CASCADE NATURAL GAS CORPORATION®

A Subsidiary of MDU Resources Group, Inc.

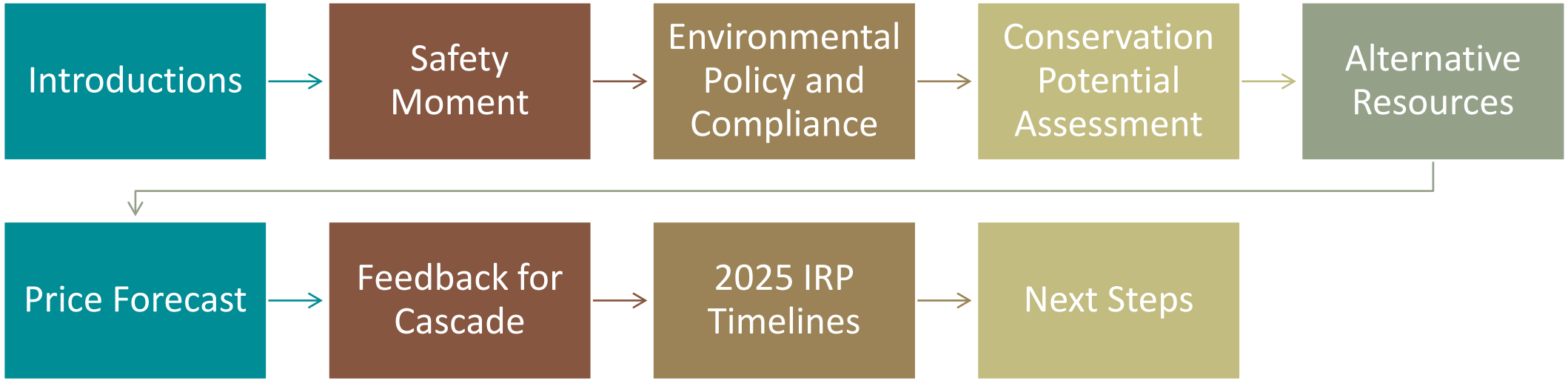
In the Community to Serve®

Integrated Resource Plan Technical Advisory Group Meeting #2

OCTOBER 24, 2024

MICROSOFT TEAMS/TELECONFERENCE

Agenda


Introductions
Safety Moment
Environmental Policy and Compliance
Conservation Potential Assessment
Alternative Resources
Price Forecast
Feedback for Cascade
2025 IRP Timelines
Next Steps

Safety Moment

Winter Safety – Protecting Yourself from the Cold

What you wear in winter can make the difference in protecting yourself from the cold and preventing frostbite and hypothermia.

- Keep your head warm with a hat
- Cover mouth with face mask or scarf to protect your lungs
- Outer coat should be tightly woven and water repellant
- Wear several loose-fitting, lightweight warm layers
- Wear mittens; they are warner than gloves
- Wool socks and waterproof boots keep feet warm

Environmental Policy and Compliance

Cascade's commitment to reducing emissions

Cascade Natural Gas, along with MDU Resources Group's other natural gas companies, established a GHG reduction target to reduce methane emissions 30% by 2035 compared to 2022 levels.

Environmental Policy:

The Company will operate efficiently to meet the needs of the present without compromising the ability of future generations to meet their own needs. Our environmental goals are:

- *To minimize waste and maximize resources;*
- *To be a good steward of the environment while providing high quality and reasonably priced products and services; and*
- *To comply with or surpass all applicable environmental laws, regulations and permit requirements*

Emissions from Natural Gas Distribution Operations

Cascade's methane emissions from pipeline infrastructure and GHG emissions from combustion equipment

- Cascade reported 1,721 mT CO2e emissions from leak emissions per HB 2518 to the UTC in 2023.
- Cascade reported 27,198 mT CO2e emissions for distribution system and compressor station emissions to the Department of Ecology and the EPA's GHG Reporting Program in 2023.
- EPA finalized updates to Subpart W natural gas distribution system reporting that starts in RY 2025.
  - Updated emissions factors
  - Reporting of emissions from pneumatic devices, blowdowns, and other large release events
- Cascade and sister companies joined One Future Coalition in 2024.
- EPA GHG Reporting Program released the 2023 data on October 15, 2024.

Reducing Operations Emissions

- Cascade is committed to methane emissions reductions
  - Since 2019, Cascade replaced approximately 54 miles of vintage steel with new polyethylene plastic or protected steel in Washington. Cascade has no unprotected steel pipeline and no cast iron pipe.
  - Created a more robust inventory of GHG emissions in all operational areas for 2024 and ongoing
  - Joined One Future Coalition and will be collaborating with entities nation-wide to reduce methane intensities and improve distribution operations.
  - Cascade mitigates methane leaks and has adopted a program to quickly address even small leaks that are not considered a public safety concern.
  - Exploring more ways to reduce emissions in normal operations, including the use of methane capture technology for pipeline blowdowns.
  - Piloting an emission survey using Picarro and Advanced Mobile Leak Detection technology in 2024.

Reducing Customer Emissions

Energy Efficiency and Conservation/DSM

- Maximizing cost-effective therm savings for Residential, Commercial, and Industrial Customers
- Adaptive management for changing codes, standards, and forecasts

Low-Income Weatherization Offerings

- Targeted outreach, increased participation in Low-Income EE programs
- Funding 100% project cost

Annual EE and Conservation/ DSM Savings	WA		OR	
	therms	MT CO2e	therms	MT CO2e
2019	760,956	4,038	499,135	2,648
2020	659,176	3,498	427,060	2,266
2021	1,243,223	6,597	525,372	2,788
2022	627,941	3,459	508,067	2,799
2023*	912,782	5,028	601,036	3,311
*Report is pending WUTC approval				

Climate Commitment Act

Program establishing a declining cap on GHG emissions from covered entities consistent with the limits established in RCW 70A.45.020, and a program to track, verify, and enforce compliance with the cap through the use of compliance instruments.

Anthropogenic GHG Emissions Reductions:

- Achieve 1990 levels (90.5 million metric tons) by 2020
- 45% below 1990 levels (50 million MT) by 2030
- 70% below 1990 levels (27 million metric tons) by 2040
- 95% below 1990 levels (5 million metric tons) by 2050

Covered Entities:

- Fuel suppliers, natural gas distribution, electric utilities, and large facilities.
- Landfills and certain emissions intensive and trade exposed (EITE) entities are added in during 2nd and 3rd compliance periods.

Climate Commitment Act - Linkage

Most recently, Washington, California and Quebec made a joint announcement on September 23, 2024, stating they are currently considering amendments to their cap-and-trade regulations to ensure the achievement of their 2030 goals.

Climate Commitment Act

Cascade's regulated emissions:

- Customer Emissions – about 2 million metric tons CO2e in 2023
  - All core customers
  - Non-core customers that are not covered entities under the CCA (≤25,000 mT CO2e), and excludes customers that may "opt-in" to program individually, fall under the national security designation, or successfully petition to be emissions-intensive and trade exposed (EITE) entity
- Operations Emissions – 27,198 metric tons CO2e
  - Methane leakage
  - Large fuel combustion equipment (e.g. compressor stations)

Climate Commitment Act

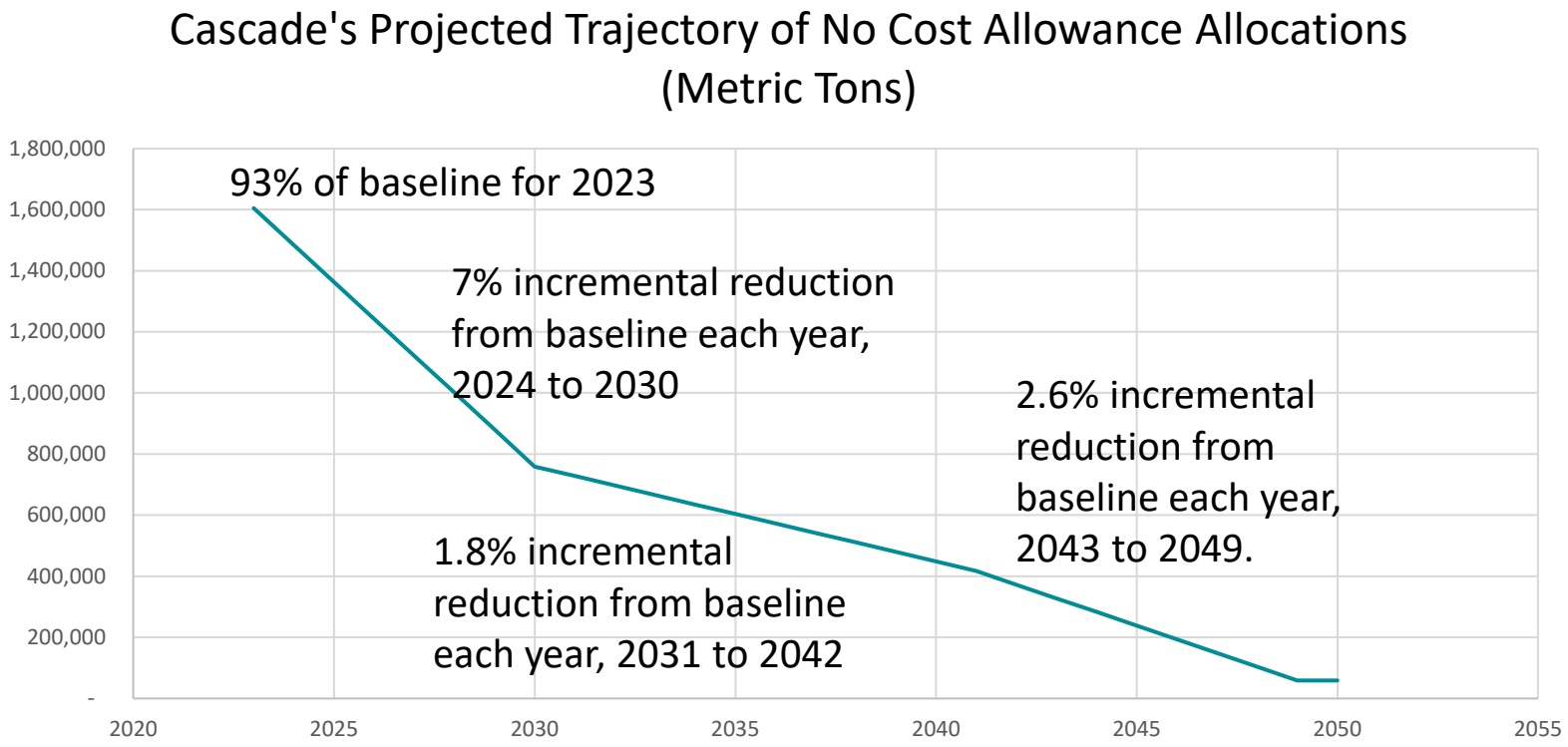
Baseline emissions
- 2015-2019 average

Ecology distributes no-cost allowances to Natural Gas Suppliers each October for the following year.

Natural gas utilities may use a portion of those allowances directly for compliance.

A large portion must be "consigned" at auction each year.

Consignment proceeds are used to benefit customers, through oversight of the Commission.



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Climate Commitment Act

Rule Requirements Commenced on January 1, 2023

4 Year Compliance Periods

- 2023-2026, 2027-2030, 2031-2034, …

Compliance Demonstrations

- Full compliance demonstrations required by Nov 1 of the year following the end of a 4-year compliance period
- Interim compliance period demonstrations by Nov 1 annually of 30% of prior year's emissions.
  - First interim compliance demonstration is November 1, 2024.

CCA Compliance Options

Allowances

- Allowances are equal to one ton of CO2e emissions

Energy Efficiency and Conservation/Demand-side Management

- Therm energy savings

Renewable Natural Gas

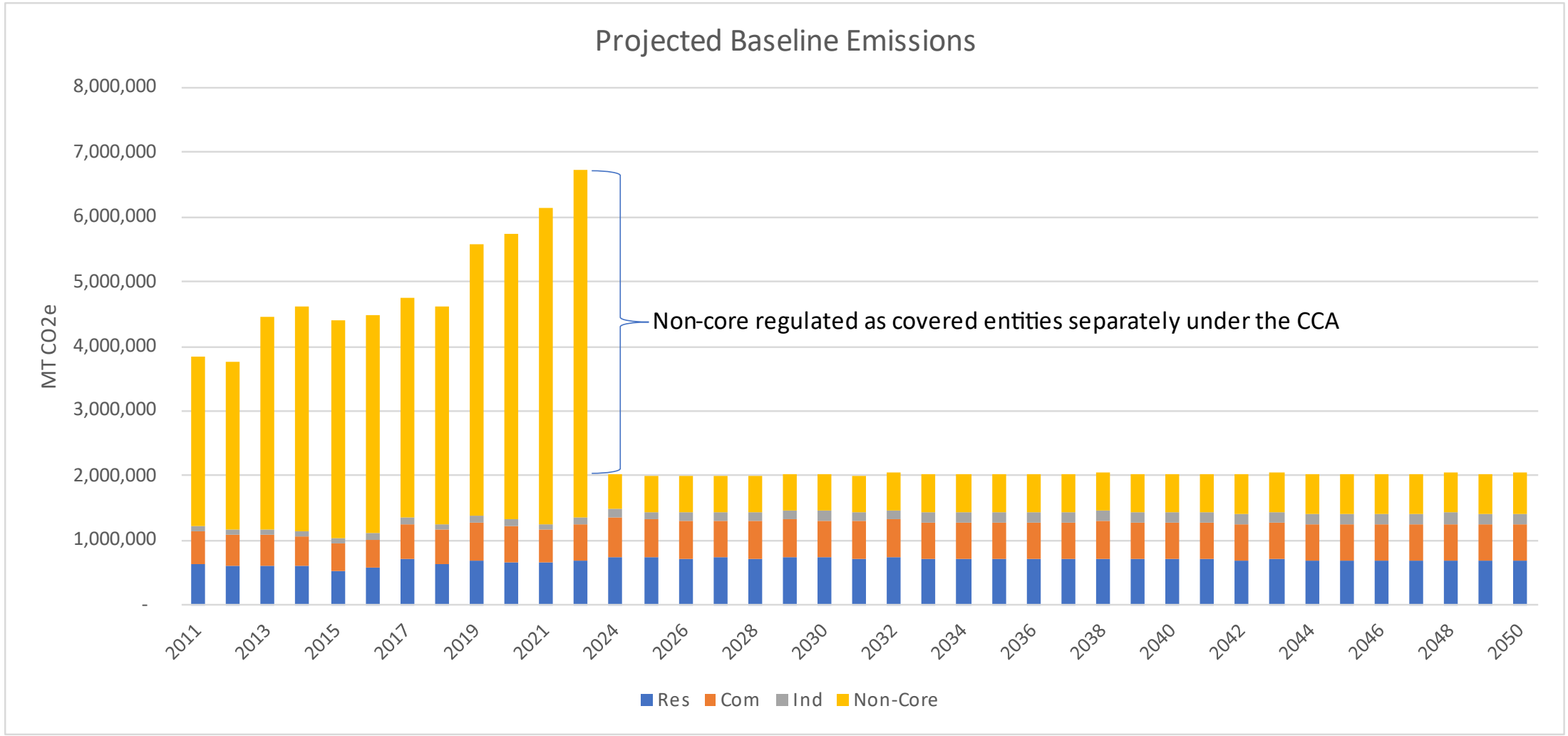
- One for one replacement of fossil gas emissions through renewable thermal credits

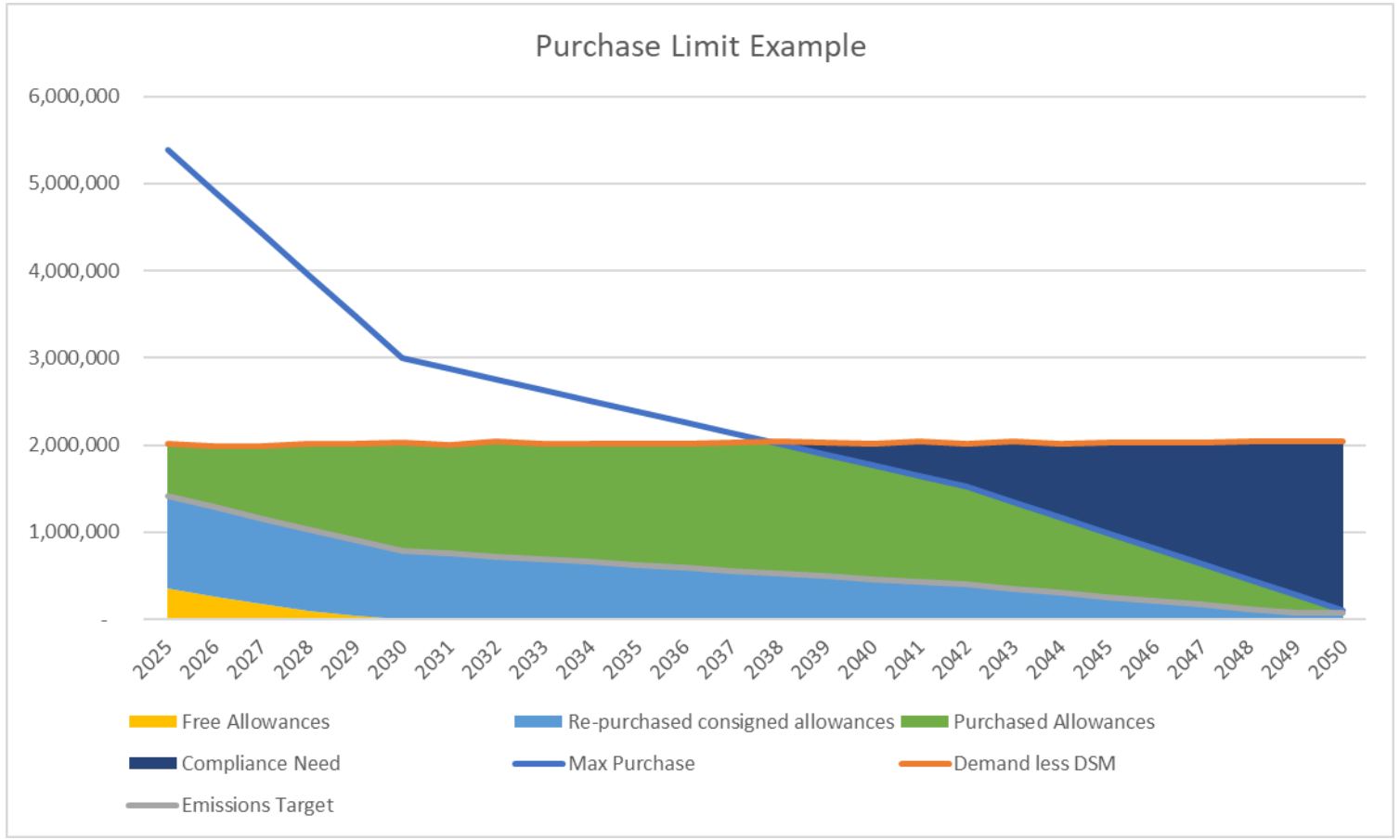
Offsets

- Limit use to 8% of compliance obligation in first compliance period (3% from tribal), 6% thereafter.

Other

- Carbon Capture, Synthetic methane, etc.


Projected Baseline Emissions
8,000,000
7,000,000
6,000,000
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
-
MT CO2e
Non-core regulated as covered entities separately under the CCA
2011
2013
2015
2017
2019
2021
2024
2026
2028
2030
2032
2034
2036
2038
2040
2042
2044
2046
2048
2050
Res
Com
Ind
Non-Core



- Considering current purchase limit of up to 10% of available allowances at auction.
- If allowances remain cost-effective, Cascade would be held to the auction purchase limit.
- In addition, allowances are available on the secondary market.

Building and Energy Code

Washington

- WA IA 2066 could have a large impact on the WA State Energy Codes (WSEC). If passed in November, there will likely be a review and/or rewrite of the current WSEC.

Oregon

- ODOE's Buildings Working Group is currently informing model(s) for the development of Oregon's Energy Strategy. Cascade will continue to monitor.

Local and Regional Initiatives (WA)

- Initiative 2117 seeks to repeal the 2021 Climate Commitment Act. It would eliminate the cap-and-trade system put in place by the law and prevent state agencies from implementing any new carbon tax or cap-and-trade policies.
- Initiative 2066 would prohibit state and local governments from restricting or discouraging the use of natural gas in buildings. It would prevent authorities from passing regulations that phase out natural gas in favor of electrification. Additionally, it mandates that gas utilities provide natural gas to any customer within their service area, even if other energy sources are available.

Local and Regional Initiatives (OR)

- City of Bend Environmental and Climate Committee (ECC) continues to convene:

2024

- **August-Sept**- ECC meeting, results of analysis on gas pathways, ECC to develop recommendations
- **October**- Council check-in
- **Nov-Dec**- ECC to define resource needs and implementation plan for short term actions to be included in council goal setting for GY 25-27 & determine stakeholder engagement group and process

2025

- **Jan-April**- Deep dive analysis on prioritized policies
- **May-July**- Stakeholder meeting and developing recommendations
- **August** - Council check in- analysis, results and recommendations to council

Thermal Energy Networks (TENs) Law

- Allows utilities to “own, control, operate or manage any thermal energy network” in Washington
- Focus is on non-combustible fluids transferring heat to eliminate on-site GHG for heating, cooling, domestic hot water and refrigeration; and/or improving energy efficiency
- To maintain priority for developing TENS pilots in their service territories, gas companies have 12 months from effective date of June 6 to announce written intent to WUTC to deploy a project in a specific location
  - Pilot project must be deployed within 30 months of effective date to maintain this priority w/ possibility for extension
- A gas company may receive Commerce grant funding to offset difference between LDC’s lowest reasonable cost resources and the costs of building /operating TENs pilot project.
  - Difference is determined by WUTC and provides the dollar amount for the purposes of making the grant
- Each gas company receiving grant for TENS pilots must coordinate with other awardees, WUTC, the Commerce, and consultants with expertise on successful thermal energy networks

TENs Exploration and Next Steps

- Cascade has received internal approvals to actively pursue potential TENs opportunities, beginning with focus on Washington pilot efforts
  - Company is hiring a manager to lead TENs development efforts
  - Preliminary meetings taking place with potential vendors and project leads
  - May contract with third-party to support project origination and help design Cascade-focused TENs potential assessment, similar to Company's DSM assessment
  - Will be seeking clarification from regulators on finer points of TENs law to ensure ability to meet requirements
  - Company has been approached in Oregon to consider future TENs laws

National Focus

- EPA finalized Subpart W updates that increase the methane emission sources local distribution system utilities must report annually. The new reporting requirements are effective in RY 2025.
- EPA released a request for information on the “Use of Advanced and Emerging Technologies for Quantification of Annual Facility Methane Emissions under the GHGRP”. We anticipate EPA to consider these methods in a future Subpart W future rulemaking to allow company-specific emissions quantification. Comments are due November 27.
- EPA released the electric generation unit GHG rule on April 25, 2024, requiring new high operation natural gas combustion turbines to install pollution controls equivalent to carbon capture. Also, existing coal units not installing controls would retire before 2032, opt to co-fire with natural gas and retire before 2039, or install carbon capture to operate past 2039. Some states and industry have challenged the rule, and no stay has been issued by a court. EPA is currently exploring GHG standards for existing natural gas combustion turbines.
- SEC finalized the GHG and Climate Disclosure Rule in March 2024, establishing a framework that require publicly traded companies to disclosure of scope 1 and scope 2 GHG emissions and certain impacts starting in 2026. Businesses filed legal challenges and the SEC voluntarily stayed the rule pending resolution of the legal challenges.
- Federally funded regional Clean Hydrogen Hubs (H2Hubs) were initiated to help accelerate and support the production, storage, delivery, and end-use of clean hydrogen.

Conservation Potential Assessment

IRP 2025 UPDATE

2025 IRP CPA Scenario Updates

Reference 2025 IRP	Low Growth	High Growth
2025 IRP Base Demand Forecast	2025 IRP Low Demand Forecast	2025 IRP High Demand Forecast
All scenarios updated with new avoided costs, HDDs, updated inflation rate and distribution system loss		

Scenario Summary

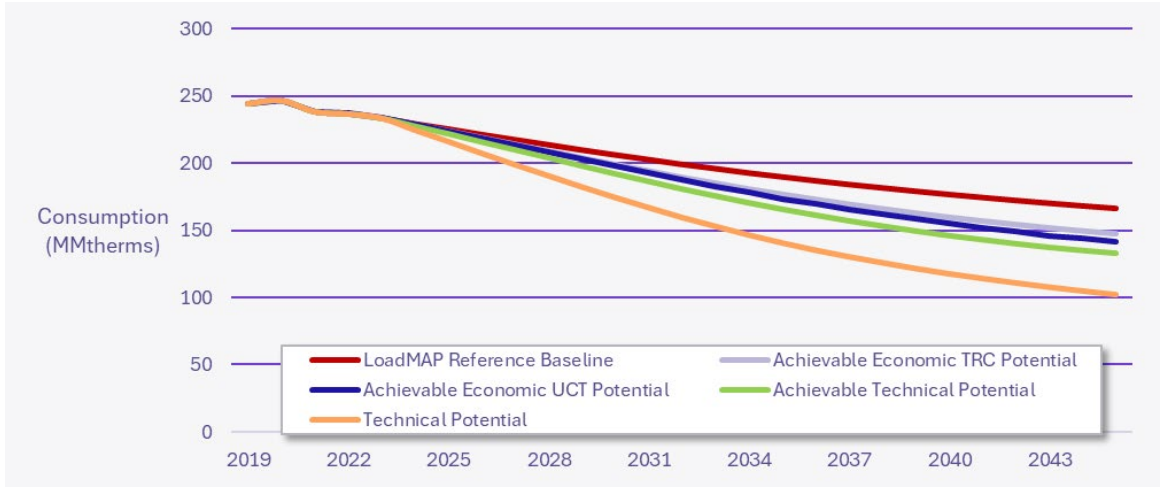
Cumulative Energy Savings of Achievable Economic UCT Potential (mTherms)

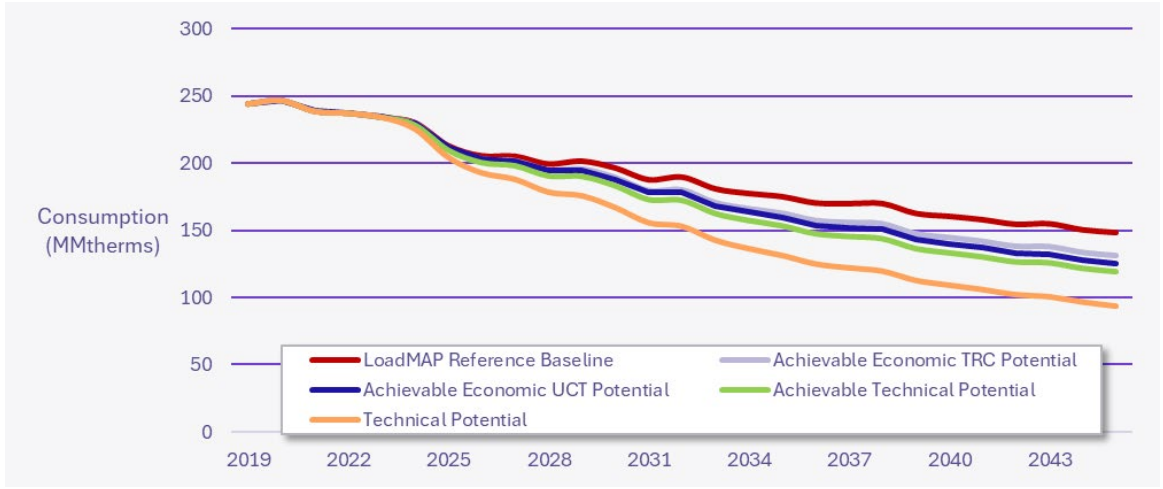
Scenario	Group	Sector	Sum of 2025	Sum of 2030	Sum of 2035	Sum of 2040	Sum of 2045
2023 Original	Regular Income	Residential	341.4	1,863.5	4,264.8	6,520.1	8,036.8
	Moderate Income	Residential	595.2	2,784.3	5,248.5	7,137.4	7,962.4
	Low Income	Residential	33.2	193.6	457.5	688.8	826.5
	Commercial	Commercial	670.3	3,128.5	5,099.4	5,979.6	6,128.6
	Industrial	Industrial	142.1	614.2	1,057.7	1,326.2	1,429.9
2023 Original Total			1,782.2	8,584.1	16,127.9	21,652.0	24,384.3
Reference - 2025 IRP	Regular Income	Residential	347.5	1,863.1	4,071.9	6,122.2	7,425.5
	Moderate Income	Residential	592.1	2,736.1	4,924.3	6,623.0	7,264.2
	Low Income	Residential	41.0	218.7	466.1	689.5	780.9
	Commercial	Commercial	733.0	3,219.1	5,005.3	5,728.6	5,747.3
	Industrial	Industrial	141.3	663.1	1,127.8	1,409.9	1,523.4
Reference - 2025 IRP Total			1,854.9	8,700.1	15,595.4	20,573.1	22,741.4
Low Growth	Regular Income	Residential	346.3	1,833.6	3,987.9	5,968.7	7,196.6
	Moderate Income	Residential	589.5	2,690.8	4,824.1	6,459.6	7,054.0
	Low Income	Residential	48.3	255.6	554.4	811.8	951.6
	Commercial	Commercial	734.6	3,259.2	5,057.3	5,753.5	5,748.6
	Industrial	Industrial	141.5	600.6	1,011.0	1,253.3	1,341.2
Low Growth Total			1,860.2	8,639.9	15,434.6	20,246.9	22,291.9
High Growth	Regular Income	Residential	347.5	1,895.0	4,183.0	6,337.4	7,761.7
	Moderate Income	Residential	592.1	2,781.2	5,049.1	6,842.0	7,573.7
	Low Income	Residential	48.5	263.4	580.2	860.5	1,025.0
	Commercial	Commercial	734.5	3,303.7	5,184.0	5,961.8	6,018.8
	Industrial	Industrial	141.3	663.1	1,127.8	1,409.9	1,523.4
High Growth Total			1,864.0	8,906.4	16,124.2	21,411.5	23,902.7

2023 Original

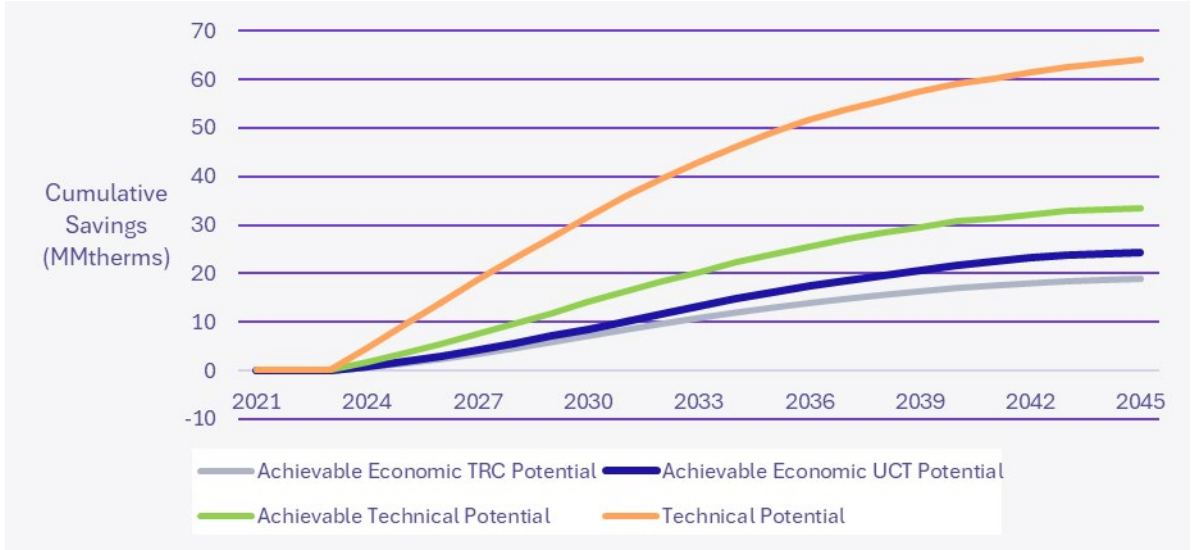
2025 Reference

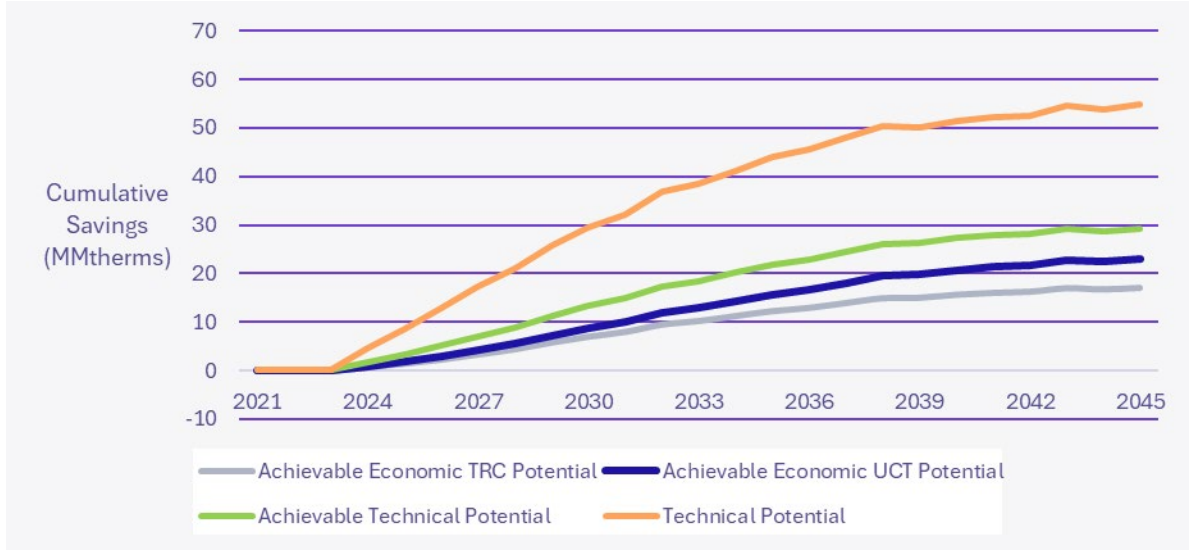
Projected Consumption





Projected Savings





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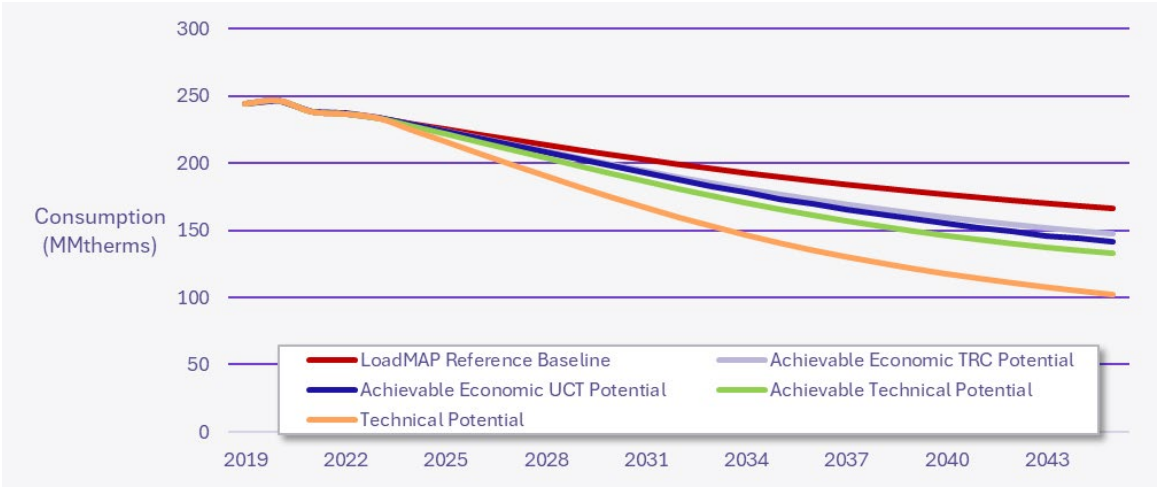
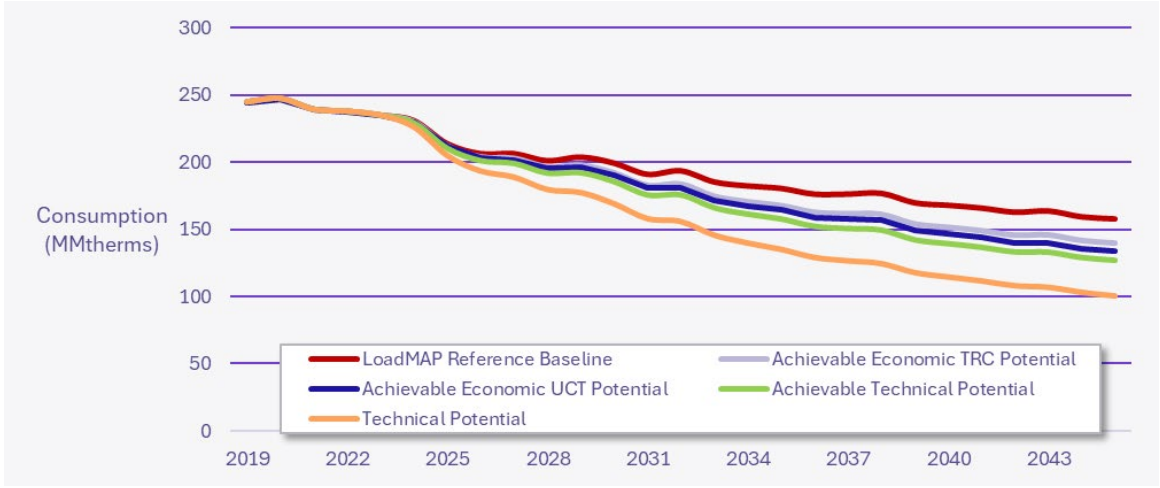
2023 Original

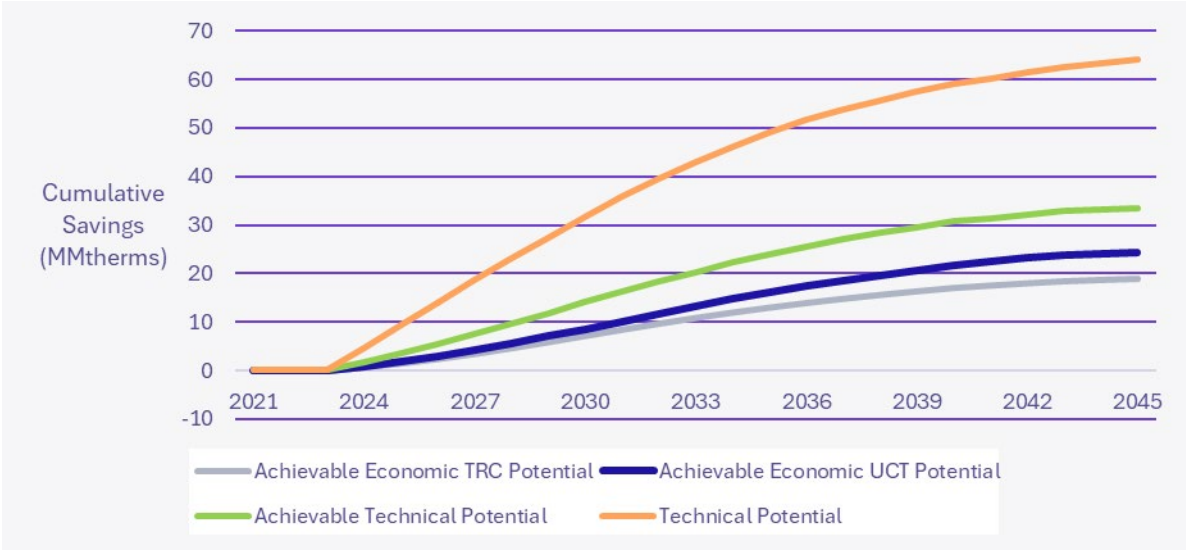
2025 High Growth

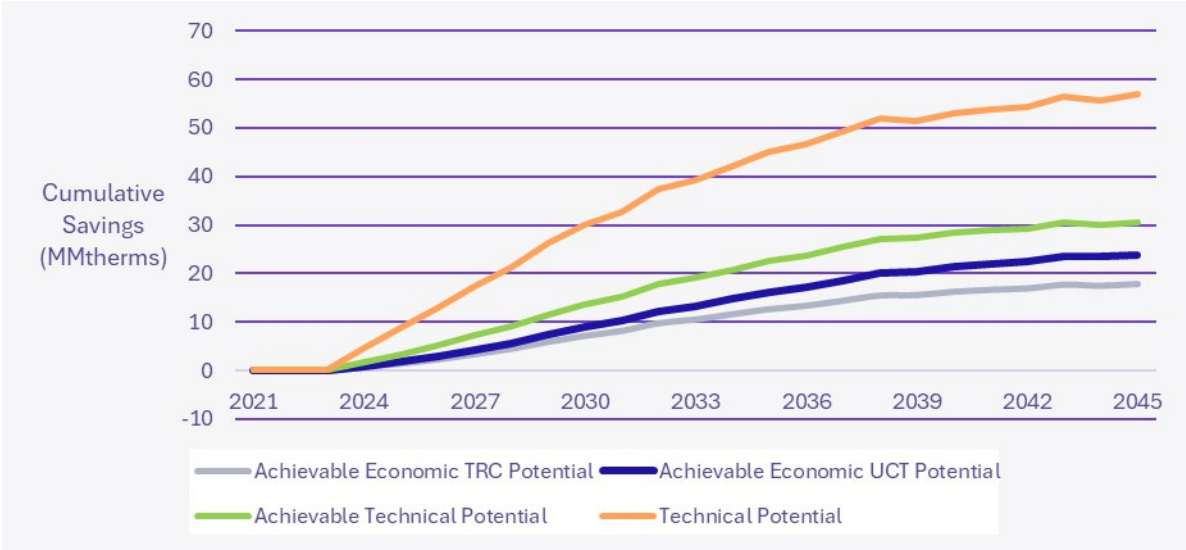
Projected Consumption





Projected Savings





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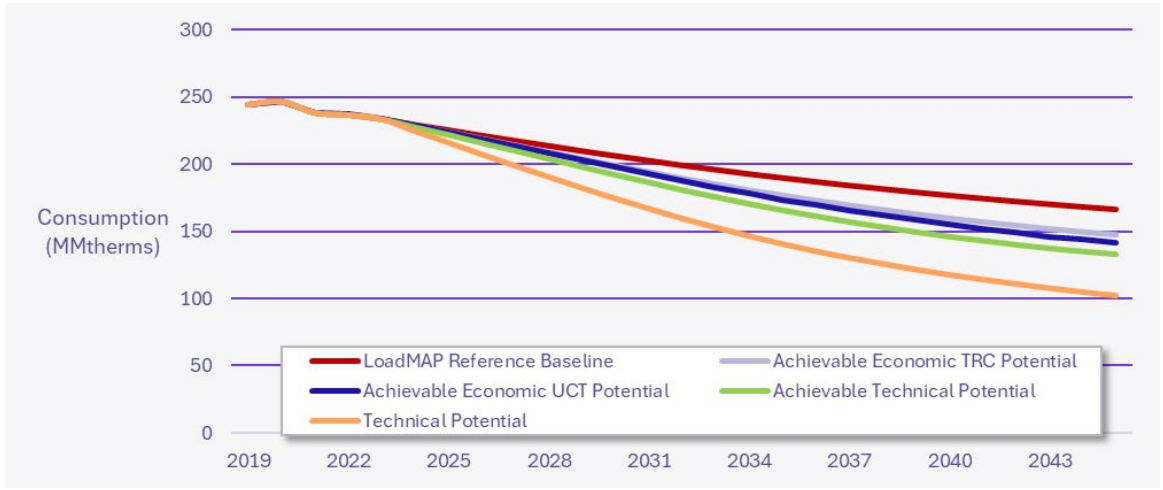
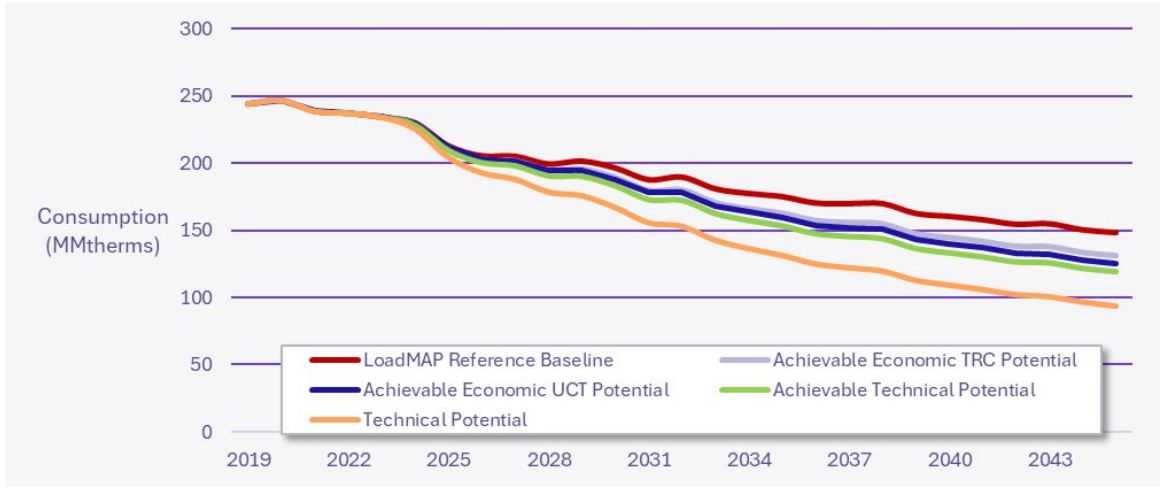
2023 Original

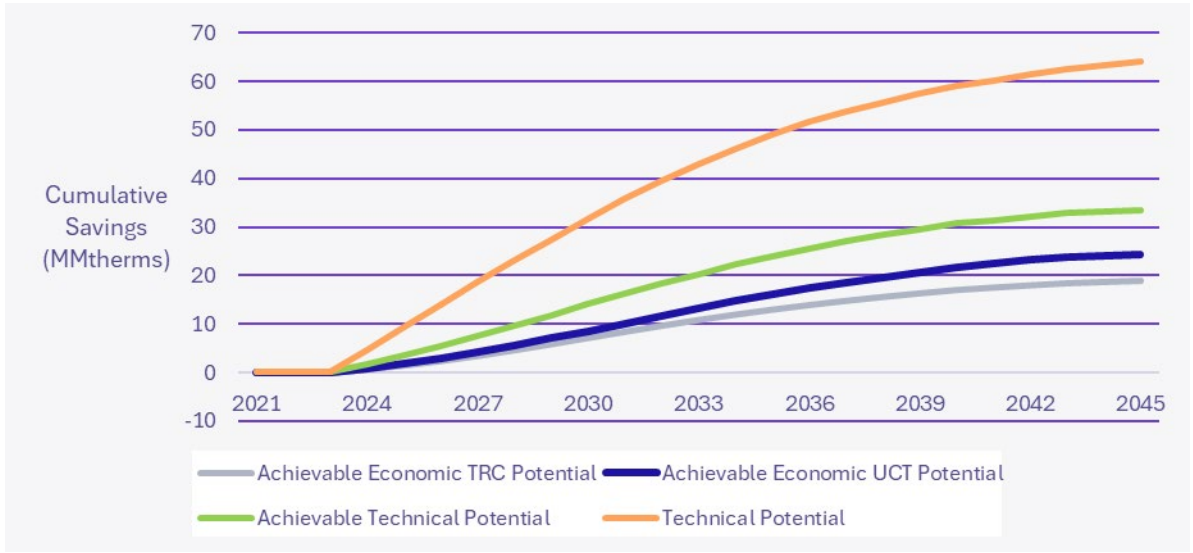
2025 Low Growth

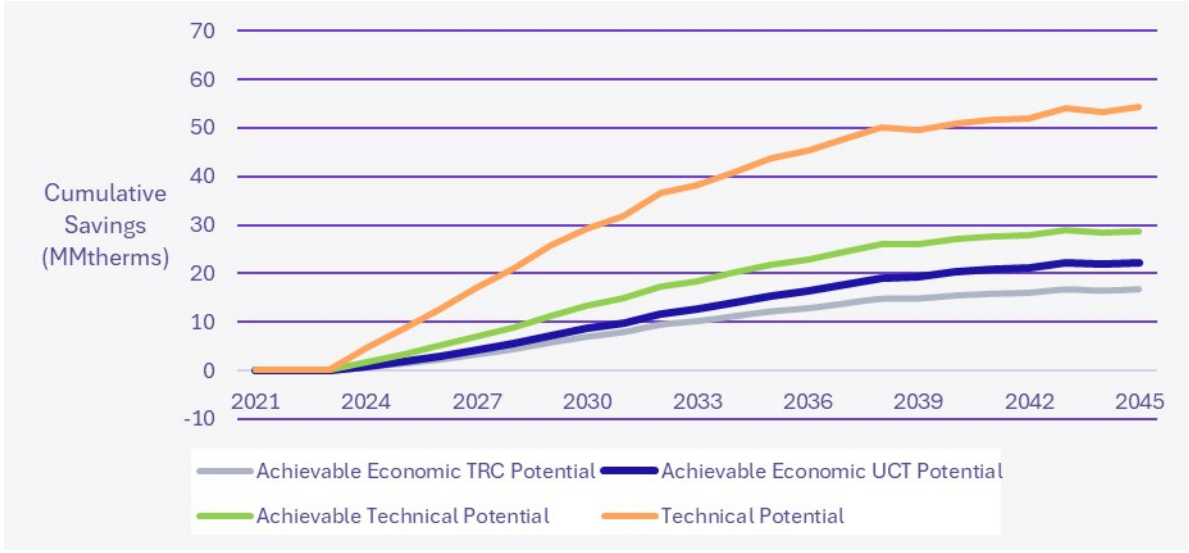
Projected Consumption





Projected Savings





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Overall Change in Savings by 2045

Percent Change of Cumulative Energy Savings by 2045 in Comparison to 2023 CPA

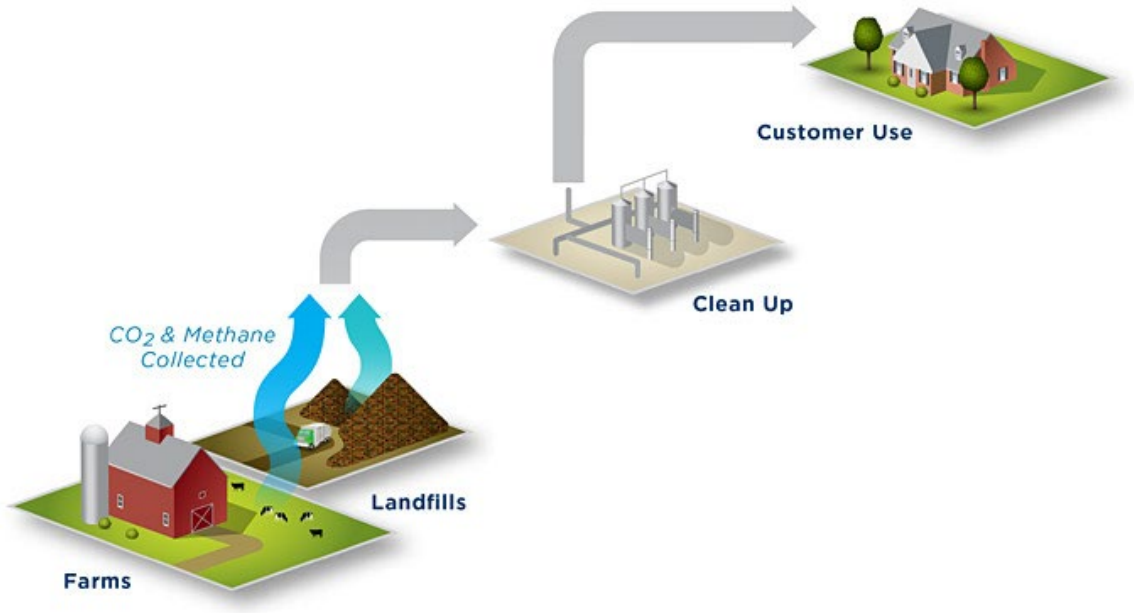
Sector	2025 IRP Reference	High Growth	Low Growth
Regular Income- Residential	-7.6%	-3.4%	-10.5%
Moderate Income- Residential	-8.8%	-4.9%	-11.4%
Low Income- Residential	18.7%	24.0%	15.1%
Commercial	-6.2%	-1.8%	-6.2%
Industrial	6.5%	6.5%	-6.2%
Overall	-5.9%	-2.0%	-8.6%

Top 20 Measures

Total Cumulative Savings in all Sectors by 2045 (mTherms)

Top Measures	2023 Original	Reference - 2025 IRP	High Growth	Low Growth
Furnace - Direct Fuel	5,414	4,449	4,774	4,236
Water Heater <= 55 gal.	2,157	2,414	2,414	2,414
Insulation - Ceiling, Upgrade	2,163	1,824	1,824	1,824
Fireplace	922	1,270	1,565	1,066
Insulation - Roof/Ceiling	1,312	1,155	1,155	1,132
Insulation - Basement Sidewall	1,221	1,004	1,004	1,004
Unit Heater	1,139	967	1,016	897
Insulation - Wall Cavity, Installation	779	995	995	995
Insulation - Wall Cavity	840	739	739	739
Insulation - Ceiling, Installation	748	618	618	618
Ducting - Repair and Sealing	642	527	527	527
Insulation - Ducting	504	414	414	414
Gas Boiler - Insulate Hot Water Lines	428	408	408	386
Boiler	260	399	399	393
Strategic Energy Management	320	349	349	306
ENERGY STAR Connected Thermostat	262	330	330	330
Water Heater - Pipe Insulation	289	283	283	283
Gas Boiler - Hot Water Reset	273	245	245	237
Furnace	278	239	239	238
Doors - Storm and Thermal	272	232	235	230

Alternative Resources



What is Renewable Natural Gas (RNG)?

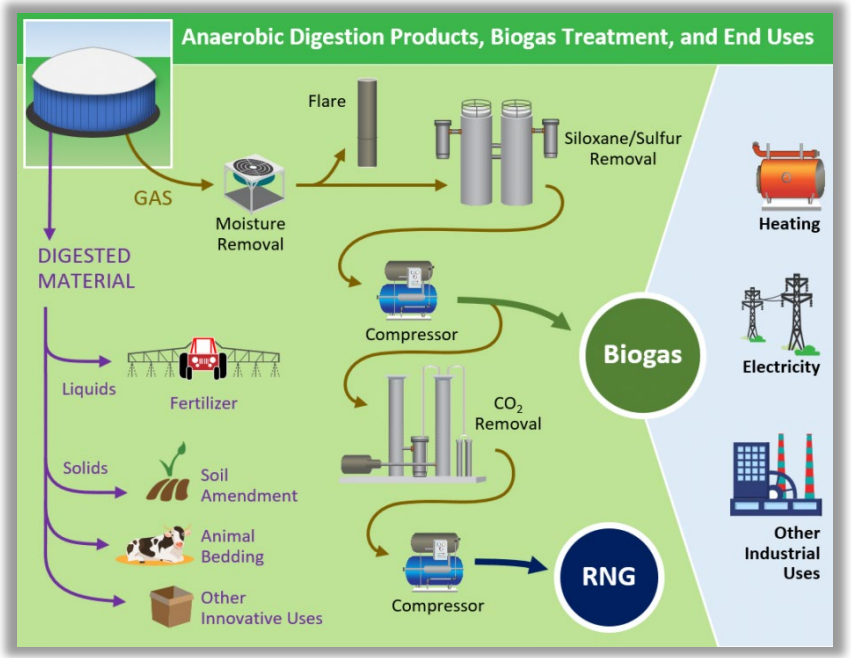
RNG is pipeline quality natural gas produced from various biomass sources through biochemical processes such as anaerobic digestion or gasification.[1]

[1] U.S. Department of Energy, Alternative Fuels Data Center, Renewable Natural Gas

Renewable Natural Gas

Examples:

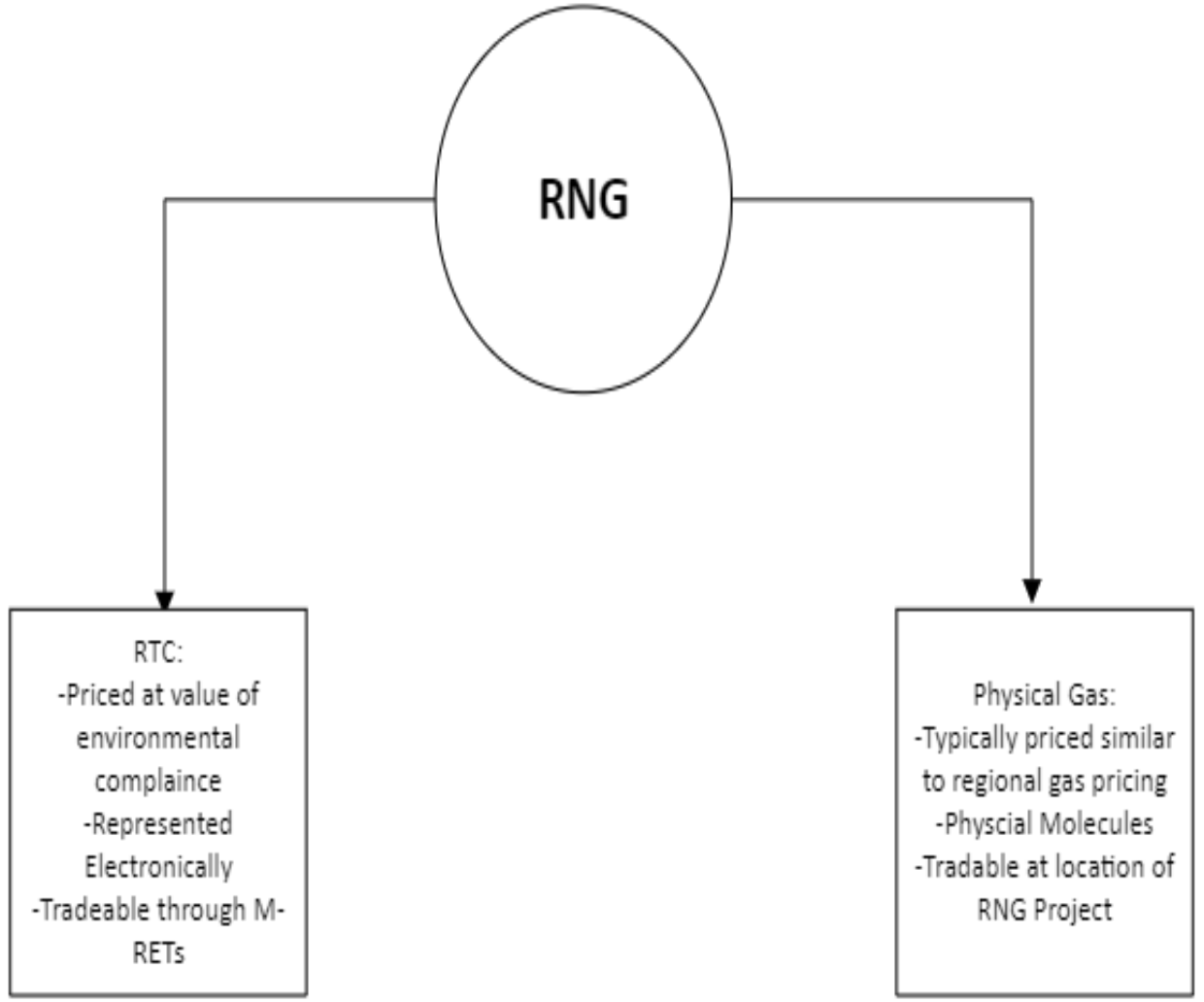
- Biogas from Landfills
  - Collect waste from residential, industrial, and commercial entities.
  - Digestion process takes place in the ground, rather than in a digester.
- Biogas from Livestock Operations
  - Collects animal manure and delivers to anaerobic digester.
- Biogas from Wastewater Treatment
  - Produced during digestion of solids that are removed during the wastewater treatment process.
- Other sources include organic waste from food manufacturers and wholesalers, supermarkets, restaurants, hospitals, and more.[1]



[1] U.S. Department of Energy, Alternative Fuels Data Center, Renewable Natural Gas

RNG potential

- RNG can be broken into two components
  - RTC – Renewable Thermal Certificate
  - Physical Gas
- RNG projects
  - Horn Rapids/Lamb Weston
  - Deschutes Landfill
- Compliance – Supporting documentation needed for OR reporting
  - Feedstock
  - Location
  - Carbon Intensity
- Restrictions:
  - Book and Claim
  - Carbon Intensity
- Opportunities
  - Peak Day On System Resources
  - Emissions Reduction Resource



Renewable Thermal Certificate

A Renewable Thermal Certificate (RTC) is a market-based instrument designed to incentivize the use of renewable energy sources for heating and cooling purposes. While renewable energy credits (RECs) have traditionally focused on electricity generation from renewable sources like wind or solar, RTCs specifically target the use of renewable energy for thermal applications, such as space heating, water heating, and industrial processes.

The mechanism works by assigning a certain value or credit to each unit of renewable thermal energy produced or consumed. These credits can then be traded or sold on the market, allowing entities that generate excess renewable thermal energy to sell their credits to those who need them to meet regulatory requirements or sustainability goals.

RTC programs vary by region and may be implemented at the state or regional level, often as part of broader renewable energy or greenhouse gas reduction initiatives. By creating a market for renewable thermal energy, RTCs help drive investment in renewable heating and cooling technologies and promote the transition to a more sustainable energy system.

Principles of RNG Cost-Effectiveness Evaluation

On the surface, RNG appears to not be cost effective when compared to traditional natural gas, but a number of factors can level the playing field

- Potential hedge value of RNG
- Value of environmental attributes
- Cost savings related to building vs. buying

RNG is a critical resource in Cascade's projected compliance resource stack related to the CPP and CCA, but must be acquired prudently

When not deemed cost effective, RNG acquisition may still be desired under certain regulatory exceptions (Oregon SB 98)

Cascade's Cost Effectiveness Formula

$$C_{RNG} = I_{RNG} - AC_U - AC_D + \sum_{T=1}^{365} (P_{RNG} + VC - CIF) * Q$$

$$C_{Conventional} = \sum_{T=1}^{365} (P_{Conventional} + VC) * Q$$

Where

C_{RNG} = The all-inclusive annual cost of a proposed RNG project
I_{RNG} = The annual required investment to procure a proposed RNG resource. If Cascade is simply buying the gas and/or environmental attributes, this value is zero.
AC_U = Avoided upstream costs
AC_D = Avoided distribution system costs
P = Daily price of gas being evaluated
Q = Daily quantity of gas being evaluated
VC = Variable cost to move one dekatherm of gas to Cascade's distribution system. This value can be zero if a project connects directly to the Company's system.
CIF = Carbon Intensity Factor. This is calculated by multiplying the Company's expected carbon compliance cost by 1 minus the ratio of a proposed projects carbon intensity to conventional gas' carbon intensity.
$C_{Conventional}$ = The all-inclusive annual cost of conventional natural gas.

If $C_{Conventional} \geq C_{RNG}$, a project can be considered cost effective, and should be acquired. If not, the project may still be considered under the regulatory exceptions

Key Inputs

Case/RIN Selector	D5
State Jurisdiction	WA
Project Terms (yrs)	15
Project Output Volumes (dth)	200,000
Project Output Percentage (Obliged)	100.0%
Supply Price (annualized)	$1.45
Project Investment Percentage	100.0%
Project Investment	$3,000,000
Carbon Treatment	Landfill CNG
RINs Risk Rating	Avg
Inflation Escalator?	CPI
RNG Revenue Increase / (Decrease)	$1,471,938
RNG Percentage Change	0.51%
Voluntary RNG Price Adder ($/therm)	$0.91107
Potential Market Value (Enterprise Value)	-$21,432,726

Purchase Vs. Build?

Cascade utilizes different models based on whether the Company is evaluating the purchase of RNG or the building and ownership of an RNG generating facility

While philosophically the same, build model provides a more detailed breakdown of items related to ownership

Purchase model considers revenue that the Company would earn from transportation agreements of volumes of RNG that Cascade would not own

Build opportunities typically allow for a cheaper cost/RTC, but may contain risks related to uncertainty around capital investment costs.

Future Considerations

Include Risk Reduction value from avoided cost as RNG benefit?

Stochastic analysis of key inputs

Modification of CIF factor to use IRP marginal carbon compliance cost?

The State of Hydrogen

RNG and Hydrogen will be critical in meeting the dual goals of decarbonizing energy pipelines while maintaining the benefits of reliability and resiliency provided by our distribution system

Hydrogen Shot [Hydrogen Shot | Department of Energy]

- 111 Goal: reduce the cost of clean hydrogen by 80% to $1 per 1 Kg in 1 decade

H2Hubs

- Release of NOI to fund Bipartisan Infrastructure Law's $8 billion program
- Develop regional hubs across the country
- Hubs will include production, processing, delivery, storage, and end-use of hydrogen
- FOA in Sept/Oct 2022

Hydrogen Research

Sister company investment in GTI and LCRI

LCRI [Low-Carbon Resources Initiative (epri.com)]

- 5-year collaborative supported by electric and gas utilities
- Advance the technologies needed for deep decarbonization within the next decade so they can be deployed in the 2030 to 2050 timeframe

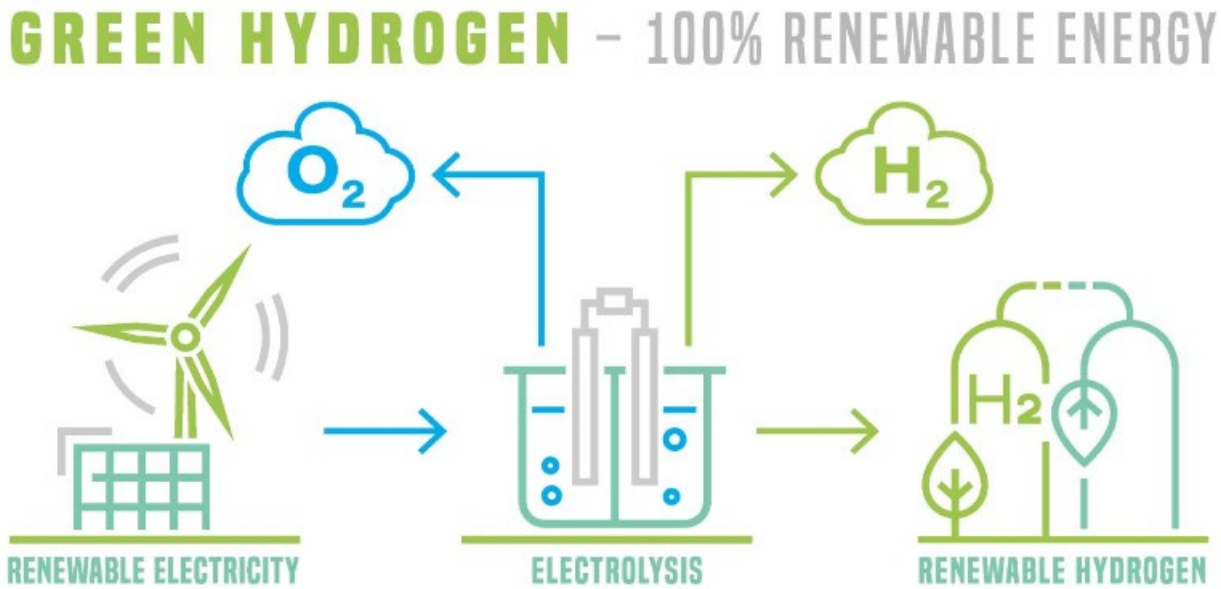
GTI Hydrogen Technology Center[Hydrogen Technology Center • GTI Energy]

- Cross-cutting research, product development, and demonstration projects, focused on clean hydrogen production, storage, delivery, and use

Hydrogen

Examples:

- Blue
  - Steam methane reforming with carbon sequestration
- Turquoise
  - Reforming methane into hydrogen gas and a solid carbon byproduct
- Green
  - Utilizing electrolysis from renewables to split the molecule into hydrogen and oxygen
- Pink
  - Similar to green, but utilizes electricity from nuclear power
- Gold
  - Microbe conversion of residual hydrocarbons from depleted, abandoned oil wells

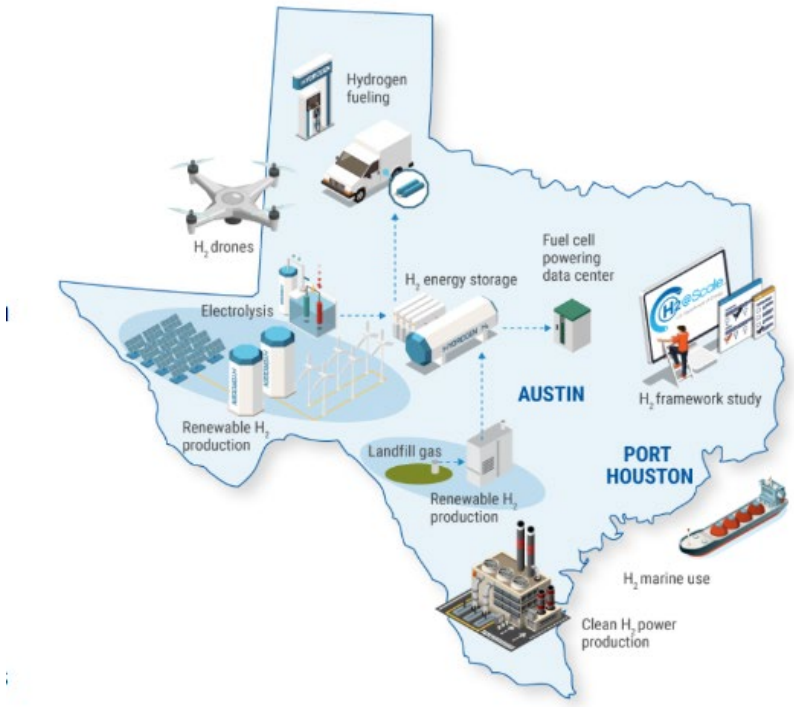


Photo/Innovation News Network

[1] U.S. Department of Energy, Alternative Fuels Data Center, Renewable Natural Gas

Hydrogen Research – examples

H2@SCALE IN TEXAS AND BEYOND



ASSESSING H2 COMPATIBILITY IN NATURAL GAS INFRASTRUCTURE

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Synthetic Methane

Green and pink hydrogen made through electrolysis can be combined with waste CO_2 to produce synthetic methane using chemical or biological processes. This process known as methanation entails incremental cost to the production of green and pink hydrogen.

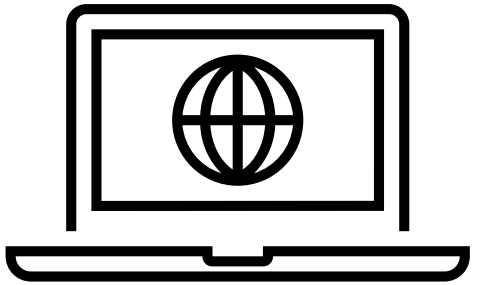
Carbon Capture

Carbon Capture and storage is a process in which a relatively pure stream of carbon dioxide from industrial sources is separated, treated and transported to a long-term storage location.

Cascade is looking at Carbon Capture for large industrial customers.

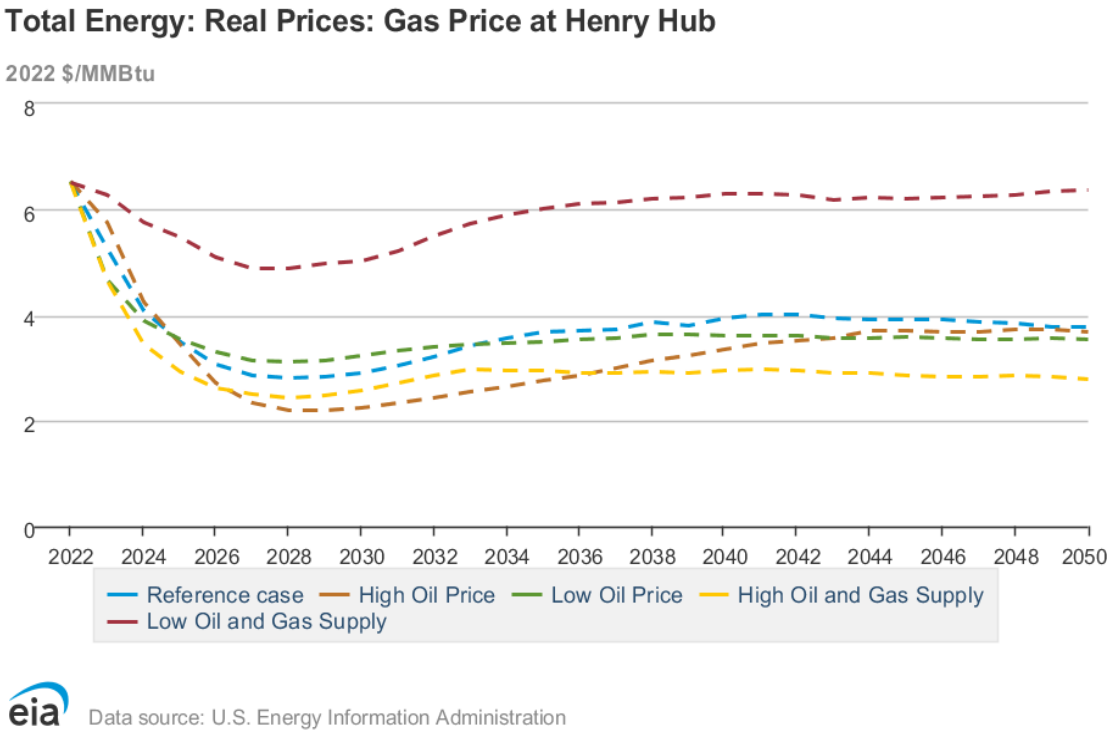
Carbon Capture is not currently eligible for Oregon or Washington compliance programs, these projects could provide a way to offset carbon.

Price Forecast



Long Range Market Outlook

Domestic natural gas consumption for electric generation is projected to decrease by 2050, while industrial natural gas consumption is projected to increase. Natural gas production is projected to increase across all cases due in part to large increases in LNG export demand. Taking these factors into consideration, EIA projects that the Henry Hub price will remain at or below $4/MMBtu through the projection period in most cases.[1]



[1] EIA's Annual Energy Outlook 2023

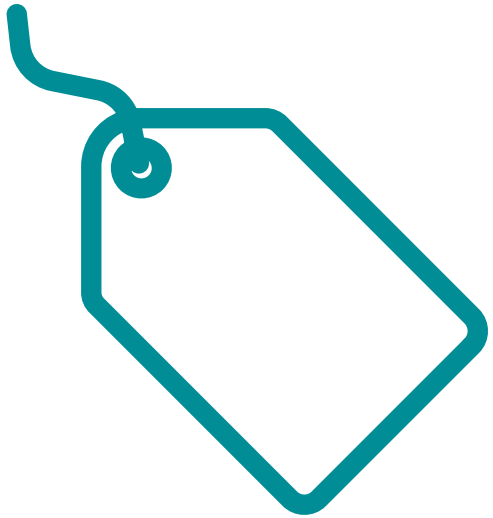
Long Range Price Forecast - Sources

Cascade's long-term planning price forecast is based on a blend of current market pricing along with long-term fundamental price forecasts.

The fundamental forecasts consider sources such as Wood Mackenzie, EIA, the Northwest Power and Conservation Council (NWPCC), S&P Global, the Intercontinental Exchange (ICE), and various third-party long-term price forecasts.

While not a guarantee of where the market will ultimately finish, Henry Hub NYMEX is the most current information that provides some direction as to future market prices.

Wood Mackenzie's long-term forecast is at a monthly level by basin. Cascade uses this to help shape the forecast's monthly basis pricing.



Sources Continued

THE COMPANY ALSO RELIES ON EIA'S FORECAST; HOWEVER, IT HAS ITS LIMITATIONS SINCE IT IS NOT ALWAYS AS CURRENT AS THE MOST RECENT MARKET ACTIVITY. FURTHER, THE EIA FORECAST PROVIDES MONTHLY BREAKDOWNS IN THE SHORT-TERM, BUT LONGER-TERM FORECASTS ARE ONLY BY YEAR.

CNGC ASSIGNS A WEIGHT TO EACH SOURCE TO DEVELOP THE MONTHLY HENRY HUB PRICE FORECAST FOR THE 20-YEAR PLANNING HORIZON.

ALTHOUGH IT IS IMPOSSIBLE TO ACCURATELY ESTIMATE THE FUTURE, FOR TRADING PURPOSES THE MOST RECENT PERIOD HAS BEEN THE BEST INDICATOR OF THE DIRECTION OF THE MARKET. HOWEVER, CASCADE ALSO CONSIDERS OTHER FACTORS (HISTORICAL CONSTRAINTS) WHICH CAN LEAD TO MINOR ADJUSTMENTS TO THE FINAL LONG-RANGE FORECAST.

Price Forecast Weights

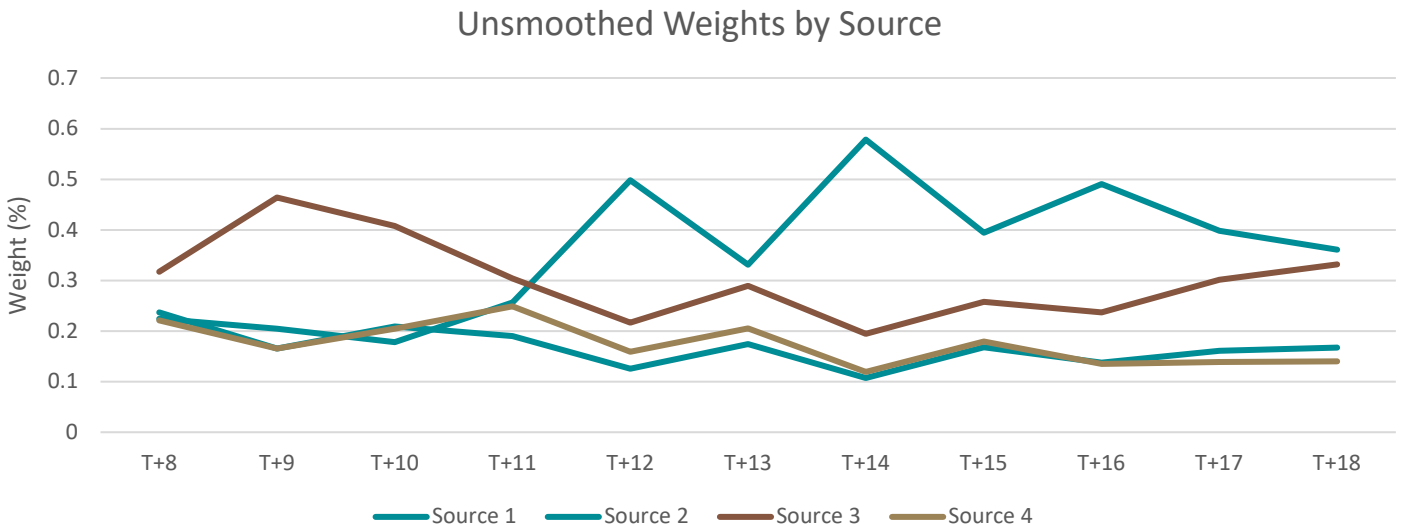
Considerations in weight assignments:

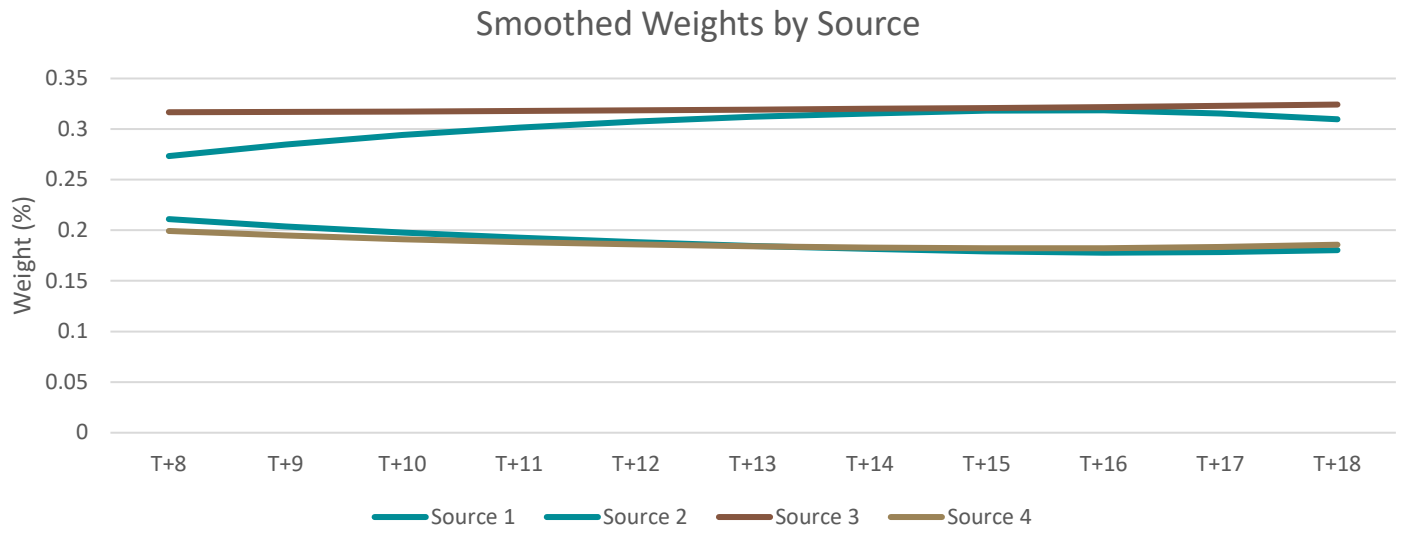
- Cascade produces a weighting system based on an analysis of the symmetric mean absolute percentage error (SMAPE) of its sources since 2010;

SMAPE = |(Actual – Forecast)/((Actual + Forecast)/2)|

Cascade calculates the weight of the inverse of the SMAPEs of each source, which are then smoothed using Holt-Winters smoothing.

- Some sources produce forecasts daily, while others are far less frequent.
  - Cascade uses an age dampening mechanism to account for this in its price forecast, reducing the impact of forecasts that do not account for more current market information.





Example of Unsmoothed and Smoothed Weight Calculations by Source

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Price Forecast Weight Adjustments

In Months T+1 to T+12, Cascade uses NYMEX Forward pricing for all locations exclusively;

- For short term forecasting, the marketplace is ideal because forward prices should reflect all current events that impact the forecast (weather, storage, etc.)
- Long term forecasting is more concerned about the fundamental market intelligence, which is reflected in the analysis of Cascade's sources.

Months T+13 to T+48 are used to interpolate the weights from exclusively NYMEX to the weights calculated from each source's SMAPE.

Months T+49 onward use the age dampened (if applicable) weights of each source.

Example Weights For Price Forecast

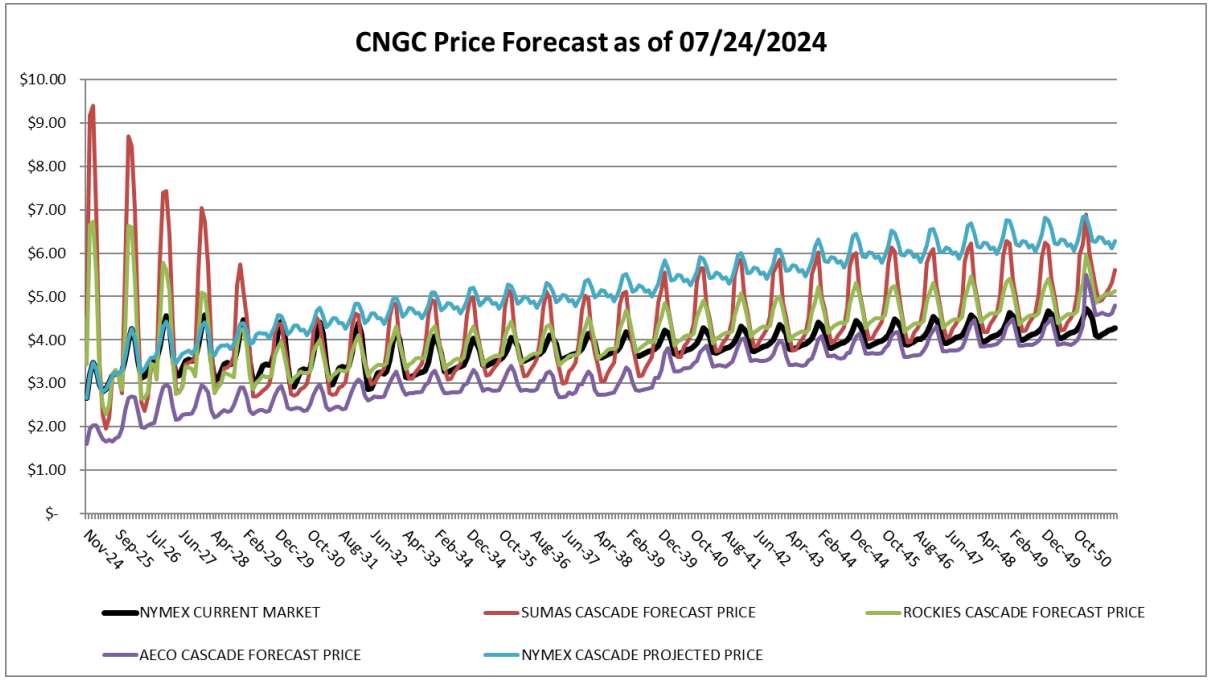
NOT INTERPOLATED

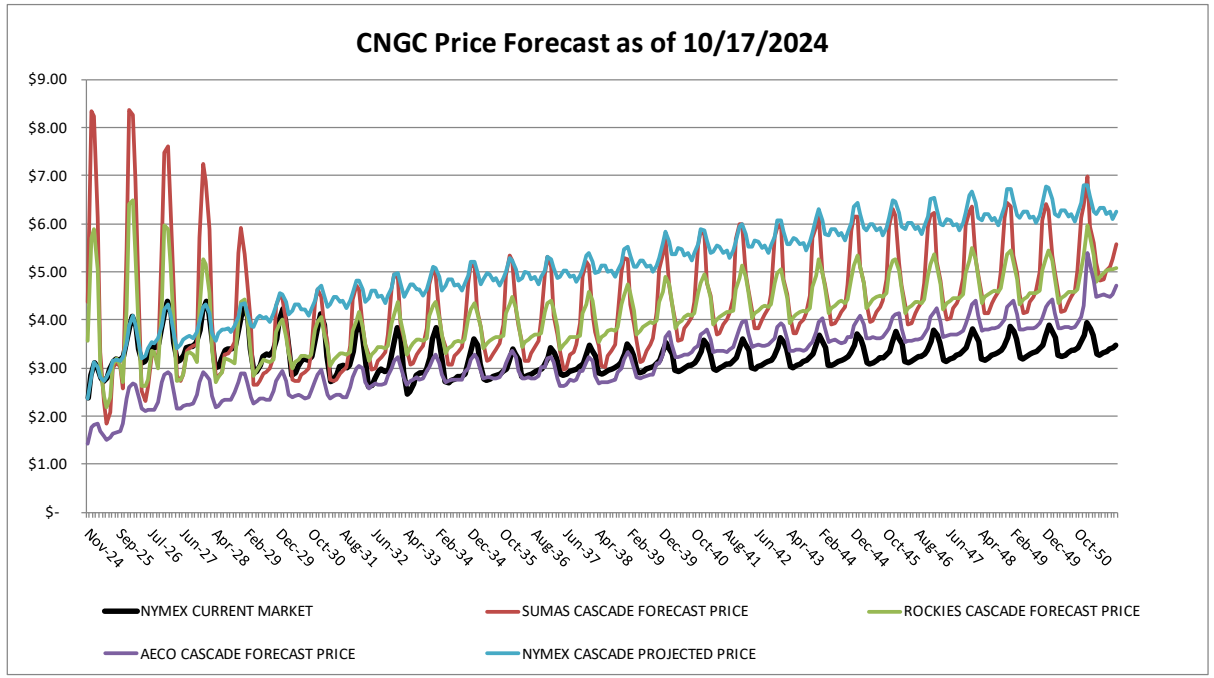
	Source 1	Source 2	Source 3	Source 4
Oct-25	100.000%	0.000%	0.000%	0.000%
Nov-25	20.326%	28.635%	28.147%	22.892%
Dec-25	20.019%	29.098%	28.057%	22.826%
Jan-26	19.760%	29.431%	28.038%	22.771%
Feb-26	19.525%	29.678%	28.079%	22.718%
Mar-26	19.278%	29.901%	28.161%	22.661%
Apr-26	19.021%	30.089%	28.289%	22.600%
May-26	18.761%	30.230%	28.470%	22.538%
Jun-26	18.501%	30.313%	28.709%	22.477%
Jul-26	18.244%	30.325%	29.012%	22.419%
Aug-26	17.996%	30.254%	29.384%	22.366%
Sep-26	17.756%	30.105%	29.823%	22.316%

INTERPOLATED

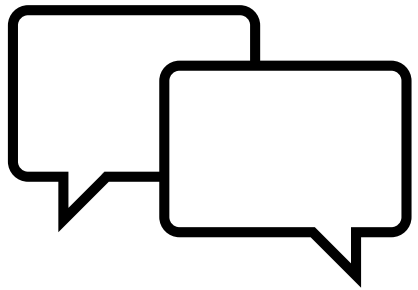
	Source 1	Source 2	Source 3	Source 4
Oct-25	100.000%	0.000%	0.000%	0.000%
Nov-25	97.917%	0.749%	0.736%	0.599%
Dec-25	95.833%	1.516%	1.462%	1.189%
Jan-26	93.750%	2.292%	2.184%	1.774%
Feb-26	91.667%	3.073%	2.908%	2.353%
Mar-26	89.583%	3.859%	3.634%	2.924%
Apr-26	87.500%	4.645%	4.367%	3.489%
May-26	85.417%	5.427%	5.111%	4.046%
Jun-26	83.333%	6.199%	5.871%	4.597%
Jul-26	81.250%	6.955%	6.654%	5.142%
Aug-26	79.167%	7.686%	7.465%	5.682%
Sep-26	77.083%	8.389%	8.310%	6.218%

Price Forecast





Feedback for Cascade



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Questions/Next Steps

Review Plans for TAG 3 Discussion

- Respond to TAG 2 Feedback
- Distribution System Planning
- Final Integration Results
- Finalization of Planned Components
- Proposed new 2- to 4-year action plan
- TAG 2 is Thursday, October 24

2025 WA IRP Schedule

Process Item	Date	Process Element
Receive feedback on TAG 2	Friday, November 8, 2024	
First Draft	Friday, December 6, 2024	
Comments Due	Friday, January 10, 2025	
TAG 3	Wednesday, February 5, 2025	Respond to TAG 2 feedback, Distribution System Planning, Final Integration Results, finalization of plan components, Proposed new 2- to 4-year Action Plan
Final Draft	Tuesday, March 4, 2025	
Comments Due	Tuesday, April 15, 2025	
TAG 4 (if needed)	Thursday, May 1, 2025	
Final Complete By	Friday, May 16, 2025	
File	Friday, May 23, 2025	

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Integrated Resource Plan Technical Advisory Group Meeting #2

OCTOBER 24, 2024

MICROSOFT TEAMS/TELECONFERENCE

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