

Washington Energy Decarbonization Examination

Decarbonization Advisory Group Meeting 2

Welcome + Introductions



UTC
Washington Utilities
and Transportation
Commission

SSC

Meeting Operating Guidelines

1. Let's share airtime in order to listen to, and hear from, as many perspectives as possible.
2. Let's manage our participation together to start and end on time.
3. Let's use respectful and inclusive language.

Zoom Etiquette

1. Please stay on mute when not speaking, and use the chat to ask questions, while presentations are in-progress.
2. Please use the “raise hand” function to ask a question during Q+A periods, and let us know your name and affiliation (if you have one).
3. Please note that we are recording this session.

Today's To Dos

- Here is what we are here to do today
 - Review business-as-usual (BAU) and business-as-planned (BAP) projections
 - Gather input into the decarbonization scenarios
 - Scenario parameters
 - Data assumptions/sources
- Here is what we are not here to do today
 - Review decarbonization scenario results

Who's in the Room?

Go to www.menti.com and use the code **6772 7688**



Agenda

1. Project Overview - 10 min
2. BAU and BAP preliminary results - 10 min
3. BAU and BAP Q&A - 15 min
4. Decarbonization Scenario Development - 60 min
5. Next Steps - 5 min

Project Overview

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Why is the Commission undertaking this examination?

Senate Bill 5092, section 143 provided funding for the Commission to:

“examine feasible and practical pathways for investor-owned electric and natural gas utilities to contribute their share to greenhouse gas emissions reductions as described in RCW 70A.45.020, and the impacts of energy decarbonization on residential and commercial customers and the electrical and natural gas utilities that serve them.”

RCW 70A.45.020 states that Washington shall limit anthropogenic emissions of greenhouse gases (GHGs) as follows:

- (i) By 2020, reduce GHGs to 1990 levels, or 90.5 million metric tons;
- (ii) By 2030, reduce GHGs to 50 million metric tons, or 45% below 1990 levels;
- (iii) By 2040, reduce GHGs to 27 million metric tons, or 70% below 1990 levels;
- (iv) By 2050, reduce GHGs to 5 million metric tons, or 95% below 1990 levels.

Senate Bill 5092, section 143 requirements

The examination must identify and consider:

“(i) How natural gas utilities can decarbonize;

(ii) The impacts of increased electrification on the ability of electric utilities to deliver services to current natural gas customers reliably and affordably;

(iii) The ability of electric utilities to procure and deliver electric power to reliably meet that load;

(iv) The impact on regional electric system resource adequacy, and the transmission and distribution infrastructure requirements for such a transition;

(v) The costs and benefits to residential and commercial customers, including environmental, health, and economic benefits;

(vi) Equity considerations and impacts to low-income customers and highly impacted communities; and

(vii) Potential regulatory policy changes to facilitate decarbonization of the services that gas companies provide while ensuring customer rates are fair, just, reasonable, and sufficient.”

What are we working on together?

By June 1, 2023, the Washington Utilities and Transportation Commission will use the Energy Decarbonization Pathways Examination to report to the legislature on “feasible and practical pathways for investor-owned electric and natural gas utilities to contribute their share to greenhouse gas emissions reductions as described in RCW 70A.45.020, and the impacts of energy decarbonization on residential and commercial customers and the electrical and natural gas utilities that serve them.”^[1]

The legislature will use this information to inform discussions on decarbonization targets and policies for investor-owned natural gas utilities.

This project is about identifying and describing the various pathways to achieve a certain level of natural gas emissions reduction. This project is not about choosing one pathway.

[1] Senate Bill 5092 Section 143.4.

What we done so far

- Calibrated the model to 2019 base year
- Generated the BAU scenario
- Integrated stakeholder feedback into BAP assumptions
- Generated the BAP scenario
- Generated base year hourly demand profiles

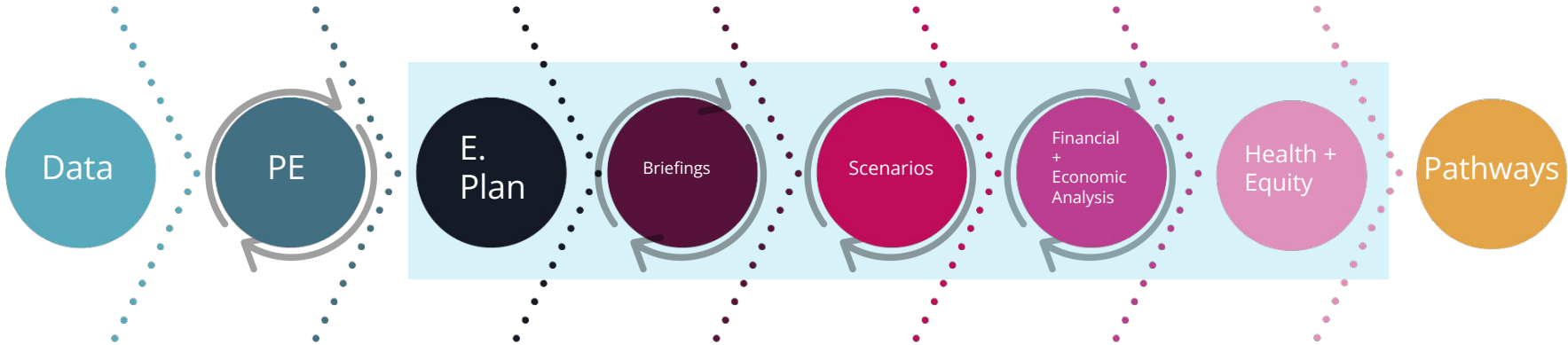
What's coming next


- Data Methods Assumptions Manual
- FAQ
- Trends briefs
- BAP results

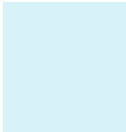
Engagement Review

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Engagement in Climate Action Planning



 Iteration + Adaptive Management


 Active Engagement Period

Engagement Approach

- Overall project will be set **involve/collaborate** (see next slide) for influence on the decision.
- We will ensure a transparent and accessible engagement process.
- We will use diverse techniques to effectively reach diverse stakeholders across the state.
- We will gather input on the social, economic, and equity impacts of decarbonization actions.
- We will design engagements to facilitate collaboration, rather than polarization.

IAP2 Spectrum of Public Participation

IAP2's Spectrum of Public Participation was designed to assist with the selection of the level of participation that defines the public's role in any public participation process. The Spectrum is used internationally, and it is found in public participation plans around the world.

INCREASING IMPACT ON THE DECISION 					
	INFORM	CONSULT	INVOLVE	COLLABORATE	EMPOWER
PUBLIC PARTICIPATION GOAL	To provide the public with balanced and objective information to assist them in understanding the problem, alternatives, opportunities and/or solutions.	To obtain public feedback on analysis, alternatives and/or decisions.	To work directly with the public throughout the process to ensure that public concerns and aspirations are consistently understood and considered.	To partner with the public in each aspect of the decision including the development of alternatives and the identification of the preferred solution.	To place final decision making in the hands of the public.
PROMISE TO THE PUBLIC	We will keep you informed.	We will keep you informed, listen to and acknowledge concerns and aspirations, and provide feedback on how public input influenced the decision.	We will work with you to ensure that your concerns and aspirations are directly reflected in the alternatives developed and provide feedback on how public input influenced the decision.	We will look to you for advice and innovation in formulating solutions and incorporate your advice and recommendations into the decisions to the maximum extent possible.	We will implement what you decide.

BAU and BAP Results

Business-As-Usual Definition

A business-as-usual scenario is:

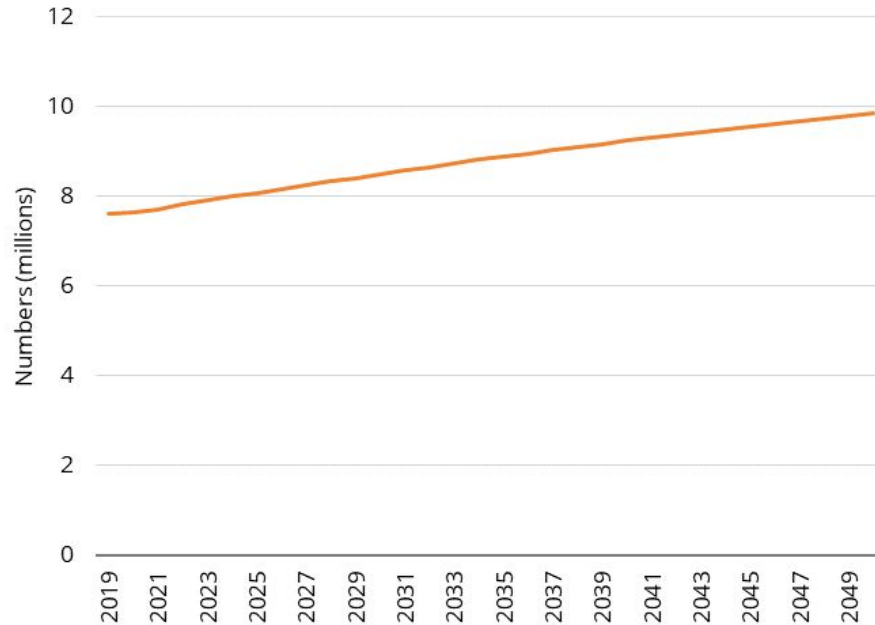
- A pathway to 2050 should no intervention to energy systems or emissions producing activities occur
- State policies or planning are not integrated
- Reflects the population and employment growth and distribution, current activity patterns and the resulting energy and emissions

BAU Assumptions

- Population growth
- Employment growth
- Transportation fuel standards
- Heating and cooling degree days
- Energy use by buildings
- New building growth

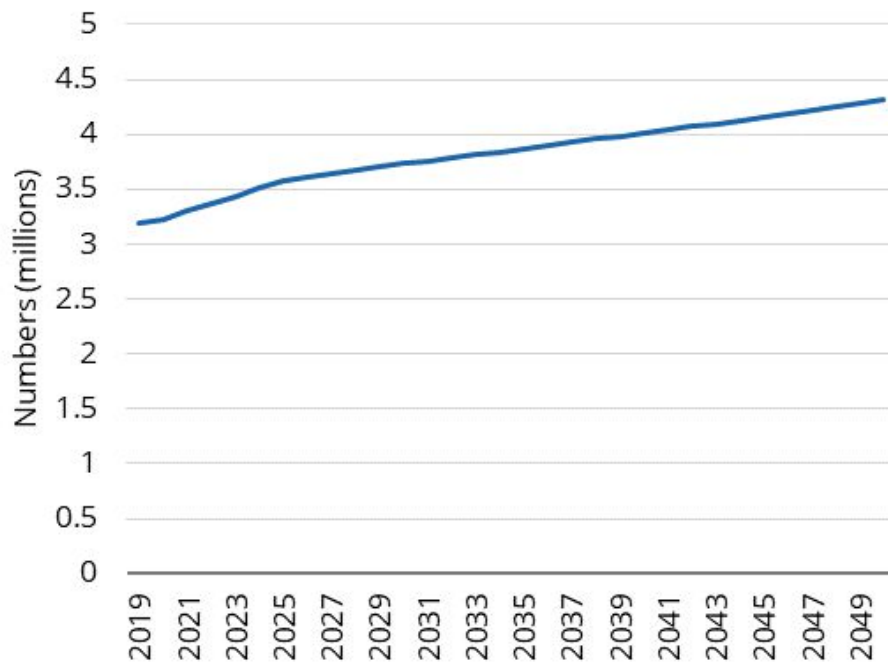
Business-as-usual (BAU)

Action	Details	Sources
Population Growth	7.61 million people in 2019 8.89 million people by 2035 (avg of 1.05% per year) 9.85 million people by 2050 (avg of 0.7% per year) Average rate of growth - 72,329 people per year	Office of Financial Management Projections of the state population by age, sex and race Growth Management Act population projections for counties: 2010 to 2040



Business-as-usual (BAU)

Action	Details	Sources
Employment Growth	3.20 million jobs in 2019 3.87 million jobs by 2035 (avg of 0.5% per year) 4.32 million jobs by 2050 (avg of 0.7% per year) Average rate of growth - 36,162 jobs per year	Office of Financial Management Long-Term Economic Forecast



Business-as-usual (BAU)

Action	Details	Sources
Transportation Fuel Standards	CAFE Fuel standards: Vehicle fuel consumption rates reflect the implementation of the U.S. Corporate Average Fuel Economy (CAFE) Fuel Standard for Light-Duty Vehicles, and Phase 1 and Phase 2 of EPA HDV Fuel Standards for Medium- and Heavy-Duty Vehicles.	(2012) (CAFE standards) retrieved from https://www3.epa.gov/otaq/climate/documents/420f12050.pdf http://www.nhtsa.gov/fuel-economy
Heating and Cooling Degree Days	Projections of Heating and Cooling degree days by county - Climate Explorer (nemas.org)	Climate Explorer (nemas.org) Statistically downscaled global climate models for county and county-equivalents
Energy Use by Buildings	Baseline building equipment types/stocks held from 2019-2050.	Residential Energy Consumption Survey (RECS) for baseline building equipment types State Energy Data System (SEDS) for building equipment efficiencies
New Building Growth	Residential buildings. Buildings are added alongside population growth; building types added based on building mix of county where population growth is happening. Non-residential buildings. Growth based on projected growth in employment; building types added based on building mix of county where job growth is happening.	

Business-As-Planned Definition

To be a business-as-planned action, it must be:

- In rule;
- Funded;
- Legislatively required; or
- Following market trends (e.g., observed EV adoption rates).

The BAP Incorporates:

- Clean Energy Transformation Act (CETA)
- Climate Commitment Act (CCA)
- Washington State Energy Code (WSEC)
- Clean Buildings Act for Washington
- Move Ahead Washington
- Advancing Green Transportation
- EV Supporting Infrastructure
- + more

Business as Planned (BAP)

Action	Details	Sources
Clean Energy Transformation Act (CETA)	Requires Washington's electric utilities to achieve 100% coal-free electricity generation by 2025; 100% carbon neutral electricity generation by 2030 (80% actually generated; 20% can be offsets, RECs, etc.); 100% clean electricity generation by 2045.	SB 5116 (CETA) Final Bill Report
Climate Commitment Act	<p>45% reduction by 2030, 70% by 2040 and 95% by 2050 in greenhouse gas emissions.</p> <p>Starting on Jan. 1, 2023, the cap-and-invest program will cover industrial facilities, certain fuel suppliers, in-state electricity generators, electricity importers, and natural gas distributors with annual greenhouse gas emissions above 25,000 metric tons of carbon dioxide equivalent.</p> <p>CSPACE (HB 2405), Urban Heat Island Mitigation (HB 114), Renewable Hydrogen by PUDs (SB 5588), Solar Fairness Act (SB 5223)</p>	SB 5125 Climate Commitment Act SB 5223 SB 5588 HB 2405 HB 1114

Business as Planned (BAP)

Action	Details	Sources
Washington State Energy Code (WSEC)	<p>Relevant elements</p> <ul style="list-style-type: none">- New commercial (includes multifamily 4 stories and higher) 100% electric heat pumps heating and 50% electric heat pump water heating- Buildings between 2013 and 2032 move to 70% reduction in energy use (from 2006) over this time period- Banning of natural gas for space and water heating in some cities	<p>Washington State Energy Code Washington State Energy Code Roadmap</p>
Clean Buildings Act for Washington	<p>Tier 1 - Existing buildings more than 50,000 sqft need to meet energy targets, starting in 2026.</p>	<p>Washington State Clean Buildings Performance Standard</p>
Clean Fuel Standard	<p>Requires fuel suppliers to gradually reduce the carbon intensity of transportation fuels to 20 percent below 2017 levels by 2038. There are several ways for fuel suppliers to achieve these reductions, including:</p> <ul style="list-style-type: none">• Improving the efficiency of their fuel production processes• Producing and/or blending low-carbon biofuels into the fuel they sell• Purchasing credits generated by low-carbon fuel providers, including electric vehicle charging providers	<p>Washington Clean Fuel Standard</p>

Business as Planned (BAP)

Action	Details	Sources
<p>Move Ahead Washington</p>	<p>A \$16.8 billion comprehensive transportation funding and appropriations package which leverages anticipated funds from the Climate Commitment Act's cap-and-invest allowance auctions to preserve and maintain existing transportation infrastructure, expand transit, cycling, and walking infrastructure, replace diesel ferries with hybrid electric ones, and support hydrogen and electric vehicle infrastructure deployment across the state. Approx \$10 billion from CCA and \$6 billion from other sources</p> <p>Mode shift: 5% increase in bike/ped and transit ridership between now and 2050, in the urban counties. Rural counties 2%</p>	<p>House 2022 Supplemental Transportation Budget Proposals</p> <p>Legislative Evaluation & Accountability Program Committee Transportation Document</p>
<p>Advancing Green Transportation</p>	<p>HB 2042 - Encourages electric vehicle and alternative vehicle adoption by providing tax credits, exemptions, grants, and technical support for electric and alternative vehicles purchases</p> <p>HB 5811 - Directs the Department of Ecology to adopt the motor vehicle emissions standards of California, including its Zero Emissions Vehicles program; also requires labels to be affixed that disclose the comparative GHGs for new vehicles, including passenger cars, light duty trucks, and medium duty passenger vehicles.</p> <ul style="list-style-type: none"> - Standards start taking effect in 2024. - New personal use and light duty commercial vehicle sales; 8% in 2024 and 100% in 2035 - By 2035, deliveries to Washington must be: <ul style="list-style-type: none"> - 55% Classes 2b–3 trucks – vans, medium pickup trucks - 75% Classes 4–8 trucks – delivery trucks, delivery/service vans, lighter truck tractors, bucket trucks - 40% Class 8 truck tractors – cement trucks, dump trucks, sleeper cab trucks 	<p>HB 2042</p> <p>HB 5811</p> <p>Department of Ecology - Zero Emission Vehicles</p>

What we heard

- Stay updated on CCA rules as they evolve
- Focus on CETA is appropriate; less focus on Washington's Renewable Portfolio Standard and the Energy Independence Act
- Clean Buildings Act for Washington - Not including Tier 2 as it does not have any targets yet
- Include Clean Fuel Standards in the BAP
- Additional context for Renewable Natural Gas in Decarbonization Scenarios:
 - Organic Materials Management - HB 1799
 - Reducing Methane Emissions from Landfills - HB 1663

Updated BAP Results

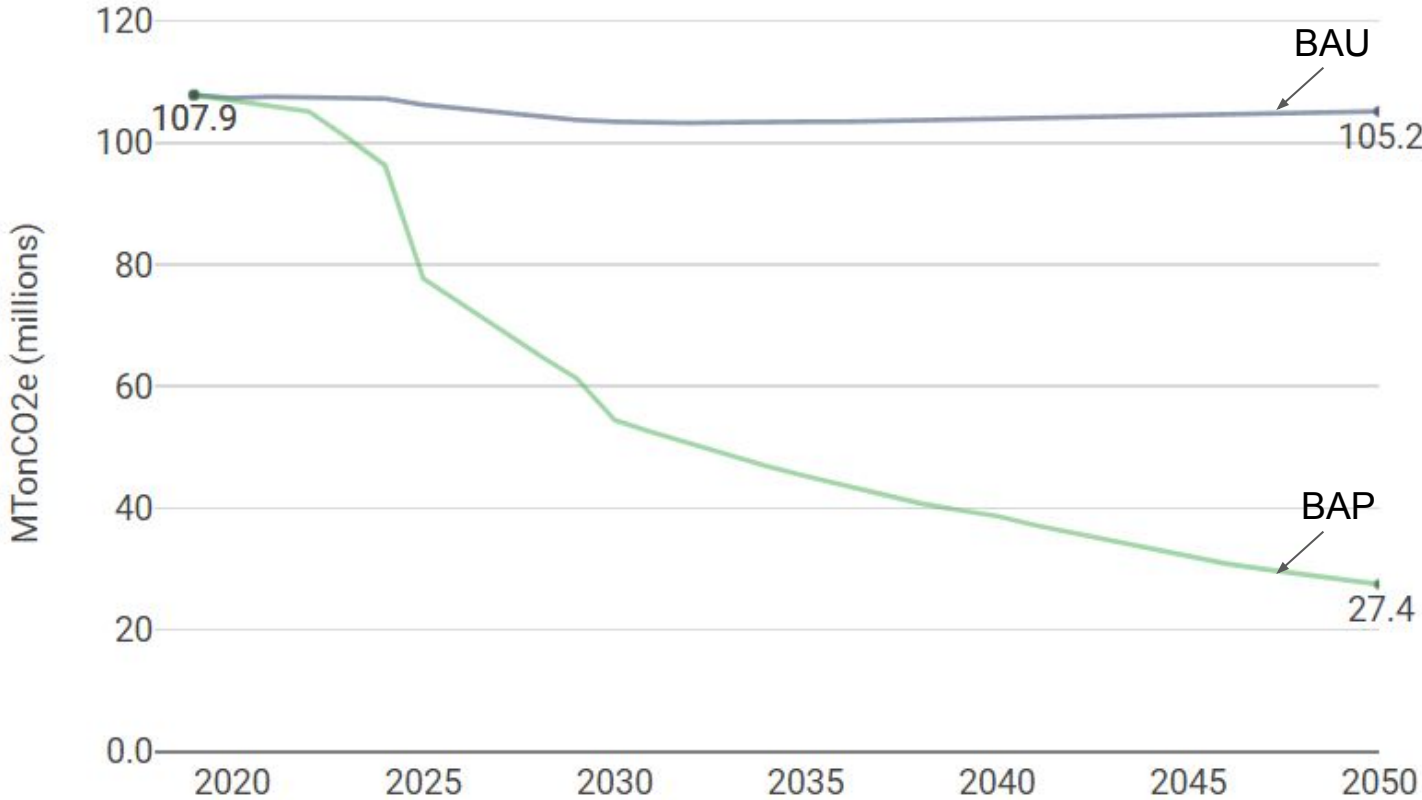
Oct. 4, 2022

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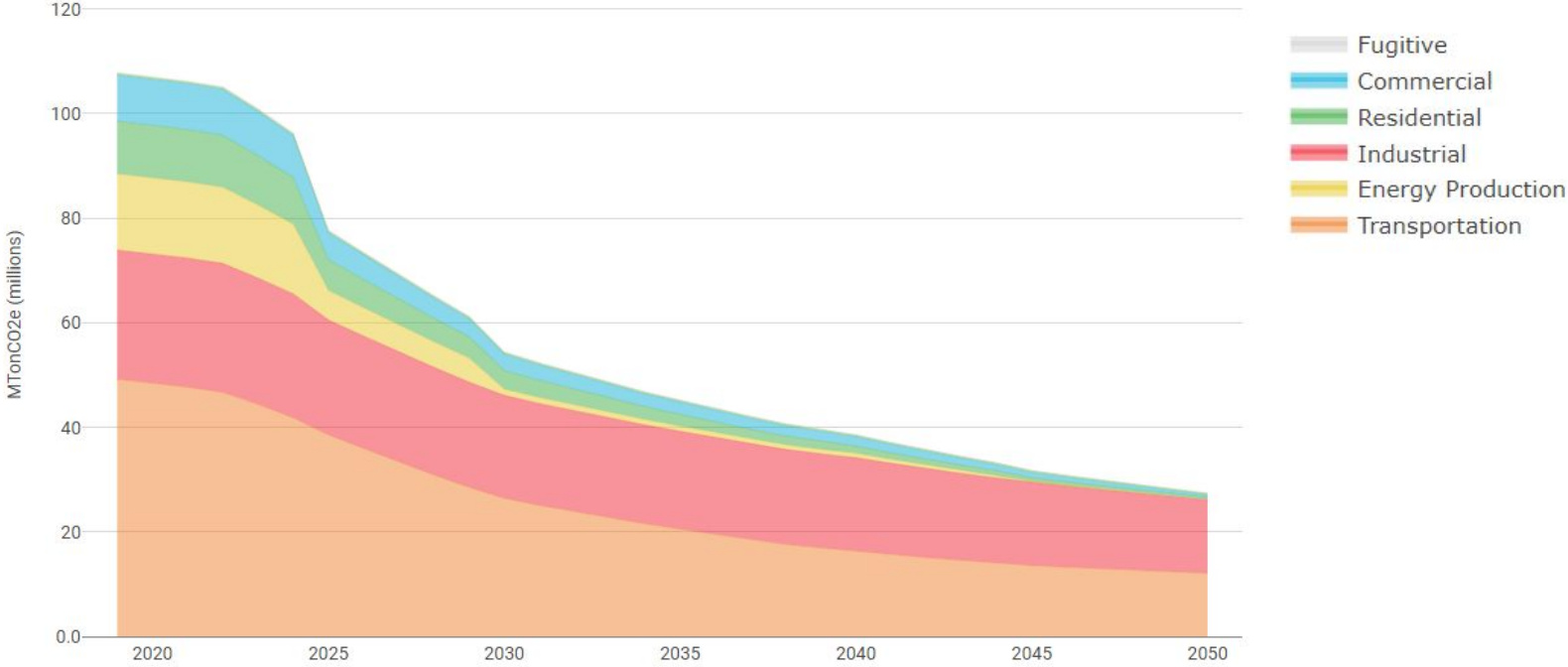
BAP Results Updates - Oct. 4, 2022

- The BAP was updated after the second DAG meeting on September 7, 2022.
- Facilities emission data from EPA GHGRP was used to better allocate industrial energy use and emissions to sub-sectors.
- Industrial process emission data from EPA GHGRP data was added.
- Emissions from still gas at refineries were added.
- Emissions from electricity were corrected to include emissions from out-of-state generation.
- Modeled CCA impact was refined to reflect sectors not covered by CCA
 - Excluded facilities with less than 25,000 tonne emissions
 - Excluded marine and aviation emissions
 - Excluded agricultural businesses
- The following slides present the revised graphs

BAP Results - Overall Emission (revised)

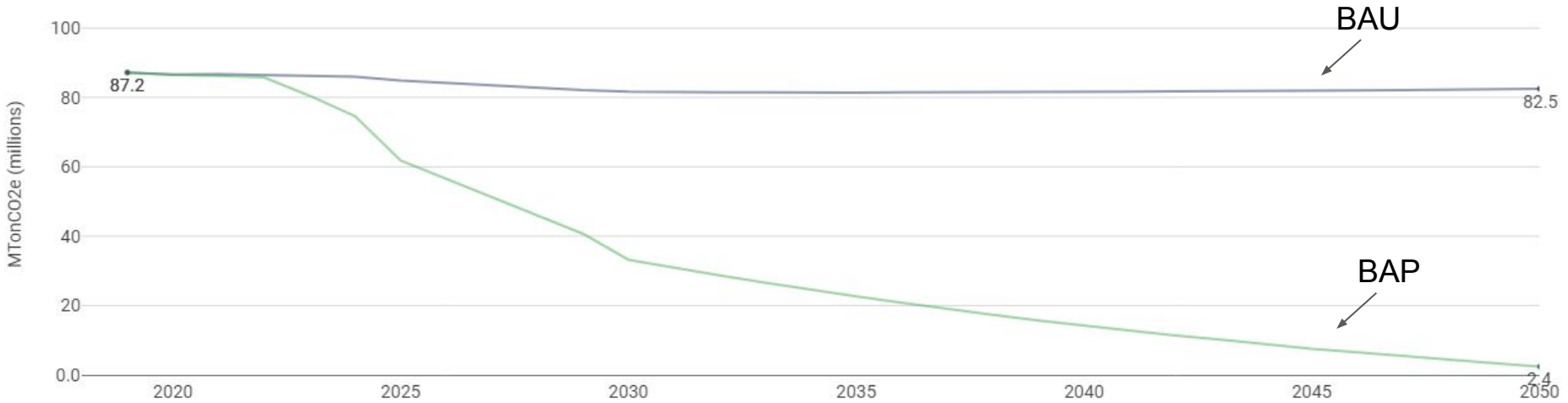


BAP Results - Emission By Sector (revised)

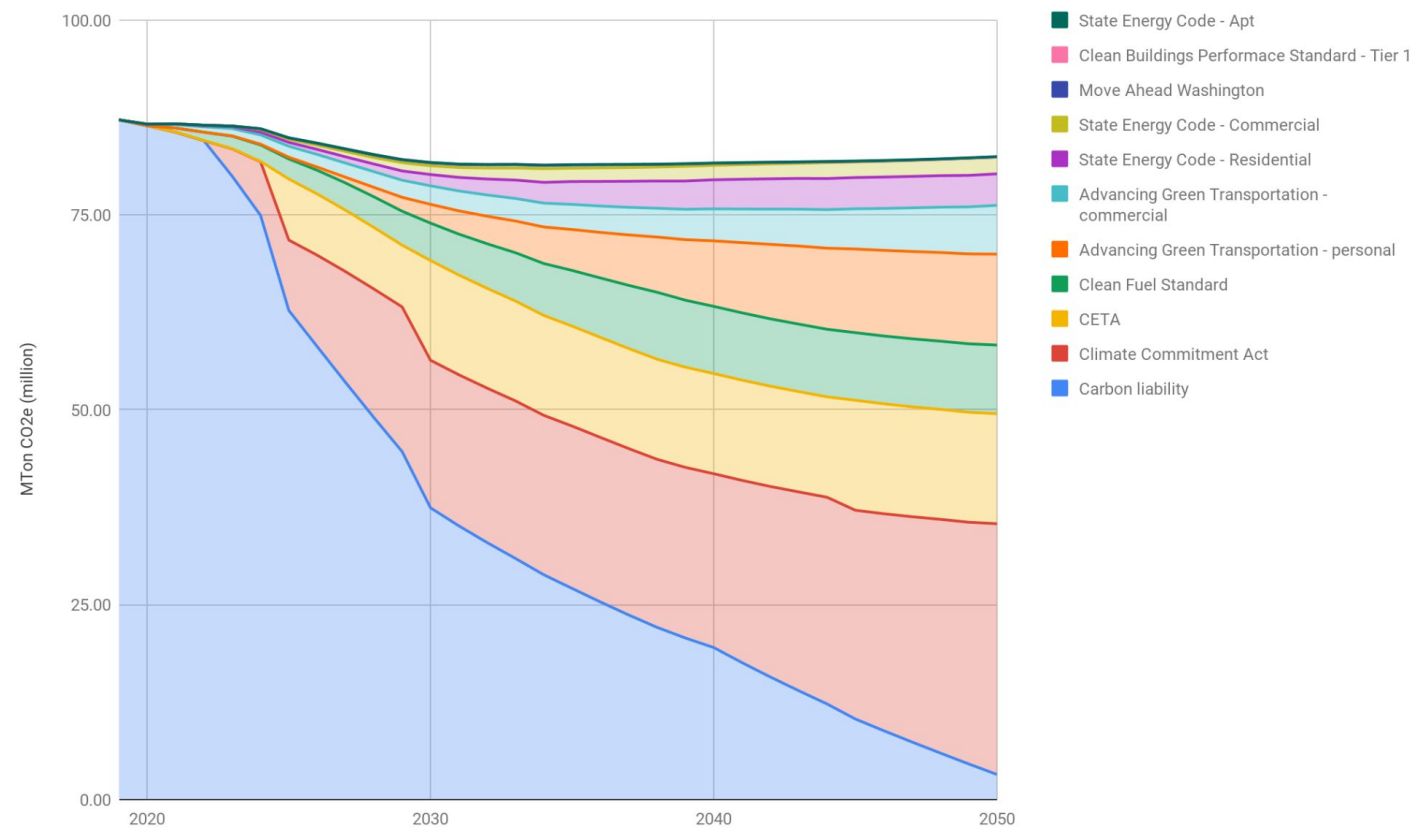


BAP Results Presented on Sept. 7

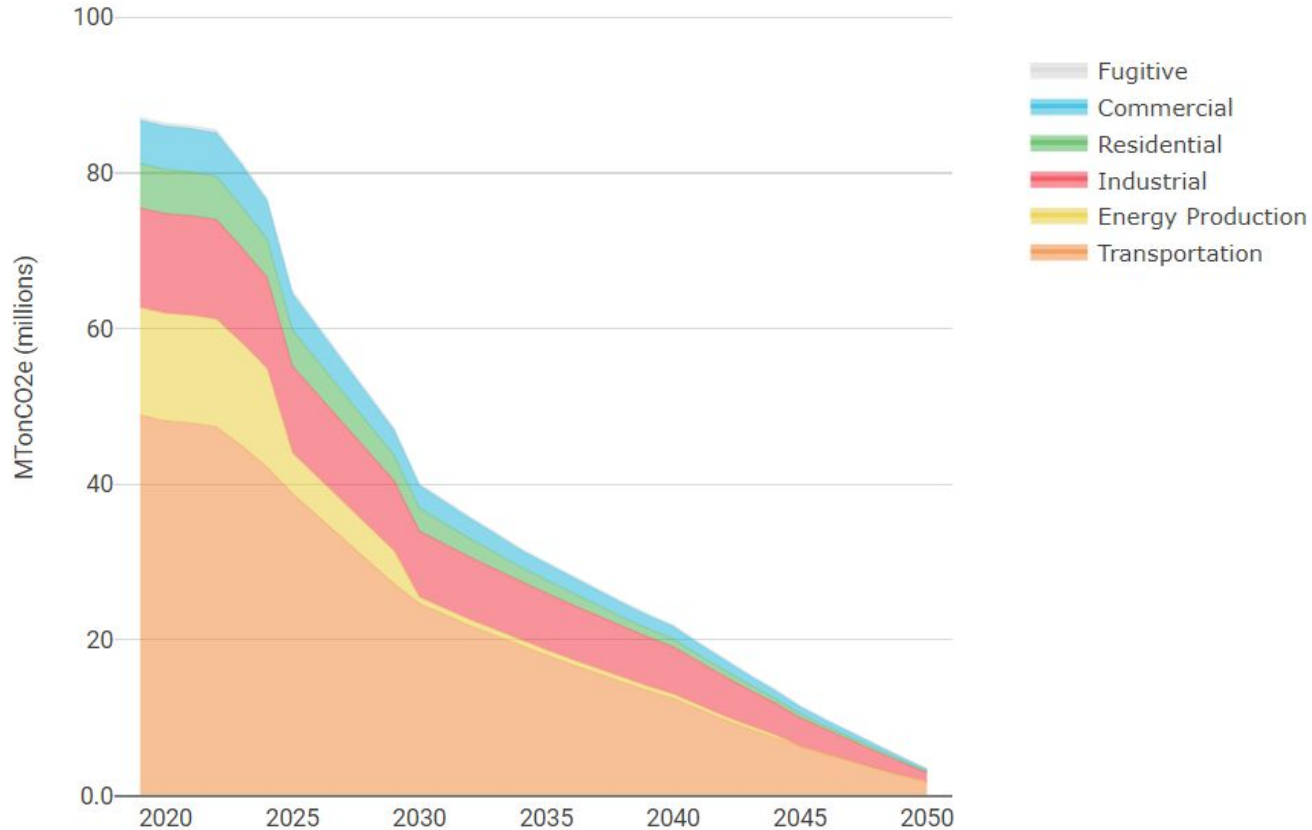
BAP Results - Overall Emission - Sept. 7 draft



BAP Results - Emission Wedges - Sept. 7 draft



BAP Results - Emission By Sector - Sept. 7 draft



BAP Q&A

Decarbonization Scenarios

What is Scenario?

- A possible future
 - It need not be desirable, thus it is not a vision.
 - It need not be likely, thus it is not a forecast.
- Emphasizes a process of change, not just a point in the future.

Characteristics

- Plausible description of a future
- Relevant to the key strategic issues and decisions at hand
- Challenging to today's conventional wisdom
- Divergent from each other
- Balanced

Scenario Development

1

Identification

2

Defining
scenarios

3

Setting
parameters

Senate Bill 5092, section 143 requirements

The examination must identify and consider:

“(i) How natural gas utilities can decarbonize;

(ii) The impacts of increased electrification on the ability of electric utilities to deliver services to current natural gas customers reliably and affordably;

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(iv) The impact on regional electric system resource adequacy, and the transmission and distribution infrastructure requirements for such a transition;

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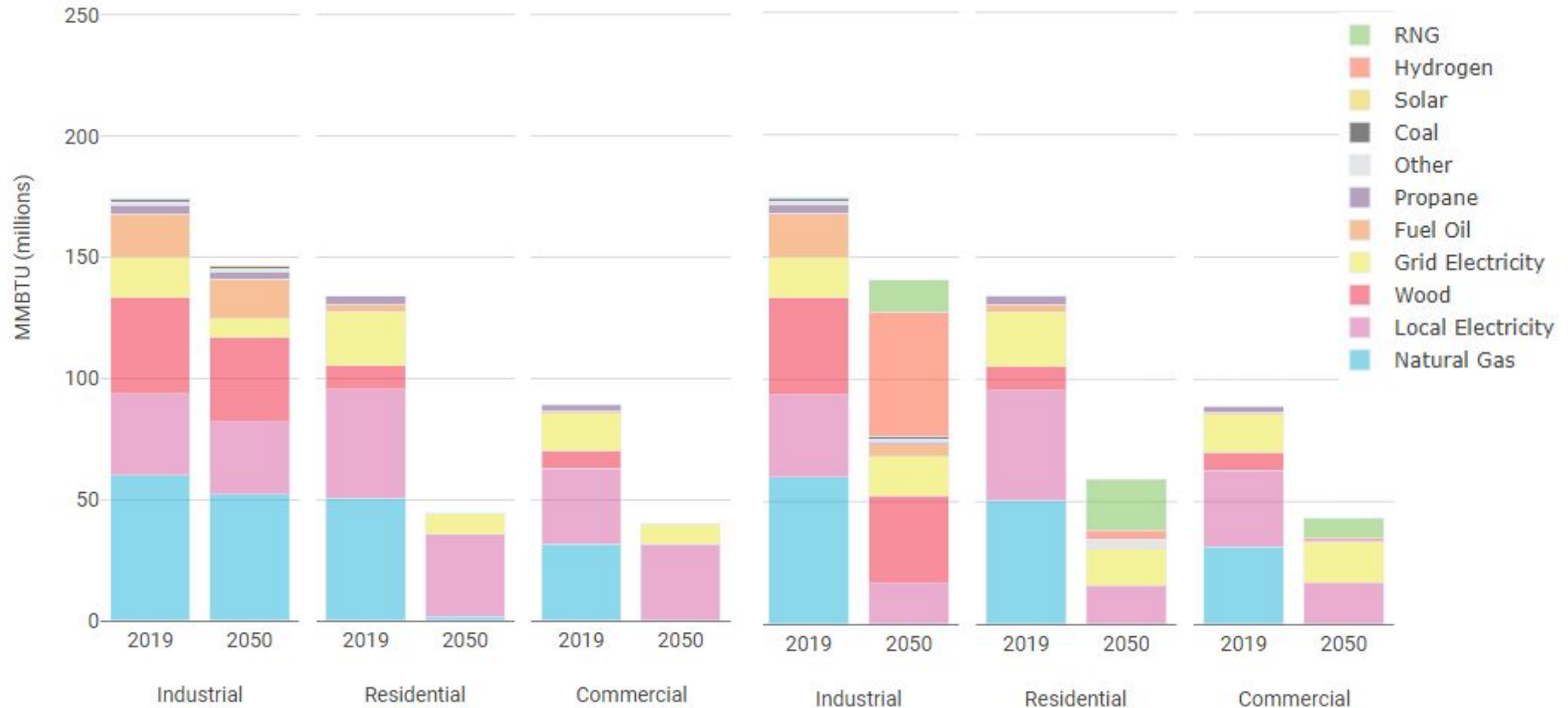
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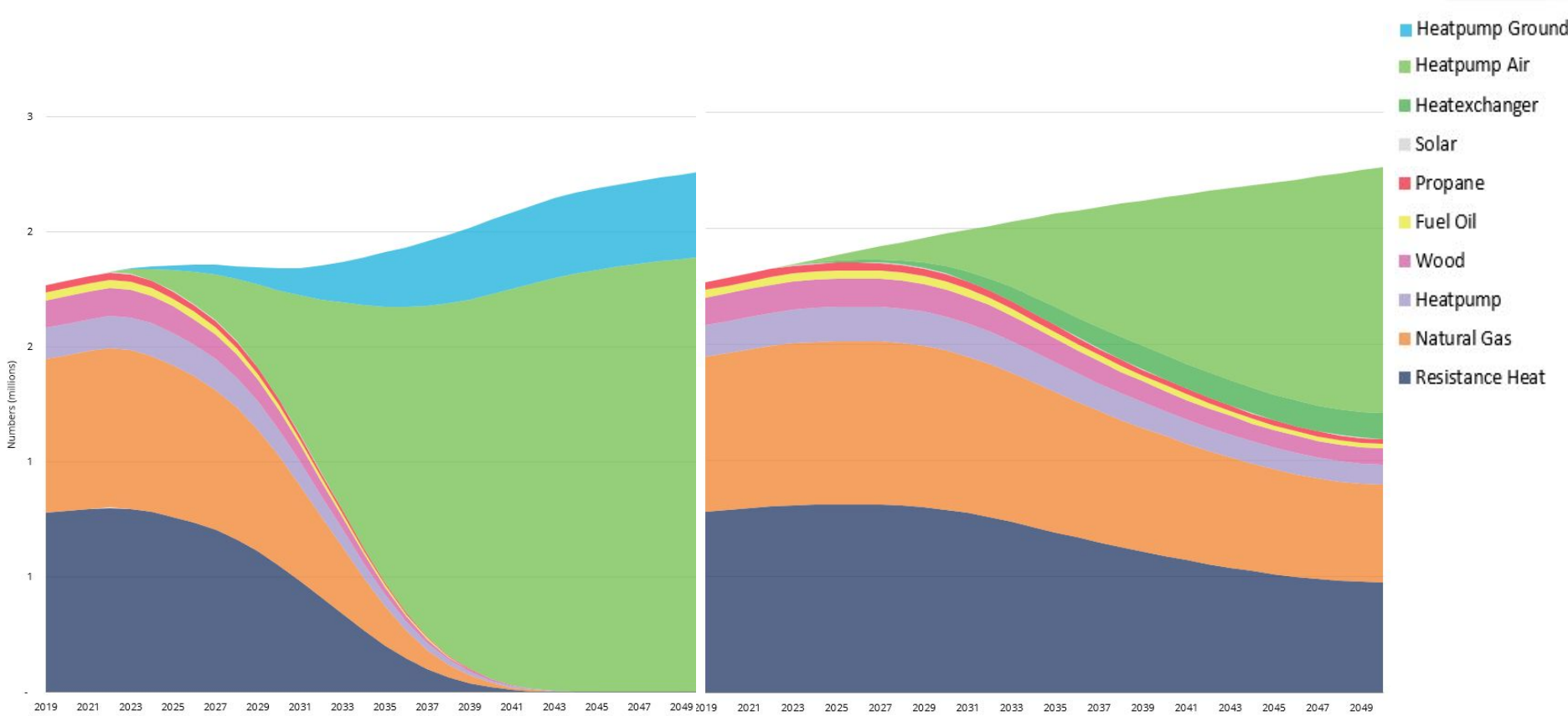
How Do We Use Scenarios?

- Design scenarios that reduce emissions to meet target
- Quantify how scenario achieves emissions reductions
 - Electricity demand (annual and peak) that must be met with renewable generation
 - In-state renewable generation, imports, exports
 - Natural gas demand that must be met with RNG, synthetic methane, or hydrogen
 - In-state alternative fuel production, imports, exports
 - Demand response
 - Energy storage
- Compare scenarios relative to BAP based on
 - Demand-sector costs
 - Energy production costs
 - Electricity-transmission capacity used
 - Electricity-generation resource adequacy
 - Non-financial equity considerations

Examples of scenarios - Energy Use by Sector/Fuel



Examples of scenarios - Heat System Types



Megatrends: Demographic Trends

- Washington is growing fast
- Urbanizing and suburbanizing
- Ethnically and racially diversifying
- Benefits of growth not equitably distributed or experienced



Megatrends: Economic Shifts

- Pandemic recovery and the new normal
- WA companies lead on sustainability
- On the horizon: decarbonizing industry



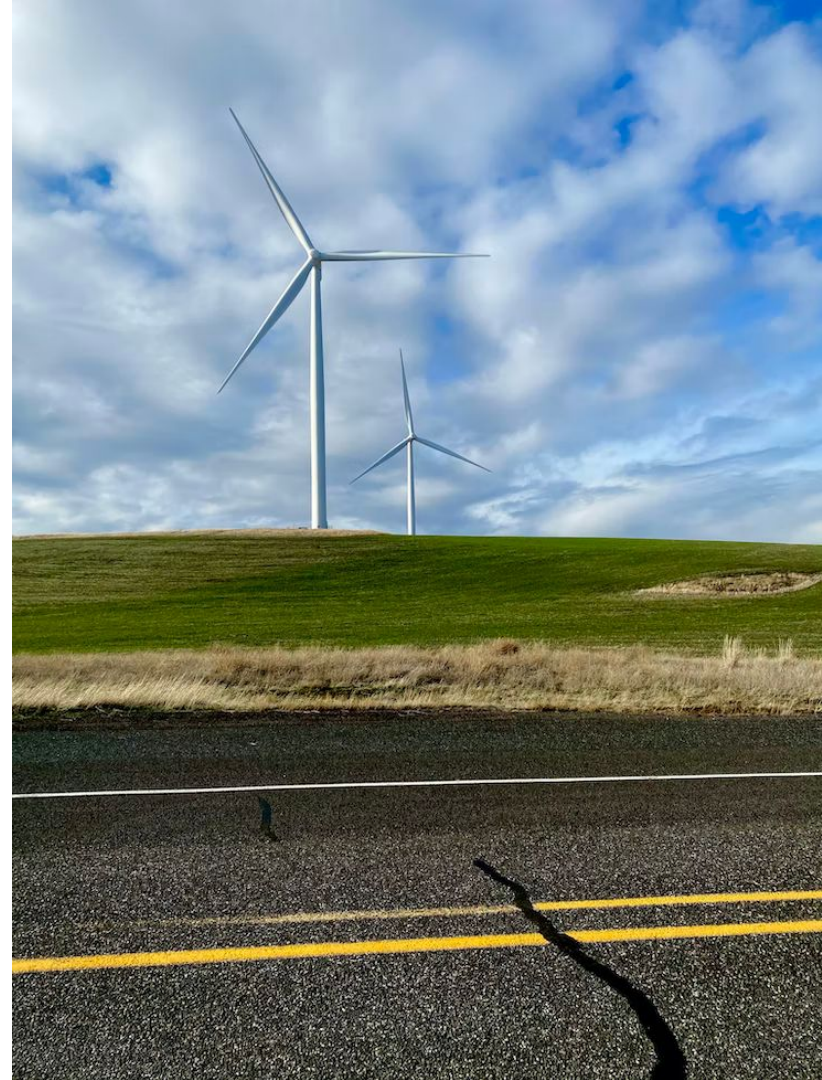
Megatrends: Buildings and Energy Efficiency

- Reduce energy use, then switch fuels
- Revised energy codes will reduce energy demand of new buildings
- Building performance standards will reduce energy demand of existing buildings
- Increased demand management tech and distributed energy production



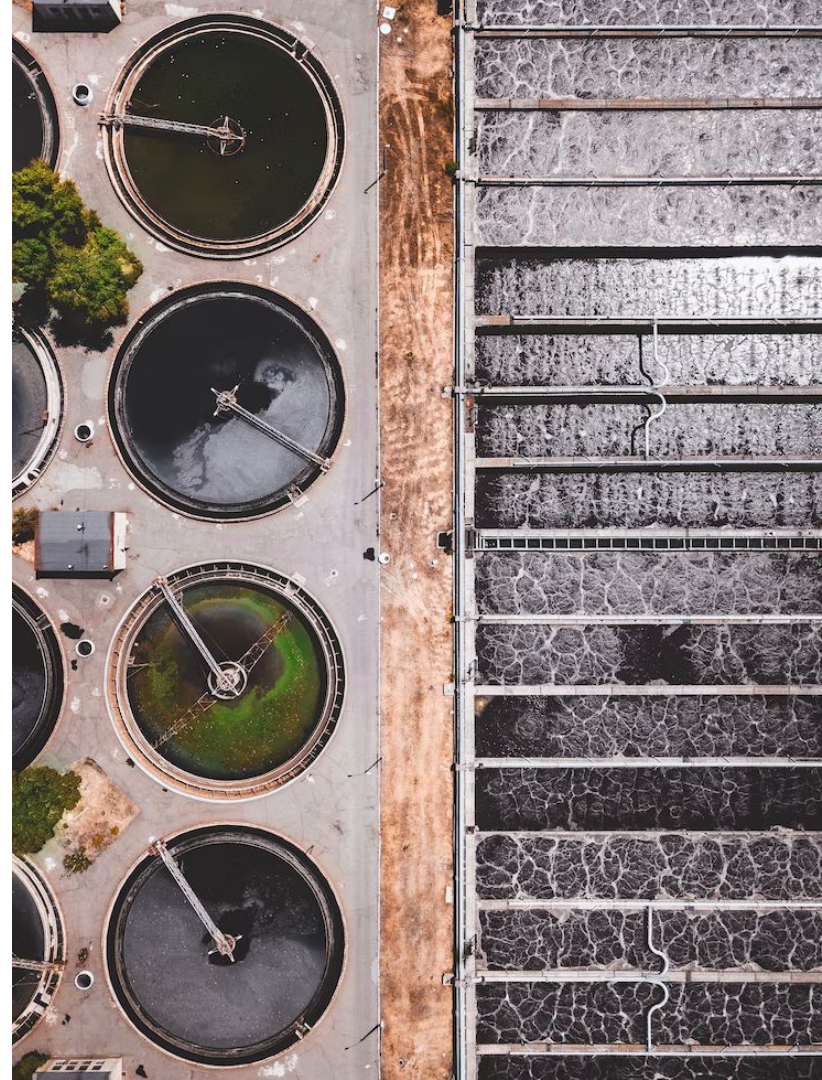
Megatrends: Renewable Energy

- Renewables continue to decrease in price, with some pandemic setbacks
- Renewable electricity production expected to soar with state and federal support, day-ahead market
- Siting renewable energy projects will be politically challenging
- Transmission capacity restraints remain big challenge



Megatrends: Alternative Fuels

- Hydrogen, biomethane (renewable natural gas), synthetic methane, biofuels (ethanol, biobutanol, alternative jet fuel, algal oil, etc.) production rising with state and federal support
- 3-5% RNG blend possible using only in-state feedstocks, but expensive
- Local hydrogen production could accelerate with more fed. support



Megatrends: Mobility

- Public transit ridership down, private vehicle use up
- Transit and government fleets electrifying due to state and federal funds
- Active modes increasing and shared mobility here to stay
- Electric vehicles slowly increasing in popularity for light-duty use; ambitious goals but low supply



Common Actions

Energy Efficiency

Maximum mode shifting

Shift to higher density residences in urban zones

Deep retrofits in the building stock

Passive House Standard Energy Code for New Buildings

Efficiency improvements in the building stock

Efficiency improvements in industry

Carbon storage and sequestration

Low-Carbon Scenarios

Electrification	Alternative Fuels
Rapid electrification of existing and commercial heating systems	Natural gas in existing residential and commercial heating systems replaced by natural gas heat pumps
Electrification of appliances in residential and commercial buildings	Adoption of hydrogen into residential homes
Deployment of decentralized solar PV and storage	Clean hydrogen and RNG in the natural gas grid
Increased electrification of commercial transportation	Clean hydrogen and CRNG used in a greater share of commercial transportation
Electrification of some industrial processes	Industrial processes use clean hydrogen, RNG and other fuels

Low-Carbon Scenarios

Electrification	Alternative Fuels
Renewable electricity import fraction	In-state production of RNG
Utility-scale battery storage	In-state production of synthetic methane
	In-state production of green hydrogen

Setting Parameters

Install heat pumps for heating system in existing residential buildings

Electrification	Alternative Fuels
Target <u>100%</u> of existing buildings <u>80%</u> electric air source <u>20%</u> electric ground source By <u>2040</u>	Target <u>100%</u> of existing buildings using natural gas <u>100%</u> natural gas air source By <u>2040</u>

Next Steps

1. Model low-carbon scenarios
2. Financial analysis
3. Co-benefits/equity analysis

Common Actions - Both Scenarios

Action	Specification
Deep retrofits in the building stock	Retrofit 95% of existing buildings by 2040 to achieve a 50% reduction in space heating/cooling and other non water heating energy use
Efficiency improvements in industry	Improve the energy efficiency of industrial facilities not covered by CPP to achieve a 50% reduction in energy use by 2050
Maximum mode shifting	Transfer 10% personal-use vehicle trips to electric micro-mobility (e.g., e-bike/e-scooter) in urban counties by 2035
Shift development to higher density residences in urban zones	Fraction of single new builds to be reduced to 25% of new buildings in counties with high urban density by 2040
Carbon storage and sequestration	Deploy sufficient carbon storage and sequestration to offset remaining emissions in excess of GHG target
Passive House standard energy code for new buildings	Set minimum energy standards for new buildings to reach Passive House standards starting in 2035

Electrification - Demand Side Actions

Action	Specification
Rapid electrification of existing residential and commercial heating systems	<ul style="list-style-type: none">● Install 100% electric heat pumps in existing residential buildings by 2040● Install 100% electric hot water heat pumps in existing residential buildings by 2040● Install 100% electric heat pumps in existing commercial buildings by 2040● Install 50% electric hot water heat pumps in existing commercial buildings by 2043
Electrification of new appliances in residential and commercial buildings	<ul style="list-style-type: none">● 100% new appliance sales electric by 2035 in residential buildings● 100% new new appliance sales electric by 2035 in commercial buildings
Commercial use vehicles up take mainly electric	<ul style="list-style-type: none">● 100% Classes 2b–3 trucks electric (vans, medium pickup trucks)● 90% Classes 4–8 trucks electric (delivery trucks, delivery/service vans, lighter truck tractors, bucket trucks)● 80% Class 8 truck tractors electric
Electrification of some industrial processes, clean hydrogen and RNG for the remainder	<ul style="list-style-type: none">● Deploy electricity in industries - replace 70% fossil fuels with electricity by 2050

Electrification - Demand Side Actions

Action	Specification
Deployment of decentralized solar PV and storage	<ul style="list-style-type: none">• Enable distributed energy resources - 24.7 TWh of rooftop solar PV generation by 2035• Enhance energy storage - Add storage capability to 25% of residential non-apartment building stock by 2035, assume each storage unit is specified to 14 kWh
Renewable electricity imports	<ul style="list-style-type: none">• Import sufficient renewable electricity to meet X% electricity demand within the state
Deployment of utility-scale battery storage	<ul style="list-style-type: none">• Add 10,000 MW of utility storage capacity

Alternative Fuels - Demand Side Actions

Action	Specification
Natural gas in existing residential and commercial heating systems replaced by natural gas heat pumps	<ul style="list-style-type: none">• Install 100% electric & natural gas heat pumps in existing residential buildings by 2040• Install 100% electric & natural gas hot water heat pumps in existing residential buildings by 2040• Install 100% electric & natural gas heat pumps in existing commercial buildings by 2040• Install 50% electric & natural gas hot water heat pumps in existing commercial buildings by 2040
Clean hydrogen and RNG in the natural gas grid	<ul style="list-style-type: none">• New round of standards for appliances and equipment beyond those codified in 2021 - 15% hydrogen injected into the natural gas distribution system by 2035• Use full RNG potential of 87.5 tBTU by 2050
Adoption of hydrogen into residential homes	<ul style="list-style-type: none">• Deploy clean hydrogen fuel cells for homes - 5% of homes will have hydrogen fuel cell by 2030

Alternative Fuels - Demand Side Actions

Action	Specification
Clean hydrogen and CRNG used in a greater share of light duty and heavy duty commercial vehicles	<ul style="list-style-type: none">• 100% Classes 2b–3 trucks - 80% EV, 20% ZEV (vans, medium pickup trucks)• 90% Classes 4–8 trucks - 50% EV, 50% ZEV (delivery trucks, delivery/service vans, lighter truck tractors, bucket trucks)• 80% Class 8 truck tractors - 20% EV, 80% ZEV
Industrial processes use clean hydrogen, RNG and other fuels	<ul style="list-style-type: none">• Deploy green hydrogen and RNG in industries - 70% Hydrogen/RNG adoption by 2050

Alternative Fuels - Demand Side Actions

Action	Specification
In-state production of RNG	<ul style="list-style-type: none">• Produce sufficient RNG to provide X% of RNG demand within the state
In-state production of synthetic methane	<ul style="list-style-type: none">• Produce sufficient synthetic methane to provide X% of demand within the state
In-state production of clean hydrogen	<ul style="list-style-type: none">• Produce sufficient hydrogen to provide X% of hydrogen demand within the state