



**2015**

# **Integrated Resource Plan**

**Public Input Meeting 5**

**November 14, 2014**

# Agenda

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- Introductions
- EIM Update
- Price Curve Scenarios
- Portfolio Development Draft Results
- *Lunch Break (1/2 hour) | 1:30 PT/12:30 MT*
- Portfolio Development Draft Results



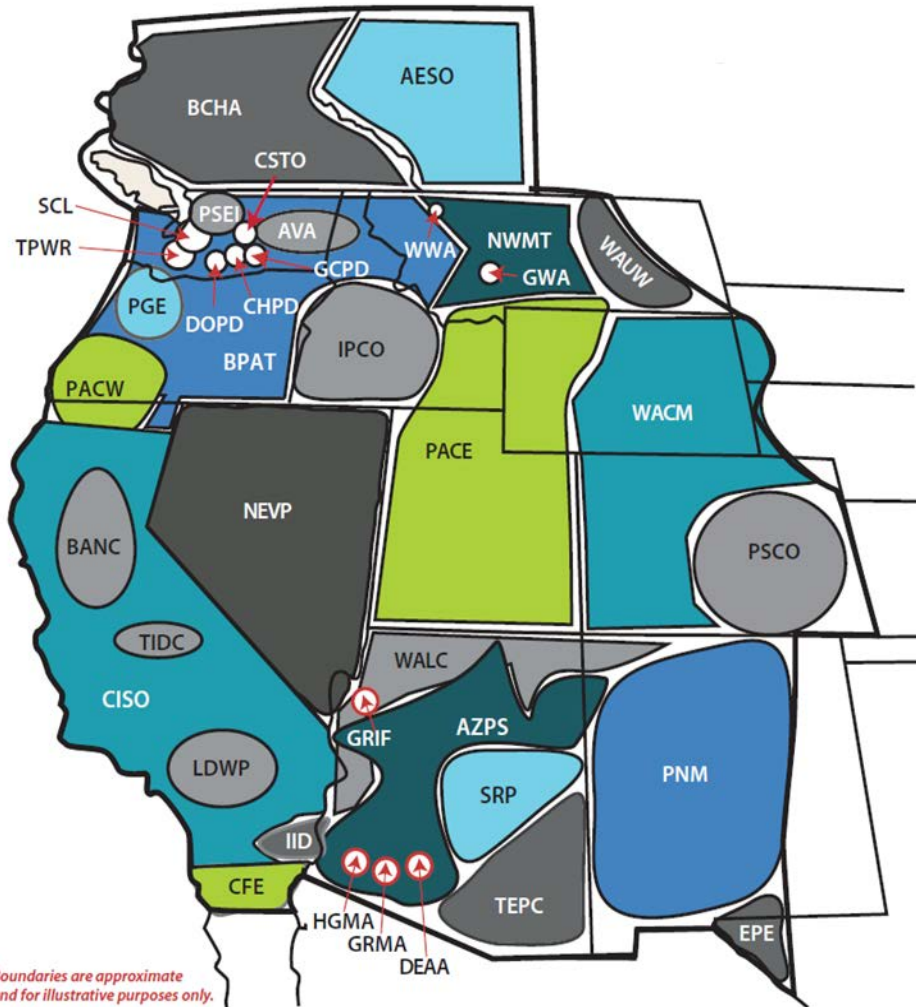
**2015**

# **Integrated Resource Plan**

**PacifiCorp – CAISO**

**Energy Imbalance Market - Update**

# Operational Challenges Resulting From 38 Balancing Authorities in Western Interconnection



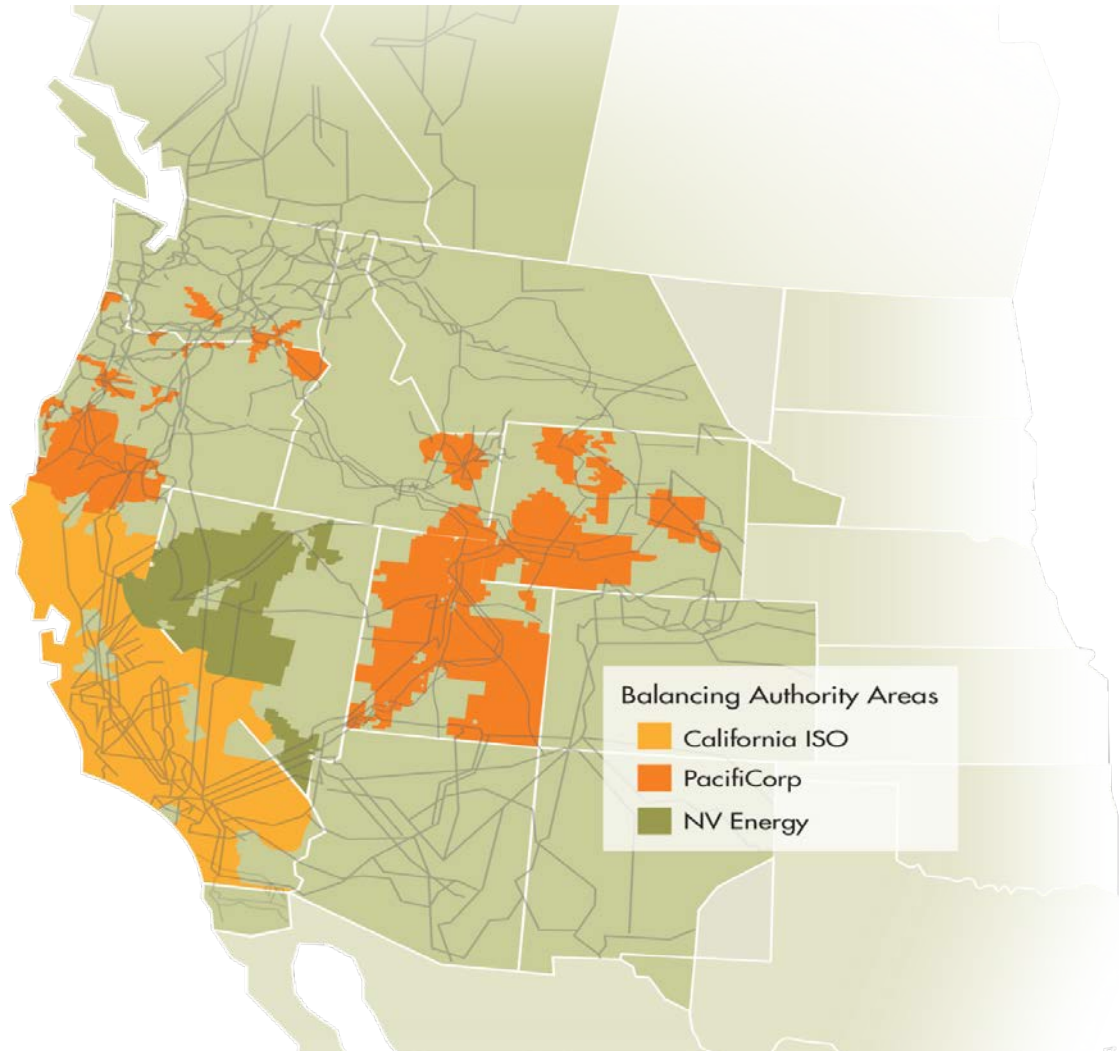
*Boundaries are approximate and for illustrative purposes only.*

Source: Western Electricity Coordinating Council 3.4.14

- Sept. 8, 2011 | Southwest outage highlighted shortcomings in operations planning and real-time situational awareness
- No trading between balancing authorities intra-hour results in inefficiencies and higher costs to customers
- Barrier to transition from baseload resources to variable energy resources

# Initial EIM Footprint

(PacifiCorp 2014, NV Energy 2015)

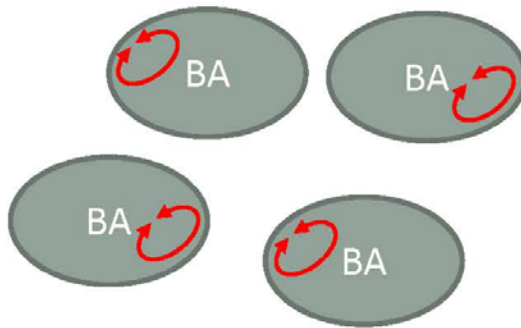


- Co-optimized, automated, 5-minute economic dispatch across the EIM footprint.
- Large geographic, temporal & resource diversity.
- Benefits include reduced costs to serve customers, improved situational awareness, and more effective integration of renewables.

# What Does the EIM Do?

Today:

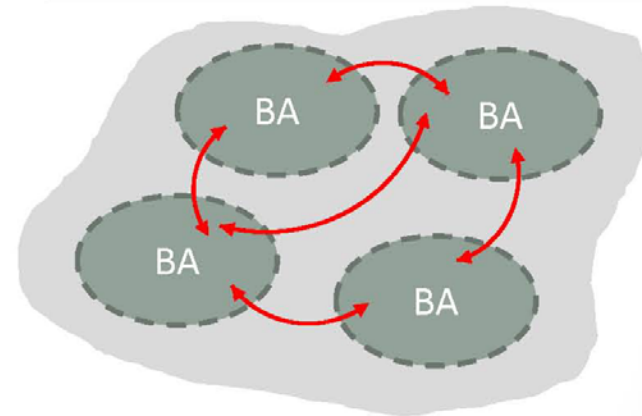
Each BA must balance loads and resources **w/in its borders.**



- Limited pool of balancing resources
- Inflexibility
- High levels of reserves
- Economic inefficiencies
- Increased costs to integrate wind/solar

In an EIM:

The market dispatches resources across BAs to balance energy



- Diversity of balancing resources
- Increased flexibility
- Decreased levels of reserves
- More economically efficient
- Decreased integration costs

Source: Presentation of Commissioner Travis Kavulla (MT), PUC EIM Group Chair, UBS Conference Call, Jan 31, 2014

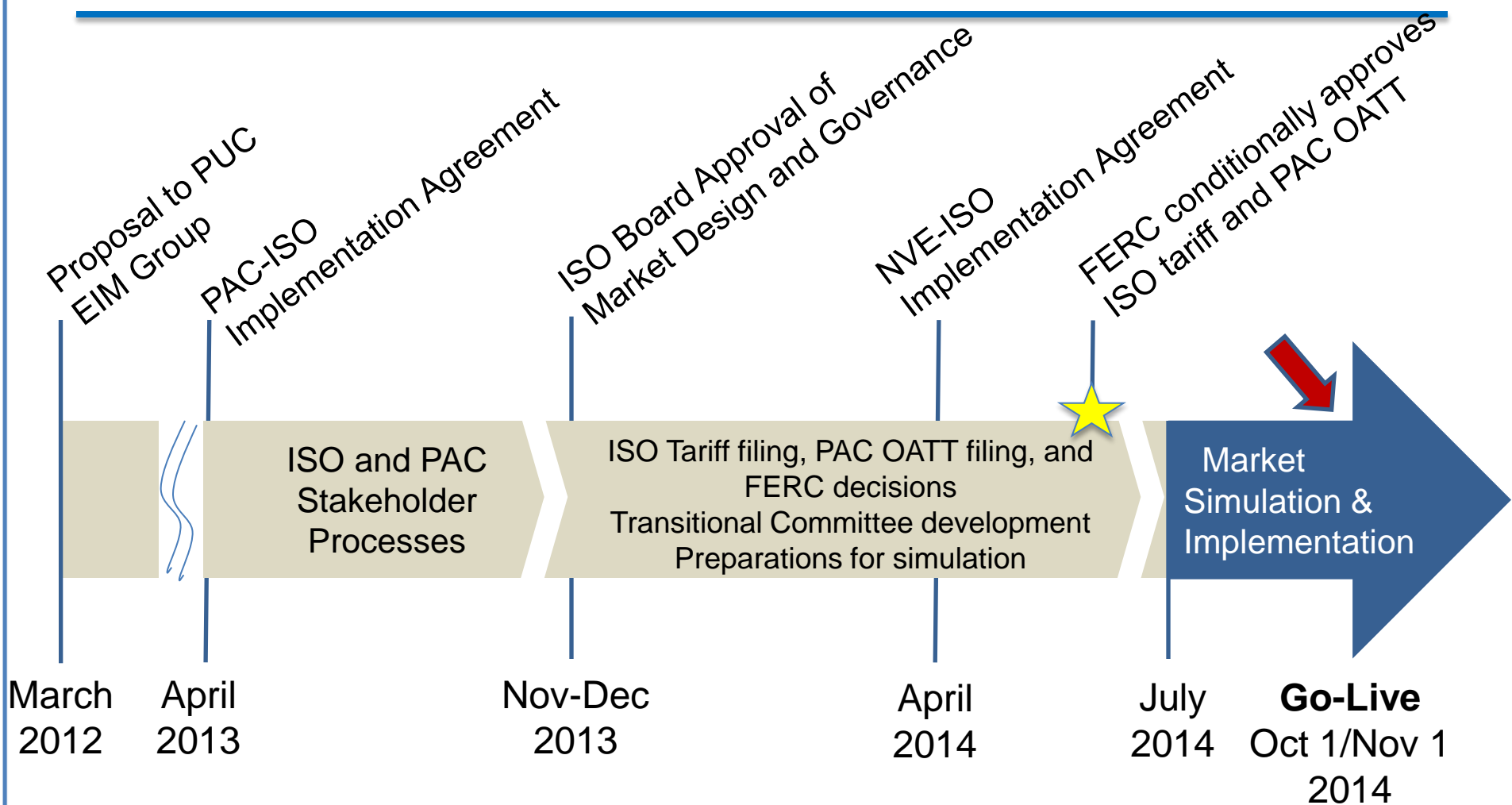
# March 2013 E3 Study

## PacifiCorp Attributed EIM Benefits (million 2012\$)

Benefit Category	Low transfer capability		Medium transfer capability		High transfer capability	
	Low Range	High Range	Low Range	High Range	Low Range	High Range
Interregional dispatch	\$ 7.0	\$ 5.5	\$ 11.2	\$ 8.9	\$ 11.2	\$ 8.9
Intraregional dispatch	\$ 2.3	\$ 23.0	\$ 2.3	\$ 23.0	\$ 2.3	\$ 23.0
Flexibility reserves	\$ 1.2	\$ 6.1	\$ 3.2	\$ 14.9	\$ 3.9	\$ 22.5
Renewable curtailment	\$ 0.0	\$ 0.0	\$ 0.0	\$ 0.0	\$ 0.0	\$ 0.0
<b>Total benefits</b>	<b>\$ 10.5</b>	<b>\$ 34.6</b>	<b>\$ 16.7</b>	<b>\$ 46.8</b>	<b>\$ 17.4</b>	<b>\$ 54.4</b>

*Note: Attributed values may not match totals due to independent rounding.*

# EIM History and Timeline





# FERC Tariff Filing and Order

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- FERC has provided broad acceptance of all EIM operational provisions in the ISO and PacifiCorp tariffs
- FERC accepted BPA/ISO agreement revisions for 15-minute EIM Transfers
- BPA coordination continues related to California-Oregon Intertie (“COI”) Dynamic Transfer Capability (“DTC”) limits
- The ISO petitioned FERC for a temporary lowering of the price cap for initial 90 day startup period





# EIM Transitional Committee

STEP 1

STEP 2

## Stakeholder Transitional Committee

### Structure and Operation

- Advisory committee to ISO Board
- 9-11 members
- Open meeting policy

### Roles:

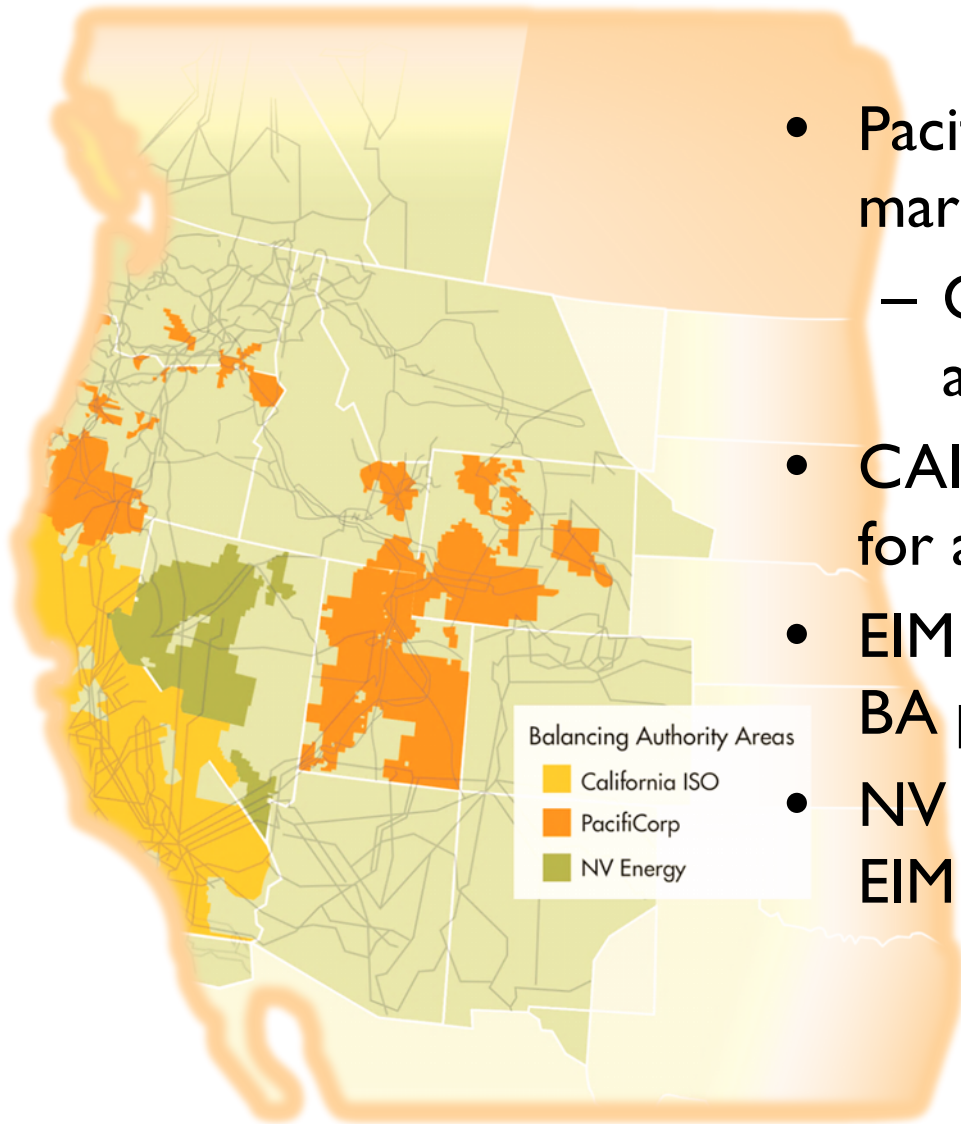
- Participate in ISO stakeholder process on early EIM matters
- Propose independent EIM governance structure

### Anticipated Public Stakeholder Process:

- February 2015 – Committee to post “straw proposal”
- Stakeholder process anticipated through August 2015

Independent  
EIM  
Governance  
Structure

# Prospects for EIM Expansion



- PacifiCorp is supportive of broader market coordination
  - Greater regional coordination is a priority in the West
- CAISO approach is highly scalable for added participation
- EIM design intended to encourage BA participation
- NV Energy scheduled to join the EIM starting October 2015

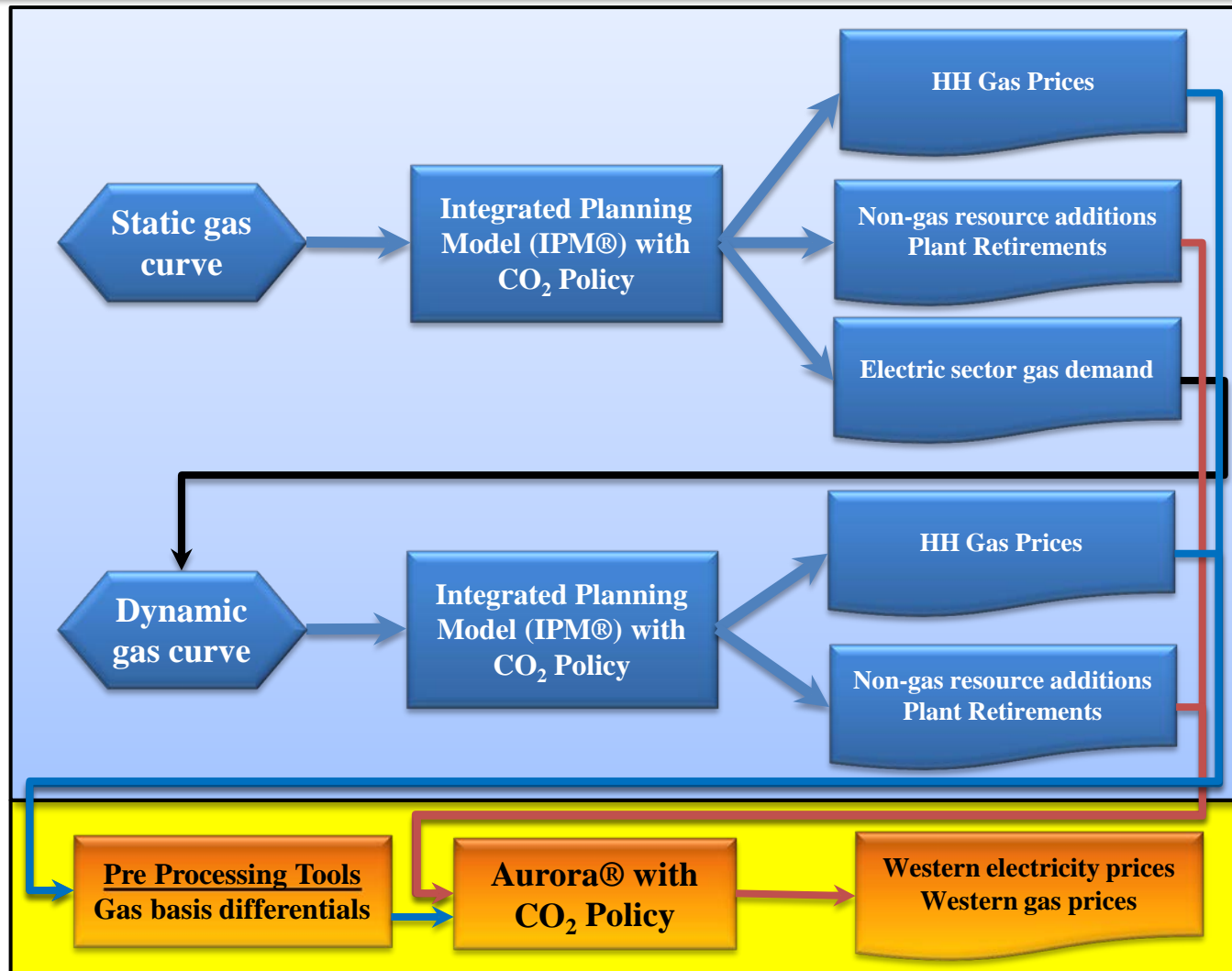


# 2015

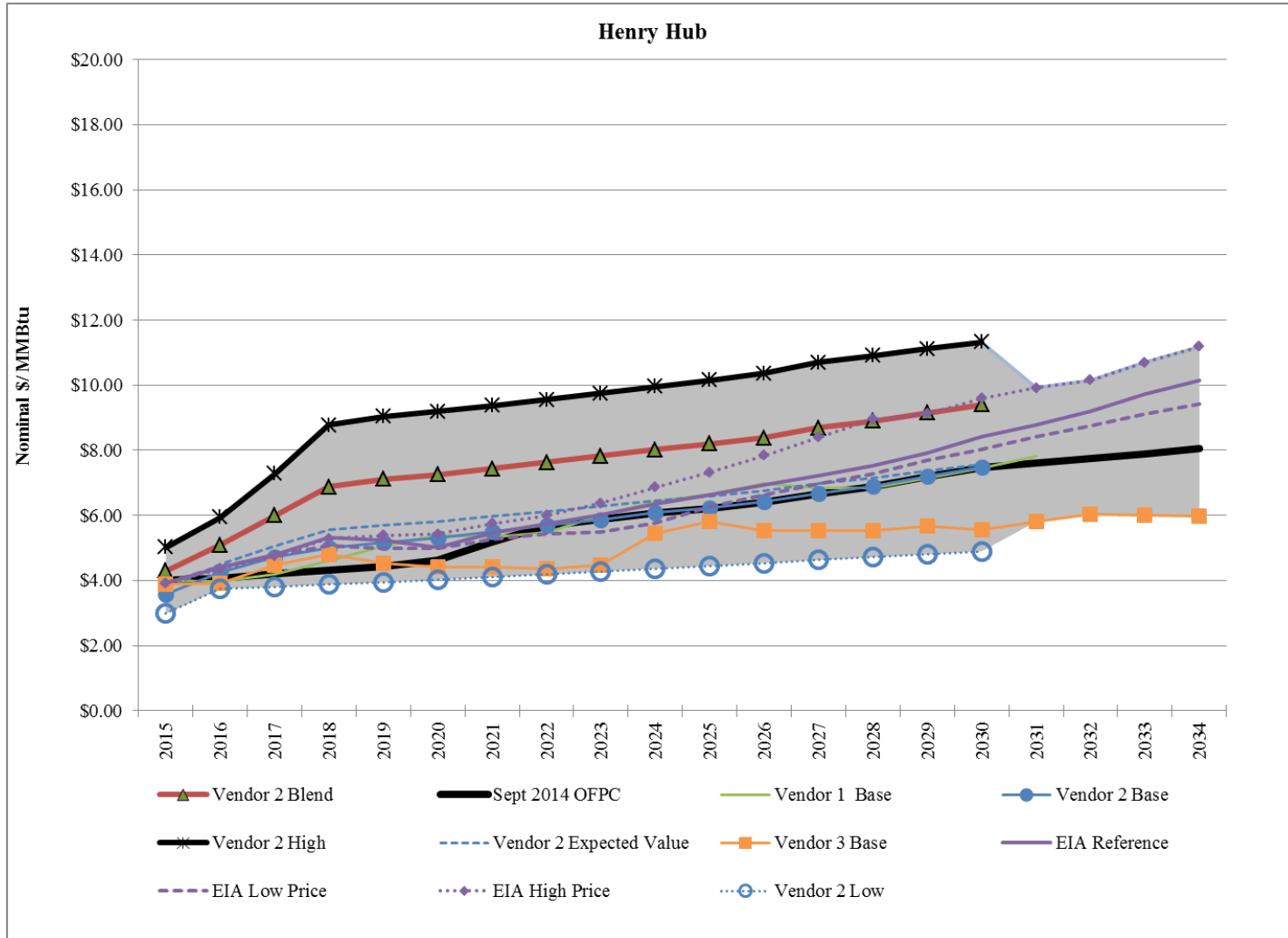
# Integrated Resource Plan

## Price Curve Scenarios

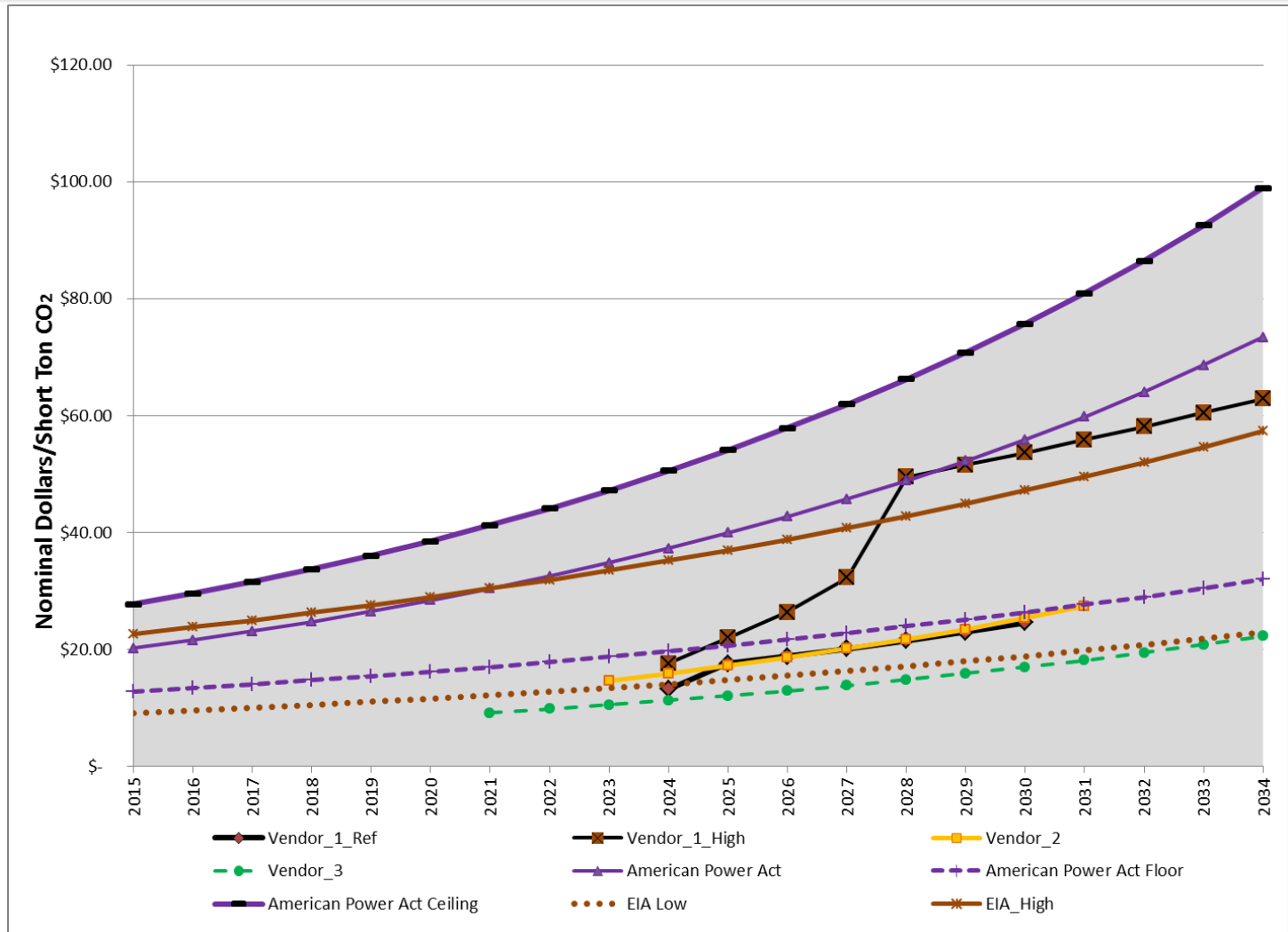
# Price Scenarios – Modeling Convention



# Survey of Forecasts – Natural Gas



# Survey of Forecasts – CO<sub>2</sub>

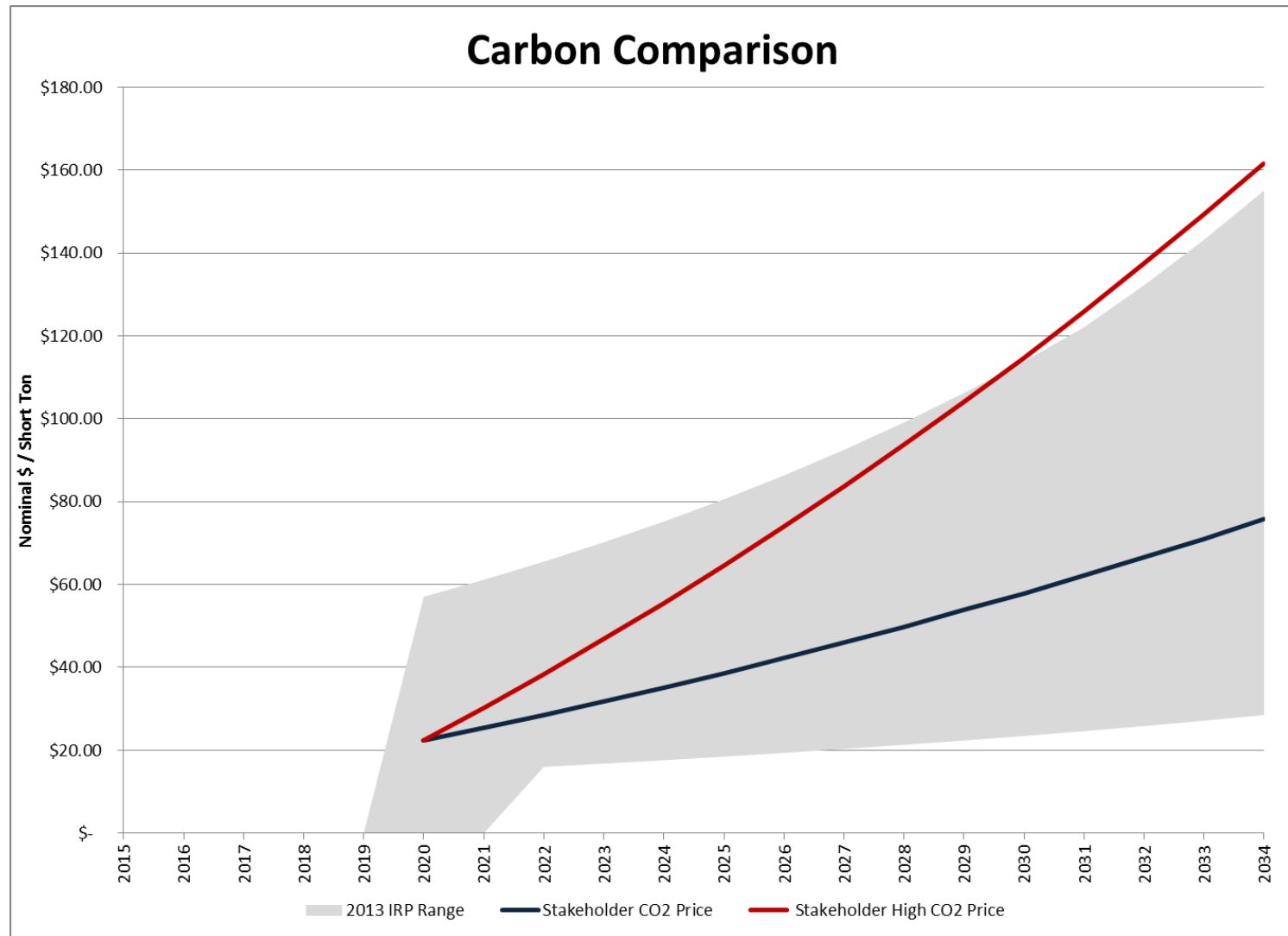




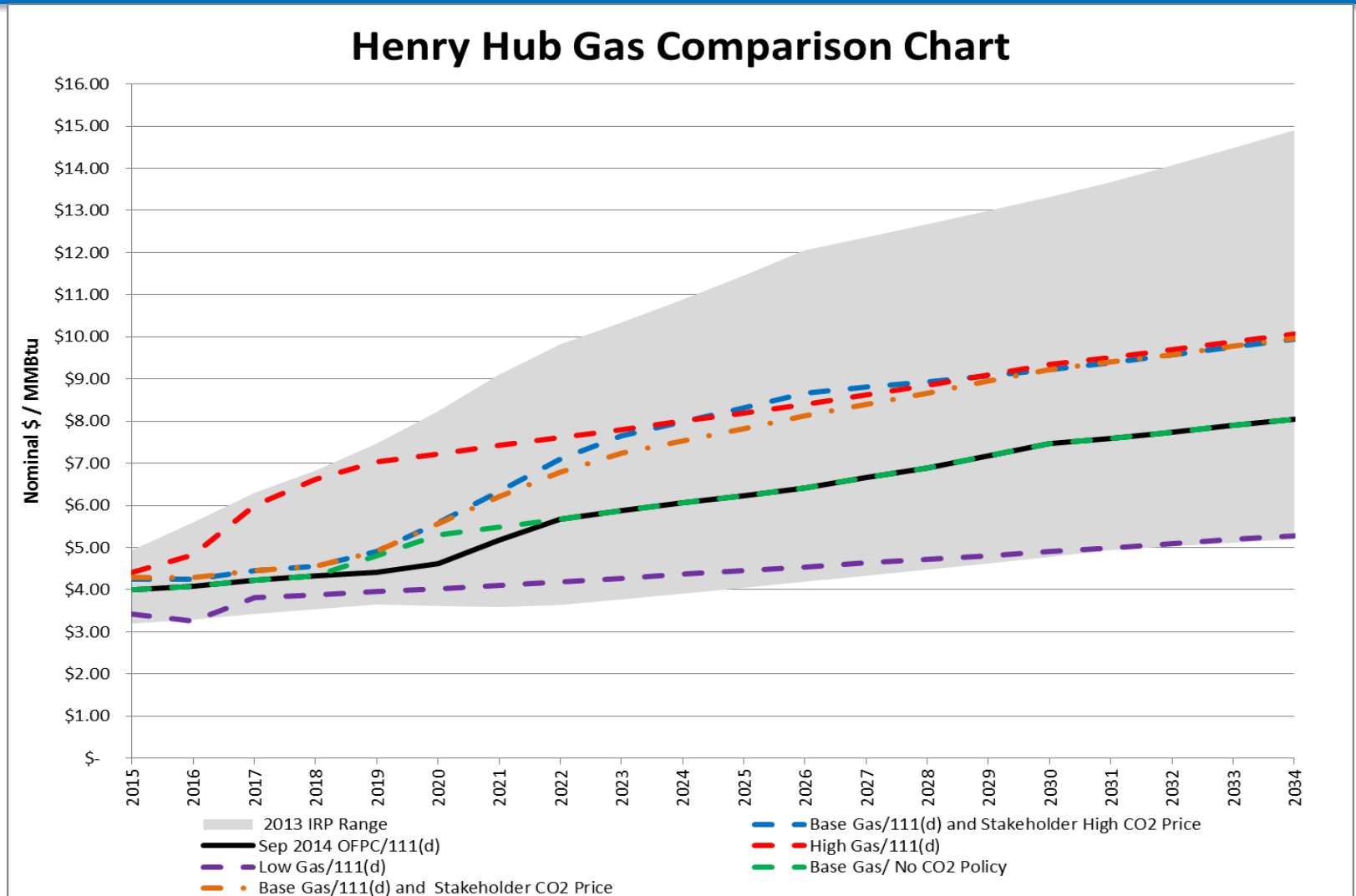
# Price Scenarios – 2015 IRP

Scenario	Portfolio Development Cases	PaR Studies	Natural Gas	Power
Sep 2014 OFPC/III(d)	C02 through C13; Sensitivities, but for S-11	Yes	Sep 2014 OFPC (72-months market; 12-months blend; fundamentals per Vendor 2 base)	Sep 2014 OFPC (72-months market; 12-months blend; fundamentals per Aurora forecast)
Base Gas/No CO <sub>2</sub> Policy and No III(d)	C01	No	Sep 2014 OFPC through 2018; 12-months blend; fundamentals per Vendor 2 base	Sep 2014 OFPC through 2018; 12-months blend; fundamentals per Aurora forecast
Base Gas/III(d)+Stakeholder CO <sub>2</sub> Price	C14, C14a	No	Sep 2014 OFPC gas adjusted for increased electric sector demand	Fundamentals all months per Aurora forecast
Low Gas/III(d)	n/a	Yes	Fundamentals all months per Vendor 2 low case	Fundamentals all months per Aurora forecast
High Gas/III(d)	n/a	Yes	Fundamentals all months per Vendor 2 blend	Fundamentals all months per Aurora forecast
Base Gas/III(d)+High Stakeholder CO <sub>2</sub> Price	S-11	Yes	Sep 2014 OFPC gas adjusted for increased electric sector demand	Fundamentals all months per Aurora forecast

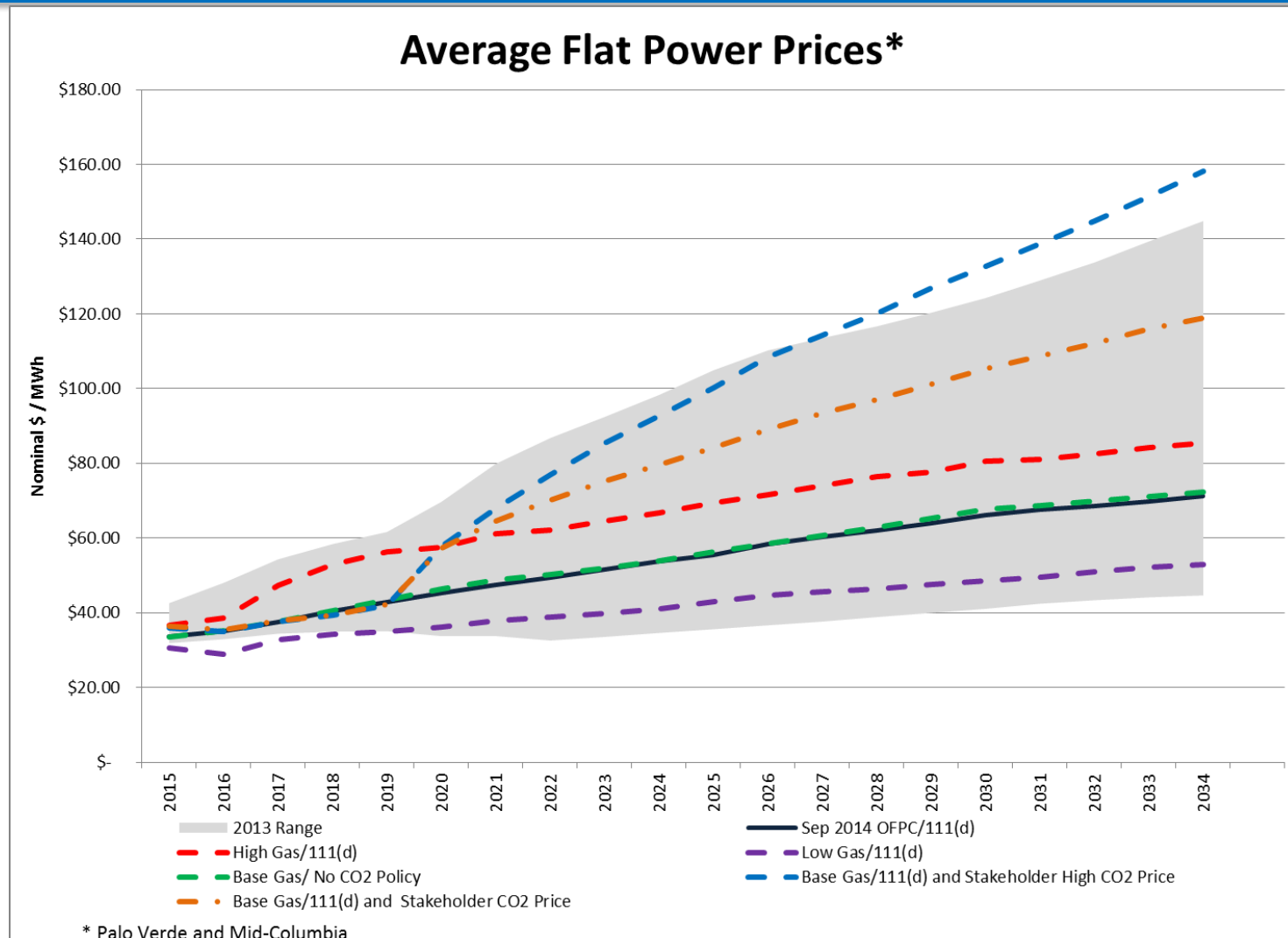
# Carbon Comparison – 2015 IRP vs. 2013 IRP



# Henry Hub Gas Price Comparison – 2015 IRP vs. 2013 IRP



# Power Price Comparison – 2015 IRP vs. 2013 IRP





# 2015

# Integrated Resource Plan

## Portfolio Development Cases

# Portfolio Development Highlights

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- PacifiCorp has completed its initial resource portfolio modeling, and draft results among 30 different cases have been summarized – additional review of these findings will continue as stochastic risk analysis of the resource portfolios begins.
- EPA’s proposed 111(d) emission rate targets for states in which PacifiCorp owns fossil generation and serves retail customers can be met with re-allocation of existing system renewable resources, cost-effective energy efficiency, and limited re-dispatch of existing fossil units.
- Cases that assume EPA’s proposed emission rate targets are met with system renewable resources for those states where PacifiCorp owns fossil generation but does not serve retail customers will inform PacifiCorp’s acquisition path analysis in the 2015 IRP and on-going discussions with stakeholders in these states to identify acceptable 111(d) compliance plans.
- 111(d) compliance strategies that target cost effective energy efficiency resources and that prioritize re-dispatch of existing fossil generation are lower cost than strategies with increased, higher cost energy efficiency acquisition and/or that prioritize acquisition of new renewable generating assets.
- Nonetheless, opportunities to acquire low-cost renewable resources and low-cost energy efficiency will mitigate 111(d) compliance risks.
- With many portfolios showing resource needs are largely met with incremental acquisition of energy efficiency and front office transactions (FOTs) through the front ten years of the planning horizon, the Company will need to continue to monitor market conditions to ensure there is adequate market supply over time.
- Depending on the case, new renewables may be needed beginning 2020 for RPS compliance; however, lower cost unbundled REC alternatives will be analyzed before selecting the 2015 IRP preferred portfolio.
- In the latter half of the twenty year planning horizon, uncertainties around Regional Haze and green house gas policy drive variability in resource mix among the cases.

# Portfolio Development Update

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- 50 System Optimizer runs required to develop 30 resource portfolios.
- Draft results have been completed for each core case.
  - Completed cases meet assumed I II (d) compliance obligations and state RPS compliance obligations, as applicable.
  - Completed cases reflect estimated costs for new resource transmission integration costs and transmission reinforcement costs, as applicable.
- Core Case Fact Sheets (handout)
  - Documents key input assumptions for each case.
  - Documents draft results for each case (**New!**).
    - PVRR System Costs
    - Resource Portfolio Summary
    - System CO<sub>2</sub> Emissions
    - I II (d) Compliance Profile, as applicable
  - Notice will be sent via the IRP Mailbox when spreadsheet results are posted to the IRP website.

# Core Case Definitions

Case	111(d) Rule	111(d) Compliance Priority	CO <sub>2</sub> Price	FOTs	Price Curve
C01	None	None	None	Base	Base/No 111(d)
C02	All States, Emis. Rate	Re-dispatch + Base EE	None	Base	Sep 2014 OFPC
C03	All States, Emis. Rate	Re-dispatch + Inc. EE	None	Base	Sep 2014 OFPC
C04	All States, Emis. Rate	Renewable + Inc. EE	None	Base	Sep 2014 OFPC
C05	Retail States, Emis. Rate	Re-dispatch + Base EE	None	Base	Sep 2014 OFPC
C05a	Retail States, Emis. Rate	Re-dispatch + Base EE	None	Base	Sep 2014 OFPC
C06	Retail States, Emis. Rate	Re-dispatch + Inc. EE	None	Base	Sep 2014 OFPC
C07	Retail States, Emis. Rate	Re-dispatch + Inc. EE	None	Base	Sep 2014 OFPC
C09	Retail States, Emis. Rate	Re-dispatch + Base EE	None	Limited	Sep 2014 OFPC
C11	Retail States, Emis. Rate	Re-dispatch + Acc. EE	None	Base	Sep 2014 OFPC
C12	Mass Cap, New+Existing	None	None	Base	Sep 2014 OFPC
C13	Mass Cap, Existing	None	None	Base	Sep 2014 OFPC
C14	Retail States, Emis. Rate	Re-dispatch + Base EE	Yes	Base	Base/CO <sub>2</sub> Adjusted
C14a	Retail States Emis. Rate	Re-dispatch + Base EE	Yes	Base	Base/CO <sub>2</sub> Adjusted

- Cases C01 and C05a are replicated among three different Regional Haze Scenarios.
- All other cases are replicated among two different Regional Haze Scenarios.



# Case Definition Updates

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- Cases C05 through C07
  - No longer assume physical allocation of renewable resources by state boundary (not likely).
  - A key III(d) uncertainty is how states might address fossil generation that does not serve retail load in the state, and the Company continues to engage with parties in these states to identify acceptable III(d) compliance plans (i.e. reflecting PacifiCorp's plans to stop operating Cholla Unit 4 as a coal-fired asset by the end of 2024).
  - Consequently, cases C05 through C07 are defined as variants of cases C02 through C04 by removing Arizona, Colorado, and Montana from PacifiCorp's III(d) compliance solution.
  - Cases C02 through C04 will inform PacifiCorp's 2015 IRP acquisition path analysis and continued discussions with stakeholders in these states.
- Cases C08 and C10 were eliminated (both assumed physical allocation of renewable resources by state boundary).
- Cases C09 (constrained FOTs) and C11 (accelerated DSM) are aligned with III(d) assumptions per Case C05.
- Based on stakeholder feedback, Case C13 was added (note, the previous Case C13 has been renamed as Case C14) to provide a second mass cap case applicable to only existing fossil resources.
- Added alternatives to Cases C05 and C14
  - Cases C05a-1 and C05a-2 were added to analyze an Oregon unbundled REC RPS compliance strategy.
  - Upon reviewing Regional Haze retirement assumptions on the timing of new resources, Case C05a-3 was added to replicate the Oregon RPS unbundled REC strategy with alternative coal retirement assumptions.
  - Case C14a replicates Case C14, but allows endogenous retirement of coal units not already assumed to have an early retirement date under the applicable Regional Haze Scenario.

# Regional Haze Scenarios

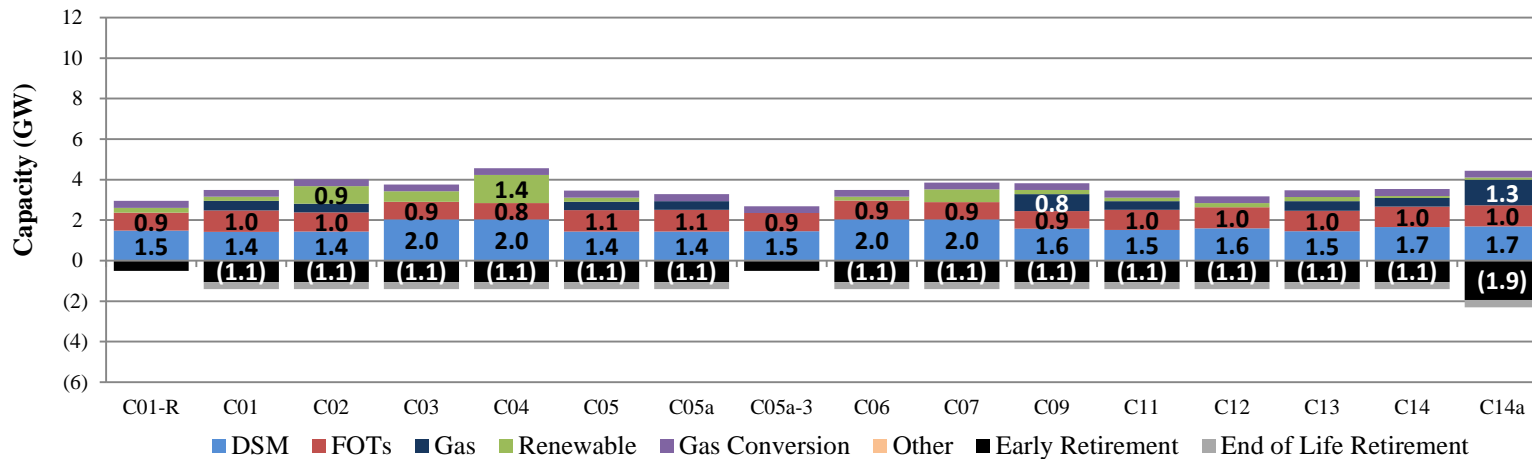
Coal Unit	Reference	RH-1	RH-2	RH-3
Dave Johnston 1	Shut Down Dec 2027	Shut Down Mar 2019	Shut Down Mar 2019	Shut Down Dec 2027
Dave Johnston 2	Shut Down Dec 2027	Shut Down Dec 2027	Shut Down Dec 2023	Shut Down Dec 2027
Dave Johnston 3	SCR by Mar 2019; Shut Down Dec 2027	Shut Down Dec 2027	Shut Down Dec 2027	Shut Down Dec 2027
Dave Johnston 4	Shut Down Dec 2027	Shut Down Dec 2032	Shut Down Dec 2032	Shut Down Dec 2027
Hunter 2	SCR by Dec 2021	Shut Down by Dec 2032	Shut Down by Dec 2024	Shut Down by Dec 2032
Huntington 1	SCR by Dec 2022	Shut Down by Dec 2036	Shut Down by Dec 2024	SCR by Dec 2022
Huntington 2	SCR by Dec 2022	Shut Down by Dec 2021	Shut Down by Dec 2021	Shut Down by Dec 2029
Jim Bridger 1	SCR by Dec 2022	Shut Down by Dec 2023	Shut Down by Dec 2023	SCR by Dec 2022
Jim Bridger 2	SCR by Dec 2021	Shut Down by Dec 2032	Shut Down by Dec 2028	SCR by Dec 2021
Wyodak	SCR by Mar 2019	Shut Down by Dec 2039	Shut Down by Dec 2032	Shut Down by Dec 2039

**Common to All Scenarios:**

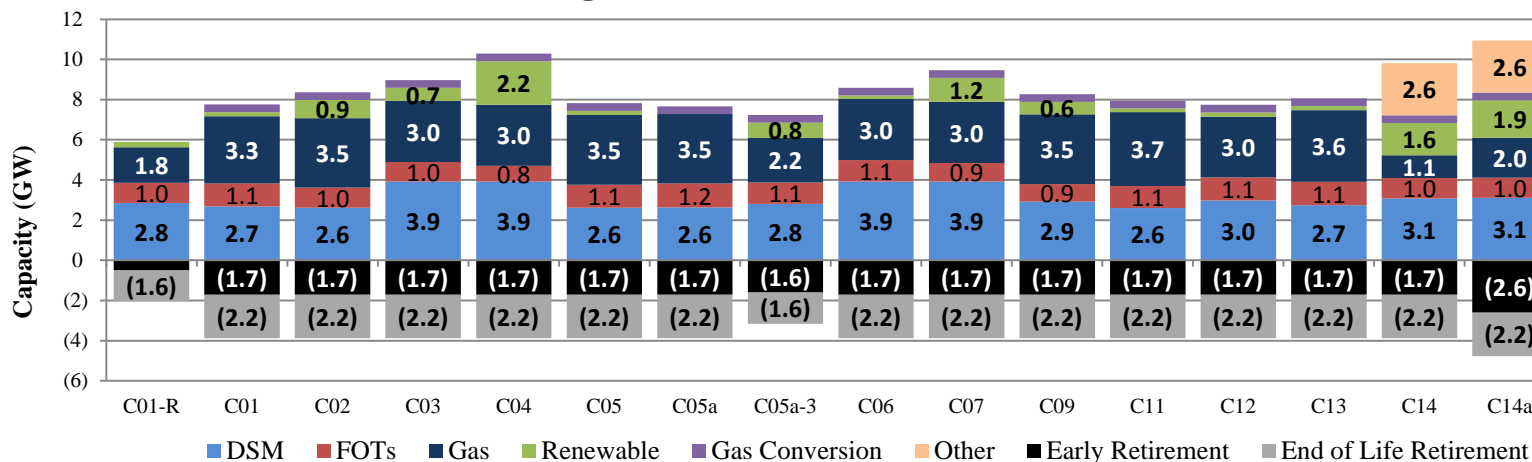
Carbon 1&2 shutdown 2015; Cholla 4 gas conversion 2025; Colstrip 3&4 SCR 2023/2022, respectively; Craig 1&2 SCR 2021/2018, respectively; Hayden 1&2 SCR 2015/2016, respectively; Naughton 1&2 shutdown 2029; Naughton 3 gas conversion 2018, shutdown 2029; Hunter 1&3 SCR 2021/2024, respectively; and Bridger 3&4 SCR 2015/2016, respectively

# Portfolio Snapshot: RH-1\*

## Regional Haze Scenario 1: 2024



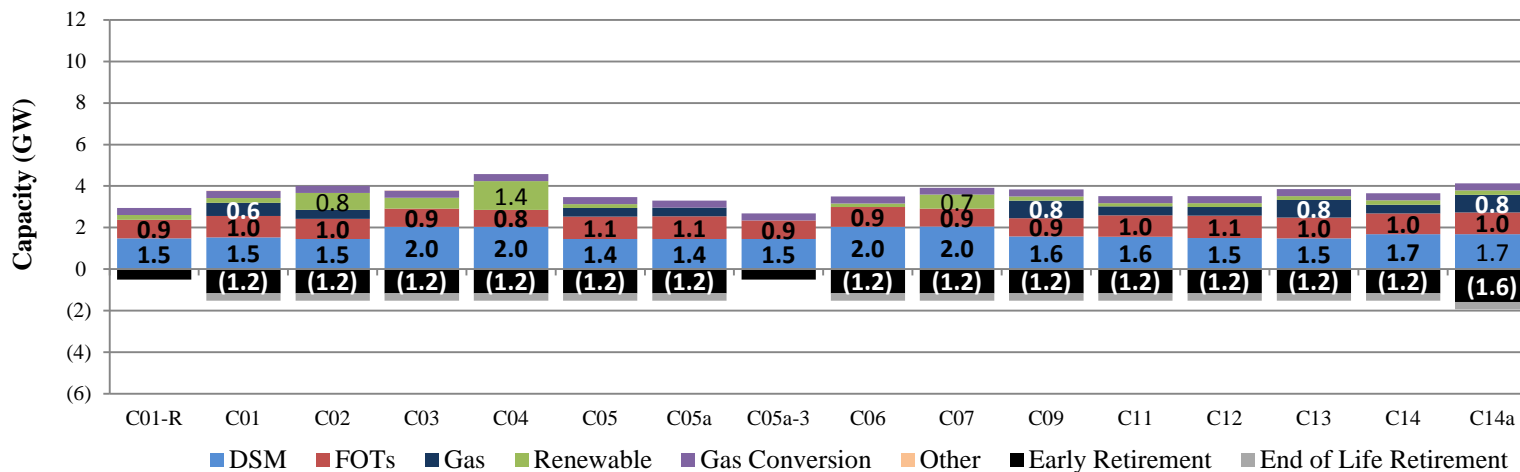
## Regional Haze Scenario 1: 2034



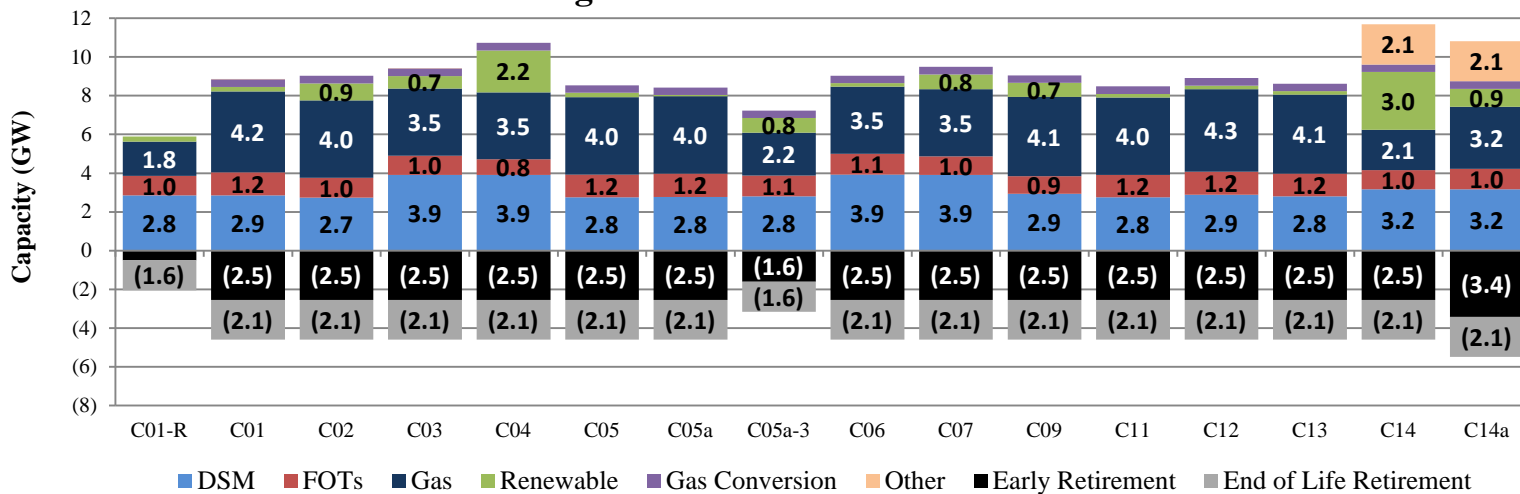
\*Note: Cases C01-R and C05a-3 reflect the Reference and RH-3 Regional Haze Scenarios, respectively. "Other" in Cases C14 and C14a is comprised of East modular nuclear.

# Portfolio Snapshot: RH-2\*

## Regional Haze Scenario 2: 2024

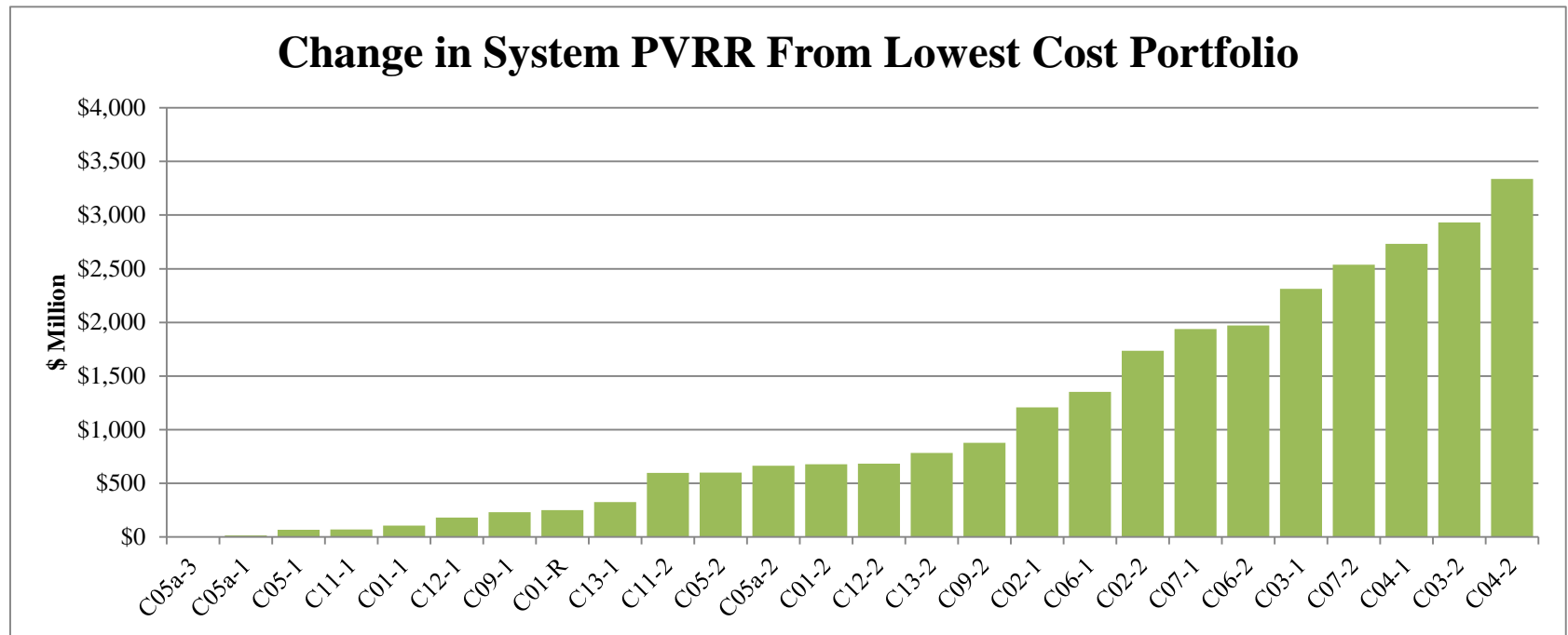


## Regional Haze Scenario 2: 2034



\*Note: Cases C01-R and C05a-3 reflect the Reference and RH-3 Regional Haze Scenarios, respectively. "Other" in Cases C14 and C14a is comprised of East modular nuclear.

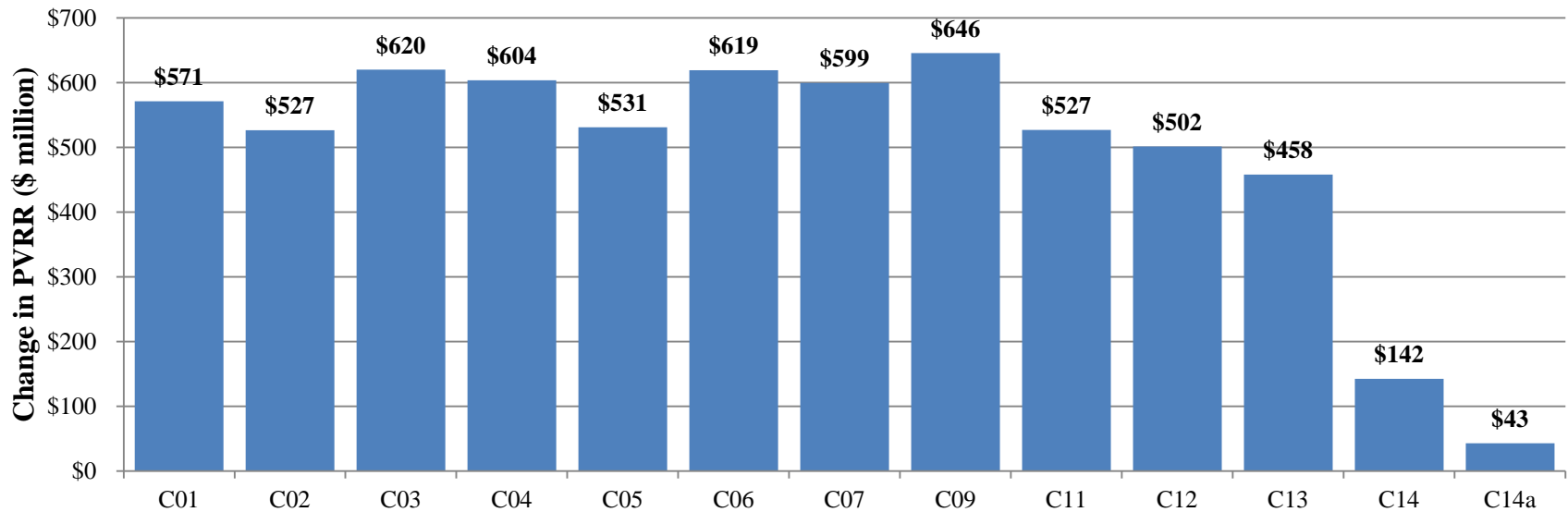
# Relative Portfolio System Costs



- Based on System Optimizer results, Case C05a-3 is the lowest cost portfolio.
- Cases C05a-1, C05-1, and C11-1 are all within \$100m of Case C05a-3.
- Cases C14 and C14a are not shown in the figure above – these cases are between \$12.7 billion and \$13.0 billion higher cost than Case C05a-3.
- Mean PVRR costs, risk-adjusted PVRR costs, and other cost and risk metrics will be assessed using PaR to inform the preferred portfolio selection process.

# Regional Haze System Cost Impacts: RH-2 as Compared to RH-1

Increase in System PVRR for RH-2 Case Relative to RH-1 Cases



- In Cases C01 through C13, Regional Haze Scenario 2 portfolio costs are between \$458 million to \$646 million higher than Regional Haze Scenario 1 portfolio costs.
- With CO<sub>2</sub> prices assumed applicable to Cases C14 and C14a, CO<sub>2</sub> expenses largely overshadow the relative cost differential between Regional Haze Scenarios.

# III(d) Compliance Overview

	All States (C02-1, C03-1, C04-1)	Retail States (C05-1, C06-1, C07-1)
Strategy A (C02-1 & C05-1)	<ul style="list-style-type: none"> <li>• New East NGCCs</li> <li>• Base EE</li> <li>• Backdown of West NGCCs</li> <li>• Backdown of WY, AZ, CO, MT Coal</li> <li>• New RE = 866 MW 2020-2021, 37 MW in 2030 for OR RPS</li> </ul>	<ul style="list-style-type: none"> <li>• New East NGCCs</li> <li>• Base EE</li> <li>• Backdown of West NGCCs</li> <li>• No Coal Backdown</li> <li>• New RE = 206 MW 2020-2024 for OR RPS</li> </ul>
Strategy B (C03-1 & C06-1)	<ul style="list-style-type: none"> <li>• New East NGCCs</li> <li>• Inc. EE (Up to 1.5% of sales)</li> <li>• Backdown of West NGCCs</li> <li>• Backdown of WY, AZ, CO, MT Coal</li> <li>• New RE = 511 MW in 2020, 144 MW in 2030 for OR RPS</li> </ul>	<ul style="list-style-type: none"> <li>• New East NGCCs</li> <li>• Inc. EE (Up to 1.5% of sales)</li> <li>• Backdown of West NGCCs</li> <li>• No Coal Backdown</li> <li>• New RE = 175 MW 2020-2022 for OR RPS</li> </ul>
Strategy C (C04-1 & C07-1)	<ul style="list-style-type: none"> <li>• New East NGCCs</li> <li>• Inc. EE (Up to 1.5% of sales)</li> <li>• Backdown of West NGCCs</li> <li>• Backdown of AZ &amp; CO Coal</li> <li>• New RE = 2,161 MW 2020-2029; no additional for OR RPS</li> </ul>	<ul style="list-style-type: none"> <li>• New East NGCCs</li> <li>• Inc. EE (Up to 1.5% of sales)</li> <li>• No West NGCC Backdown</li> <li>• No Coal Backdown</li> <li>• New RE = 1,197 MW 2020-2031; no additional for OR RPS</li> </ul>

- Strategy A = Flexible allocation of system RE and ID/CA EE; base cost effective selection of EE; prioritize fossil re-dispatch (coal at 7-months effective full load operation) before adding new system renewables
- Strategy B: Flexible allocation of system RE and ID/CA EE; incremental EE of up to 1.5% of retail sales forced; prioritize fossil re-dispatch (coal at 7-months effective full load operation) before adding new system renewables
- Strategy C: Flexible allocation of system RE and ID/CA EE; incremental EE of up to 1.5% of retail sales forced; prioritize new system renewables before re-dispatching fossil

# III(d) Compliance in States with Fossil Generation and No Retail Customers

- Comparison of Cases C02 through C04 with Cases C05 through C07 provide an opportunity to understand the implications of a critical III(d) uncertainty, which is how states might address fossil generation that does not serve retail load in the state.
- Application of state emission rate targets to PacifiCorp's share of fossil generation in these states places disproportionate compliance burden on PacifiCorp customers that is not reasonable.
- Assuming PacifiCorp meets its share of emission rate targets in AZ, CO, and MT with re-dispatch, with flexible allocation of system renewable resources, and with flexible allocation of and ID/CA energy efficiency, the present value revenue requirement of system costs is increased by \$0.8 billion to \$1.1 billion when compared to those cases that remove these states from the III(d) compliance solution.
- These cases will inform PacifiCorp's acquisition path analysis in the 2015 IRP and will inform on-going engagements with these states to find workable and equitable compliance solutions – these cases highlight the following:
  - Compliance costs will be mitigated by obtaining relief in achieving interim emission rate targets, which would account for early action like PacifiCorp's proposed plans to cease operating Cholla 4 as a coal fired facility by the end of 2024.
  - Compliance costs would be partially mitigated by including situs assigned energy efficiency resources from all states in its multi-state III(d) compliance strategy.
  - Compliance costs would be partially mitigated if PacifiCorp were able to use III(d) compliance attributes from all qualifying facility resources, regardless of REC ownership.
  - Compliance costs would be partially mitigated if PacifiCorp applied assumed distributed generation energy across its system toward meeting III(d) emission rate targets.



# Oregon RPS Scenarios

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- Case C05 assumes OR RPS requirements will be met with new renewable assets.
  - C05-1 = 154 MW of UT solar in 2020, 25 MW of WY wind in 2020, and 27 MW of OR wind in 2024 (206 total MW)
  - C05-2 = 106 MW of WY wind in 2020, 58 MW of UT solar in 2023, and 12 MW of WY wind in 2024 (176 total MW)
  - In both cases, OR does not have an RPS compliance shortfall until 2029; however, with banking rules, earlier acquisition reduces the future need of situs assigned renewable resources.
- Potentially lower cost solutions may be available for Oregon customers by acquiring unbundled RECs to defer the need to meet RPS requirements with assets beyond the planning horizon.
- Cases C05a-1 and C05a-2 are alternatives to C05-1 and C05-2, respectively, that eliminate situs assigned RPS resources from the portfolio.
- The levelized cost or benefit of meeting Oregon RPS with new generating assets, given current assumptions regarding the draft III(d) rule, are preliminary assessed by comparing the differential in System Optimizer PVRR costs between Cases C05 and C05a per megawatt-hour of situs assigned Oregon RPS generation removed from the portfolio.

# Levelized Cost/Benefit of Alternative RPS Compliance Cases with Current III(d) Assumptions

	(Increase)/Decrease in System PVRR with Removal of OR RPS Renewables (\$m)	Nominal Levelized (Increase)/Decrease in System Cost PVRR per MWh of OR RPS Renewable Energy Removed (\$/MWh)
Case C05-1 less C05a-1	\$54.4	\$14/MWh
Case C05-2 less C05a-2	(\$63.1)	(\$17)/MWh

- Under Regional Haze Scenario 1, system costs are reduced by about \$14/MWh of situs assigned Oregon RPS renewable generation when these assets are removed from the portfolio.
- Under Regional Haze Scenario 2, system costs increase by about \$17/MWh of situs assigned Oregon RPS renewable generation when these assets are removed from the portfolio.
- Differences between the two scenarios are driven by the interaction of Oregon situs assigned RPS renewable energy with the flexible allocation of system renewable resources to meet III(d) emission rate goals and the type/location of Oregon situs assigned renewable resources in the C05-1 and C05-2 portfolios.
  - Oregon situs assigned renewable energy is used for Oregon RPS compliance and for Oregon III(d) compliance.
  - Oregon situs assigned renewable energy is not re-allocated to other states for III(d) compliance purposes.
  - When situs assigned renewable energy is used for Oregon RPS and III(d) compliance, this frees up existing system renewable energy that can be allocated to other states for III(d) compliance purposes.
  - When situs assigned Oregon RPS resources are included in the portfolio, back down of existing Wyoming coal generation is avoided, which mitigates III(d) compliance costs and offsets potential cost savings of deferring situs assigned Oregon RPS generating assets.
  - In Regional Haze Scenario 1, limited transmission in Wyoming limits low cost Wyoming wind, and the III(d) compliance benefits are not enough to entirely offset cost savings when Oregon situs assigned renewable resources are removed from the portfolio.
  - In Regional Haze Scenario 2, assumed retirements of Dave Johnston Units 1&2 allows more low cost Wyoming wind, and the III(d) compliance benefits more than offset cost savings when Oregon situs assigned renewables are removed from the portfolio.
- Additional portfolio analysis of Oregon RPS compliance will be performed to inform preferred portfolio selection in the 2015 IRP.

# Reminder - Upcoming Meetings

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- III(d) Scenario Maker Confidential Technical Workshops
  - Two onsite workshops
    - Portland
    - Salt Lake City
  - To be scheduled
- January 29-30, 2015
  - Confidential Coal Analysis
  - Stochastic Results
  - Sensitivity Analysis Results
  - Preferred Portfolio and Action Plan
- February 26, 2015
  - Final Report