Integrated Resource Planning

ROUNDTABLE 21-2

MARCH 2021





MEETING LOGISTICS

Electronic version of presentation:

- *https://www.portlandgeneral.com/our-company/energy-strategy/resource-planning/integrated-resource-planning/irp-public-meetings*

Teams Meeting

- Please click the meeting link sent to your email or here:
  - Join Microsoft Teams Meeting
  - +1 971-277-2317 (dial this number into your phone for best results)
  - PW: 244 262 580#

  *Please use Microsoft Edge or Google Chrome with Teams as it will give you the best experience
- During the presentation, all attendees will be muted; to unmute yourself via computer, click on the microphone that appears on the screen when you move your mouse
- To unmute yourself over the phone, press *6
- If you call in using your phone in addition to joining via the online link, please make sure to mute your computer audio
- There is now a meeting chat feature rather than a Q&A feature. Pull this up on the menu bar when you move your mouse and look for the little message icon

SAFETY MOMENT

Spring Safety Tips

Changeable weather – be prepared for dry, wet, warm, and cold weather by taking extra care with your attire and supplies

Slips, trips, and falls – softer ground or muddy conditions can be hazards in the spring weather; wear weather/work appropriate shoes and watch your step

Spring outdoor work – think about ladder safety and inspect your tools before you begin outdoor projects

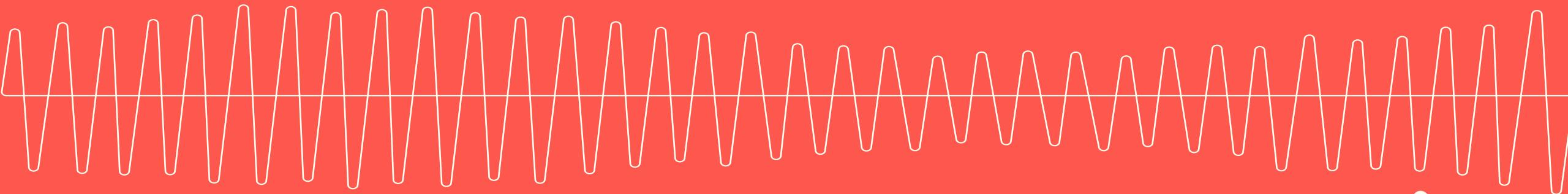
AGENDA

Welcome and introductions	15 minutes
Community values and the 2022 IRP	30 minutes
Modeling overview	30 minutes
Transmission update	30 minutes
Portfolio requests from participant	10 minutes

COMMUNITY VALUES AND THE 2022 IRP

JESSICA GRAEBER

ROUNDTABLE 21-1



COMMUNITY VALUES

ROUNDTABLE 20-4 July 29, 2020

28 participants

What we heard:

Participant values

Key topics of interest

COMMUNITY VALUES

Prompts we discussed in July 2020

- What is important to you as a consumer of energy and/or a representative of your organization?
- Are there values from the 2019 IRP process that resonate with you or that do not resonate with you?
- What additional values would you like to bring to this process that have not been mentioned?
- What would you like to see from PGE in how we approach this process? How will you know that you have been heard?
- What else would you like to share?

COMMUNITY VALUES

COMMUNITY VALUES

What we heard about most from the attendees in July was a focus on…

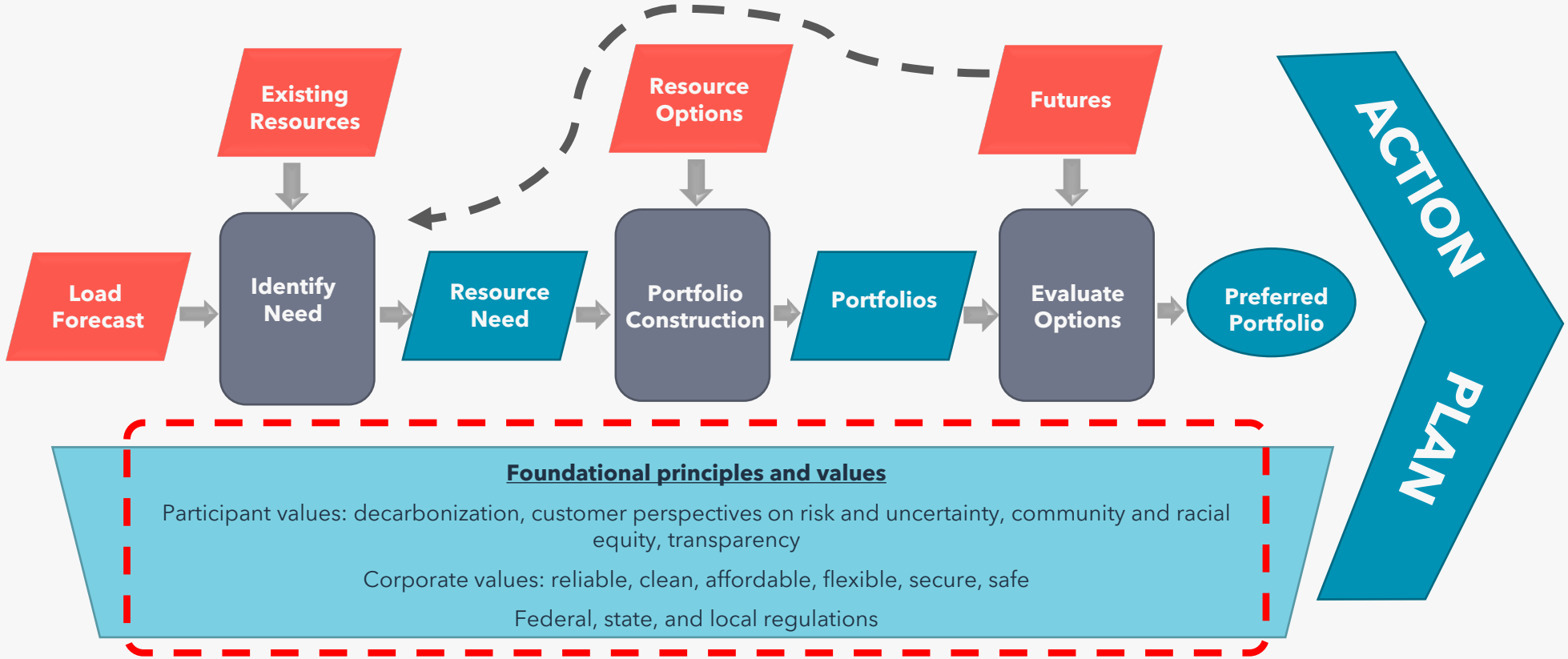
- How to achieve reliability and affordability in a decarbonized system
- How to think about risk and uncertainty
- How to promote community involvement in PGE processes and how to clearly communicate what the IRP action plan means to the public
- How to address and prioritize the climate crisis in IRP analysis

COMMUNITY VALUES

How we integrate the values conversation

- Used to guide framing questions that direct analysis
- Inform studies, model inputs, considerations of risk, and other influences on decision points
- Adjust engagement to fit participant needs
- Adapt how and when we share information, draft results, and parts of the written report to support participant engagement

FOUNDATION TO THE IRP



COMMUNITY VALUES

As we move forward with the 2022 IRP, we will continue to listen and respond to the values, questions, and concerns that come up in our process

- We will continue to partner with PGE's Diversity, Equity, and Inclusion team to evolve our public process
- We will revisit the values and priorities shared in July 2020 as well as additional input shared during the process
- We will continue to welcome feedback and suggestions for analytical processes

We welcome feedback at irp@pgn.com

QUESTIONS/DISCUSSION?

MODELING AND PROCESS: 2022 IRP

Nora Xu

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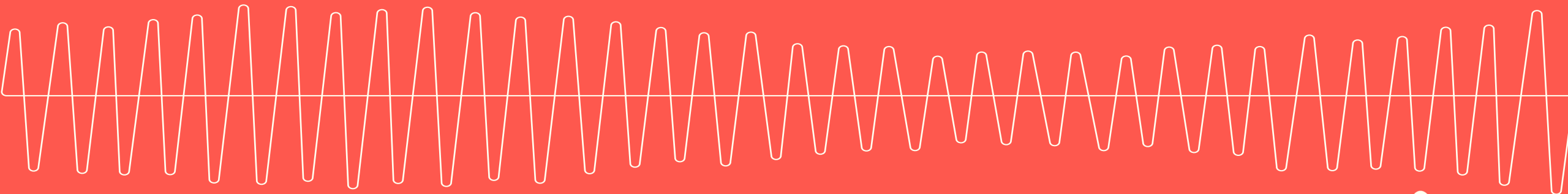


INTEGRATED RESOURCE PLANNING

Least-cost planning started in Oregon in 1989

Today's IRP Guidelines:
Best balance of cost and risk
Significant involvement of the public
Consistent with the long-run public interest

General IRP timing

PUBLIC MEETINGS/PUBLIC REVIEW PROCESS

PGE ANALYSIS

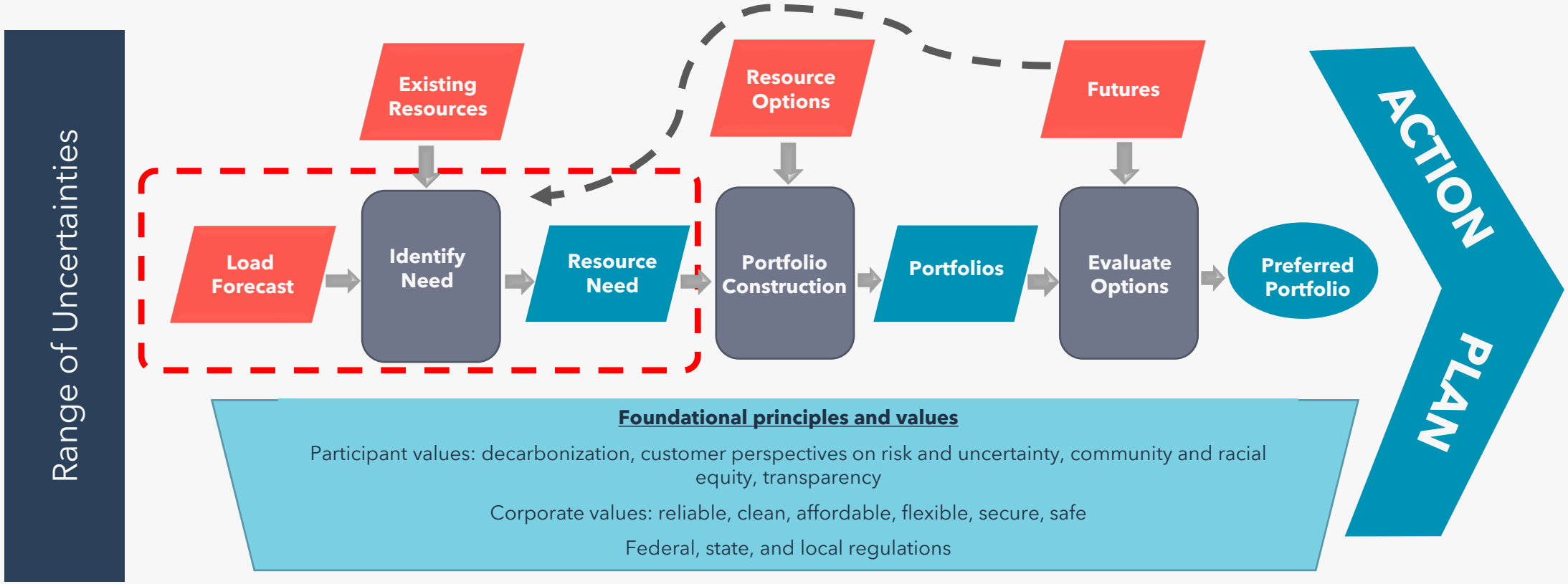
DRAFT IRP DEVELOPMENT

DRAFT IRP DISTRIBUTION

FINAL IRP

OPUC PROCESS

Foundational analytical process



Identify the need

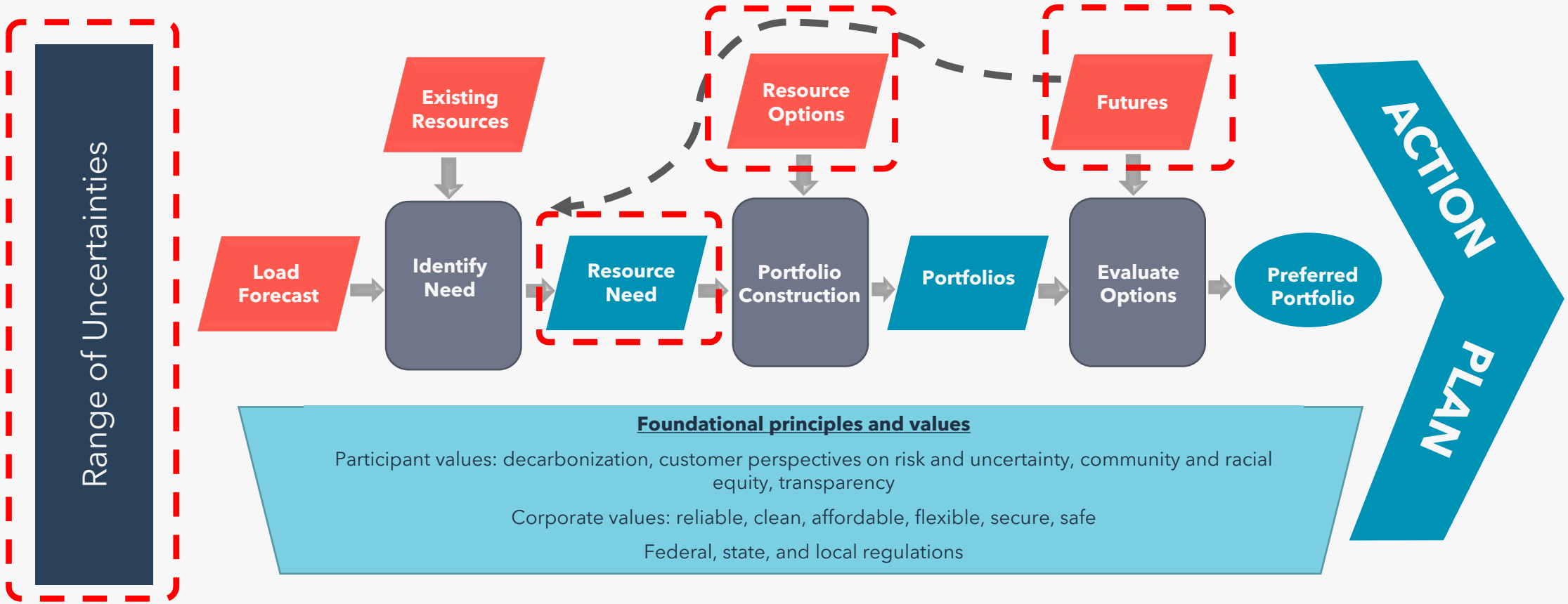
- The starting point for analysis is with a look at our need for resources in the future
- Needs are impacted by a many factors:
  - Customer preferences
  - Econometric load forecasts
  - Energy Efficiency forecasts
  - Distributed Energy Resource forecasts
  - Impacts of rapidly evolving technologies like flexible loads
  - Changes in resource mix
  - Policy drivers, such as RPS or clean energy policies

Identify the need

Meeting our needs requires…

- **Capacity** – the assurance that resources will be available to serve load
- **Energy** –the actual generation from your available resources over the course of the year
- **Flexibility** – the ability to respond to changes in resource output and forecast error and variability from load and variable energy resources
- Compliance with regulations, including the Renewable Portfolio Standard (RPS) and the Governor's Executive Order 20-04

Foundational analytical process



Consider Uncertainties

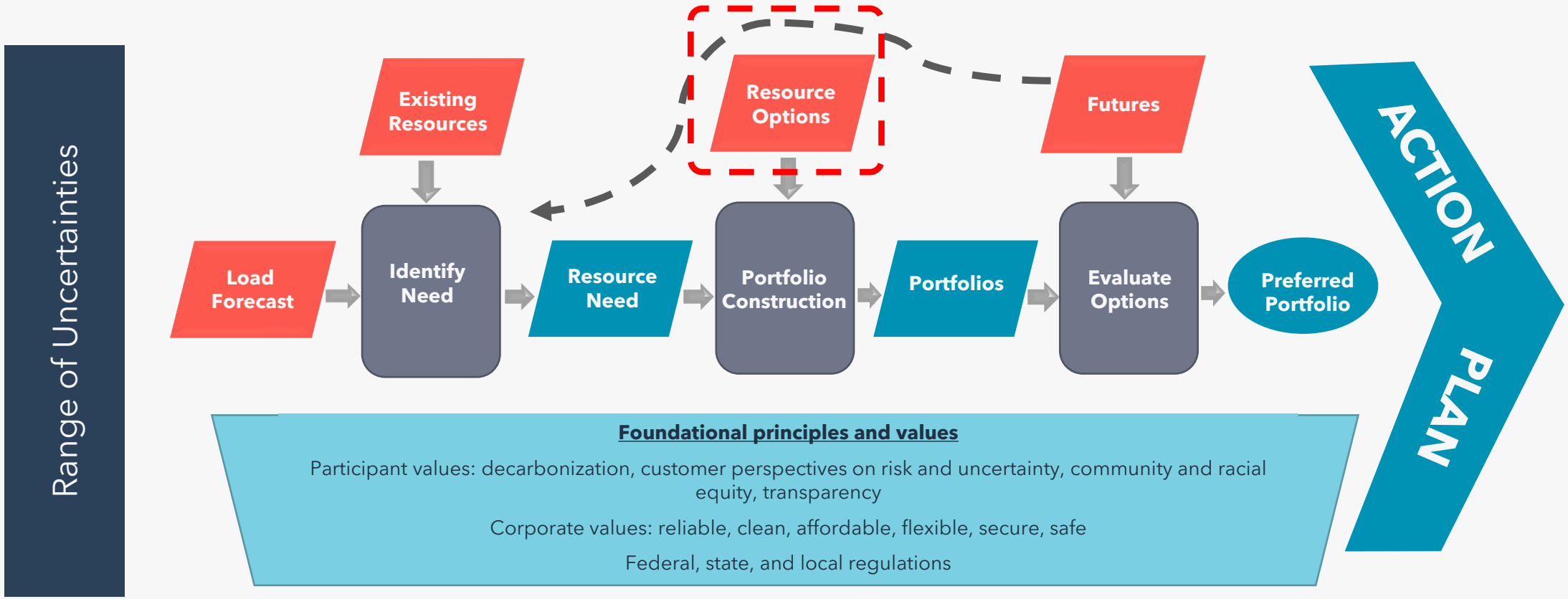
There are many variables that affect resource planning…

- Uncertainty in future needs
- Uncertainty in future market conditions
- Uncertainty in future technological progress
- Uncertainty in future policy drivers and decisions

Additional uncertainties can be investigated in a variety of ways

- Potential future need sensitivities:
  - Voluntary Renewable Programs
    - GEAR
    - Community solar program
    - Collective renewable programs
  - PURPA QFs

Foundational analytical process

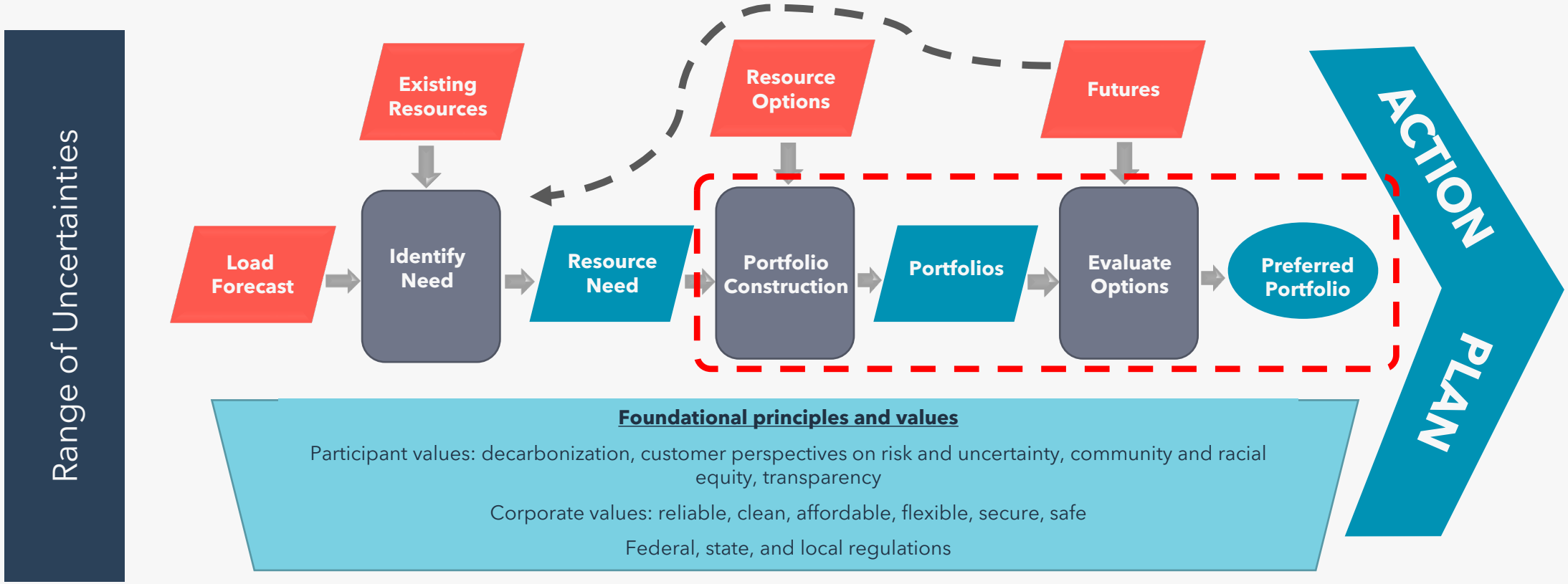


Consider resource options

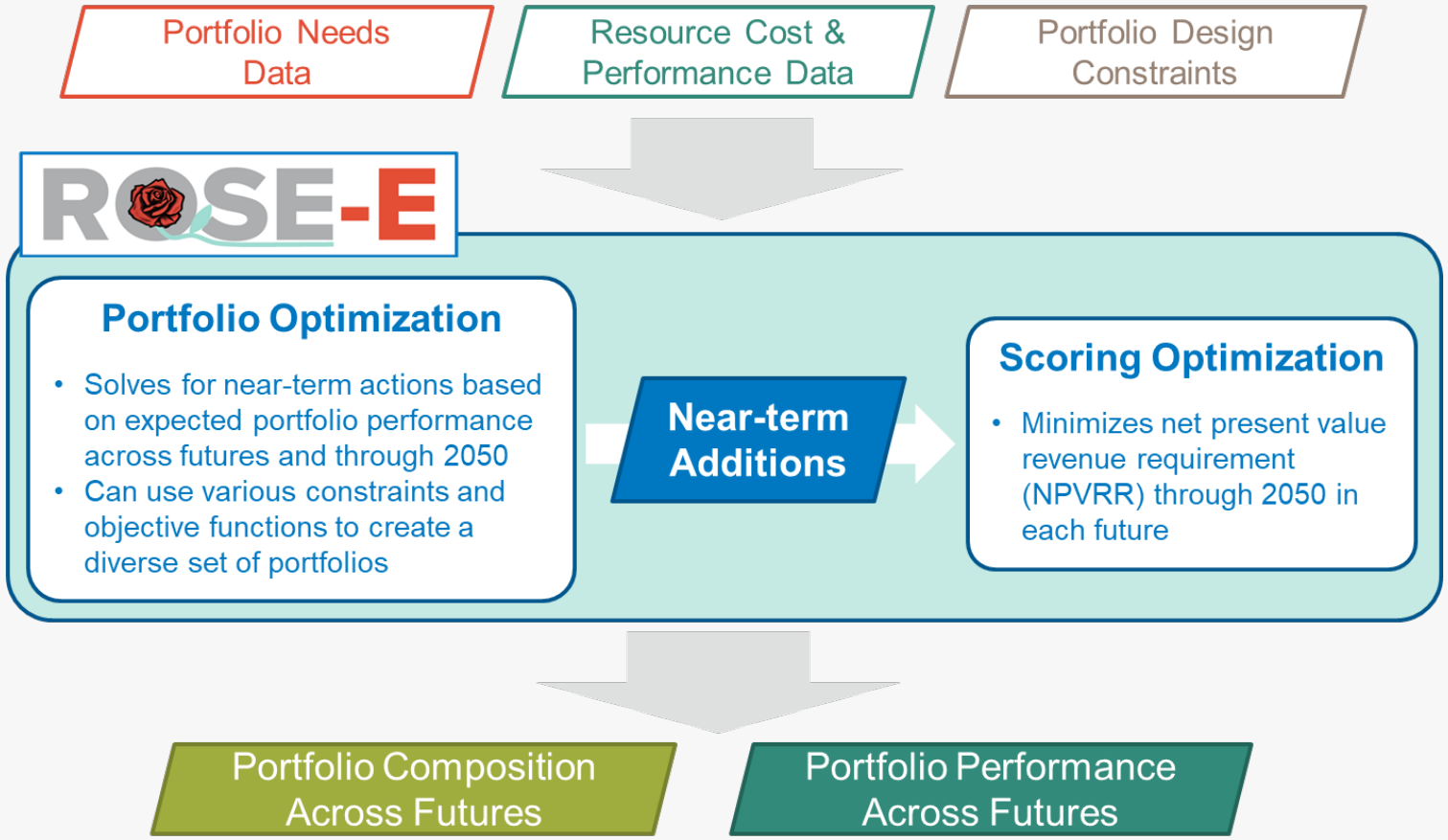
- Distributed Energy Resources, Flexible Load and Energy Efficiency
- Renewables
- Storage resources
- Thermal Resources
- Emerging Technologies

- Refer to Roundtable 21-1 for an update on the Supply Side Study

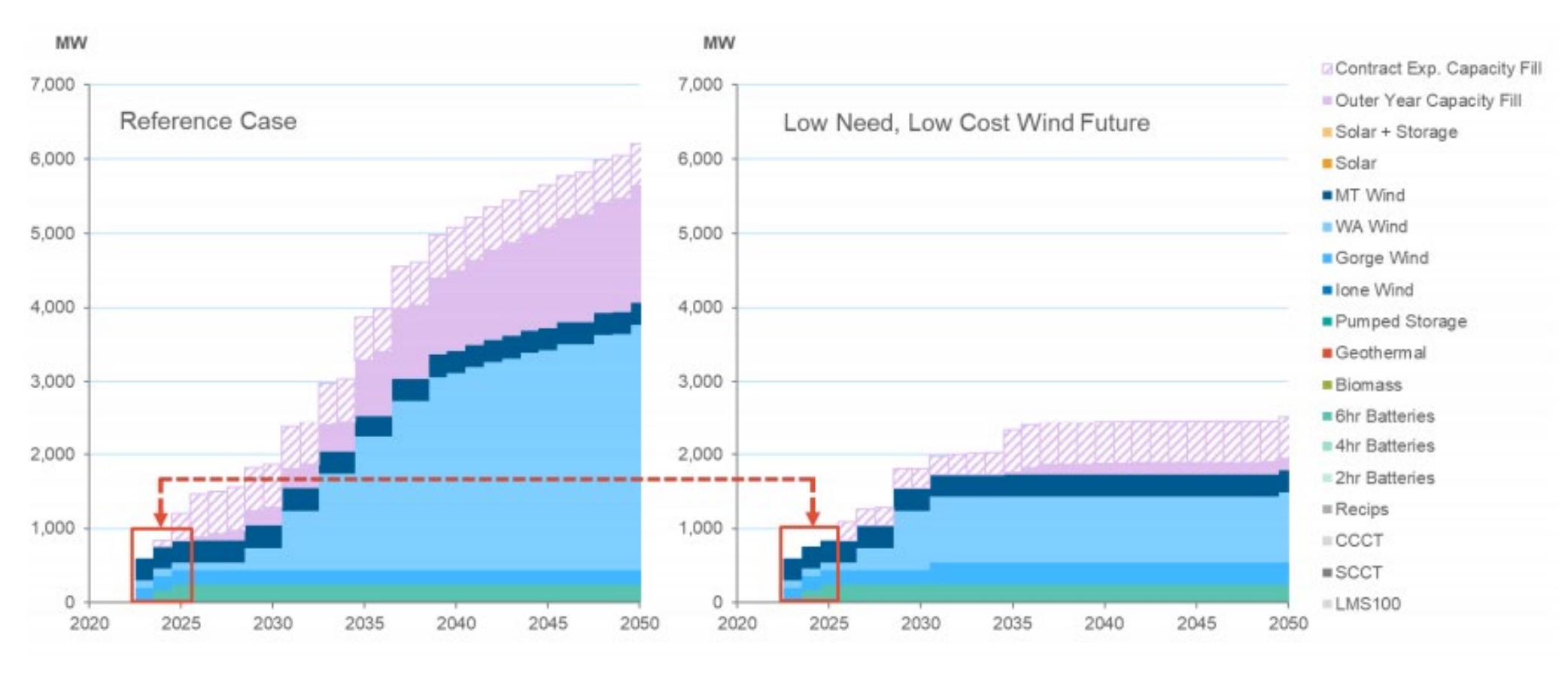
Foundational analytical process



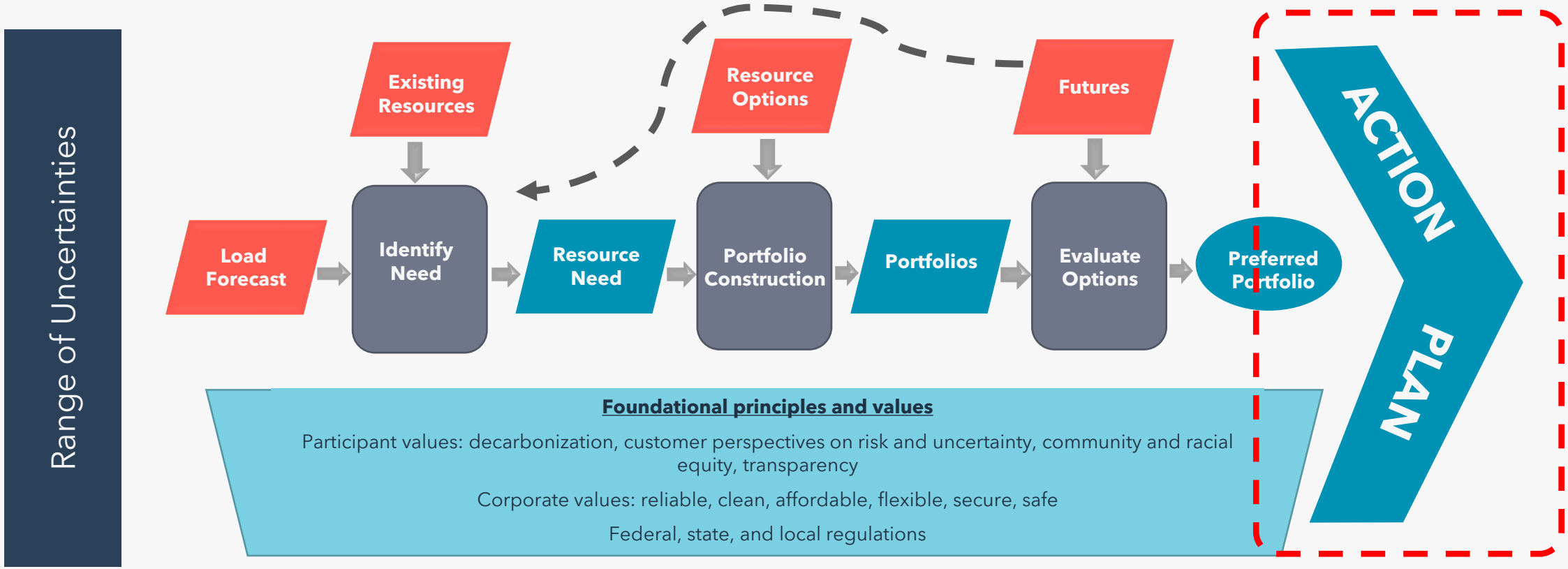
Construct and evaluate portfolios



Flexible portfolio construction for different futures



Foundational analytical process



Thoughtfully pursue long-term goals with the Action Plan

- Overarching context of the Action Plan continue to include our **foundational principles and values** discussed earlier, and customer and participant feedback through public process
- Through the portfolio analysis process, we seek to evaluate a wide range of potential strategies for meeting near term needs. Examples include:
  - Specific resource options
  - Size and timing variations
  - Participant-requests (please send us these!)
- Assess performance of portfolios across traditional and non-traditional metrics
- In the 2019 IRP we asked, what characteristics do the best performing portfolios share?
  - Customer resources: EE and DER adoption and participation
  - Renewable resource additions
  - Capacity resource additions

General IRP timing

PUBLIC MEETINGS/PUBLIC REVIEW PROCESS

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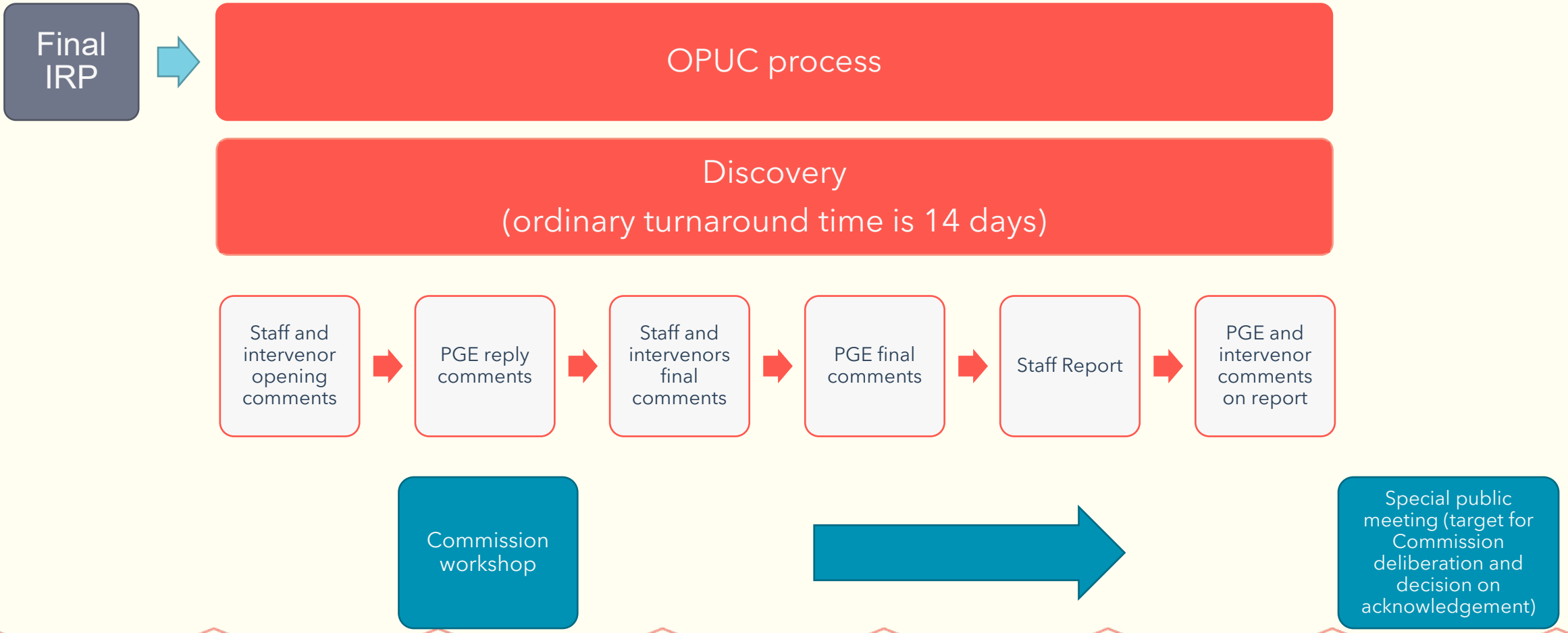
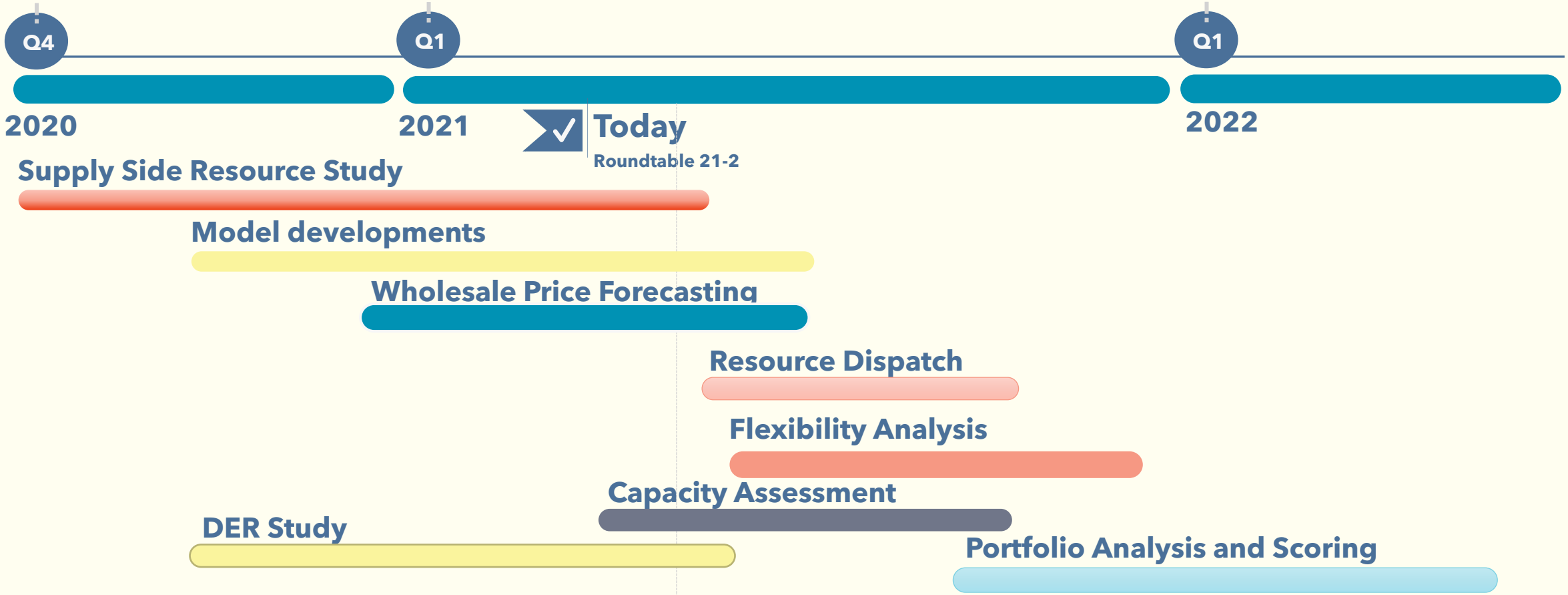
General IRP timing



Draft 2022 IRP analysis timeline



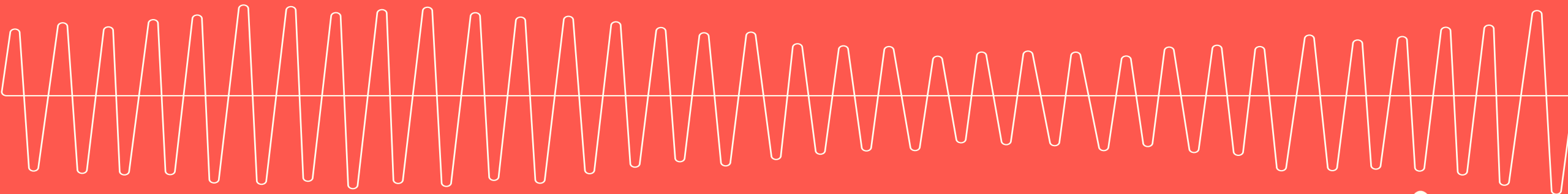
Questions & Comments

We’re seeking your feedback!

TRANSMISSION UPDATE

SETH WIGGINS

ROUNDTABLE 21-2



Incorporating transmission into IRP

Previous IRPs assumed generic off-system resources selected were able to acquire all necessary transmission to deliver to PGE

- The associated costs were set at BPA tariff rates
- MT Wind transmission costs came from MRDAP and recent BPA and PSE tariff filings

Wood Mackenzie's WECC-wide model (run in Aurora) limited zone-to-zone transfers based on physical transmission capacity limits

We are proposing that the IRP include a more detailed incorporation of the current transmission landscape

- Using BPA data, off-system resource additions will be constrained during the Action Plan window by what long-term posted transmission capacity is available

Incorporating transmission into IRP

The 20-2 presentation outlined a process from which a transmission inventory can be calculated

- [BPA inventories & flowgate impacts] -> MW available for each substation
- This value divided by .8 to reflect Interim Transmission Solution
    - Requiring the use of long-term transmission products for 80% of nameplate capacity

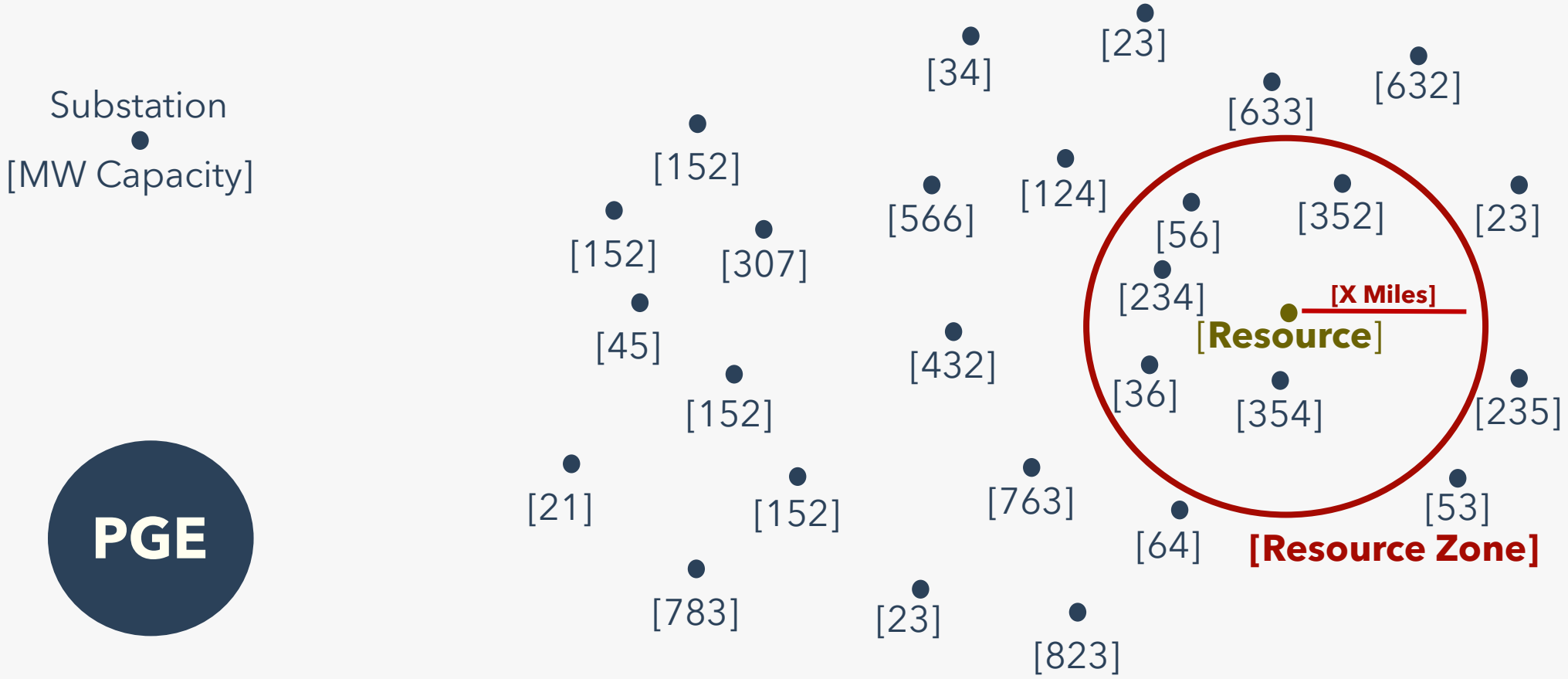
Today will expand on that presentation's ideas about:

1. Resource zone (RZ) aggregation
2. Average flowgate/addition size impacts
3. Non-market capacity

Resource zone aggregation

To use substation capacity data, some form of zonal aggregation is needed

- Suppose we want to consider some resource to serve PGE load



All MW values, locations illustrative

Resource zone aggregation: Two questions

How large should the aggregated resource zone be?

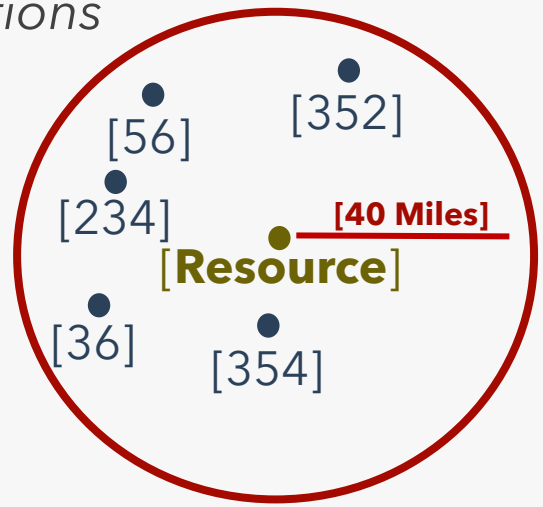
- Too small fails to capture available capacity
- Too large doesn't capture capacity limitations
    - *Currently using 40 miles, open to participant suggestions*

How should we aggregate the capacity in the region?

- Summation wouldn't capture flowgate impacts
- An average would miss available capacity
    - *Currently using maximum within X miles*

This creates a total resource zone inventory

- *Result: There are 354 MW available for this resource zone*
- *How much ROSE-E can add is a different question*



All MW values, locations illustrative

Resource zone inventory reductions

The goal of transmission analysis is to limit resource additions by contractual capacity

- *The change in inventory associated with a resource addition (its 'impact') must be estimated*

There is a 1:1 relationship between substation capacity and resource impact

- *For example, if Eagle-PGE* has 100MW of capacity, we can only add 100MW at Eagle*

However, there are corresponding impacts on other substations' capacities

- *A 100MW addition Eagle-PGE will also reduce the capacity of nearby Badger-PGE**

The impact by resource zone must be generalized twice, from:

- *Variation within a resource zone (differs by substation)*
    - Solution: Average flowgate impacts
- *Variation by quantities added (differs by addition)*
    - Solution: Average addition size impacts

*Denotes substations where PGE can accept delivery
All MW values, locations illustrative

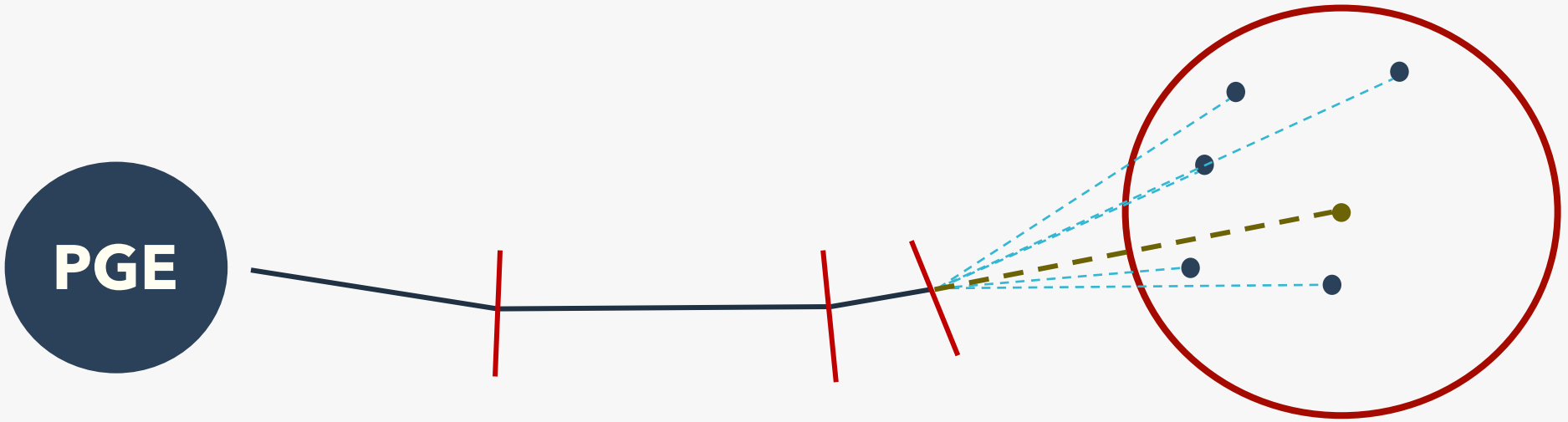
Average flowgate impacts

Inventories are calculated by determining the total amount capacity through flowgates

- The 'passable impact' derived in April 2020 slides (#13, also in appendix)

Each of these substations have slightly different effects* on each flowgate

- These are averaged to create one flowgate impact per resource zone



* POR PTDF – POD PTDF
All MW values, locations illustrative

Average addition size impacts

There are non-linear impacts to resource additions

- Changes to flowgates can cause 'jumps'

ROSE-E evaluates 0-9999MW resource additions

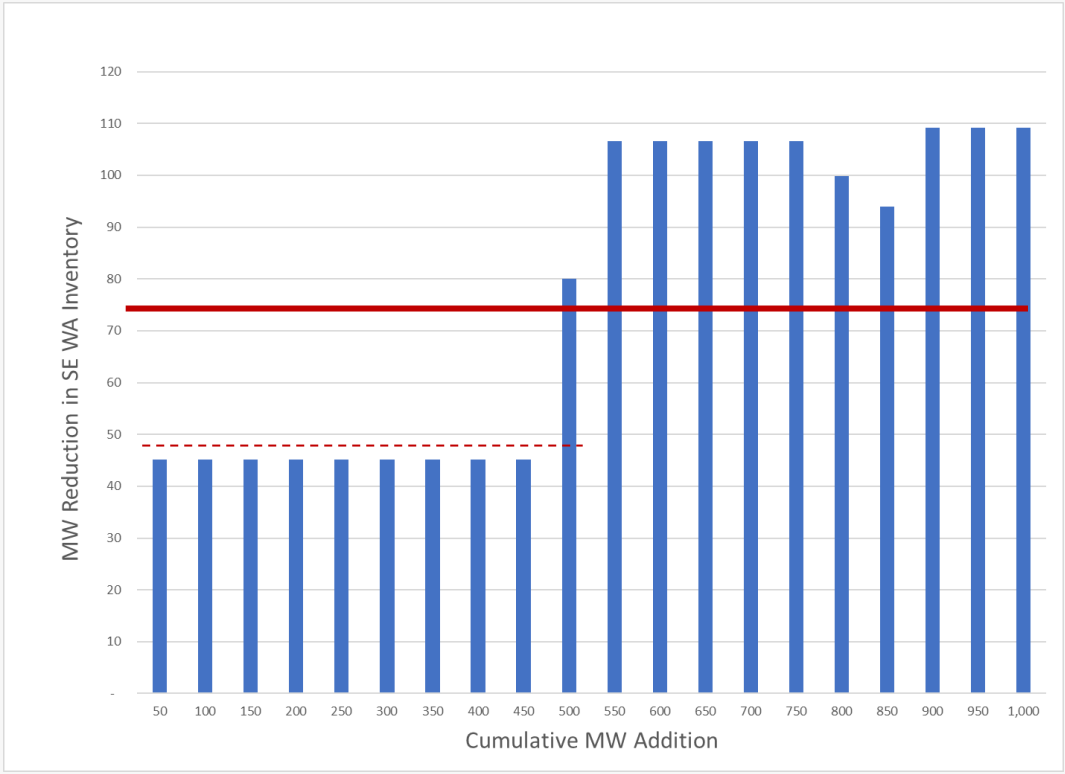
- Using the impact associated with the first addition would miss impact difference
- Generalization is needed as there are (RZxRZxNxN)* number of impacts

Currently using average of 20x50 MW additions

- Average to right: 77 MW

Values would be different using alternative choices

- 10x25: ~48 MW: *open to feedback here*



* RZ denotes the number of resource zones evaluated
All MW values, locations illustrative

Resource zone inventory reductions

Starting with the following transmission inventories

	Inventories
RZ1	428
RZ2	322
RZ3	894

An Rz x Rz matrix of transmission impacts can then be created

	RZ1	RZ2	RZ3
RZ1	1.2	1.5	.5
RZ2	.1	1.1	.3
RZ3	.37	.2	.9

If ROSE-E wants to add 100 MW from RZ1

	Inventories
RZ1	428-120=308
RZ2	322-10=312
RZ3	894-37=857

Inventories are reduced by the following amount

All MW values, locations illustrative

Non-market capacity

Thus far, we've been extrapolating from BPA inventories

However, an adjustment is warranted for additional capacity beyond BPA's website

- We know third parties in the market hold some quantity of transmission capacity

Currently modeling an additional 5% of capacity, open to feedback

All MW values, locations illustrative

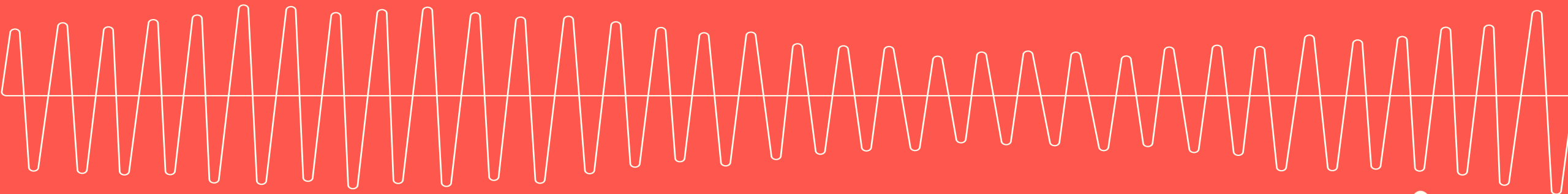
Questions & Comments

We’re seeking your feedback!

PORTFOLIO REQUESTS FROM PARTICIPANTS

SETH WIGGINS

ROUNDTABLE 21-1



Portfolio requests

Our portfolio optimization model ROSE-E has flexibility to evaluate any specific resource/size/year combination

- For example, we could estimate the portfolio effects of adding 235 MW of SE Washington wind in 2036 and/or 150 MW of 6-hr batteries in 2027
- In the 2019 IRP, we used this capability to evaluate the size and timing of 16 different renewable additions MW/year combinations

We are also able to model carbon emission trajectories

- For example, we could evaluate a linear reduction in emissions to net zero by 2040
  - Or we plan to make the same total reductions in steps

We are open to any suggestions for portfolio questions to be evaluated

- Please contact us (email: IRP@PGN.com)

QUESTIONS/DISCUSSION?

THANK YOU

CONTACT US AT:
IRP@PGN.COM

ATTACHMENT A: ACRONYMS

BPA: Bonneville Power Administration

DER: distributed energy resources

EE: energy efficiency

EO 20-04: Executive Order 20-04 directing state agencies to take action to reduce and regulate greenhouse gas emissions

GEAR: green energy affinity rider

IRP: integrated resource plan

LUCAS, ROM, PGE-zone, Sequoia, ROSE-E, and AURORA: models PGE uses for IRP analysis (see Appendix I: 2019 IRP Modeling Details from the 2019 IRP)

MRDAP: Montana Renewable Development Action Plan

MW: megawatt

NPVRR: net present value revenue requirement

NWPCC: northwest power and conservation council

OPUC: Oregon Public Utility Commission

PNNL: pacific northwest national laboratory

PSE: Puget Sound Energy

QF: qualifying facility

RPS: renewable portfolio standard

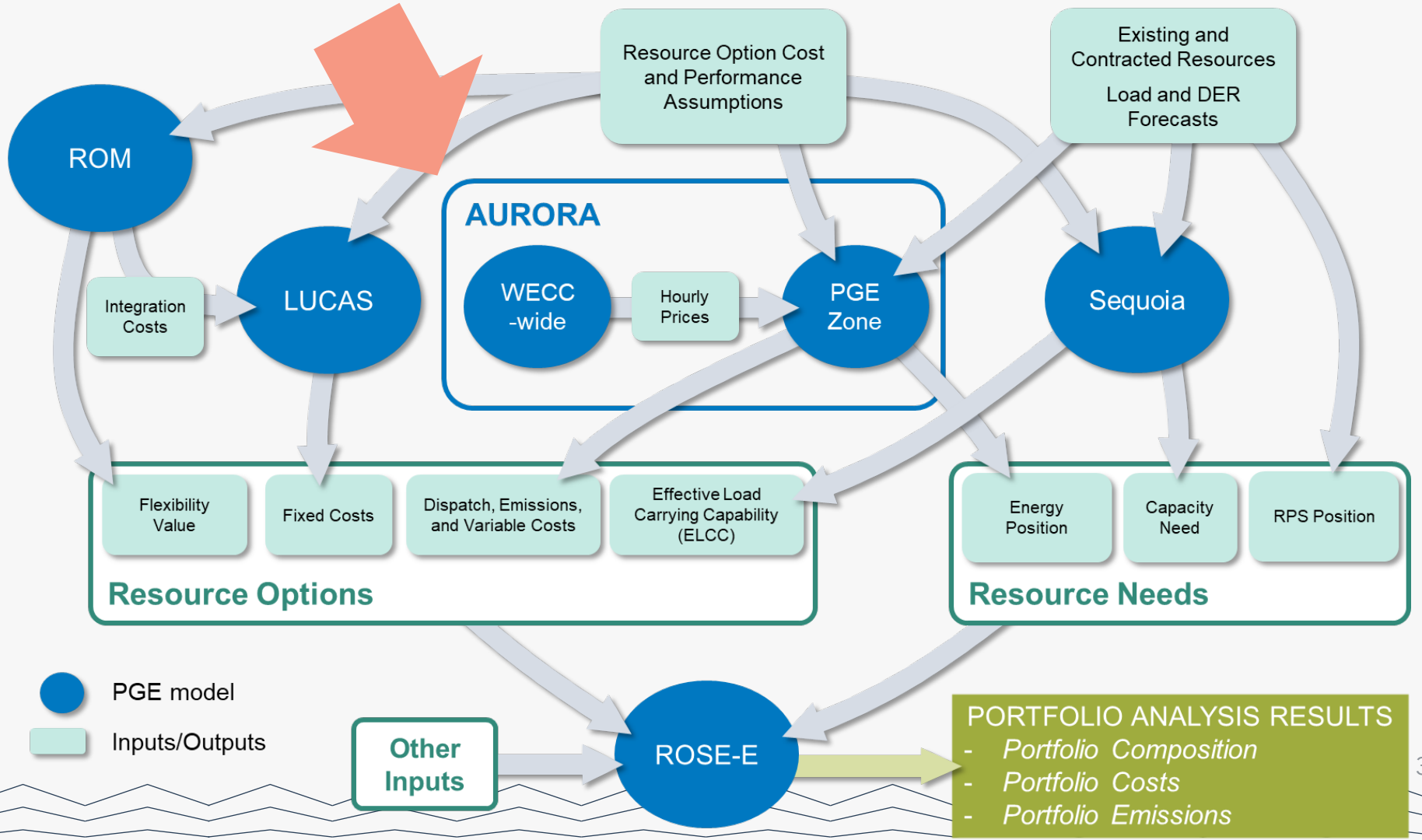
RZ: resource zone

SB 978: Senate Bill 978

WECC-wide: Western Interconnection (today- the generators, transmission lines, and other facilities that comprise the Western Interconnection electrical grid, which is a NERC region)

WM: Wood Mackenzie

WECC-wide market price forecasting



Modeling Transmission Capacity per Pathway

Define ***"Passable Impact"*** as the largest TSR that would generally be granted by BPA based on posted ATC*

- Can be calculated for each source/sink/year permutation in two steps:

1. Determine the total *Passable Impact* for each flowgate:

*(Source PTDF – Sink PTDF) * MW Demanded = Total flowgate impact (MW)*

Redefine and rearrange:

Total Passible Impact (MW) *=Total* ***available*** *flowgate impact (MW) / (Source PTDF – Sink PTDF)*

2. Calculate the total *Passible Impact* for each flowgate on path:

•Take the smallest *Passible Impact* among all flowgates

- Example: Total *Passible Impact* for pathway in 2020 = 10 MW

Total Passable Impact (hypothetical)	2020
South of Allston N>S	528
Cross Cascades North E>W	623
West of Lomo E>W	42
Cross Cascades South E>W	345
North of Hanford N>S	756
North of John Day N>S	8345
Paul-Allston N>S	10
Raver-Paul N>S	355
West of McNary E>W	24
West of Slatt E>W	263
West of John Day E>W	34
South of Custer N>S	993
North of Echo Lake S>N	500

** Assuming no subgrid or other complications*