
2019 TAG Meeting #6:

Review of Clean Energy Transformation Act,
scenarios and sensitivities, upstream gas
emission methodology



Welcome

- Safety message
- Introductions
- Opening remarks
- Action items review

Meeting objectives

- PSE and TAG members review and discuss an overview of the Clean Energy Transformation Act
- TAG members provide input on IRP modeling framework of the Clean Energy Transformation Act
- PSE and TAG members discuss upstream gas emission methodology

Action items from prior IRPAG and TAG meetings



Open action items from previous IRPAG and TAG meetings

Action item #	Description (and meeting reference)	PSE action	Status
1	Identify contact for PSE's carbon reduction goals. (IRPAG #1, May 30, 2018)	PSE will include a listening session at the May 22, 2019 IRPAG meeting #3.	In progress
2	Include carbon impact in scenarios or sensitivities. (IRPAG #1, May 30, 2018 and TAG #2, October 11, 2018)	PSE will model various carbon impacts.	In progress
3	Investigate converting the gas emission rate to a percentage. (TAG #2, October 11, 2018 and TAG #3, December 6, 2018, and January 9, 2019)	PSE will include gas emission rate as a percentage and details on methodology in the draft IRP and final IRP. PSE will consider distributing the details before the draft.	In progress*



Note: * denotes items that will be included in the draft and final IRP; other items can be found in the appendix

Open action items from previous IRPAG and TAG meetings

Action item #	Description (and meeting reference)	PSE action	Status
4	Provide a description of the difference between the 2017 and 2019 combined heat and power potential prior to the May 15, 2019 Draft IRP. (TAG #3, December 6, 2018)	PSE will provide the description by March 29, 2019.	Complete
5	Follow up with a TAG member regarding posting communication received prior to the revision of TAG guidelines. (TAG #3, December 6, 2018, TAG #4, January 9, 2019)	Irena Netik reached out to the TAG member by phone and the communication identified will be posted to www.pse.com/irp .	Complete
6	Consider methodology for posting TAG questions and answers publicly. (TAG #4, January 9, 2019)	PSE is still considering this request and developing a proposal for a communication approach.	In progress

Open action items from previous IRPAG and TAG meetings

Action item #	Description (and meeting reference)	PSE action	Status
7	Include E3's regional resource adequacy study at a future TAG meeting. (TAG #4, January 9, 2019)	Resource adequacy was discussed at TAG #5 on February 7, 2019 and will include E3's regional resource adequacy study.	Complete
8	Host a presentation on the Energize Eastside project and invite TAG members. (TAG #4, January 9, 2019)	The presentation has been added to the agenda to TAG #7 on August 6, 2019.	In progress
9	Consider providing an energy efficiency dialogue around policy and implementation of energy efficiency. (TAG #4, January 9, 2019)	This dialogue has been added to the agenda to TAG #7 on August 6, 2019.	In progress

Open action items from previous IRPAG and TAG meetings

Action item #	Description (and meeting reference)	PSE action	Status
10	Convert the gas planning standard into the electric planning standard equivalent. (TAG #4, January 9, 2019)	PSE reconsidered this request and instead will be highlighting the differences in the standards at TAG #5.	Complete
11	Finalize meeting notes from TAG #4. (TAG #4, January 9, 2019)	PSE distributed meeting notes on January 23; stakeholders provided feedback by January 30; PSE posted the final meeting notes to www.pse.com/irp on February 6, 2019.	Complete

Open action items from previous IRPAG and TAG meetings

Action item #	Description (and meeting reference)	PSE action	Status
12	PSE will develop a graph of LOLP by month and will distribute it to the TAG.	PSE distributed to TAG members and posted on www.pse.com/irp .	Complete
13	PSE will consider evaluating the ELCC of longer storage batteries.	PSE distributed to TAG members and posted on www.pse.com/irp .	Complete
14	Finalize meeting notes from TAG #5. (TAG #5, February 7, 2019)	PSE distributed meeting notes on February 21; stakeholders provided feedback by February 28; PSE posted the final meeting notes to www.pse.com/irp on March 7, 2019.	Complete

Washington Clean Energy Transformation Act



Clean Energy Transformation Act (CETA)

Signed into law on May 7, 2019

The Clean Energy Transformation Act requires utilities to:

2025: eliminate coal-fired resources from electric power supply

2030: carbon neutral energy supply

At least 80% non-emitting and renewable resources

Up to 20% alternative compliance options

2045: carbon free energy supply

100% non-emitting and renewable resources

Additional provisions

- Electric utilities shall use the social cost of greenhouse gas emissions when developing IRPs and clean energy action plans.
- The law also includes:
 - Safety and reliability protections
 - Customer protections

What does this mean for PSE?

- Conservation: expand PSE's conservation programs to our customers
- Coal: remove coal from PSE's energy supply portfolio
- Resources: acquire significant amounts of non-emitting and renewable resources
- Transmission: begin developing new transmission corridors to renewable energy zones

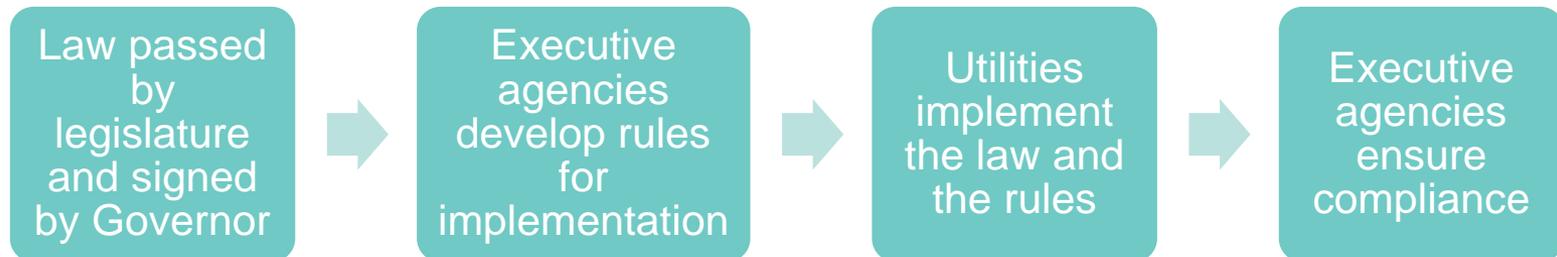
Rules governing IRPs

WAC 480-100-238 (electric) and 480-100-238 (gas)

"Integrated resource plan" means a plan describing the **mix of energy supply resources and conservation that will meet current and future needs at the lowest reasonable cost to the utility and its ratepayers.**

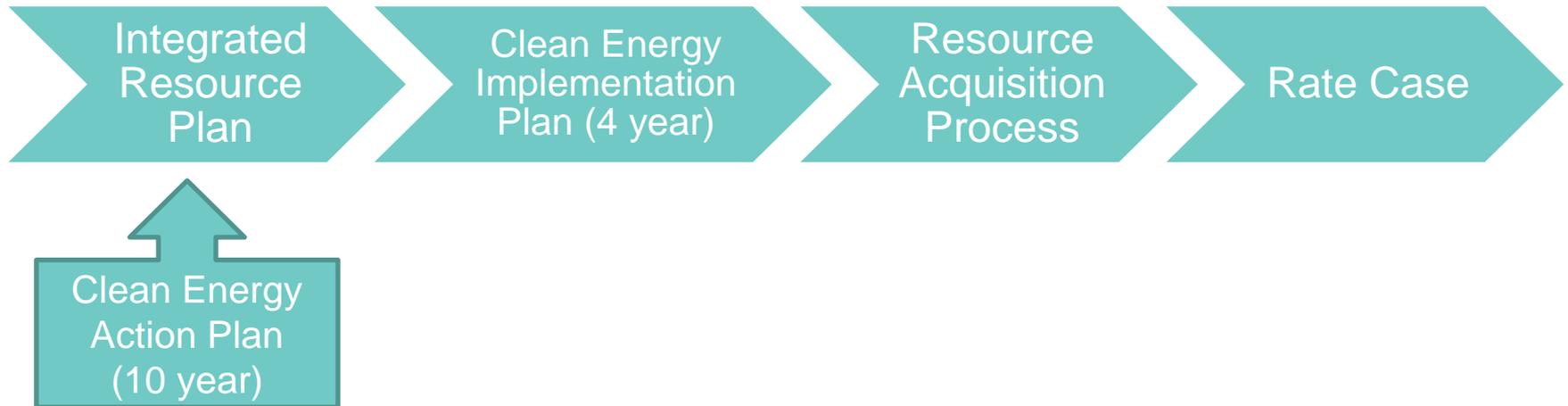
RCW 19.280.030

Requirements of a resource plan developed in the Integrated Resource Plan.



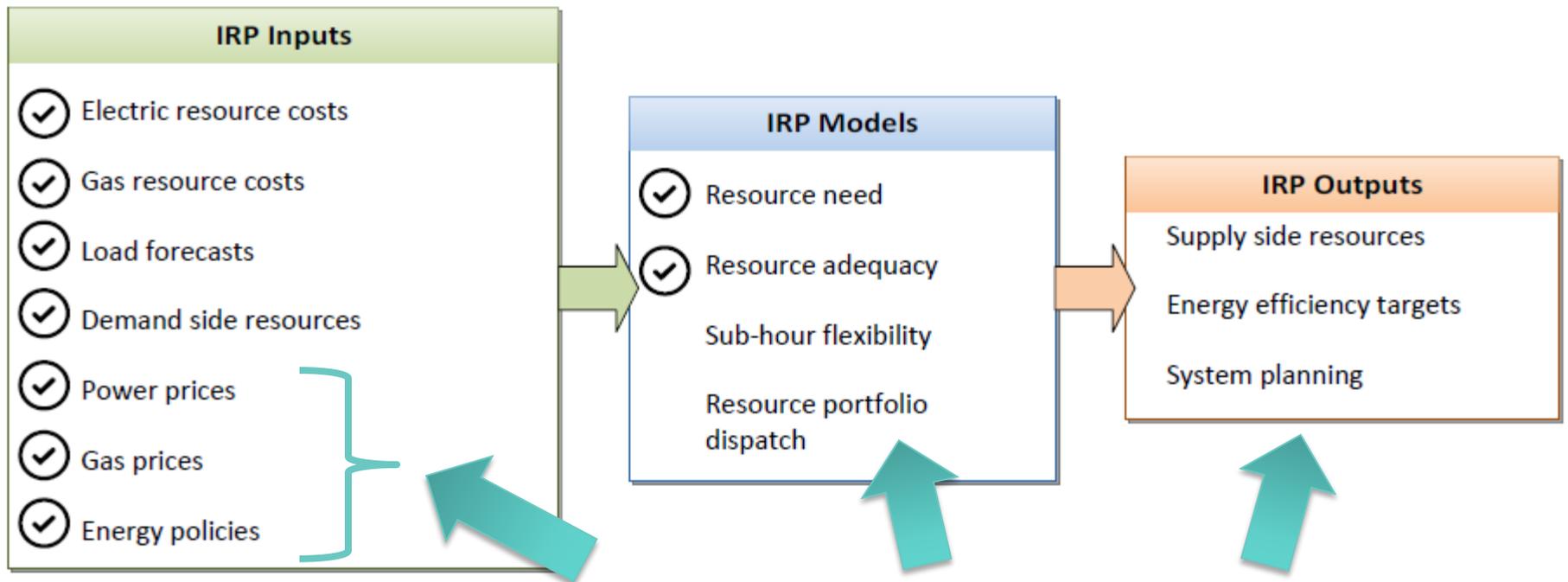
IRP's role in the regulatory process

Clean Energy Transformation Act changes the role of the IRP:



IRP analytical process overview

- PSE has established an analytical framework to develop its **20-year forecast of demand side resources and supply side resources** that appear to be cost effective to meet the growing needs of our customers.



Planning horizons

By end of **2025: Eliminate coal-fired resources** from electric power supply mix (Section 3)

By January 1, **2030: carbon neutral energy supply** (Section 4)

- Use renewable and non-emitting resources to meet at least 80% of retail electric load
- Use alternative compliance options to meet up to 20% of retail electric load
- Pursue all cost-effective, reliable, and feasible conservation
- Measured over four compliance periods: 2030-2033; 2034-2037; 2038-2041; 2042-2044

By January 1, **2045: 100% carbon free energy supply** (Section 5)

Eligible resources

- All cost-effective, reliable and feasible **conservation**
- **Non-emitting resources:** energy, capacity or ancillary services without emitting greenhouse gas as a by-product (Section 2 (28)(a))
 - New large scale hydro is not included, except for pumped storage (Section 4 (1)(d))
- **Renewable resources:** water (hydro), wind, solar, geothermal, renewable natural gas, wave, ocean, or tidal power, renewable hydrogen, certain biodiesel and biomass (Section 2 (34))

Compliance options

Section 4 (1)(b)

- (i) Alternative compliance payment (Section 9)
- (ii) Unbundled renewable energy credits (RECs)
 - No geographic limit
 - REC generated during four-year compliance period
- (iii) Energy transformation projects-defined in Section 2 (18)(b) with criteria developed by the Department of Ecology
- (iv) Municipal solid waste projects built prior to 1992

Cost cap compliance pathway

- Investments in renewable and non-emitting resources must be maximized to use for 2% annual increase in revenue for compliance (Section 6 (3)(a))

RCW 19.285 (renewable portfolio standard) remains in effect and counts toward compliance

Social cost of carbon

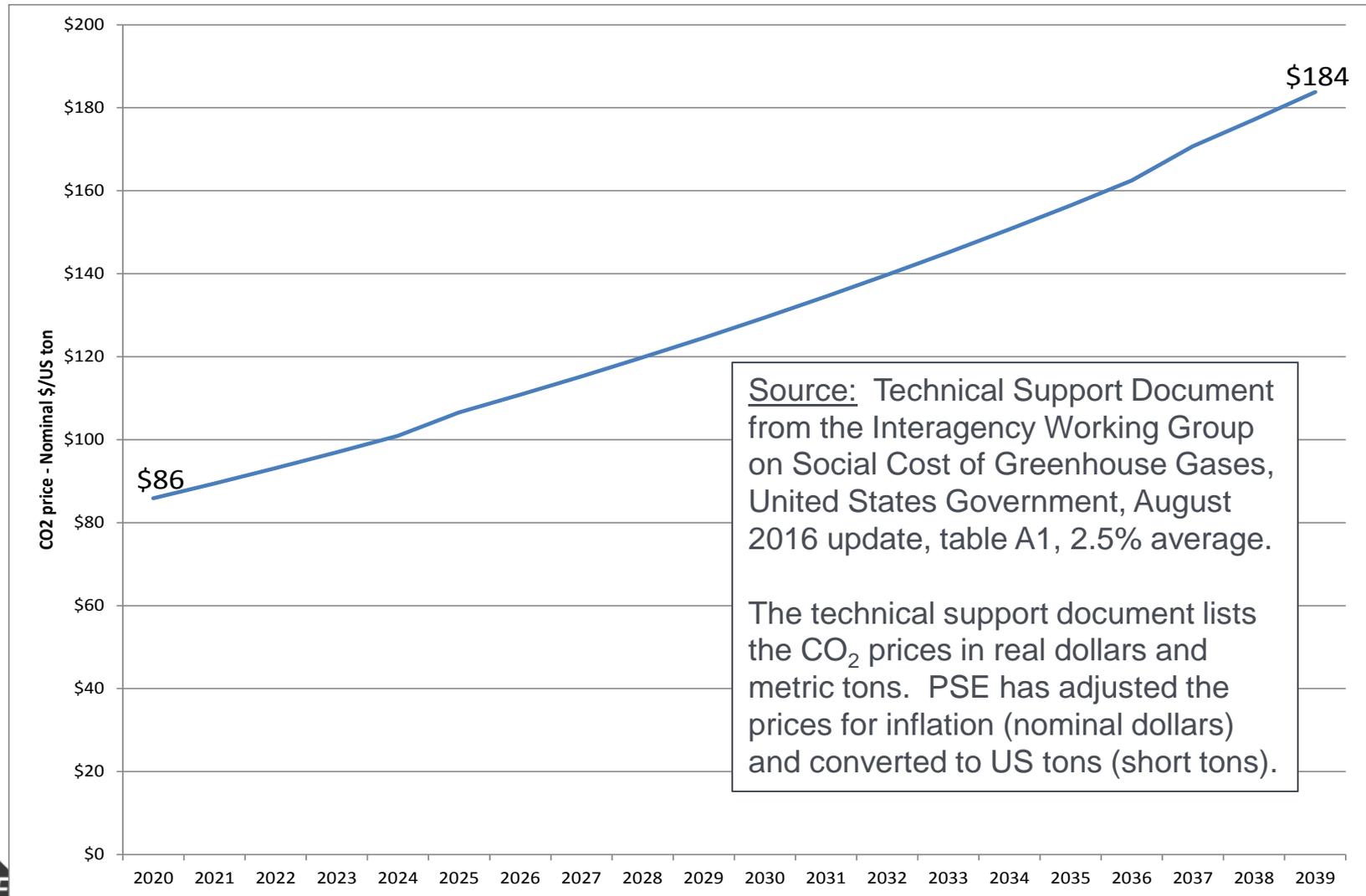
Set by the Interagency Working Group on Social Cost of GHG of the US government, August 2016 (Section 15)

Electric utilities shall consider the social cost of GHG emissions, when developing IRPs and clean energy action plans (Section 14)

- Conservation programs and targets
- Developing IRPs and clean energy action plans
- Evaluating and selecting intermediate and long-term resource options

Gas utilities required to use social cost of GHG in conservation planning under a separate bill (House Bill 1257, sections 11 & 15)

Social cost of carbon in Washington



Social cost of upstream emissions from natural gas: plan for 2019 IRP

Electric utility planning

- CETA does not include references to upstream emissions, but PSE will include

Gas utility planning

- HB 1257, section 15, requires upstream emissions for conservation planning, and PSE will also apply on supply side resource planning

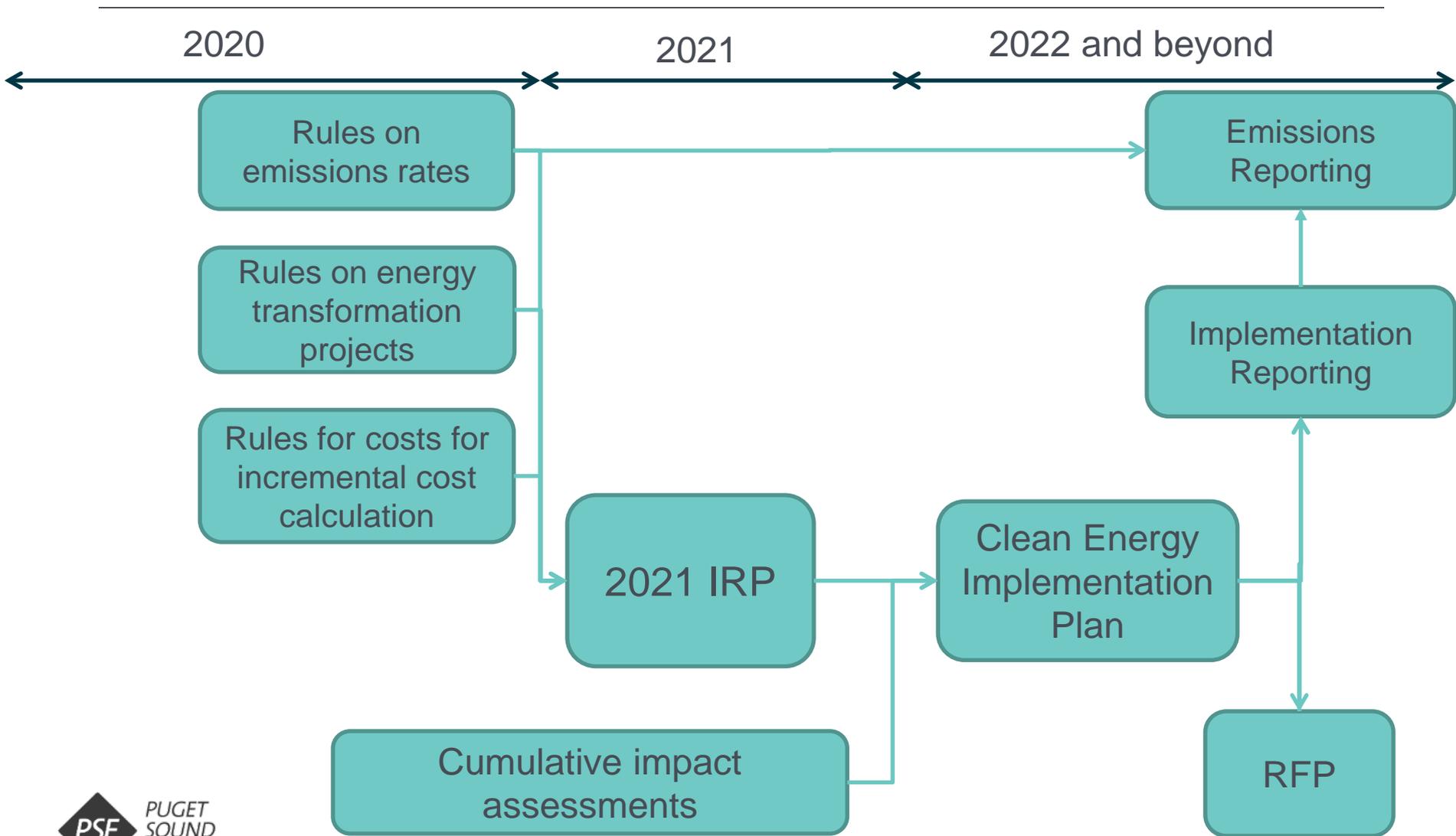
Key changes to the IRP laws

Numerous additions that include/clarify things we already do or things the commission already has authority to do

New items

- Vulnerable populations assessment (Section 14 (1)(k))
- Ten-year clean energy action plan (Section 14 (1)(l) and (5)(d))
 - Identify cost effective demand side & supply side resources
 - Including demand response and distributed resources
 - Establish a resource adequacy requirement
 - Identify expansions needed for bulk transmission and distribution
 - Identify extent to which a utility may need to rely on alternative compliance
- Social cost of carbon as a planning adder (Section 14 (3)(a))

Timeline for first clean energy plan



Lunch break



Scenarios and sensitivities with the Clean Energy Transformation Act



What is a market price scenario?

Market price scenarios are different sets of assumptions that create future power market conditions.

- Gas prices, carbon regulation and regional loads create different wholesale market power prices, which affect the relative value of different resources.
- Wholesale price forecasts developed using the AURORA model.
- This analysis models all major generators in the interconnected Western U.S., along with loads.

2019 IRP scenarios presented in the October 11, 2018 IRP TAG Meeting

Scenario	Demand	Gas Price	CO2 Price	Notes
1 Base + No CO ₂ Price Referred to as "Base + No CO ₂ "	Mid	Mid	None	Includes existing policies
2 Base + CO ₂ Fee	Mid	Mid	I-1631	CO ₂ fee applied across WECC
3 Base + Social CO ₂ Price Referred to as "Base + Social CO ₂ "	Mid	Mid	Social (\$42/metric ton – 2007\$)	CO ₂ price applied across WECC; cost of upstream emissions added to gas plants
4 Base + High Social CO ₂ Price Referred to as "Base + High Social CO ₂ "	Mid	Mid	High Social (\$62/metric ton – 2007\$)	CO ₂ price applied across WECC; cost of upstream emissions added to gas plants
5 Low	Low	Low	None	
6 High	High	High	High Social (\$62/metric ton – 2007\$)	CO ₂ price applied across WECC; cost of upstream emissions added to gas plants



Note: All scenarios account for all existing policies such as state RPS requirements, CA AB32, and BC CO₂ policy

2019 IRP electric & gas price scenarios

Electric & Gas IRP

Scenario	Demand	Gas Price	CO ₂ price
1. Base	Mid	Mid	Social Cost of Carbon in WA Upstream Natural Gas GHG
2. Low	Low	Low	Social Cost of Carbon in WA Upstream Natural Gas GHG
3. High	High	High	Social Cost of Carbon in WA Upstream Natural Gas GHG

Gas IRP only

Scenario	Demand	Gas Price	CO ₂ price
4. Base + CO2 Tax	Mid	Mid	Social Cost of Carbon in WA Upstream Natural Gas GHG Tax of \$15/ton + inflation

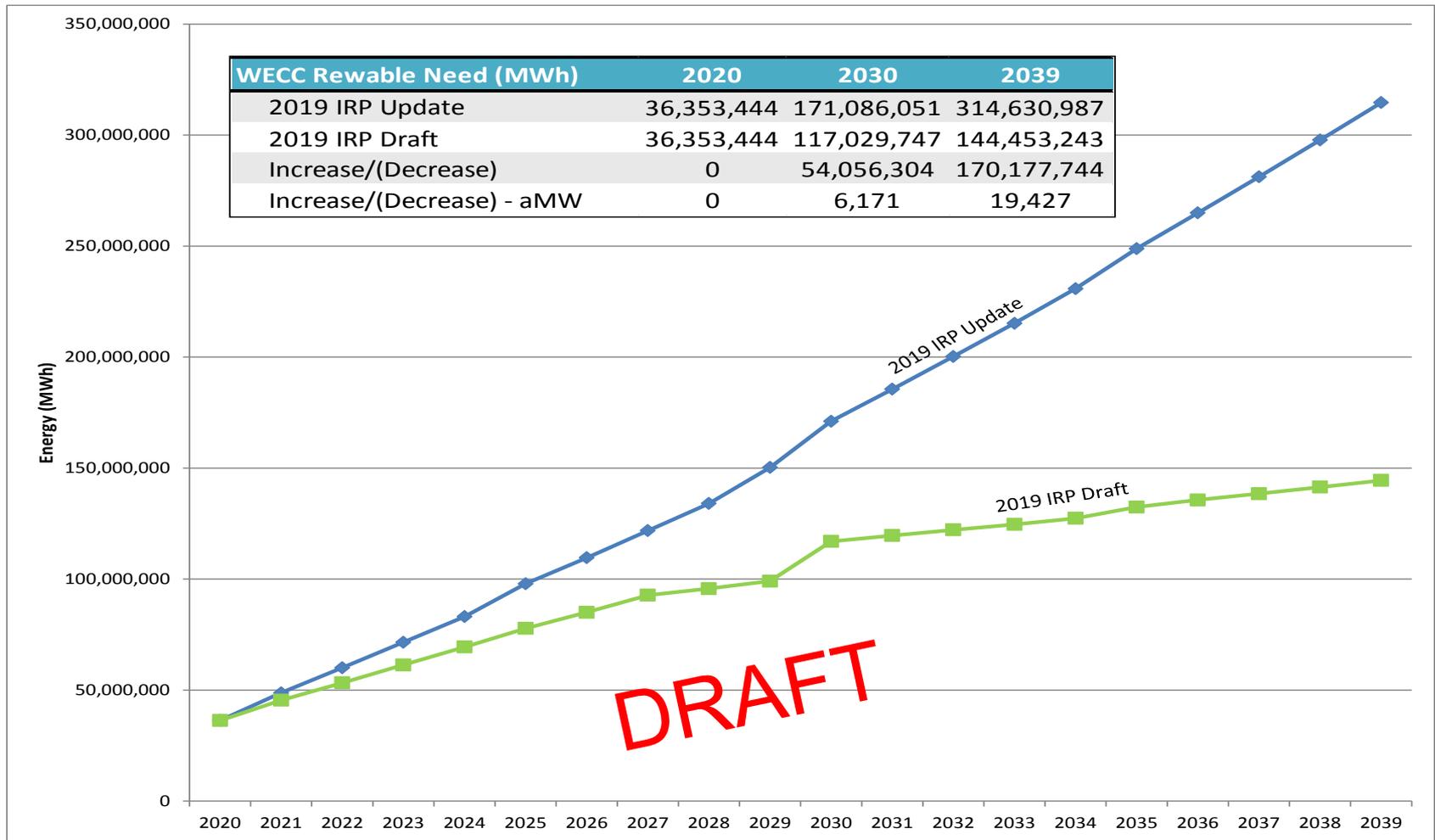
Modeling updates to the electric price forecast

- Social cost of carbon starting at \$86/US ton (nominal) in 2020 and growing to \$184/US Ton (nominal) in 2039 as a planning adder in Washington including upstream emissions on natural gas
- Gas Prices
 - Updated to Wood Mackenzie fundamental gas price forecast fall 2018, levelized \$3.50/MMBtu. Previously spring 2018 forecast, levelized \$3.74/MMBtu
- Renewable Portfolio Standard (RPS)/ Clean Electricity Standards
 - California Senate Bill (SB) 100 signed into law in September 2018
 - New Mexico SB 489 signed into law on March 22, 2019
 - Nevada SB 358 signed into law on April 22, 2019
 - Washington SB 5116 signed by Governor on May 7, 2019

RPS / Clean Energy Standards

State	RPS / Clean Energy Standards Goal in 2019 IRP Update	RPS Goal in 2019 IRP Draft
California	2045: 100% of retail sales must be renewable or carbon-free electricity	50% by 2030
Nevada	50% for calendar year 2030 and every year thereafter (must generate, acquire or save electricity from renewable energy systems) GOAL (not an RPS standard): 100% zero carbon dioxide emission resources by 2050	25% by 2025
New Mexico	100% zero carbon resources by January 1, 2045	20% by 2020
Washington	100% of sales to be greenhouse gas neutral by 2030 ➤ 80%: must be met by non-emitting/renewable resources State Policy: 100% of sales met by non-emitting/renewable resources by 2045	15% by 2020

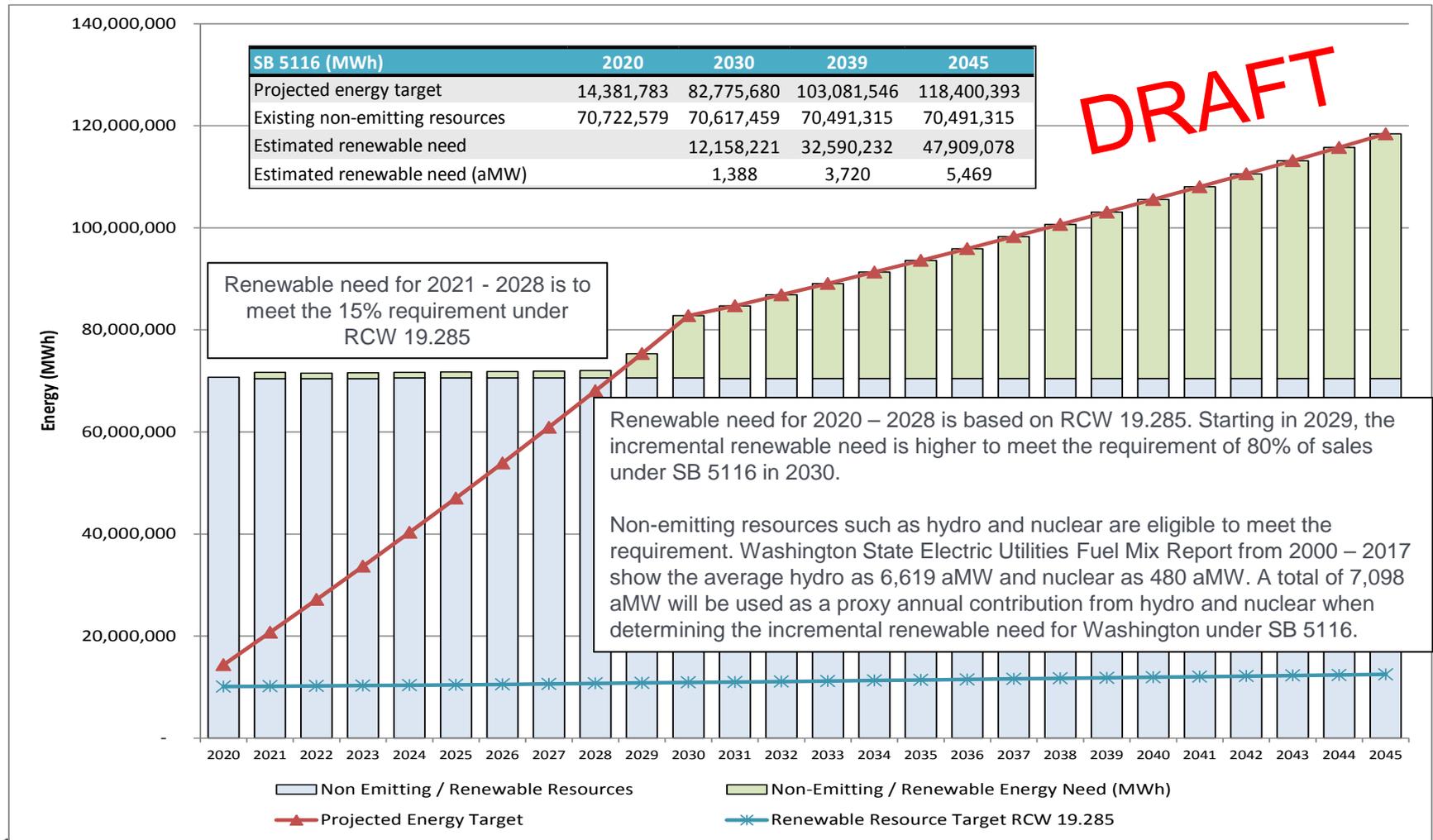
WECC Minimum Renewable Energy Needed for Compliance



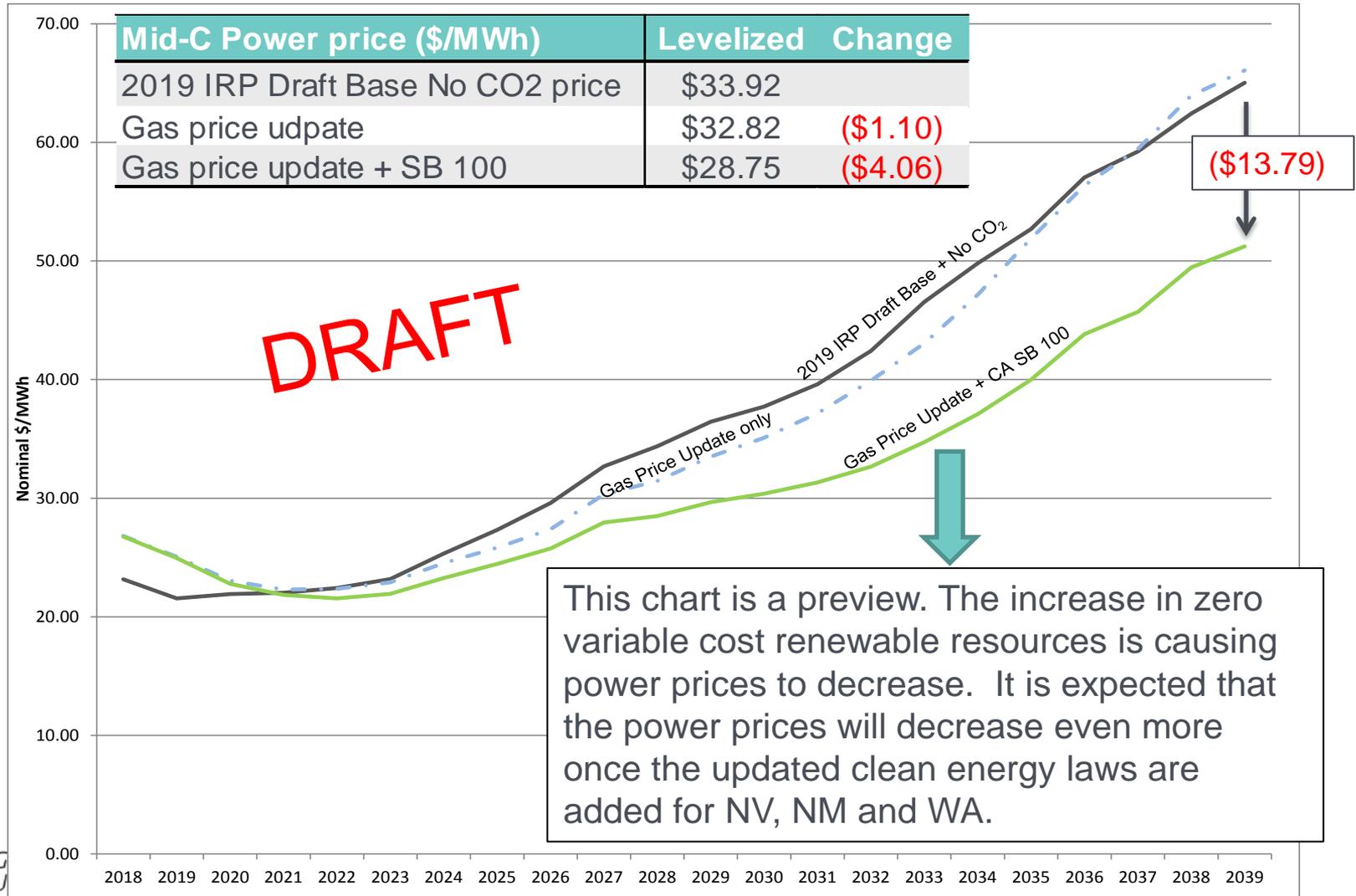
Washington RCW 19.285 vs. SB 5116

	RCW 19.285	SB 5116
Title	Energy Independence Act	Clean Energy Transformation Act
Requirement	15% of sales (delivered load) after conservation by 2020	At least 80% of sales (delivered load) after conservation met by renewable resources 2030 with up to 20% by alternative compliance
Qualifying resources	<u>Renewable resources:</u> Wind, solar, biomass, geothermal, landfill gas, wave, ocean, tidal, biodiesel, gas from sewage treatment, and incremental efficiency upgrades to existing hydro.	<u>Non-emitting resources:</u> Water (hydro), wind, solar, biomass, geothermal, wave, ocean, tidal, biodiesel, renewable hydrogen, renewable natural gas, and nuclear
Location of resource	PNW or delivered real-time	Not specified
Qualifying utility	Electric utility that serves more than 25,000 customers in Washington	All electric utilities serving customers in Washington
Notes		Must still be in compliance with RCW 19.285

Renewable energy needed in Washington to support Clean Energy Transformation Act



Draft power prices with update gas prices and CA SB 100



PSE's need for non-emitting renewable resource under the Clean Energy Transformation Act

PSE's estimated need for non-emitting and renewable energy by 2030

	MWh	aMW
2030 estimated sales before conservation	24,764,636	2,827
2017 IRP conservation *Just context: 2019 IRP will update conservation	3,419,807	390
Estimated sales net of conservation	21,344,829	2,437
80% of estimated sales net of conservation	17,075,863	1,949
Existing non-emitting resources *Assume normal hydro conditions and P50 wind & solar	6,257,523	714
Need for new non-emitting resources	10,818,340	1,235

After existing resources, PSE still needs over 10.8 million MWh of new non-emitting resources to get to **at least** 80% of electric sales.

Example of resources needed to meet 10.8 million megawatt hours in 2030

This example is for illustrative purposes only. The 2019 will optimize the mix of resources with conservation.

For example a 100 MW renewable resource such as wind at 30% capacity factor will produce $100 * 8760 * 0.30 = 262,800$ MWh/year.

- In order to produce 10,818,340 MWh/year with a 30% capacity factor resource, we would need 4,117 MW nameplate.
- This is an additional 4,117 MW on top of the current 1,813 MW of existing non-emitting resources.

Annual Capacity Factor	MWh/year for 100 MW	MWh target at 80%	Nameplate (MW) Needed
30%	262,800	10,818,340	4,117
44%	385,440	10,818,340	2,807
27%	236,520	10,818,340	4,574

Scenarios vs. portfolio sensitivities

The purpose of a scenario is to create a 20-year power price.

The purpose of the sensitivity is to test different resources in PSE's portfolio.

Scenarios are about the market; sensitivities are about PSE's place in the market.

Portfolio sensitivities

- The purpose of the sensitivity is to test how different resources or environmental regulations change PSE's portfolio.
- Portfolio sensitivity analysis must be performed within a scenario and the results compared back to the least cost portfolio for that scenario.
- When looking at a sensitivity, PSE examines different aspects of how the portfolio changed, such as:
 - Resource mix
 - Portfolio cost
 - Portfolio emissions
- Baseline assumptions in PSE's portfolio related to the Clean Energy Transformation Act:
 - 2030: **at least** 80% of electric sales met by renewable/non-emitting resources
 - 2045: 100% of electric sales met by renewable/non-emitting resources

Comparison of updated sensitivity list to sensitivities presented on Jan 9, 2019

List of sensitivities as of January 9, 2019

- ✓1. Clean Energy Standard: net zero by 2030
2. 100% Clean Energy Standard: no fossil fuel plants by 2030
- ✓3. CO₂ emission reduction: **at least** 80% by 2035
- ✓4. CO₂ emission reduction: PSE's 50 x 2040 Goal
5. *Carbon Abatement Curve*
6. Declining market reliance for peak capacity
7. Declining market reliance: hydro slice
8. *Increasing market reliance for peak capacity: Colstrip transmission redirect*
- ✓9. Force retirement of Colstrip: 3&4 by end of 2025
 - Depending on results of portfolio analysis
10. Demand side resources: extended DSR potential
11. Demand side resources: alternative discount rate
12. *Alternative resource costs*
- ✓13. Shortened life of new baseload gas plants: 20 years
14. No LNG
15. Force retirement of Colstrip: 1&2 by end of 2019
16. *Force retirement of Colstrip: 1-4 by end of 2019*

Draft list as of May 29, 2019

1. 100% non-emitting resources by 2030
2. Declining market reliance for peak capacity (can include additional hydro)
3. Demand side resources: extended DSR potential
4. Demand side resources: alternative discount rate
5. Colstrip 1 & 2 retired by end of 2019
6. No LNG: Gas utility only sensitivity



Addressed by CETA



Current list for 2019 IRP sensitivities

Draft 2019 IRP sensitivities

Baseline assumptions:

2030: **at least** 80% of electric sales met by renewable/non-emitting resources

2045: 100% of electric sales met by renewable/non-emitting resources

Theme	Sensitivity
Emission reduction policies	1. 100% non-emitting resources by 2030
Market reliance	2. Declining market reliance for peak capacity (can include additional hydro)
Emission reductions/resource assumptions	3. Demand side resources: extended DSR potential 4. Demand side resources: alternative discount rate 5. Colstrip 1 & 2 retired by end of 2019 6. No LNG: Gas utility only sensitivity

Sensitivity 1: 100% non-emitting resources by 2030

Description: Evaluate the portfolio resource mix to meet 100% of electric delivered load with non-emitting/renewable resources by 2030.

Baseline assumption:

- 2030: **at least** 80% of electric sales met by renewable/non-emitting resources
- 2045: 100% of electric sales met by renewable/non-emitting resources

Sensitivity assumption:

- 2030: 100% of electric sales met by renewable/non-emitting resources

Sensitivity 2: declining market reliance

Description: Reduce dependence on market to meet peak capacity need.

- Focus is capacity and reliability. CETA significantly reduces financial risk.

Baseline assumption:

- 1559 MW of short term capacity market

Sensitivity assumption:

- 1131 MW of short term capacity market
 - NPCC latest report¹ showed region will be ~700 MW short by 2023
 - RFP target as filed June 8, 2018: 272 MW
 - 700 MW – 272 MW = 428 MW
 - 1559 MW – 428 MW = 1131 MW

¹--<https://www.nwcouncil.org/energy/energy-topics/resource-adequacy/pacific-northwest-power-supplyadequacy-assessment-for-2022>

Sensitivity 3: extended DSR potential

Description: Extend the 10-year accelerated CPA to see impact on resources.

Baseline assumption:

- Baseline: Accelerated 10-year conservation potential assessment (CPA) using commercially available measures, per RCW.

Sensitivity assumption:

- Extend the trend:
 - Continue the pace of conservation
 - Not a conservation question: No-cost, must take change to load.

Sensitivity 4: alternative discount rate for DSR

Description: Recast the Conservation Potential Assessment (CPA) with lower discount rate for residential conservation

Baseline assumption:

- PSE weighted average cost of capital (WACC)

Sensitivity assumption:

- Discussed during CPA presentation on December 6, 2018, TAG 3
- 4% real discount rate from 7th Power Plan (6.5% nominal)

Sensitivity 5: early Colstrip 1&2 retirement

Description: Force retirement of Colstrip 1&2 at the end of 2019

Baseline assumption:

- Colstrip 1&2 retire mid-2022

Sensitivity assumption:

- Colstrip 1&2 retires at the end of 2019
- Assuming retain transmission
- Create a shorter-term power bridging agreement based on levelized costs to cover lost capacity and energy

Sensitivity 6: no LNG

Description: Assume Tacoma LNG is not completed

Baseline assumption

- Tacoma LNG facility operational in 2020/2021 heating season

Assumptions

- Remove Tacoma LNG as a supply side resource
- Eliminate the related distribution expansion as a supply side resource alternative
- Examine impact on resource plan

Additional analysis for Washington legislation



Cost cap compliance pathway

Utilities may comply by spending 2% per year, compounding, on incremental costs to comply with CETA. Section 6 (3)(a & b)

- Annual rate increases averaged over four years: 2% increase every year
- Only associated with incremental costs directly associated with CETA compliance

WUTC Rulemaking required to define incremental costs

Cost cap compliance pathway analysis

Incremental cost implies comparison to a baseline without CETA

Does the incremental cost calculation include social cost of carbon?

Unclear

- Maybe no: social cost of carbon is not included in utility rates
- Maybe yes: IRP incorporates social cost of carbon

Calculate baseline and cost cap implications both ways to inform rule making

Upstream natural gas emission methodology



Outline

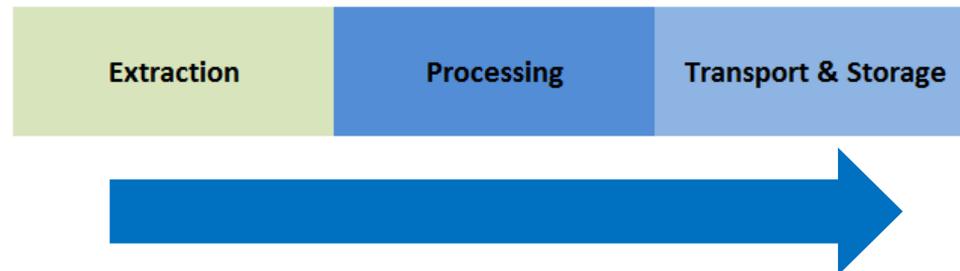
- Review the data presented at the October 11, 2018 TAG #2
- Review the upstream gas emission rate scope
- Provide new information available to supplement derivation of the upstream rate
- Explain how the emission rate will be applied in the 2019 IRP

Emission Rate Comparison

October 11, 2018 TAG#2 <i>gCO2e/MMBtu</i>	May 29, 2019 TAG#6 (Canadian Supply) <i>gCO2e/MMBtu</i>	May 29, 2019 TAG#6 (Domestic Supply) <i>gCO2e/MMBtu</i>
9,484	10,803	12,121

Upstream gas emission rate components

- Emission rate associated with extraction, processing and transport of natural gas along the supply chain
- Natural gas supply chain includes:
 1. Extraction & Production – the extraction of raw natural gas from underground formations
 2. Processing - the removal of impurities
 3. Transport & storage – the delivery of natural gas from the wellhead and processing plant to city gate transfers
 4. Fuel - energy required to move the gas (in gas driven compressors)
 5. Distribution – delivery of natural gas from the major pipeline (city gate) to the end users



Upstream gas emission rate data sources

Reliance on data published by the Puget Sound Clean Air Agency (PSCAA)

- PSCAA commissioned an independent lifecycle analysis for the Tacoma LNG Project
- Two models considered, each relies on national inventory data from each segment along the natural gas supply chain
 1. **GHGenius** – Canadian model used to examine all stages of natural gas pathways for life cycle assessments
 - Used for baseline sensitivity in PSCAA analysis
 2. **REET** (Greenhouse gases, Regulated Emissions, and Energy use in Transportation) – Argonne National Lab model, also used for life cycle assessments
 - Used for upper bound sensitivity in PSCAA analysis

GHGenius upstream emission rate

GHGenius

- Uses v4.0a (2016)
- Newer version is available (v5.0c, 2018); however, upstream emissions are lower so values in v4.0a are more conservative
- Regionally specific (by Province)
- Includes all stages of the natural gas supply chain
- Emissions data sourced from Pollutant Inventories and Reporting Division of Environment Canada
- Gas statistics sourced from Statistics Canada and the Canadian National Energy Board
- Most widely adopted protocol for Canada

GREET upstream emission rate

GREET

- Updated October 2018
- US specific
- Includes all stages of the natural gas supply chain
- Emissions data sourced from EPA GHG Inventory
- Gas statistics sourced from US Energy Information Administration
- Most widely adopted protocol for United States

Published emission rates

Natural Gas Supply Chain Upstream Life Cycle Emission Rates

Supply Chain Segment		GHGenius (Baseline Sensitivity), g/MMBtu				GREET (Upper Sensitivity), g/MMBtu			
		Carbon Dioxide	Methane	Nitrous Oxide	Carbon Dioxide Equivalent	Carbon Dioxide	Methane	Nitrous Oxide	Carbon Dioxide Equivalent
Natural Gas Extraction	Extraction	2,303.16	25.05	0.110	2,962.2	2,153.87	8.04	0.019	2,360.5
Extraction Fugitive		2.69	115.53	0.000	2,890.9	0.00	137.87	0.000	3,446.6
Natural Gas Processing	Processing	2,325.46	10.35	0.040	2,596.1	1,665.98	5.94	0.013	1,818.3
Processing Fugitive		1,101.04	0.00	0.000	1,101.0	702.06	6.17	0.000	856.3
Transmission - Distribution	Transport & Storage	1,192.80	2.29	0.009	1,252.8	1,650.74	63.04	1.385	3,639.4
Total		6,925.14	153.21	0.160	10,803.0	6,172.66	221.05	1.417	12,121.1

Source: Puget Sound Clean Air Agency, Final Supplemental Environmental Impact Statement (March 29, 2019)

Upstream Emission Rate -
Sum of All Segments
Expressed in CO₂equivalent
(CO₂e)

Emission rate derivation – extraction to end use

<i>Upstream Segment</i>	<i>End-Use Segment (Combustion)</i>	<i>Emission Rate Total</i>	<i>Upstream Segment CO₂e Emissions Percent</i>
<i>GHGenius</i> 10,803 g/MMBtu	+ 54,400 g/MMBtu	= 65,203 g/MMBtu	19.9%
<i>GREET</i> 12,121 g/MMBtu	+ 54,400 g/MMBtu	= 66,521 g/MMBtu	22.3%

End-Use Combustion Emission Factor: EPA Subpart NN

- Canadian supply: GHGenius
- US supply: GREET

Next steps



Action items review and next steps

Date	Action
June 12	PSE posts draft meeting notes with action items on IRP website and distributes draft meeting notes to TAG members
June 19	TAG members review meeting notes and provide comments to PSE at irp@pse.com
June 26	PSE posts final meeting notes on IRP website: www.pse.com/irp



THANK
YOU

IRP comment period



Action items included in 2019 Draft and Final IRPs



Action items for inclusion in the draft and final 2019 IRPs

Action item #	Description (and meeting reference)	PSE action	Status
1	Investigate converting the gas emission rate to a percentage. (TAG #2, October 11, 2018 and TAG #3, December 6, 2018, and January 9, 2019)	PSE will include gas emission rate as a percentage and details on methodology in the draft IRP and final IRP. PSE will consider distributing the details before the draft.	In progress
2	Add line miles and project status to the planned major projects list and include cost ranges. (TAG #4, January 9, 2019)	To be included in the draft IRP and final IRP. Cost ranges will be included if publically available.	In progress
3	Include several previous IRP load forecasts in the IRP and compare those forecasts to actuals for multiple years. (TAG #4, January 9, 2019)	To be included in the draft and final IRP.	In progress

Action items for inclusion in the draft and final 2019 IRPs

Action item #	Description (and meeting reference)	PSE action	Status
4	Verify the calculation used to develop the EV load as a percentage of load in 2035. (TAG #4, January 9, 2019)	To be included in the draft IRP and final IRP.	In progress
5	Add a recommendation for time-of-day rate analysis to the 2019 IRP action plan. (TAG #4, January 9, 2019)	PSE will add a recommendation for time-of-day rate analysis to the 2019 IRP action plan.	In progress