CASCADE NATURAL GAS CORPORATION®
A Subsidiary of MDU Resources Group, Inc.

In the Community to Serve®

Integrated Resource Plan Targeted Technical Advisory Group Meeting #2

FEBRUARY 15, 2024

MICROSOFT TEAMS/TELECONFERENCE

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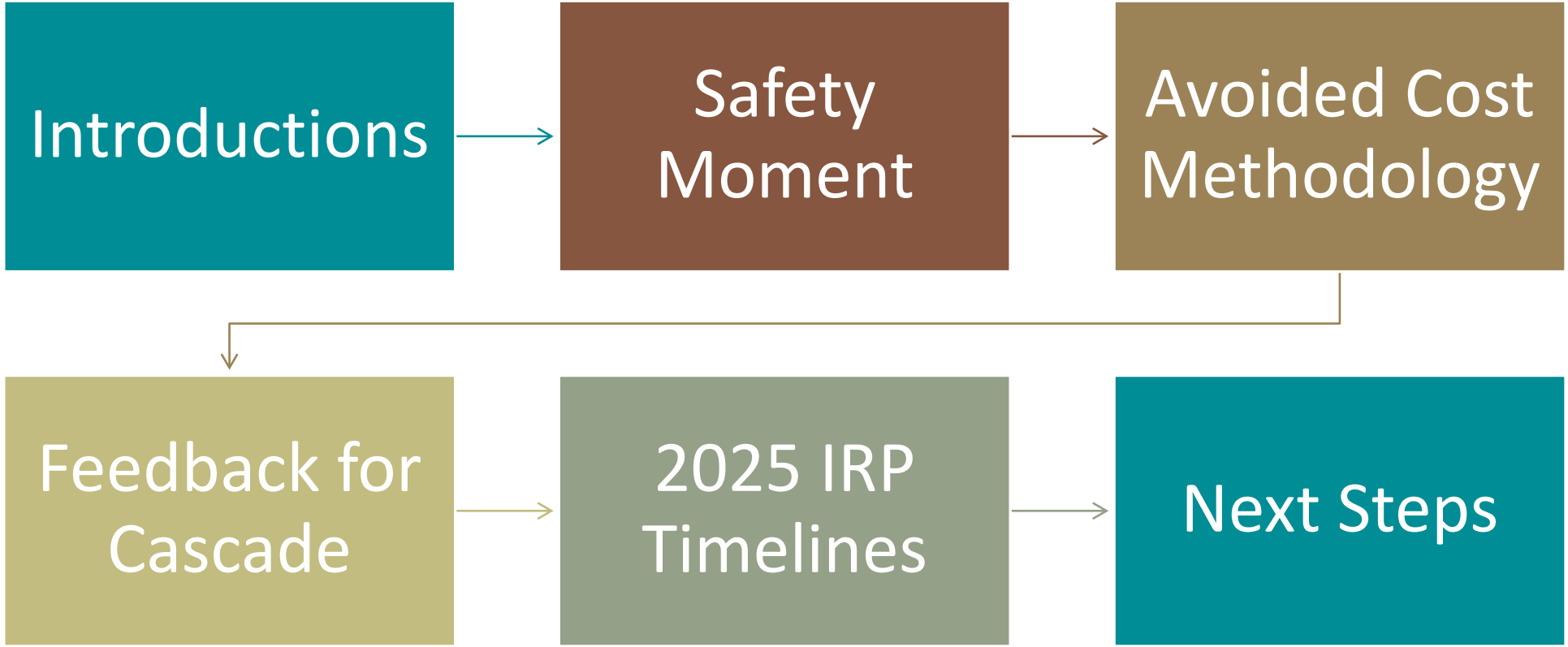
Agenda


Introductions
Safety Moment
Avoided Cost Methodology
Feedback for Cascade
2025 IRP Timelines
Next Steps

Safety Moment

Avoided Cost Methodology and Calculation

Avoided Cost Overview

As part of the IRP process, Cascade produces a 27-year price forecast and 45 years of avoided costs.

The avoided cost is an estimated cost to serve the next unit of demand with a supply side resource option at a point in time. This incremental cost to serve represents the cost, including environmental impacts, that could be avoided through energy conservation.

The avoided cost forecast can be used as a guideline for comparing energy conservation with the cost of environmental impacts, acquiring, and transporting natural gas to meet demand.

Avoided Cost Overview

For the 2025 IRP, Cascade will continue to use the information learned from prior IRPs to create a transparent and intuitive final avoided cost.

The various elements of the avoided cost will need to be reconsidered with regards to emissions reductions goals.

The Company produces an expected avoided cost case based on peak day and, in the case of distribution system costs, peak hour.

Avoided Cost Formula

The components that go into Cascade's avoided cost calculation are as follows:

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

Where:

$AC_{nominal}$ = The nominal avoided cost for a given year. To put this into real dollars you must apply the following: Avoided Cost/(1+Discount Rate)^Years from the reference year.

TC_v = Variable Transportation Costs

TC_F = Fixed Transportation Costs (When Avoidable)

SC_v = Variable Storage Costs

CC = Commodity Costs

E_{Comp} = Environmental Compliance Costs

DSC = Distribution System Costs

RP = Risk Premium

E_{adder} = Environmental Adder, as recommended by the Northwest Power and Conservation Council

Avoided Cost Methodology

Variable Transportation costs are pulled directly from the major pipelines that Cascade utilizes (NWP, GTN, Enbridge, Ruby, Nova Gas Transmission (NGTL) and Foothills).

Fixed Transportation are only included when avoidable (i.e.. potential to offset upstream capacity acquisition)

Storage costs are only captured if there is an avoidable future storage cost (i.e.. On system storage).

Commodity Costs are taken from Cascade's 27-year price forecast.

Cascade will be requesting feedback regarding its methodology related to environmental compliance costs

The Company's distribution system cost calculation looks at forecasted capital expenses related ONLY to growth, and uses the company's load growth forecast to translate these costs to a per therm basis.

Risk premium is calculated as the delta from deterministic and stochastic pricing

Environmental adder still applies to all elements of the avoided cost, still 10% as per NWPCC guidance

Transportation Costs

- Upstream transportation costs can be broken out into two elements: fixed costs and variable costs.
  - Fixed costs or reservation costs are what Cascade pays to the upstream pipelines regardless of whether gas flows on the pipeline. These are not avoidable for existing contracts.
  - Variable costs are paid when gas flows on the upstream pipeline. These are avoidable costs.
    - Different upstream pipelines charge different rates for their variable costs. Since the avoided costs is concerned with the marginal cost of the next therm that flows, Cascade takes an average of these pipelines variable rates. Since it's not known which pipeline that therm will flow on.
  - Fixed costs on proposed incremental upstream transportation are considered an avoidable cost and can be part of the final calculation.

Storage Costs

- Storage costs are only captured if there is an avoidable future storage.
  - An example of this would be an on-system storage facility that is utilized to serve peak day demand.
  - For Cascade's system, all storage is off-system and provides a net-positive benefit to customers, so it does not qualify as an avoided cost.

Commodity Costs

- Commodity Costs are taken from Cascade's 27-year price forecast.

- During the 2023 IRP TAG process, there were questions about whether this represented Cascade's marginal commodity cost. Some stakeholders brought up the idea of RNG being a more accurate representation of Cascade's marginal commodity cost.
  - When evaluating the cost of RNG, it is important to separate the physical gas molecules from the environmental attributes.
    - The avoided cost from the environmental attributes, is already captured in the environment compliance cost element of the avoided cost. Including it here would be double counting this cost.
    - The physical gas molecules are typically valued at the basis price of one of the basins Cascade purchases gas from, which aligns with Cascade's current methodology of using its price forecast to capture avoided commodity costs.

Environmental Compliance Costs

- In the 2023 IRP, Cascade utilized the Social Cost of Carbon with a 2.5% discount rate, adjusted to real 2021 dollars.
  - This is done in accordance with RCW80.28.395 which requires the use of the Social Cost of Carbon to value cost of greenhouse gas emissions resulting from the use of natural gas.

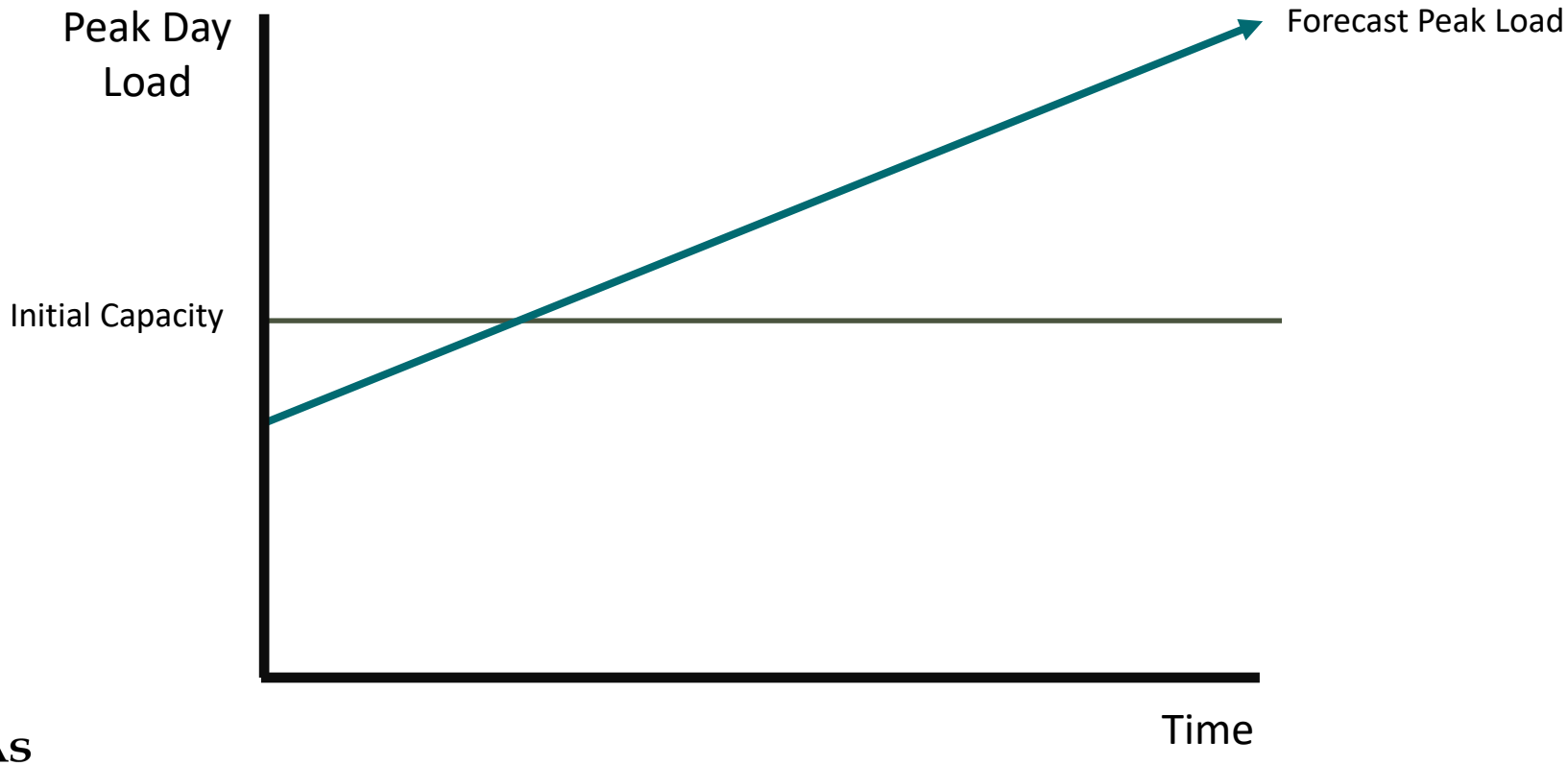
- With the passing of the Climate Commitment Act, Cascade believes it may be more accurate to utilize the company's marginal compliance cost associated with this rule.
  - For example, projected cost of CCA allowances.

Cascade requests feedback from this TAG as to how stakeholders believe the company should calculate its environmental compliance costs.

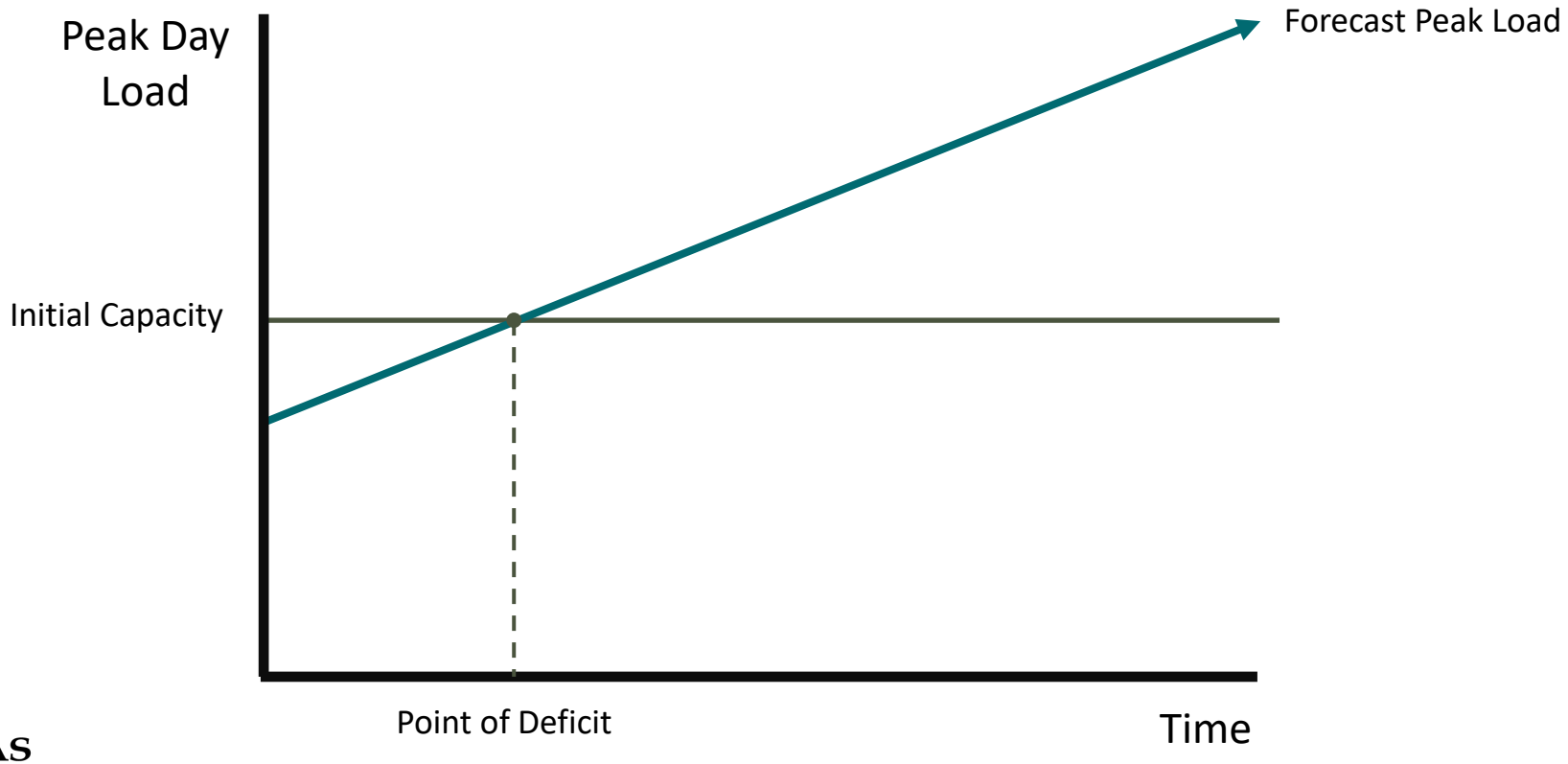
Methodology – Distribution System Costs

- In the 2023 IRP, Cascade moved away from deriving distribution system costs from margin.
  - The Company's new distribution system cost calculation looks at forecasted capital expenses related ONLY to growth, and uses the company's load growth forecast to translate these costs to a per therm basis.
  - Additionally, it's important to recognize that while energy efficiency may not be able to fully eliminate the need for a distribution system enhancement, it can defer the need for these enhancements to a later year. Because of the economic principle of the time value of money, this deferral has value, and that value is the avoided distribution system cost
- Since Avoided Cost is based on peak day, this deferral value is then multiplied by the ratio of peak day demand to an average day's demand to get the impact on peak day.
- Distribution system analysis is concerned with the pressure during peak hour, so the daily number must then be multiplied by the ratio of peak hour demand to that day's total demand.

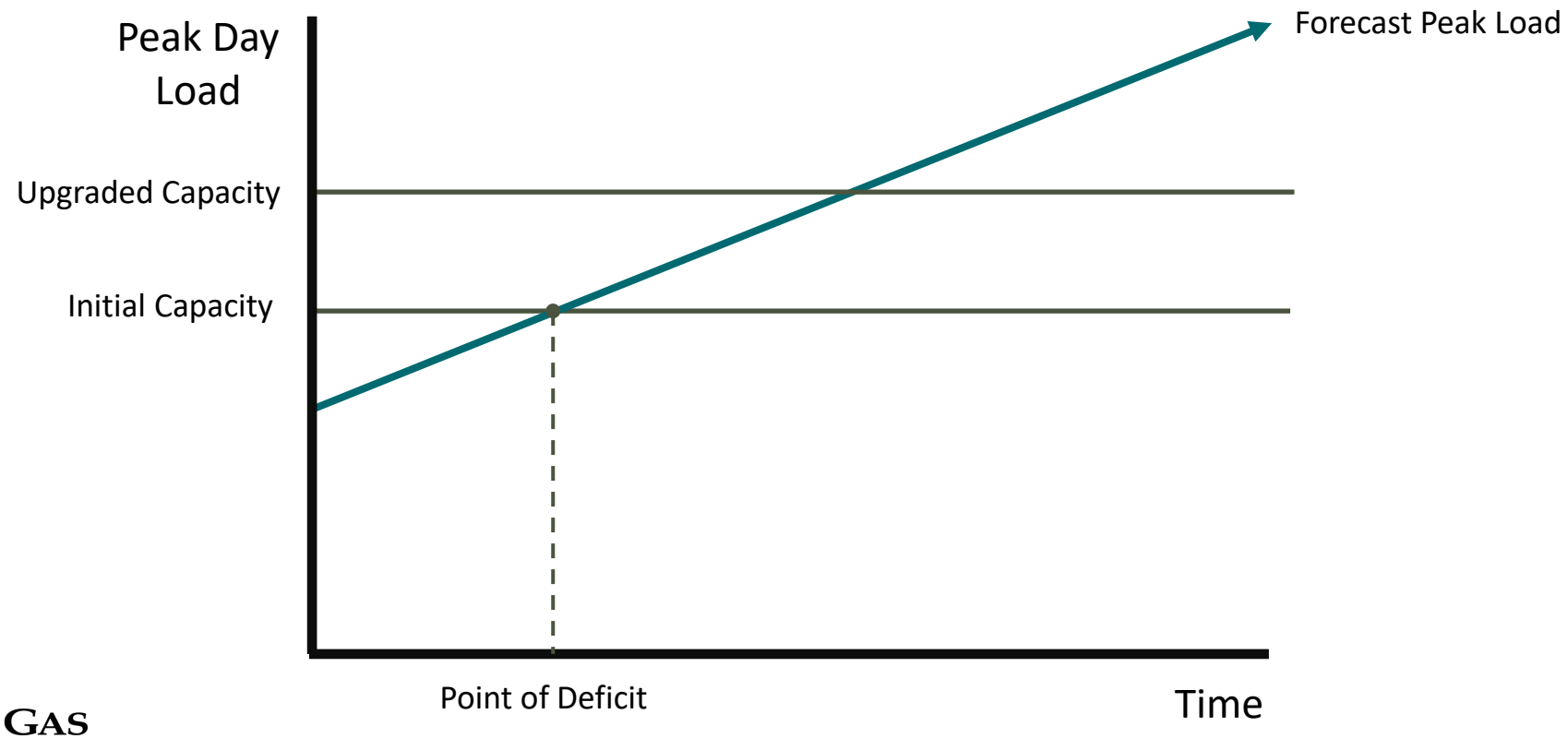
Capacity Modeling



Capacity Modeling



Capacity Modeling



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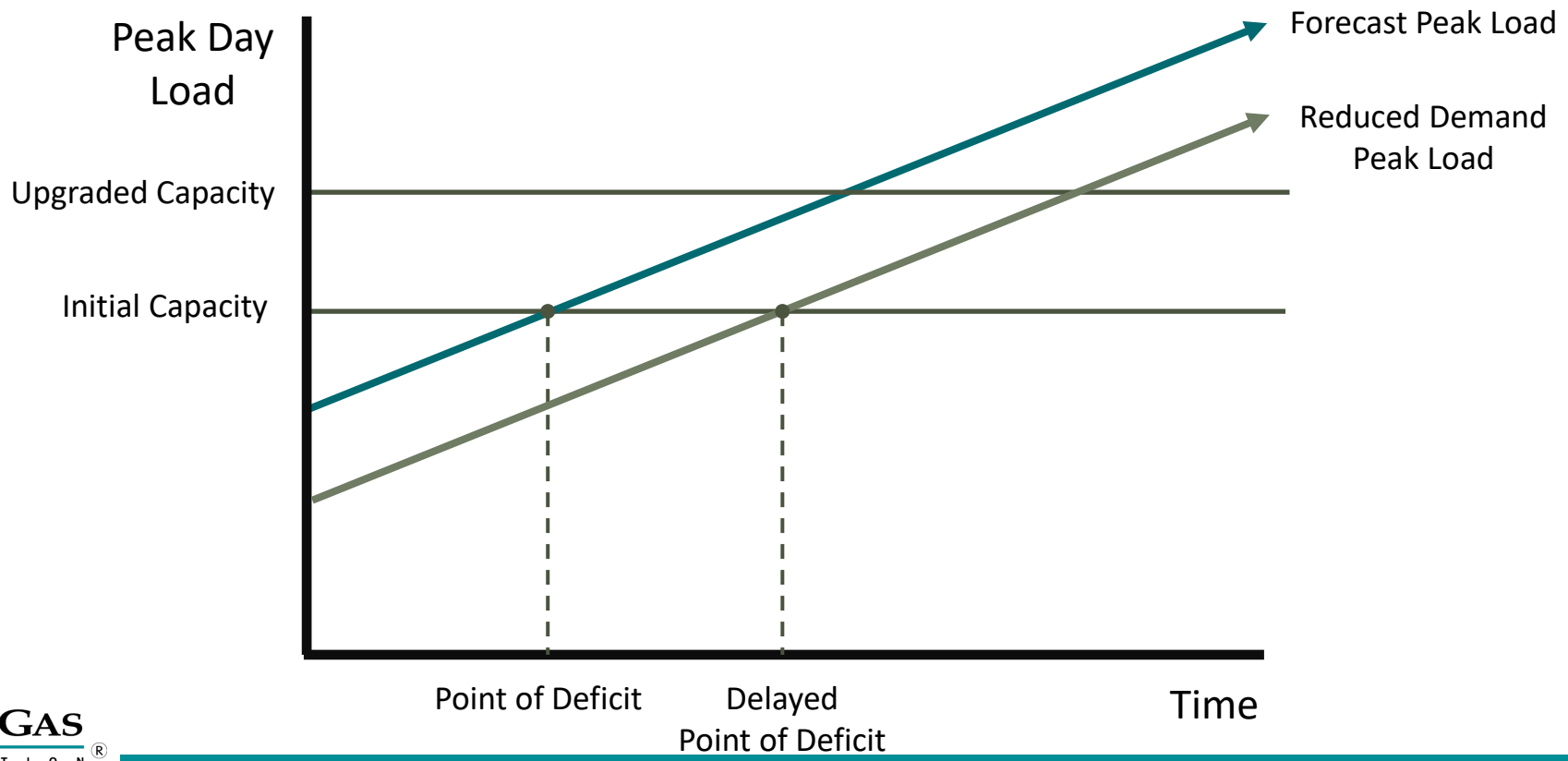
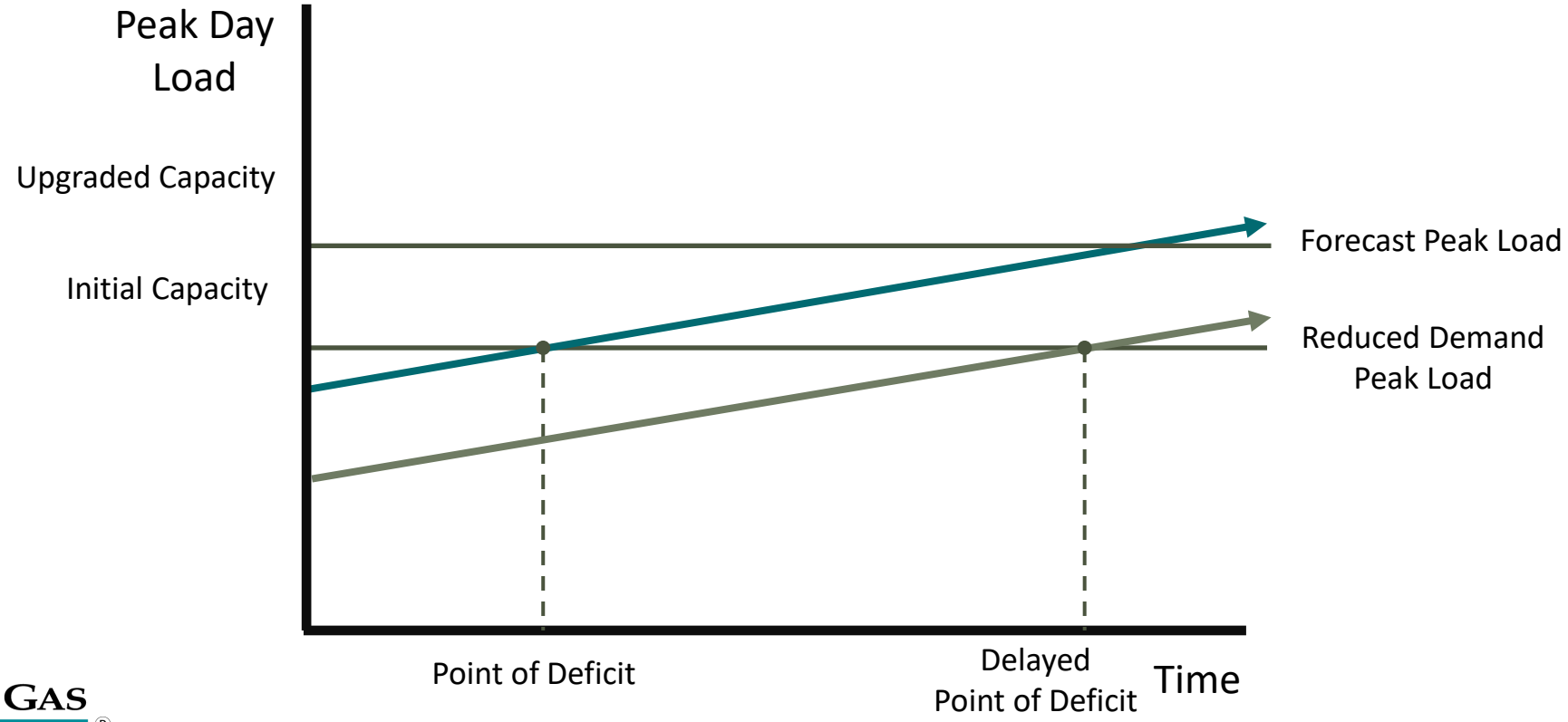
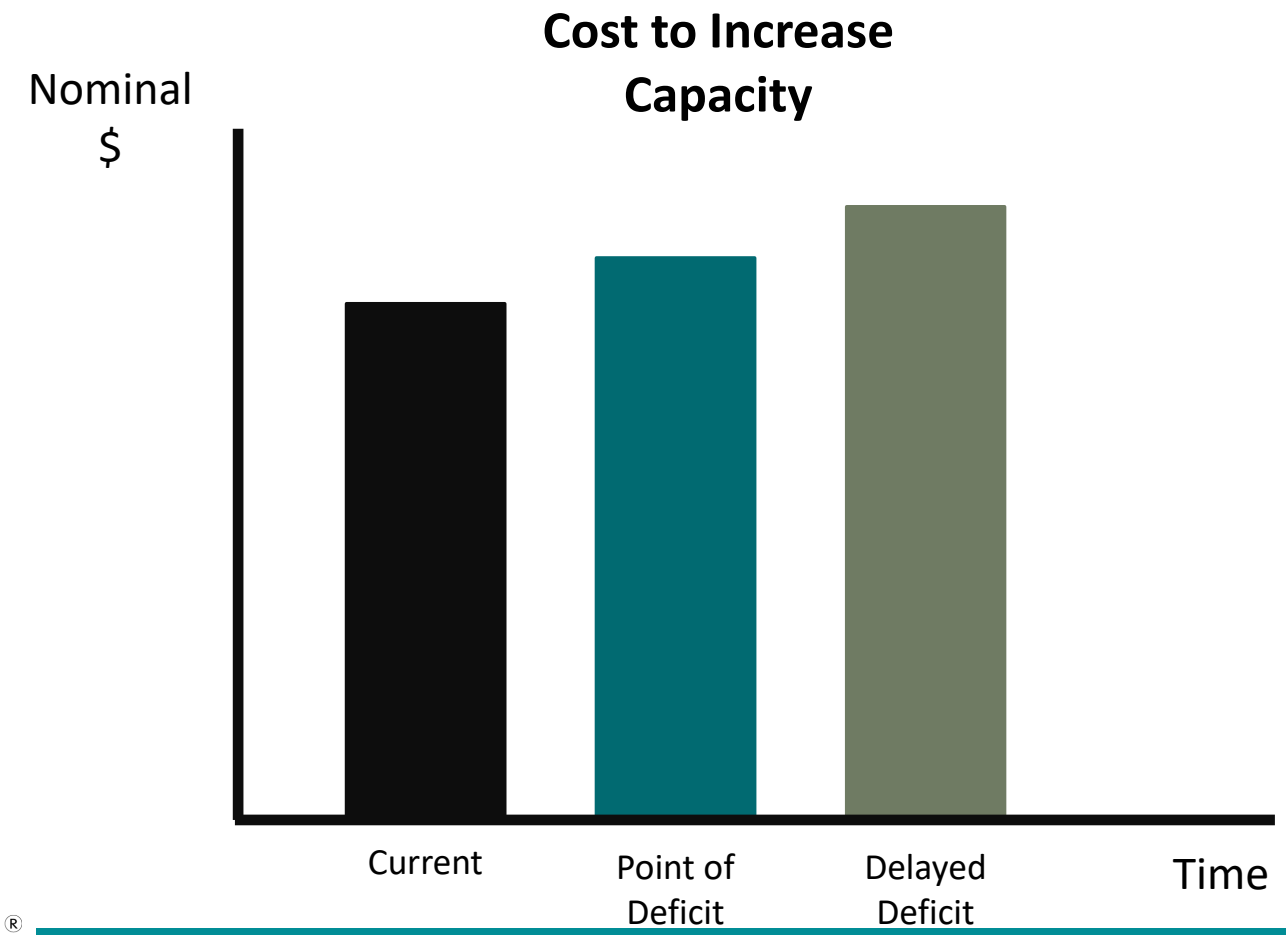


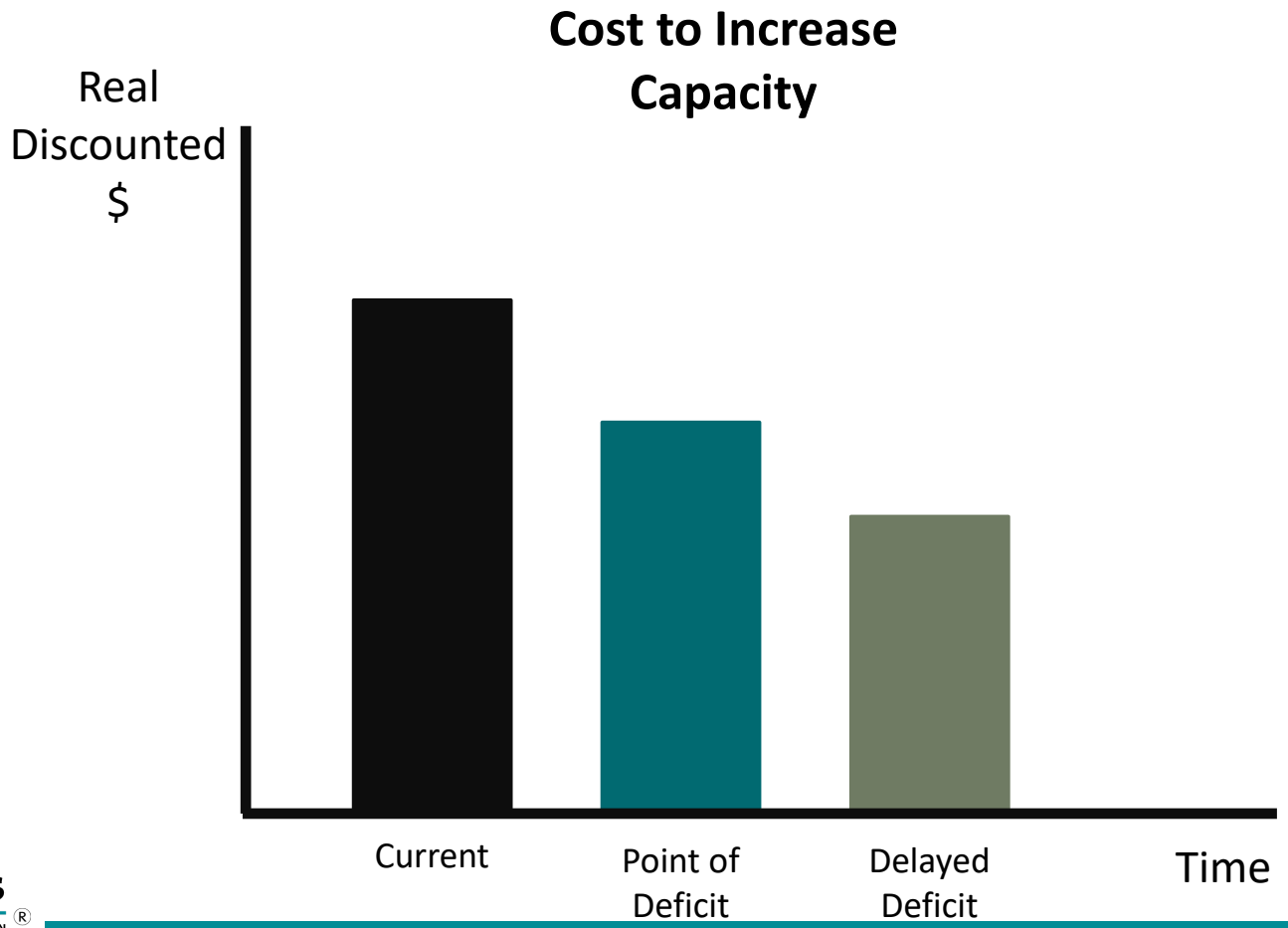
Capacity Modeling



Cost of Capacity Enhancement



Deferral Valuation



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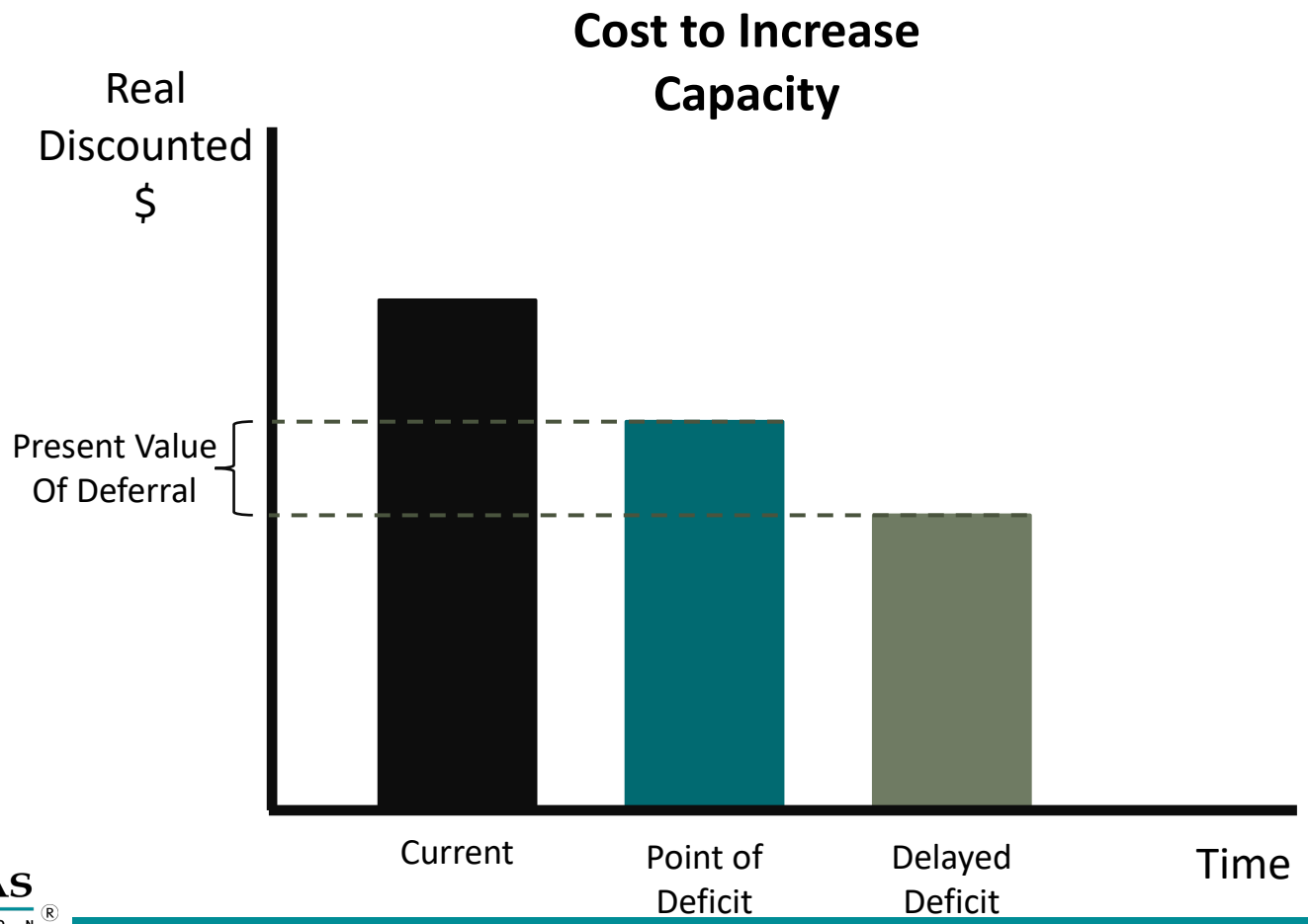
Deferral Valuation



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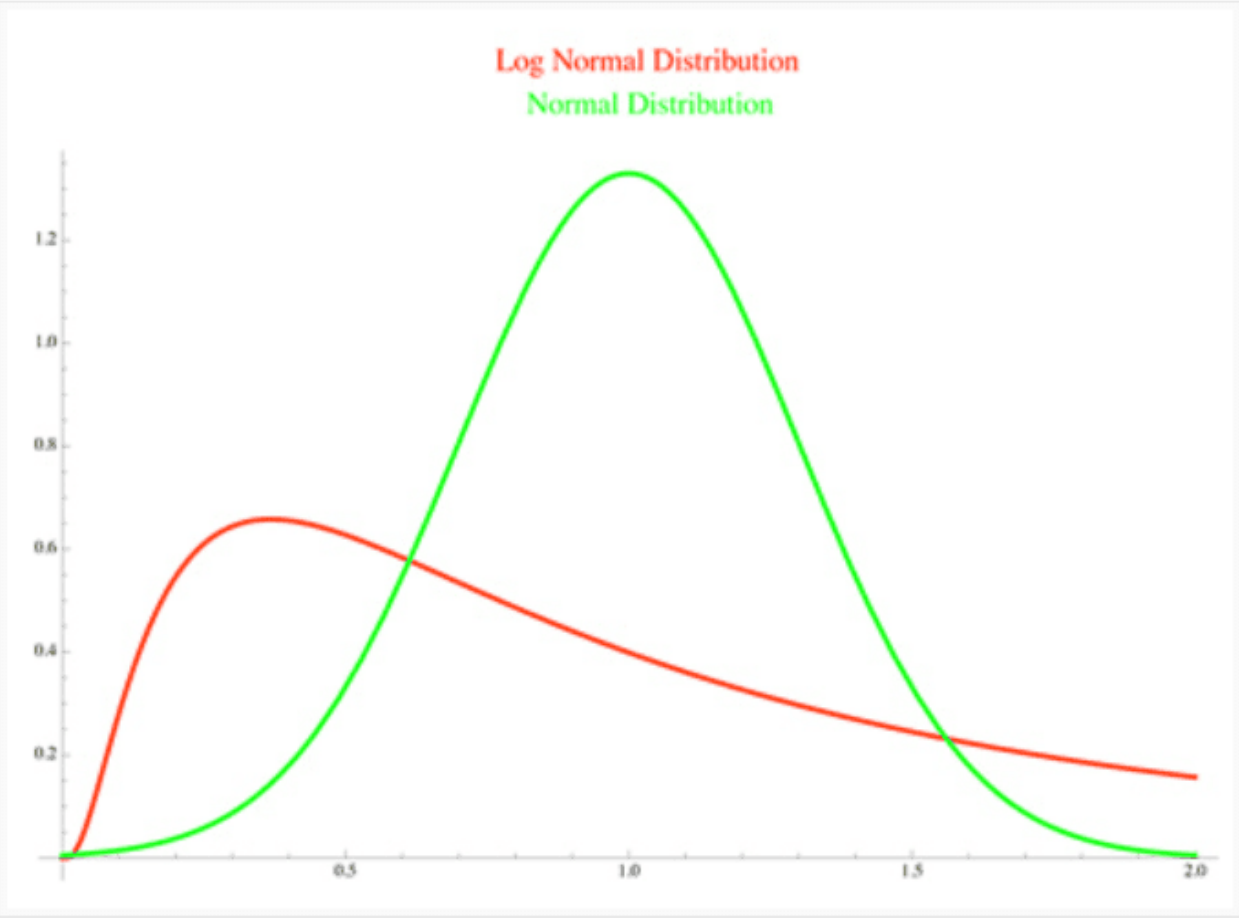
Methodology – Risk Premium

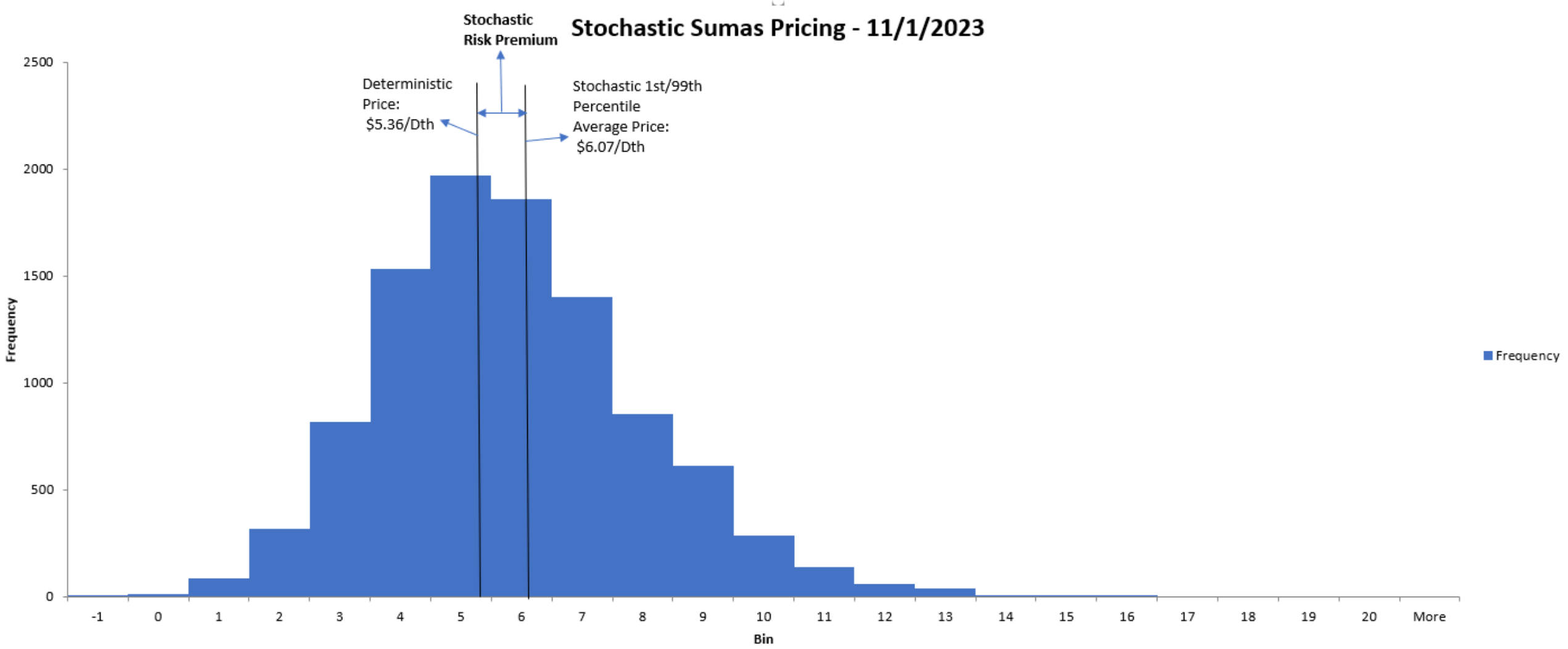
Cascade defines risk premium as the difference between the impacts of a potential extreme upward price movement versus that of an extreme downward price movement.

Due to the lognormal nature of stochastic gas prices, the risk presented from rising prices will typically exceed that of falling prices.

This analysis is used in a risk-adjusted price calculation, where the stochastic risk premium is compared to an annualized deterministic price to calculate the final risk premium.



A Quick Visual: Normal vs. Lognormal Distributions



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Risk-Adjusted Risk Premium Final Calculation

(Deterministic Price * .75 + (((99th Percentile Stochastic Price + 1st Percentile Stochastic Price) /2) * .25)) - Deterministic Price

- Captures the difference between expected pricing and a blend of deterministic and stochastic pricing
- This methodology is consistent with other risk-adjusted processes in Cascade's IRP, and informed by the calculations performed by other regional LDCs
- Accurately captures the increasing uncertainty around pricing, as nominal risk premium generally increases over time

2023 IRP Avoided Cost Risk Premium

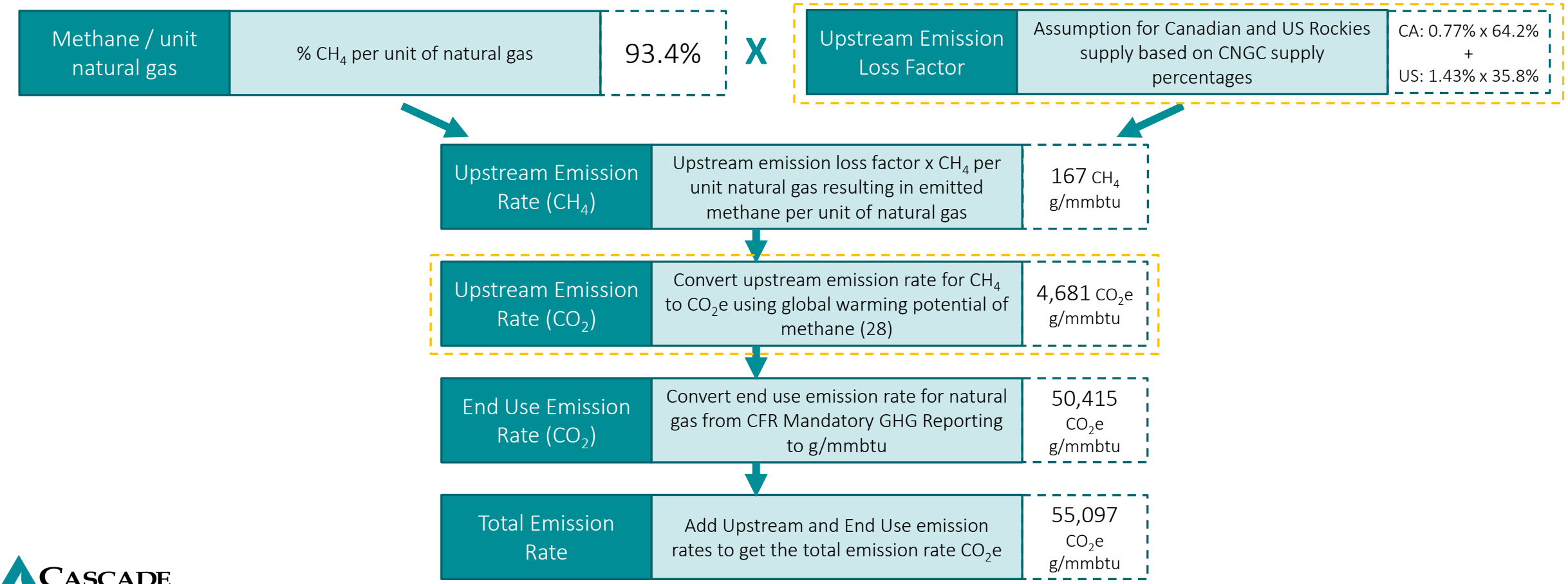
Year #	Calendar Year	Risk Reduction Value ($/Dth)
1	2023	-$0.010
2	2024	-$0.011
3	2025	-$0.018
4	2026	-$0.013
5	2027	$0.001
6	2028	$0.014
7	2029	$0.046
8	2030	$0.077
9	2031	$0.175
10	2032	$0.239
11	2033	$0.204
12	2034	$0.146
13	2035	$0.125
14	2036	$0.256
15	2037	$0.235
16	2038	$0.168
17	2039	$0.225
18	2040	$0.263
19	2041	$0.296
20	2042	$0.296

Environmental Adder

- Environmental adder still applies to all elements of the avoided cost, as per WUTC Staff guidance, still 10% as per NWPCC guidance.

Cascade's Upstream Emission Rate Methodology

Equation: $Emission\ Rate_{Total} = \mathbf{Upstream\ Emission\ Rate_{CO_2e}} + Customer\ Emission\ Rate_{CO_2e}$



Avoided Cost - Conclusion

Cascade appreciates any feedback related to any element of the avoided cost calculation, especially feedback related to the environmental compliance cost element.

Cascade's resource planning team plans to provide its avoided cost figures to the Company's energy efficiency team around July; they will be sending back a conservation potential assessment based on these inputs.

Feedback for Cascade?

Any other changes or ideas that Cascade should consider for calculating the Avoided Cost?

Process Item	Date	Process Element
Targeted-TAG	Thursday, January 25, 2024	What is an IRP and how to get involved
Targeted-TAG	Thursday, February 15, 2024	Avoided Cost
Targeted-TAG	Wednesday, March 6, 2024	Energy Efficiency
Targeted-TAG	Thursday, March 28, 2024	Equity in the IRP
Targeted-TAG	Thursday, April 11, 2024	Distribution System Planning
Targeted-TAG	Thursday, April 25, 2024	CCA/Compliance Modeling
Targeted-TAG	Thursday, May 16, 2024	Customer/Load Forecast
Targeted-TAG	Friday, May 31, 2024	Resource Integration
TAG 1	Thursday, June 13, 2024	Process, Key Points, IRP Team, Timeline, Regional Market Outlook, Planned Scenarios and Sensitivities, Stakeholder Engagement, Demand and Customer Forecast and Non-Core Outlook, Drilling down into segments of demand forecast. Upstream Pipeline presentation.
Receive feedback on TAG 1	Friday, June 28, 2024	
TAG 2	Thursday, July 25, 2024	Respond to TAG 1 Feedback, Distribution System Planning, Alternative Resources, Price Forecast, Avoided Costs, Current Supply Resources, Transport Issues, Carbon Impacts, Energy Efficiency, Bio-Natural Gas, Preliminary Resource Integration Results.
Receive feedback on TAG 2	Friday, August 9, 2024	
First Draft	Friday, September 6, 2024	
Comments Due	Friday, October 4, 2024	
TAG 3	Wednesday, October 30, 2024	Respond to TAG 2 feedback, Final Integration Results, finalization of plan components, Proposed new 2- to 4-year Action Plan
Final Draft	Tuesday, December 3, 2024	
Comments Due	Tuesday, January 14, 2025	
TAG 4 (if needed)	Thursday, January 30, 2025	
Final Complete By	Friday, February 14, 2025	
File	Monday, February 24, 2025	

2025 WA IRP Schedule

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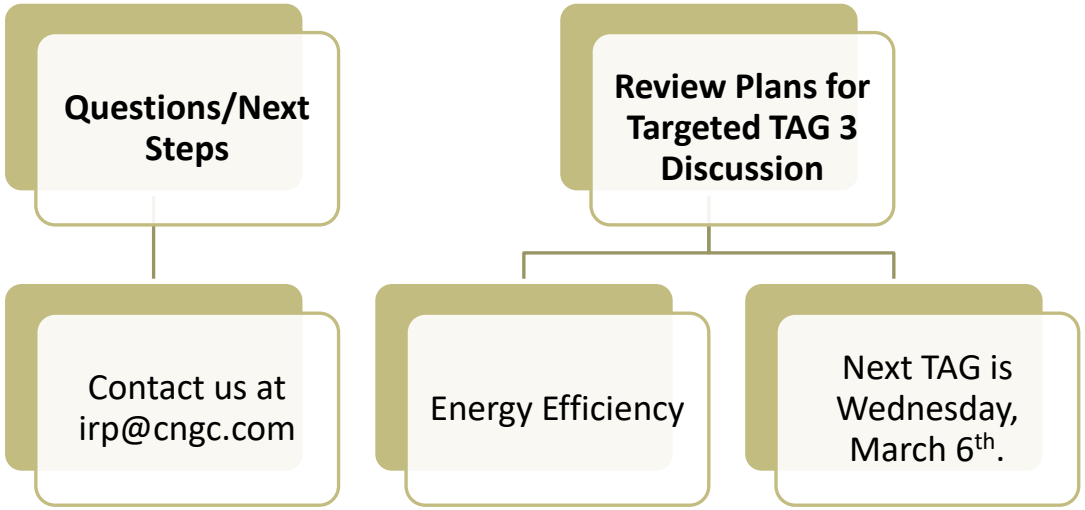

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