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# Integrated Resource Plan (OR) Technical Advisory Group Meeting #4

SEPTEMBER 20, 2022

MICROSOFT TEAMS/TELECONFERENCE

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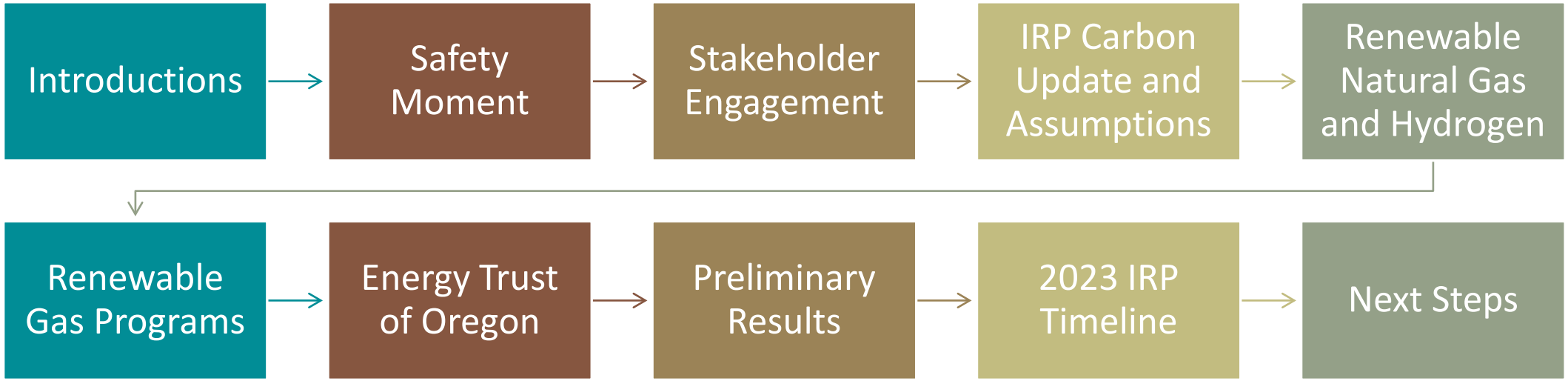
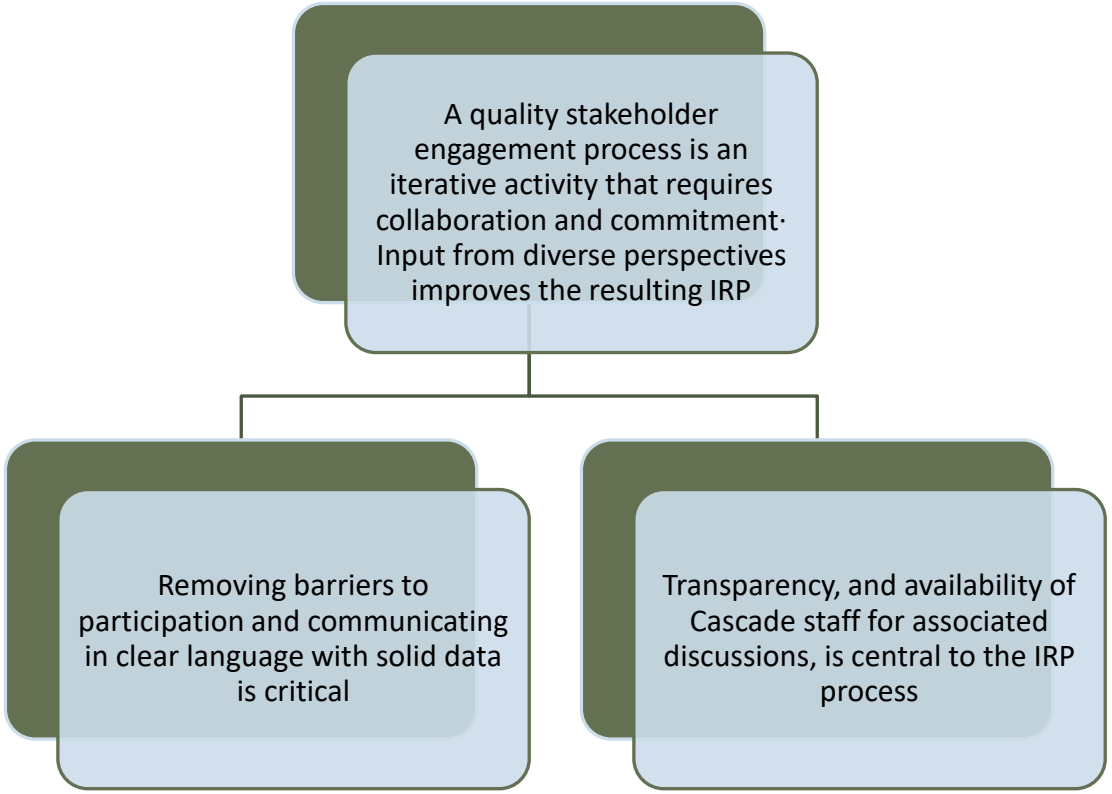
# Agenda


Introductions
Safety Moment
Stakeholder Engagement
IRP Carbon Update and Assumptions
Renewable Natural Gas and Hydrogen
Renewable Gas Programs
Energy Trust of Oregon
Preliminary Results
2023 IRP Timeline
Next Steps


# Safety Moment

# Stakeholder Engagement[1]




What is a Stakeholder?

Customers and the general public participating in the IRP process are called Stakeholders. Stakeholders also include the professional analytical staffs of the state utility commissions and groups representing residential and industrial customers. Further, community-based organizations and independent experts attending the series of meetings.

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1: SEE STAKEHOLDER ENGAGEMENT DESIGN DOCUMENT AT OREGON INTEGRATED RESOURCE PLAN - CASCADE NATURAL GAS CORPORATION (CNGC.COM)

# IRP Carbon Update and Assumptions

# Topics to Cover

Cascade's commitment to reducing emissions
- Current Baseline Customer Emissions
- Emissions Reductions

GHG Policy
- Climate Protection Program (CPP)
  - Ways to offset emissions
- The local focus
  - Bend
  - Bellingham
  - Whatcom County
- National focus

Different policies between WA and OR

Next Steps and Conclusion

# Cascade's commitment to reducing emissions

As an energy provider proudly serving Washington and Oregon, Cascade Natural Gas has an important role to play in securing a lower carbon future for the Pacific Northwest. Natural gas remains the cleanest option to meeting the region's peak energy demand. This means keeping Cascade's system reliable and affordable for customers while helping communities meet their GHG emission reduction targets.

Communities and agency programs focused on emissions reductions for Cascade include: Bend, Bellingham, Whatcom County, Oregon Climate Protection Program and Washington Climate Commitment Act.

**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*

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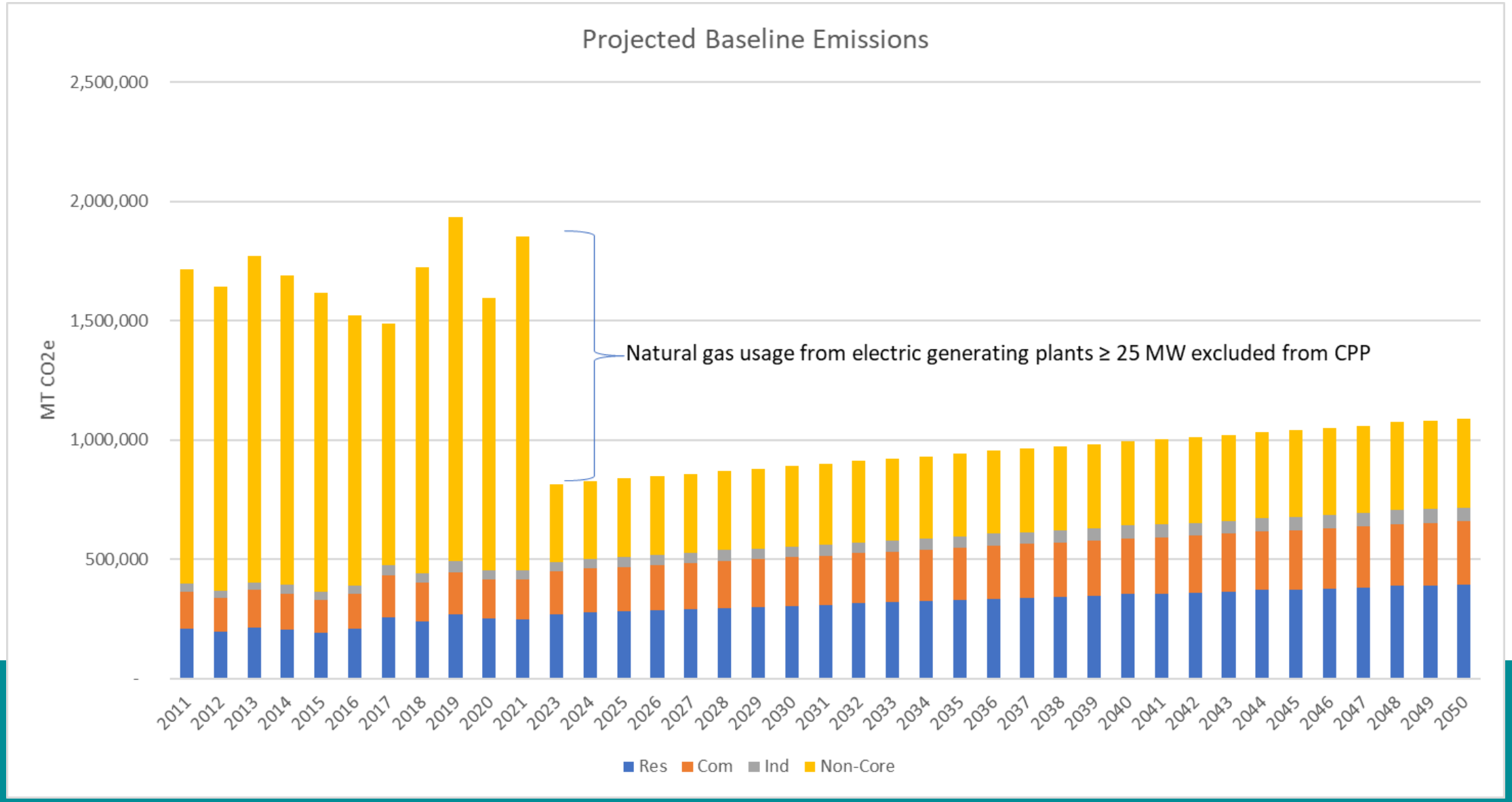



# Projected Emissions for CPP Compliance for Cascade's IRP Baseline

# Reducing Customer Emissions

## Energy Efficiency and Conservation/DSM

- Increasing focus on energy efficiency and benchmarking
- Commercial program adaptation to meet increased goals
- Exploring opportunities with transport customers for CPP compliance

## Renewable Natural Gas

- Cascade is engaged in discussions with developers on several projects.
- RNG deliveries could start by mid to late 2024.

| Annual EE and Conservation/ DSM Savings | OR | | WA | |
|---|---|---|---|---|
| | therms | MT CO2e | therms | MT CO2e |
| **2019** | 499,135 | 2,648 | 760,956 | 4,038 |
| **2020** | 427,060 | 2,266 | 659,176 | 3,498 |
| **2021** | 525,372 | 2,788 | 1,243,223 | 6,597 |

# Emissions from Natural Gas Distribution Operations

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

- Distribution system methane emissions reported to Oregon Department of Environmental Quality (DEQ) equals about 8,000 metric tons of $CO_2e$.
- EPA recently announced amendments to Subpart W reporting, proposing emission factor updates and reporting of "other large release events" starting in reporting year 2023. EPA defines the release events as releases of ≥250 MT CO2e (~500,000 scf of pipeline quality natural gas).
- With other operational emissions added to our inventory, we expect total annual emissions between 11,000 to 16,000 metric tons of CO2e.
- Cascade's methane emissions rate is in the range of 0.07% and 0.11% (% of volume of methane emitted per total methane throughput volume).

# Reducing Operations Emissions

## Cascade is committed to operational emissions reductions

- Cascade became a founding member of EPA's Natural Gas Star Methane Challenge Program in March 2016 participating in Excavation Damages Prevention category.
  - Created Public Awareness Coordinator position and implemented a Damage Prevention Program.
  - Actively participating in 811, Common Ground Alliance, local underground utility coordinating councils, and damage complaint programs in Washington and Oregon.
  - Analyze excavation damages and report data to EPA.
- Created a more robust inventory of GHG emissions in all operational areas for 2022 and ongoing.
  - Example is expansion of internal reporting of gas losses to include much smaller non-hazardous releases.
- 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.

# Reducing Operations Emissions

## System Integrity Projects

- Since 2012, Cascade has replaced over 45 miles of early vintage steel pipe with new steel or polyethylene pipe in Oregon and over 98 miles in Washington.
- Cascade is better positioned than most US utilities as it has no unprotected steel pipeline and no cast iron pipe.

# Climate Protection Program

*Program established by DEQ through Governor Brown's Executive Order 20-04 to reduce greenhouse gas emissions. The Program applies a declining cap on emissions from certain covered entities, and establishes a program to track, verify, and enforce compliance with the cap through use of compliance instruments.*

## Covered Entities:

- Fuel suppliers (liquid fuels, propane, and non-natural gas fuel)
- Natural gas suppliers
- Large industrial facilities (non-natural gas fuel use and process emissions)

## GHG Emissions Reduction Targets:

- 50% reduction from baseline by 2035
- 90% reduction from baseline by 2050

# Climate Protection Program

## Excluded emissions/sources:

- Natural gas operation emissions
- Emissions from biomass-derived fuels (e.g. RNG)
- Emissions from non-combustion use of natural gas, if approved by DEQ
- Emissions from electric generating plant units greater than or equal to 25 MW

## Cascade's regulated emissions:

- Customer Emissions – about 800,000 metric tons CO2e in 2023
  - All core customers
  - All non-core (transport) customers, excluding electric generation

# Climate Protection Program

## Baseline

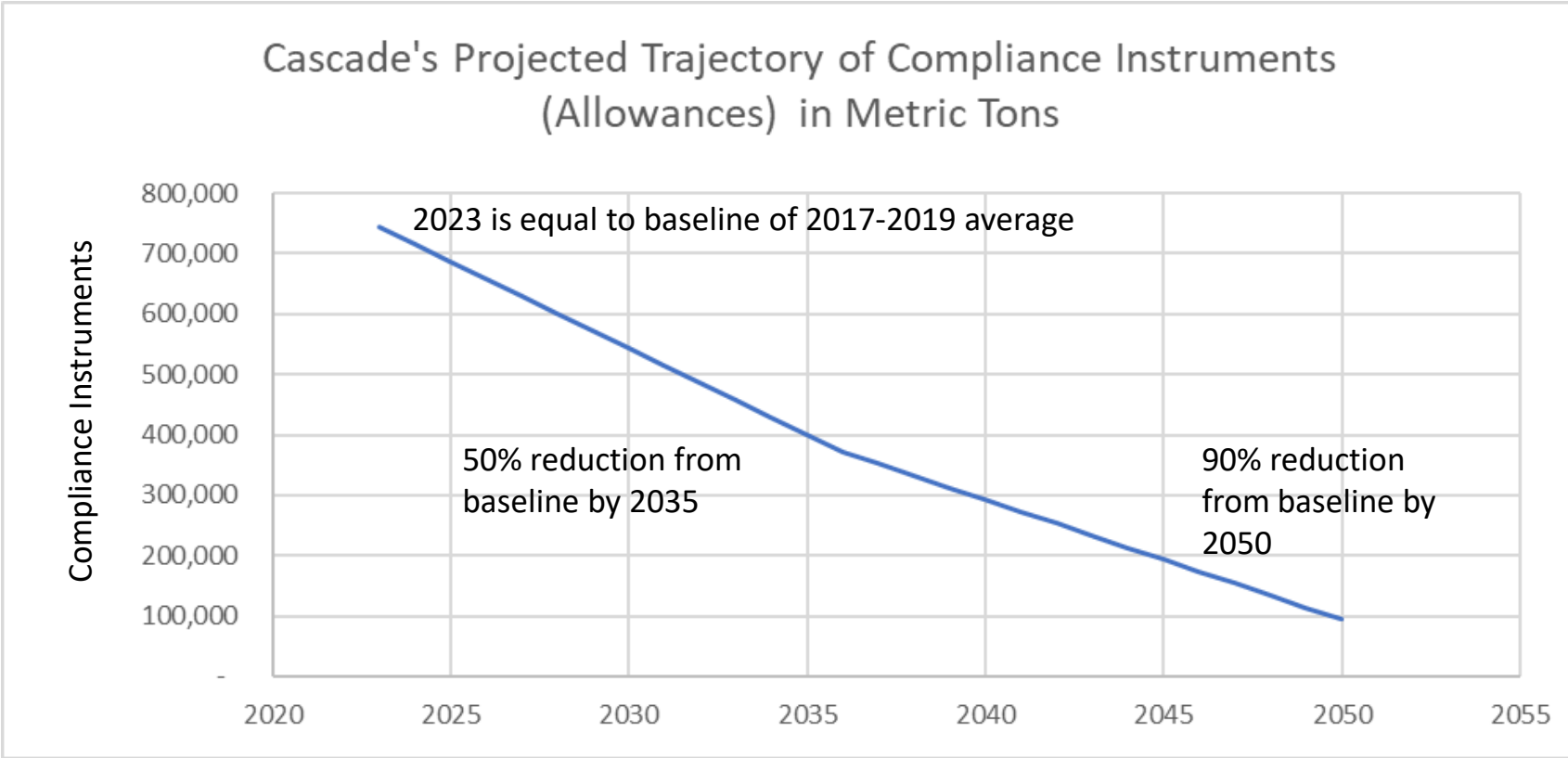
- 2017-2019 average

## Compliance Instruments (Allowances) Allocated to Cascade

- See chart

## Compliance Instrument Allocations

- DEQ distributes compliance instruments into covered entities' accounts each March

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# Climate Protection Program

Rule Requirements Commence on January 1, 2022

3 Year Compliance Periods

- 2022-2024, 2025-2027, 2028-2030, …

Compliance Demonstrations

- Compliance demonstrations required by Nov 28 of the year following the end of a 3-year compliance period

# CPP Compliance Options

## Renewable Natural Gas

- One for one replacement

## Hydrogen

- Future option

## Allowances

- Allowances are allocated by DEQ and decline overtime
- Unlimited banking of allowances
- Potential for trading between covered entities, but unknown

## Energy Efficiency and Conservation/Demand-side Management

## Community Climate Investment (CCI) Credits

- Limited use:
  - Compliance Period 1 – limit use to 10% of compliance obligation
  - Compliance Period 2 - limit use to 15% of compliance obligation
  - Compliance Period 3 – limit use to 20% of compliance obligation
- Allowed to bank for 2 compliance periods

# CPP Compliance Options

RNG limits in Cascade's modeling are based on the Company's potential share of RNG projected values in 2019 AGF/ICF Study.

- The 2019 AGF study provides RNG potential by 2040 by RNG type, and adoption curves for the various types of RNG are then used to generate acquisition curves for each resource

Cascade's position is that the constraining factor for maximum hydrogen acquisition will be the amount that can be safely blended with geologic gas

- According to a technical report by the Gas Technology Institute, "If less than 20% hydrogen is introduced into distribution system the overall risk is not significant for both distribution mains and service lines." Also, the National Renewable Energy Laboratory's research findings indicate adding hydrogen blends at 20% or less to existing natural gas pipeline systems would result in only minor increases in safety risk
- This is a volumetric quantity. Hydrogen burns at a lower heating volume, and all modeling is done in therms (energy) vs. volume. The adjusted safe blending quantity of hydrogen energy is approximately 7.4%

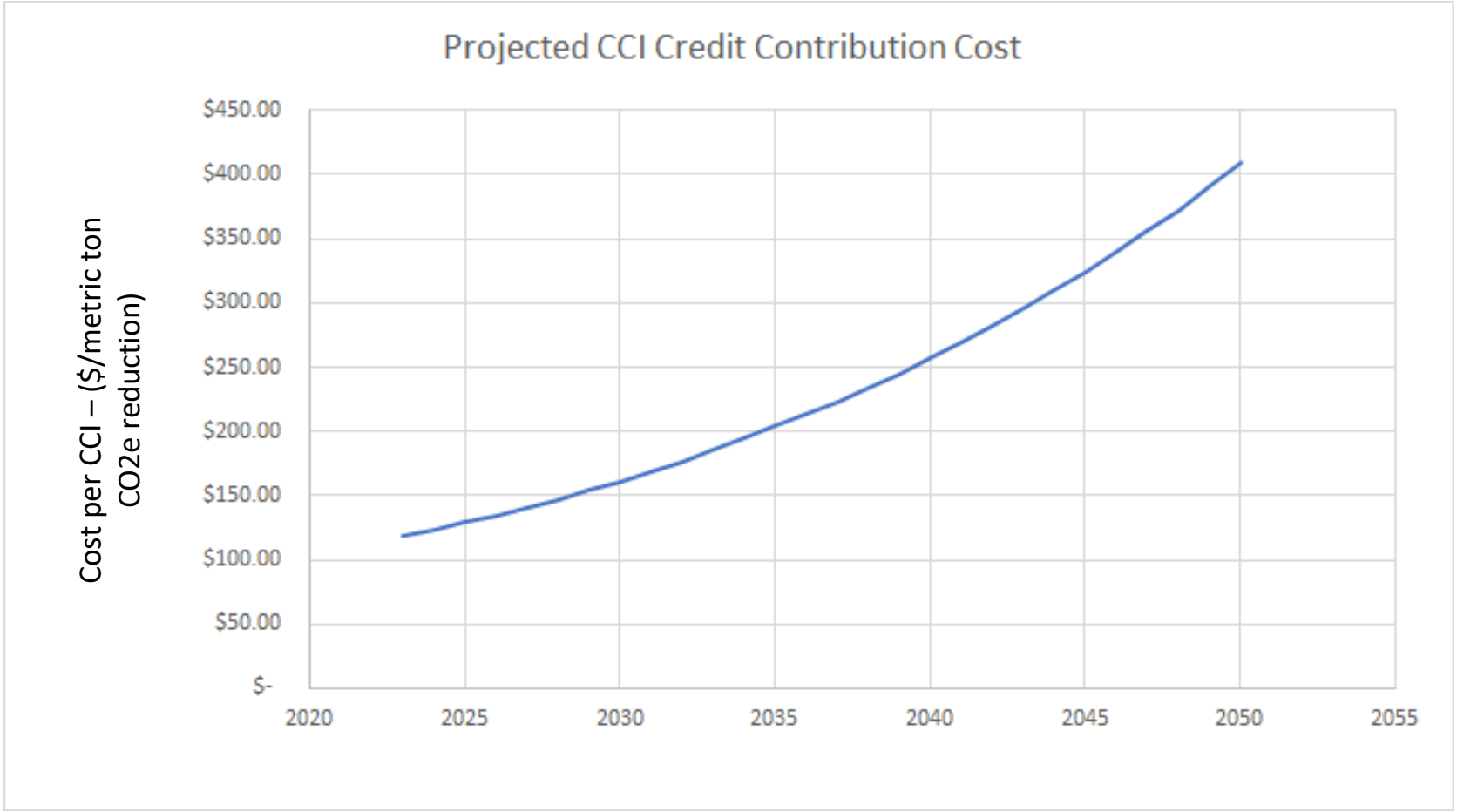
# CPP Compliance Options

## CCI Projected Costs

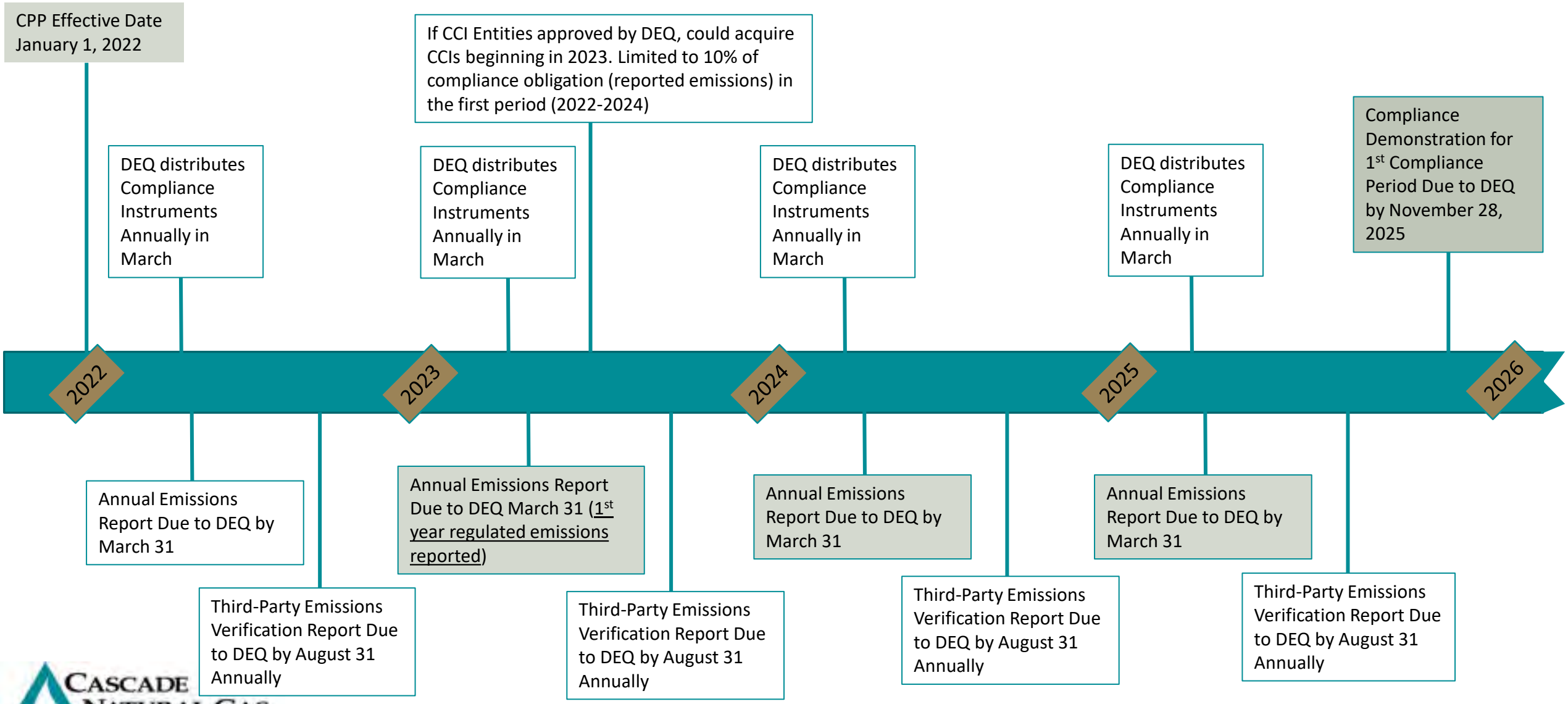
- Equation in OAR 340-271-0820(3)(a)(A):

*CCI Credit Contribution Amount = CCI Credit Contribution Amount in Table 7 x CPI-U West for January of the calendar year for the price in Table 7 that is currently in effect / CPI-U West for January 2021*

Jan 2021 CPI-U West = $277.24



# CPP Compliance Schedule – First Compliance Period

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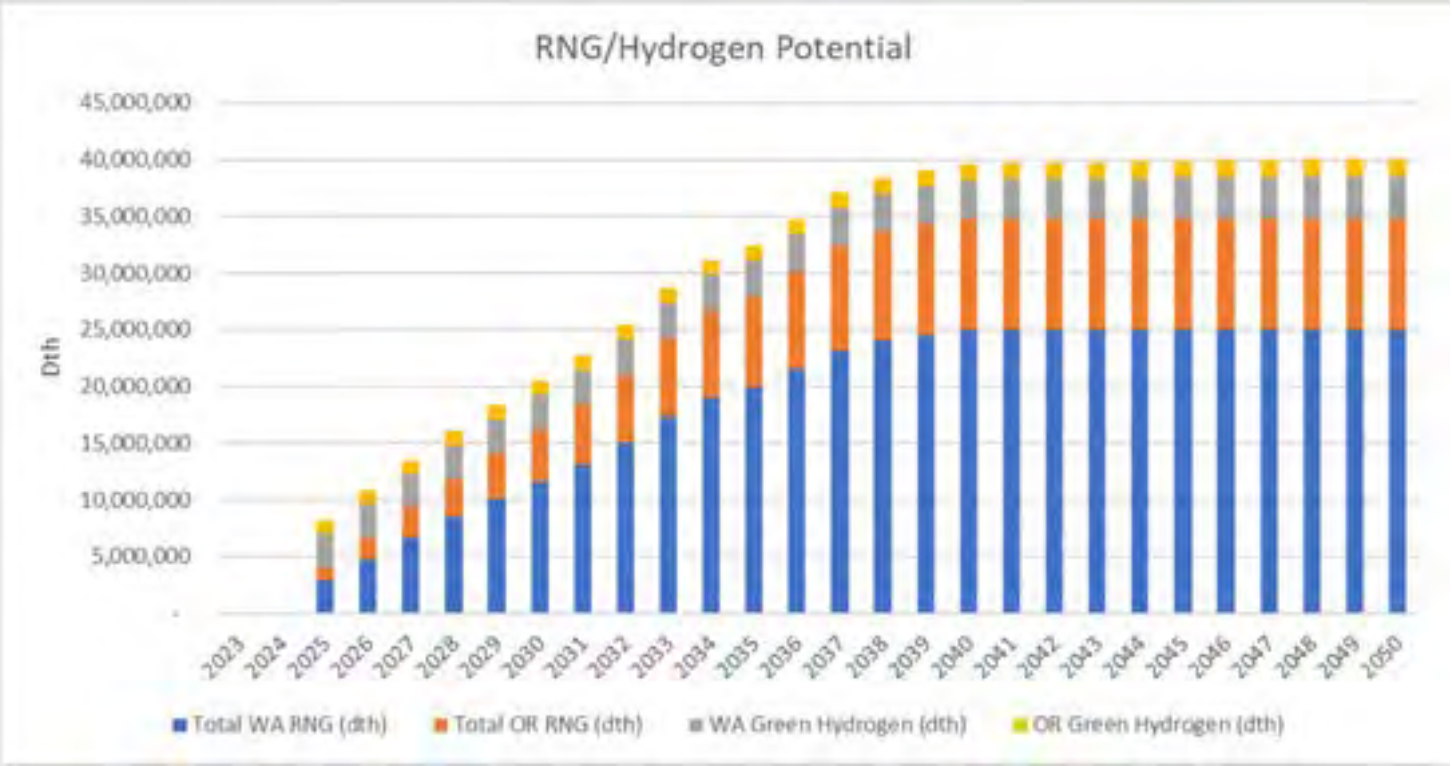


# CPP Resource Projections

# City of Bend

Aspirational goal to reduce GHG by 40% by 2030 based on 4 areas of focus:

- Energy Supply
- Transportation
- Energy in Buildings
- Waste and Materials

There isn't a specific carve-out for what Cascade is required to do for this action plan. However, Cascade's representative on the original Climate Action Steering Committee (CASC) helped identify pathways for gas to support the City goals through development of an offset program and a biodigester plant. Regulatory is working on offset programs and Cascade was awarded Bend landfill RFP.

The City's current Environment and Climate Committee is having preliminary discussions about the role of gaseous fuels as part of a decarbonized future. Cascade intends to share information on its emerging RNG efforts and overall renewable gas potential as appropriate.

Cascade will have ongoing check-ins with Bend City Staff around environmental priorities and how Cascade can best support their efforts.

# City of Bellingham

Bellingham City Council passed an ordinance on Feb 7, 2022, which requires electric space and water heating equipment for new commercial and large (4+ story multifamily buildings) buildings. It also requires incremental improvements in EE (building envelope, lighting, insulation) and solar installation or readiness in new buildings.

The electric-only mandate for space and water heating does not apply to single family construction, detached houses, duplexes, townhomes or row houses.

The ordinance takes effect August 7, 2022.

Cascade is running sensitivity analyses based on the new limitations to the use of natural gas in new buildings. Cascade pulled historical data from the 2017-2021 to see which customers would have been affected if this ban took place earlier. The result was approximately 50 customers per year. Cascade decremented customer counts by 50, cumulatively, each year for the forecast.

# City of Bellingham

The City of Bellingham continues to work on the design of a Climate Action Fund. Preliminary drafts indicate that this would be treated as a property tax and would direct funds towards electrification, among other efforts. Following the City Council and Mayor expressing reservations about the design and timing of the plan it was announced they will delay putting the measure on the November ballot.

# Whatcom County

On July 27th, 2021, Whatcom County voted to ban the construction of new refineries, coal-fired power plants and other fossil fuel-related infrastructure

This does not constitute a gas ban but may have impacts on distribution system enhance projects if needed in Whatcom County.

# National Focus

US Dept of Energy is in process of holding a proposed rulemaking for energy conservation standards for commercial water heating equipment. This rulemaking may result in impacts to baseline equipment used to determine the Company's Energy Efficiency portfolio.

The US Dept of Energy has also launched a notice of intent for funding opportunities for Clean Hydrogen Programs associated with the Bipartisan Infrastructure Law. Cascade is monitoring opportunities for partnerships in this sector across the states we serve.

EPA recently announced amendments to Subpart W (O&G segment) operational GHG emissions reporting, proposing emission factor updates and additional reporting of "other large release events". These changes are proposed to be effective starting in reporting year 2023. Comments are due this fall with final rule by end of year.

US Supreme Court issued its decision July 1st on West Virginia v. the EPA, ruling on the extent of EPA's ability to regulate carbon emissions from power plants. EPA is expected to propose new GHG regulation on existing electric generating units in 2023 considering the court's decision. Future rulemaking could result in additional low carbon fuel requirements for new and existing electric generation.

Inflation Reduction Act – bill was signed into law on August 16, 2022. Includes climate change investments to promote decarbonizing the economy. A Methane Emissions Reduction Program is included in the law and would require fees or investments in reducing methane leaks from natural gas value chain.

# Differing Policy Between WA and OR

| Emissions Compliance Option Differences | WA CCA | OR CPP |
|---|---|---|
| RNG - Environmental Attributes | ? | X |
| RNG – Biogas with Associated Environmental Attributes | X | X |
| No Cost Allowance Allocations | X | X |
| Auctions for Additional Allowance Purchases | X | |
| Allowance trades between covered entities | | ? |
| Environmental Offsets | X | |
| Community Climate Investment Credits (CCI Credits) | | X |
| Energy Efficiency and Conservation | X | X |
| Hydrogen | X | X |

Differences with compliance options across the states we serve are anticipated to create some challenges with compliance planning.

Limiting RNG to demonstrating contractual delivery is misaligned with other states' determinations and overlooks recognition of how electric RECs are considered and other state agency recognition of RNG compliance use.

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# Conclusion and Next Steps

Compliance planning and demonstrations for the OR CPP

- Working with OPUC and other LDCs on regulatory mechanisms (e.g. transport customer compliance)

Cascade continues to pay close attention to National, Regional, and Local policies related to Carbon

Will provide a brief update of the modeling impacts at TAG 5

# Renewable Natural Gas

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# What is Renewable Natural Gas (RNG)?

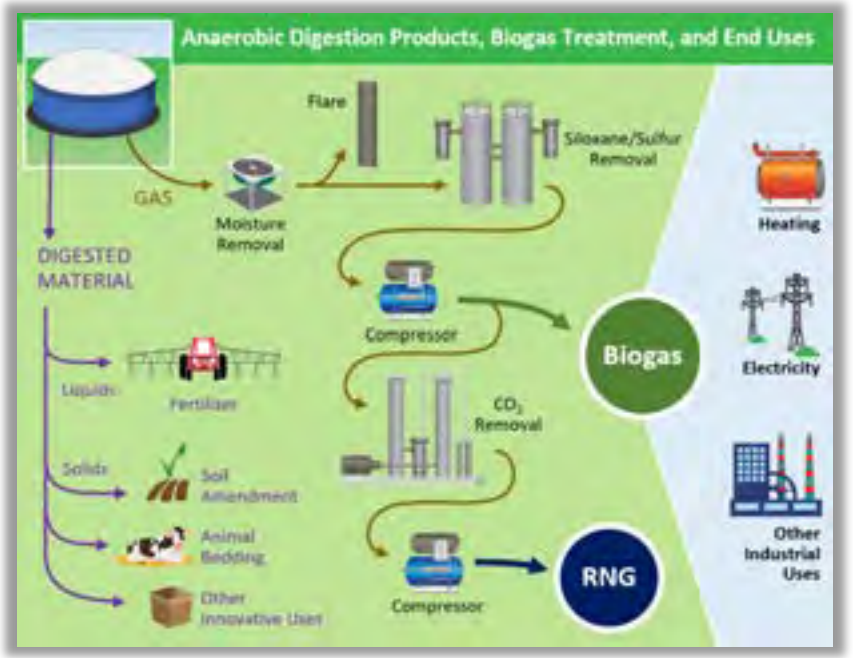
RNG is pipeline quality natural gas produced from various biomass sources through biochemical processes such as anaerobic digestion or gasification.[1]

[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

# Benefits

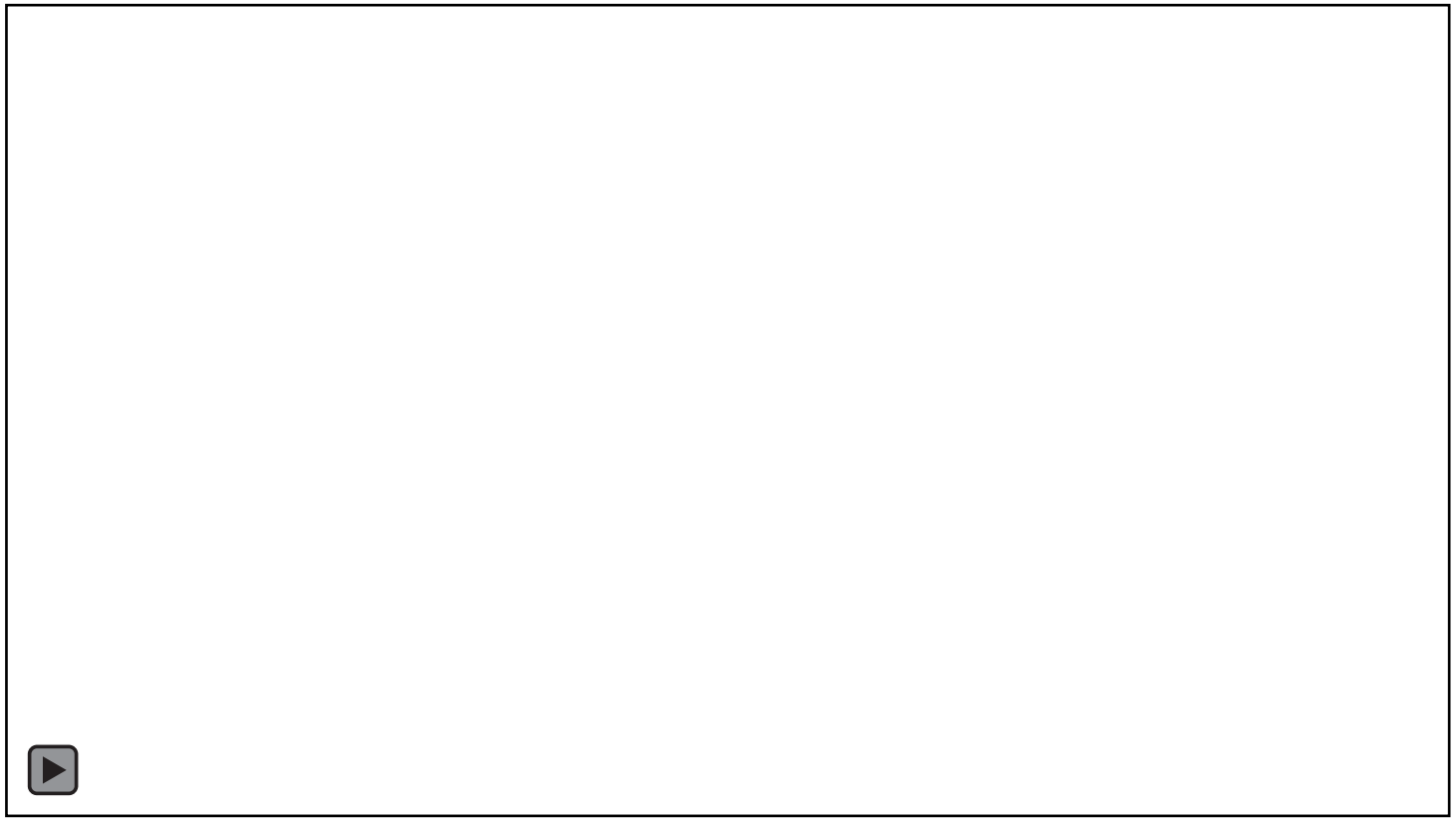
**Fuel diversity benefits** – Use of RNG increases and diversifies domestic energy production. RNG can be used as a baseload fuel source with high availability rates. It leverages existing infrastructure such as pipelines and heavy-duty vehicles. Biogas feedstocks for RNG are generated continuously from a variety of sources.

**Economic benefits** – The development of RNG projects can benefit the local economy through the construction of RNG processing and fueling station infrastructure and sale of natural gas-powered vehicles. National, state and local incentives may be available depending on the end use, such as credits for production of RNG used for vehicle fuel. These financial incentives can provide additional economic drivers for project development.

# Benefits

**Local air quality benefits** – Replacing traditional diesel or gasoline with RNG can significantly reduce emissions of nitrogen oxides and particulate matter, resulting in local air quality benefits. RNG is comprised primarily of methane; compared to fossil natural gas, RNG contains zero to very low levels of constituents, such as ethane, propane, butane, pentane or other trace hydrocarbons.

**Greenhouse gas emission reductions** – RNG projects capture and recover methane produced at a landfill or anaerobic digestion (AD) facility. Methane has a global warming potential more than 25 times greater than CO2 and a relatively short (12-year) atmospheric life, so reducing these emissions can achieve near-term beneficial impacts in mitigating global climate change. For facilities that are not already required to mitigate such emissions, an RNG project can reduce methane emissions significantly.



# Renewable Natural Gas

# 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

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# 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 |

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# 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

# 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?

# Voluntary RNG/Offset Program

Internal re-organization planning to staff the program

Work in process to secure RNG resources and/or attributes

Next steps:

- IT systems/ billing systems in place
- Stakeholder meetings
- Program/tariff filing

# 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 Research – examples

## H2@SCALE IN TEXAS AND BEYOND


## ASSESSING H2 COMPATIBILITY IN NATURAL GAS INFRASTRUCTURE

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# Cascade Natural Gas Renewable Gas Programs

## RNG DEVELOPMENT STATUS

KENT CROUSE – INDUSTRIAL SERVICES MANAGER – RENEWABLE NATURAL GAS & $H_2$

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# Overview

Priority 1 – On System RNG Development with Attribute Purchase

- 4 projects in active contract negotiations
- 1 project in early development

Priority 2 – On System RNG Development, Transportation Only

- Where Environmental Attributes cannot be purchased, these projects displace geological gas on Cascade's system
- 1 project under contract
- 1 project in active contract negotiation
- 5 projects in early development

# Deschutes County Landfill, Bend OR

- Cascade/Jacobs Engineering Team was successful candidate chosen through RFP process to own and operate processing facilities to convert landfill gas to RNG.
- RNG to be injected into local distribution system.
- Currently working through landfill operation & contractual details with Deschutes County
- Volumes/Term - 2,500,000 therm/yr, 20 Years - TBD

# Combined Landfill/Food Waste Project– Benton, County

- 3rd part developer has rights to raw biogas from two sources in close proximity to each other - a Landfill and a Food Processing Plant.
- Currently in contract negotiations with developer to purchase RNG from both locations.
- RNG to be injected into local distribution system.
- Volumes/Term - 1,250,000 therm/yr, 15 years

# Municipal Industrial Food Wastewater Project– Franklin, County

- Wastewater from 6 food producers/manufacturers aggregated in municipal processing facility
- Purchase and Interconnect contract negotiations in progress
- RNG to be injected into local distribution system.
- Volume/Terms - 3,400,000 therm/yr, 15-20 years

# Industrial Food Waste Project– Yakima, County

- Food Waste from Industrial Food Processor
- Purchase and Interconnect contract negotiations in progress
- RNG to be injected into local distribution system.
- Volume/Terms - 715,000 therm/yr, 10 years

# National Food Waste Aggregator – Cowlitz, County

- Food Waste aggregated from ~100 grocery stores in Washington & Oregon
- Interconnect Agreement executed for RNG transportation service
- RNG to be injected into local distribution system.
- Volumes - 1,800,000 therm/yr, operation start planned Q4/23

# Dairy RNG Project– Snohomish, County

- 3,500 Head Dairy Operation
- Interconnect Agreement in negotiation for RNG transportation service
- RNG to be injected into local distribution system.
- Volumes - 815,000 therm/yr, operational start late Q4/23

# Single RNG Projects can provide significant local impacts

The RNG from many of the projects discussed above will displace near 100% of traditional natural gas consumed in the system they are injected into during times of low usage.

# Demand Side Management Overview

# Agenda

- Cascade & Energy Trust of Oregon Partnership
- CNGC Ongoing Efforts
- About Energy Trust
- Energy Trust's Resource Assessment Model Overview and Methodology
- IRP Savings Projection Overview
  - The Deployment of Cost-Effective Achievable Savings
- Forecast Results

# CNGC & Energy Trust Partnership

Cascade will continue to work with Energy Trust of Oregon to provide Energy Efficiency options to our Oregon Communities.

In addition, we are expanding the partnership to help meet:

- Climate Protection Program Obligations
- Local Community Greenhouse Gas Emission Reductions targets

# CNGC Ongoing Efforts

# Energy Efficiency for Transport Customers

There is currently untapped potential to improve energy efficiency for some Cascade Transport Customers

Cascade is exploring Carbon Compliance Audits

1. Customer usage and data release considerations
2. Contract with vendor to perform audits
3. Partner with Energy Trust to leverage existing programs if potential is identified

# Community Commitments

- Dedicated Manager, Energy Efficiency Programs
- DSM Efforts in Bend, Oregon
  - RNG Outlook
  - Bend Climate Priorities
- Ongoing meetings with Bend City Staff
  - Opportunities to refine DSM efforts
    - Community data tracking
    - Open communication and in-person discussions
- Low Income Weatherization program revisions

# Energy Efficiency Resource Assessment for CNG's 2023 IRP

September 20th, 2022

Energy Trust of Oregon

# Agenda

- About Energy Trust
- Energy Trust's Resource Assessment Model Overview and Methodology
- IRP Savings Projection Overview
  - The Deployment of Cost-Effective Achievable Savings
- Forecast Results

# About us

Independent nonprofit

Serving 1.8 million customers of Portland General Electric, Pacific Power, NW Natural, Cascade Natural Gas and Avista

Providing access to affordable energy

Generating homegrown, renewable power

Building a stronger Oregon and SW Washington

# Clean and affordable energy since 2002

**From Energy Trust's investment of $2.2 billion in utility customer funds:**

**Nearly 770,000 sites**
transformed into energy efficient, healthy, comfortable and productive homes and businesses

**18,000 clean energy systems**
generating renewable power from the sun, wind, water, geothermal heat and biopower


**$8.9 billion** in savings over time on participant utility bills from their energy-efficiency and solar investments

**36.2 million tons of carbon dioxide** emissions kept out of our air, equal to removing 7 million cars from our roads for a year

# 2022 Programs – Acquiring all C/E Efficiency

- Residential – Existing and New Homes
  - Single family, moderate income, rental, manufactured homes
  - Weatherization (insulation, windows, air sealing)
  - Gas fireplaces, furnaces
  - Water heaters
- Commercial – Existing, New, Multifamily, SEM
  - Retail, offices, schools, groceries….all market segments
  - HVAC, controls, water heating, windows, insulation
- Industrial & Agriculture – Non transport sites
  - Manufacturing facilities, greenhouses
  - HVAC, O&M, process improvements

# Cascade Natural Gas & Energy Trust

- Serving Cascade Territory in Oregon for over 16 years, since 2006:
  - Served over 20,500 households, over 1,500 commercial sites and over 55 industrial sites

# Energy Trust's Resource Assessment Model Overview

# Resource Assessment (RA) Purpose

- Informs utility Integrated Resource Planning (IRP)
- Provides estimates of 20-year energy efficiency potential and the associated load reduction
- Helps utilities to strategically plan future investment in both demand and supply side resources

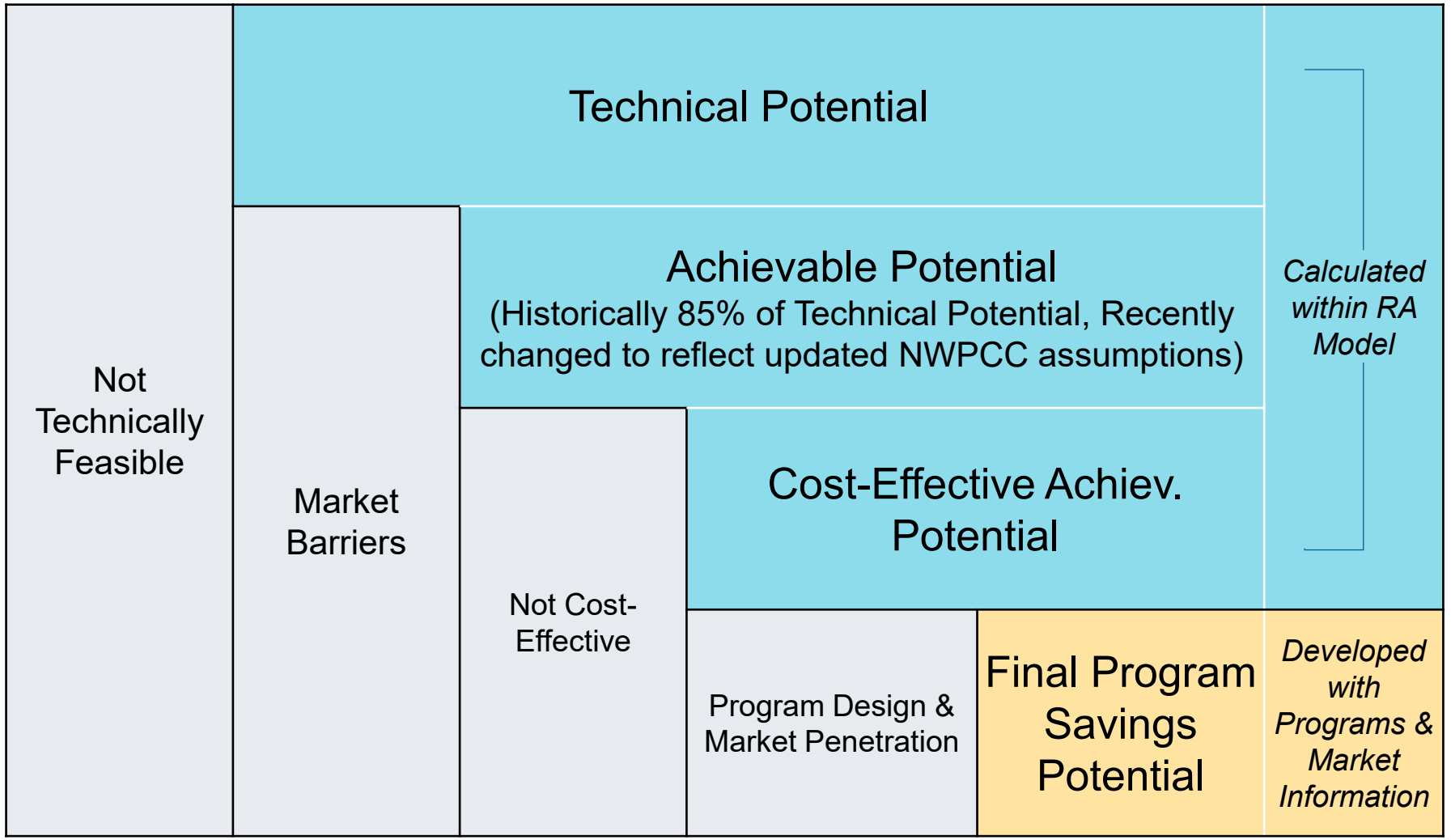
# RA Model Background

- 20-year energy efficiency potential estimates
- “Bottom-up” modeling approach – measure level inputs are scaled to utility level efficiency potential
- Energy Trust uses a model in *Analytica* that was developed by Navigant Consulting in 2014
  - The *Analytica* RA Model calculates Technical, Achievable and Cost-Effective Achievable Energy Efficiency Potential.
  - Final program/IRP targets are established via a deployment protocol exogenous of the model.
- Inputs refreshed to reflect most up to date assumptions according to IRP schedules
- A “living model” which is constantly being improved

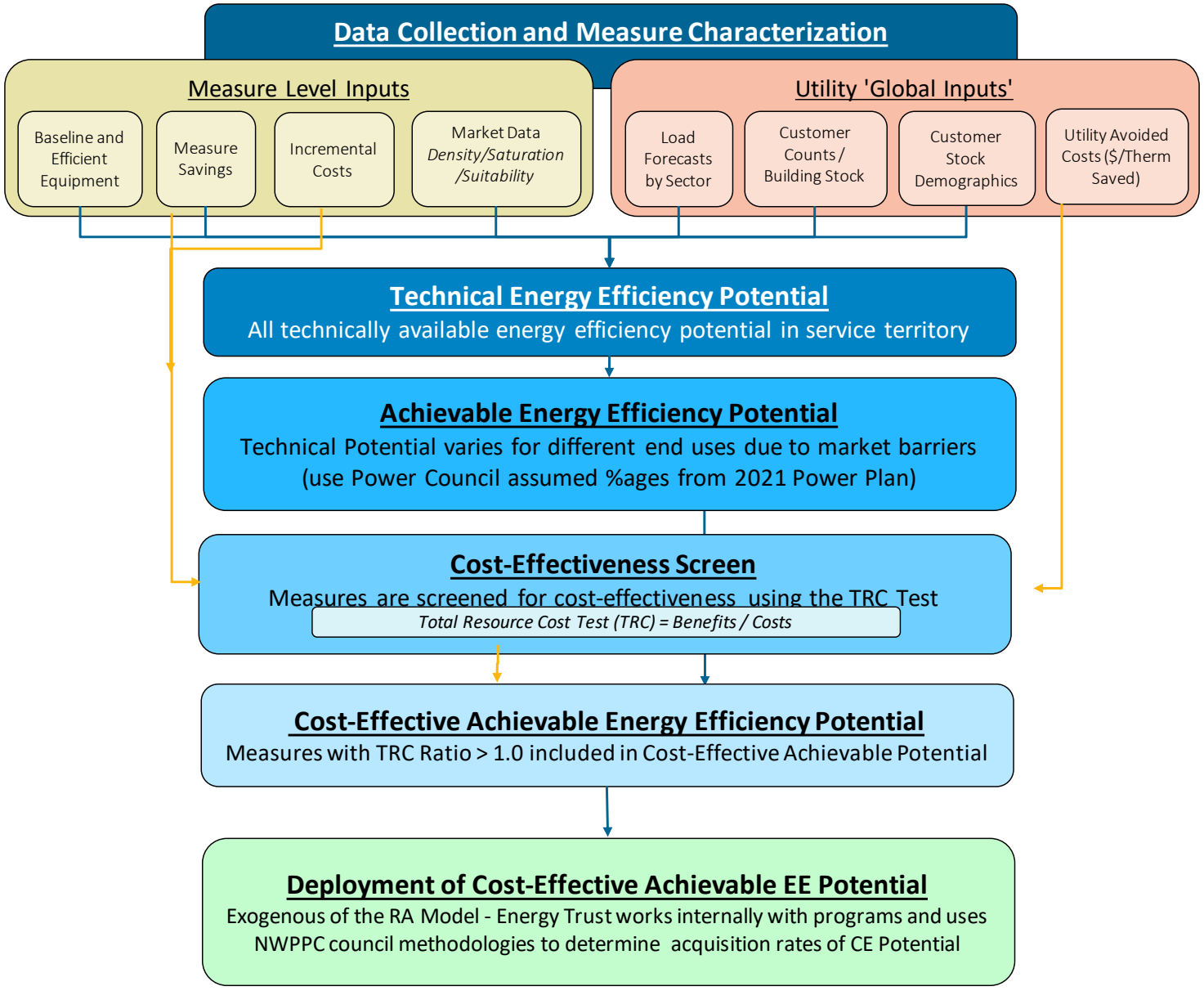
# Changes to Modeling Since 2020 IRP

- Lost opportunity/unconstrained potential
- Align with NWPCC achievability assumptions
- Measure updates, new measures and new emerging technologies included in the model

# Forecasted Potential Types



# 20-Year IRP EE Forecast Flow Chart



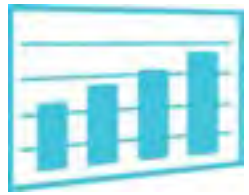
# Methodology Overview

‘Bottom-up’ modeling approach:

1. Measure inputs are characterized per unit
2. Number of units per scaling basis are estimated
   - *Residential*: # of Homes Served
   - *Commercial*: 1000s of Sq. Ft. Served
   - *Industrial*: Customer Segment Load Forecasts
3. The savings and costs of each measure are scaled to the utility level based on scaling basis inputs provided by CNG

## Simple Example *(Illustrative Numbers)*

# RA Model inputs



## Measure Level Inputs

**Measure Definition and Application:**
- Baseline/efficient equip. definition
- Applicable customer segments
- Installation type (RET/ROB/NEW)*
- Measure life

**Measure Savings**

**Measure Cost**
- Incremental cost for ROB/NEW measures
- Full cost for retrofit measures

**Market Data** (for scaling)
- Density
- Baseline/efficient equipment saturations
- Suitability

## Utility 'Global' Inputs

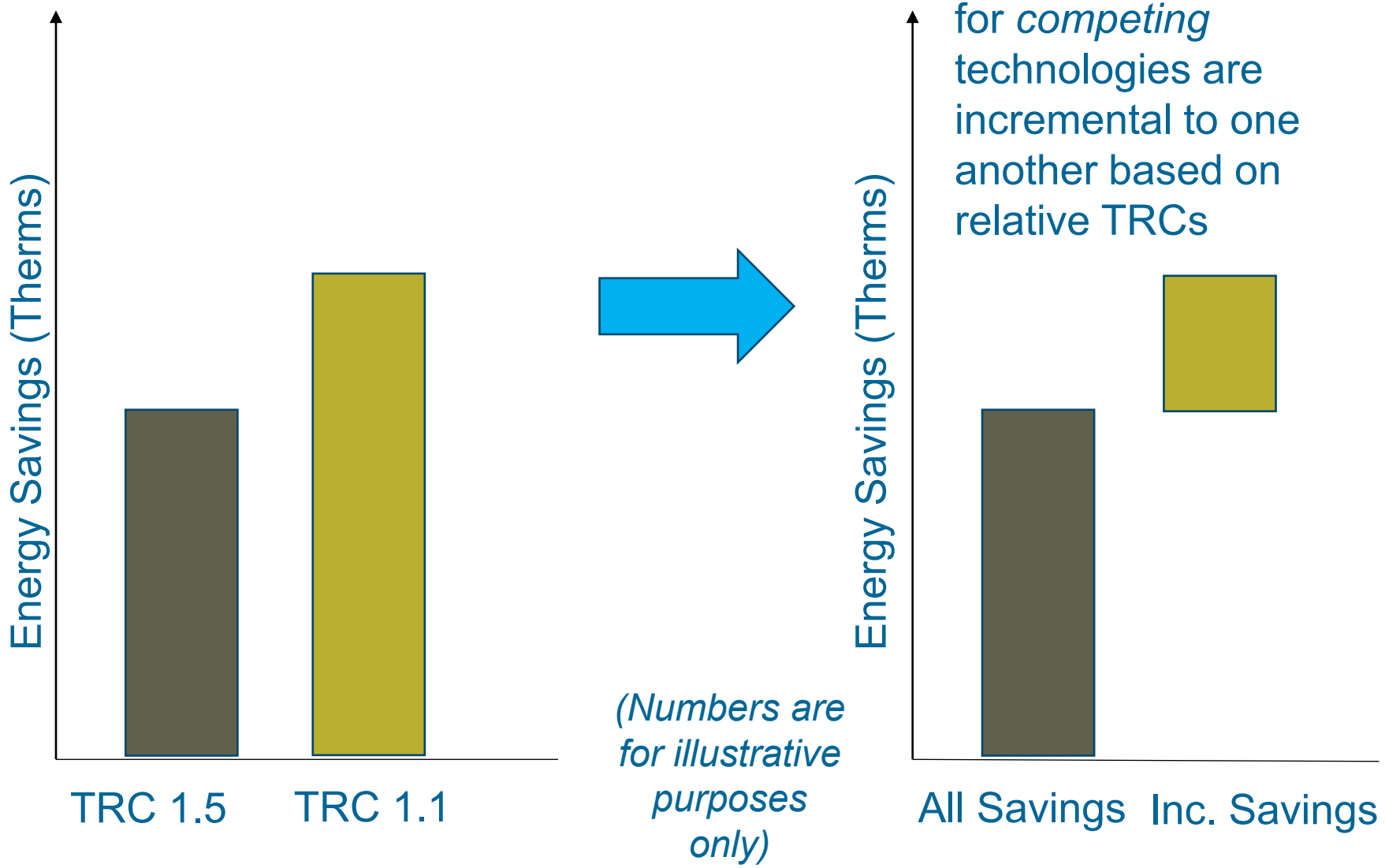
**Customer and Load Forecasts**
- Used to scale measure level savings to a service territory
  - Residential Stocks: # of homes
  - Commercial Stocks: 1000s of Sq.Ft.
  - Industrial Stocks: Customer load

**Avoided Costs (provided by utilities)**

**Customer Stock Demographics:**
- Heating fuel splits
- Water heat fuel splits

** RET = Retrofit; ROB = Replace on Burnout; NEW = New Construction*

# Incremental Measure Savings Approach
# Competition groups




Savings potential for *competing* technologies are incremental to one another based on relative TRCs

# Cost-Effectiveness Screen

- Energy Trust utilizes the Total Resource Cost (TRC) test to screen measures for cost effectiveness

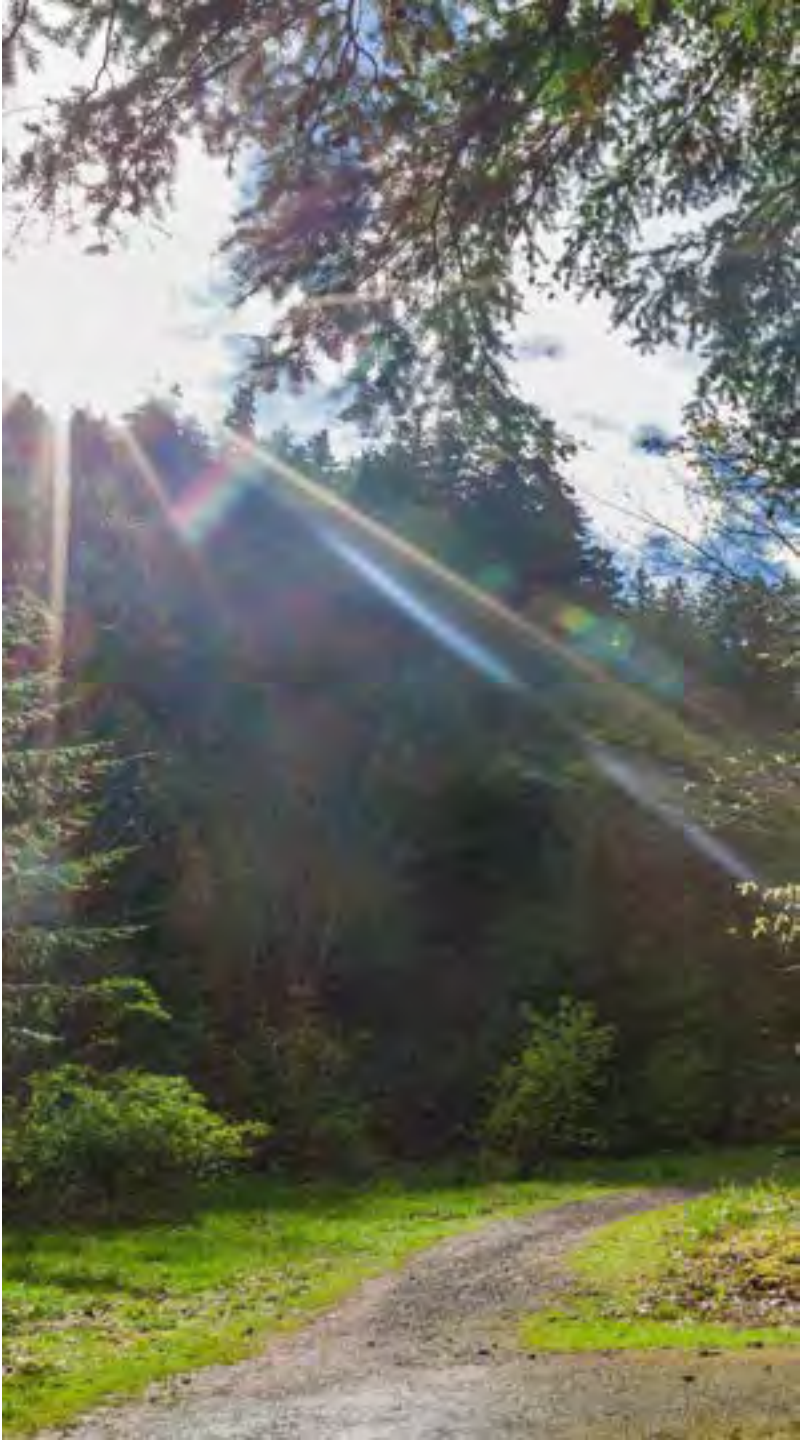
$$TRC = \frac{Measure\ Benefits}{Total\ Measure\ Cost}$$

- If TRC is > 1.0, it is cost-effective

- Measure Benefits:
  - Avoided Costs (provided by CNG)
    - Annual measure savings x NPV avoided costs per therm
  - Quantifiable Non-Energy Benefits
    - Water savings, etc.

Total Measure Costs:

- The customer cost of installing an EE measure (full cost if retrofit, incremental over baseline if replacement)



# Cost-Effectiveness Override in Model

Energy Trust applied this feature to measures found to be NOT Cost-Effective in the model but are offered through Energy Trust programs.

Reasons:

1. Blended avoided costs may produce different results than utility specific avoided costs
2. Measures offered under an OPUC exception per UM 551 criteria.

# Model Outputs

- Types of Potential:
  - Technical
  - Achievable
  - Cost-Effective Achievable
- Levelized Cost
- Measure Costs & Benefits
- Supply Curves

# IRP Savings Projections:
## Methodology to Deploy Cost-Effective Achievable Potential

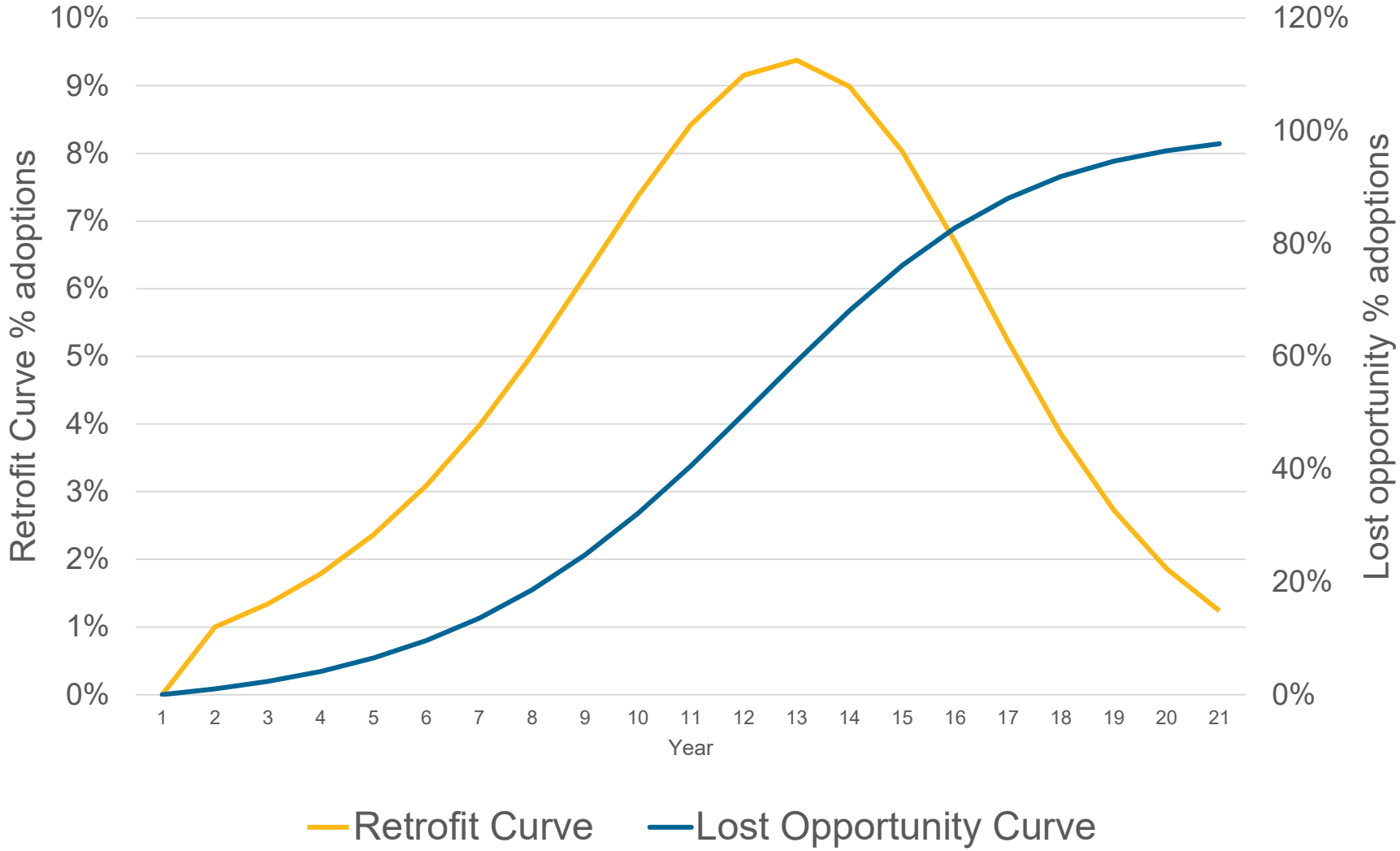
# Why Deploy?

- The RA model results represent the maximum savings potential in a given year.
- Ramp rates are an estimate of how much of that available potential will come off CNG's system each year.
- Energy Trust ramp rates are based on NWPCC methods and ramp rates, but calibrated to be specific to Energy Trust.

# Ramp Rate Overview

- Total RA Model cost-effective potential is different depending on the measure type.
  - **Retrofit measure savings** are 100% of all potential in every year, therefore must be distributed in a curve that adds to 100% over the forecast timeframe (bell curve)
  - **Lost opportunity measure savings** are the savings available in that year only and deployment rates are what % of that available potential rate can be achieved – results in an s-curve
- Generally follows the NWPCC deployment methodology
  - 100% cumulative penetration for retrofit measures over 20-year forecast
  - 100% annual penetration for lost opportunity by end of 20-year forecast (program or code achieved)
  - Hard to reach measures or emerging technologies do not ramp to 100%

# Ramp Rate Examples



# Ramp Rate Calibration

Energy Trust calibrates the first five years of energy efficiency acquisition ramp rates to program performance and budget goals.

**Years 1-2**

- Program forecasts – based on budget and current market conditions

**Years 3-5**

- Planning and Programs work together to create forecast

**Years 6-20**

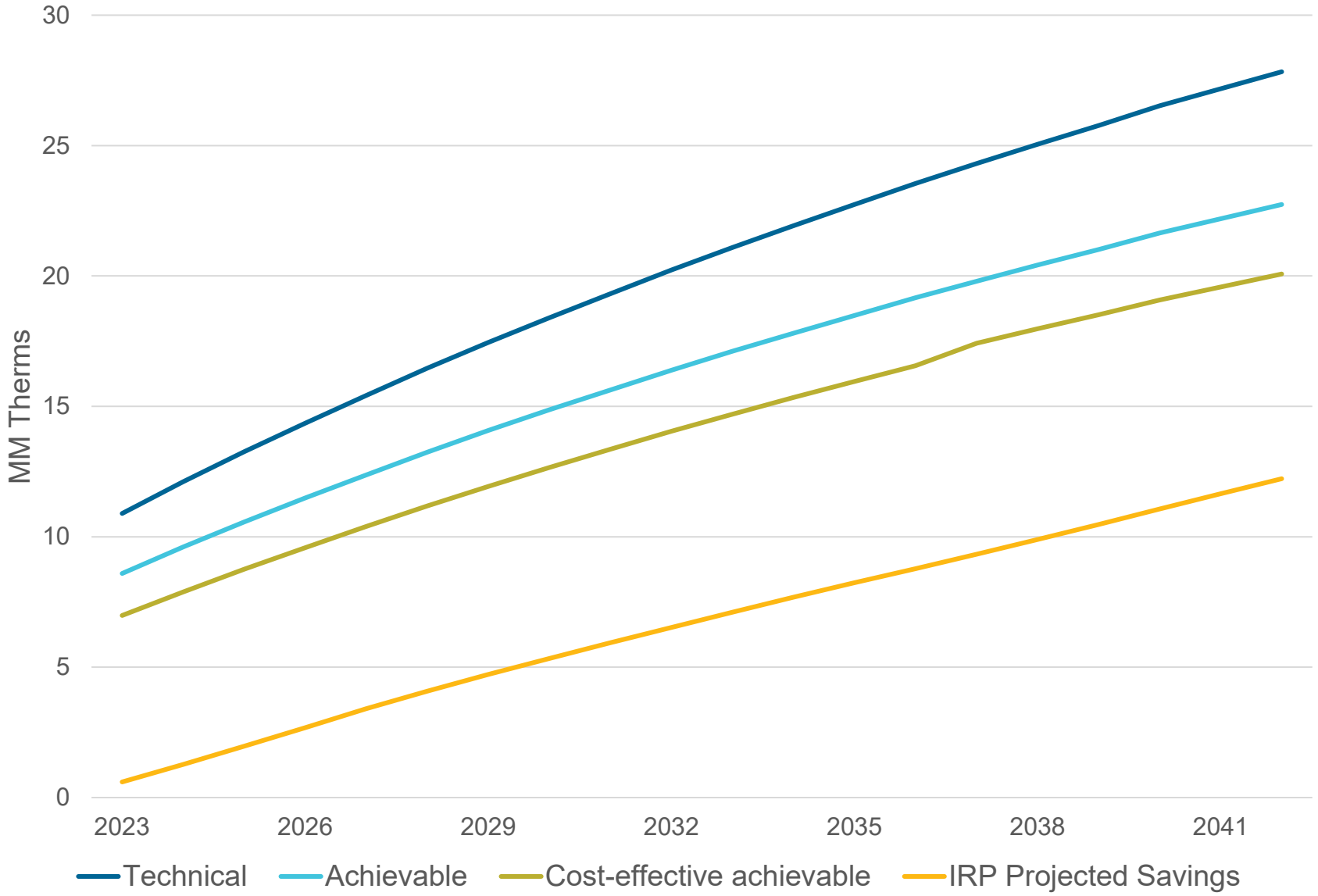
- Planning forecasts long-term acquisition rate to generally align NWPCC

# Application of Ramp Rates & Relation to RA Model Results

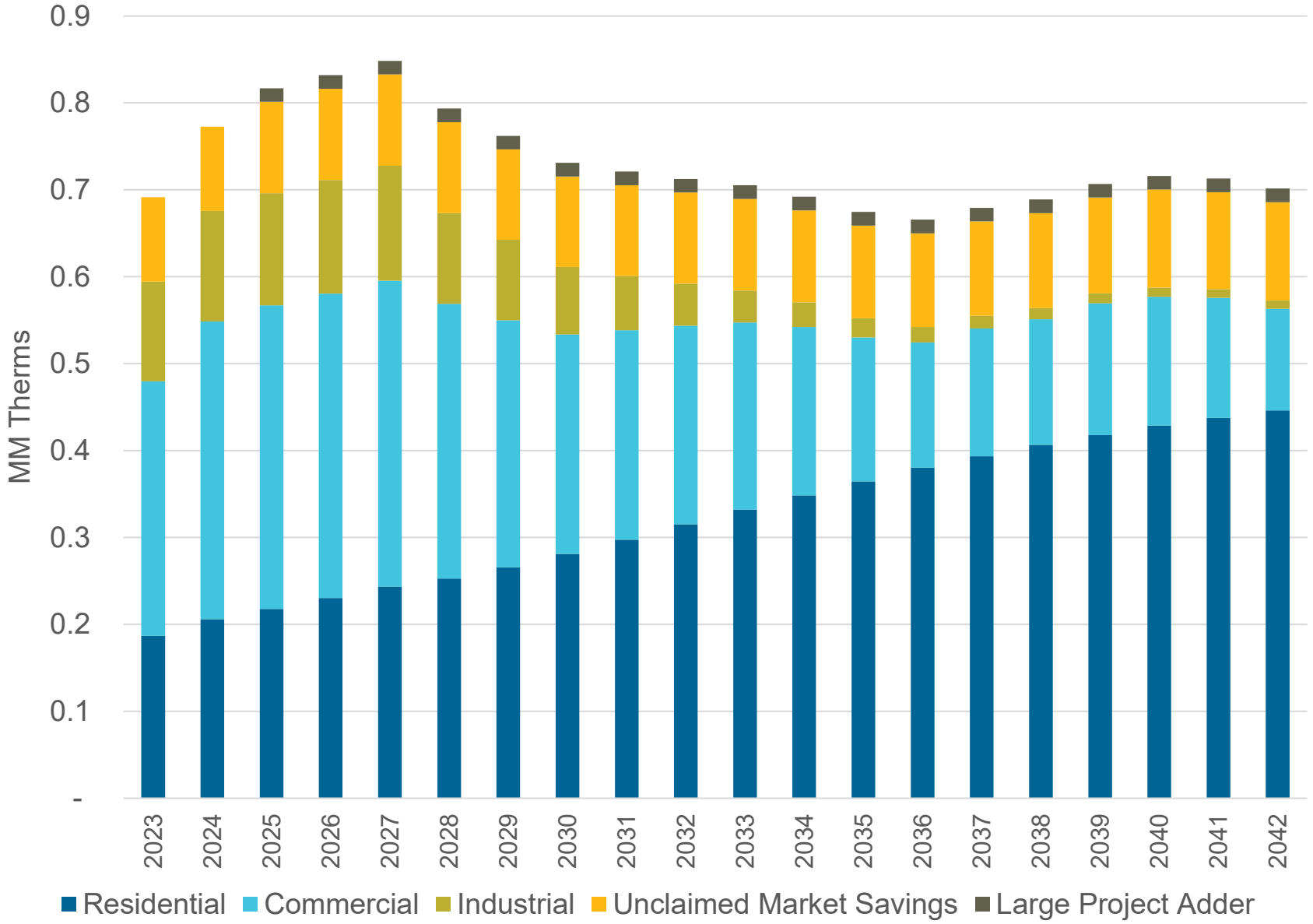
- Energy Trust's calibration process means ramp rates are not the same as the NWPCC, but follow similar methods.
- Ramp rates are specific to CNG.
- The application of these ramp rates is the reason why not all of the RA Model Cost-Effective Achievable Potential is forecasted to be acquired.
- The deployment process is done exogenously of the RA Model.

# CNG’s 2023 IRP Results

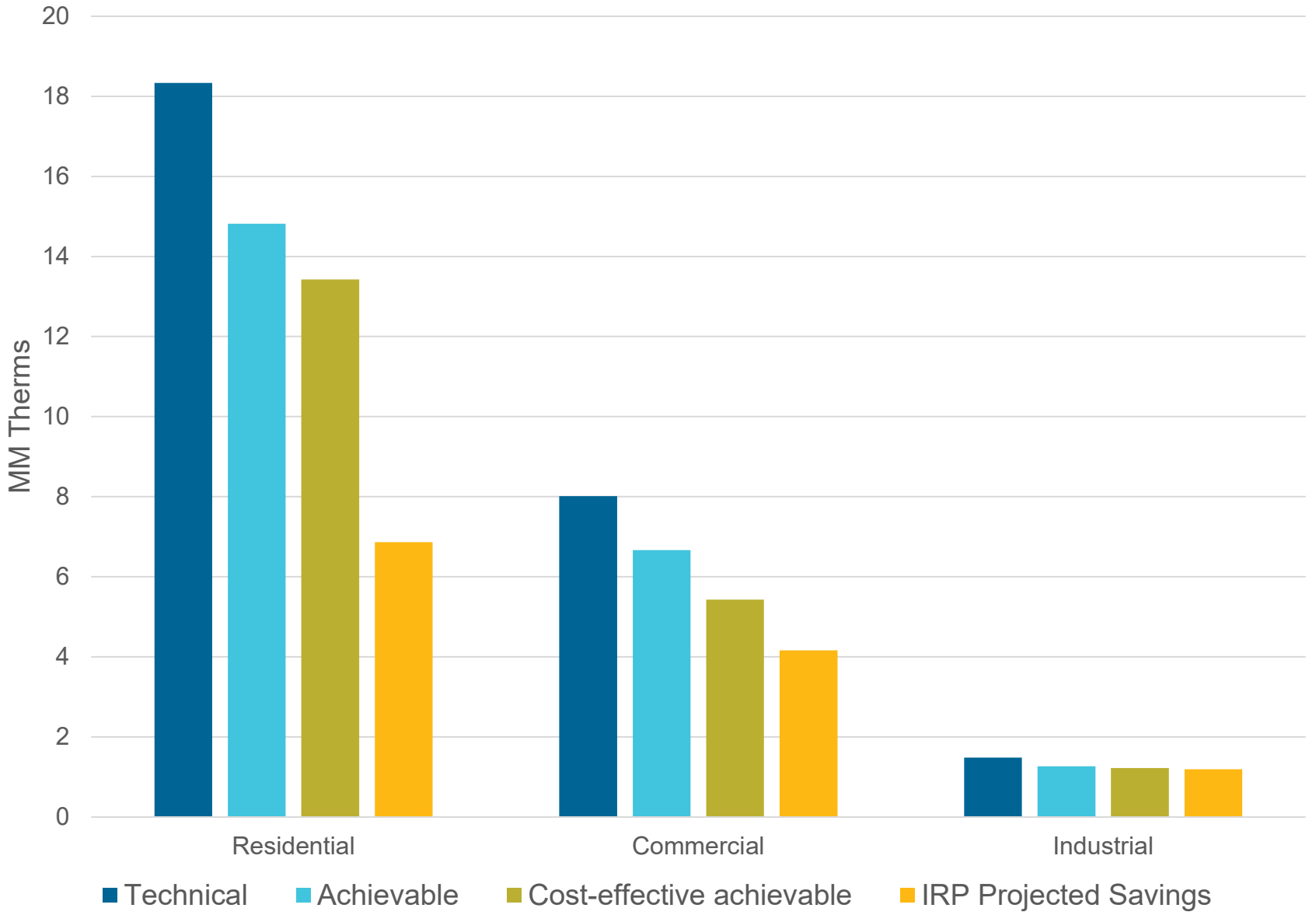
# Cumulative Savings by Type and Year



# Annual Deployed IRP Forecasted Savings



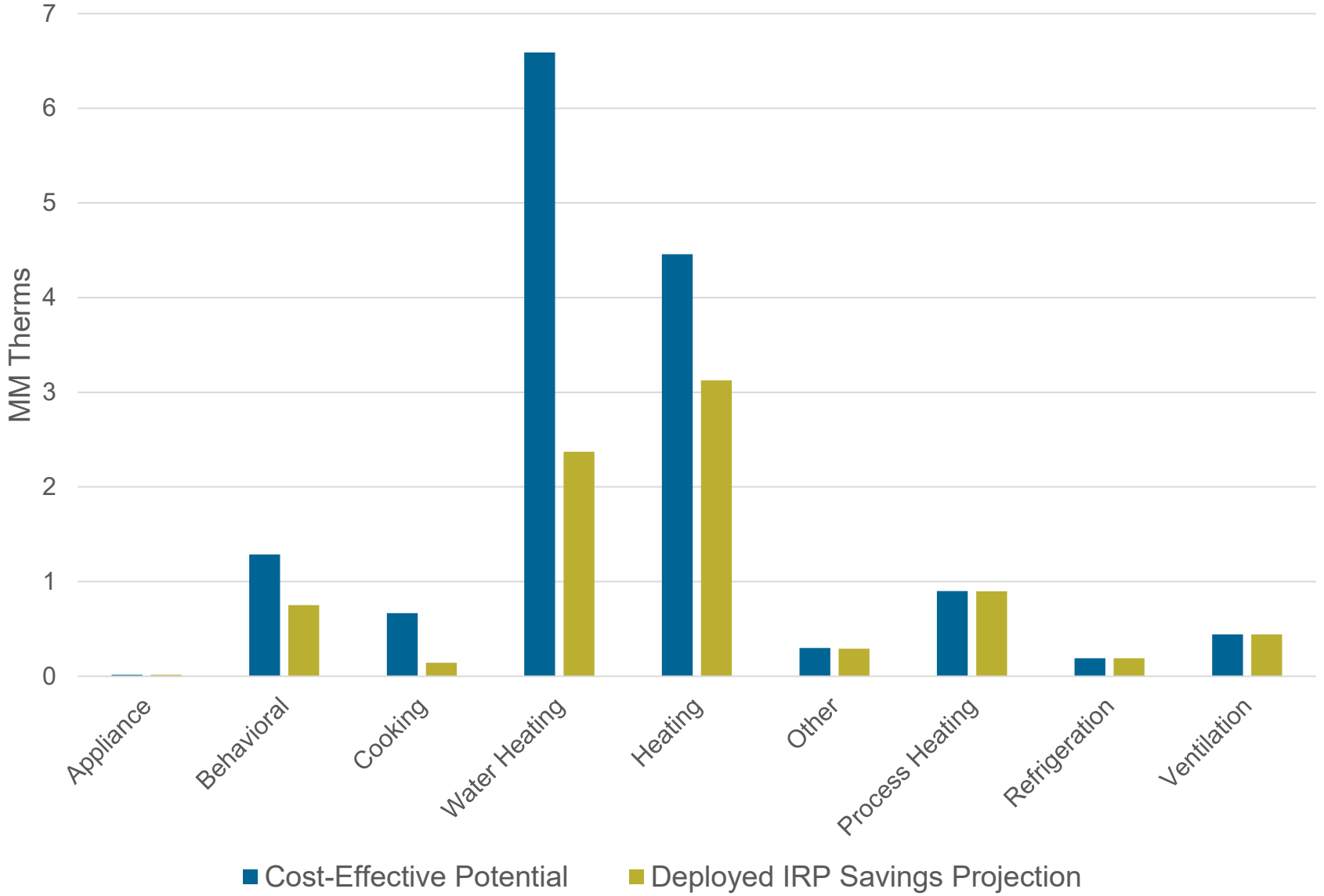
# Cumulative Savings by Sector and Type



# Cumulative Savings by Sector and Type (Therms)

| | Residential | Commercial | Industrial | All Sectors |
|---|---|---|---|---|
| **Technical Potential** | 18,333,106 | 8,011,512 | 1,486,157 | 27,830,775 |
| **Achievable Potential** | 14,814,813 | 6,663,051 | 1,263,233 | 22,741,098 |
| **Cost-effective Achievable Potential** | 13,423,463 | 5,430,091 | 1,224,379 | 20,077,933 |
| **IRP Projected Savings** | 6,865,056 | 4,162,029 | 1,193,202 | 12,220,287 |

# Cumulative Cost-Effective Savings & IRP Savings Projections by End-Use Compared



# Cost Effective Override Effect

Energy Trust applied this feature to measures found to be NOT Cost-Effective in the model but are offered through Energy Trust programs under OPUC Exception

| Measures that are Overridden | Override Applied? | Notes |
|---|---|---|
| Res - Attic/Ceiling insulation | TRUE | OPUC Exception |
| Res - Floor insulation | TRUE | OPUC Exception |
| Res - Wall insulation | TRUE | OPUC Exception |
| Res – Efficient Gas Clothes Washer | TRUE | OPUC Exception |
| Res – Gas heated new manufactured homes | TRUE | OPUC Exception |
| Com – Wall insulation | TRUE | OPUC Exception |
| Com – Flat roof insulation | TRUE | OPUC Exception |

# Cost Effective Override Effect

Energy Trust applied this feature to measures found to be NOT Cost-Effective in the model but are offered through Energy Trust programs under OPUC Exception

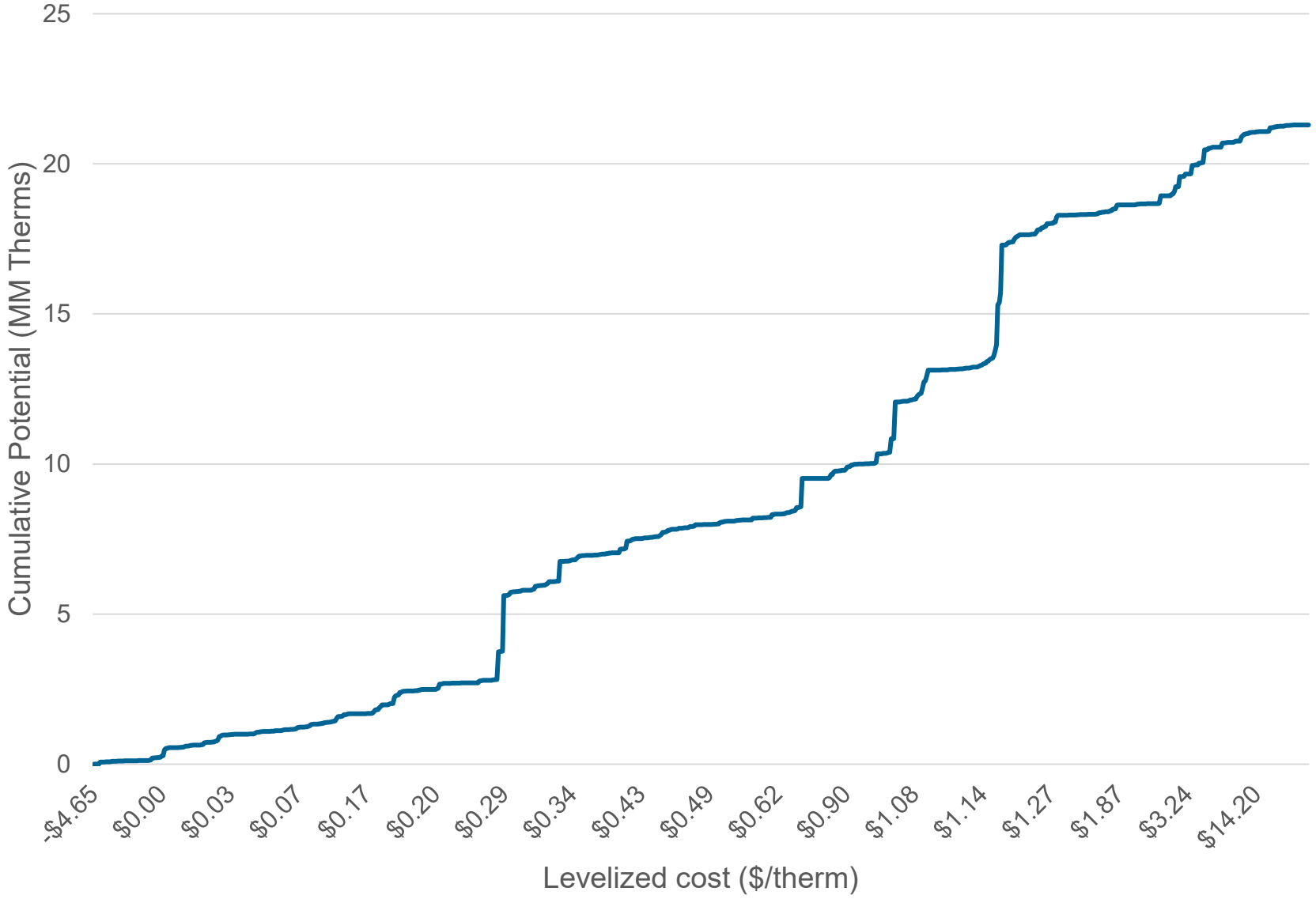
| Total Cumulative Potential | Cost-Effective Potential | Deployed IRP Savings Projection |
|---|---|---|
| Savings with CE Override (MM Therms) | 20.08 | 12.22 |
| Savings with NO CE Override (MM Therms) | 19.50 | 11.76 |
| Variance (MM Therms) | 0.58 | 0.46 |
| **CE Overridden % of Total Potential** | **2.9%** | **3.7%** |

# Peak Day Factors and Cumulative Peak Day Savings Estimates

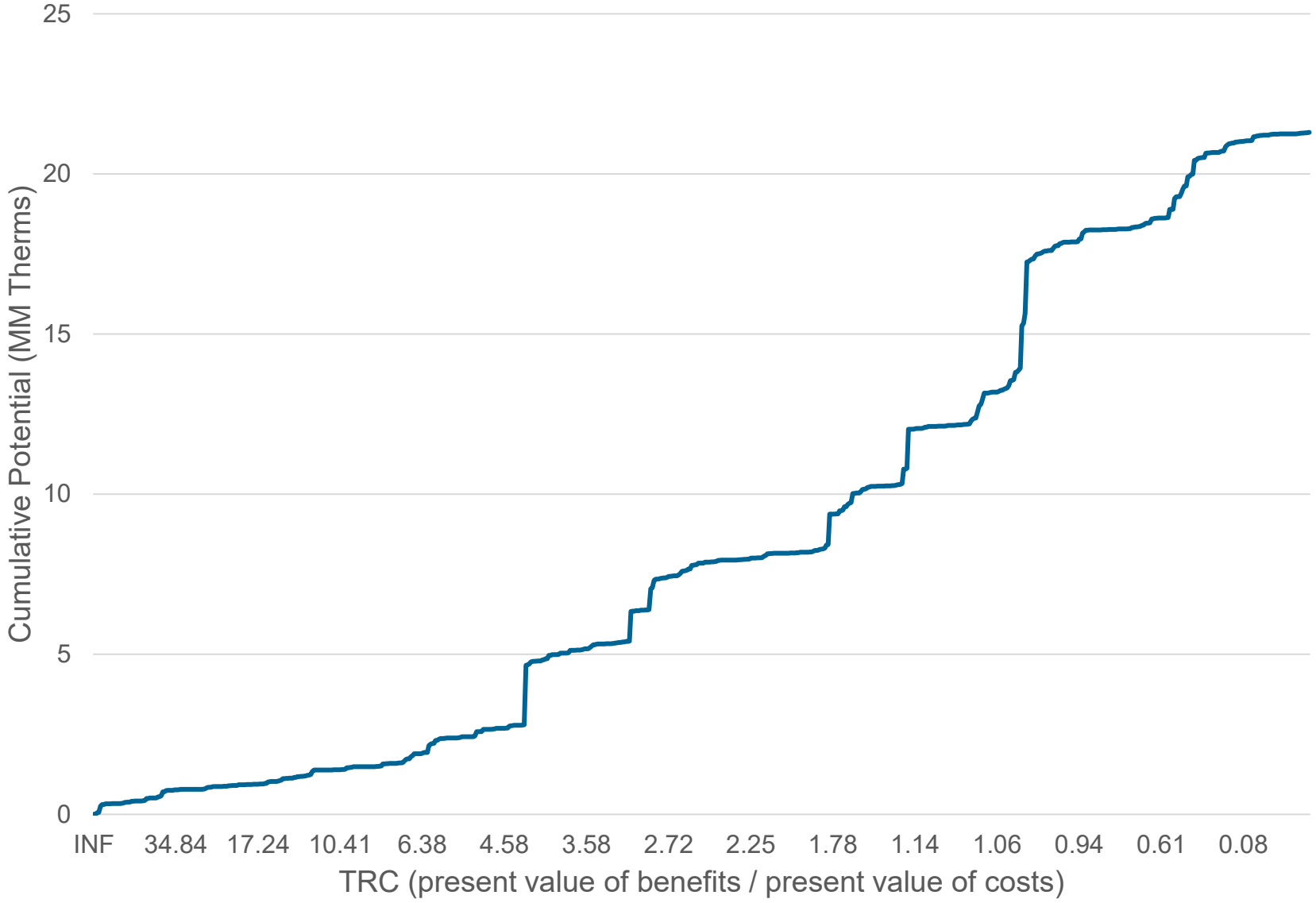
- Energy Trust also provides estimates of a peak day reduction in peak day consumption
- Peak Day factors derived from Energy Trust avoided cost calculations

| | Peak Day Factor | CE Potential Peak Day Therms (cumulative) | IRP Savings Targets Peak Day Therms (cumulative) |
|---|---|---|---|
| Cooking | 0.36% | 643 | 428 |
| Com Heating | 1.77% | 79,221 | 66,857 |
| Domestic Hot Water | 0.33% | 11,242 | 4,916 |
| FLAT | 0.27% | 1,920 | 1,921 |
| Res Heating | 1.98% | 202,928 | 120,865 |
| Res Clothes Washer | 0.20% | 1 | - |

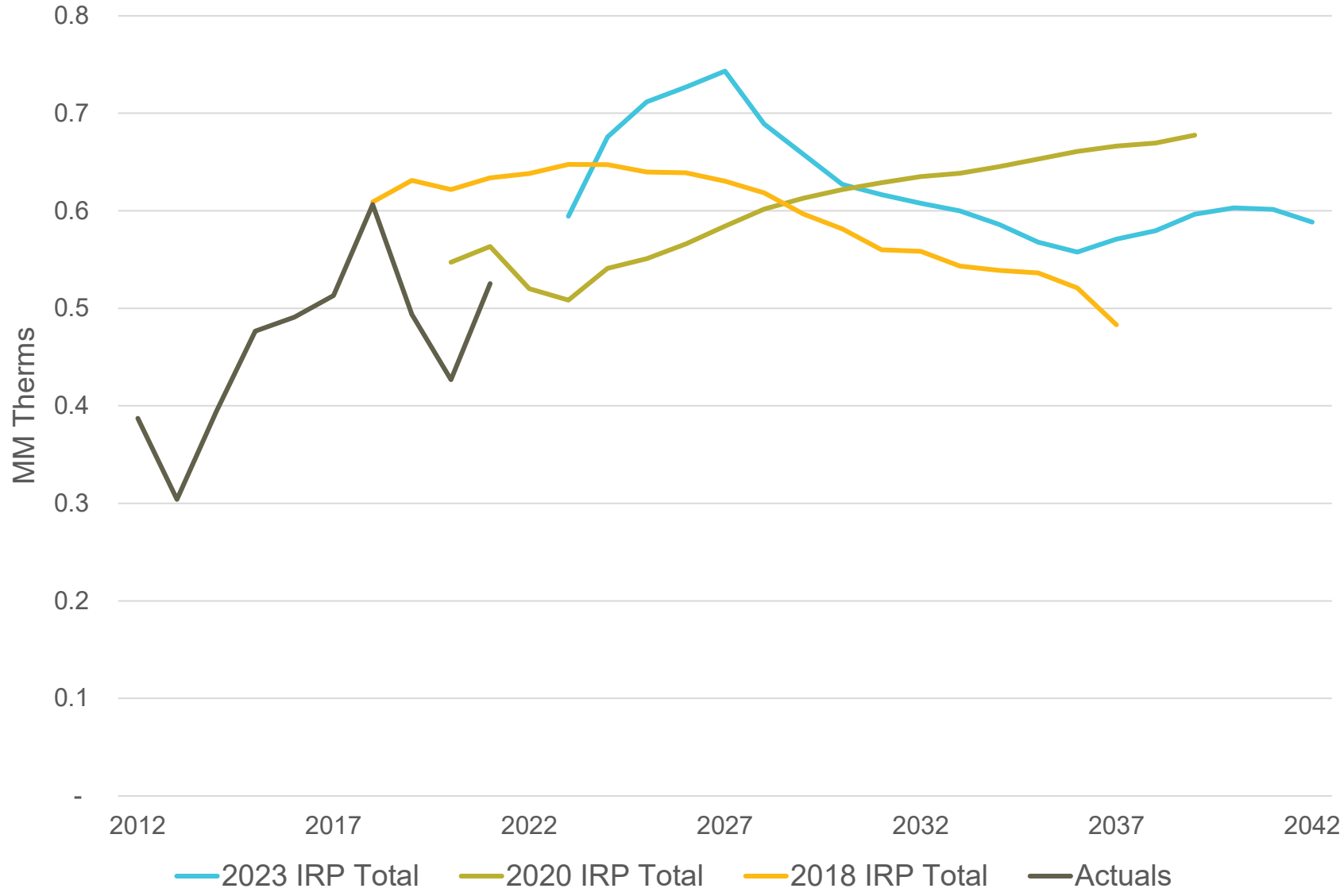
# Supply Curve by Levelized Cost (20-year Cumulative Achievable Potential)



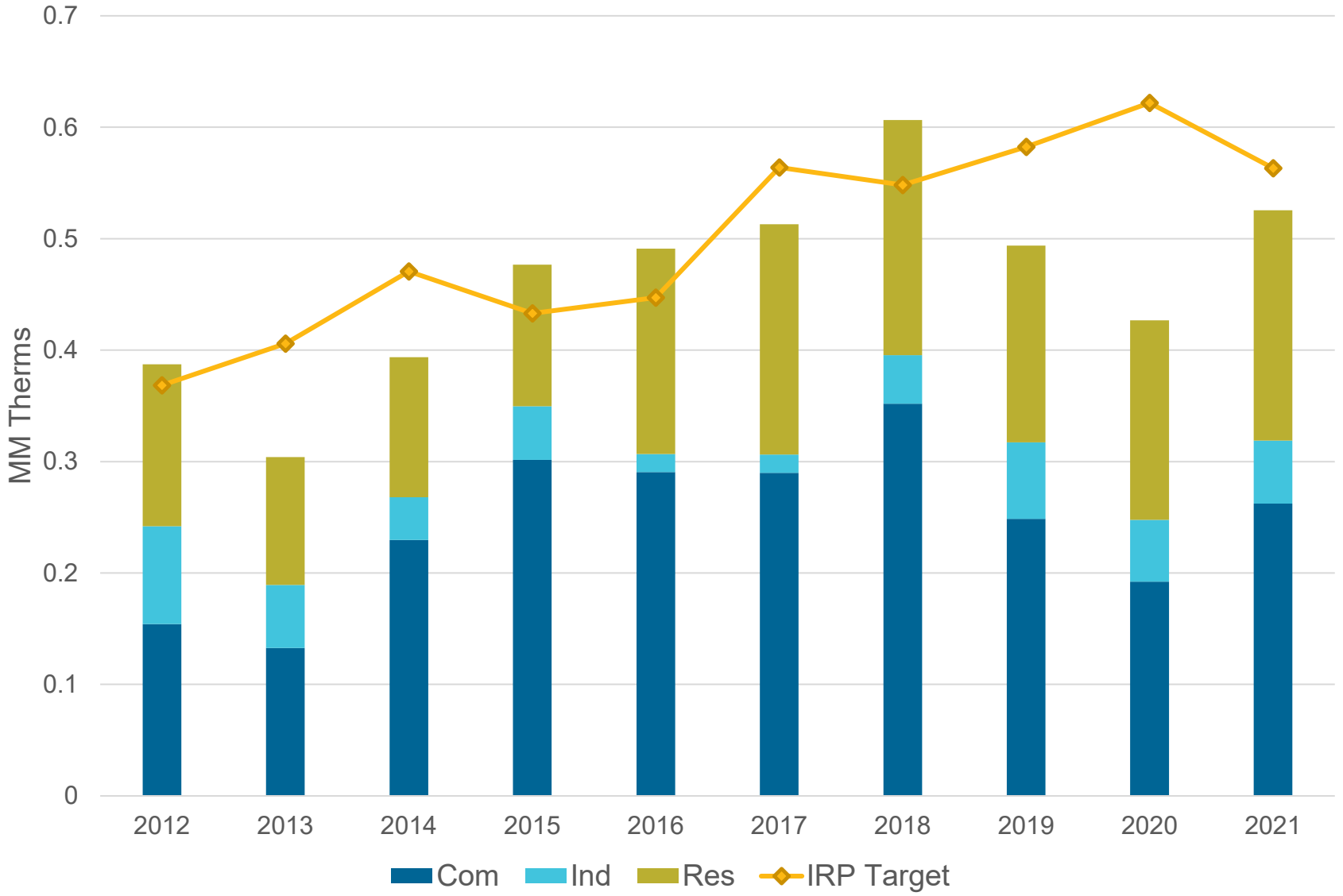
# Supply Curve by TRC Ratio (20-year Cumulative Achievable Potential)



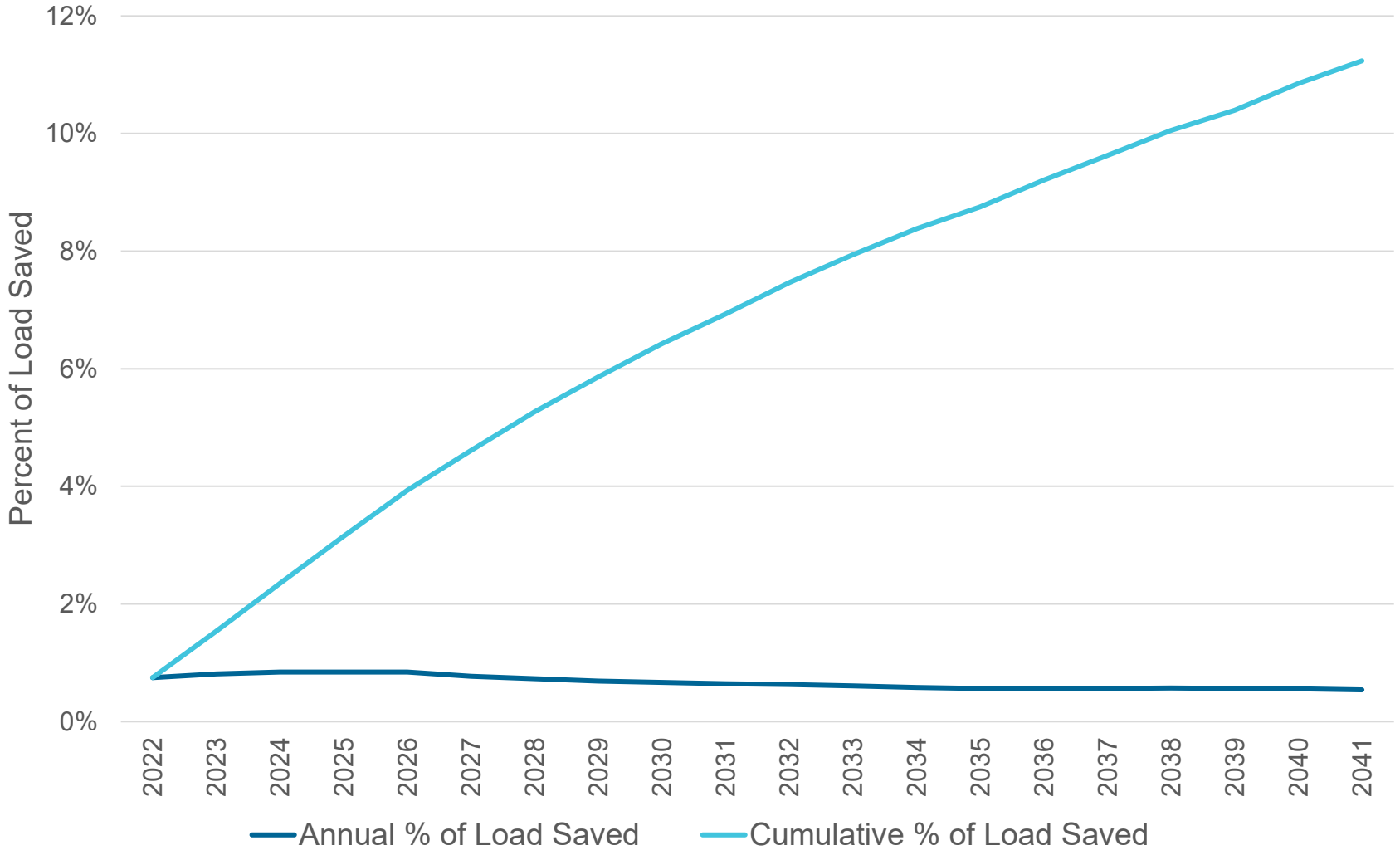
# IRP Forecasts Compared to Actual Savings (Annual MM Therms)



# Historical Performance compared to IRP targets (Annual MM Therms)



# Savings as a Percent of Load Forecast




Average Annual % of Load Saved = 0.67%

# Thank you

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EnergyTrust of Oregon

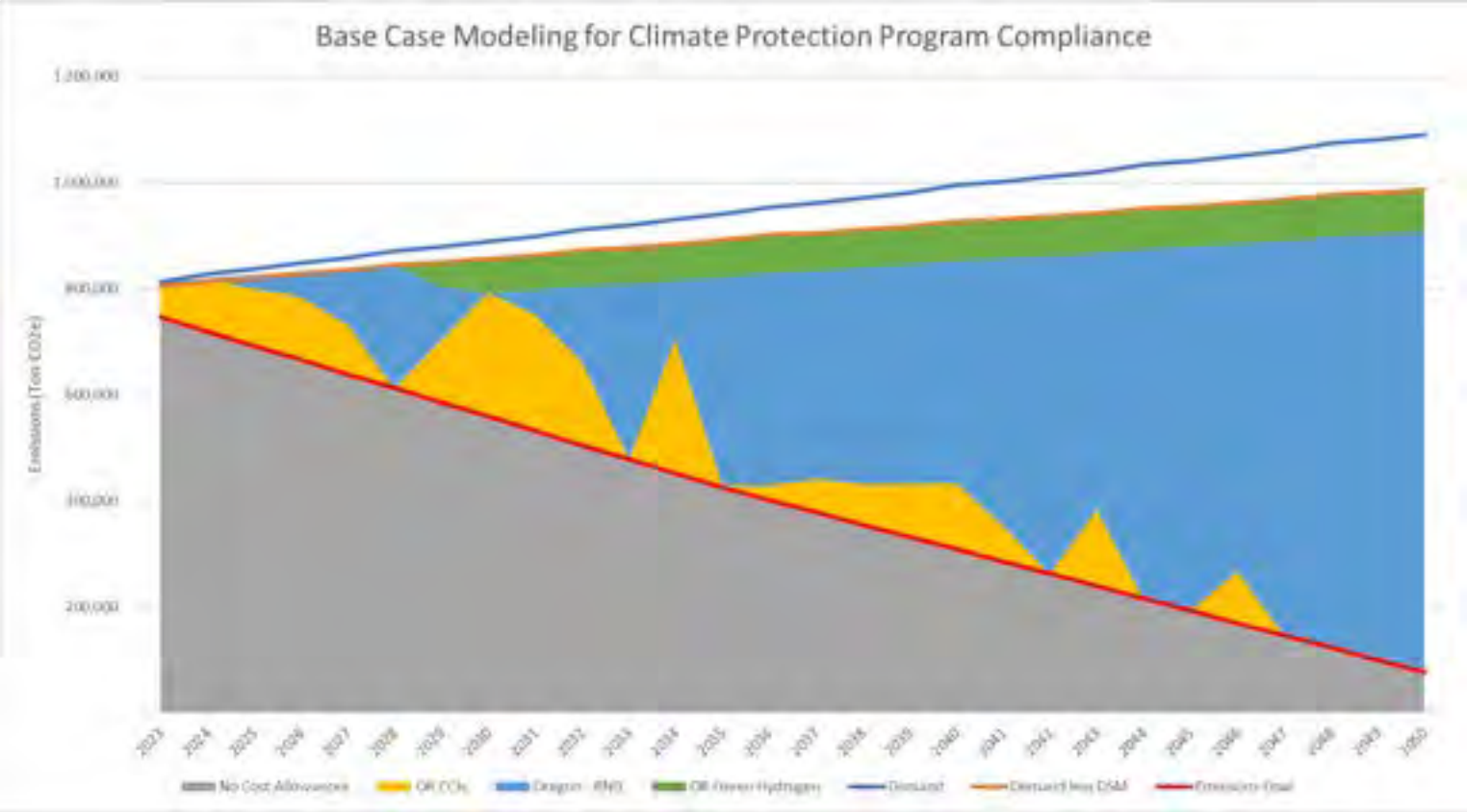
# Preliminary Results

# Preliminary upstream pipeline transportation results

| | First year shortfall w/o DSM | Max Shortfall | First year shortfall w/ DSM | Max Shortfall |
|---|---|---|---|---|
| Zone 11 | 2034 | 7,570 | 2046 | 1,430 |
| Zone ME-WA and GTN | 2038 | 20,390 | 2049 | 3,600 |

- Preliminary results show shortfalls on transportation side.
- DSM delays about 11-12 years.
- Remaining shortfall could be solved by targeted DSM, pipeline expansion, on-system RNG/Hydrogen if deemed peak day reliable, etc.

# Base Case Modeling for Climate Commitment Act

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# Questions?

# 2023 IRP Remaining Schedule

| Process Items | Process Elements | Date |
|---|---|---|
| TAG 5 (WA) | Final Integration Results, finalization of plan components, Proposed new 2- to 4-year Action Plan. | 9/28/2022 |
| TAG 5 (OR) | Final Integration Results, finalization of plan components, Proposed new 4-year Action Plan. | 11/9/2022 |
| Draft of 2022 IRP distributed (WA) | Filing of Draft IRP | 11/24/2022 |
| Draft of 2022 IRP distributed (OR) | Filing of Draft IRP | 1/5/2023 |
| Comments due on draft from all stakeholders (WA) | Comments due from Stakeholders | 1/13/2023 |
| Comments due on draft from all stakeholders (OR) | Comments due from Stakeholders | 2/24/2023 |
| TAG 6, if needed (WA) | An additional TAG if needed based on comments from Stakholders | 2/1/2023 |
| TAG 6, if needed (OR) | An additional TAG if needed based on comments from Stakholders | 3/15/2023 |
| IRP filing (WA) | IRP Final Filing | 2/24/2023 |
| IRP filing (OR) | IRP Final Filing | 4/14/2023 |

## Questions/Next Steps

## Review Plans for TAG 5 Discussion

- Final Integration Results
- Finalization of Plan components
- Proposed new Action Plan
- Next WA TAG 5 is tentatively Thursday, September 28
- Next OR TAG (TAG 5) is Wednesday, November 9

# Contact Information

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# Integrated Resource Plan (OR) Technical Advisory Group Meeting #4

SEPTEMBER 20, 2022

MICROSOFT TEAMS/TELECONFERENCE

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