2025 Gas Integrated Resource Plan

Technical Advisory Committee Meeting No. 7 Agenda

Wednesday, August 21, 2024
Virtual Meeting

Topic	Time (PTZ)	Staff
Feedback from prior TAC	10:30	All
Natural Gas Market Overview	10:40	Tom Pardee
Natural Gas Price Forecast	11:20	Michael Brutocao
Avoided Cost Methodology	11:30	Tom Pardee

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Natural Gas Market Overview

2025 Gas IRP – TAC 7

Tom Pardee

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Key macro and oil assumptions

Macro assumptions

Geopolitics

- Sanctions and bans on Russian exports remain in place through to 2030 but ease thereafter with 'normality' re-established from 2035.
- While we continue to see an increase in bilateral conflicts, as per the recent events between Iran and Israel, we do not assume an escalation to a multilateral conflict in the region. We assume the war and the Red Sea transit issues end before Q4 2024.

Macroeconomic outlook

- Inflation continues to decline; interest rates loosen in 2024
- Global economy to hold steady in 2024 but weakness in Europe and China provide recession risk.
- Geopolitical tensions increase as China and the G7 compete for ties with non-OECD and BRICS+
- Global GDP growth of 2.2% (CAGR), 2028 to 2050

Energy transition

- Energy and environmental policy continue to focus on CO_2 reduction, but countries fail to achieve net zero targets.
- Global temperature rise to around 2.5 °C compared to pre-industrial levels.

Gas and LNG assumptions

US LNG pause

- The Biden administration's pause on granting new non-FTA approvals for US LNG projects lasts until the end of 2024 and is relaxed in 2025 after the elections.
- Existing and under-construction projects are not impacted.
- Some projects with existing non-FTA approval that are set to expire before the expected commissioning could proceed to FID in 2024. Consensus is emerging that non-FTA extensions will be granted if the project can provide a reasonable explanation for delayed FID since the first approval. We assume one project sourcing gas from the US will take FID in 2024.

Russian gas and LNG supply

- Pipe exports to the EU decline further after 2024 as the Russia-Ukraine transit contract expires. New pipelines to China, including the Far East (2028) and Power of Siberia 2 (2033) pipelines, continue to develop.
- Western sanctions create issues for Russian LNG – we have risked the production profile of the existing and under-construction projects and assume no new Russian LNG FIDs for the foreseeable future.
- Sanctions-related issues with ice-class LNG shipping restrict the use of the Northern Sea Route to Asia. The European Parliament passed rules allowing EU governments to restrict Russian LNG imports, but until a formal ban is in place, we assume imports continue.

Energy policies and implications for gas

- Europe: gas demand continues to decline in line with Fit-for-55 targets, but the EU fails to achieve RePowerEU targets. Some decarbonisation initiatives, like electrification of heating, face challenges.
- US: IRA supports renewables development, but scaling up to ambitions remains tough, resulting in resilient gas demand.
- Asia: after stagnating in the near term, gas demand returns to growth in key emerging markets, reaching 15.4% of regional primary demand by 2050 versus about 11% in 2024.

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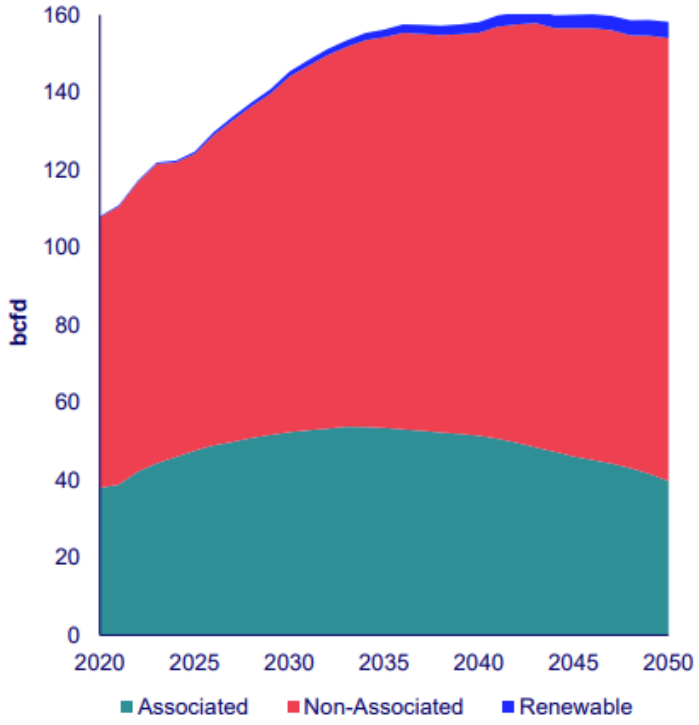
North America natural gas at a glance

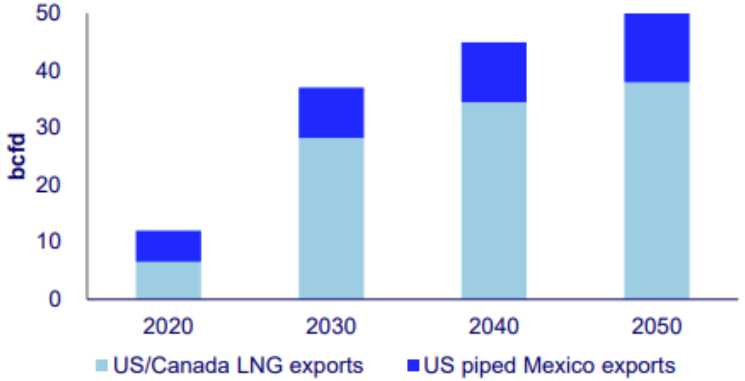
Gas market expands by over 30% until early 2040s to reach over 160 bcfd

Associated supply growth accelerates but peaks by mid-2030s



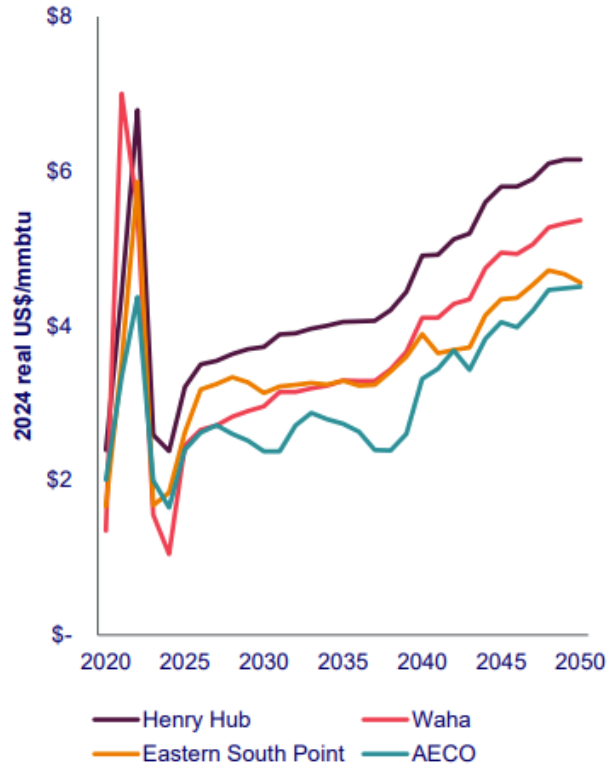
Source: Wood Mackenzie

LNG exports triple by 2050 despite near term delays in the US



Stronger power load growth supports resilient domestic gas demand

Henry Hub gas prices reach $6/mmbtu by late 2040s



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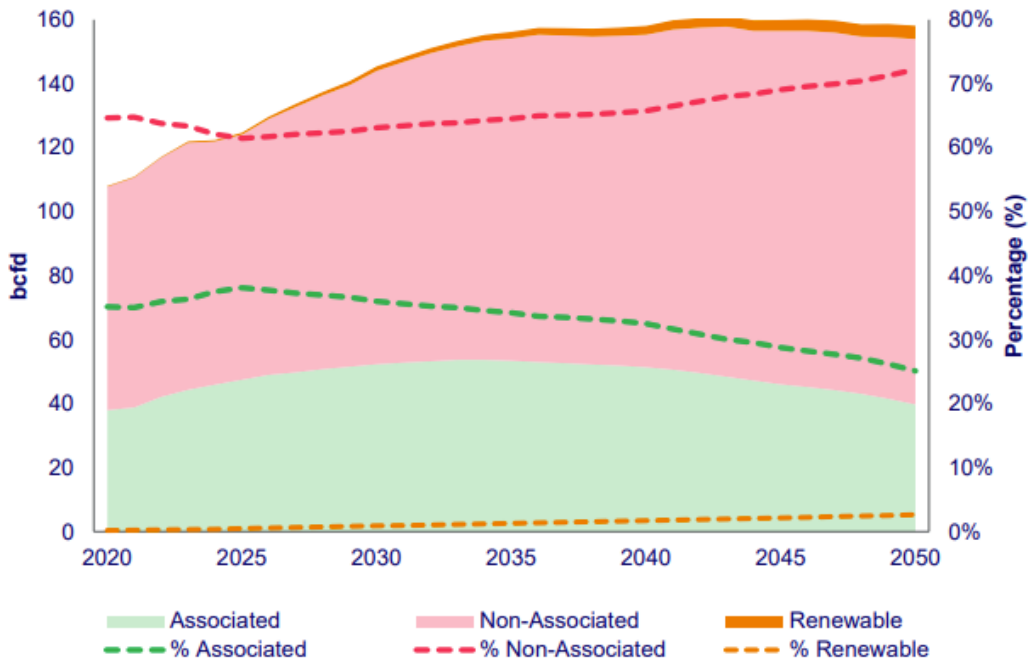
Supply

North America gas supply grows yearly by an average of 3.3 bcfd until the mid-2030s before stabilizing near 160 bcfd through 2050

Permian associated gas is the largest growth region over the next five years; however, the Haynesville is the largest growth area over the next ten years; Post-2040 there is a greater call on non-associated gas sources

North America gas by type



Renewable

RNG production grows tenfold between 2023 and 2050 supported by low carbon policies, such as the Low Carbon Fuel Standard (LCFS), Renewable Fuel Standard (RFS) and the Inflation Reduction Act (IRA), and ample resources of landfill and dairy biogas feedstock. Still, in the long term, RNG supply will be a modest 3% of the total North America natural gas supply.

Non-Associated

Softer near-term gas prices negatively impact short term non-associated gas supply growth. However, growing demand in the medium term will need to be met by growth from non-associated regions. Gulf Coast, Western Canada and the Northeast will grow by a combined 24 bcfd by 2035 from current levels. Haynesville could deliver 11 bcfd of growth by 2035. Continued Northeast supply growth is needed to meet demand in the long term.

Associated

Strong oil prices support liquids-focused drilling activity, bringing large volumes of low-cost associated gas to market. This temporarily delays some non-associated gas growth until later in the forecast. Associated gas growth is fueled by the Permian and Western Canada. The Permian accounts for 80% of associated gas growth by 2035, adding 8 bcfd from 2024 levels, followed by 11% coming from WCSB adding 1 bcfd.

[No Title]

Source: Wood Mackenzie

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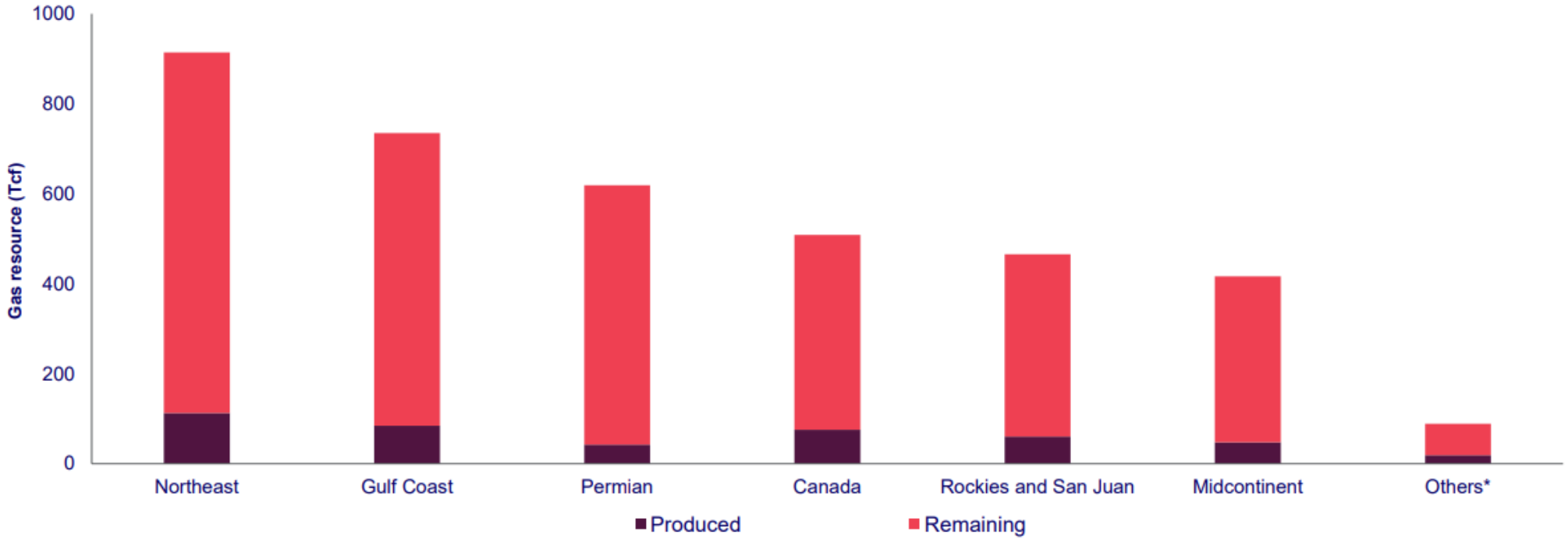
Supply

North America has significant gas resource available for development

In addition to commodity prices, factors such as demand, well economics, infrastructure, regulations, emissions considerations and investor sentiment will dictate how much resource is ultimately produced

Remaining gas resource for key regions



Source: Wood Mackenzie

*Others: Fort Worth, West Coast

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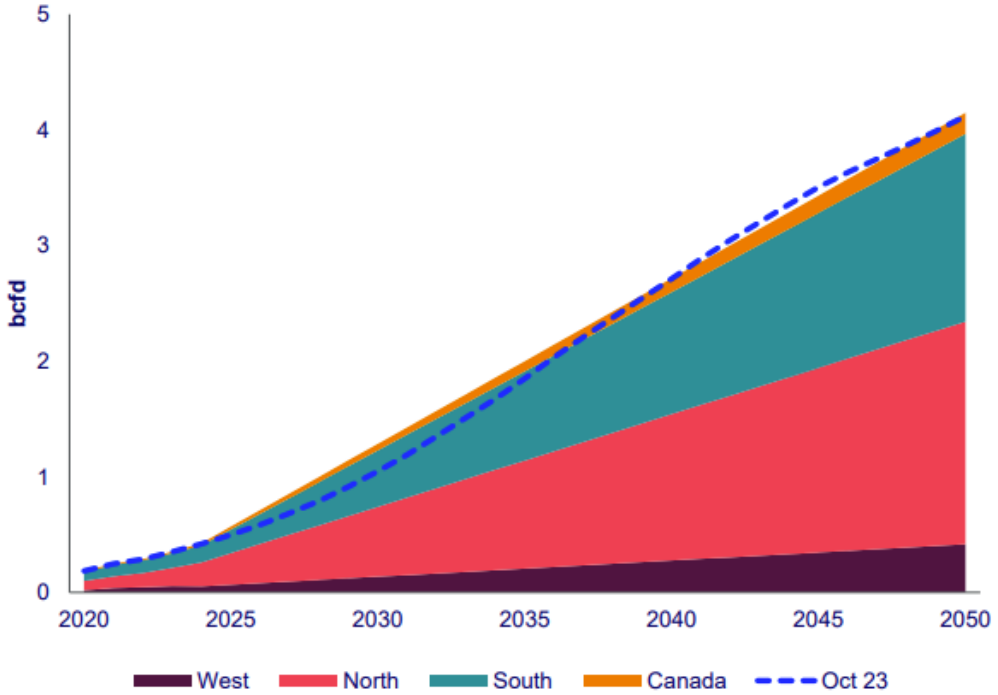
Supply

With appropriate technology development and policy frameworks, North America renewable natural gas (RNG) production will grow to over 4 bcfd by 2050

RNG production capacity has doubled since 2020, and more projects are expected to come online in the long term supported by ample landfill and dairy farm resources

RNG production forecast by region



Canada

British Columbia, Quebec and Ontario lead RNG production as local utilities and government aggressively commit to net carbon-zero targets and stakeholders capitalize on credits from the Clean Fuel Standard. RNG producers invest in development of new feedstock types and technologies that take advantage of local resources.

US Gulf Coast

RNG production in Texas benefits from proximity to LNG export facilities. Major players in the industry look at RNG to decarbonize shipments to oversees markets with aggressive emission reduction targets. Landfill gas sites dominate the supply mix in the region, but producers also invest in large farm projects in the area to utilize environmental credits available in the transport sector.

US Northeast

More RNG facilities come online as utilities and states seek to fulfill GHG emission reduction goals, which are one of the most aggressive in the nation. Ohio, Pennsylvania and Indiana are among top five states with highest RNG production in our forecast, benefiting from large landfill projects and dairy RNG potential.

US Pacific

Pioneering the nation with its progressive low-carbon policies, the west leads in new dairy project developments until the late 2020s. California remains the top RNG producer in our forecast, but we expect demand will transition from fueling NGVs to fulfilling LDC and industrial sector.

Source: Wood Mackenzie, Argonne National Laboratory RNG Database, IEA Outlook for biogas and biomethane

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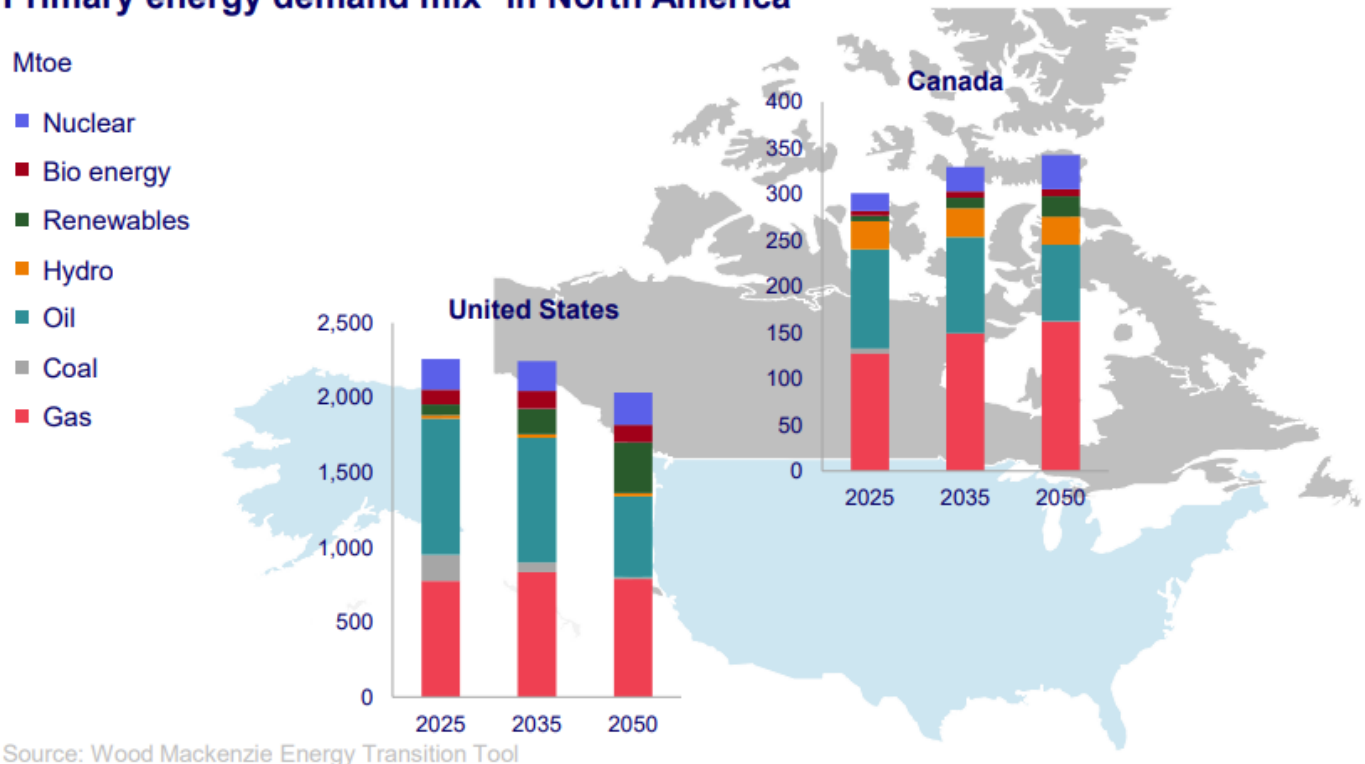
Demand

Gas plays a pivotal role in the energy transition with its market share in the energy mix growing by 5% from 2025 to 2050 at the expense of coal and oil

Gas represents about 40% of North American total energy demand in 2050

Primary energy demand mix* in North America



Canada	• Gas demand continues to climb throughout the decades with the emergence of blue hydrogen developments and new industrial opportunities • The near elimination of coal and decrease in oil demand is driven by switching to gas for power and continued expansion of renewables. • New technologies including large scale CCS projects create an environment for reduced emissions, allowing expansion in demand.
United States	• Gas demand grows at a CAGR of 0.7% between 2025 and 2035, driven primarily by growth in blue hydrogen and industrial sectors. • Between 2035 and 2050, the CAGR drops to -0.4% due to the energy transition, such as gas displacement from low-carbon hydrogen in the industrial sector and building electrification in the LDC sector. • Gas remains resilient in the power sector and supports more robust load growth through the 2030s, but rising renewable generation erodes gas demand in the 2040s albeit at a more gradual rate compared to the previous outlook.

Source: Wood Mackenzie Energy Transition Tool

*Gas is based on Wood Mackenzie 2024 North America gas strategic planning outlook. Other commodities are based on Wood Mackenzie's 2023 commodity strategic planning outlook

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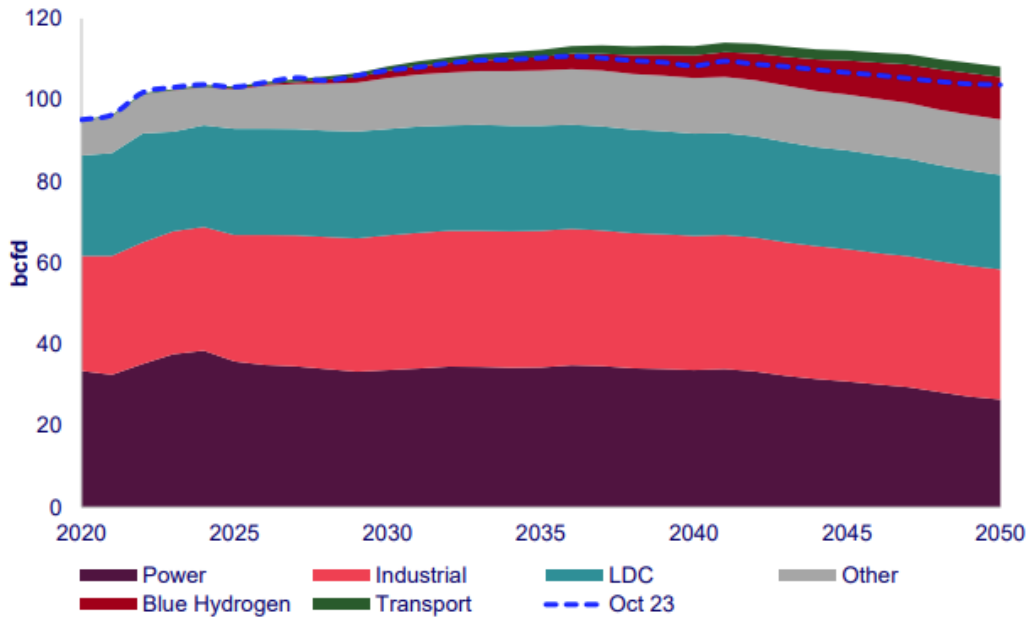
North America domestic gas demand will continue to rise well into the 2040s

Gas use in the power sector continues to be resilient, driven by the retirement of coal-fired plants in the near term and sustained power demand growth stemming from data centers and industry reshoring in the long term

North America gas demand by sector



Source: Wood Mackenzie

Wood Mackenzie's "Other Demand" matches the EIA definition, which is lease and plant fuel and pipeline losses. It is the gas used within the industry, where the two biggest components to its growth are supply (the more supply the more L&P fuel) and LNG exports.

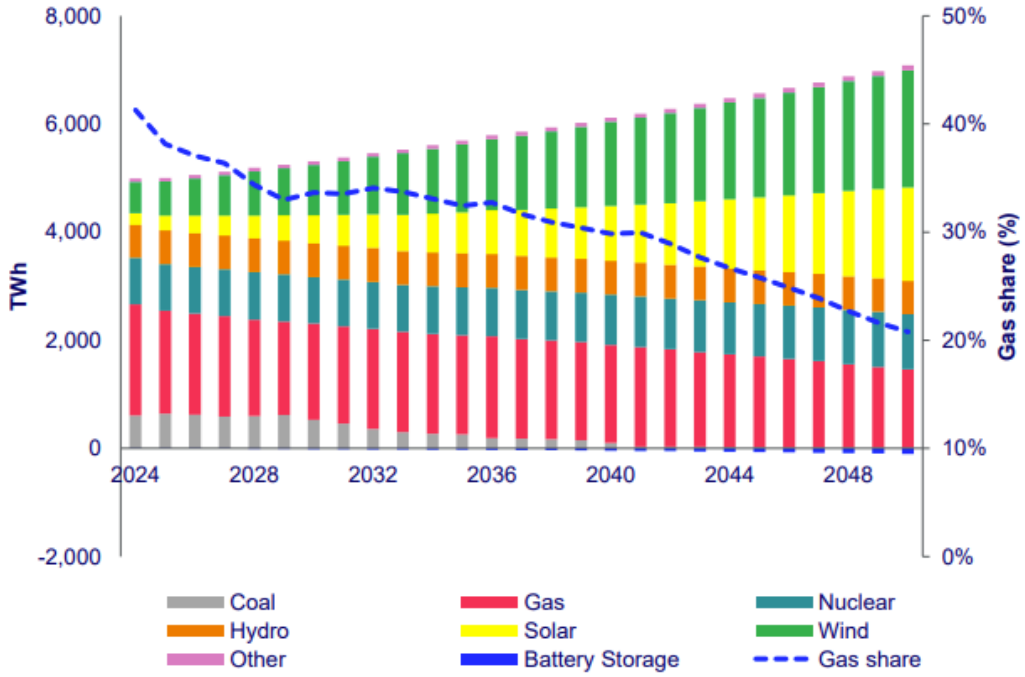
Transport	Transportation demand includes the consumption of natural gas in vehicles and small-scale bunkers. We expect the demand to grow from 0.4 bcfd in 2024 to 2.5 bcfd in 2050. This growth will be bolstered by widespread adoption of RNG, substantial funding and tax credit from the IRA for the US market, as well as recent technological advancements in gas engines for heavy-duty trucks.
Blue hydrogen	North America will lead blue hydrogen supply with over 56% of global production by 2050, requiring 10.4 bcfd of gas demand. The momentum is highly concentrated in the US as the Production Tax Credit announced under the IRA remains one of the market's most robust financial support mechanisms for low-carbon hydrogen. Three of the seven hubs selected by the DoE in 2023 to receive US$7 billion in funding will be blue hydrogen hubs and help drive growth.
Other	With rising gas production and LNG exports, we expect other demand to grow by 4.3 bcfd between 2024 and 2050.
LDC (residential and commercial)	We expect the combined demand for residential and commercial sectors to peak at 26.2 bcfd in the early 2030s. The subsequent decline can be attributed to the displacement of demand by hydrogen and the ongoing building electrification. In this update, we see potential upside risks from slower adoption of building electrification, influenced by preemptive US legislation and reduced heat pump sales.
Industrial	Industrial demand will reach 30.3 bcfd in 2024 and peak at 33.54 bcfd by 2035. We expect over 50 new industrial projects in the US and Canada to be commissioned between 2024 and 2031 to facilitate this expansion. Over the long term, North American industrial demand will decline to 31.9 bcfd by 2050. This is due to replacing grey hydrogen with low-carbon hydrogen in the ammonia, refining, and methanol sectors.
Power	Although gas demand in the power sector will decrease by 8% over the next decade, the decline is much more gradual compared to our previous update, as gas' share in the power market will stay close to 30% by 2040. Stronger power load growth from data centers used for AI, cloud computing, digitization and industry reshoring – particularly the semiconductor industry – requires gas to help support the grid as solar and wind continue to face transmission constraints.

Demand

Compared to prior outlook, North America sees about 5% higher overall power loads from data center buildout and re-shoring of semiconductor industry

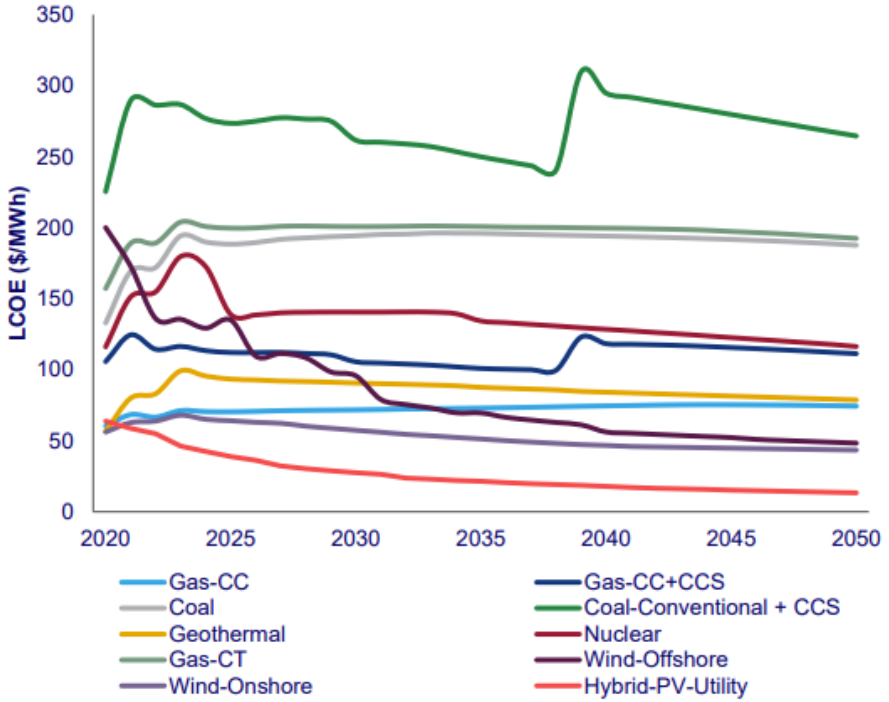
Decline of gas share in power stack is much slower as renewables see limited growth from challenges with interconnection queues and transmission bottlenecks

North America power generation by type



Source: Wood Mackenzie

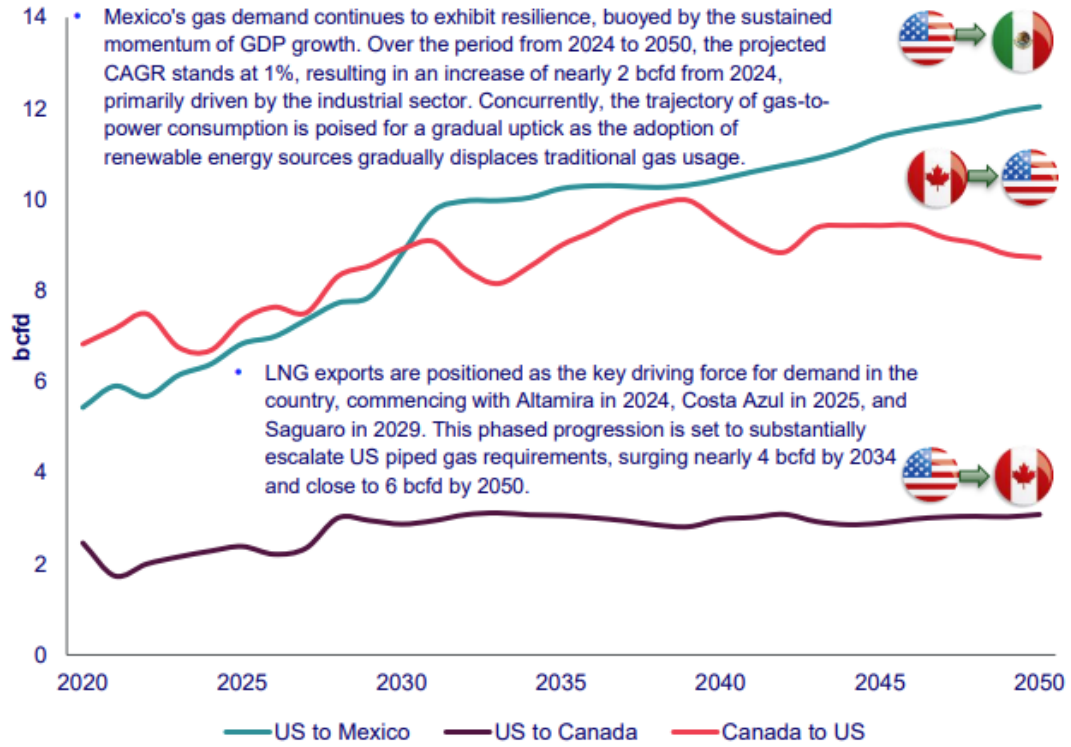
Levelized cost of energy (LCOE)



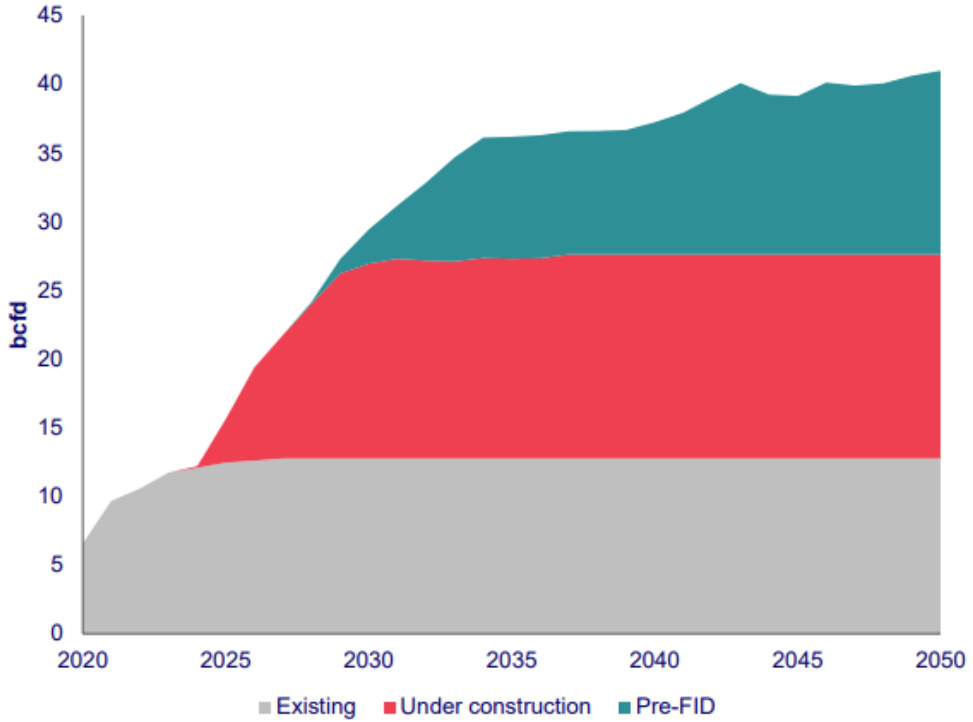
US exports to Mexico almost double by 2050 as west coast Mexican LNG exports gain momentum while indigenous production declines

The Biden administration's DOE non-FTA permit approval pause delays some US LNG projects in the near term but the prospect for more pre-FID North America LNG remains bright

North American piped trade flows



North American LNG exports



Source: Wood Mackenzie

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North America liquefied natural gas export facilities, existing and under construction (2016–2027)

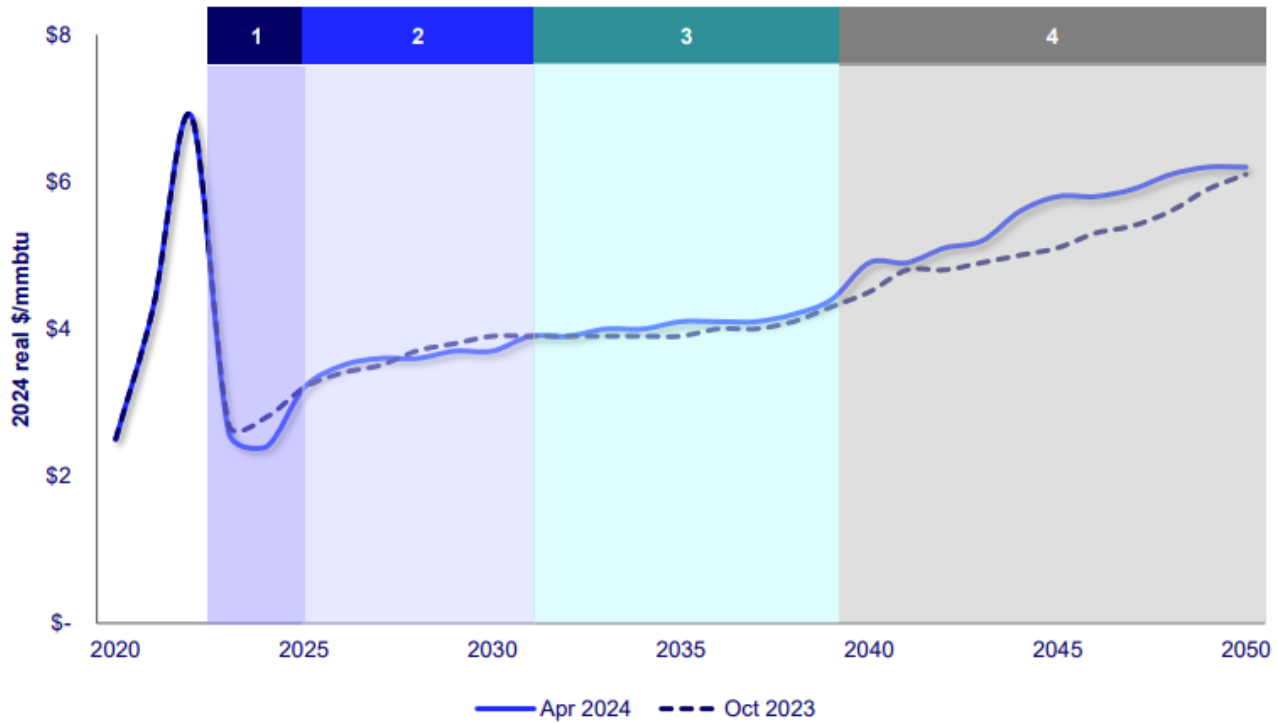
Data source: U.S. Energy Information Administration, *Liquefaction Capacity File*, and trade press
Note: Bcf/d=billion cubic feet per day. Map current as of October 2023.

Price & margin outlook

Henry Hub prices reach $6/mmbtu by late 2040s

Henry Hub prices rebound to $3.50/mmbtu by 2026 with rising LNG exports and restraints from non-associated producers on supply growth

Gas price outlook



Source: Wood Mackenzie

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1 (2024-2025)
Bloated storage inventory pressures prices to the downside, but LNG project ramp-ups begin to tilt the market to balance, especially with near-term production curtailments.

2 (2026-2031)
North America LNG exports increase substantially with delayed US projects but also from accelerated Canadian and Mexican projects. Despite higher associated supply led by higher oil prices, restraints from non-associated producers could prevent the market from becoming oversupplied again.

3 (2032-2038)
Market expansion continues with more US LNG exports and domestic demand growth – notably from a more resilient power sector. Henry Hub prices stabilizes through sustained growth in the associated supply until mid-2030s and a Haynesville production rebound.

4 (2039-2050)
The size of the gas market peaks by the early 2040s and declines in associated and Haynesville production put significant upward pressure on Henry Hub prices especially with demand resiliency in the power sector. Production from legacy gas basins increases to moderate Henry Hub prices from spiking up.

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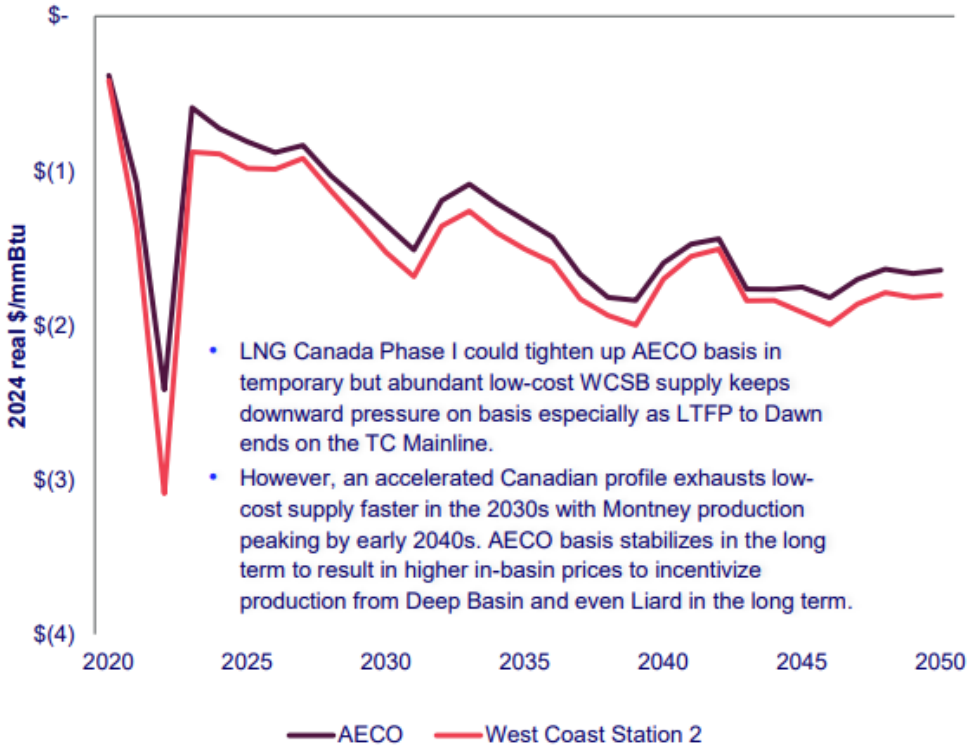
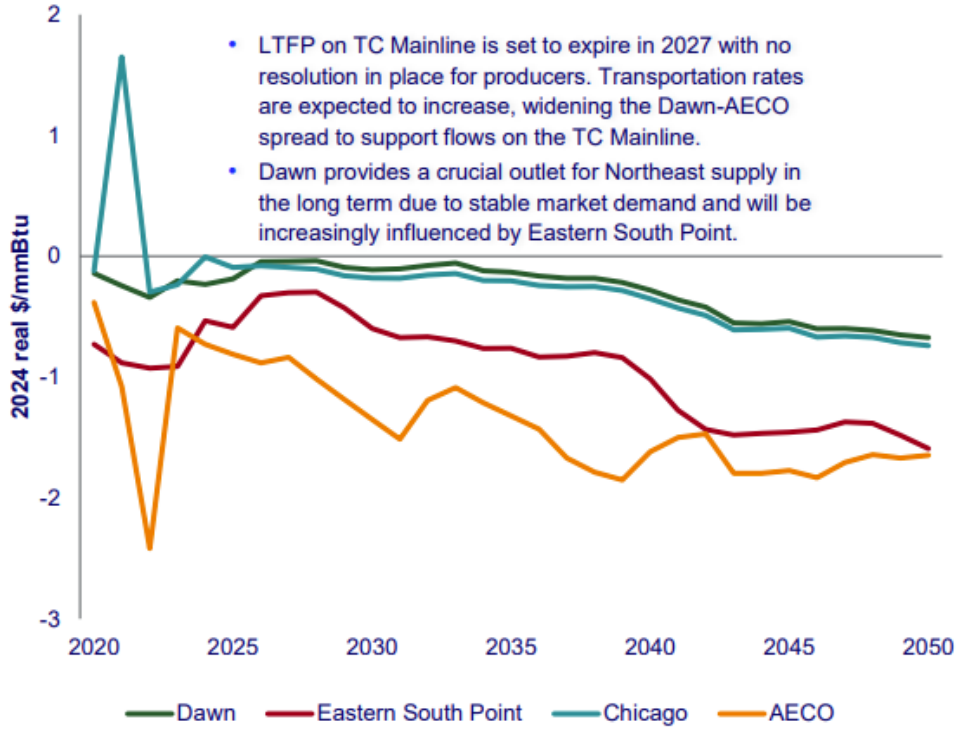
AECO weakens in the long term as WCSB still requires piped exports to clear marginal supply despite new LNG exports

Supply competition intensifies for Eastern Canada in the long term with stable market demand and the Northeast wins out with widening Eastern South Point-Dawn spread

Western Canada



Eastern Canada



Source: Wood Mackenzie

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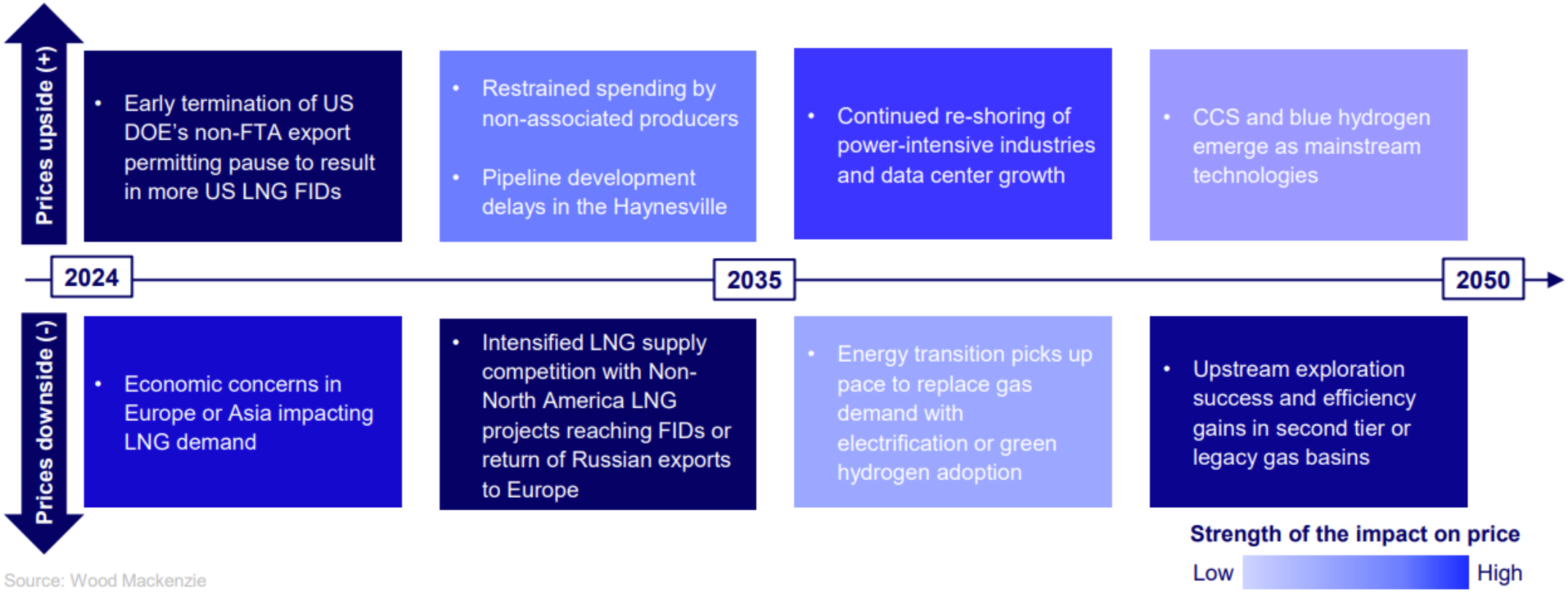
Price risks

North American gas prices



Source: Wood Mackenzie

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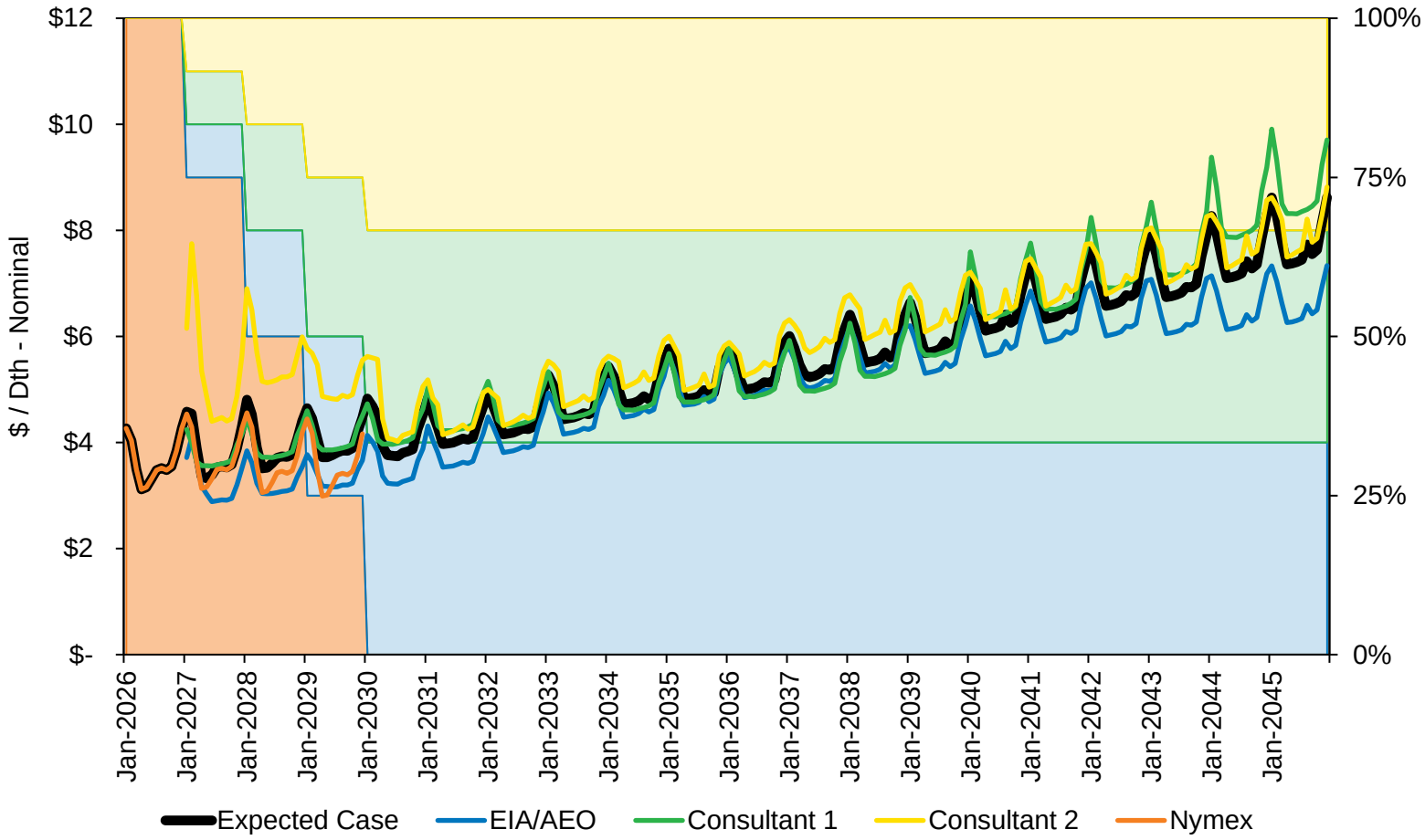
Natural Gas Market Price Forecast

Michael Brutocao, Natural Gas Supply Analyst
Technical Advisory Committee Meeting No. 7
August 21, 2024

Henry Hub Expected Case Price Forecast



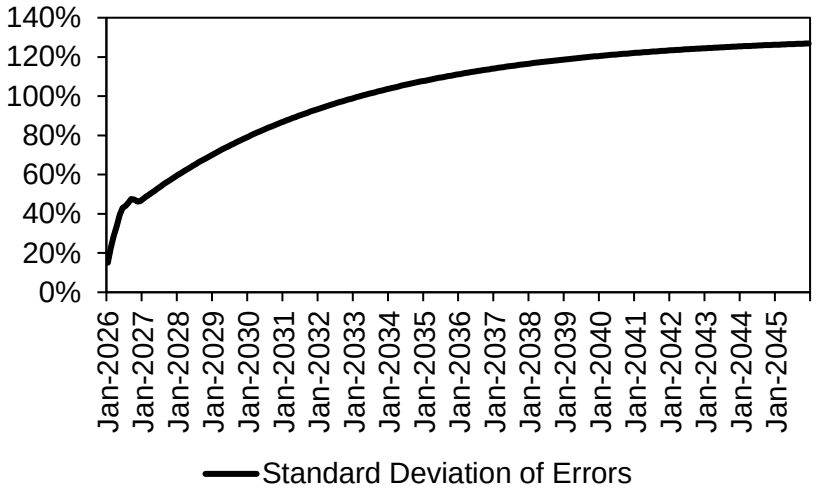
- Levelized Price: $4.95
- Data Sources
  - NYMEX forward market prices on August 5, 2024
  - Annual Energy Outlook 2023
  - Consultants 1 & 2 monthly price forecast
- Methodology
  - Average price of forecasts
  - Decreasing blend of NYMEX

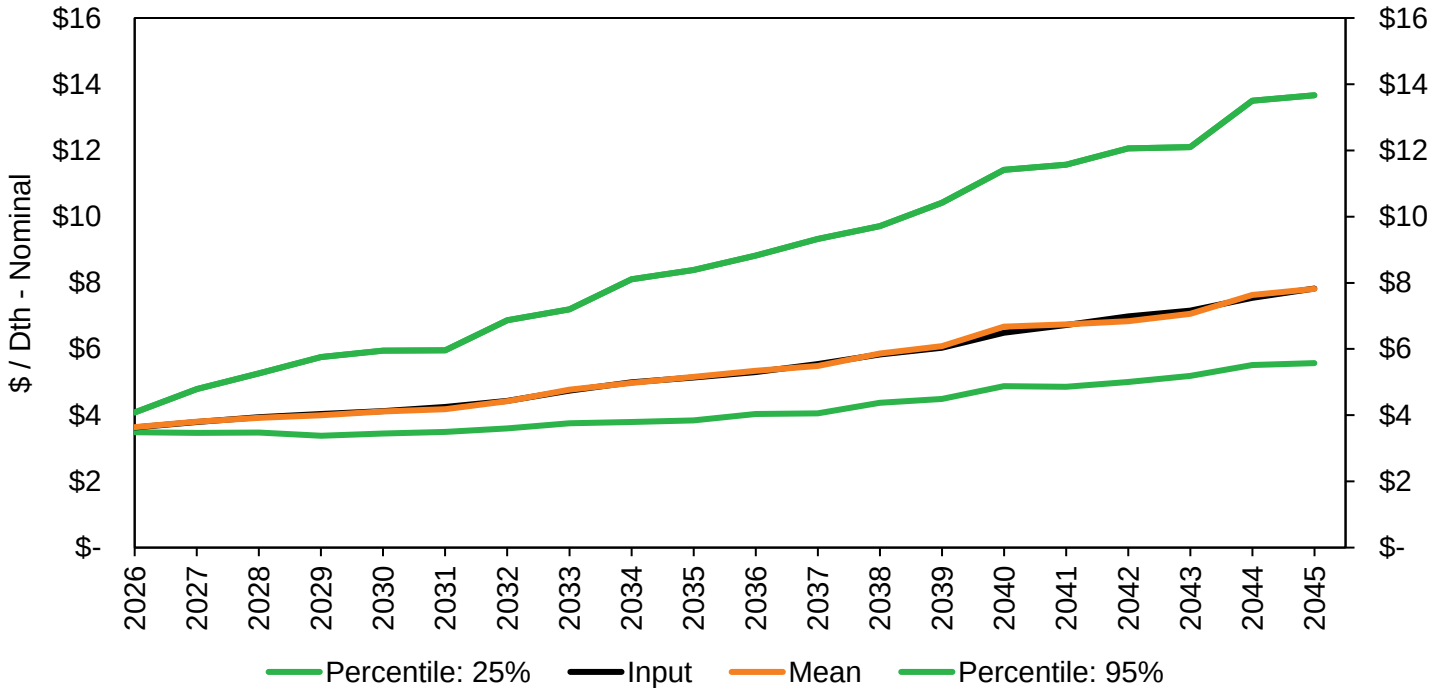
	NYMEX	Other
2026	100%	0%
2027	75%	25%
2028	50%	50%
2029	25%	75%
2030 - 2045	0%	100%

Annual Energy Outlook 2023 – Natural Gas Spot Price at Henry Hub

Henry Hub Stochastic Price Forecast

- Stochastic Inputs
  - Expected Case Forecast
    - Data Source: See previous slide
  - Autocorrelation (94.31%)
    - Data Source: Historical monthly prices at Henry Hub
  - Standard Deviation of Errors
    - Data Source: Historical daily NYMEX forward market prices
    - Data Source: Historical monthly prices at Henry Hub

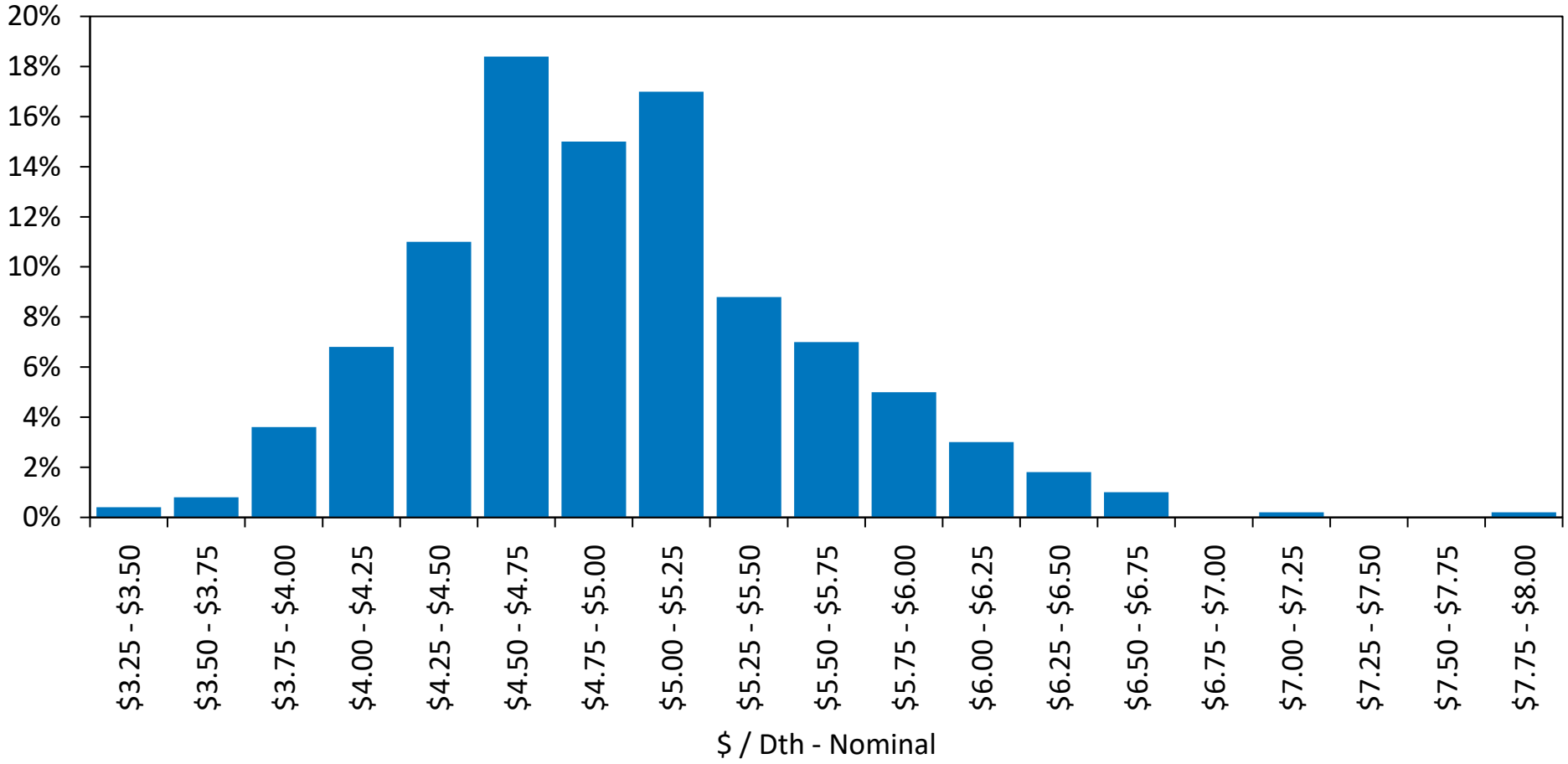




- Methodology
  - Start from Expected Case Forecast
  - Perform adjustment for Autocorrelation to prior month
  - Randomly draw from prices with lognormally distributed standard deviation of errors

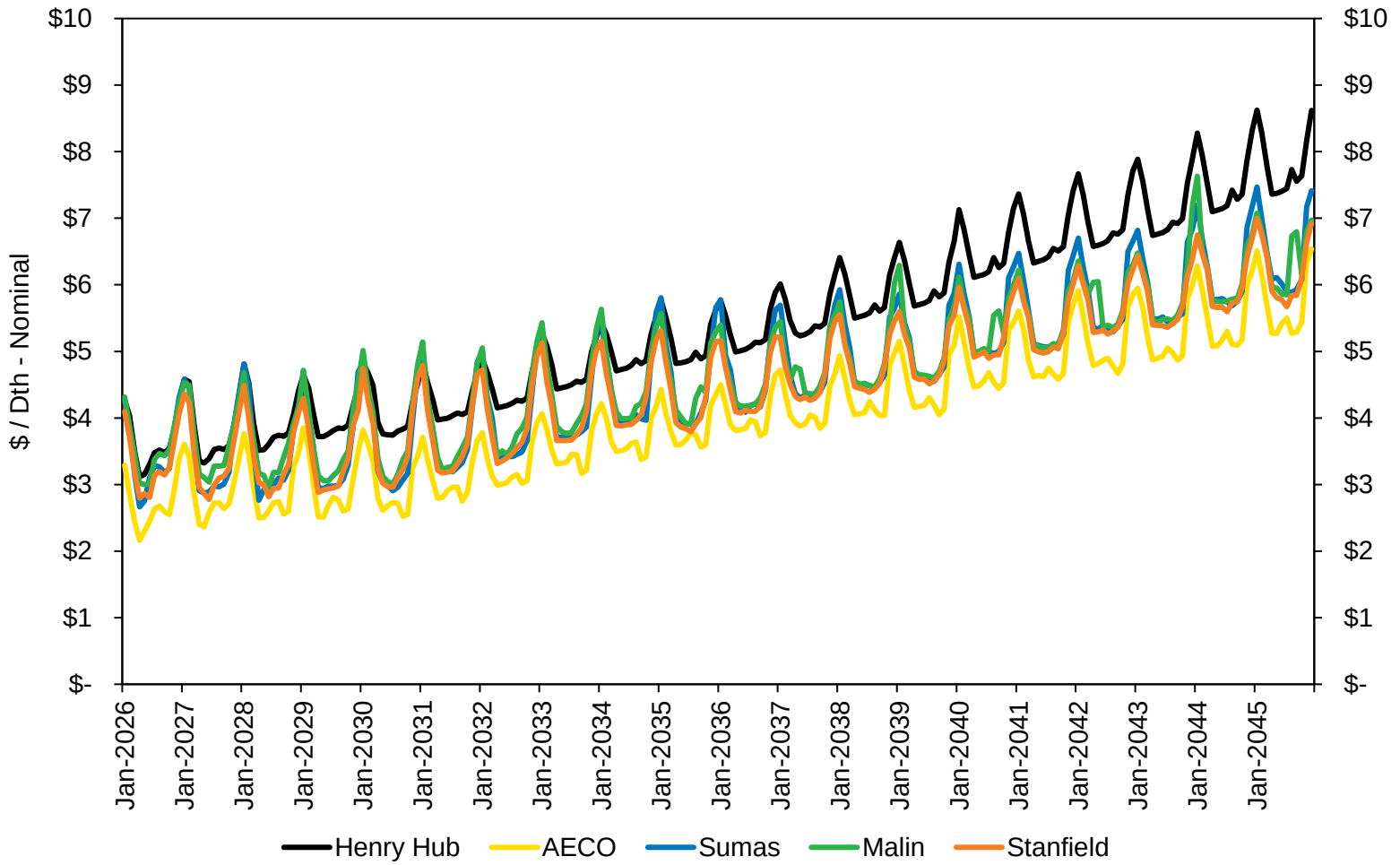
Historical Monthly prices at Henry Hub

Henry Hub Stochastic Price Forecast - Levelized



Data Source: Consultant 2 percent basis price differential to Henry Hub forecast

All Basins Expected Case Price Forecast



Levelized Prices

Henry Hub	$4.95
AECO	$3.67
Sumas	$4.30
Malin	$4.38
Stanfield	$4.21

Data Source: Consultant 2 percent basis price differential to Henry Hub forecast

Avoided Cost Methodology

2025 Gas IRP – TAC 7

EE Rules guidance - Idaho

- Include commodity, Interstate transport costs and current policy and distribution component, if measurable to avoid, in the avoided cost calculation
  - The distribution component calculation once determined must be presented to the Commission for approval and included in the IRP DSM avoided cost calculation. (CASE NO. INT.G.22-03)

EE Rules guidance - Oregon

OAR 860-030-0007
Gas Utility Avoided Costs

- **(1)** Investor-owned gas utilities shall file a proposed avoided-cost method and draft avoided costs with their integrated resource plans pursuant to Order No. 89-507. The avoided-cost method filed should be appropriate for determining the cost effectiveness of weatherization measures from the gas utility's perspective.
- **(2)** A gas utility may propose, or the Commission may require a gas utility to file the data described in OAR 860-030-0007 (Gas Utility Avoided Costs)(1) during the two-year period between filing integrated plans pursuant to Order No. 89-507 to reflect significant changes in circumstances, such as acquisition of a major block of resources. Such a revision will become effective 90 days after filing.
- **(3)** At least every two years, the gas utility must file with the Commission the data described in section (1) of this rule.
- Current Elements in UM 1893 from the companies most recently acknowledged IRP
  - Global Inputs (Discount rate, inflation rate, NWPCC 10% adder, system peak coincident day/hour factor)
  - Commodity & Transport (Gas commodity and transportation/storage costs)
  - Environmental Compliance (environmental compliance cost)
  - Infrastructure Capacity (forecast of distribution system capital costs)
  - Risk Reduction (a value for commodity risk)
  - End Use Profiles (end use profile by source and customer class)

EE Rules guidance - Washington

Gas companies—Conservation targets.

(1) Each gas company must identify and acquire all conservation measures that are available and cost-effective. Each company must establish an acquisition target every two years and must demonstrate that the target will result in the acquisition of all resources identified as available and cost-effective. The cost-effectiveness analysis required by this section must include the costs of greenhouse gas emissions established in RCW **80.28.395**. The targets must be based on a conservation potential assessment prepared by an independent third party and approved by the commission. Conservation targets must be approved by order by the commission. The initial conservation target must take effect by 2022.

(2) The commission may require a large combination utility as defined in RCW **80.86.010** to incorporate the requirements of this section into an integrated system plan established under RCW **80.86.020**.

[**2024 c 351 s 17**; **2019 c 285 s 11**.]

NOTES:

Findings—Intent—Effective date—2024 c 351: See notes following RCW **80.86.010**.

Findings—2019 c 285: "(1) The legislature finds and declares that:

(a) Renewable natural gas provides benefits to natural gas utility customers and to the public; and

(b) The development of renewable natural gas resources should be encouraged to support a smooth transition to a low carbon energy economy in Washington.

(2) It is the policy of the state to provide clear and reliable guidelines for gas companies that opt to supply renewable natural gas resources to serve their customers and that ensure robust ratepayer protections." [**2019 c 285 s 12**.]

RCW 80.28.380: Gas companies—Conservation targets. (wa.gov)

Standard Cost Effectiveness Tests

Total Resource Cost

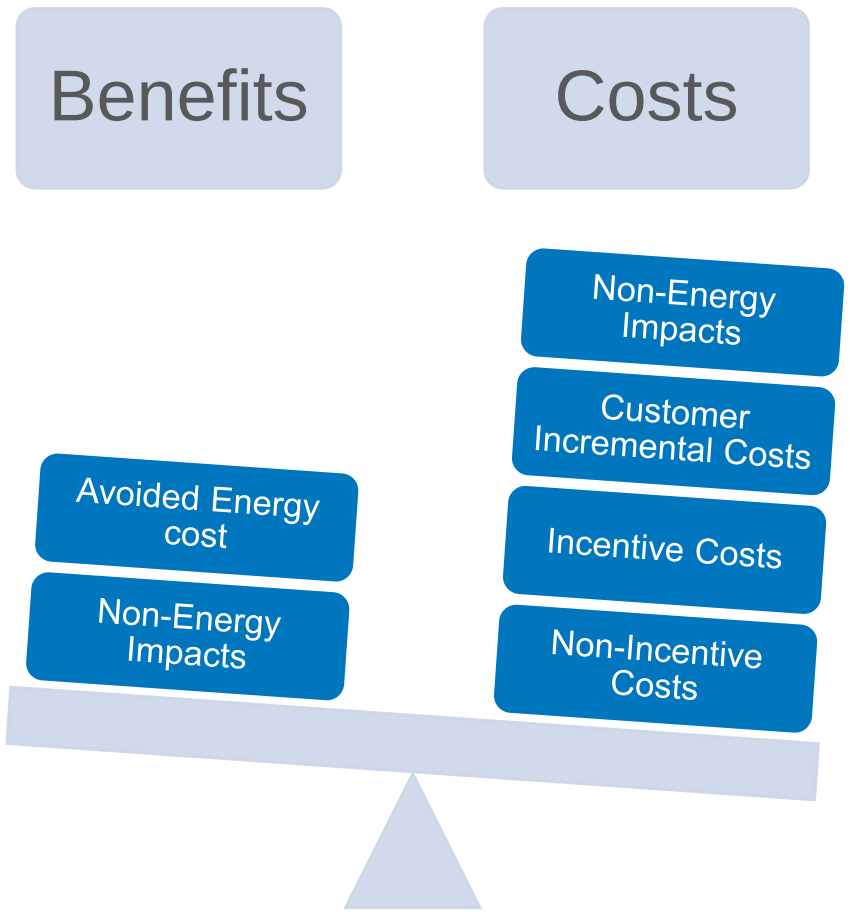
- Measures the cost to all involved
- Societal in nature
- Adjusting incentive does not impact TRC

Utility Cost Test

- Considers the impact to the utility
- Determines if programs are deferring capital investments
- We can adjust incentive to impact UCT*

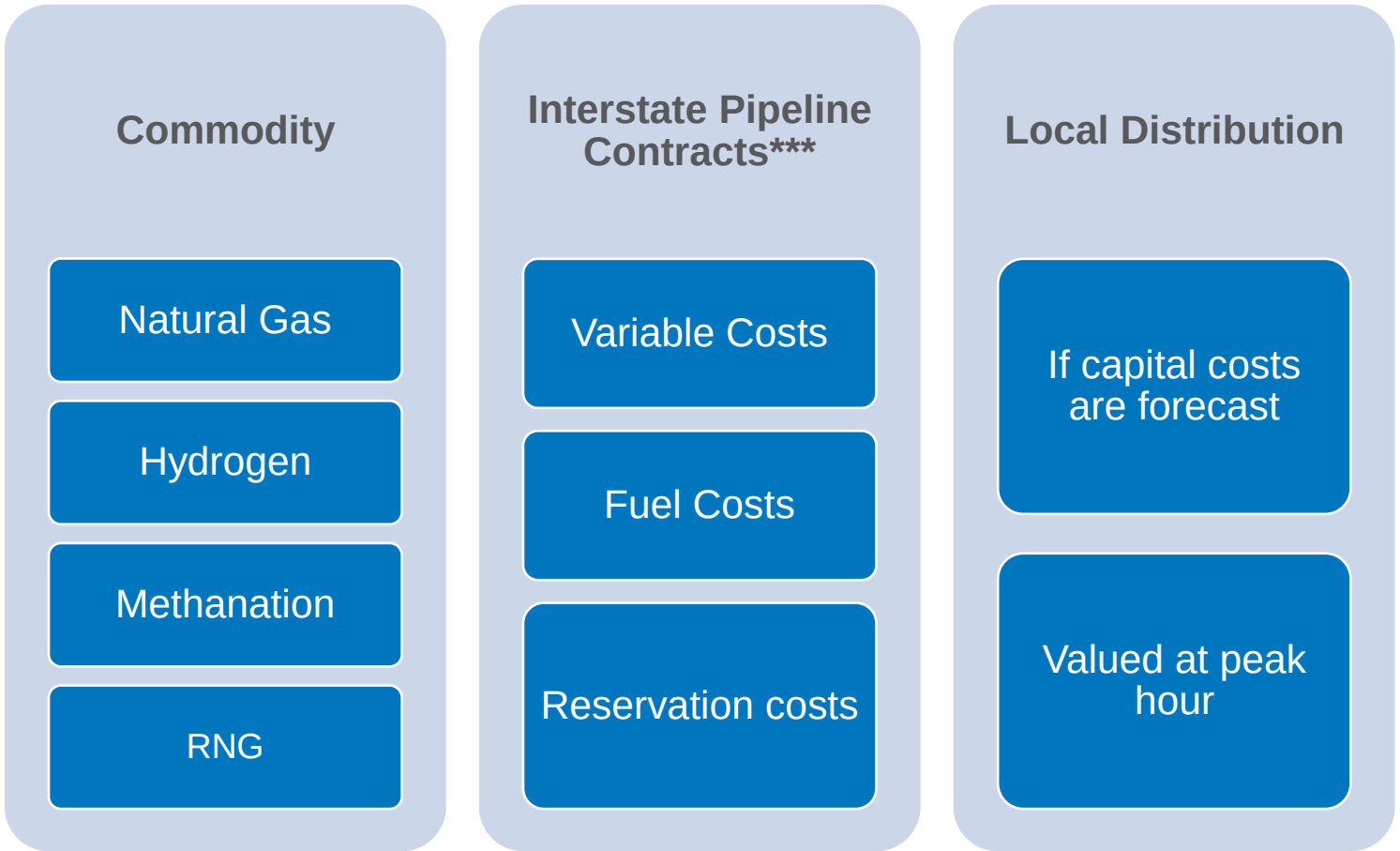
*Adjusting incentives too much in pursuit of UCT may reduce participant enthusiasm

Cost Effectiveness Items



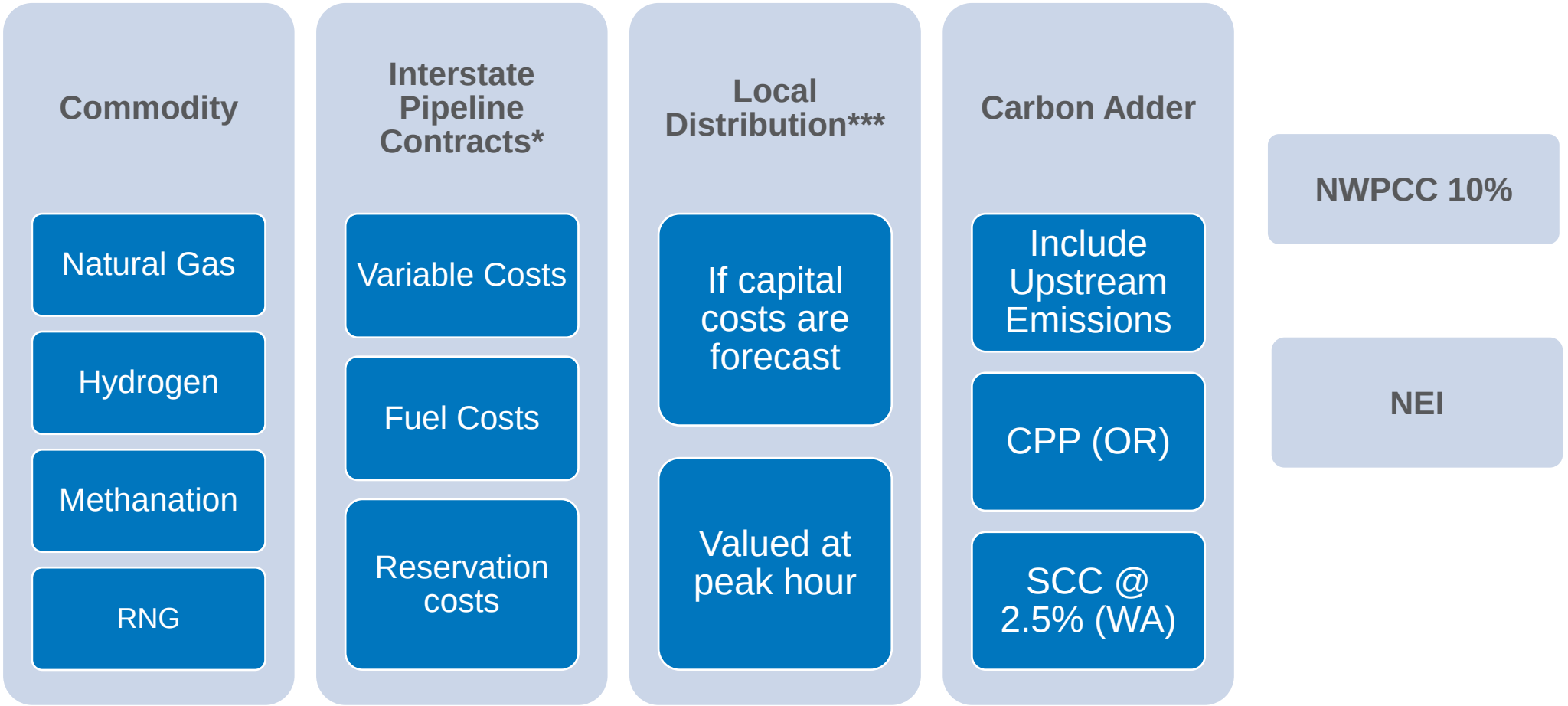
	TRC	UCT
Benefit Components		
Avoided Cost of Utility Energy	$	$
Value of Non-Utility Energy Savings	$	
Non-Energy Impacts	$	
Reduced Retail Cost of Energy		
Cost Components		
Customer Incremental Cost	$	
Utility Incentive Cost		$
Utility Non-Incentive Cost	$	$
Imported Funds (tax credits, federal funding etc)	($)	
Reduced Retail Revenues		

Idaho - Avoided Costs Input (Res, Com, Ind)



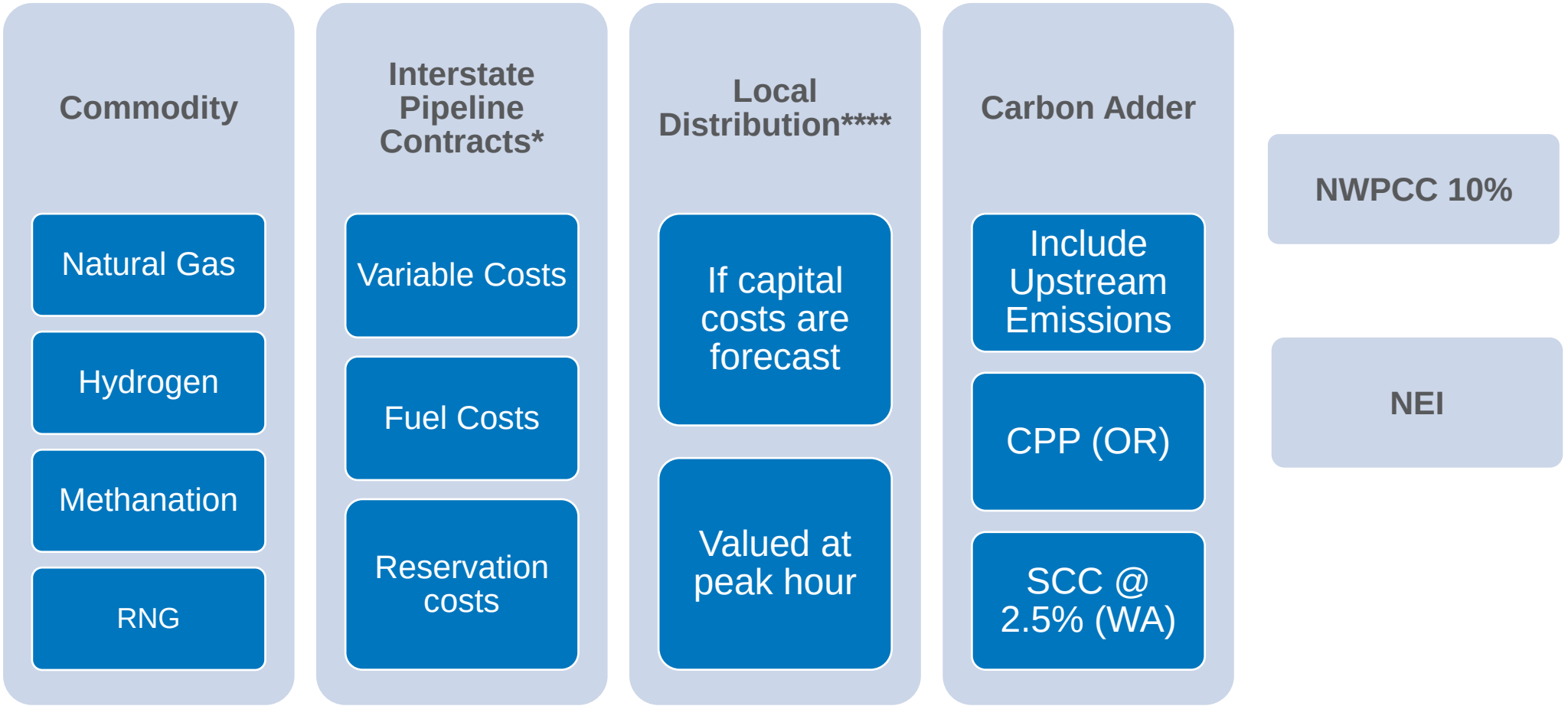
*Interstate Pipelines include GTN, NWP, NIT, Foothills, West Coast
**Storage costs from JP are excluded. Facility will need to be maintained (reliability, safety, operability) regardless of use.
***Local Distribution is excluded from interruptible customers of any class

Oregon and Washington - Avoided Costs Input (Res, Com, Ind)



*Interstate Pipelines include GTN, NWP, NIT, Foothills, West Coast
**Storage costs from JP are excluded. Facility will need to be maintained (reliability, safety, operability) regardless of use.
***Local Distribution is excluded from interruptible customers of any class

Oregon and Washington - Avoided Costs Input (Transport**)



*Interstate Pipelines include GTN, NWP, NIT, Foothills, West Coast (Avista contract costs as estimate)
**Only transport suppliers included in Avista's CCA and CPP obligations
***Storage costs from JP are excluded. Facility will need to be maintained (reliability, safety, operability) regardless of use
****Local Distribution is excluded from interruptible customers of any class

Avoided Cost (example only)