



2018 Avista Natural Gas IRP

Technical Advisory Committee Meeting
February 22, 2018
Spokane, WA

Agenda

Time	Length	Topic
9:30 AM	<i>10 minutes</i>	Introductions & Logistics
9:40 AM	<i>10 minutes</i>	Safety Moment
9:50 AM	<i>30 minutes</i>	Weather Analysis
10:20 AM	<i>60 minutes</i>	Market dynamics
11:20 AM	<i>10 minutes</i>	break
11:30 AM	<i>30 minutes</i>	Procurement Planning
12:00 PM	<i>60 minutes</i>	Lunch
1:00 PM	<i>30 minutes</i>	Emissions and Clean Air Rule
1:30 PM	<i>30 minutes</i>	Carbon policies
2:00 PM	<i>45 minutes</i>	Price forecasts and Carbon Adders
2:45 PM	<i>15 minutes</i>	wrap-up

2018 IRP Timeline

- **August 31, 2017** – Work Plan filed with WUTC
- **January through May 2018** – Technical Advisory Committee meetings. Meeting topics will include:
 - **TAC 1: Thursday, January 25, 2018: TAC meeting expectations, review of 2016 IRP acknowledgement letters, customer forecast, and demand-side management (DSM) update.**
 - **TAC 2: Thursday, February 22, 2018: Weather analysis, environmental policies, market dynamics, price forecasts, cost of carbon.**
 - **TAC 3: Thursday, March 29, 2018** : Distribution, supply-side resources overview, overview of the major interstate pipelines, RNG overview and future potential resources.
 - **TAC 4: Thursday, May 10, 2018: DSM results, stochastic modeling and supply-side options, final portfolio results, and 2020 Action Items.**
- **June 1, 2018** – Draft of IRP document to TAC
- **June 29, 2018** – Comments on draft due back to Avista
- **July 2018** – TAC final review meeting (if necessary)
- **August 31, 2018** – File finalized IRP document

Safety Moment

- Cold Weather Slips



Weather Analysis

Kaylene Schultz

Planning Standard Assumptions

Area	Coldest in 20 Year HDD	Coldest on Record HDD
WA-ID	76	82
Klamath Falls	72	72
La Grande	74	74
Medford	54	61
Roseburg	48	55

Coldest on Record Dates

WA/ID – December 30, 1968

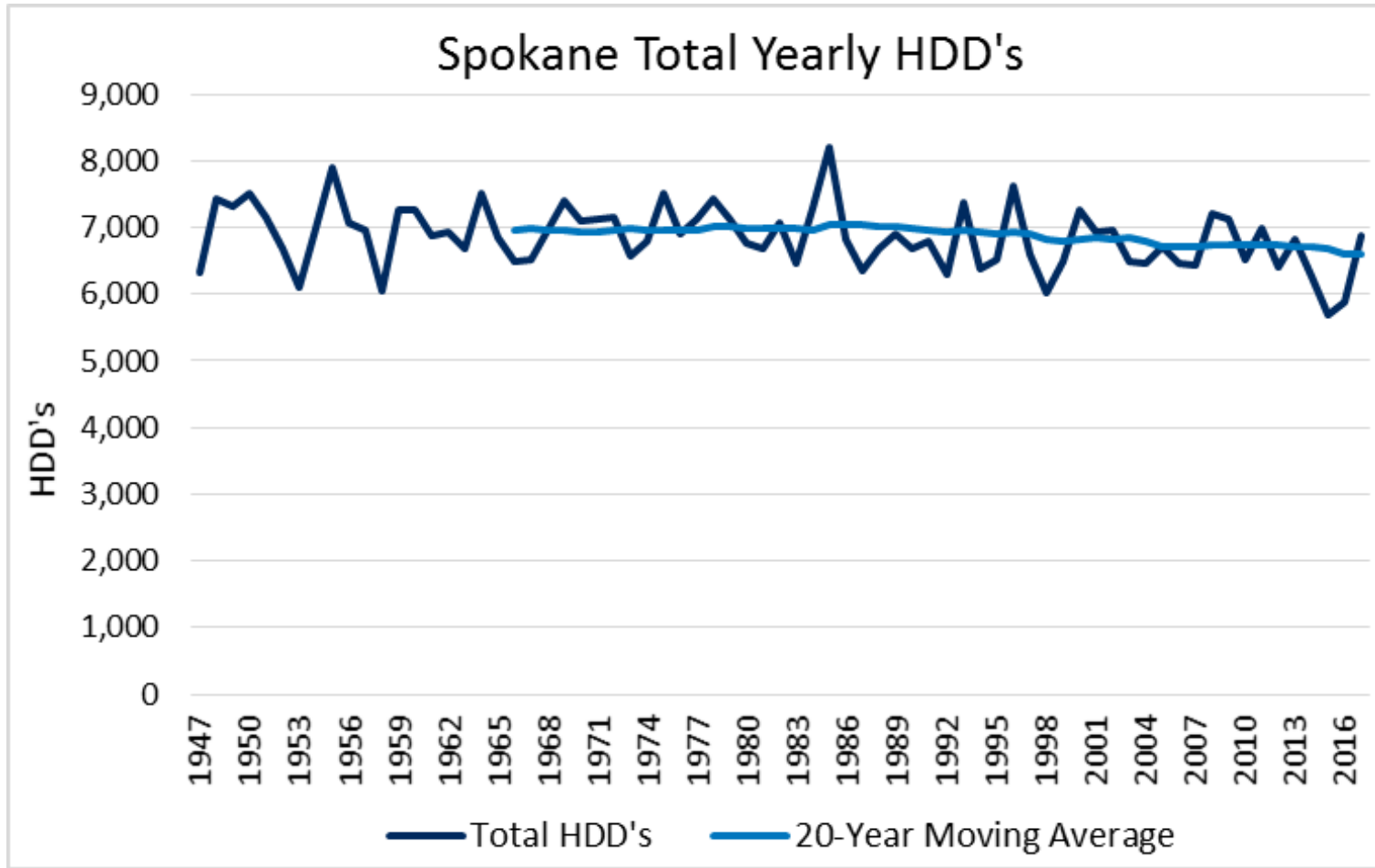
Medford – December 9, 1972

Roseburg – December 22, 1990

Klamath Falls – December 8, 2013

La Grande – December 23, 1983

Spokane

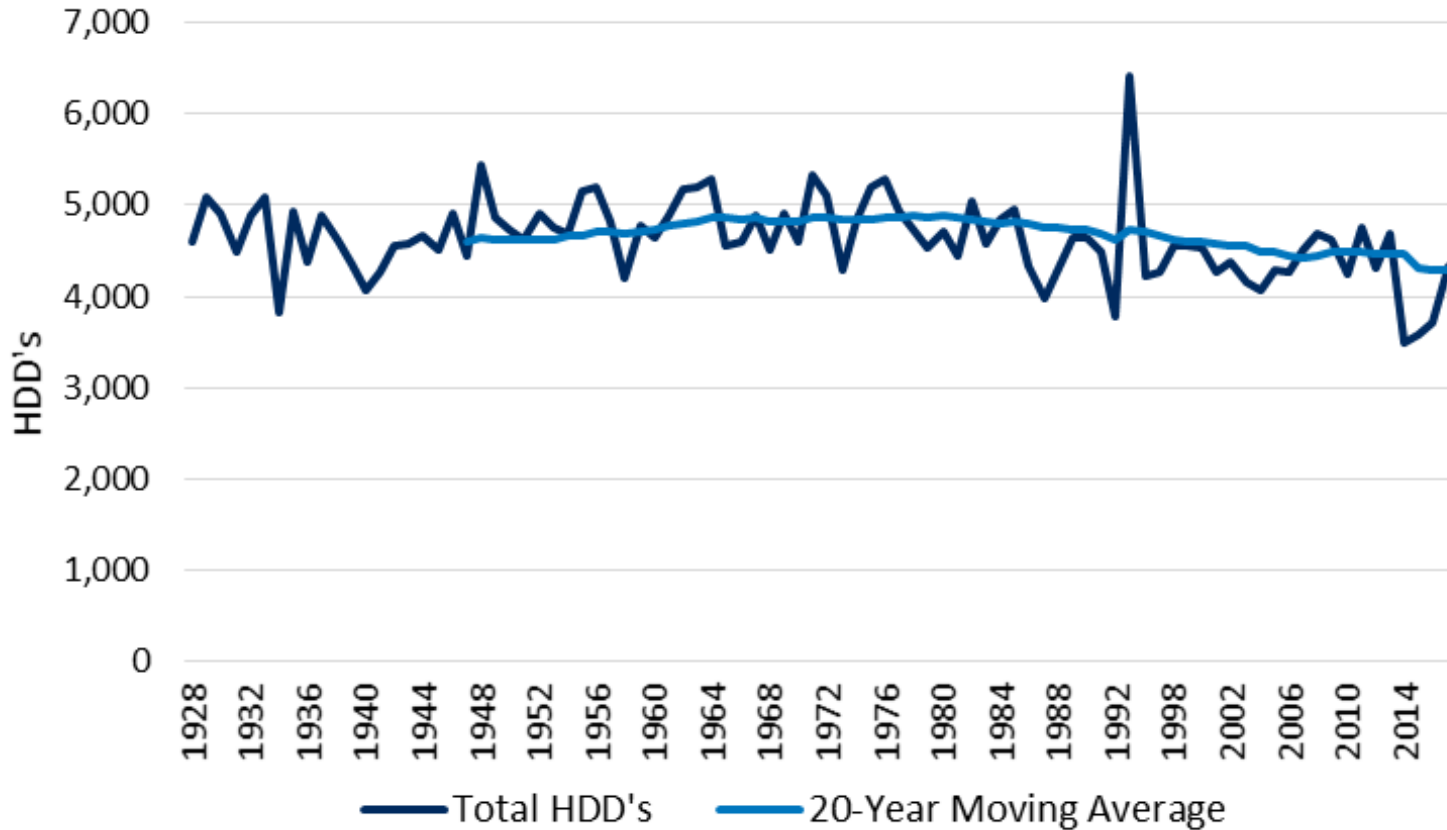


	HDD's
Min	5,681
Max	8,215
Avg.	6,853
Stdev	465
2017	6,875

*1947 - 2017

Medford

Medford Total Yearly HDD's

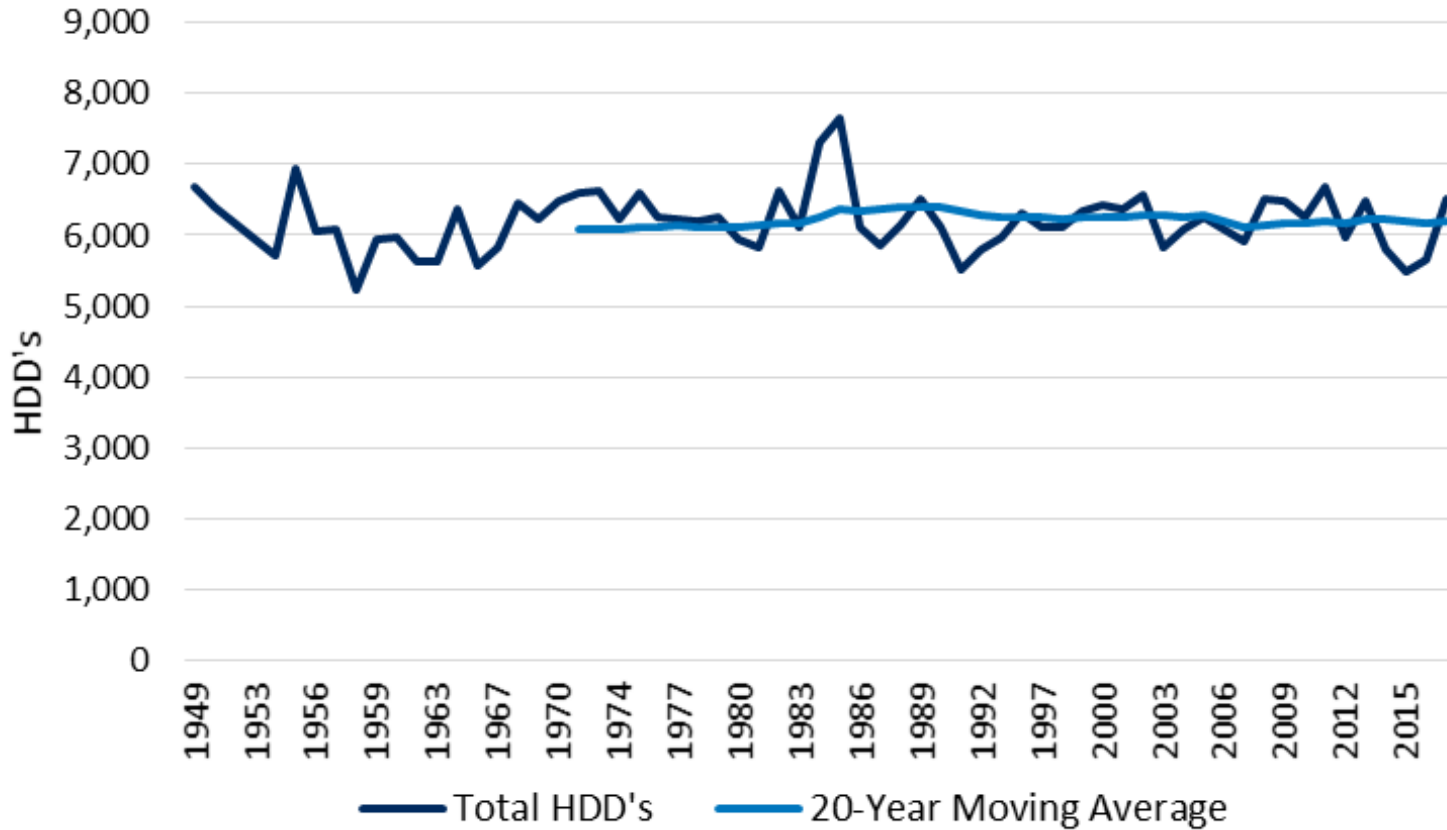


	HDD's
Min	3,482
Max	6,414
Avg.	4,629
Stdev	435
2017	4,325

*1928 - 2017

La Grande

La Grande Total Yearly HDD's

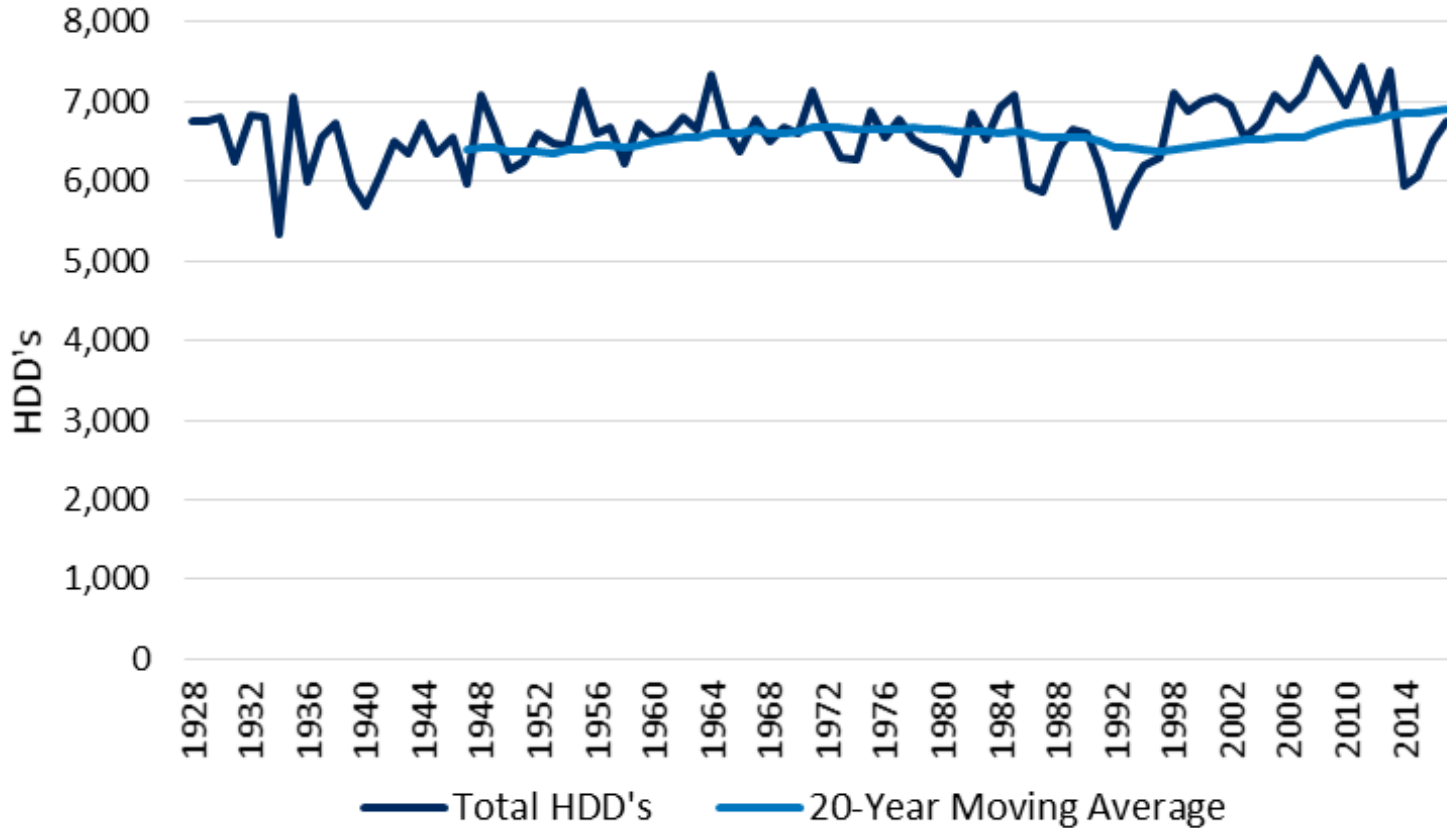


	HDD's
Min	5,224
Max	7,656
Avg.	6,192
Stdev	416
2017	6,507

*1949 - 2017

Klamath Falls

Klamath Falls Total Yearly HDD's

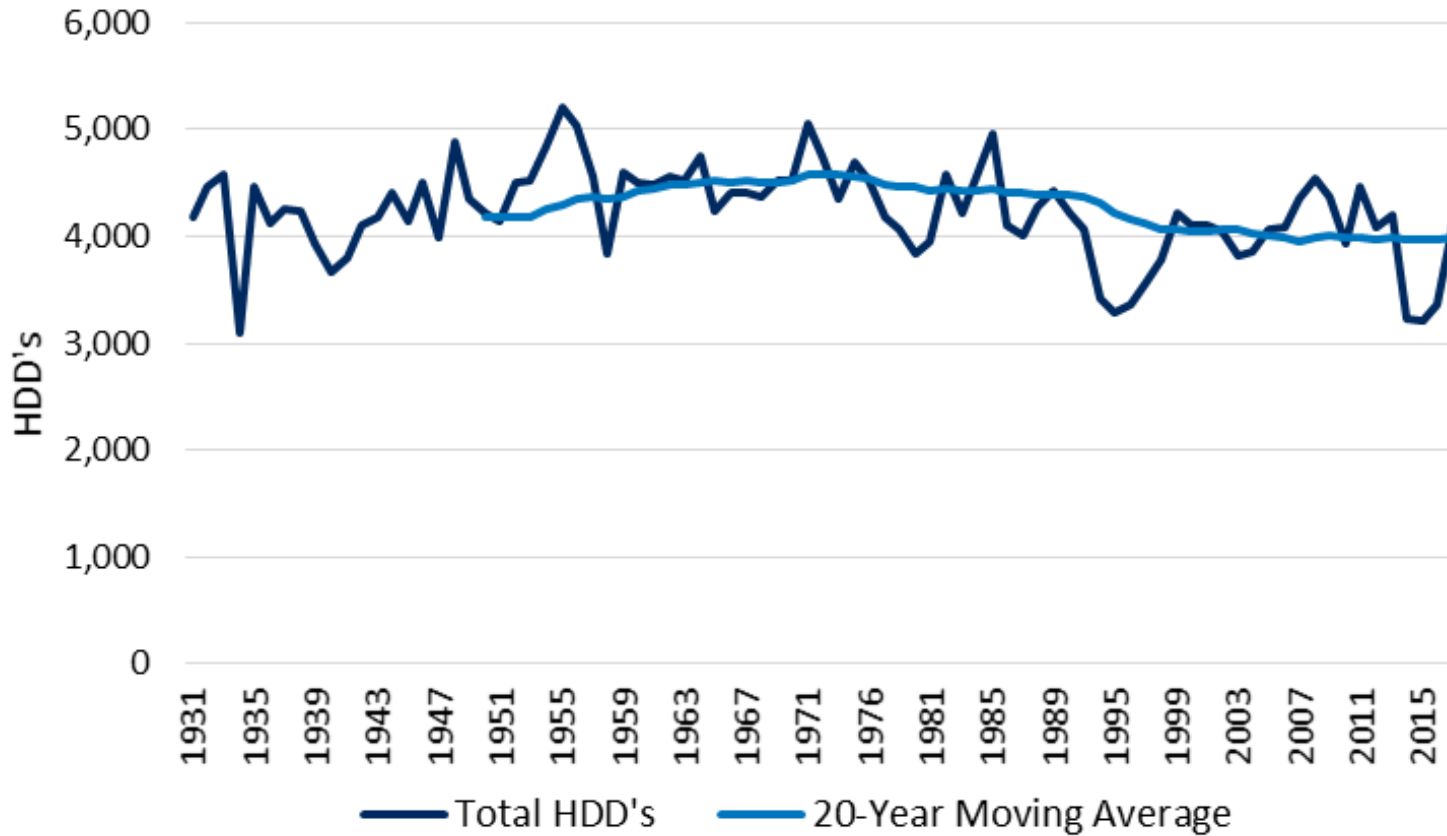


	HDD's
Min	5,334
Max	7,548
Avg.	6,584
Stdev	426
2017	6,760

*1928 - 2017

Roseburg

Roseburg Total Yearly HDD's



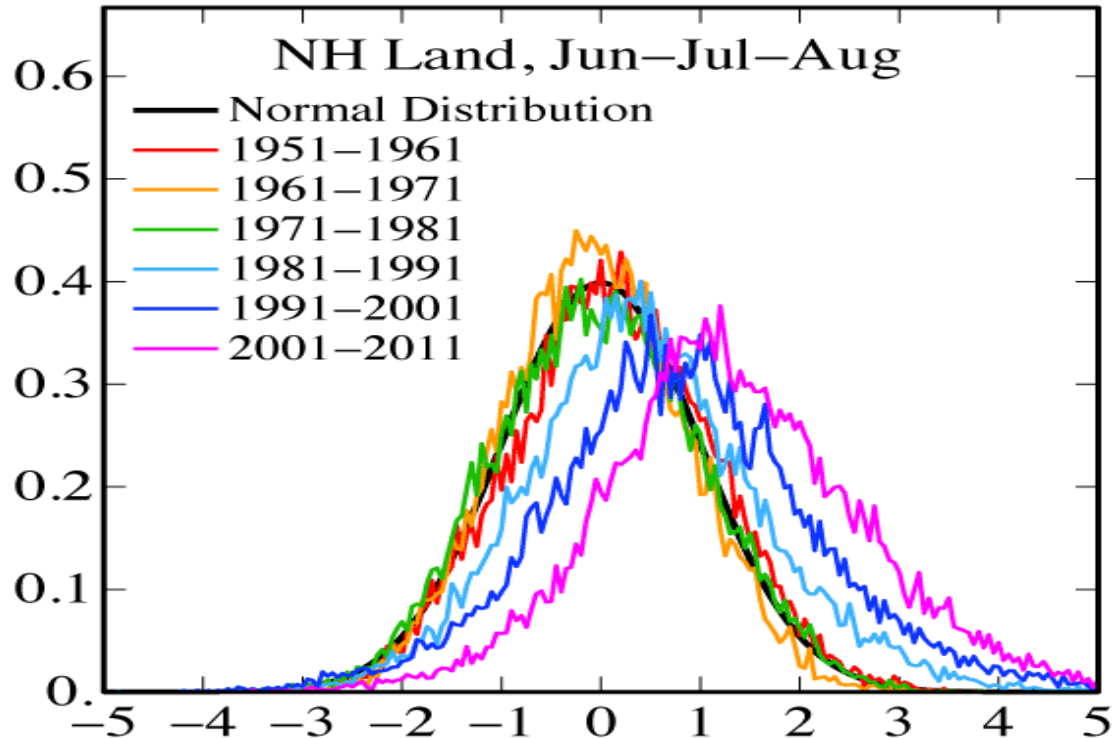
	HDD's
Min	3,100
Max	5,213
Avg.	4,224
Stdev	426
2017	4,123

*1931 - 2017

Temperature Anomaly Distribution

NASA Temperature Anomaly Distribution for Northern Hemisphere

Temperature Anomaly Distribution



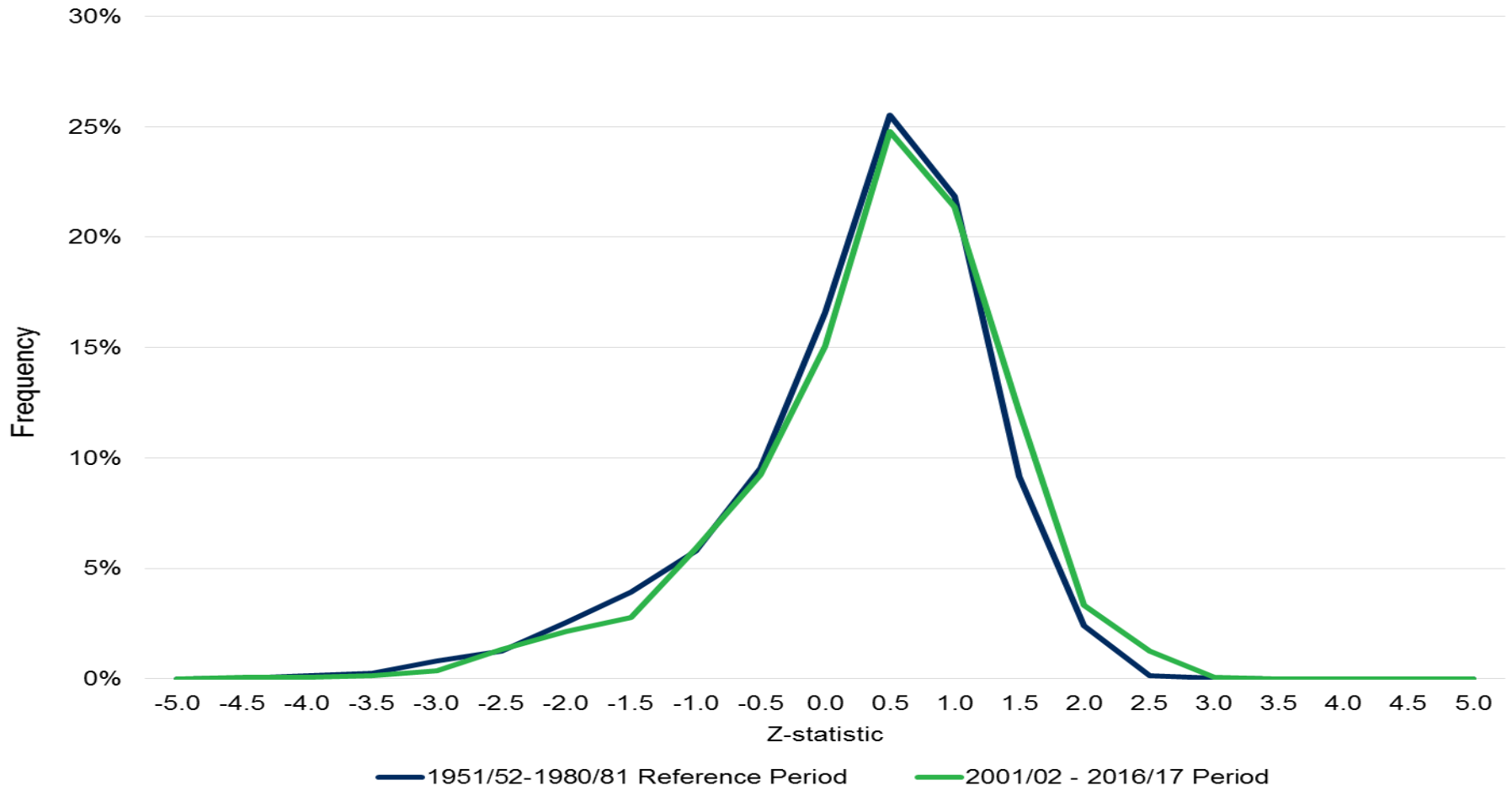
Temperature anomaly distribution: The frequency of occurrence (vertical axis) of local temperature anomalies (relative to 1951-1980 mean) in units of local standard deviation (horizontal axis). Area under each curve is unity. Image credit: NASA/GISS.

Normal Distribution: Base Reference Period 1951-1980

Source: Hansen, J., R. Ruedy, M. Sato, and K. Lo (2010), Global surface temperature change, Rev. Geophys., 48, RG4004, doi:10.1029/2010RG000345. This research has been updated and can be found at http://www.giss.nasa.gov/research/briefs/hansen_17/.

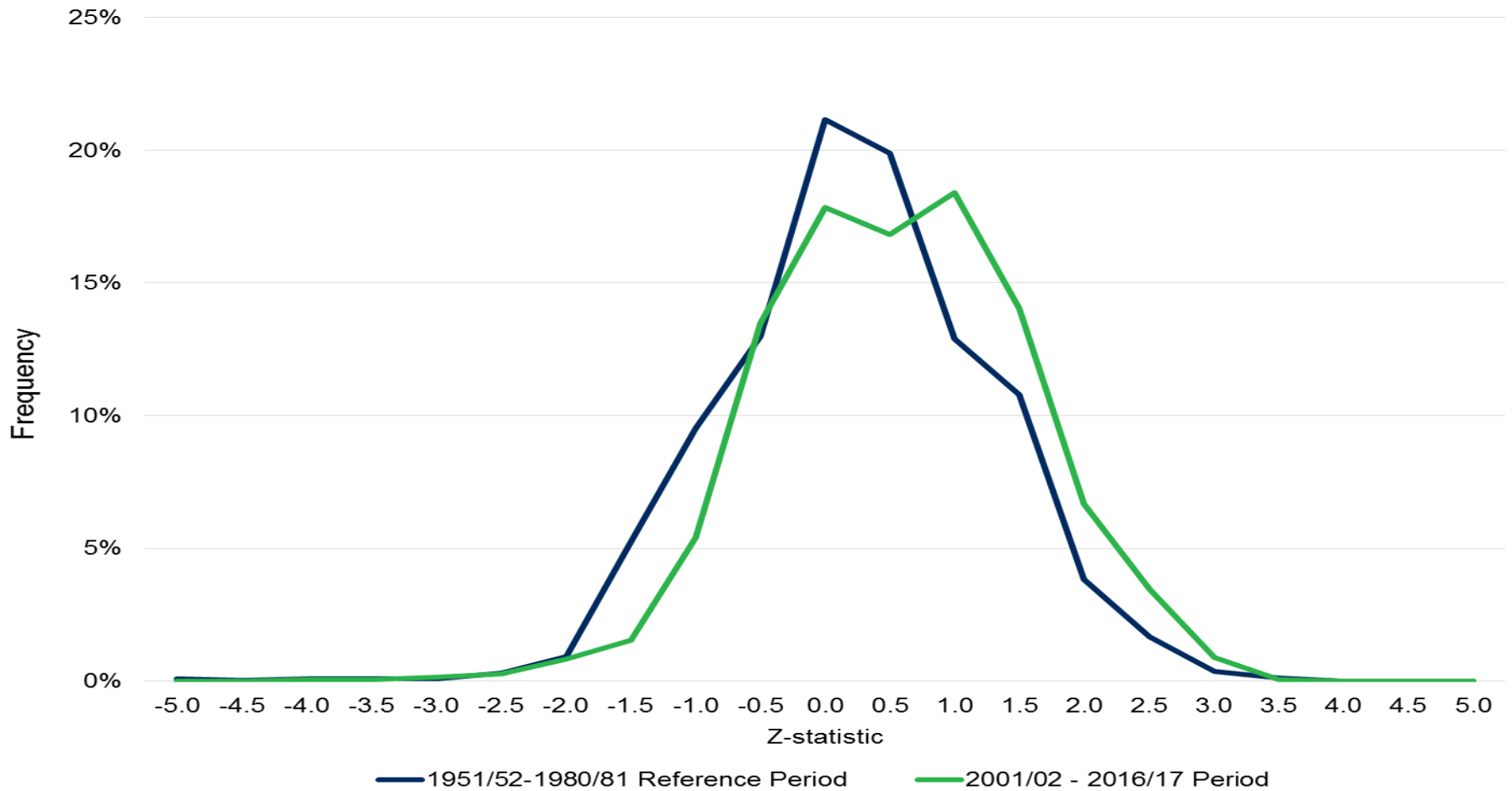
Spokane

Spokane Dec-Jan-Feb Temperature Anomaly Histogram



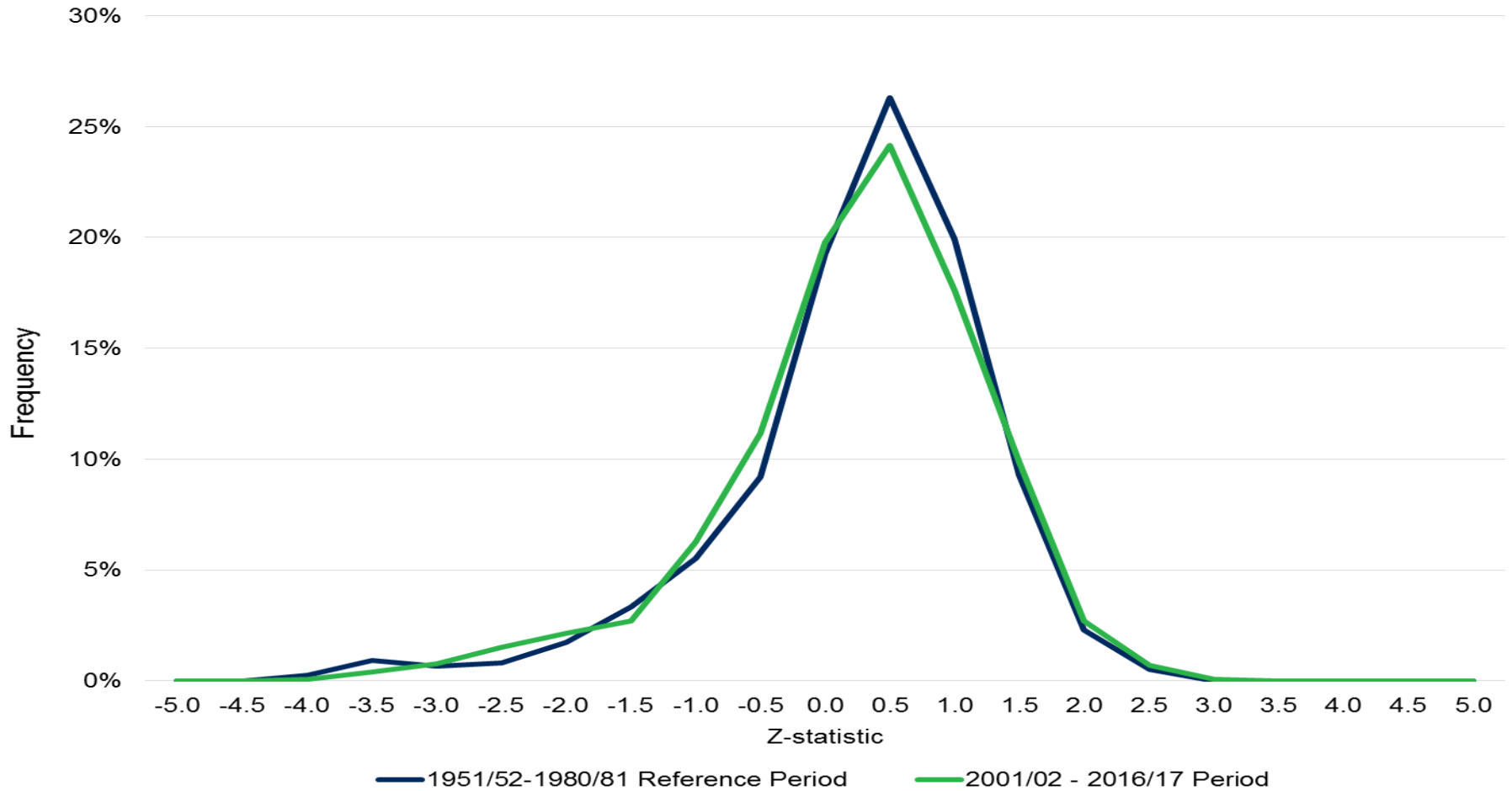
Medford

Medford Dec-Jan-Feb Temperature Anomaly Histogram



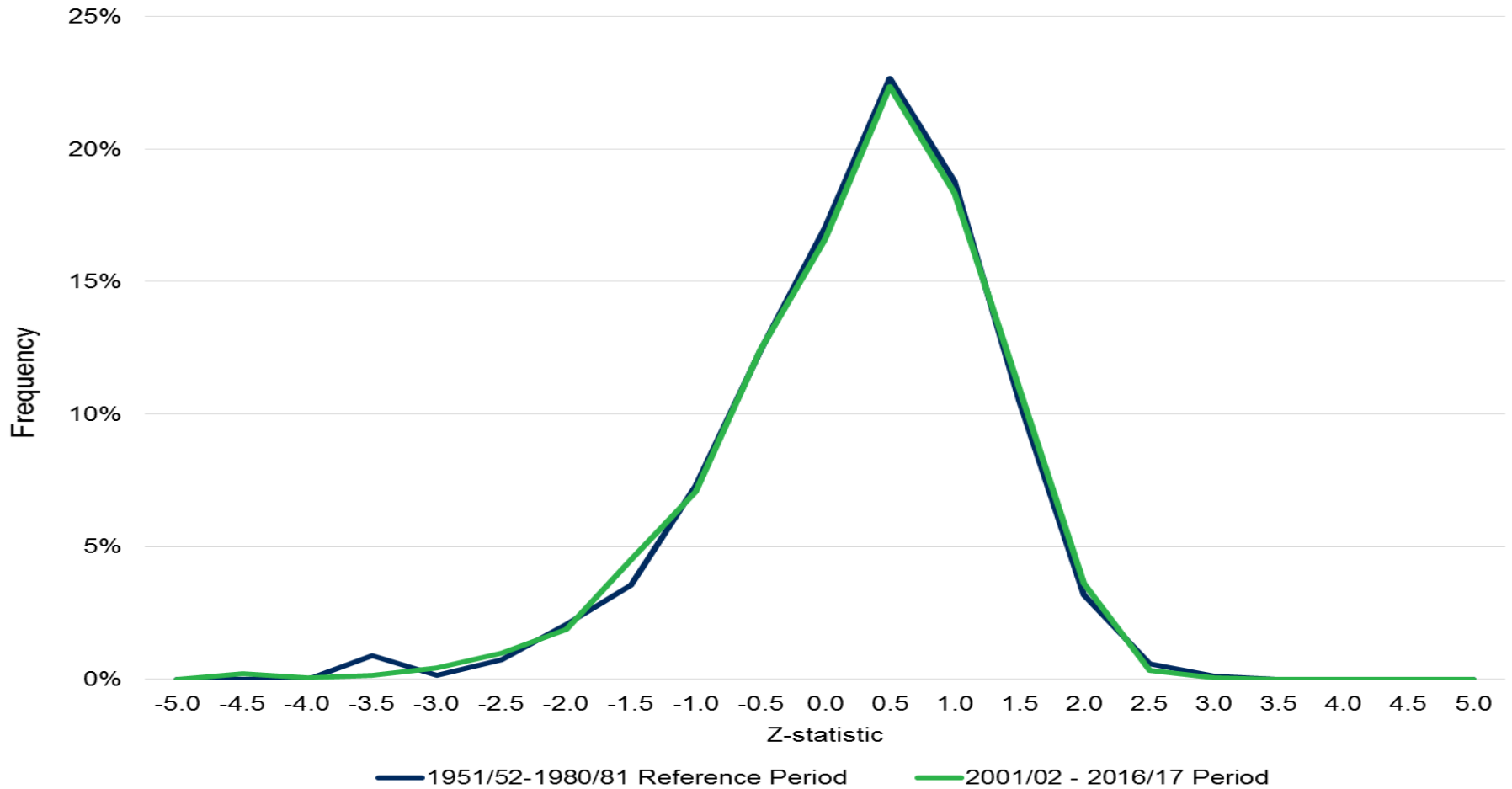
La Grande

La Grande Dec-Jan-Feb Temperature Anomaly Histogram



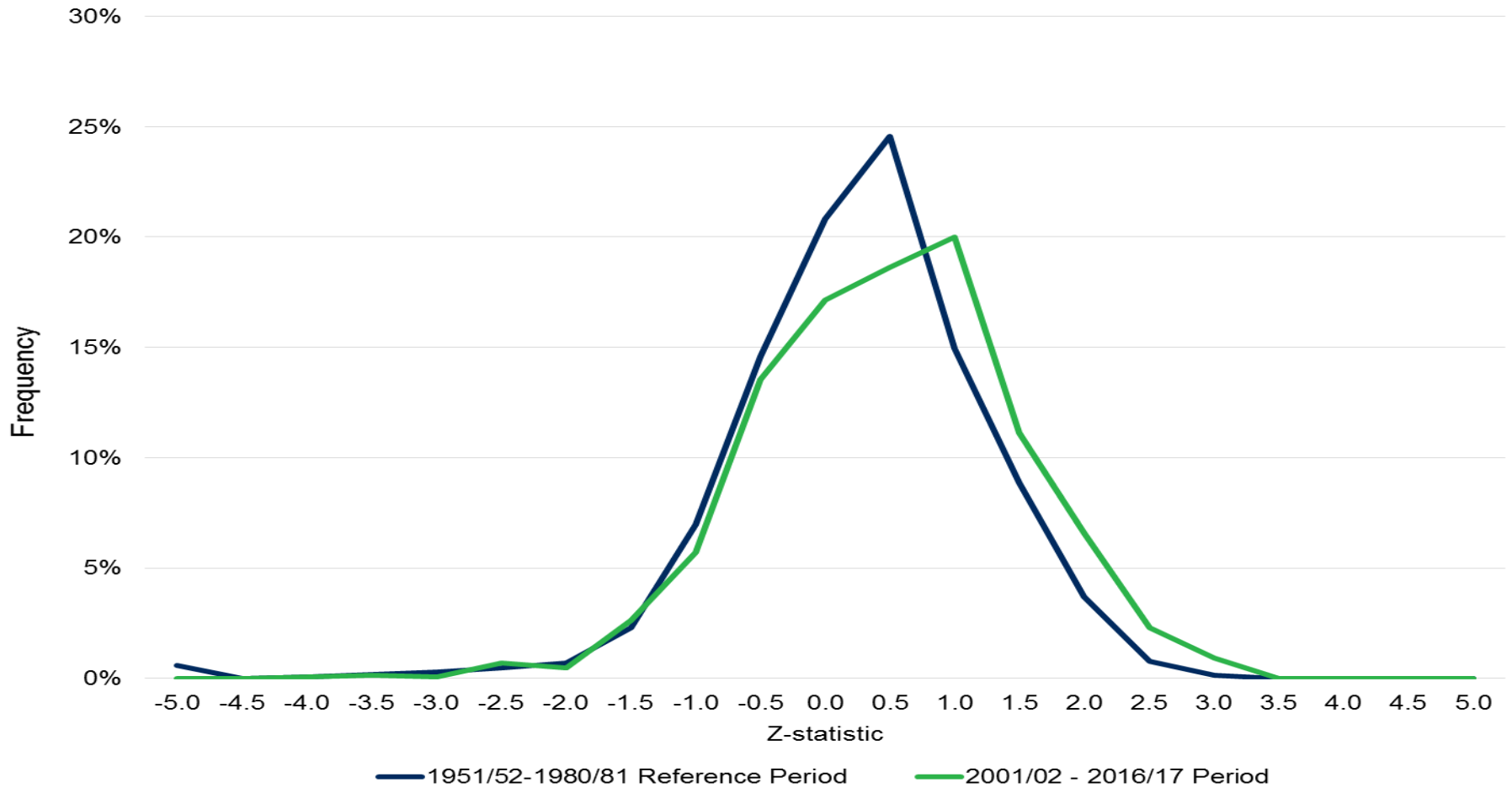
Klamath Falls

Klamath Falls Dec-Jan-Feb Temperature Anomaly Histogram



Roseburg

Roseburg Dec-Jan-Feb Temperature Anomaly Histogram



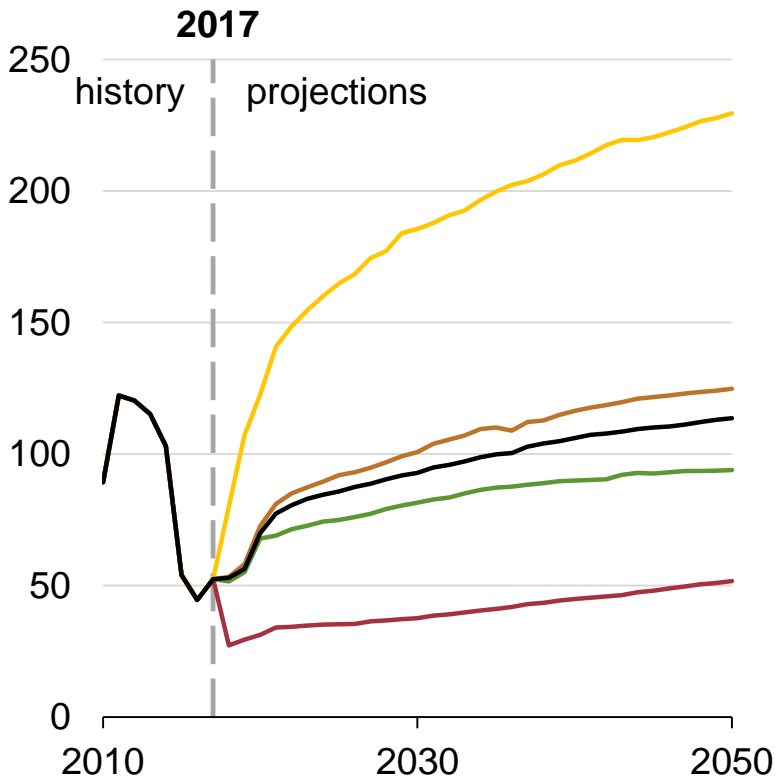


Market Dynamics

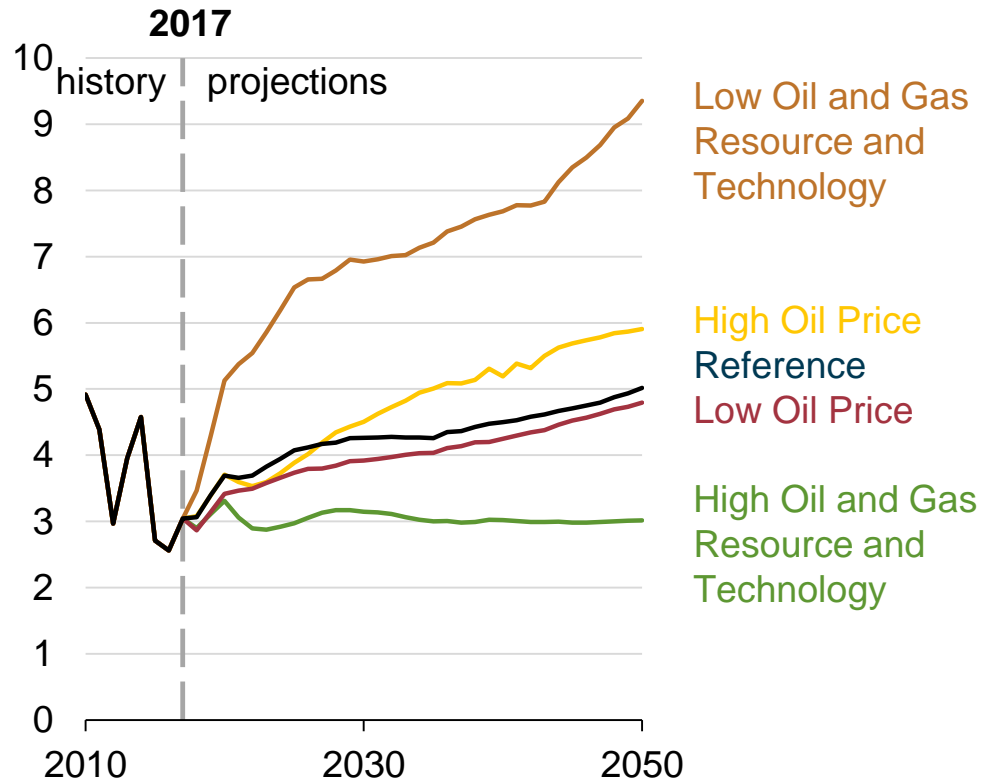
Tom Pardee
Manager of Natural Gas Planning

Assumptions about the size of U.S. resources and the improvement in technology affect domestic oil and natural gas prices—

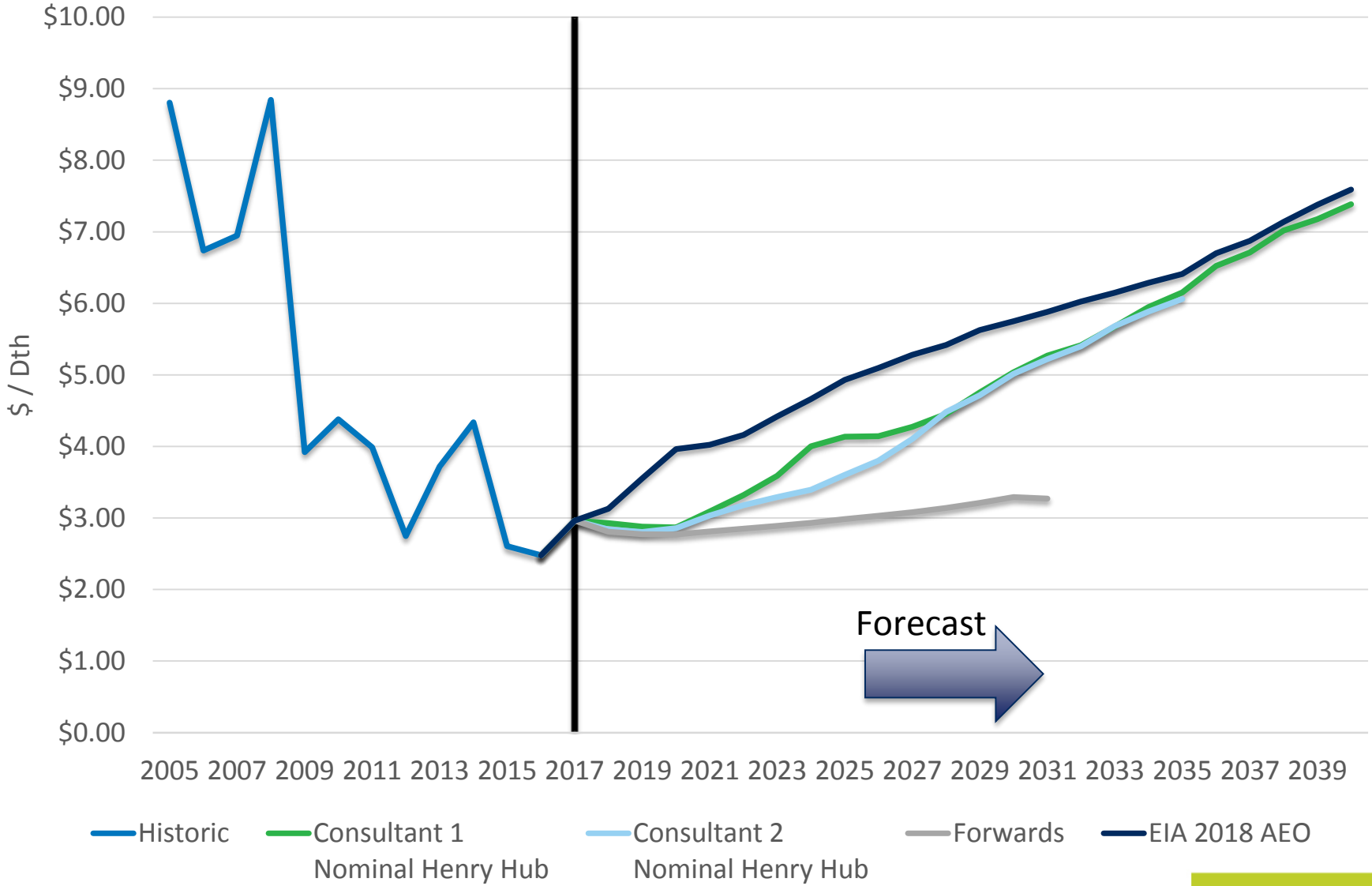
North Sea Brent oil price
2017 dollars per barrel



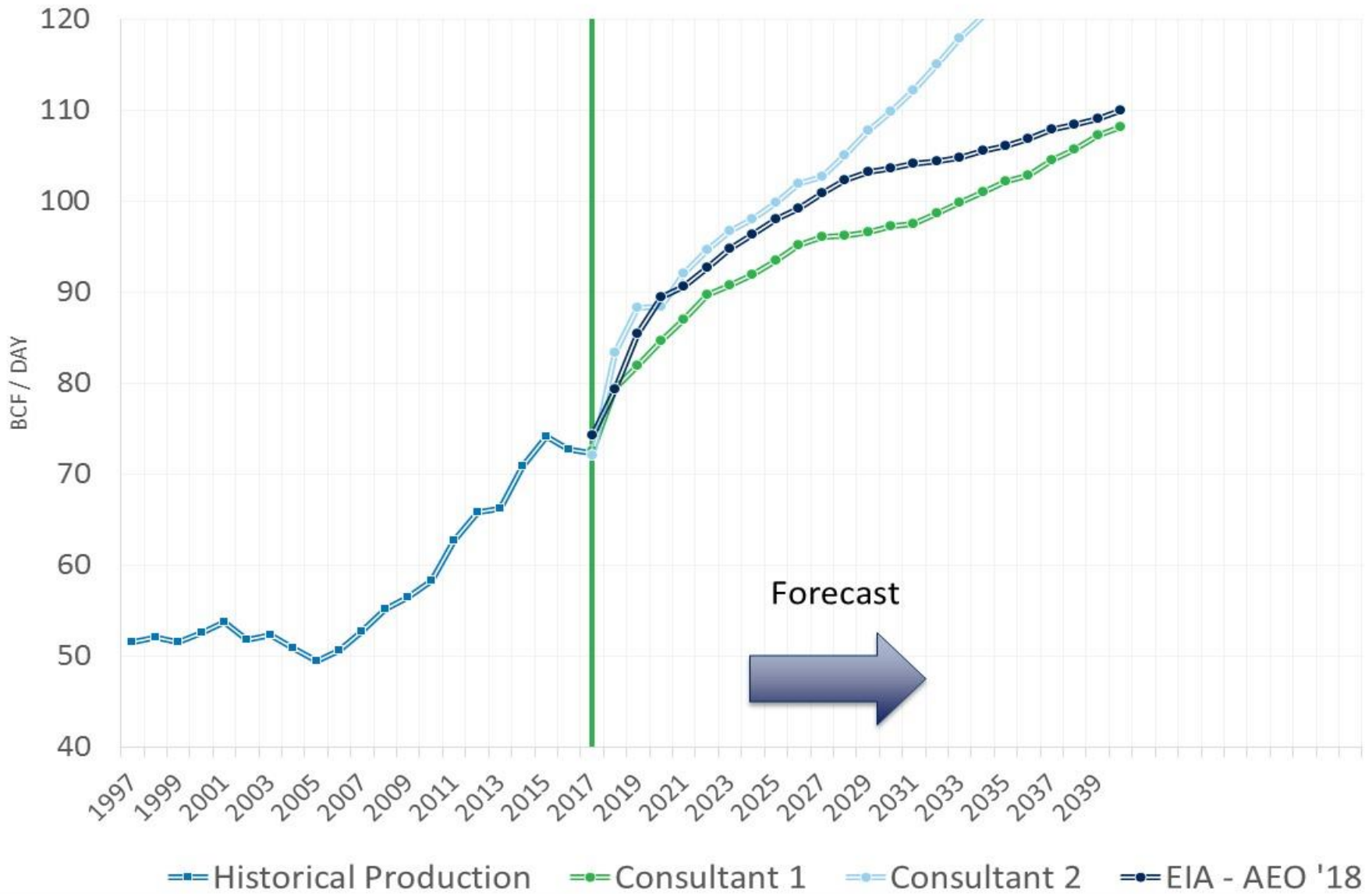
Henry Hub natural gas price
2017 dollars per million Btu



Henry Hub Forecast (Nominal \$)



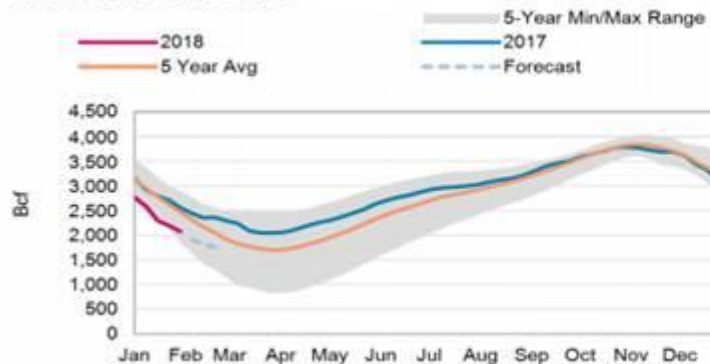
US NATURAL GAS PRODUCTION



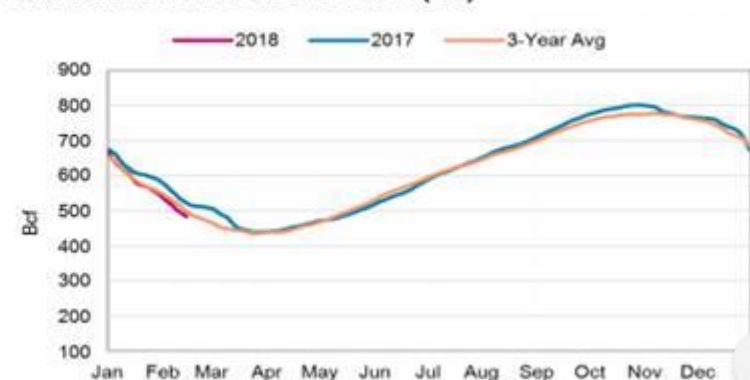
US Storage

Region	Stocks billion cubic feet (Bcf)				Historical Comparisons			
	02/09/18	02/02/18	net change	implied flow	Year ago (02/09/17)		5-year average (2013-17)	
					Bcf	% change	Bcf	% change
East	432	488	-56	-56	485	-10.9	500	-13.6
Midwest	468	543	-75	-75	648	-27.8	581	-19.4
Mountain	122	131	-9	-9	151	-19.2	142	-14.1
Pacific	213	213	0	0	205	3.9	233	-8.6
South Central	649	703	-54	-54	972	-33.2	861	-24.6
Salt	178	184	-6	-6	333	-46.5	238	-25.2
Nonsalt	472	518	-46	-46	639	-26.1	623	-24.2
Total	1,884	2,078	-194	-194	2,461	-23.4	2,317	-18.7

TOTAL U.S. INVENTORIES



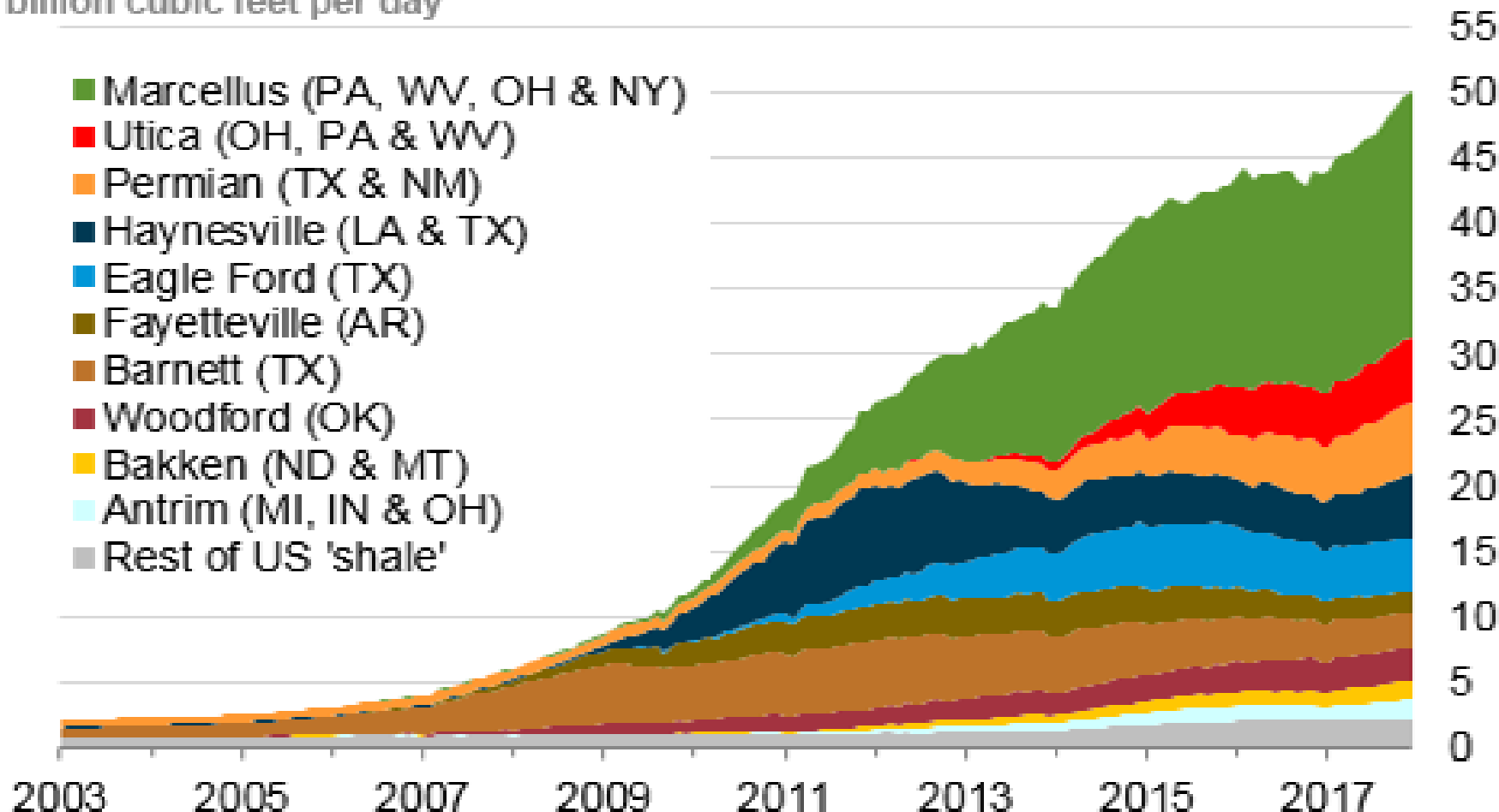
CANADIAN STORAGE INVENTORIES (Bcf)



Monthly dry shale gas production

billion cubic feet per day

- Marcellus (PA, WV, OH & NY)
- Utica (OH, PA & WV)
- Permian (TX & NM)
- Haynesville (LA & TX)
- Eagle Ford (TX)
- Fayetteville (AR)
- Barnett (TX)
- Woodford (OK)
- Bakken (ND & MT)
- Antrim (MI, IN & OH)
- Rest of US 'shale'



Sources: EIA derived from state administrative data collected by DrillingInfo Inc. Data are through December 2017 and represent EIA's official shale gas estimates, but are not survey data. State abbreviations indicate primary state(s).

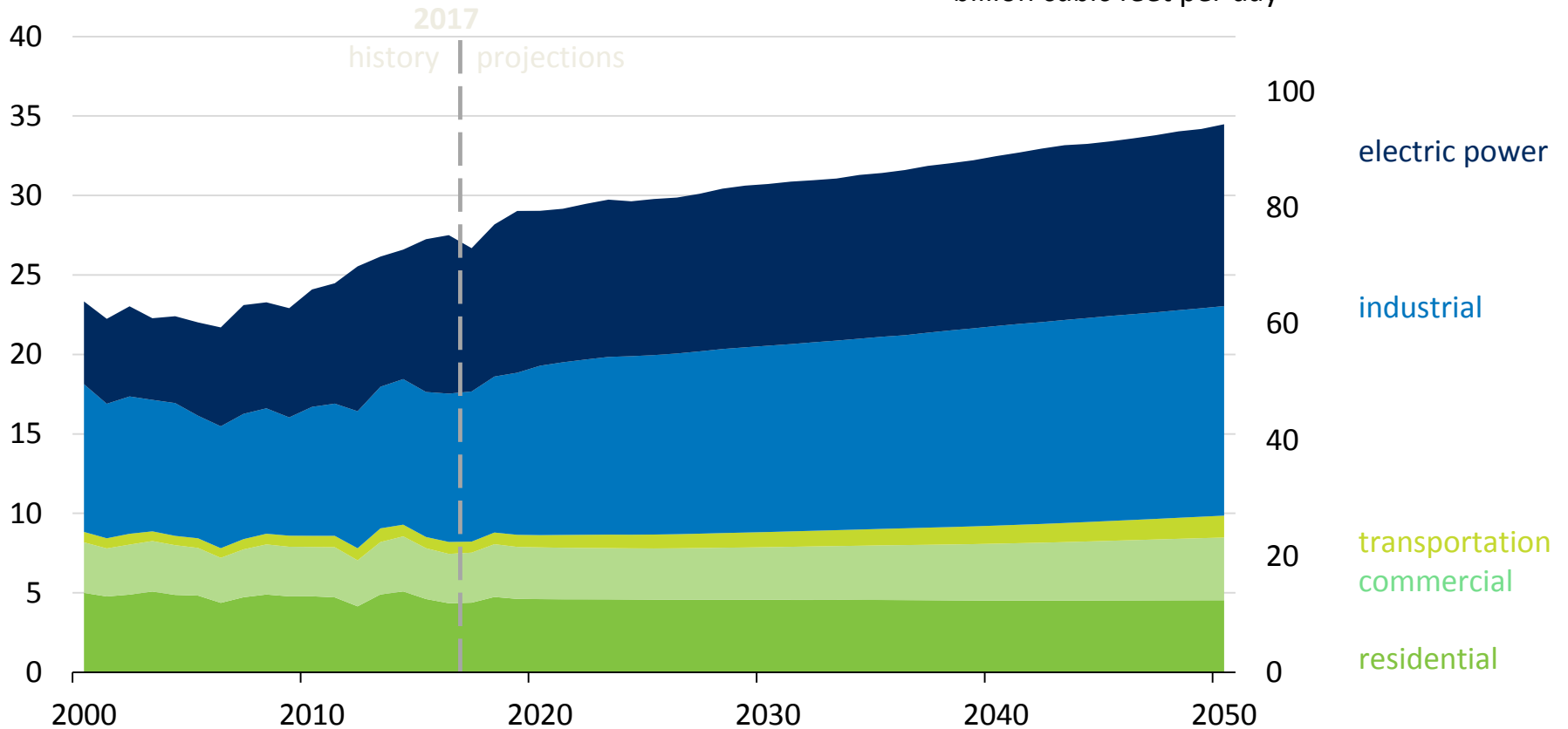


Industrial and electric power demand drives natural gas consumption growth—

Natural gas consumption by sector

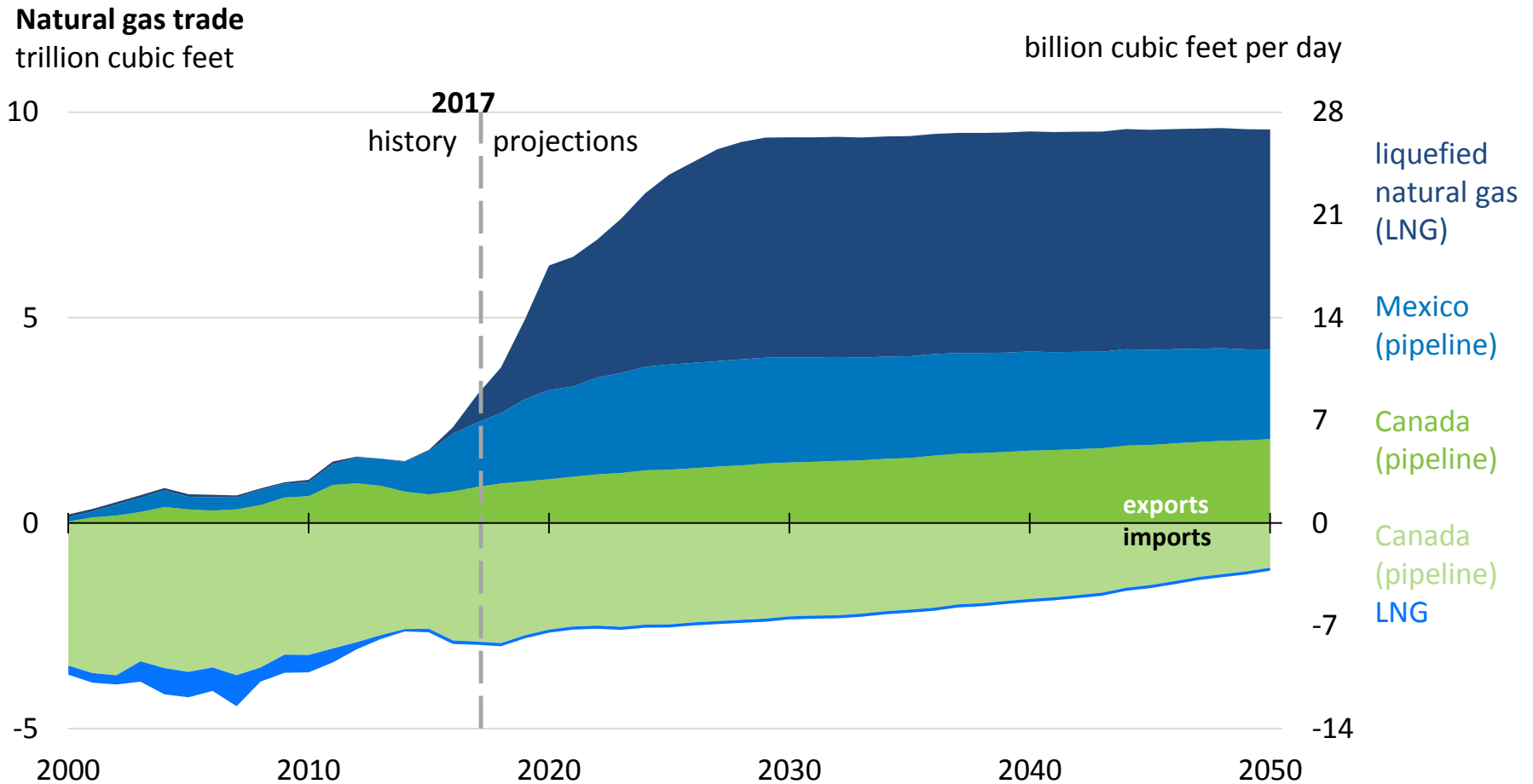
trillion cubic feet

billion cubic feet per day



Source: EIA AEO 2018

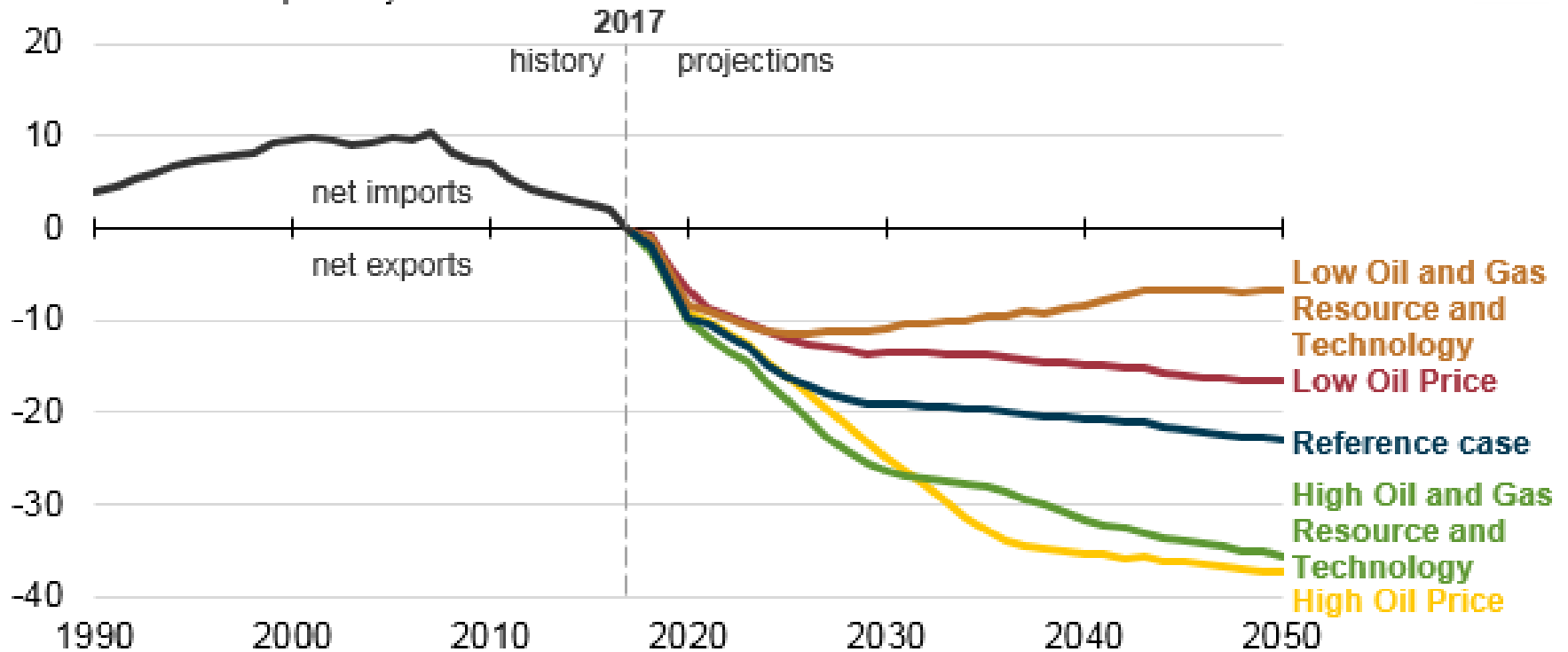
The United States is a net natural gas exporter in the Reference case because of near-term export growth and continued import decline —



Source: EIA AEO 2018

Exports

U.S. net natural gas trade (1990-2050)
billion cubic feet per day




Reference Case: 23 Bcf per day by 2050
Driven by LNG and Mexico Exports



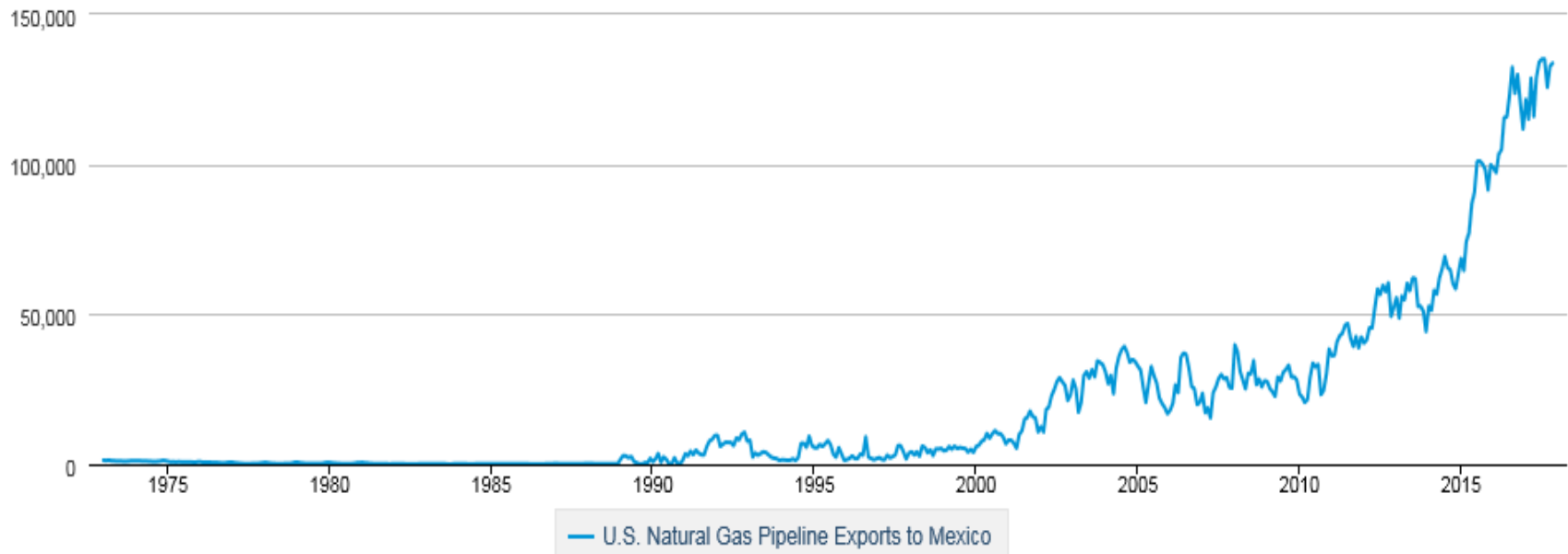
Mexico Exports

3.77 Bcf/d average

U.S. Natural Gas Pipeline Exports to Mexico

 DOWNLOAD

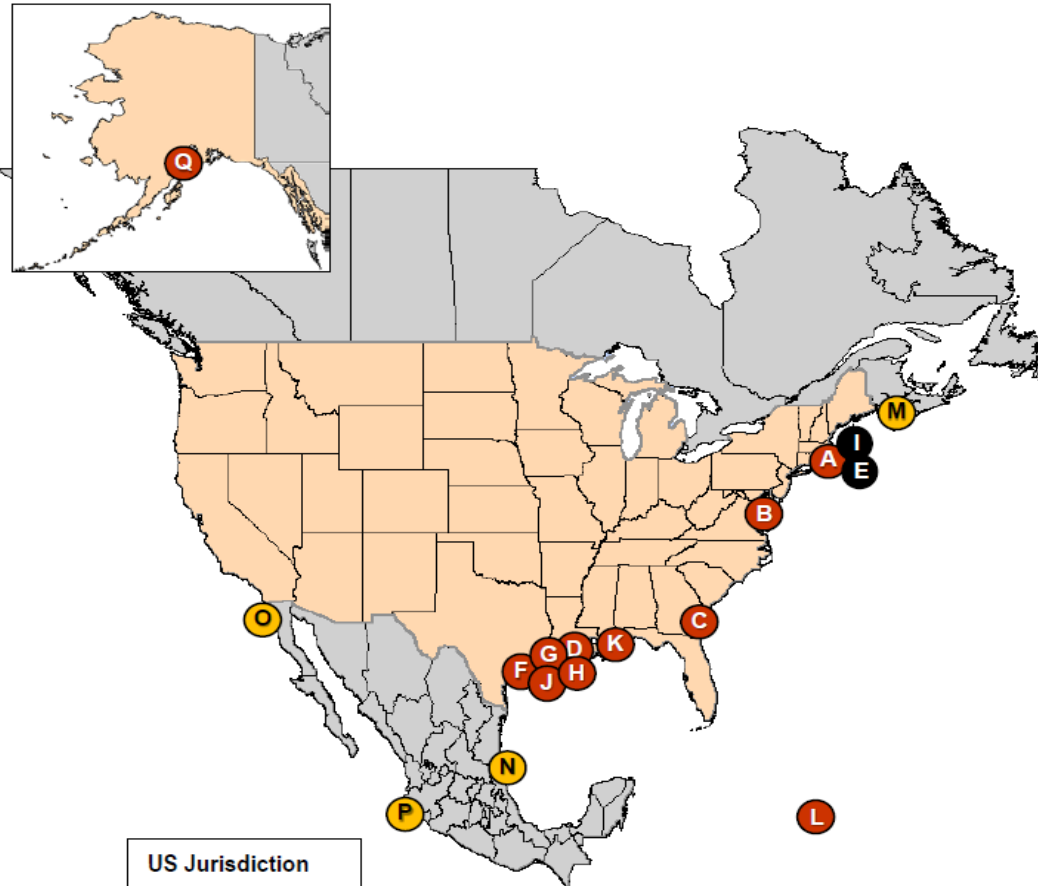
Million Cubic Feet



 Source: U.S. Energy Information Administration

North American LNG Import/Export Terminals

Existing



US Jurisdiction
 ● FERC
 ● MARAD/USCG

As of January 24, 2018

★ Authorized to re-export delivered LNG

Import Terminals

- U.S.**
- A. Everett, MA: 1.035 Bcf/d (GDF SUEZ - DOMAC)
 - B. Cove Point, MD: 1.8 Bcf/d (Dominion - Cove Point LNG)
 - C. Elba Island, GA: 1.6 Bcf/d (El Paso - Southern LNG)
 - D. Lake Charles, LA: 2.1 Bcf/d (Southern Union - Trunkline LNG)
 - E. Offshore Boston: 0.8 Bcf/d (Excelerate Energy - Northeast Gateway) ★
 - F. Freeport, TX: 1.5 Bcf/d (Cheniere/Freeport LNG Dev.) ★
 - G. Sabine, LA: 4.0 Bcf/d (Cheniere/Sabine Pass LNG) ★
 - H. Hackberry, LA: 1.8 Bcf/d (Sempra - Cameron LNG)
 - I. Offshore Boston, MA: 0.4 Bcf/d (GDF SUEZ - Neptune LNG)
 - J. Sabine Pass, TX: 2.0 Bcf/d (ExxonMobil - Golden Pass) (Phase I & II)
 - K. Pascagoula, MS: 1.5 Bcf/d (El Paso/Crest/Sonangol - Gulf LNG Energy LLC)
 - L. Peñuelas, PR: 0.3 Bcf/d (EcoElectrica)

Canada

- M. Saint John, NB: 1.0 Bcf/d (Repsol/Fort Reliance - Canaport LNG)

Mexico

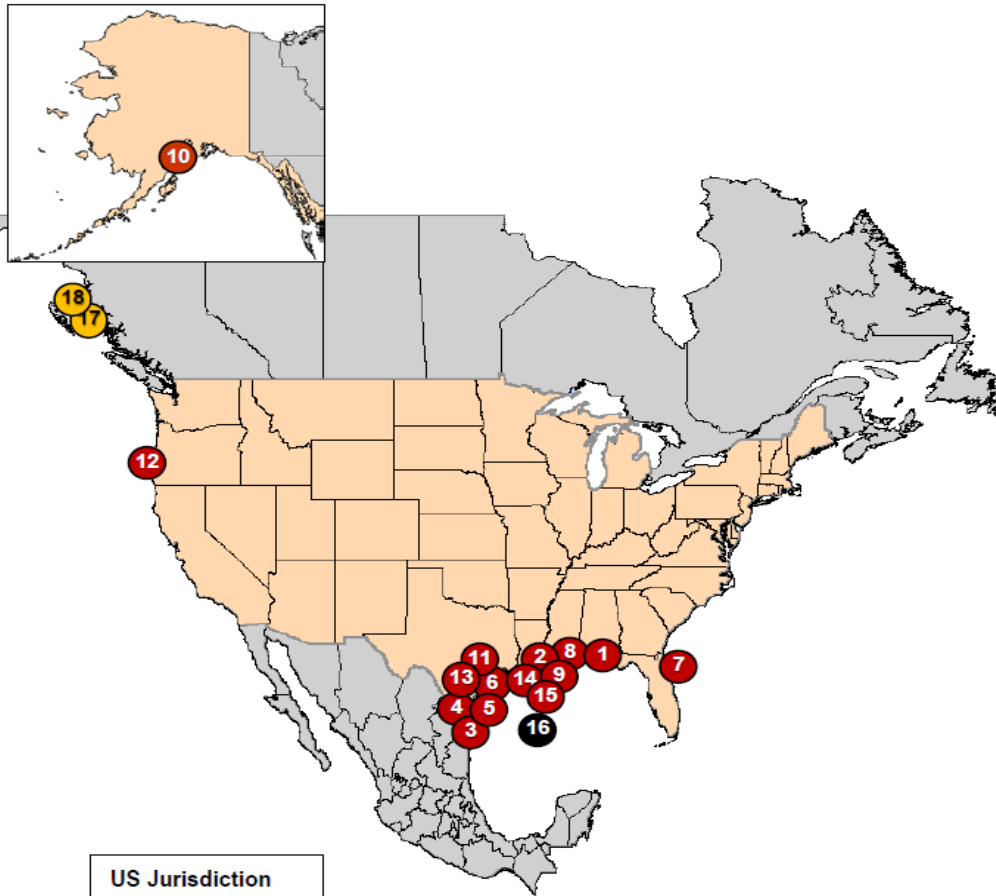
- N. Altamira, Tamulipas: 0.7 Bcf/d (Shell/Total/Mitsui - Altamira LNG)
- O. Baja California, MX: 1.0 Bcf/d (Sempra - Energia Costa Azul)
- P. Manzanillo, MX: 0.5 Bcf/d (KMS GNL de Manzanillo)

Export Terminals

- U.S.**
- Q. Kenai, AK: 0.2 Bcf/d (ConocoPhillips)
 - G. Sabine, LA: 2.8 Bcf/d (Cheniere/Sabine Pass LNG - Trains 1, 2, 3 & 4)



North American LNG Export Terminals Proposed



US Jurisdiction

- FERC
- MARAD/USCG

As of January 24, 2018

PROPOSED TO FERC

Pending Applications:

1. Pascagoula, MS: 1.5 Bcfd (Gulf LNG Liquefaction) (CP15-521)
2. Cameron Parish, LA: 1.41 Bcfd (Venture Global Calcasieu Pass) (CP15-550)
3. Brownsville, TX: 0.55 Bcfd (Texas LNG Brownsville) (CP16-116)
4. Brownsville, TX: 3.6 Bcfd (Rio Grande LNG – NextDecade) (CP16-454)
5. Brownsville, TX: 0.9 Bcfd (Annova LNG Brownsville) (CP16-480)
6. Port Arthur, TX: 1.86 Bcfd (Port Arthur LNG) (CP17-20)
7. Jacksonville, FL: 0.132 Bcf/d (Eagle LNG Partners) (CP17-41)
8. Plaquemines Parish, LA: 3.40 Bcfd (Venture Global LNG) (CP17-66)
9. Calcasieu Parish, LA: 4.0 Bcfd (Driftwood LNG) (CP17-117)
10. Nikiski, AK: 2.63 Bcfd (Alaska Gasline) (CP17-178)
11. Freeport, TX: 0.72 Bcfd (Freeport LNG Dev) (CP17-470)
12. Coos Bay, OR: 1.08 Bcfd (Jordan Cove) (CP17-494)

Projects in Pre-filing:

13. Corpus Christi, TX: 1.86 Bcfd (Cheniere – Corpus Christi LNG) (PF15-26)
14. Cameron Parish, LA: 1.18 Bcfd (Commonwealth, LNG) (PF17-8)
15. LaFourche Parish, LA: 0.65 Bcfd (Port Fourchon LNG) (PF17-9)

PROPOSED TO U.S.-MARAD/COAST GUARD

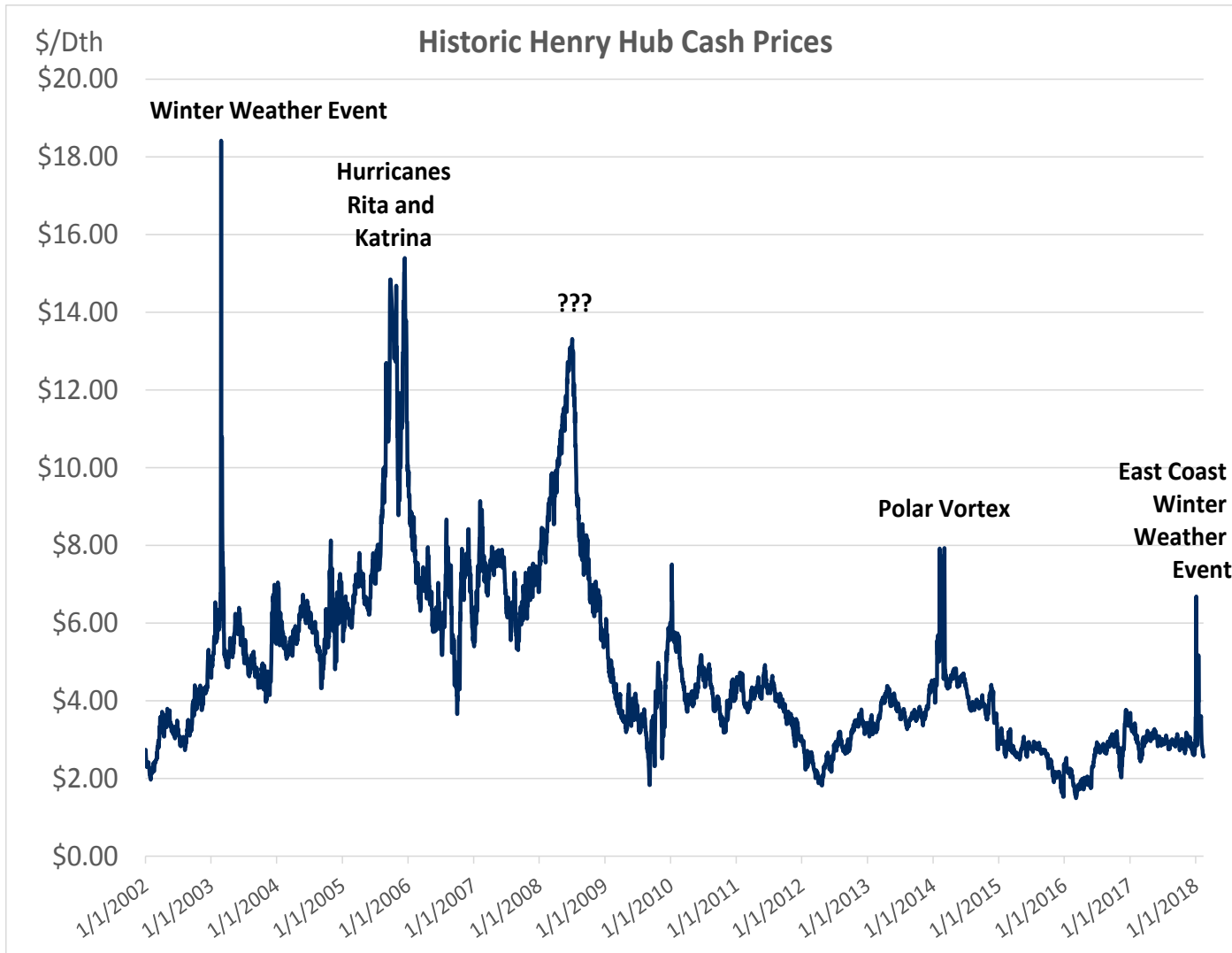
16. Gulf of Mexico: 1.8 Bcfd (Delfin LNG)

PROPOSED CANADIAN SITES

17. Kitimat, BC: 1.28 Bcfd (Apache Canada Ltd.)
18. Douglas Island, BC: 0.23 Bcfd (BC LNG Export Cooperative)

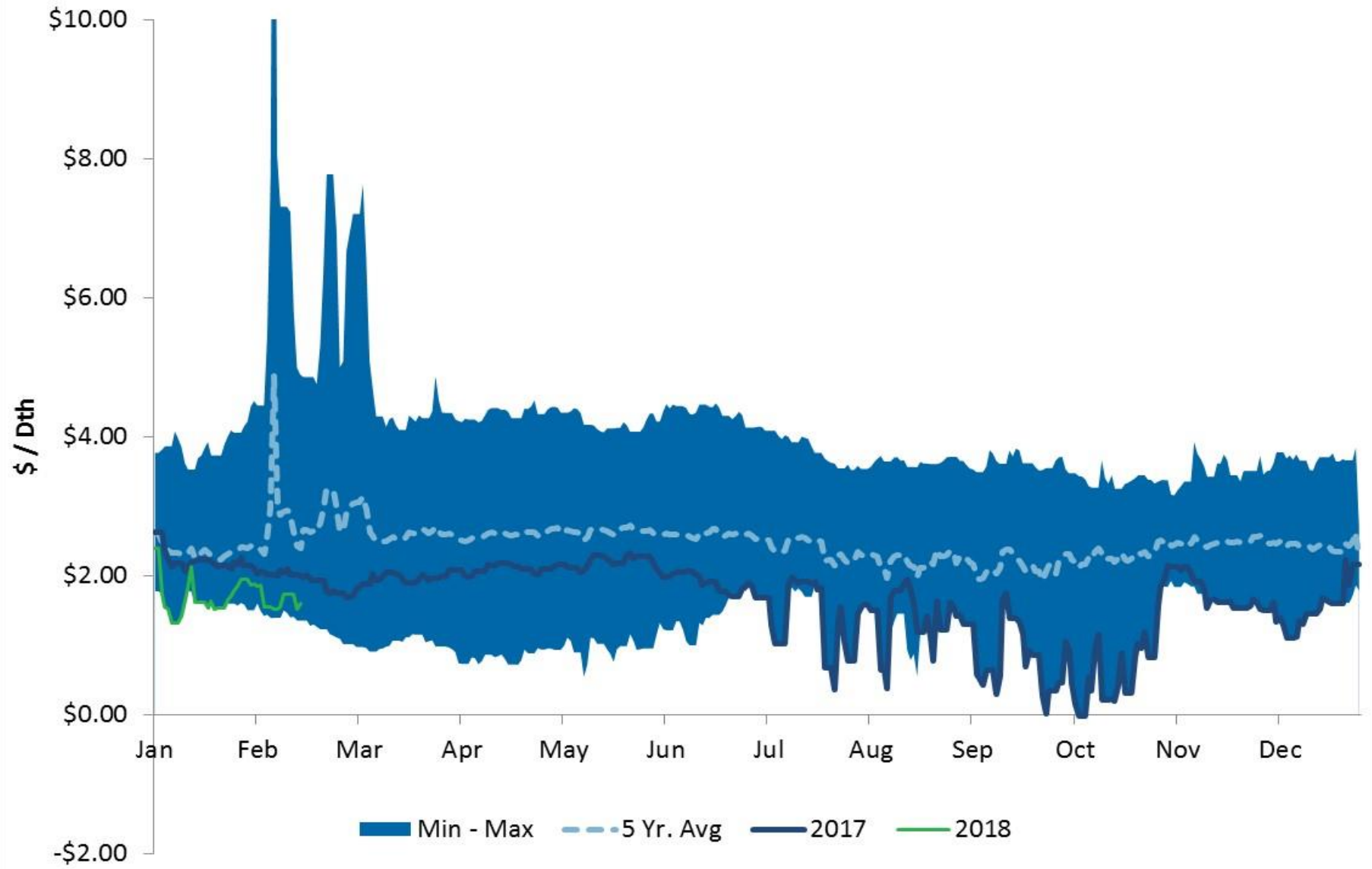
What Drives the Natural Gas Market?

Natural Gas Spot Prices (Henry Hub)

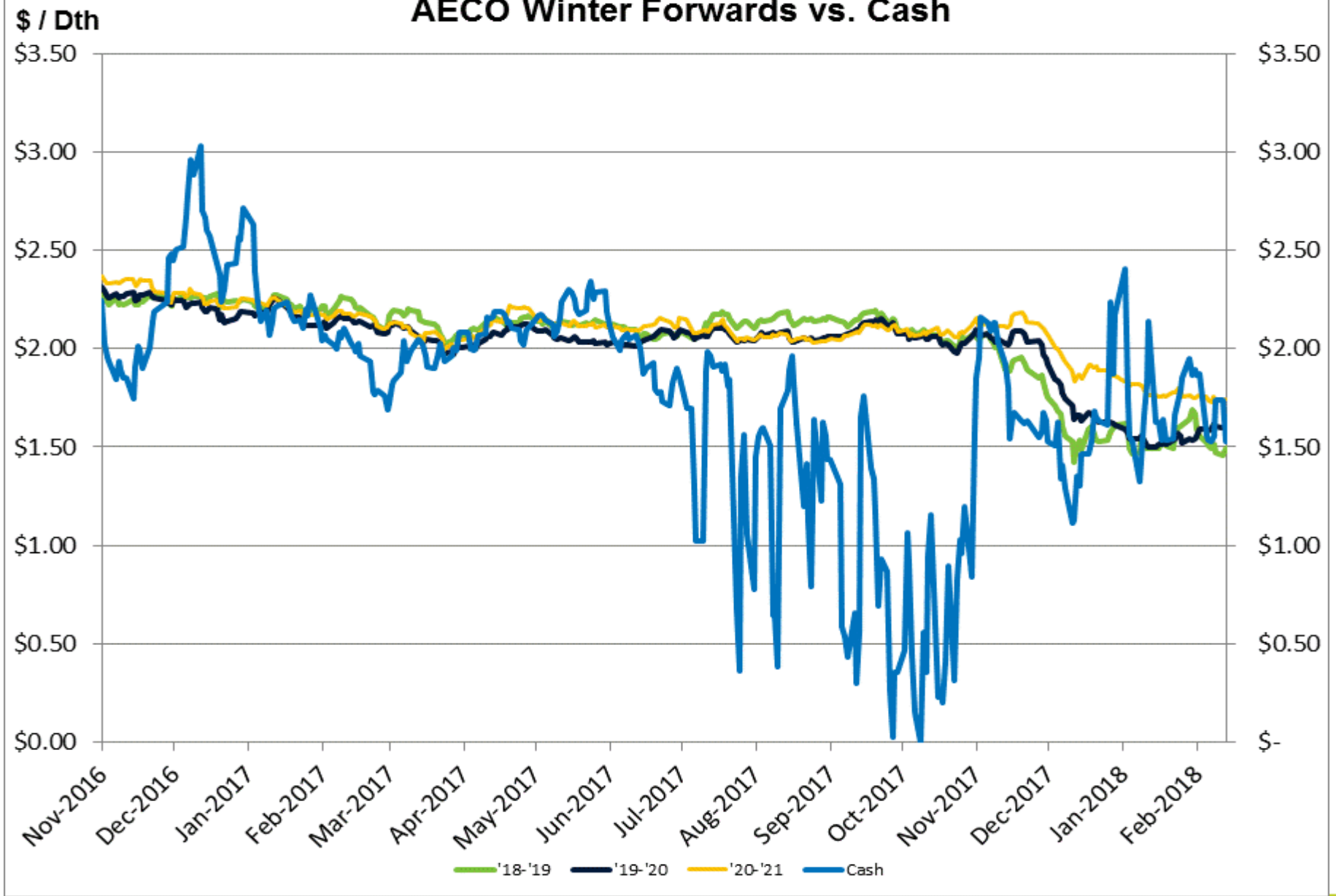


- ▶ **Supply**
 - Type: Conventional vs. Non-conventional
 - Location
 - Cost
- ▶ **Demand**
 - Residential/Commercial/Industrial
 - Power Generation
 - Natural Gas Vehicles
- ▶ **Legislation**
 - Environmental
- ▶ **Energy Correlations**
 - Oil vs. Gas
 - Coal vs. Gas
 - Natural Gas Liquids
- ▶ **Weather**
- ▶ **Storage**

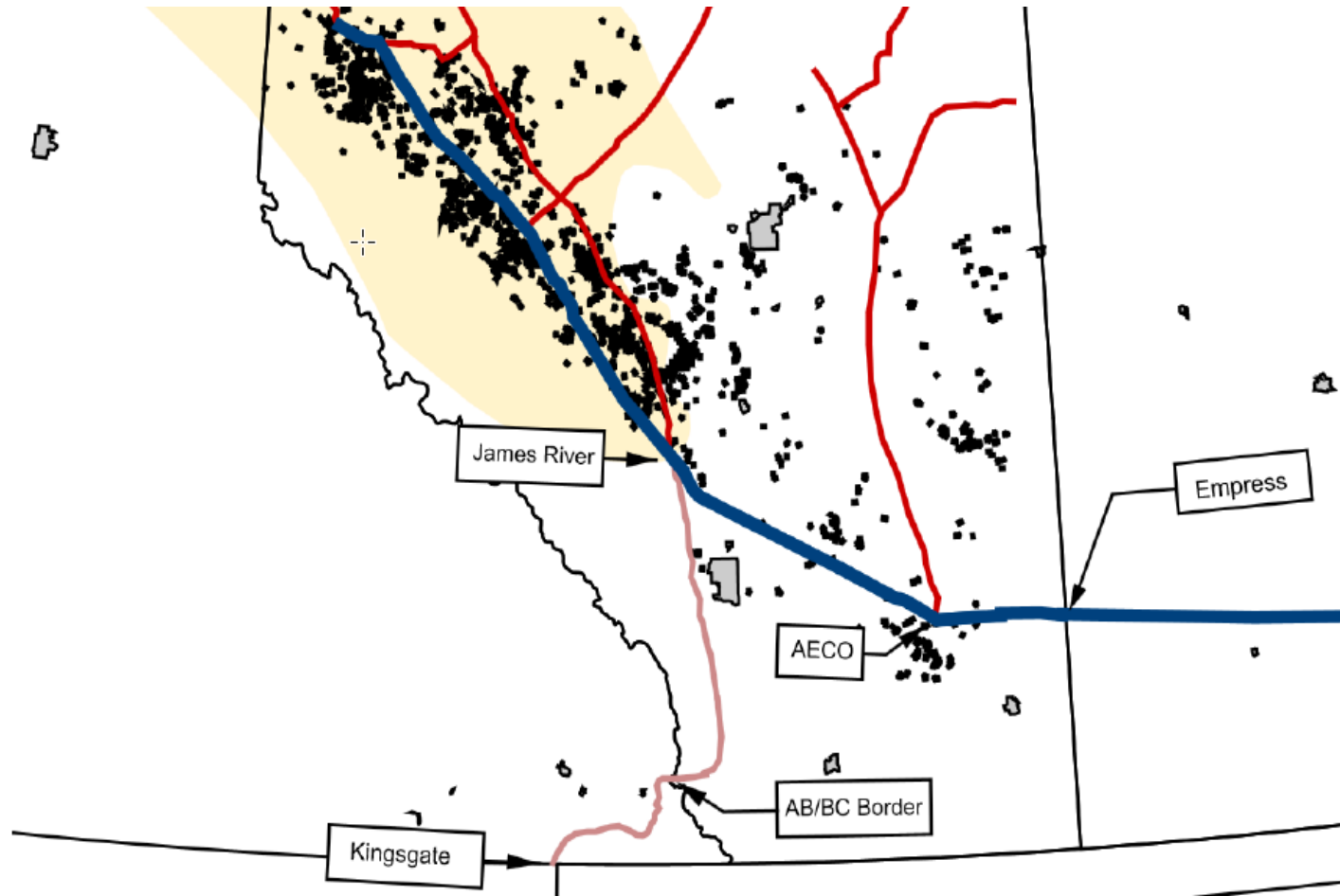
AECO Gas Daily Prices



AECO Winter Forwards vs. Cash



TransCanada System



Source: geoSCOUT, Macquarie Research, December 2017

Sources of Congestion

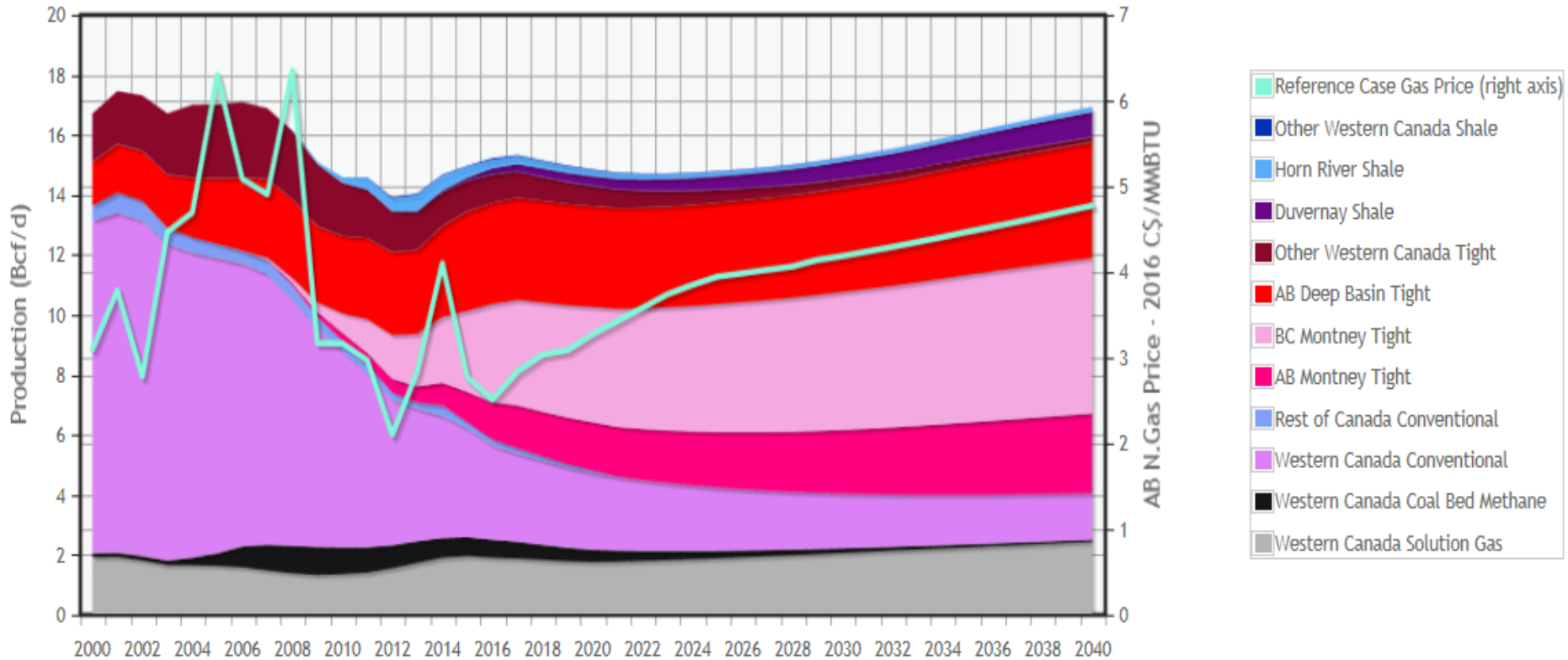
- AECO – Empress
 - Capacity through this corridor has been reduced over the years as production has moved north and west, reducing pressure
 - Newly contracted mainline firm contracts have used up uncontracted capacity
 - Storage owners (mainly between AECO and Empress) rely on IT to inject/withdraw
- James River – ABC
 - TransCanada has upgraded the capacity of the gathering system north of James river.
 - Capacity for JR- ABC remains limited to 2.3 bcf/d while GTN has room for up to 2.9 bdf/d.

How will Alberta supply/demand rebalance?

- Demand:
 - Incremental expansions in 2018, 2019 and 2020 will increase James River – ABC capacity by roughly 700 mmcf/d to match GTN takeaway capacity.
 - Oil sands expansion expected to increase demand as several new projects come on line in 2018.
 - Talk of AECO – Empress expansion. Thus far no action.
- Supply:
 - Sustained low prices have already led to a decrease in producer CAPEX budgets for 2018 and 2019.

Canadian Supply

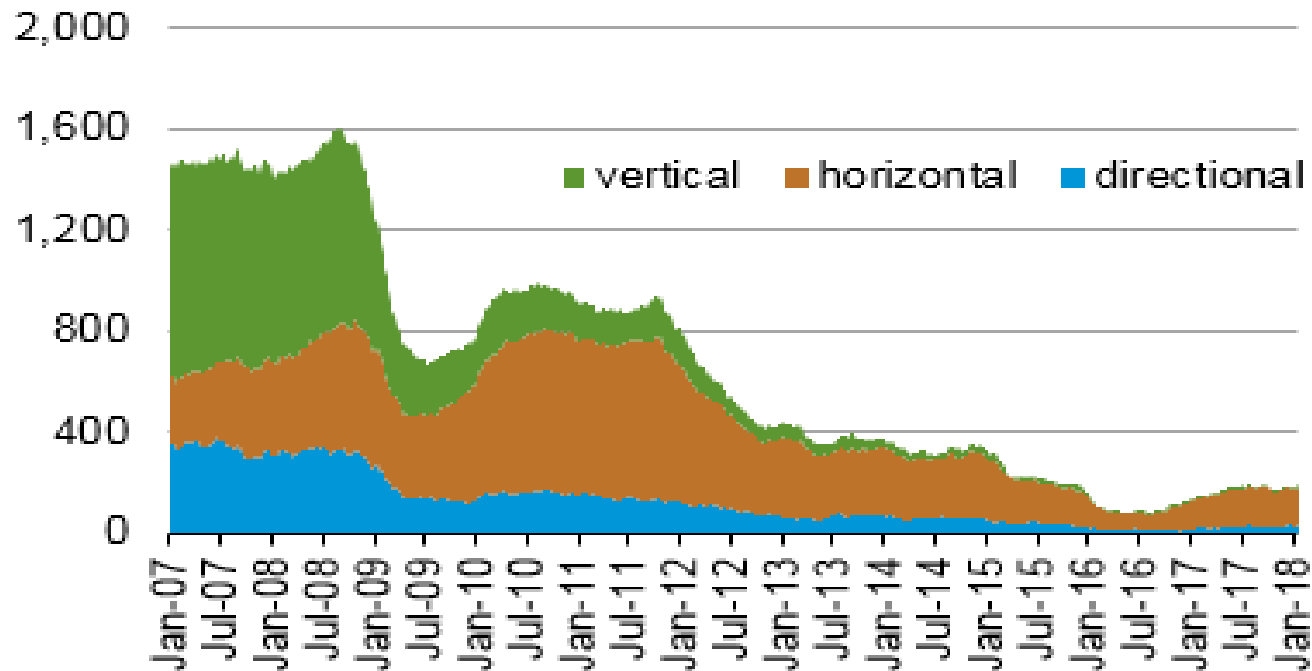
Natural Gas Production and Price - Reference Case



Natural Gas Rig Count

Weekly natural gas rig count

active rigs

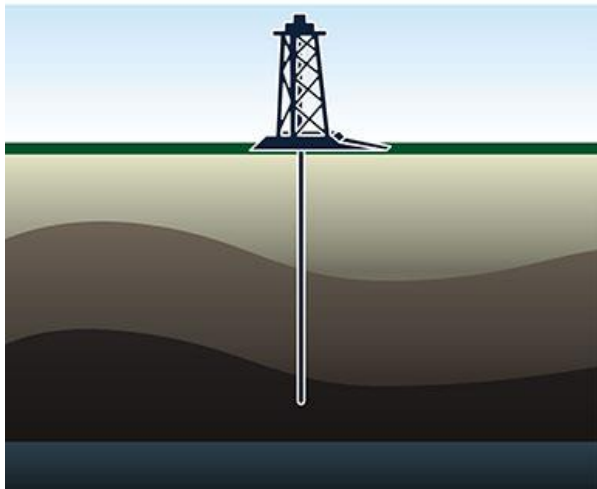


Source: Baker Hughes

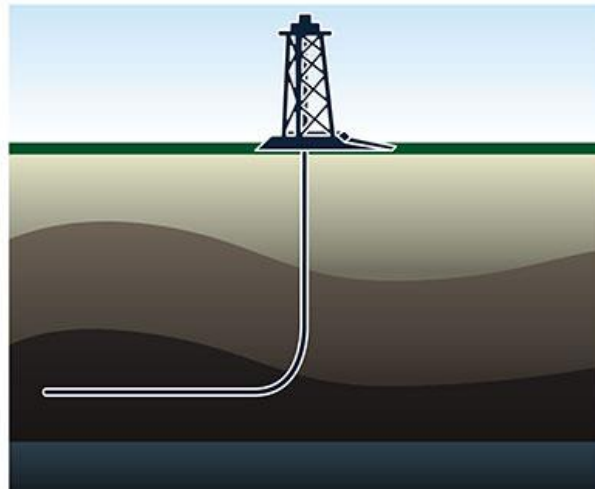
181 Active Rigs

Rig Type

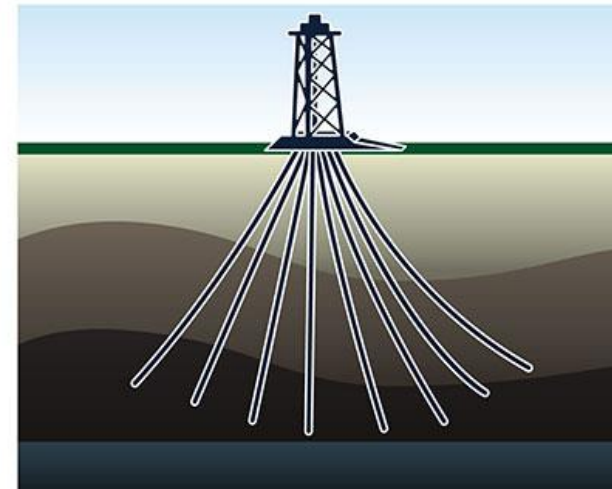
Vertical well



Horizontal well

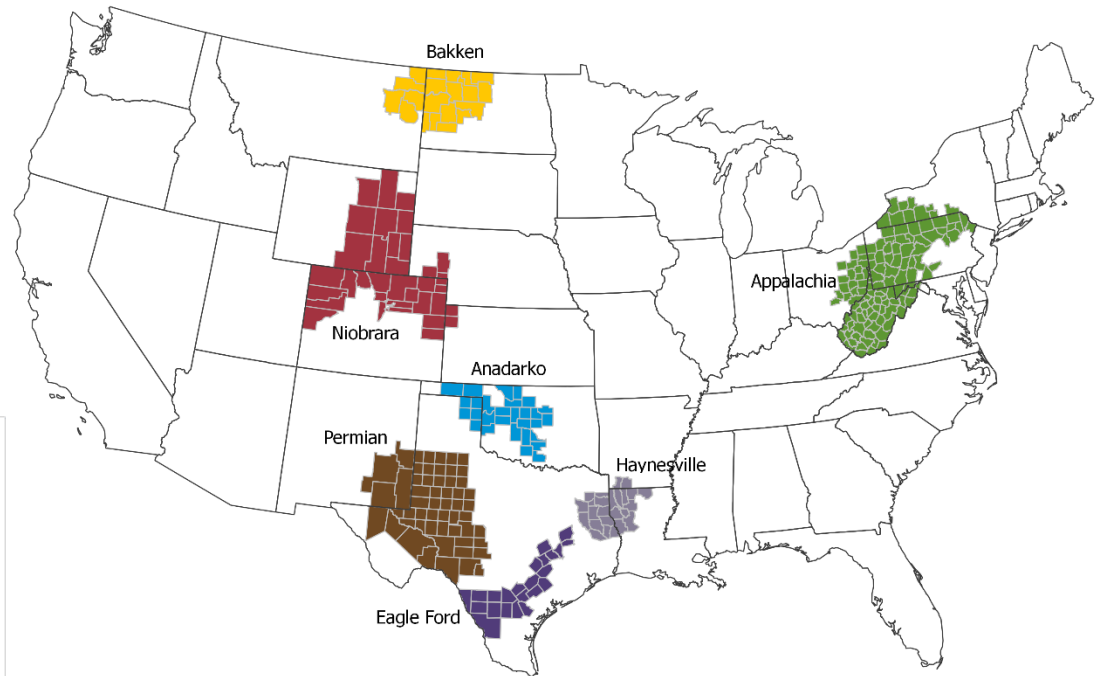
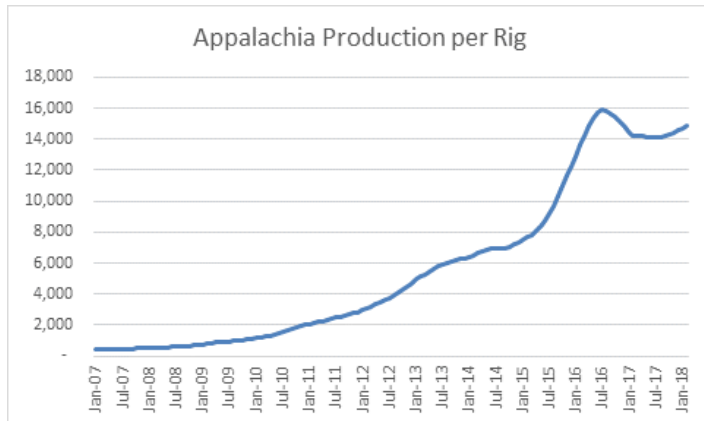


Directional well



US drilling

7 Major drilling regions in US

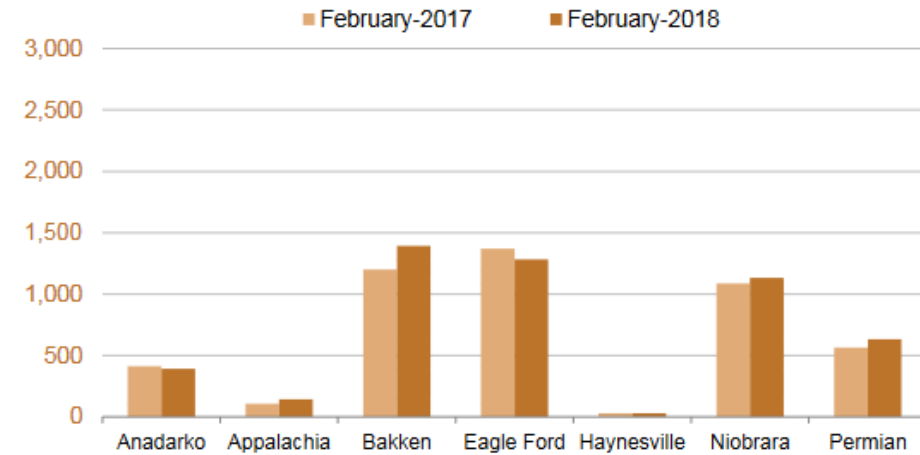


*Appalachia Production per rig increase of almost **3500%** per rig since Jan. 2007

Rig efficiency and production

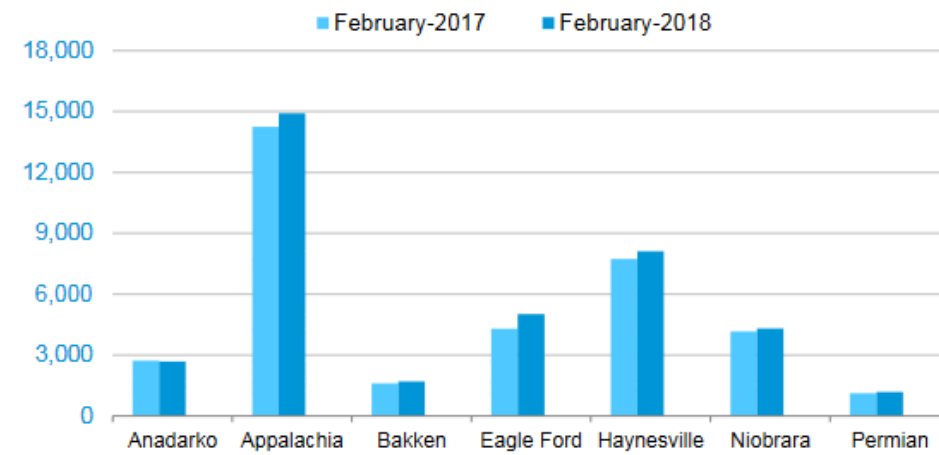
New-well oil production per rig

barrels/day



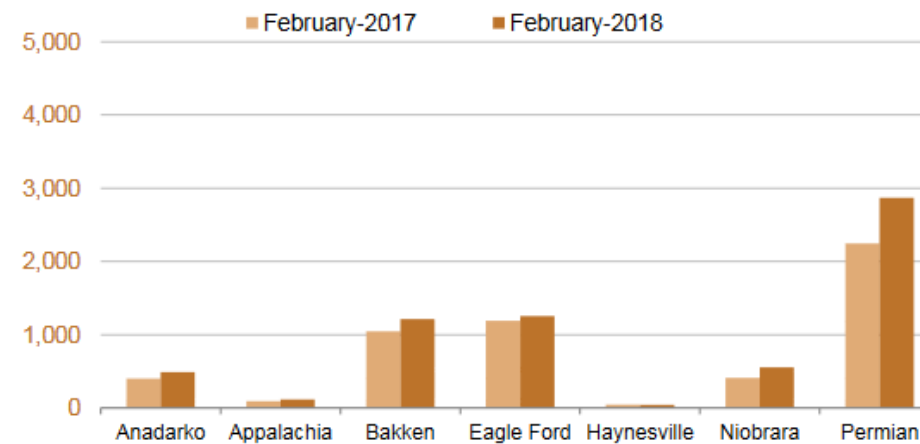
New-well gas production per rig

thousand cubic feet/day



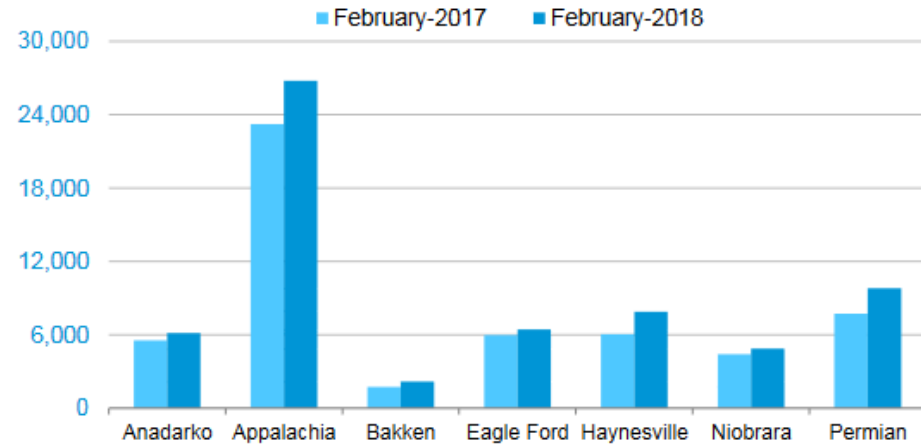
Oil production

thousand barrels/day

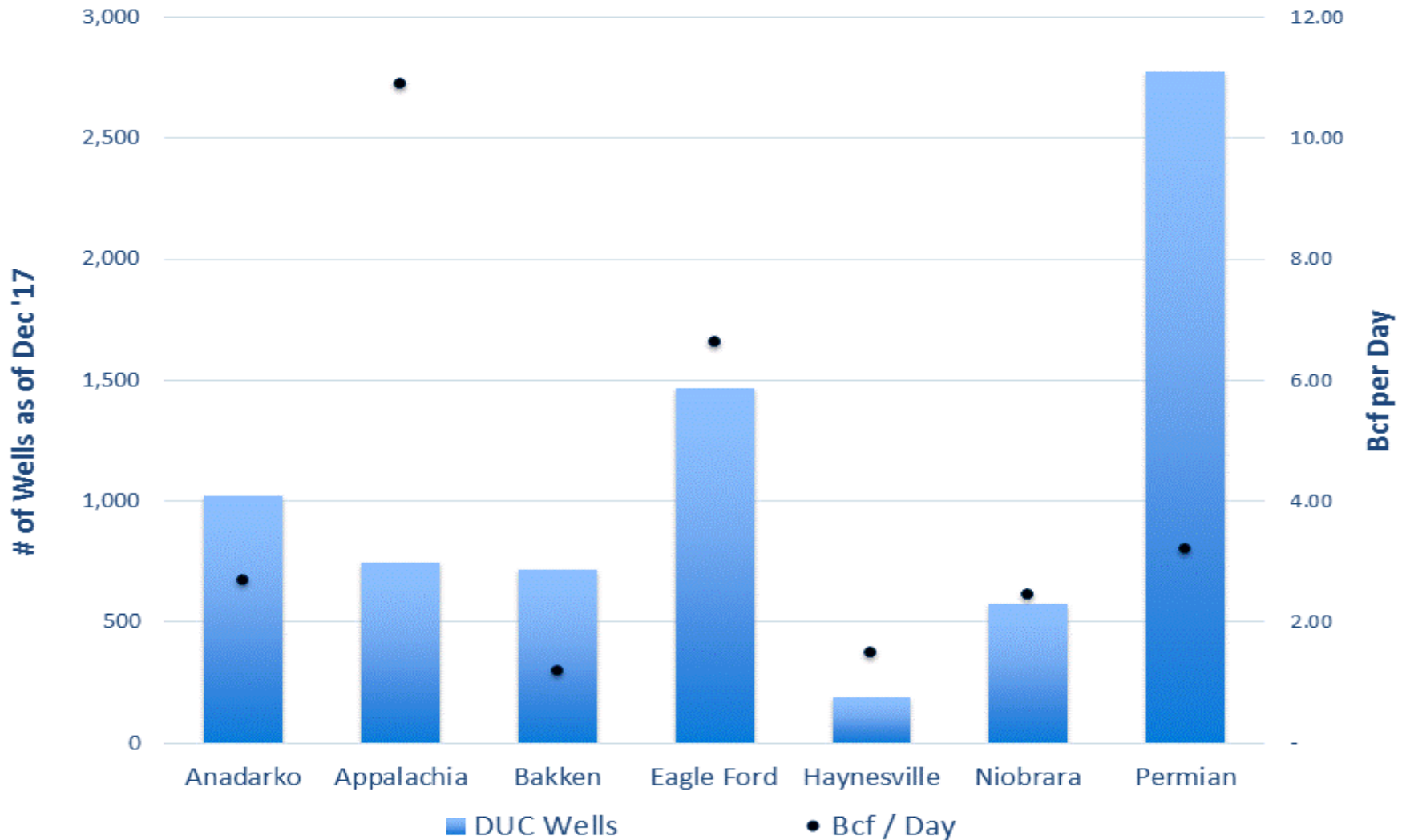


Natural gas production

million cubic feet/day



Drilled but uncompleted wells



*Almost 29 Bcf/d waiting to come online

Source: <https://www.eia.gov/petroleum/drilling/xls/duc-data.xlsx>

*Bcf per day estimate is from estimated production per well as of Dec '17

Break (10 minutes)



Procurement Planning

Tom Pardee, Manager of Natural Gas Planning

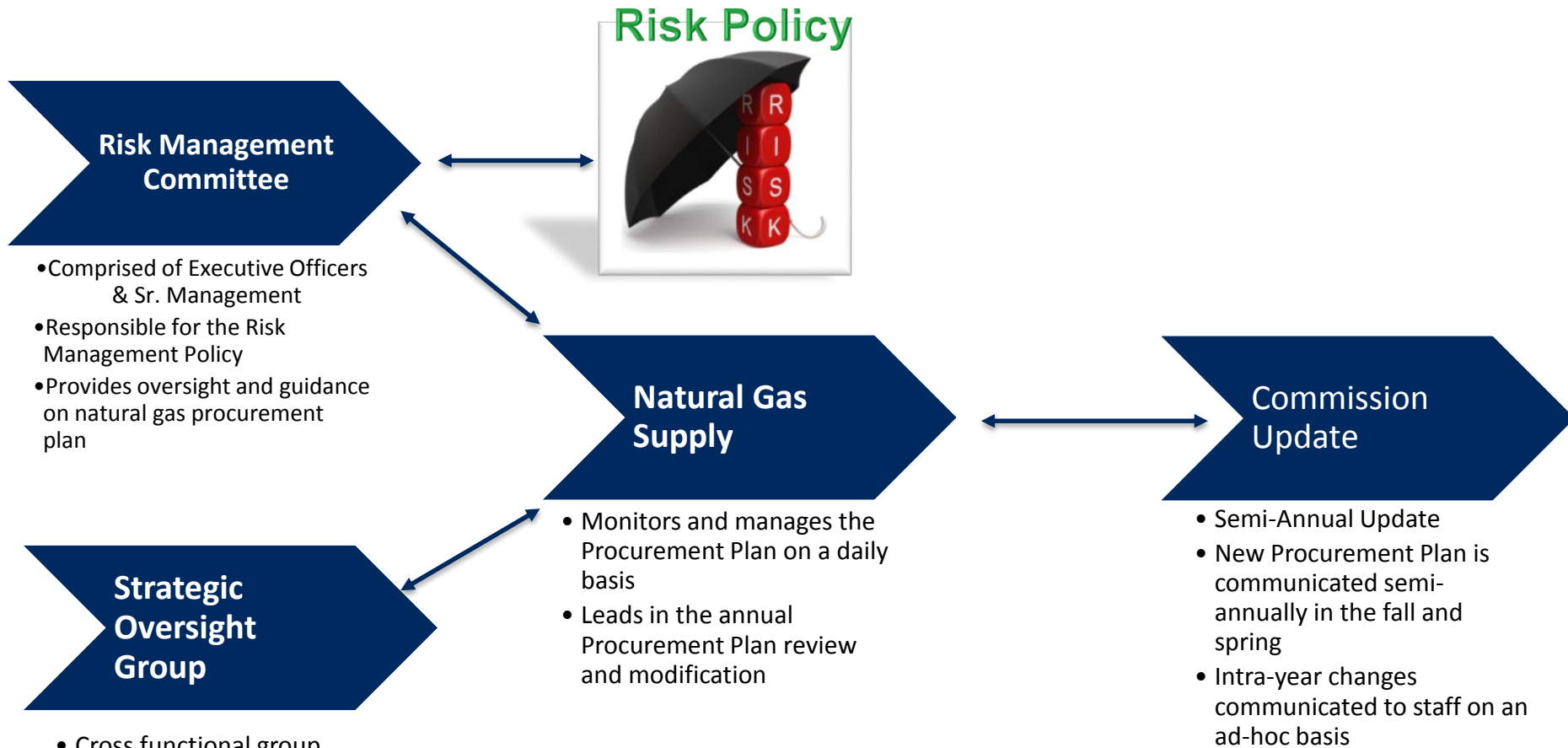
Procurement Plan Philosophy

•Mission

•*To provide a diversified portfolio of reliable supply and a level of price certainty in volatile markets.*

- We cannot accurately predict what natural gas prices will do, however we can use experience, market intelligence, and fundamental market analysis to structure and guide our procurement strategies.
- Our goal is to develop a plan that utilizes customer resources (storage and transportation), layers in pricing over time for stability (time averaging), allows discretion to take advantage of pricing opportunities should they arise, and appropriately manages risk.

Oversight and Control



Comprehensive Review of Previous Plan

Review conducted with SOG includes:

- Mission statement and approach
- Current and future market dynamics
- Hedge type and percentage
- Resources available (i.e. storage and transportation)
- Hedge windows (how many, how long)
- Long term hedging approach
- Storage utilization
- Analysis (volatility, past performance, scenarios, etc.)
- Market opportunities



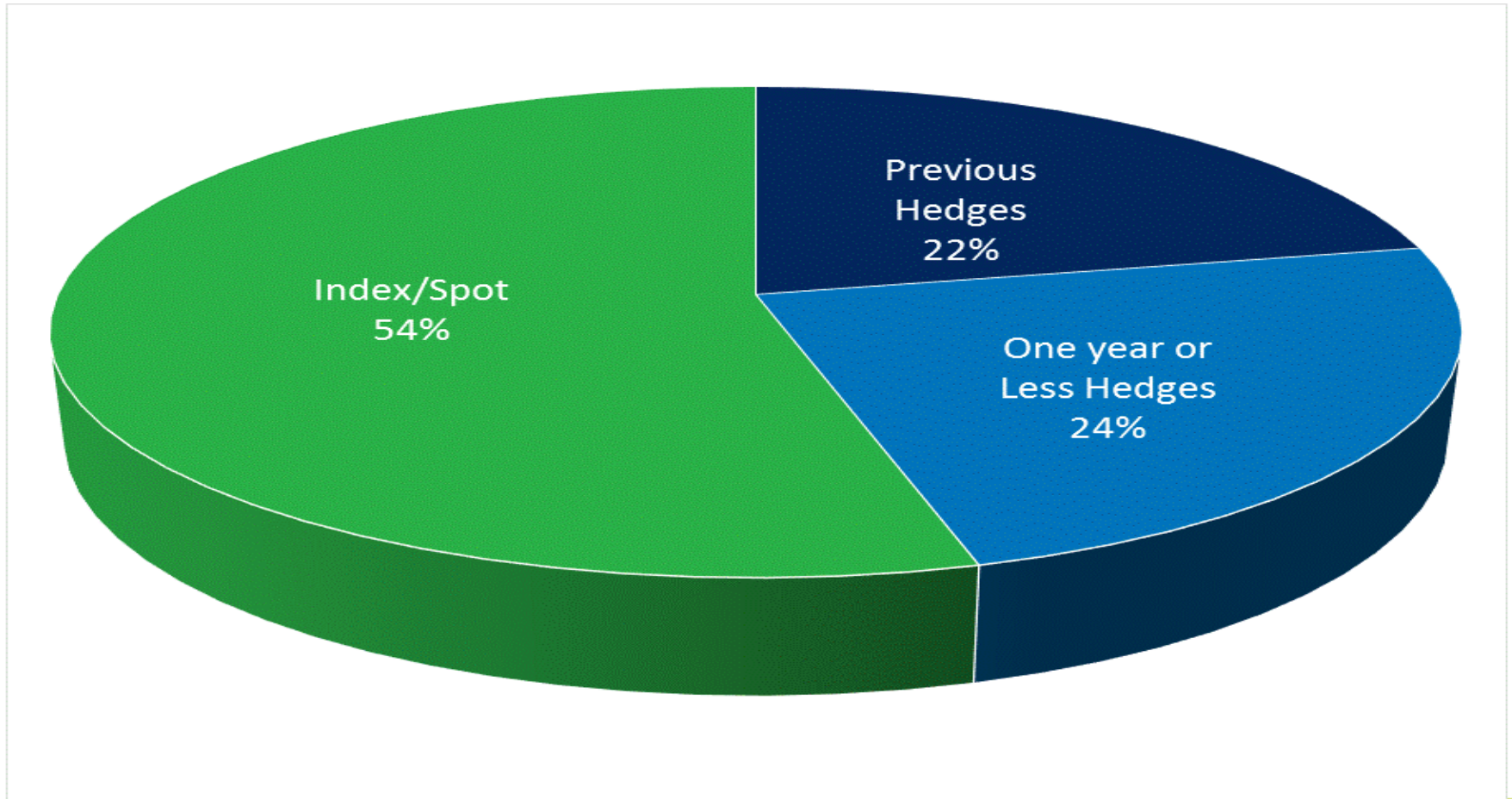
A Thorough Evaluation of Risks



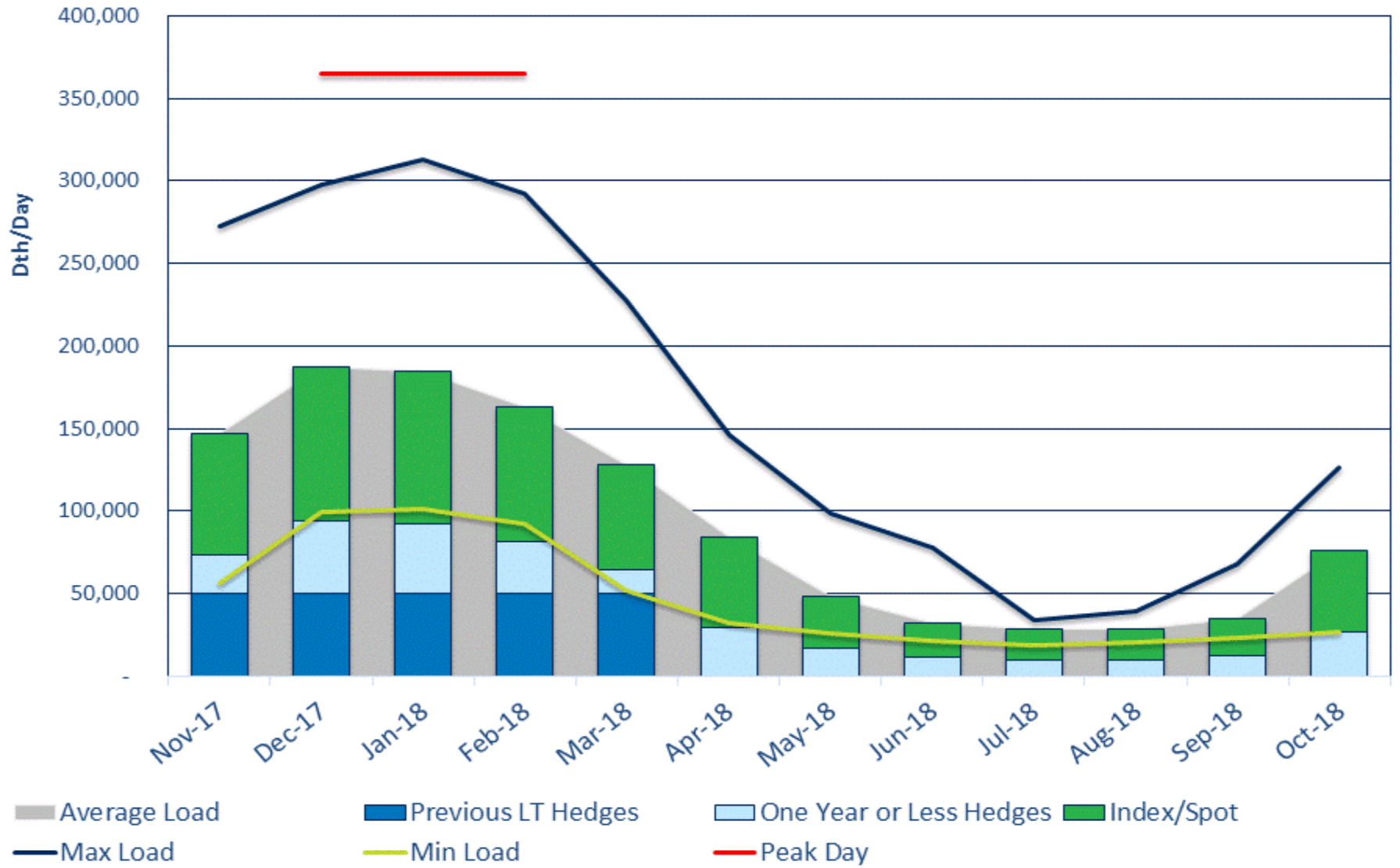
Procurement Plan Structure

- The procurement plan incorporates a portfolio approach that is diversified in terms of:
 - **Components:** The plan utilizes a mix of index, fixed price, and storage transactions.
 - **Transaction Dates:** Hedge windows are developed to distribute the transactions throughout the plan.
 - **Supply Basins:** Plan to primarily utilize AECO, execute at lowest price basis at the time.
 - **Delivery Periods:** Hedges are completed in annual and/or seasonal timeframes. Long-term hedges may be executed.
- Transactions are executed pursuant to a plan and process; however, the procurement plan allows Avista to be flexible to market conditions and opportunistic when appropriate.

Avista's Procurement Plan Composition



Natural Gas Procurement Plan vs. System Demand November 2017 through October 2018

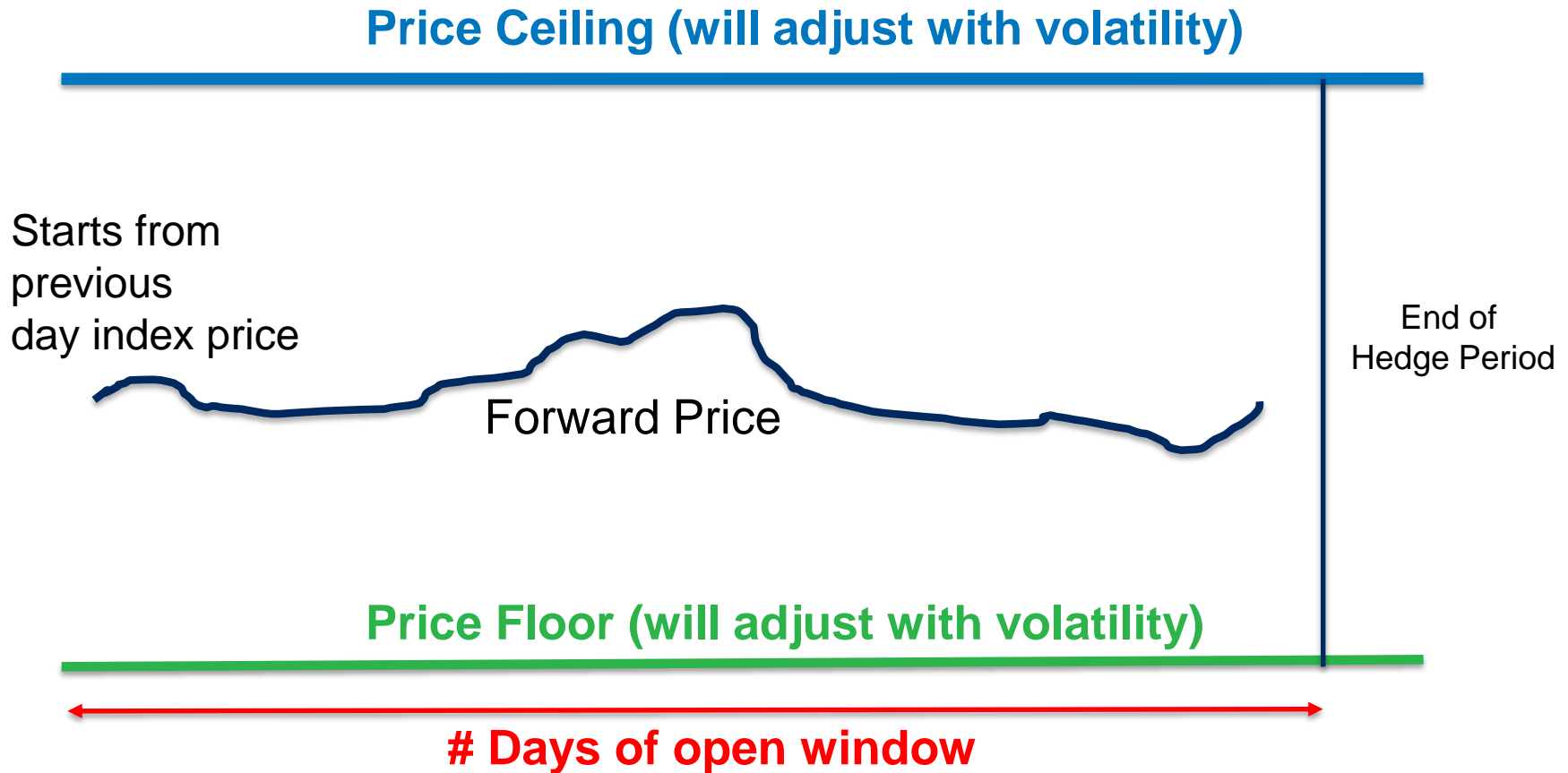


Procurement Plan

- Window mechanism with upper and lower bands that will adjust to the price of the current month of gas depending on the volatility and length of the window.
- We hedge out up to 36 months from prompt month
 - Market is liquid during this timeframe on ICE
 - Intercontinental Exchange
- 46% of annual firm customer load hedged within plan.

46% Hedges would run through this mechanism

Hedge window Example

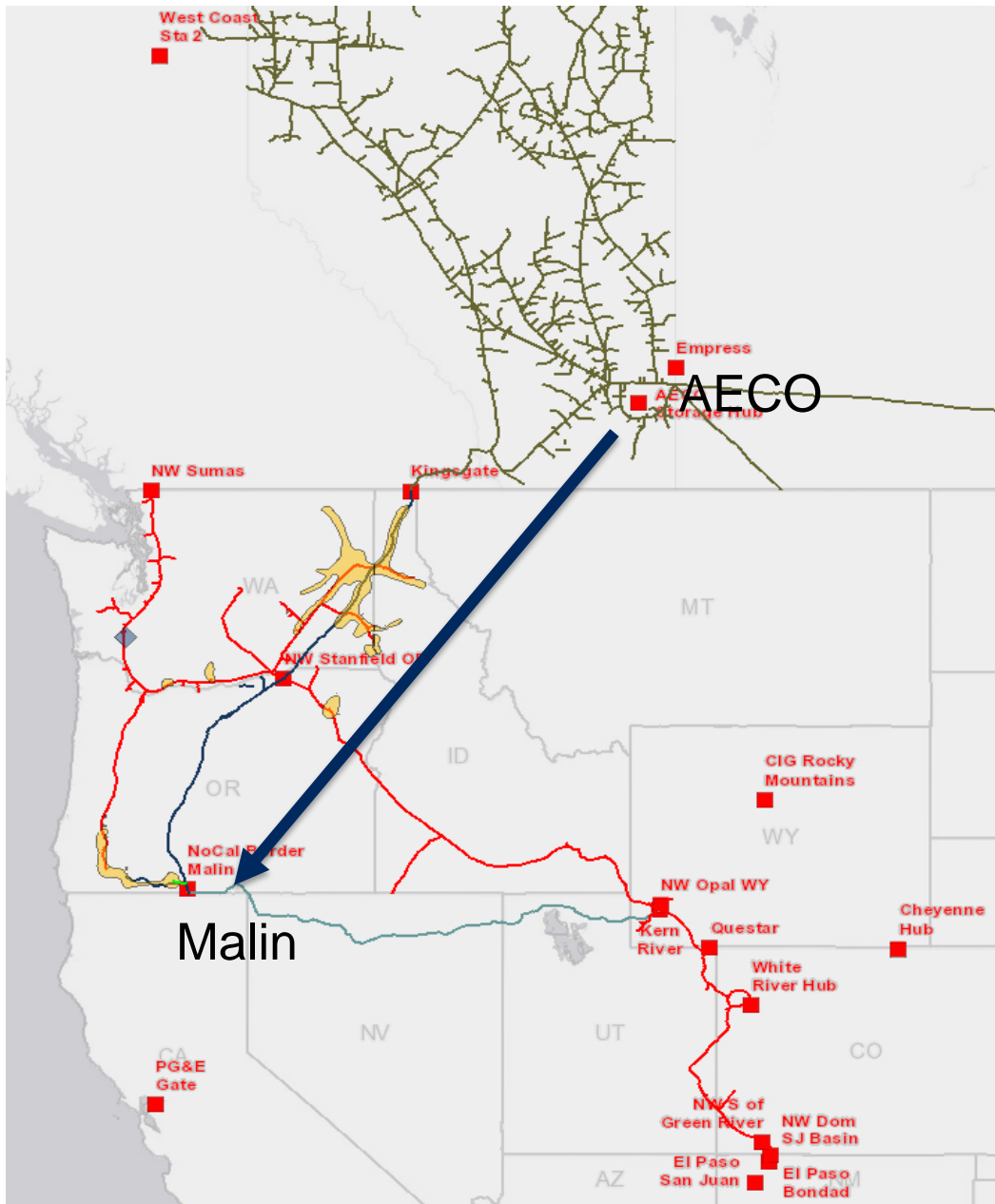


Risk Responsive Hedging Tool (in development)

- Incorporates monthly financial positions, along with market volatility to determine VaR
- The RRHT is in addition to programmatic hedging
- Inputs: all utility purchase/sale transactions, estimated customer load, storage injections and withdrawals
- Currently in testing/evaluation phase
- Anticipate reducing the amount hedged programmatically

Storage Optimization

- Utilize our Jackson Prairie facility to arbitrage spreads between daily and future gas prices.
- Maintain a peak day capability in order to serve needed demand from the facility during a peak event.
- Historic value of storage (Intrinsic)
 - buy in the summer when prices are historically lower and storing this gas until the winter when prices are historically higher
- We optimize storage by locking in spreads between any month during the program horizon.



Transportation Optimization

AECO to MALIN

Demand \$.45

Cost to transport .10

*AECO = \$1.45

MALIN = \$2.00

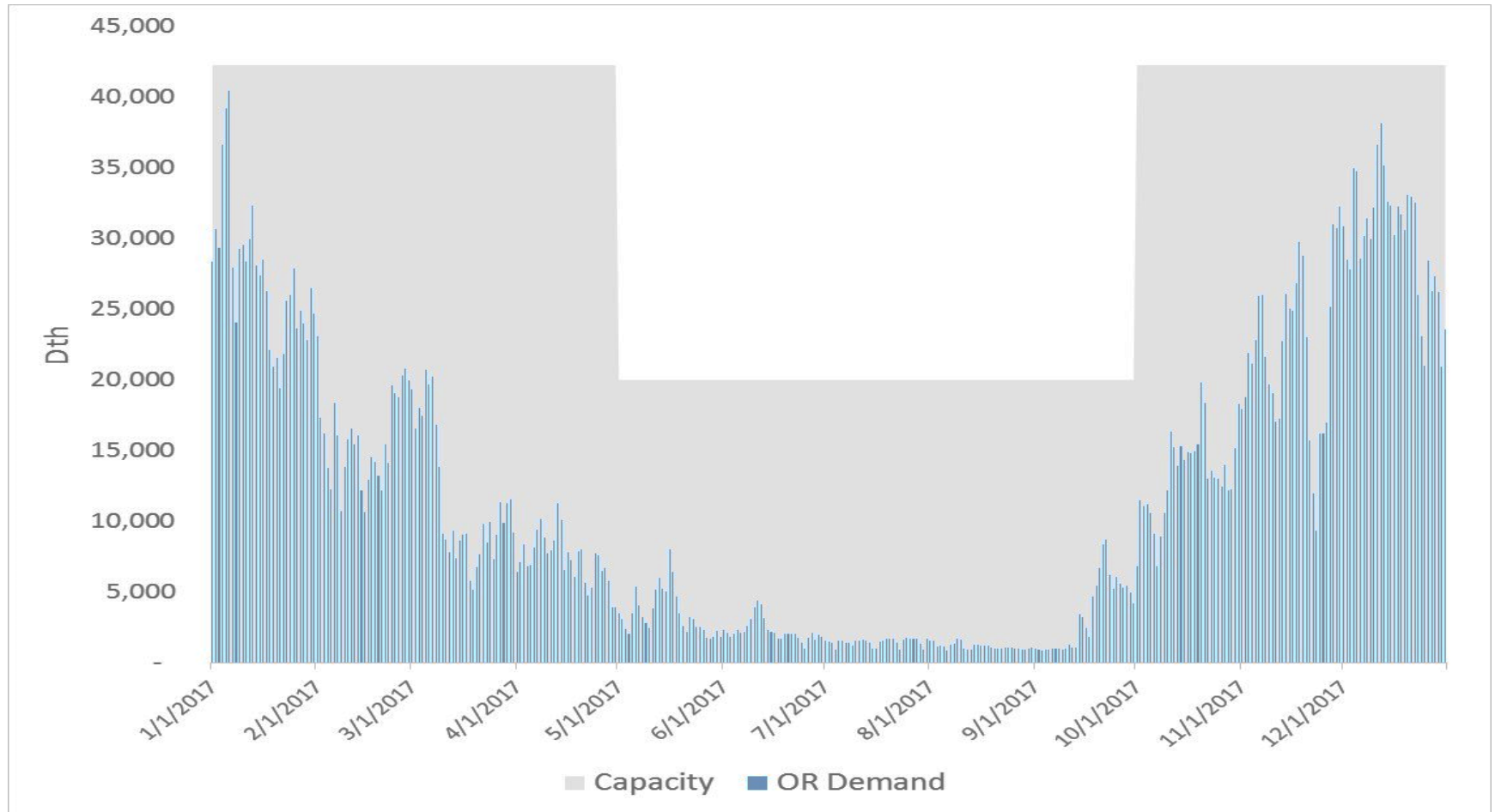
$\$.55 - \$.10 = \$.45$

Lowered cost to ratepayers by \$.45

This is referred to as a location spread.

*2/10/16

Transport Optimization - GTN



Why do we optimize?

- Combine all optimization to create more value
- Optimization has the following effects on rates:
 - WA/ID
 - For every \$2.5M of optimization, rates decrease by ~1%
 - OR
 - For every \$1M of optimization, rates decrease by ~1%

Lunch – 60 Minutes



Emissions

Tom Pardee

Avista and Carbon

Avista President Dennis Vermillion:

“We are fortunate that Washington, with its abundance of renewable hydropower generation, is already among the cleanest states in the country, but that doesn’t mean we can’t do more. Legislation that appropriately balances the interests of our customers, the economy, and the environment can effectively get us there.

“Under the Governor’s proposed climate change legislation, electric and natural gas utilities will have the ability to invest the carbon tax. Avista welcomes the opportunity to work with the Governor and the Legislature on an approach that supports our customer’s needs, creates technological advances, and considers the economic impact, even beyond the state’s borders, with the goal to improve our environment.”

BLM rule repeal

- Trump administration repealed a hydraulic fracturing regulations covering oil and gas wells on federal and tribal lands.
- The repeal, which took effect Dec. 29, 2017
- required producers to obtain BLM approval of fracturing operations, verify cementing, conduct pressure tests, and list non-proprietary fracturing chemicals on FracFocus.
- The rule, finalized in 2015, never took effect, following a stay imposed by the U.S. District Court for Wyoming, which ruled in 2016 that BLM lacked authority to adopt the regulation.

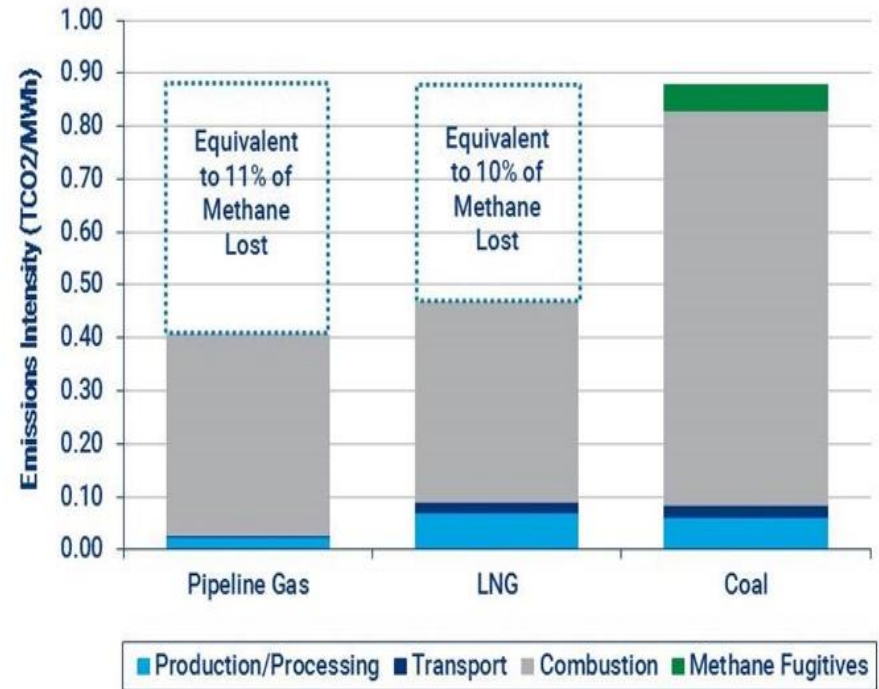
Natural Gas vs. Coal emissions

- IEA assumes a tonne of methane = 28 – 36 tonnes of CO₂ when considering its impact over a 100-year timeframe
- For gas to have higher emissions than coal, we calculate that more than 10-11% of the produced gas would need to be lost along the value chain assuming a 100 year Global Warming Potential (GWP).
- This is equal to 35 bcfd
 - Almost $\frac{3}{4}$ of the daily European demand or $\frac{1}{2}$ US demand.

Source: <https://www.woodmac.com/news/opinion/do-fugitive-emissions-of-methane-make-natural-gas-more-emissions-intensive-than-coal>

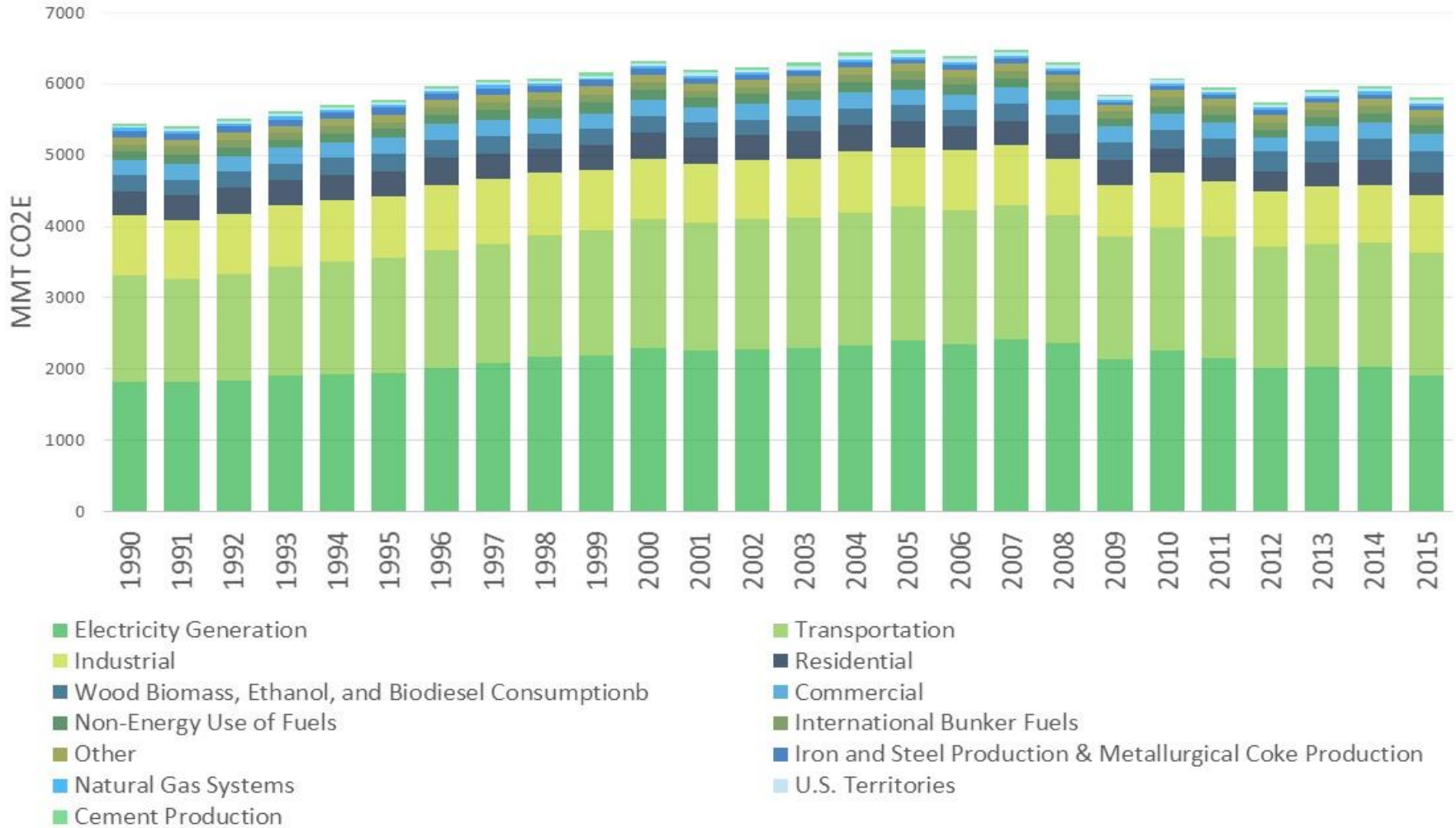
Natural Gas vs. Coal emissions cont.

- Losses are assumed to be from direct leakage into atmosphere in the form of methane.
- If Shell had an estimated 10.5% loss of its production it would lose over \$1 billion a year in profits and \$12.5 billion in corporate value.



Source: Source: Wood Mackenzie
* Assumes 100 year GWP of 34. Losses would be around 44.5% assuming

GAS EMISSIONS AND SINKS 1990 - 2015



<https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2015>

Environmental Protection Agency (EPA)

On April 17, 2012, the U.S. Environmental Protection Agency (EPA) issued cost-effective regulations to reduce harmful air pollution from the oil and natural gas industry.

A key component of the final rules is expected to yield a nearly 95 percent reduction in Volatile Organic Compounds emitted from more than 11,000 new hydraulically fractured gas wells each year. This significant reduction would be accomplished primarily through the use of a proven process – known as a “reduced emissions completion” or “green completion” -- to capture natural gas that currently escapes to the air.

In a green completion, special equipment separates gas and liquid hydrocarbons from the flowback that comes from the well as it is being prepared for production. The gas and hydrocarbons can then be treated and used or sold, avoiding the waste of natural resources that cannot be renewed.

Natural Gas STAR Program

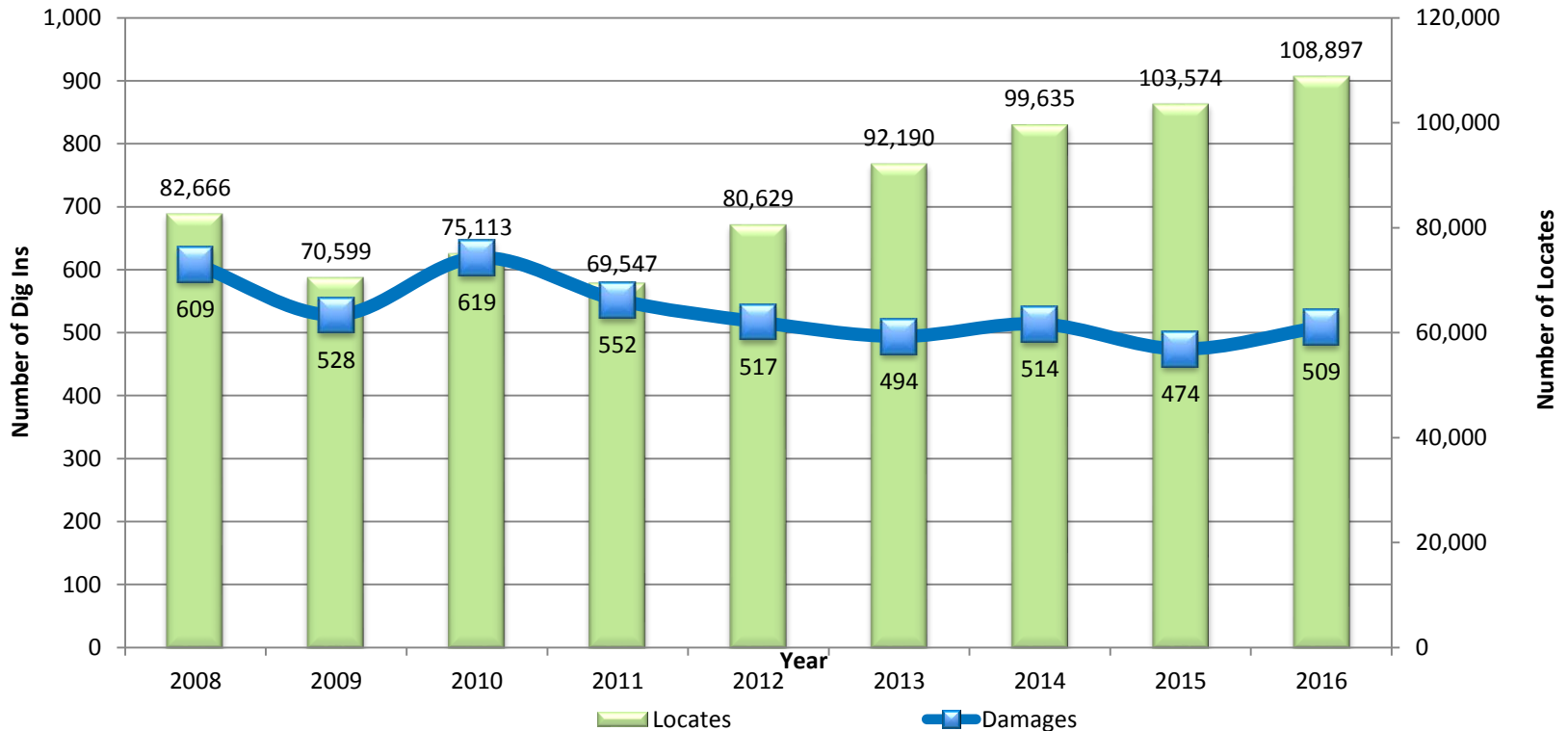
- EPA pollution prevention
- The Natural Gas STAR Program provides a framework for partner companies with U.S. oil and gas operations to implement methane reducing technologies and practices and document their voluntary emission reduction activities. By joining the Program, partners commit to:
 - 1) evaluate their methane emission reduction opportunities,
 - 2) implement methane reduction projects where feasible,
 - 3) annually report methane emission reduction actions to the EPA.
- <https://www.epa.gov/sites/production/files/2016/06/documents/partnerlist.pdf>

Natural Gas STAR Methane Challenge Program – Avista

- Avista Utilities has agreed to pursue a Best Management Practice (BMP) commitment in the NG Distribution-Excavation Damages category.
- Avista plans for continuous improvement in reducing dig in damages and has been pursuing a program for reducing such damages since 2007. This program has no scheduled end date and Avista is committed to achieving the lowest possible dig in rates in our service areas.
- Avista accumulates the number of dig-in damages that occur within each natural gas operating district on a monthly basis. The number of locate tickets generated in each of these districts are tallied also by district and by month. A report is generated which then details the number of dig-in damages per 1000 locate tickets for each district.

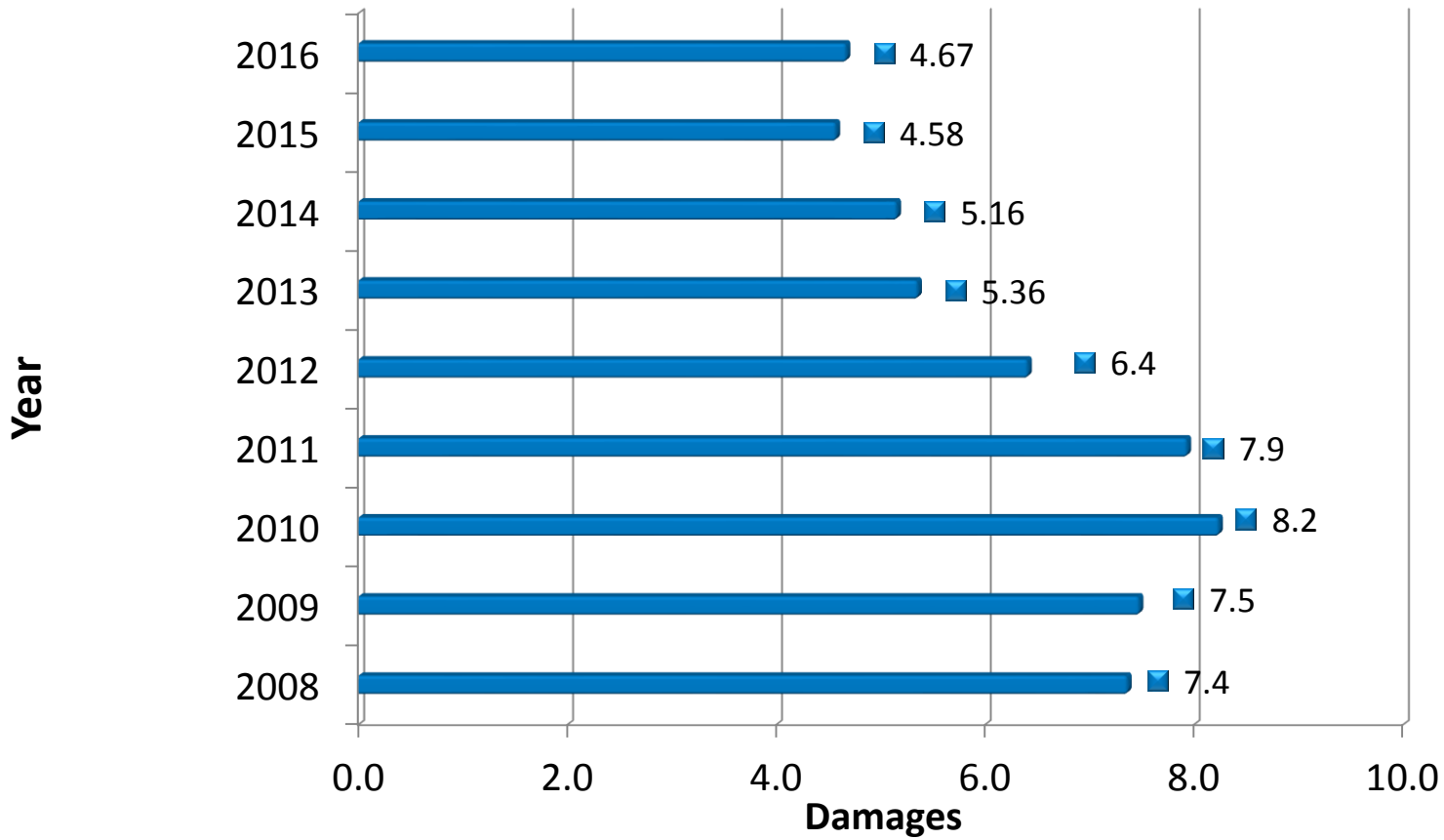
Avista Locates vs Dig In's

Company Wide: Locates vs Dig In's



Avista Locates vs Dig In's

Damages per 1000 locates

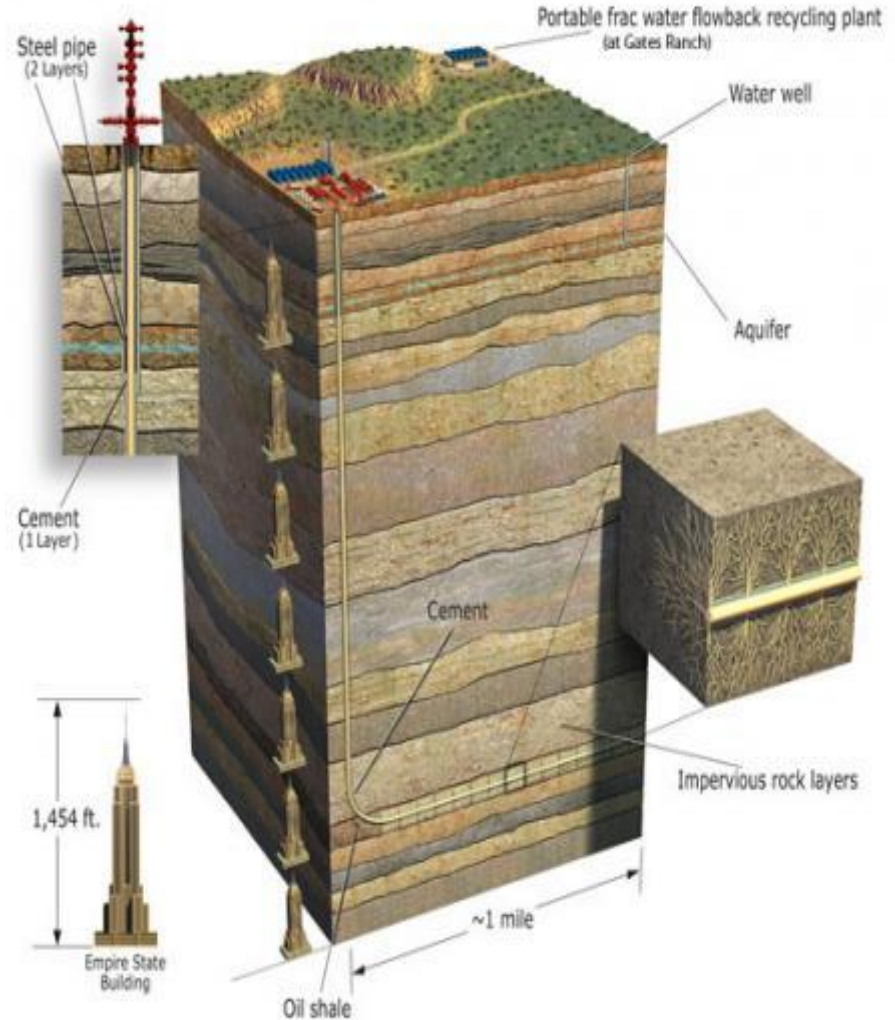


Fracking

- Fracking remains a potential risk if more robust data shows higher than known emissions or environmental pollution is caused by hydraulic fracking. This may cause more policies to be put in place making drilling less economic or halt production all together in some areas.
- *Most companies report the chemicals used in the process of hydraulically fractured wells.

Video:

<http://www.youtube.com/watch?v=2PBCTXHqZec&feature=share&list=UUMdjBoSXSeV38gd3xCparmA>



Clean Air Rule

Terms

- **"Emission reduction unit" or "ERU"** is an accounting unit representing the emission reduction of one metric ton of CO₂e.
- **Renewable Energy Certificates (RECs)** are tradable, non-tangible energy commodities in the United States that represent proof that 1 megawatt-hour (MWh) of electricity was generated from an eligible renewable energy resource (renewable electricity) and was fed into the shared system of power lines which transport energy.

Overview

- In 2015, Governor Inslee directed the Department of Ecology to develop the Clean Air Rule (CAR) to cap and reduce carbon emissions under Washington's Clean Air Act authority.
- Includes entities with 100,000 metric tons of CO₂e emissions annually and lowers the threshold to 70,000 metric tons by 2035.
- Covers natural gas distributors and power plants, as well as other facilities –baseline will be set by Ecology using five years of data due on March 31, 2017. (2012-2016)
- The CAR went into effect on October 17, 2016.
- Annual emission reductions will equal:
 - 1.7% of baseline CO₂e emissions
 - 5% over the three year compliance period
 - Reductions are shown by banking emissions reduction units (ERUs) in the registry

Overview cont.

- ERU must originate from reductions in Washington unless derived from allowances and must be retired when used for compliance
- Generate ERUs by:
 - Actual emissions reductions beyond annual compliance requirements
 - Emission reduction projects, programs or activities
- ERU banking – 10 Year Banking Provision
- Exchange ERUs through established registry
- Kaiser is excluded from Avista's emissions baseline

Activities and programs recognized as generating ERU's

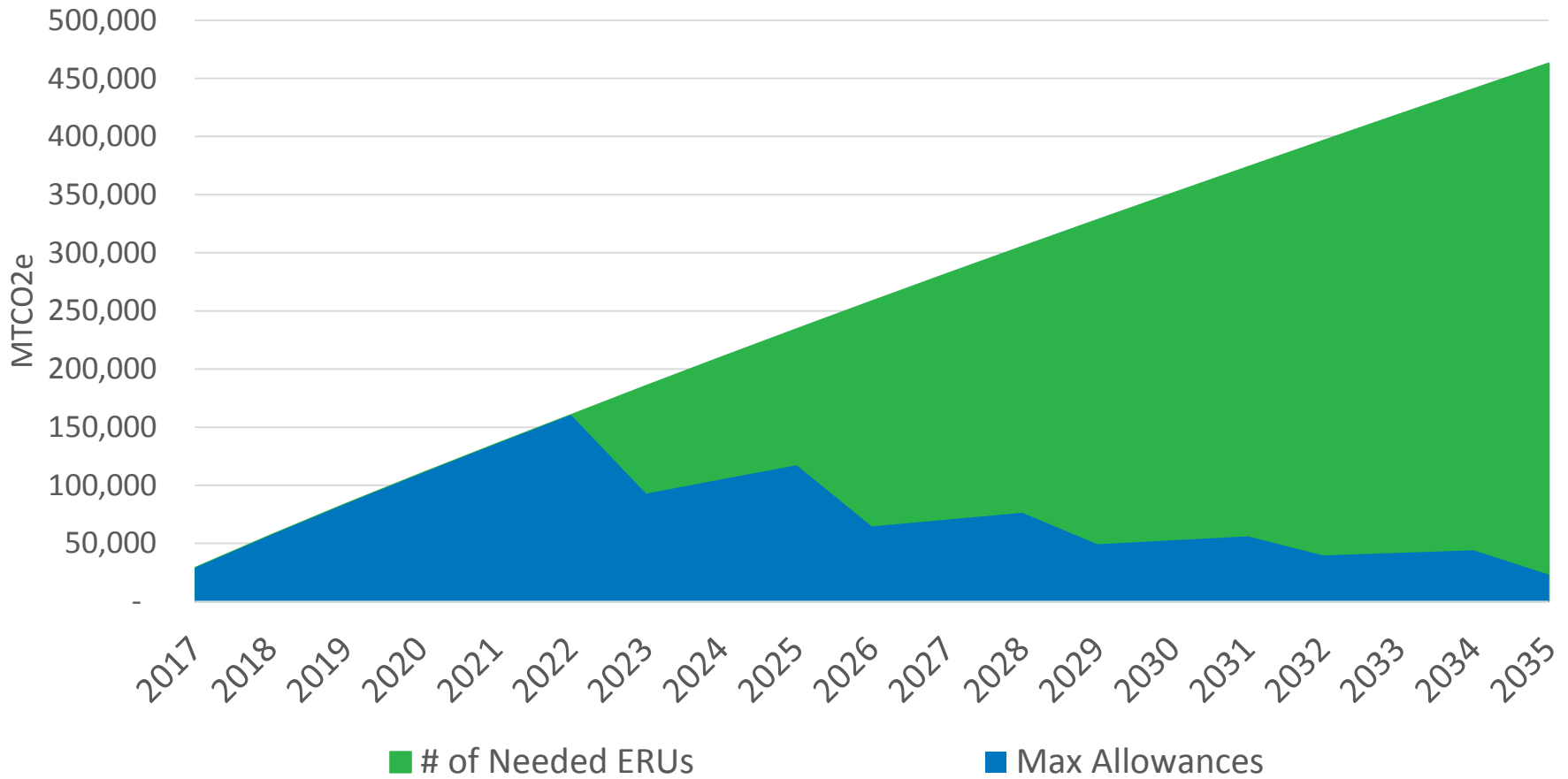
- Transportation activities;
- Combined heat and power activities;
- Energy activities;
- Livestock and agricultural activities;
- Waste and wastewater activities;
- Industrial sector activities;
- Certain Energy Efficiency Site Evaluation Council (EFSEC) recognized emission reductions; and
- Ecology approved emission reductions

Percentage Limits on Use of Allowances per compliance period

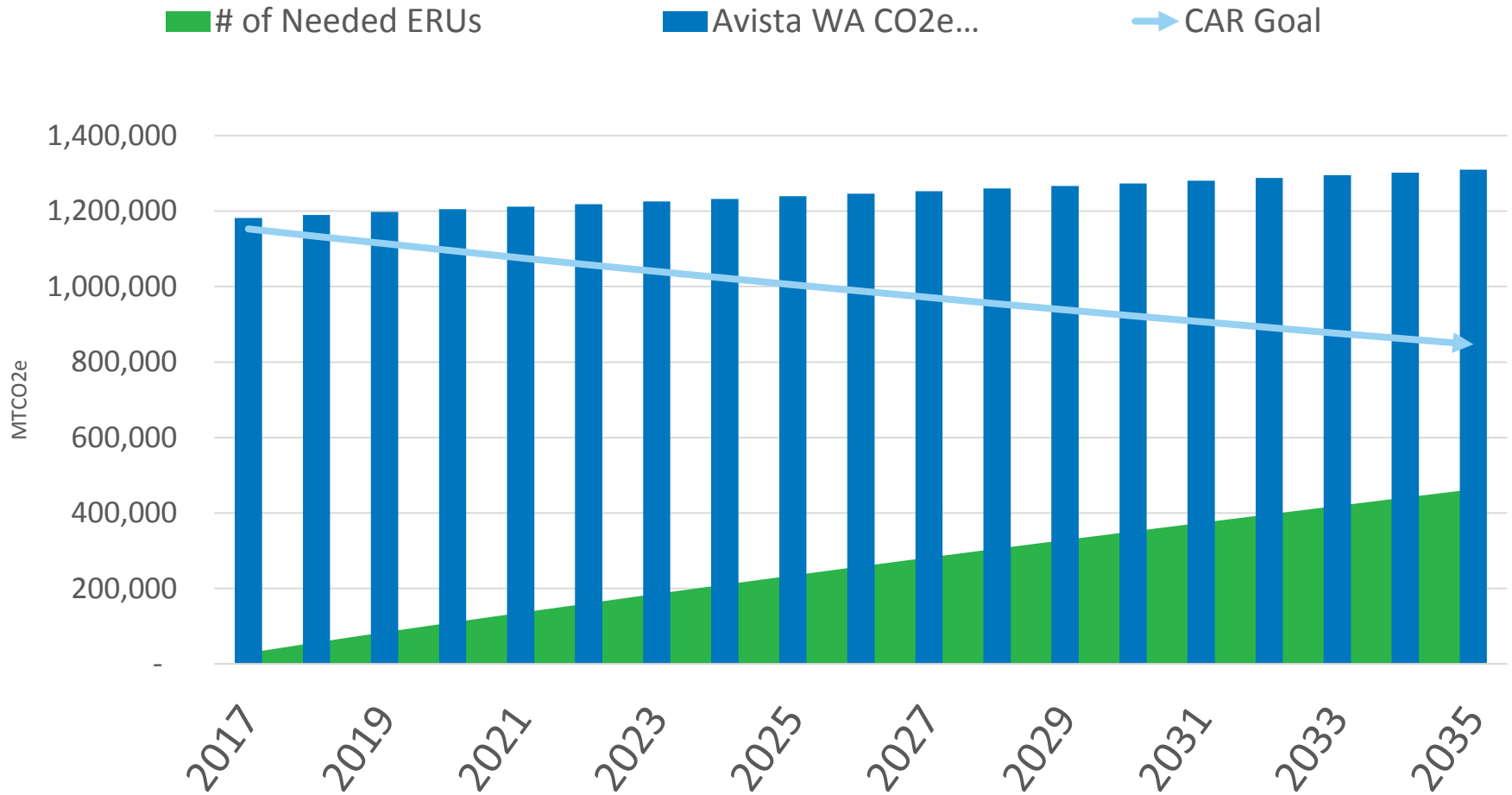
Compliance Period (Calendar year)	Report to EPA Due December 31	Report to Ecology Due July 28
2017 through 2019	2020	2021
2020 through 2022	2023	2024
2023 through 2025	2026	2027
2026 through 2028	2029	2030
2029 through 2031	2032	2033
2032 through 2034	2035	2036
2035 through 2037	2038	2039
Every 3 years	Every 3 years	Every 3 years

Compliance Period	Upper Limit
2017-22	100%
2023-25	50%
2026-28	25%
2029-31	15%
2032-34	10%
2035 and beyond	5%

CAR Allowances



Avista WA CAR goal



Potential Supply for CAR compliance

- RNG
- Solar
- Wind
- DSM



- Gas Customers, without a reduction in use, would likely be required to purchase electric generation resources in Washington State to offset emissions.



2018 Natural Gas IRP Carbon Policy Overview

John Lyons, Ph.D.
Second Technical Advisory Committee Meeting
February 22, 2018

Carbon Laws and Regulations

- Big changes at the federal level with the Trump administration
- More activity at the state and local levels
- Three main areas for carbon emissions:
 1. Regulatory mandates
 2. Cap and trade programs
 3. Carbon taxes
- Focus still on electric generation, but many states are expanding to natural gas and other fuels

Federal

- Current federal focus under a regulatory model through the Clean Air Act (CAA)
- Clean Power Plan (CPP) – reduce greenhouse gas emissions from covered existing power plants 32 percent below 2005 levels by 2030 under section 111(d) of the CAA.
 - Regulates power generation, but would impact natural gas use.
 - CPP stayed by US Supreme Court on February 9, 2016 and oral arguments June 2, 2016 at DC Circuit Court of Appeals.
 - April 4, 2017, EPA announced review to determine a new proceeding to “suspend, revise or rescind the Clean Power Plan.”
 - 10/16/17 – EPA proposed to repeal the CPP
 - Public comment period reopened to April 26, 2018 and additional listening sessions in February and March 2018

Idaho

- No active or proposed greenhouse gas legislation
- Provided comments about the CPP and the federal implementation plan
- Were working towards a state implementation plan by September 2016, but work stopped with the Supreme Court stay
- Will update after EPA makes a final decision on the CPP

Oregon

- Last IRP, “Clean Electricity, Coal Transition” law set a 50% renewable goal by 2040 and the elimination of coal power in rates by 2030
- **HB 4001 & SB 1507:** both bills create a cap and trade system for entities emitting over 25,000 metric tons carbon annually.
- In 2021, the Oregon Environmental Quality Commission would set a statewide emissions on about 100 companies who would need to reduce emissions or buy allowances.
- Revenue would be invested in clean energy or emissions mitigation programs.
- Emissions under both bills would drop 20% below 1990 levels by 2025, 45% by 2035, and 80% by 2050.

Oregon

- HB 4001 moved from House Energy & Environment Committee and referred to the Joint Committee on Ways & Means with no scheduled action for the bill.
- SB 1507 was voted out of the Senate Environment & Natural Resources Committee and referred to the Joint Committee on Ways & Means with no currently scheduled action for the bill.
- The House bill mirrors California's and the Senate bill tries to complement the "Clean Electricity, Coal Transition" bill by giving utilities free allowances for coal emissions.
- The biggest question from legislators has been the cost, which were estimated between \$400 and \$700 million annually in a Senate Committee on Environment and Natural Resources debate on February 12, but a final cost hasn't been issued yet.

Washington

- Clean Air Rule – invalidated 12/15/17
- SSB 6203: Current version is \$12/metric ton from use of fossil fuels and emissions from electric sector, increasing \$1.80/year until reaching \$30/ton in 2030
 - Originally \$20 with 3.5% plus inflation, changed to \$10 and \$2 annual increase
 - Exempts many energy intensive, trade-exposed manufacturers
 - Allows utilities a full tax credit for investing in projects and programs to reduce emissions or mitigate costs to low-income customers. This provision phases out for coal-fired generation.
 - Possible ballot initiative if the measure fails
- SHB 2839 – allows alternative regulation by the UTC and requires utilities to factor in a “carbon adder” starting at \$40/ton in resource and conservation planning if a carbon price is enacted. Failed to meet the cutoff.

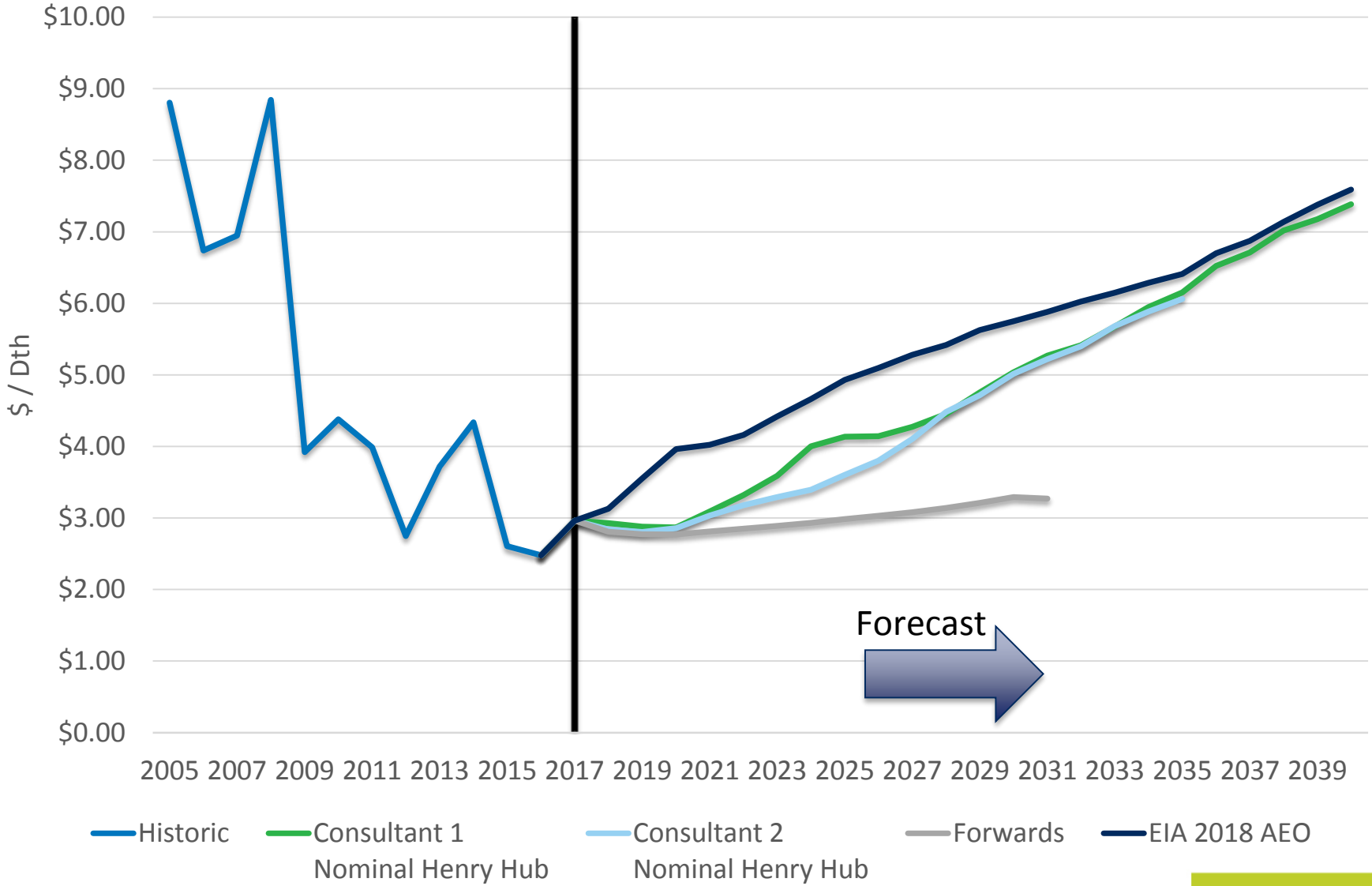
Washington

- SB 6253 requires electric utilities to remove coal-fired generation costs from rates by 2030, and reduce carbon emitting resources until 100% renewable by 2045 or face a \$100/ton cost for exceeding emission targets. Failed to meet the chamber of origin cutoff.
- HB 2580, Rep. Morris Requires the WSU Extension Energy Program and Department of Commerce to identify opportunities and cost estimates for renewable natural gas and provide recommendations by September 1, 2018. Failed to meet the chamber of origin cutoff.
- HB 2402 for 50% RPS for investor-owned utilities by 2040, consumer-owned utilities purchase non-emitting resources for future needs, and sets minimum conservation 2% of electric load and 1.5% for natural gas load. Failed to meet the chamber of origin cutoff.
- Elements of bills failing to meet the chamber of origin cutoff may still be incorporated into other bills.



Price Forecasts and Carbon Adders

Henry Hub Forecast (Nominal \$)



How prices affect IRP Planning?

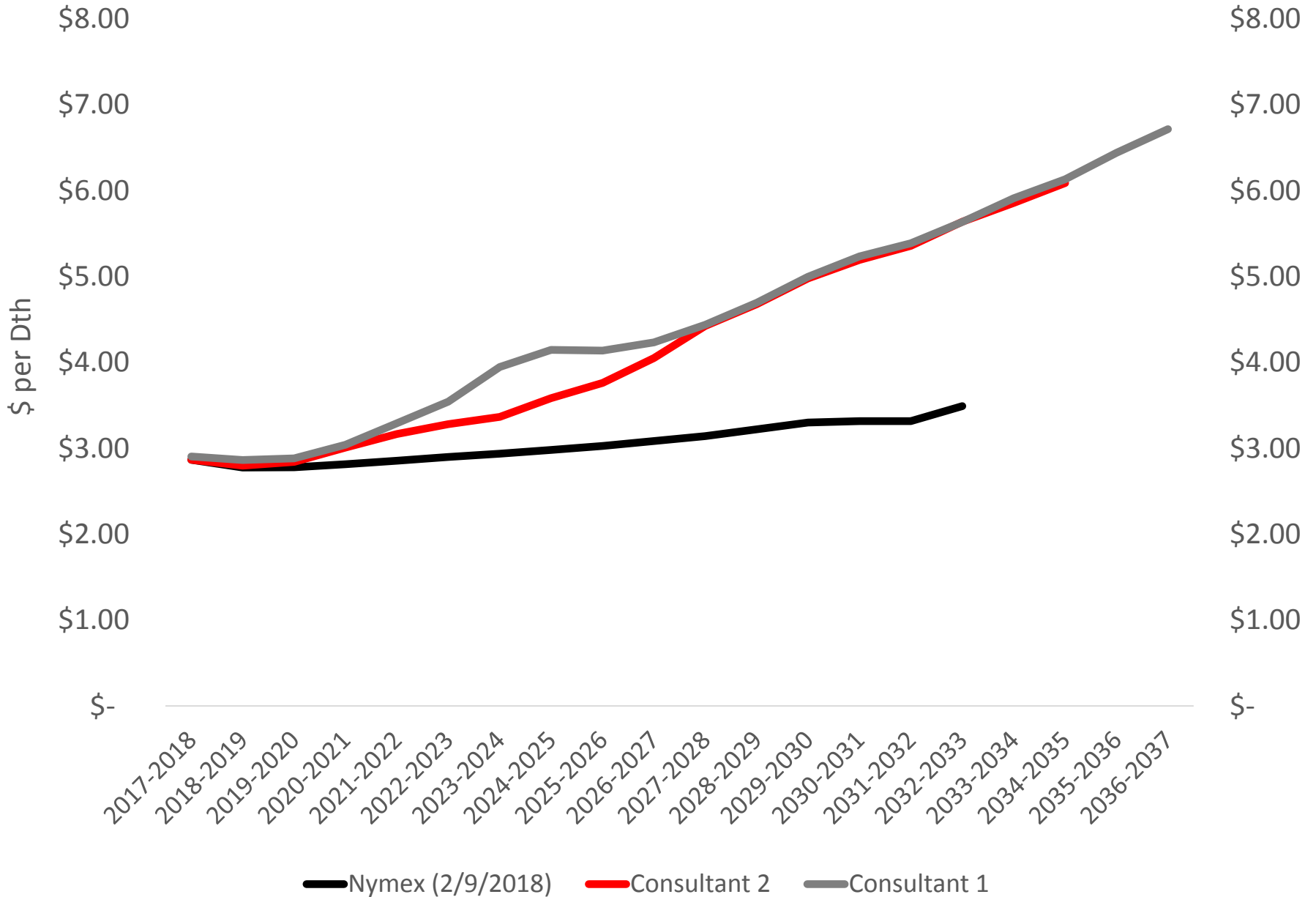
- Major component of the total cost
- Change in price **can** trigger price elastic response
- **THE** major piece of avoided costs and therefore cost effectiveness of DSM
- Can change resource selection based on basin differentials
- Storage utilization

IRP Natural Gas Price Forecast Methodology

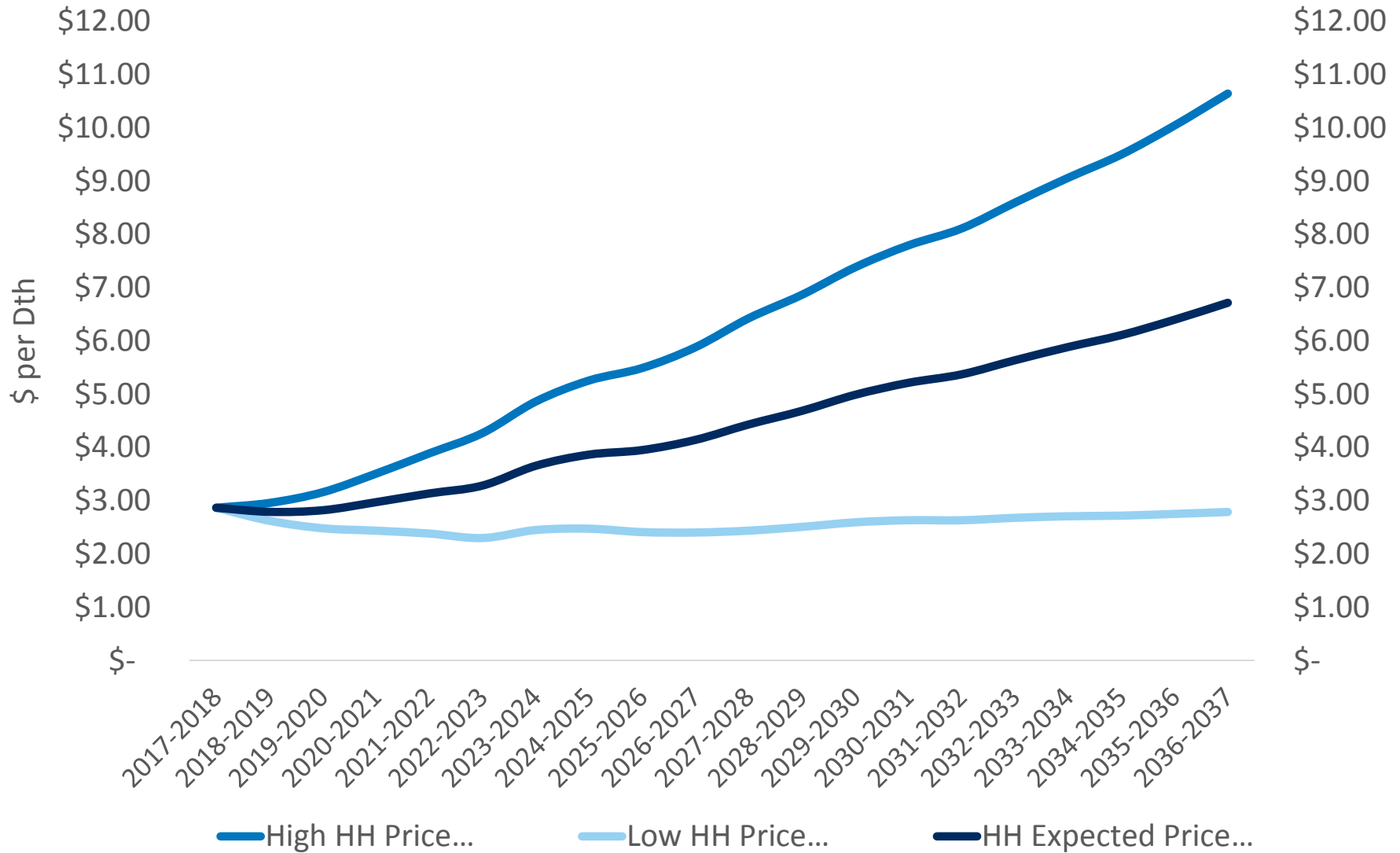
1. Two fundamental forecasts (Consultant #1 & Consultant #2)
2. Forward prices
3. Year 1 - forward price only
4. Year 2 - 75% forward price / 25% average consultant forecasts
5. Year 3 - 50% forward price / 50% average consultant forecasts
6. Year 4 – 6 25% forward price / 75% average consultant forecasts
7. Year 7 - 50% average consultant without CO2 / 50% average consultant with CO2

Expected Price forecast methodology curves

Nominal \$



2018 Henry Hub Prices - Nominal



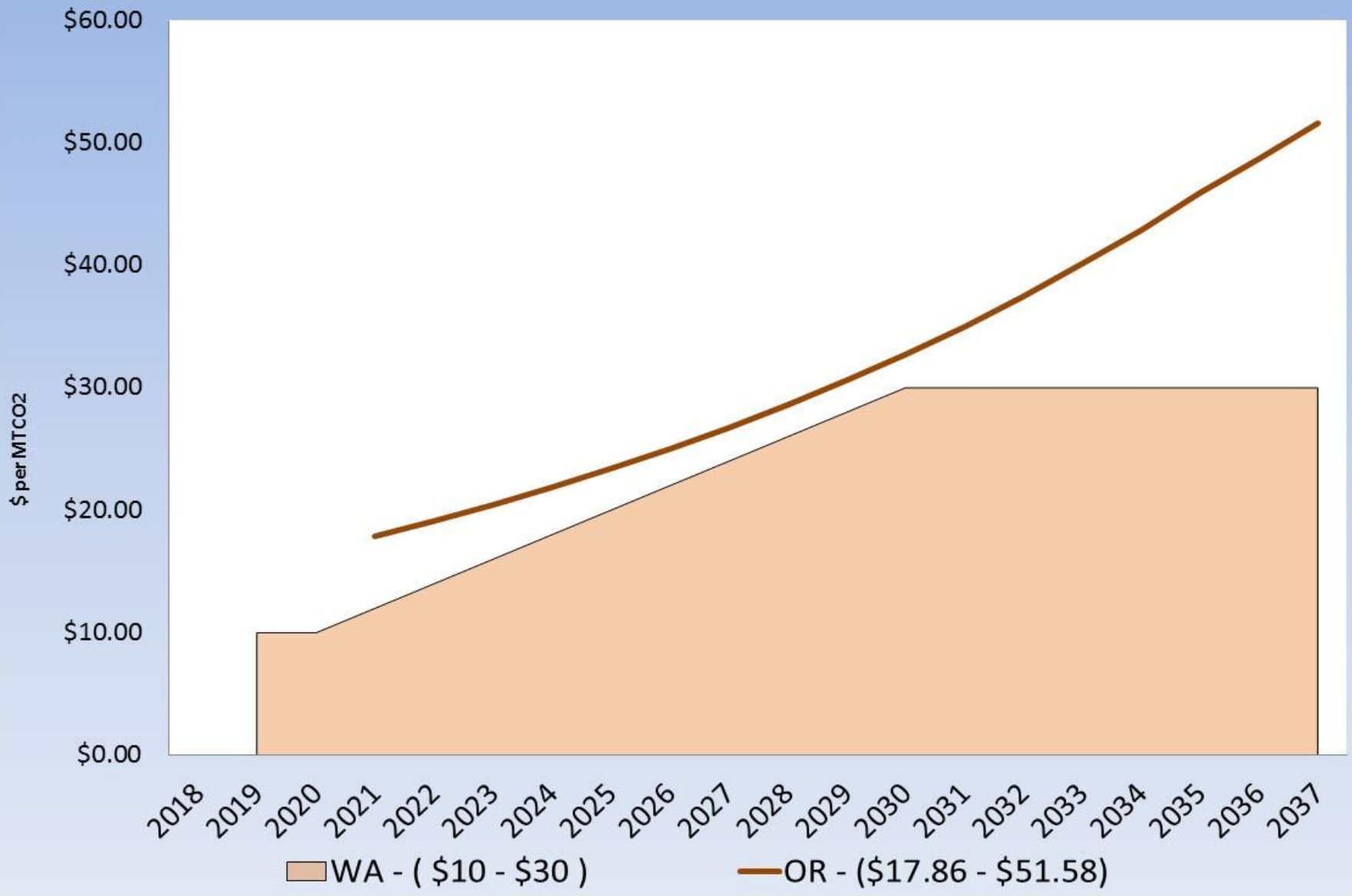
Pricing starts at the expected price for the first year

Years 2-6 price deviates by 6% per year from the expected price to create the high and low

Years 7-11 price deviates by 3% per year from the expected price to create the high and low

Years 12 – 20 the price deviates by 1.5% per year from the expected price

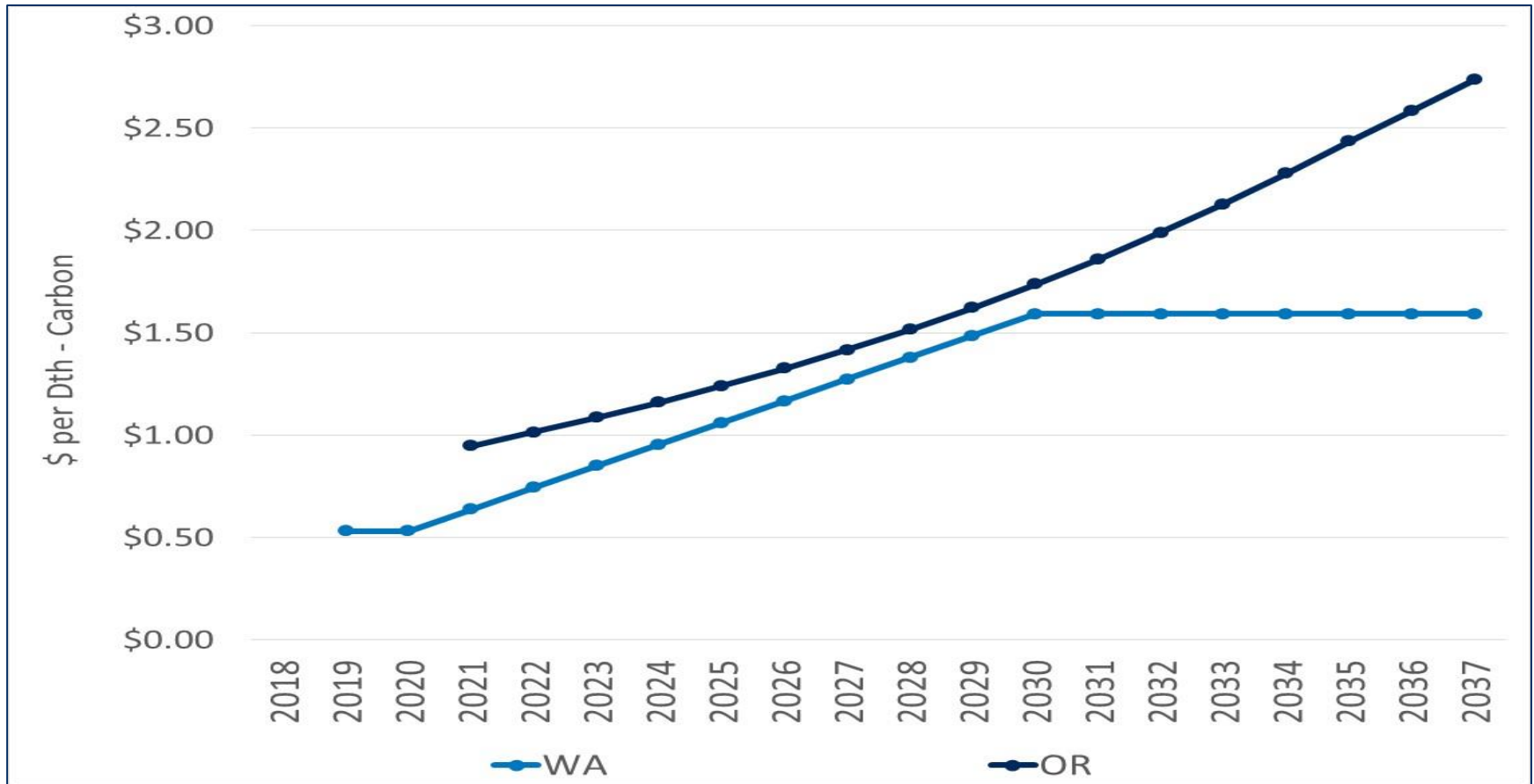
Price per MTCO2



*nominal dollars



Carbon Price by Jurisdiction



*Idaho has no carbon price adder

Carbon Tax Summary

- ID – None
- OR – Cap and Investment Program SB1070
 - Avista's price assumption are based on CA cap and trade program
 - Increases by 5% + inflation each year
- WA – Governor Inslee proposed Carbon tax (SB 6203)
 - Starts at \$10 per MTCO₂e in July 2019 and starting in 2021 adds \$2 per year until capping at \$30 in 2030.

2018 ID IRP Prices

Low – Expected – High

No Carbon Adders



2018 OR IRP prices

Low – Expected – High

Including Carbon Adders



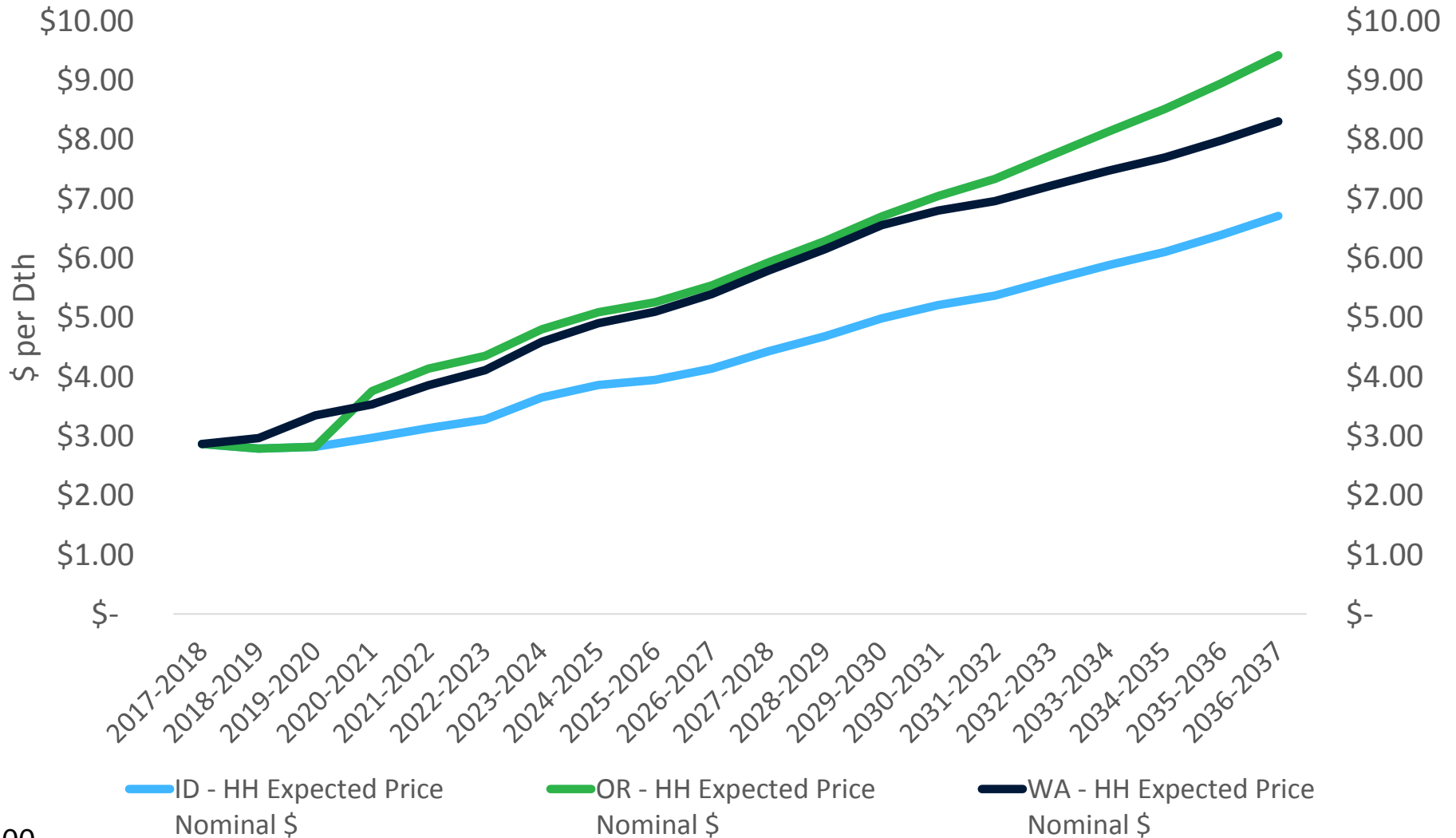
2018 WA IRP Prices

Low – Expected – High

Including Carbon Adders



2018 Henry Hub Expected Price Including Carbon Adders by State





Wrap Up

IPUC

- Staff believes public participation could be further enhanced through “bill stuffers, public flyers, local media, individual invitations, and other methods.”
- Result: Avista utilized it’s Regional Business Managers in addition to digital communications and newsletters in all states in order to try and gain more public participation. Previous IRP’s relied on website data and word of mouth.
 - eCommunity newsletter was sent out on January 15, 2018

OPUC

- Staff Recommendation No. 1
 - Staff recommends in Avista's 2018 IRP that Avista pursue an updated methodology, wherein the low/high gas price curves continue to be based on low (high) historic prices in a Monte Carlo setting, but are inflated to match the growth rate (yr/yr) of the expected price curve. The resulting curves would be based on historic prices and also produce symmetric risk profiles throughout the time horizon.
 - **Result: Avista updated its method as recommended by the Oregon commission. This new method deviates from the expected price by the following method:**
- **Pricing starts at the expected price for the first year**
 - Years 2-6 the high and low price deviate +/- 6% per year from the expected price
 - Years 7-11 the high and low price deviate by +/- 3% per year from the expected price
 - Years 12 – 20 the high and low price deviate by +/- 1.5% per year from the expected price
 - By the 20 year mark the high and low deviate from the expected price by +/- 58.5%
- Staff Recommendation No. 2
 - Staff recommends that Avista forecast its number of customers using at least two different methods and to compare the accuracy of the different methods using actual data as a future task in its next IRP.
 - Result: Avista analyzed the data, but there was nothing material discovered the come up with a meaningful forecast alternative.
- Staff Recommendation No. 3
 - Avista's 2018 IRP will contain a dynamic DSM program structure in its analytics.
 - In, prior IRPs, it was a deterministic method based on Expected Case assumptions, in the 2018 IRP, each portion will have the ability to select conservation to meet unserved customer demand, Avista will explore methods to enable a dynamic analytical process for the evaluation of conservation potential within individual portfolios and will work with Energy Trust of Oregon in the development of this process and in producing any final results for its 2018 IRP for Oregon customers.

OPUC cont.

- Staff Recommendation No. 4
 - Staff recommends that Avista provide Staff and stakeholders with updates regarding its discussions and analysis regarding possible regional pipeline projects that may move forward.
- Staff Recommendation No. 5
 - Staff recommends that in its 2018 IRP process Avista work with Staff and stakeholders to establish and complete stochastic analysis that considers a range of alternative portfolios for comparison and consideration of both cost and risk.

OPUC cont.

- Staff Recommendation No. 6
 - Environmental Considerations
 - 1. Carbon Policy including federal and state regulations, specifically those surrounding the Washington Clean Air Rule and federal Clean Power Plan;
 - Result: Carbon Policy including the Clean Power Plan and Clean Air Rule were both reviewed and included in TAC 2 Meeting materials on 2/22/2018. An indicator of where Avista's carbon reduction requirements under the CAR was also included. Since the CAR was invalidated on 12/15/2017 in Thurston County Superior Court this analysis is intended to meet the action item in addition to showing the potential impacts of similar policies.
 - 2. Weather analysis specific to Avista's service territories;
 - Result: A weather analysis was included and reviewed in TAC 2 meeting materials on 2/22/2018
 - 3. Stochastic Modeling and supply resources; and
 - 4. Updated DSM methodology including the integration of ETO

WUTC

- Include a section that discusses impacts of the Clean Air Rule (CAR).
 - In its 2018 IRP expected case, Avista should model specific CAR impacts as well as consider the costs and risk of additional environmental regulations, including a possible carbon tax.
 - **Result:**
 - Carbon Policy including the Clean Power Plan and Clean Air Rule were both reviewed and included in TAC 2 Meeting materials on 2/22/2018. An indicator of where Avista's carbon reduction requirements under the CAR was also included. Since the CAR was invalidated on 12/15/2017 in Thurston County Superior Court this analysis is intended to meet the action item in addition to showing the potential impacts of similar policies.
 - For the 2018 IRP Avista is utilizing SB6203 from the WA Senate energy committee on Feb. 1 as a proxy of a possible carbon tax in Washington State.

WUTC

- Provide more detail on the company's natural gas hedging strategy, including information on upper and lower pricing points, transactions with counterparties, and how diversification of the portfolio is achieved.
 - Avista's natural gas hedging strategy was discussed during the TAC 2 Meeting on 2/22/2018. The upper and lower pricing points in Avista's programmatic hedges is controlled by taking into consideration the volatility over the past year for the specific hedging period. This volatility is weighted toward the more recent volatility. The window length and quantity of windows is also a part of the equation. Avista transacts on ICE with counterparties meeting our credit rating criteria. The diversification of the portfolio is achieved through the following methods:
 - **Components:** The plan utilizes a mix of index, fixed price, and storage transactions.
 - **Transaction Dates:** Hedge windows are developed to distribute the transactions throughout the plan.
 - **Supply Basins:** Plan to primarily utilize AECO, execute at lowest price basis at the time.
 - **Delivery Periods:** Hedges are completed in annual and/or seasonal timeframes. Long-term hedges may be executed.

WUTC cont.

- Ensure that the entity performing the CPA evaluates and includes the following information:
 - All conservation measures excluded from the CPA, including those excluded prior to technical potential determination
 - The rationale for excluding any measure
 - A description of Unit Energy Savings (UES) for each measure included in the CPA, specifying how it was derived and the source of the data
 - The rationale for any difference in economic and achievable potential savings, including how the Company is working towards an achievable target of 85 percent of economic potential savings.
 - A description of all efforts to create a fully-balanced cost effectiveness metric within the planning horizon based on the TRC.

WUTC cont.

- Discuss with the TAC:
 - The results of Northwest Energy Efficiency Alliance (NEEA) coordination, including non-energy benefits to include in the CPA.
 - The appropriateness of listing and mapping all prospective distribution system enhancement projects planned on the 20 year horizon, and comparing actual projects completed to prospective projects listed in previous IRP's.
- Provide a rationale for any difference in economic and achievable potential savings

2017 – 2018 Avista’s Action Plan

- The price of natural gas has dropped significantly since the 2014 IRP. This is primarily due to the amount of economically extractable natural gas in shale formations, more efficient drilling techniques, and warmer than normal weather. Wells have been drilled, but left uncompleted due to the poor market economics. This is depressing natural gas prices and forcing many oil and natural gas companies into bankruptcy. Due to historically low prices Avista will research market opportunities including procuring a derivative based contract, 10-year forward strip, and natural gas reserves.
 - Result: After exploring the opportunity of some type of reserves ownership, it was determined the price as compared to risk of ownership was inappropriate to go forward with at this time. As an ongoing aspect of managing the business, Avista will continue to look for opportunities to help stabilize rates and/or reduce risk to our customers.
- Monitor actual demand for accelerated growth to address resource deficiencies arising from exposure to “flat demand” risk. This will include providing Commission Staff with IRP demand forecast-to-actual variance analysis on customer growth and use-per-customer at least bi-annually.
 - Result: actual demand was closely tracked and shared with Commissions in semi-annual or quarterly meetings.

2018 IRP Timeline

- **August 31, 2017** – Work Plan filed with WUTC
- **January through May 2018** – Technical Advisory Committee meetings. Meeting topics will include:
 - **TAC 1: Thursday, January 25, 2018:** TAC meeting expectations, review of 2016 IRP acknowledgement letters, customer forecast, and demand-side management (DSM) update.
 - **TAC 2: Thursday, February 22, 2018:** Weather analysis, environmental policies, market dynamics, price forecasts, cost of carbon.
 - **TAC 3: Thursday, March 29, 2018 :** Distribution, supply-side resources overview, overview of the major interstate pipelines, RNG overview and future potential resources.
 - **TAC 4: Thursday, May 10, 2018:** DSM results, stochastic modeling and supply-side options, final portfolio results, and 2020 Action Items.
- **June 1, 2018** – Draft of IRP document to TAC
- **June 29, 2018** – Comments on draft due back to Avista
- **July 2018** – TAC final review meeting (if necessary)
- **August 31, 2018** – File finalized IRP document