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November 5, 2019

MEMORANDUM

TO: Council Members

FROM: Steven Simmons

SUBJECT: Natural Gas Price Forecast for the 2021 Power Plan

BACKGROUND:

Presenter: Steven Simmons

Summary: This presentation will summarize recently completed work on the natural gas price forecast in preparation of the 2021 Power Plan. Gas prices for the next three to five years are expected to remain relatively low and stable as a result of an abundant and diverse supply. There is less certainty around long-term prices.

Growth in the consumption of natural gas for power generation is expected to continue as a result of low prices undercutting coal, and coal retirements across the West. Growth in the export LNG market is also expected as more facilities come on-line in the Southeastern US, and possibly British Columbia.

Relevance: Natural gas prices are a key input to many of the models and analyses used to develop the power plan. The price forecast for gas has an especially strong influence on the forecast of electricity prices and generation resource expansion decisions.

Workplan: A.3.3 Produce Natural Gas Price Forecast for the 2021 Power Plan

Background: Roughly every two years, the Council publishes a long-term natural gas price forecast that includes a medium, low and high price view for regional gas hubs. The Council's price forecast is developed from a combination of quantitative and qualitative analysis and is directly influenced by the input from the Natural Gas Advisory Committee (NGAC). This forecasting cycle provides the input for the 2021 Power Plan.

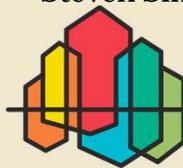
More Info: Recent gas-related presentations and NGAC
<https://www.nwcouncil.org/energy/energy-advisory-committees/natural-gas-advisory-committee>
https://www.nwcouncil.org/sites/default/files/2019_0507_p2.pdf
https://www.nwcouncil.org/sites/default/files/2018_1009_p3.pdf
https://www.nwcouncil.org/sites/default/files/2018_1113_5.pdf
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Natural Gas Price Forecast for the 2021 Power Plan

Power Committee 11/12/2019

Portland, Oregon

Steven Simmons



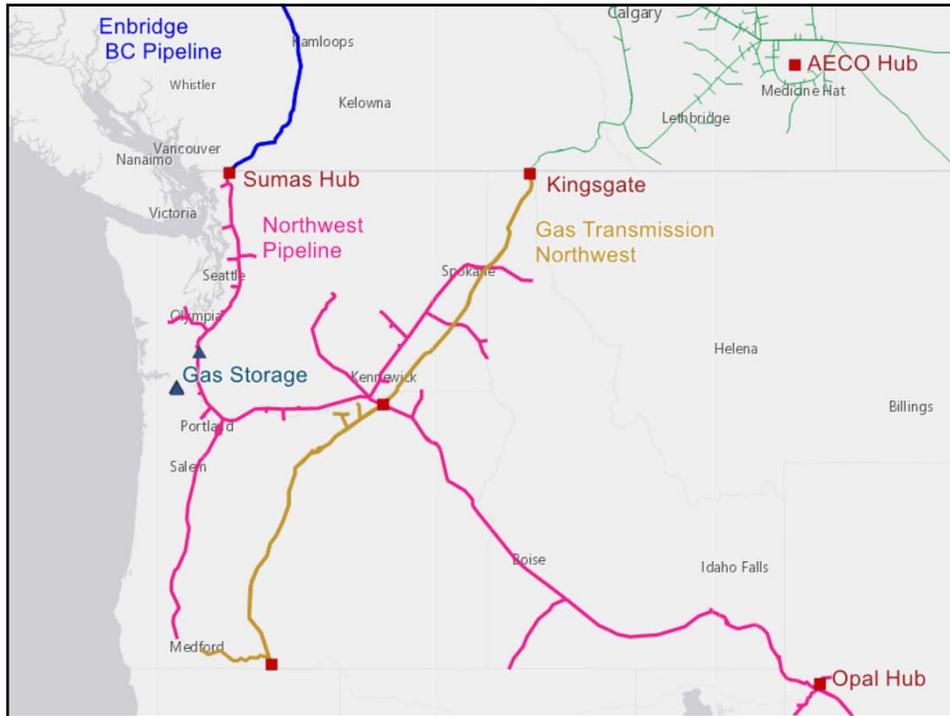
THE 2021
NORTHWEST
POWER PLAN
FOR A SECURE & AFFORDABLE
ENERGY FUTURE

Agenda

1. Background & upcoming work
2. Fundamentals
3. Forecast of Prices
4. Wrap up



THE 2021
NORTHWEST
POWER PLAN



Northwest Natural Gas System

Williams Northwest Pipeline

- Brings gas supply from BC & AB into Washington & Oregon along I-5 corridor - Winter import flows around 1,150 mmcf/day
- Largest shipper is Puget Sound Energy
- 26 gas plants – 19 on West side
- Jackson Prairie Storage Facility – largest gas storage in the Northwest (Mist Storage nearby too)
- Also interconnects with GTN, and connects to US Rockies gas supply

TransCanada Gas Transmission Northwest (GTN)

- Brings gas supply from Alberta into the Northwest and California – Winter import flows around 2,150 mmcf/day
- Largest shipper is Pacific Gas & Electric, other major shippers include Portland General Electric and Avista
- 10 gas plants - all on East side
- Plymouth peak shaving LNG on the system



Natural Gas Price Forecast Overview

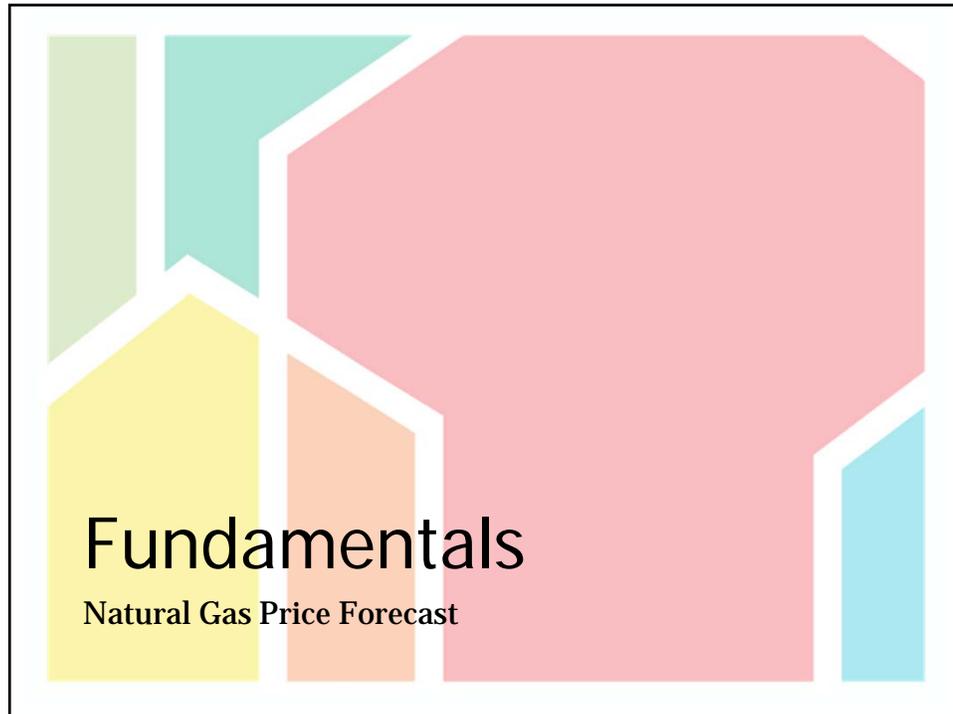
1. Forecast of monthly natural gas prices at hubs in the Northwest and other select Western hubs across the 20 year planning horizon
2. Generally the forecast is done every one to two years - the previous forecast was for the 7th Plan Mid Term
3. The Natural Gas Advisory met in June of this year – the forecast presented today is a result from that meeting
4. The forecast includes a defined range of prices
High – Medium – Low
5. Price volatility is introduced downstream in the planning process in the Regional Portfolio Model RPM



Preview of Upcoming work

1. Price and Forecast History Project
2. Upstream methane emissions
3. Price volatility and Council modeling
4. Renewable Natural Gas (RNG) and low carbon futures

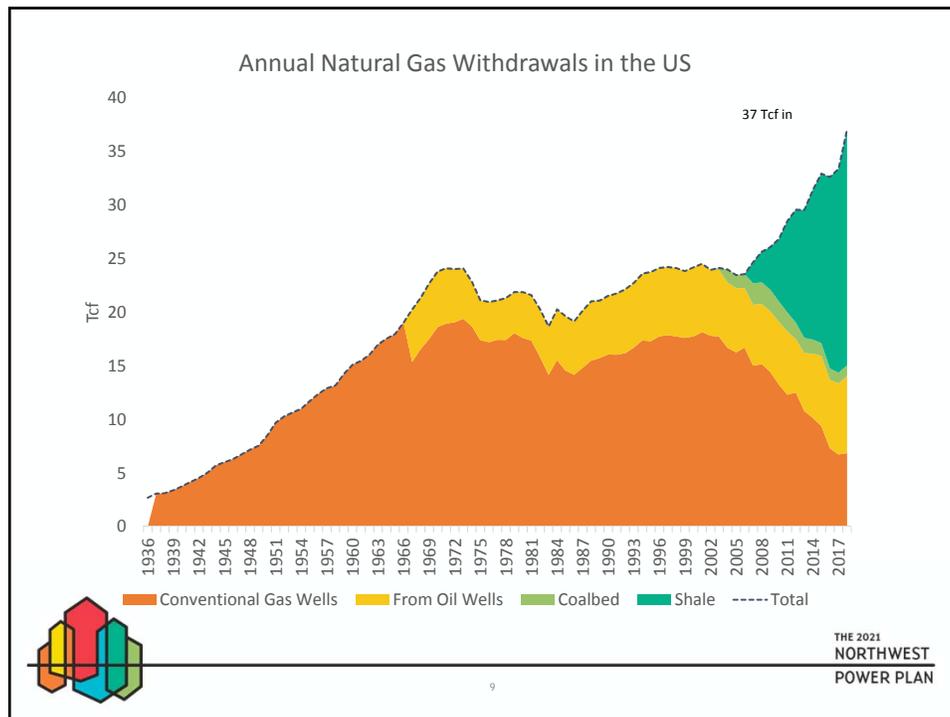




Natural Gas Fundamentals

1. **Supply** – increasing production from shale and abundant future supply
2. **Demand** – increasing in power sector, fairly flat in other sectors
3. **Imports from Canada to NW** steady
4. **LNG exports from US to world market** is growing
5. **Prices** – are low though may be more volatile moving forward





Natural Gas Supply - US

Potential Gas Committee

- Group of industry professionals that convene every two years to assess the future gas supply in the US
- The assessment includes an estimate of the technically recoverable resource base (includes probable, possible, and speculative), does not consider price or schedules for discovery and production
- 2018 Study – 3,374 Tcf natural gas
- Add in the EIA proven reserves estimate (464 Tcf) – and you get 3,828 Tcf



Natural Gas Supply

To put 3,828 Tcf in perspective

1. Cumulative withdrawals since 1936 are 1,552 Tcf
2. 2018 gas withdrawals were at 37 Tcf – an all time high
3. At this rate – that is 103 years of gas



11

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Natural Gas Supply - Canada

1. Canada is the world's 4th largest producer
2. Current production is around 6 Tcf – mostly from the provinces of British Columbia and Alberta
3. Proven reserves - 69 Tcf
4. Current estimate of technically recoverable gas – 1,220 Tcf



12

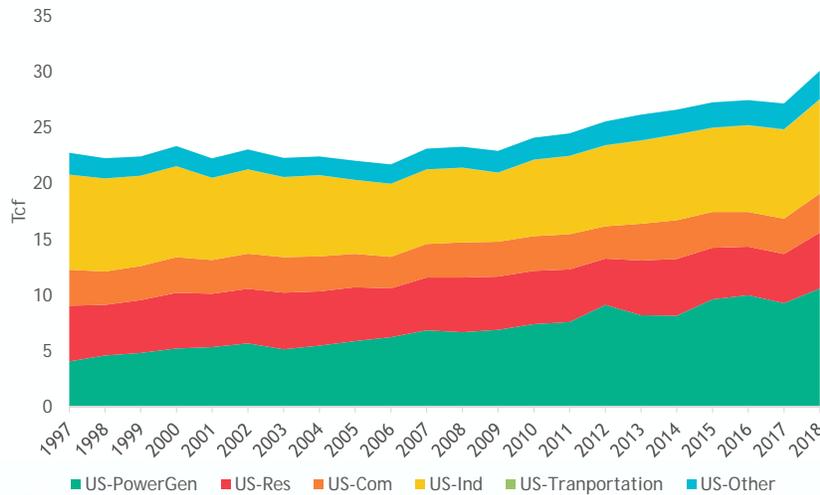
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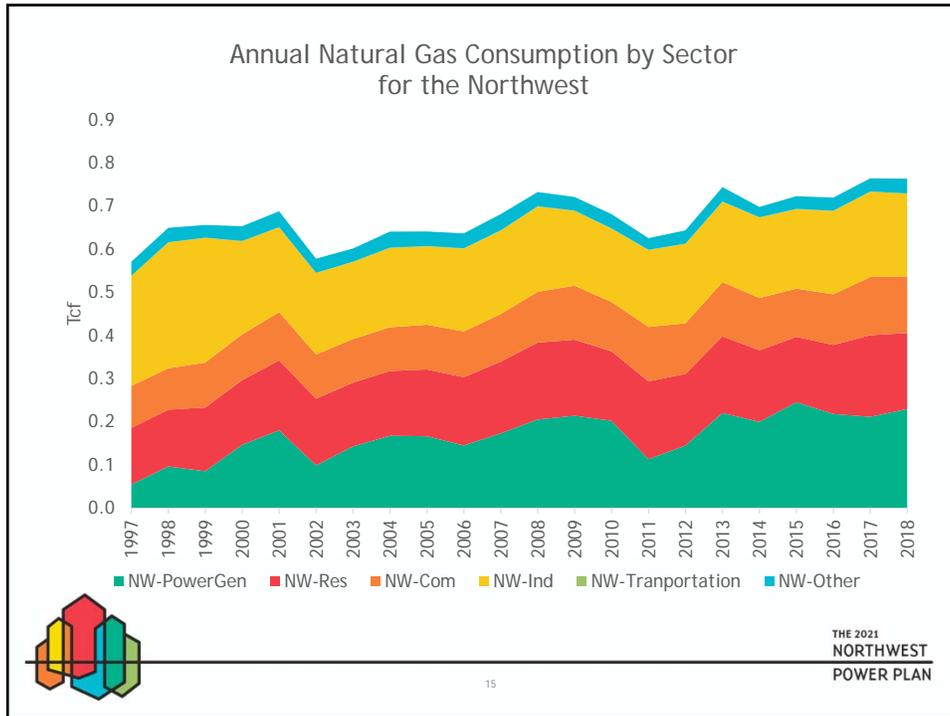
Natural Gas Consumption

1. Overall gas consumption in the US and in the Northwest has been increasing
2. Most of the growth for gas is coming from the power sector
3. The share of overall gas that is flowing to the power sector is increasing – growing interdependence between the gas supply system and the electrical power grid

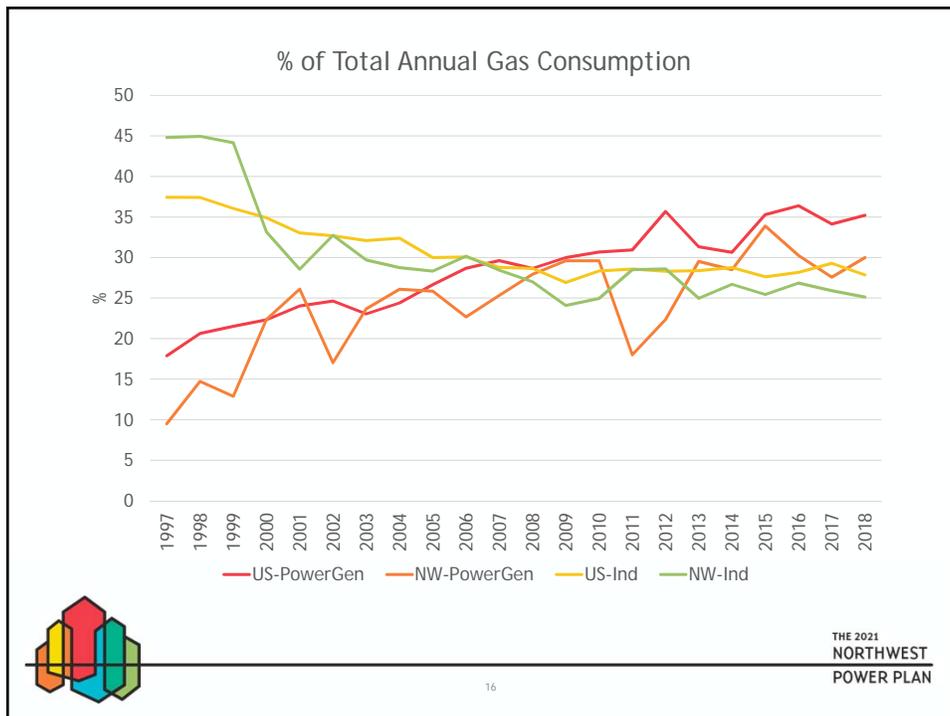


Annual Natural Gas Consumption by Sector for the US

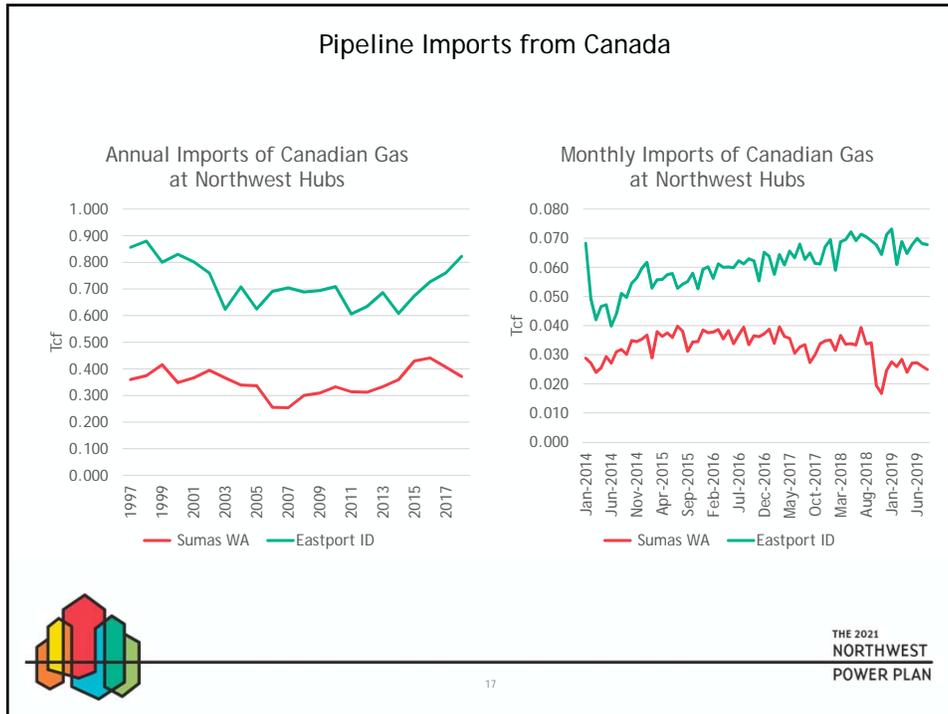




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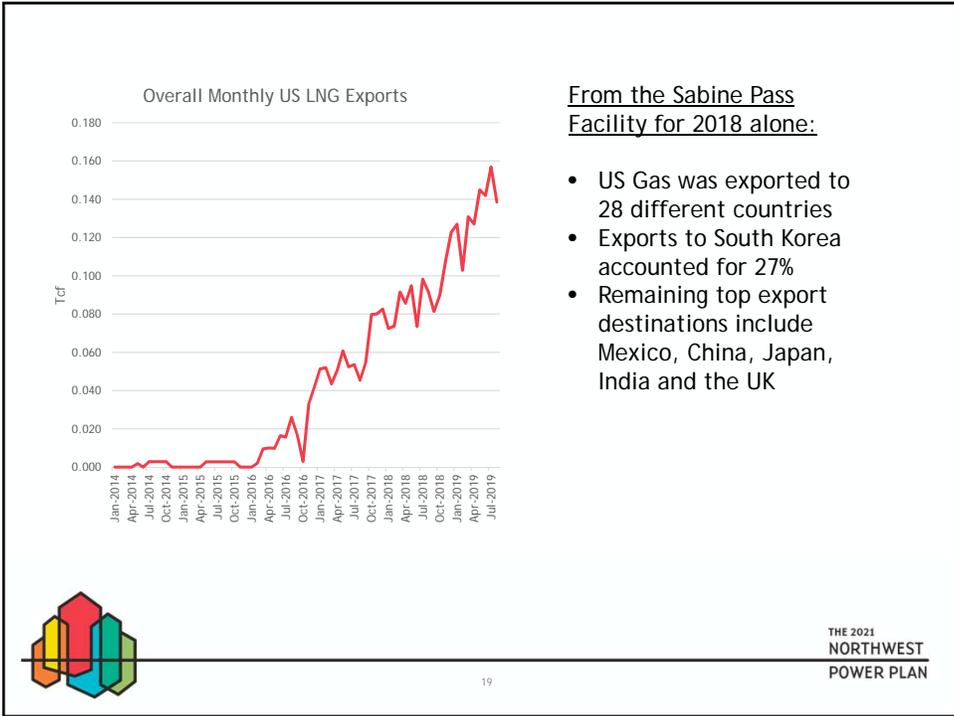
16



- ## LNG Exports
1. US Liquefied Natural Gas exports continue to grow at a rapid pace
 2. There are 4 large export facilities in operation now (in LA, TX, MD) and 2 more coming on-line this year (TX, GA)
 3. The US is now the 3rd largest LNG exporter in the world – behind Australia and Qatar
 4. Canada has 1 LNG export facility in operation (New Brunswick), but 13 proposed for British Columbia alone
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18

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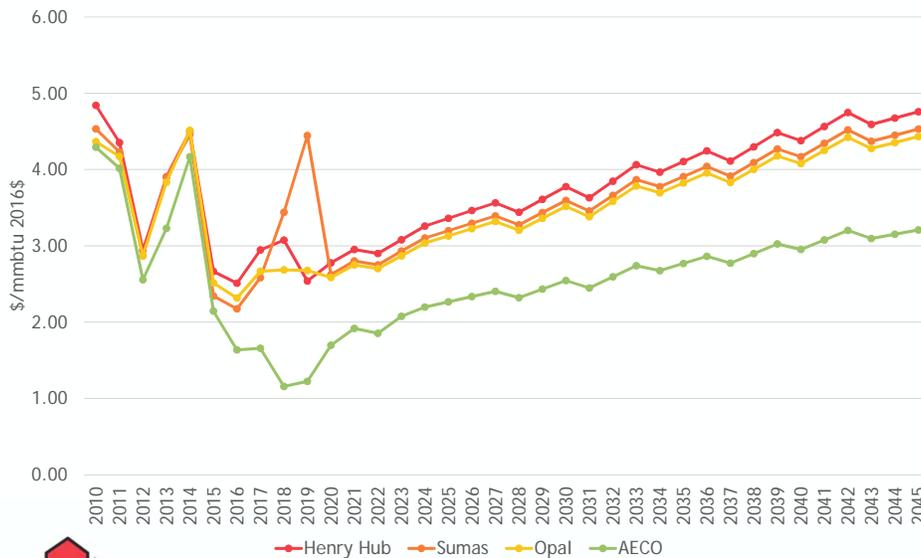


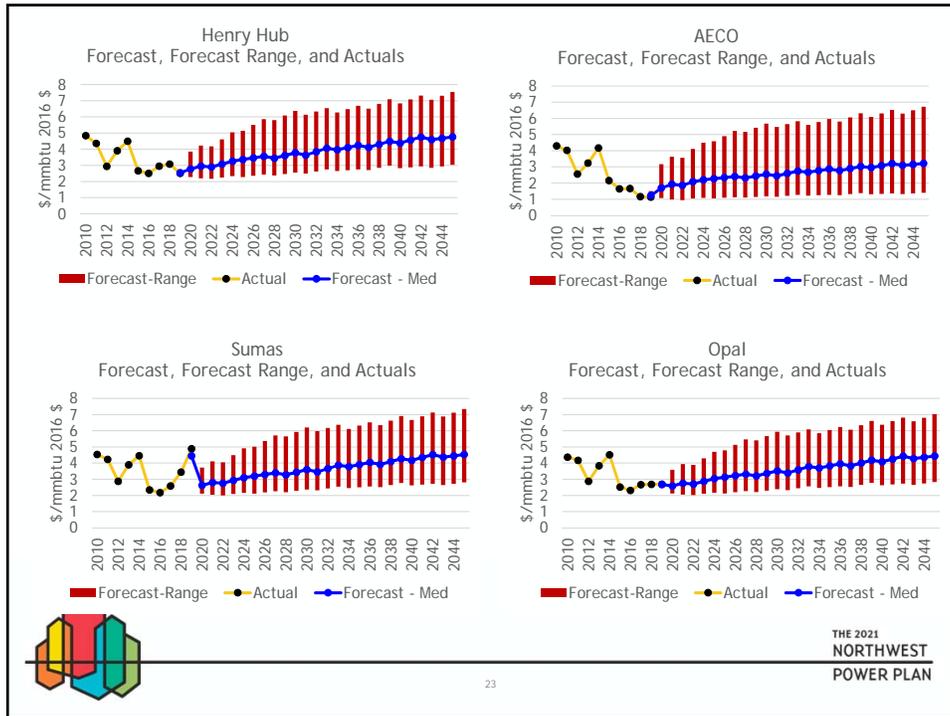
Methodology

1. Prior to NGAC (June 3, 2019) meeting, the members were surveyed for their views on future gas prices - the results were compiled anonymously
2. Other price data sets are rolled in, like the EIA, CEC, and Global Insight forecasts
3. A proposed forecast for Henry Hub is developed and provided as a starting point for discussion
4. A more finely tuned, monthly forecast for regional hubs and other western hubs is developed – both quantitatively and using forecast “art” and judgment
5. What begins as a consensus driven, single hub annual forecast is expanded into an encompassing quantitative price forecast for the region
6. Finally – hub prices are moved to delivered prices for the Council planning models

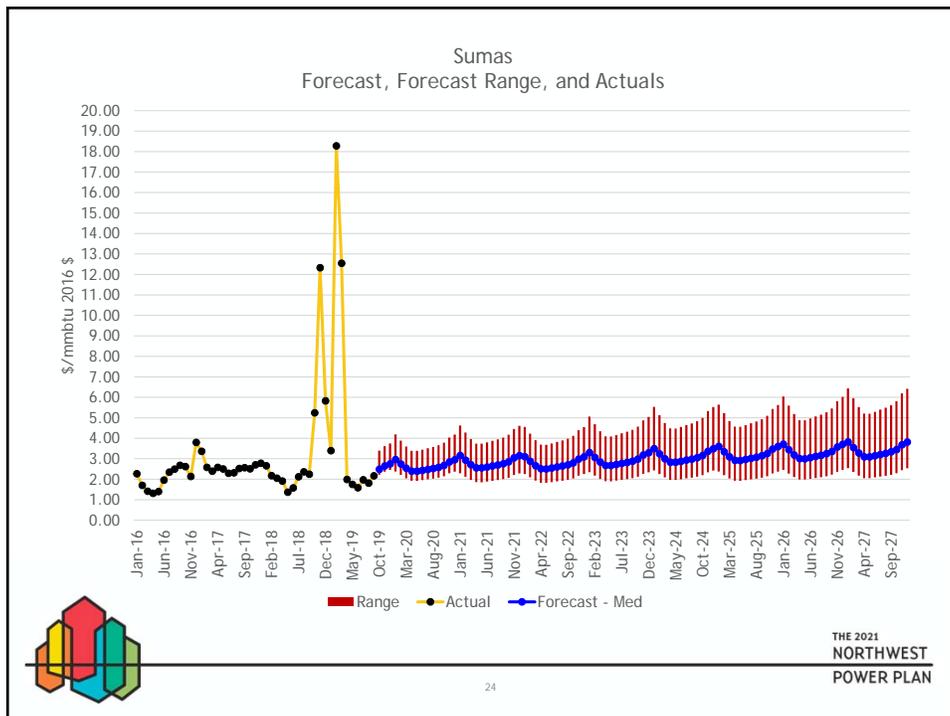


Annual Natural Gas Price Forecast by Hub

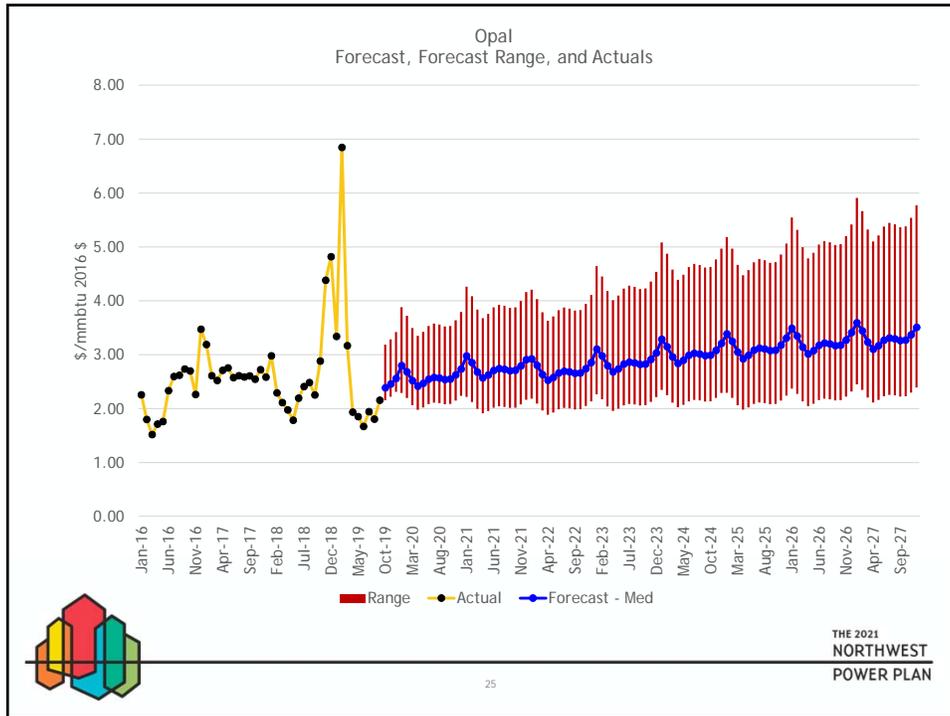




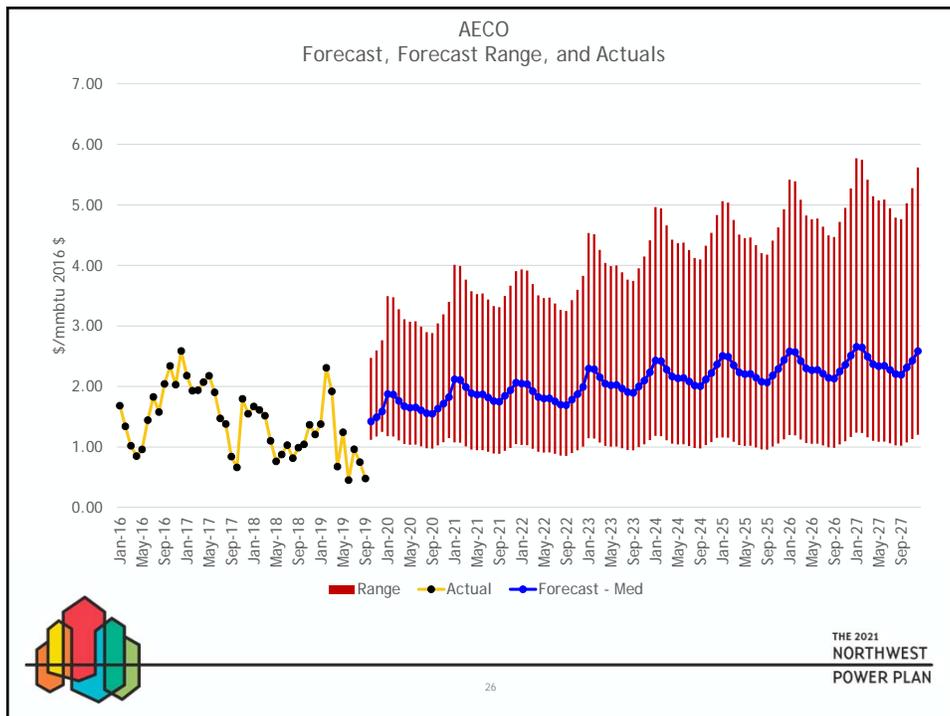
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24



25



26

Delivered Prices

1. A gas delivery cost model was built up using historic purchased gas volumes and costs
Maps specific regional power plants to specific pipelines and pipeline rates, and supply hub mixes (Sumas, AECO, Stanfield, Opal)
2. The forecast of hub prices are then used to develop a forecast of delivered prices to the plant – broken out by East and West



Other topics, issues from the NGAC

1. RNG opportunities may be opportunistic – such as a dairy farm near a pipeline. Over time could eventually get to around 5% to maybe 8% of natural gas consumption
2. Fugitive methane emissions may be lower in BC Canada than in US
3. Suggestion to incorporate prices at Stanfield into delivered price calculations
4. Awaiting the Canadian Transportation Safety Board report on the Enbridge BC Pipeline rupture – concerns over stress corrosion cracking
5. Concern around pipeline capacity being tight, and limited ability for expansion - moving forward, potential for more volatile regional pricing
6. Some potential pressures for higher natural gas prices - electric vehicle transformation reducing oil drilling – reducing associated gas, along with coal retirements and LNG exports



Questions

