Portfolio Benefit Analysis Methodology

September 28 and 30, 2022

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Safety Moment

September is Food Safety Education Month

- Wash hands before you prepare your meal and before you eat
- Separate raw meat, chicken, turkey, seafood, and eggs from cooked food and fresh produce
- Use food thermometer to ensure food is cooked to an internal temperature that kills germs

Welcome to the webinar and thank you for participating!

If you **want to type a question regarding the presentation,** insert **"Slide X followed by your question"** in the chat box!

If you **have a technical issue or a general question**, please type it in the chat box.

Please **keep yourself on mute** unless you are speaking.

If you want to **ask a question verbally,** click the 'Reaction' button and click on the **'Raise Hand'** option and we will call on you.

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Today's Speakers

Brian Tyson
Manager, Clean Energy Planning and Implementation, PSE

Tyler Tobin
Senior Energy Resource Planning and Acquisition Analyst, PSE

Alexandra Karpoff
Energy Resource Planning and Acquisition Analyst, PSE

Ray Outlaw
Manager, Clean Energy Strategy Communications Initiatives, PSE

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Agenda

- Safety moment and introductions
- Present potential methodology for utilizing customer benefits in portfolio analysis
- Discuss potential methodology and ways to improve or evolve
- Discuss potential next steps for use of this analysis

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Purpose of Today's Drop-in Session

- PSE is interested in improving its methodology for considering customer benefits.
- In the 2021 IRP, PSE used a ranking methodology to compare portfolios based on data from AURORA.
- Today, PSE will:
    - Discuss potential approaches, benefits, and drawbacks
    - Discuss one particular approach in detail
    - Seek feedback on the approaches
- Feedback will inform our approach in the upcoming Electric Progress Report and future IRPs.

Background and Purpose of Portfolio Analysis

What is a portfolio analysis and why we do it?

- A tool for resource planning purposes that helps us make decisions about the types and amounts of resources we need to serve load
- This is NOT related to program implementation, which is addressed following an RFP

What is the goal of applying customer benefits in this analysis?

- Provide insight to the benefits and burdens of each portfolio beyond cost
- Understand how changes in each portfolio can impact future benefits and burdens

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Potential Approaches (and their shortcomings)

Approach 1: Quantify each benefit in a $/benefit

- Difficult to quantify in monetary terms, lack of robust research available

Approach 2: Use AURORA outputs to compare benefits between portfolios

- Limited quantitative data

Approach 3: Use ranking of portfolios similar to 2021 IRP

- Lack of normalization in data and variation in range

Methodology: Approach 2

Step 1. Define customer benefit indicators (CBIs) that we can use from AURORA output.

Step 2. Set lowest cost portfolio as base portfolio against which to evaluate other portfolios.

Step 3. For each portfolio, convert raw numbers to an index: index each CBI based on a comparison to the corresponding CBI from the base portfolio.

Step 4. Compare portfolios: plot each portfolio on a chart showing the CBI index versus portfolio cost.

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Step 1. Define CBIs we can use from AURORA Output

	Customer benefit indicator/metric*	AURORA Output
Environmental	✓ **Reduced greenhouse gas emissions**	✓ **Metric tons of CO2 reduced**
Reduction of risks	✓ **Improved affordability of clean energy**	✓ **Portfolio cost converted to impact to customer rates**
Public Health	✓ **Improved outdoor air quality**	✓ **Short tons of SOx, NOx and PM 2.5 avoided**
Energy and Non-Energy Benefits, Reduction of Burdens	✓ **Increased participation in EE, DER and DR programs** ✓ **Increase in quantity of jobs**	✓ **Number of customers count in EE, DER and DR programs**** ✓ **Number of jobs by project****
Energy Security and Resiliency	✓ **Improved access to reliable, clean energy** ✓ **Reduction in peak demand through DR programs**	✓ **Number of customers with access to storage** ✓ **Peak reduction in MW through DR**

*CBIs presented for discussion purposes only and may or may not reflect the final CBIs to be determined through the CEIP approval process.

**Developed with proxy from outside sources

Step 1. Define CBIs we can use from AURORA Output

- Jobs Creation metric
  - Developed a technology-specific jobs/MW metric
  - Jobs numbers sourced from the U.S Energy and Employment Jobs Report released for 2022 (jobs by technology type)
  - Total MW for each technology operating nationally, sourced from the 2021 Early Release EIA Form 860 and Form 861
- Demand Response (DR) and Distributed Energy Resources (DER) participation metric
  - Sourced from the Conservation Potential Assessment and Demand Response Assessment developed by Cadmus
  - Historic DER participation data from 2021 Early Release EIA Form 861M
- All other CBI metrics are sourced directly from AURORA output

Step 1. Define CBIs we can use from AURORA Output

Potential Customer benefit indicators **NOT** included:

Customer benefit indicator:	**Reasons for exclusion:**
• Increase in quality of jobs	• Some program implementation indicators and cannot be modeled in Aurora
• Increase in culturally- and linguistically-accessible program communications for named communities	• Some require qualitative information or data that PSE does not currently have access to
• Reduction of climate change impacts	
• Improved community health	
• Decrease frequency and duration of outages	

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Step 2. Set Least Cost Portfolio as Base Portfolio

- Base portfolio from the 2021 IRP: 1-Mid Portfolio
- Convert raw CBI metrics to 0 using a z-score method

CBI	AURORA Output 2021 Mid Portfolio	Index
GHG Emissions (Short Tons)	49,194,637	0
SO2 Emissions (Short Tons)	56,812	0
NOx Emissions (Short Tons)	28,597	0
PM Emissions (Short Tons)	17,351	0
Jobs (Total)	72,418	0
Cost ($, Millions)	15,529	0
DR Peak Capacity (MW)	39	0
DER Solar Participation (Total New Participants)	3,393	0
Energy Efficiency Added (MW)	723	0
DR Participation (Total New Participants)	260,106	0
DER Storage Participation (Total New Participants)	10,699	0

Step 3. Index Other Portfolios and Compare to Base

- Base portfolio set to 0
- Positive (+) indices = better than base portfolio
  - *Much* less emissions (better outcome) than base portfolio (index = 3.34)
- Negative (-) indices = worse than base portfolio
  - *Barely* more emissions (worse outcome) than base portfolio (index = -0.01)

2021 IRP Portfolios	GHG Emissions (Metric Tons)	GHG Emissions, Indexed
1	49,194,637	0.00
A	30,937,944	2.11
C	48,664,512	0.06
D	49,021,940	0.02
F	48,694,400	0.06
G	49,105,511	0.01
H	49,624,773	-0.05
I	49,076,373	0.01
K	50,790,958	-0.18
M	46,209,782	0.34
N1	26,603,211	2.61
N2	20,248,319	3.34
O1	39,795,151	1.09
O2	37,347,559	1.37
P1	53,731,454	-0.52
P2	44,828,426	0.50
P3	56,112,692	-0.80
V1	48,900,369	0.03
V2	49,268,654	-0.01
V3	49,254,103	-0.01
W	46,073,942	0.36
AA	48,543,089	0.08

Step 3. Index Other Portfolios and Compare to Base

- The value from each portfolio contributes to the *distribution* and *standard deviation (SD)* of values
  - Adding a portfolio may change the index (z-score)

Examples:

- Portfolios 1 through M only: SD = 5.5 M
  - Index for A: 3.32 (large change)
  - Index for C: 0.06 (no change

- All 22 IRP portfolios: SD = 8.7 M

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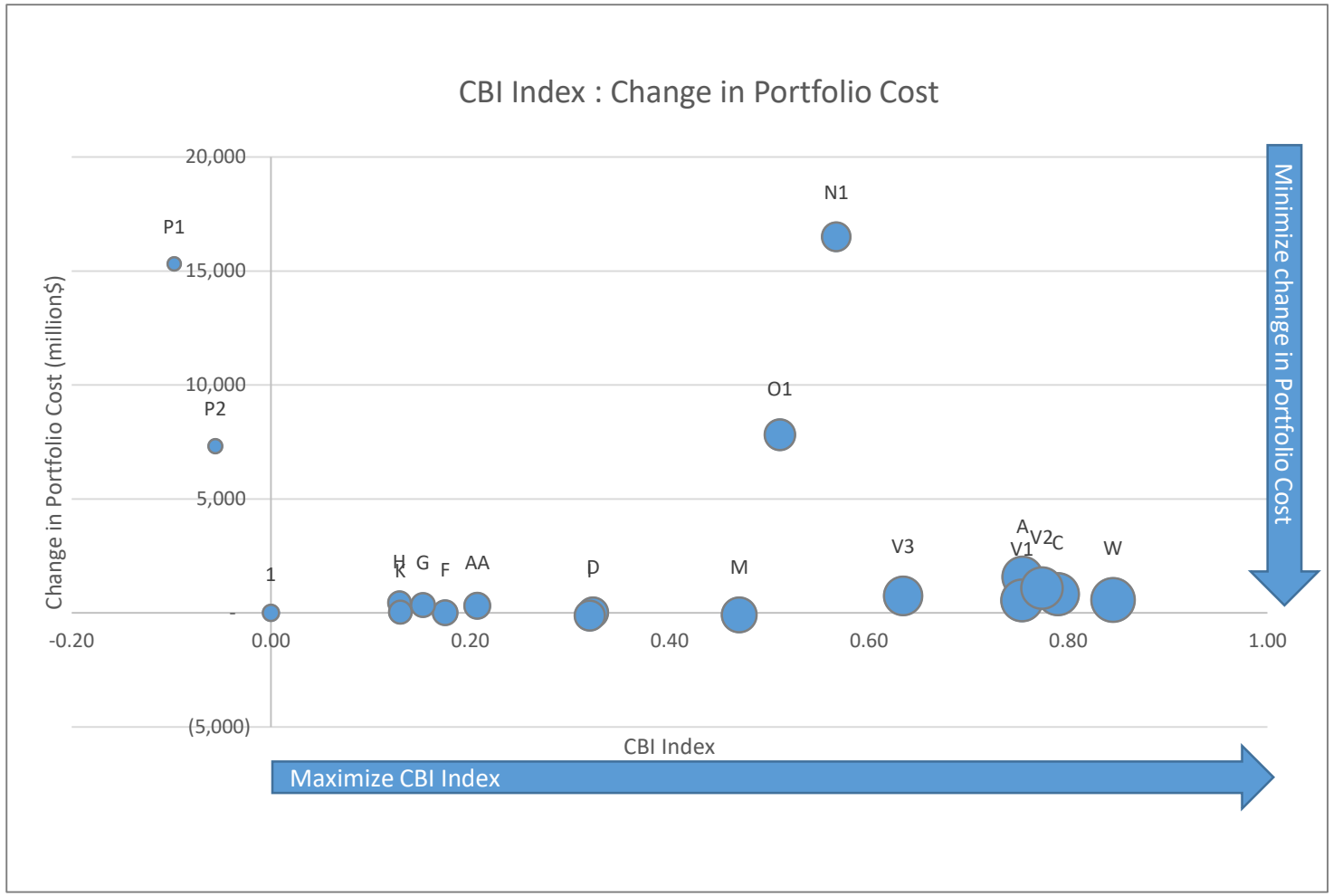
Step 4. Compare Portfolios Based on CBI Index vs. Portfolio Cost



Key Takeaways:

- Portfolios located in the bottom right corner are **most desirable**
- Demonstrates **how costs are impacted** as benefits go up or down
- Markers scaled by CBI per Cost metric to determine “CBI Efficiency”, larger dots are **more desirable**
- Gives **insight** to how PSE may make a **decision** on a final portfolio

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Methodology Summary

Benefits

- No upper/lower range bias
- Easy to interpret and compare CBIs across metrics and portfolios (data is normalized)
- Ability to assign different weights to different CBIs

Potential limitations

- Can overstate impact of small differences
- Relative measure will cause indices to vary with each new portfolio added to set

Questions

- Does this approach seem reasonable? Why or why not?
- What else should we be thinking about?
- Do we want to add weights to the indices?
- Does this help us make a more informed decision on a preferred portfolio?
- What other data sources should we consider?

Assessment Tool (Calculator)

Questions

- Does this approach seem reasonable? Why or why not?
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Next steps

September 28 and 30

- Portfolio benefits analysis drop-in sessions

September 28 – October 12

- Provide feedback or submit questions at pse.com/irp/get-involved or email irp@pse.com

September and October

- Prepare 2023 Electric Progress Report analysis

Appendix

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Emissions Metrics

How to measure?

Emissions at end of planning period	Change in emissions over planning period	Sum of emissions over planning period
End state is most important	End state is most important	Captures impact of rate of emission reduction
Smaller is better	Larger is better	Small is better

Other Metrics

- Need to spend some time reviewing and validating data sources and methodologies
- Participation-based metrics are highly sensitive to customer participation multiplies
- Jobs metric is highly sensitive to “Job/MW” multiplier
- See spreadsheet for details on existing assumptions and work to be completed

Customer Benefit Indicators Shape Outcomes

Highly impacted communities and vulnerable populations
(named communities)

Energy benefits
- Improved participation in clean energy programs from named communities

Reduction of burdens
- Improved participation in clean energy programs from named communities
- Improved affordability of clean energy
- Increase in culturally- and linguistically-accessible program communications for named communities

Non-energy benefits
- Improved participation in clean energy programs from named communities
- Increase in quality and quantity of clean energy jobs
- Improved home comfort

All PSE customers (including highly impacted communities and vulnerable populations)

Public health
- Improved outdoor air quality
- Improved community health

Energy security
- Improved access to reliable clean energy

Environment
- Reduction of greenhouse gas emissions
- Reduction of climate change impacts

Risk reduction
- Reduction of climate change impacts
- Improved access to reliable clean energy

Cost reduction
- Improved affordability of clean energy

Resiliency
- Decrease frequency and duration of outages

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Customer Benefit Indicators and Metrics

Energy
Non-energy
Burden reduction

Improved participation in clean energy programs from highly impacted communities and vulnerable populations

- Increase percentage of participation in energy efficiency, demand response and distributed resource programs or services by PSE customers within highly impacted communities and vulnerable populations
- Increase percentage of electricity generated by distributed renewable energy projects

Non-energy

Improved home comfort

- Increase dollars in net present value (NPV) in non-energy impact (NEI) benefits for energy efficiency programs (based on estimated lifetime value of NEIs)

Non-energy

Increase in quantity and quality of clean energy jobs

- Increase quantity of jobs based on:
  - Number of jobs created by PSE programs for residents of highly impacted and vulnerable populations
  - Number of local workers in jobs for programs
  - Number of part-time and full-time jobs by project
- Increase quality of jobs based on:
  - Range of wages paid to workers
  - Additional benefits offered
  - Demographics of workers

Burden reduction

Increase in culturally- and linguistically-accessible program communications for named communities*

- Increase outreach material available in non-English languages

*CETA benefit category

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Customer Benefit Indicators and Metrics

Affordability

Improved affordability of clean energy

- Reduce median electric bill as a percentage of income for residential customers
- Reduce median electric bill as a percentage of income for residential customers who are also energy-burdened

Environment
Risk reduction

Reduction of climate change impacts

- Increase avoided emissions times social cost of carbon

Resilience

Decrease frequency and duration of outages

- Decrease number of outages, total hours of outages and total backup load served during outages using SAIDI and SAIFI
- Reduce peak demand through demand response programs

Environment

Reduced greenhouse gas emissions

- Reduce PSE-owned electric operations metric tons of annual CO_{2e} emissions
- Reduce PSE contracted electric supply metric tons of annual CO_{2e} emissions

Public health

Improved outdoor air quality

- Reduce regulated pollutant emissions (SO2, NOx, PM2.5)

Public health

Improved community health

- Reduce the occurrence of health factors like hospital admittance, and work loss days (using hospital discharge rates as a proxy)

Risk reduction
Energy security

Improved access to reliable clean energy*

- Increase number of customers who have access to emergency power (through net metering and battery storage)

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*CETA benefit category

Step 2. Choose a Base Portfolio; Convert Raw Numbers to an Index

Indexing Using a Z-Score:

$$Index = \frac{Portfolio\ Value - Base\ Portfolio\ Value}{Standard\ Deviation\ of\ all\ Values}$$

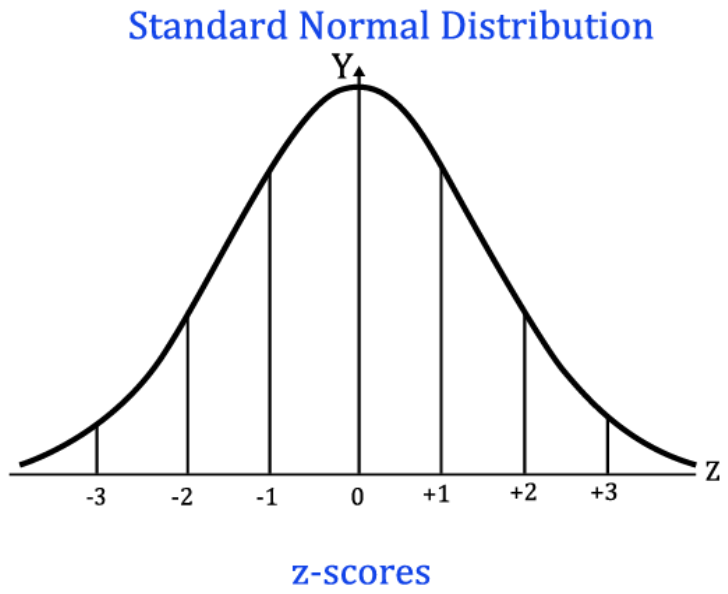
Base portfolio index = 0

- Positive (+) indices = better than base portfolio
- Negative (-) indices = worse than base portfolio

Ex.

Jobs Index = (1,000 – 200) / 400 = 2 (up 2 from base index)

DR Index = (200 – 1,000) / 400 = -2 (down 2 from base index)



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