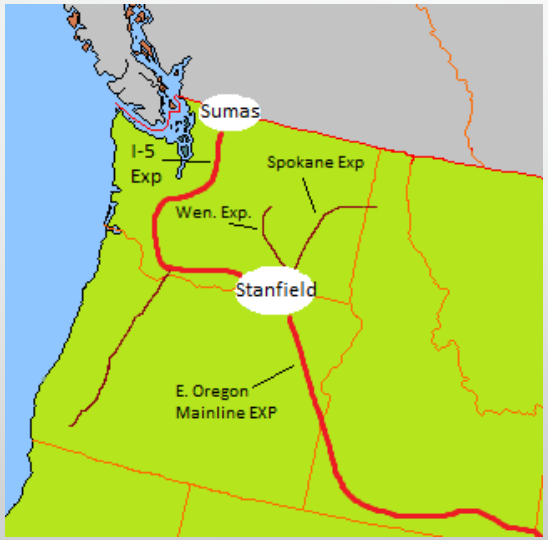
Incremental Transport – Northwest Pipeline

- I-5 Mainline Expansion – Additional capacity to move gas along I-5 corridor in western Washington
- Wenatchee Lateral Expansion – Additional capacity to move gas along Wenatchee Lateral to central Washington
- Spokane Lateral Expansion – Additional capacity to move gas along Spokane Lateral to eastern Washington
- Eastern Oregon Mainline Expansion – Additional capacity to move gas along Eastern Oregon Lateral to Oregon citygates



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Incremental Transport – South to North

- Incremental Opal– Additional capacity to move gas from Utah to Opal
- Incremental GTN S/N – Additional capacity to move gas from Turquois Flats to various citygates along GTN
- Incremental Ruby – Additional capacity to move gas from Rockies Basin to Turquoise Flats

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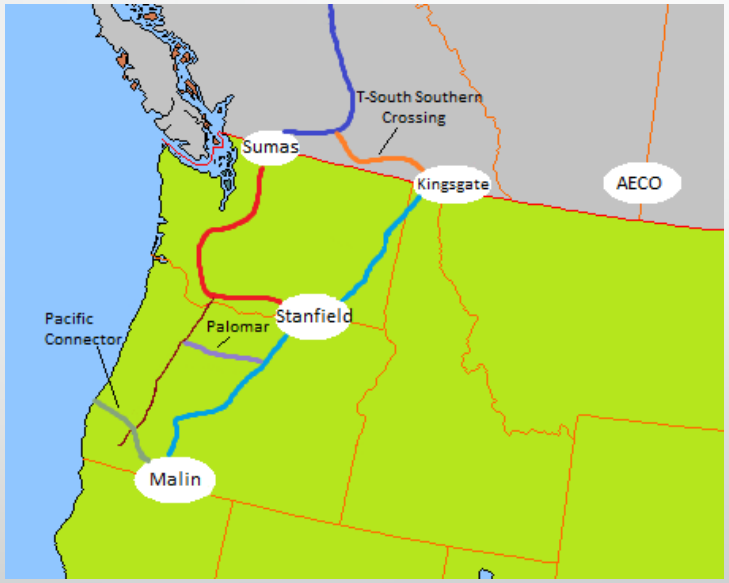
Incremental Transport – Bilateral

- T-South Southern Crossing – Price arbitrage opportunity to move gas between Sumas and AECO basins bilaterally
- Trails West (Palomar) – Additional capacity to move Rockies gas to the I-5 corridor
- Pacific Connector – Pipeline that will feed LNG facility on Oregon coast, increasing liquidity at Malin



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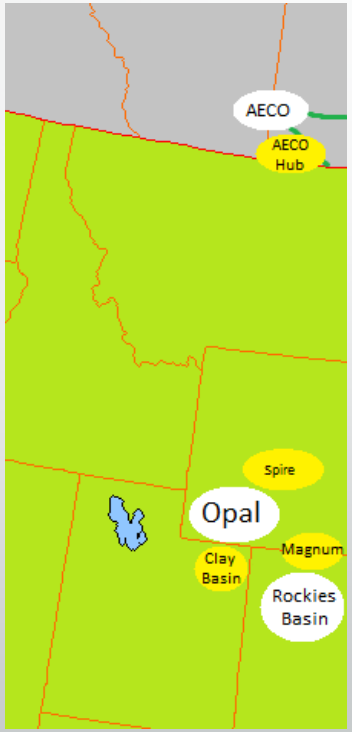
Incremental Storage - North and East

- Ryckman Creek Storage – Additional storage in southwest Wyoming serving the system, primarily Oregon
- Magnum Storage – Additional storage near Rocky Mountains, serving the system, primarily Oregon
- AECO Hub Storage – Additional storage near AECO Hub, serving the system
- Clay Basin Storage – Additional storage near Opal



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Incremental Storage - South and West

- Gill Ranch Storage – Additional storage in central California, serving the system, primarily Oregon
- Mist Storage – Additional storage in northern Oregon, serving the system, primarily Washington
- Wild Goose Storage – Additional storage in northern California, serving the system, primarily Oregon

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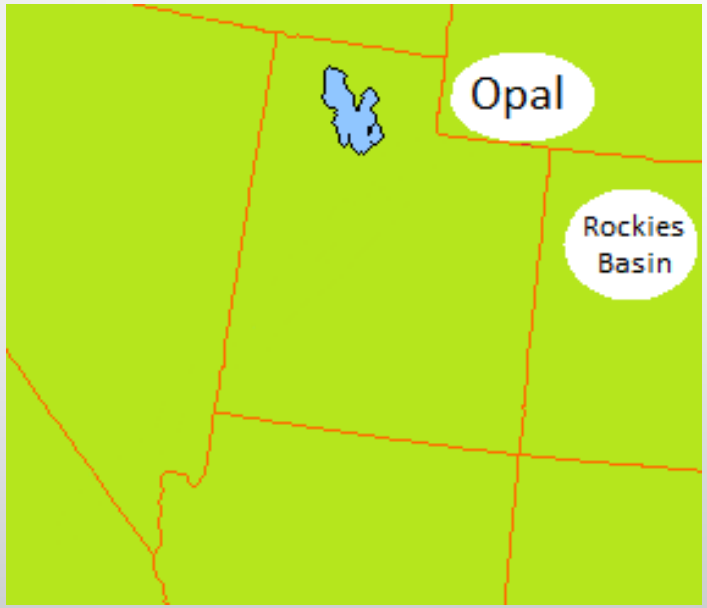
Incremental Supplies

- Incremental Opal Supply – Additional supply around the Rockies Basin
- Renewable Natural Gas – Incremental biogas supply directly to distribution system



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Price Forecast Results

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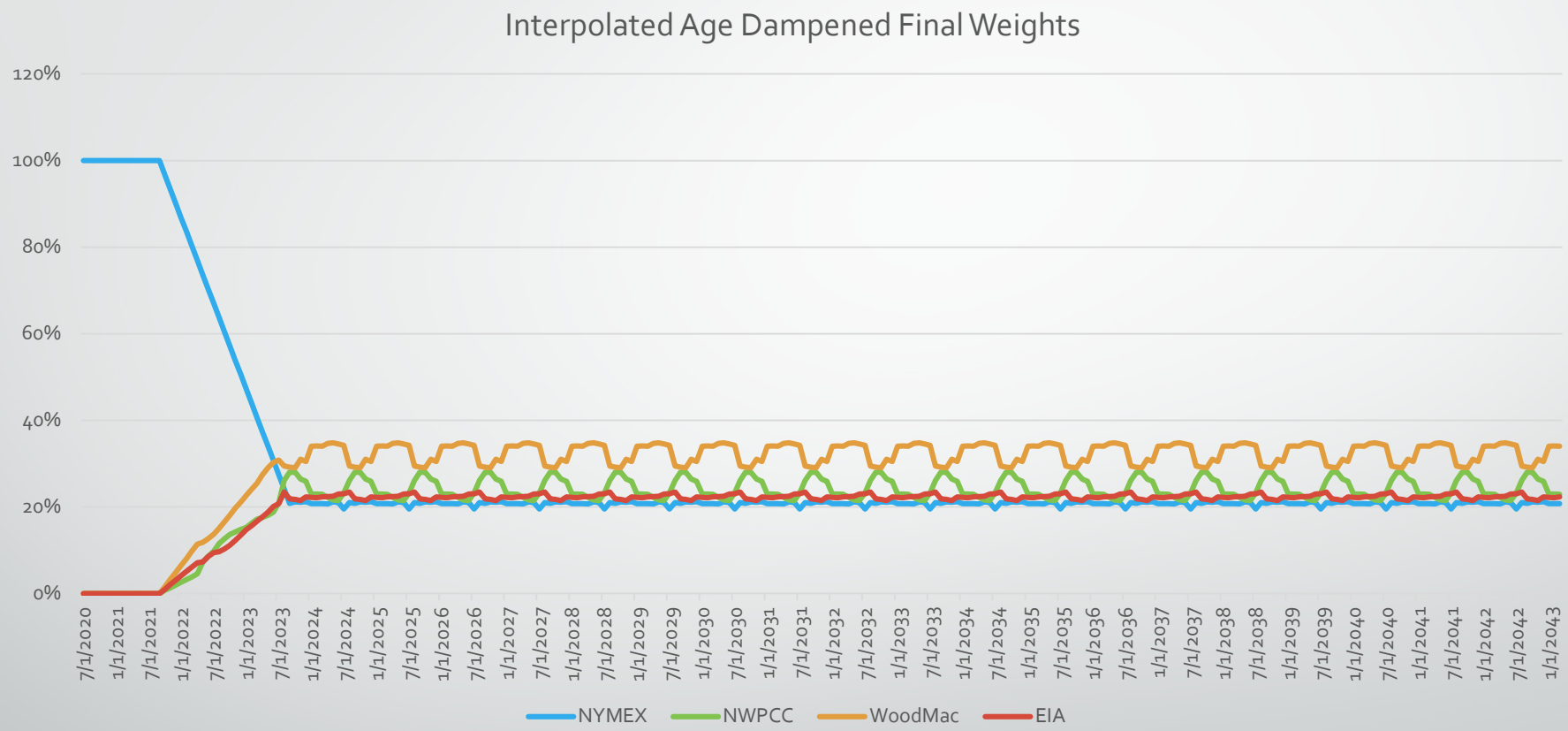

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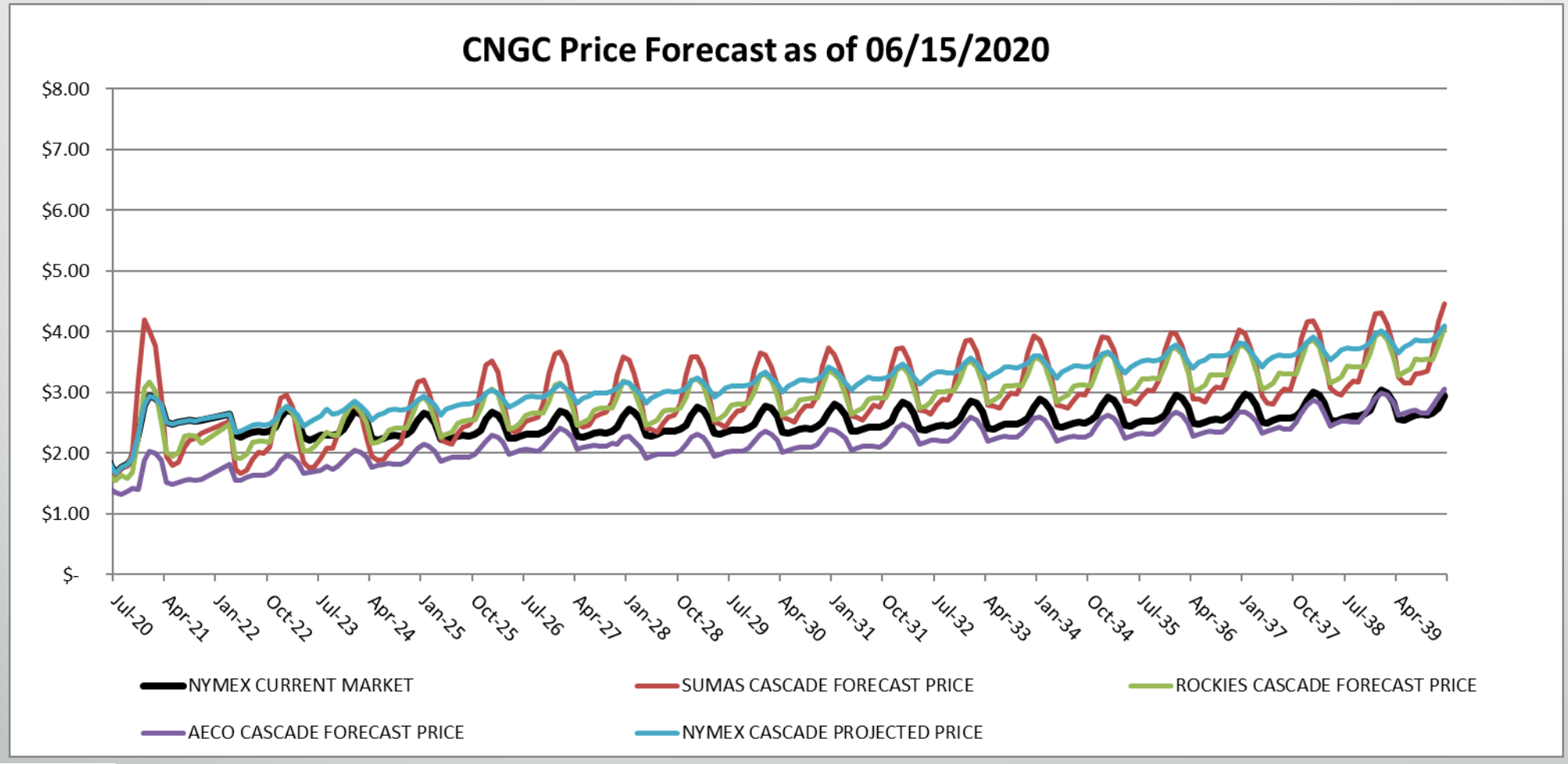

Avoided Cost Methodology and Calculation

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Avoided Cost Overview

- As part of the IRP process, Cascade produces a 20-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 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 acquiring and transporting natural gas to meet demand.

Avoided Cost Overview

- For the 2020 IRP, Cascade has continued to evolve its avoided cost formula to create a more transparent and intuitive final number.
  - Methodologies for calculating Distribution System Costs and Risk Premium have been refined.
- Cascade evaluates the impact that a range of environmental externalities, including CO_2 emission prices, would have on the avoided costs in terms of cost adders and supply costs.
- 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:

$$AC_{nominal} = TC_v + SC_v + ((CC + C_{tax}) * E_{adder}) + DSC + RP$$

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+inflation rate)^Years from the reference year.
- TC_v = Variable Transportation Costs
- SC_v = Variable Storage Costs
- CC = Commodity Costs
- C_{tax} = Carbon Tax
- E_{adder} = Environmental Adder, as recommended by the Northwest Power and Conservation Council
- DSC = Distribution System Costs
- RP = Risk Premium

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Methodology

- Transportation costs are pulled directly from the major pipelines that Cascade utilizes (NWP, GTN, Enbridge, Ruby, Nova Gas Transmission (NGTL) and Foothills).
- Storage costs are only captured if there is an avoidable future storage cost (ie. On system storage).
- Commodity Costs are taken from Cascade's 20-year price forecast.
- Risk Premium is the cost associated with hedging.
- Distribution System Costs only look at costs associated with growth. Pipeline integrity cannot be avoided.

Methodology - Carbon

- Modeling carbon compliance costs is a challenge because the future of carbon is uncertain.
- As discussed during scenarios and sensitivities, Cascade will model the impact of a variety of potential carbon pathways.
- Cascade's primary carbon forecast is the Social Cost of Carbon (SCC) forecast using a 2.5% discount rate, adjusted to real 2020 dollars. From a modeling perspective the Company does not take a stance in support or opposition of a particular carbon forecast. This complies with guidance provided in HB 1257.

Methodology – Distribution System Costs

- Cascade's distribution system costs are calculated as a function of the Company's authorized margin, weighted by the load share of each rate class.
  - Authorized margin is defined as the applicable cost of service including authorized rate of return.
- The weighted margin number is then multiplied by the percentage of projects of Cascade budgeted projects specifically related to growth.
- Since Avoided Cost is based on peak day, the margin calculation is then multiplied by the ratio of peak day demand to an average day's demand to get the margin 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.

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Example of Distribution Cost Calculation

Data Item	Value
Weighted Margin (Dth)	0.084967
* Growth Share (37%)	0.031438
*Peak Day Impact (Peak Demand/Average Demand)	0.119075
*Peak Hour Impact (Peak Hour/Peak Day Demand)	0.006112

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Methodology – Risk Premium

- Cascade defines risk premium as the additional cost the Company would have to pay for a fixed price to fully hedge its portfolio versus open market FOM prices.
- Theoretical fixed pricing comes from the company's Asset Management Agreement (AMA) Partner, Tenaska Marketing Ventures.
- Pricing is received at all three basins Cascade purchases gas from, and then blended based on expected supply needs at the basins.
- Following regional best practices, if this value is negative the Company records the risk premium as zero, as described in the following table.

2020 Avoided Cost Risk Premium

Year #	Calendar Year	Risk Reduction Value (Real $/Dth)
1	2020	-$0.159
2	2021	-$0.139
3	2022	-$0.108
4	2023	-$0.067
5	2024	-$0.104
6	2025	-$0.245
7	2026	-$0.301
8	2027	-$0.221
9	2028	-$0.109
10	2029	-$0.078
11	2030	-$0.105
12	2031	-$0.069
13	2032	$0.000
14	2033	-$0.001
15	2034	-$0.016
16	2035	-$0.030
17	2036	-$0.057
18	2037	-$0.141
19	2038	-$0.459
20	2039	-$0.304

Avoided Cost - Conclusion

- Cascade is continuing to improve its avoided cost calculation with enhancements to its distribution system and risk premium cost calculations
- Cascade's resource planning team will be providing its avoided cost figures to the Company's energy efficiency team, who will be sending back a conservation potential assessment based on these inputs.

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2020 IRP Remaining Schedule

Date (Subject to change)	Process Element	Location (Subject to change)
Wednesday, June 17, 2020	TAG 3 slides distributed to stakeholders	
Wednesday, June 24, 2020	**TAG 3: Distribution System Planning, Planned Scenarios and Sensitivities, Alternative Resources, Price Forecast, Avoided Costs, Current Supply Resources, Transport Issues.**	**Teleconference Only**
Wednesday, August 5, 2020	TAG 4 slides distributed to stakeholders	
Wednesday, August 12, 2020	**TAG 4 Carbon Impacts, Energy Efficiency, Bio-Natural Gas, Preliminary Resource Integration Results.**	**Community Service Room in Bellingham, WA - 9 am to 3 pm**
Wednesday, September 16, 2020	TAG 5 slides distributed to stakeholders	
Wednesday, September 23, 2020	**TAG 5: Final Integration Results, finalization of plan components, Proposed new 4-year Action Plan.**	**SeaTac Airport - 9 am to 12 pm**
Tuesday, November 17, 2020	Draft of 2020 WA IRP distributed	
Wednesday, December 23, 2020	Comments due on draft from all stakeholders	
Wednesday, January 27, 2021	TAG 6, if needed	WebEx Only
Friday, February 26, 2021	IRP filing in Washington	

ADDITIONAL QUESTIONS?

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Bruce Folsom - Consultant

Cascade Natural Gas Corporation

2020 Integrated Resource Plan

Technical Advisory Group Meeting #3

Wednesday, June 24th, 2020

Microsoft Teams Meeting

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