Northwest **Power** and **Conservation** Council

April 30, 2019

MEMORANDUM

TO: **Power Committee Members**

FROM: **Gillian Charles, Mike Starrett**

SUBJECT: **Development of generating resources reference plants**

BACKGROUND:

Presenter: Gillian Charles, Mike Starrett

Summary: In preparation for the 2021 Power Plan, staff will be providing the Power Committee a series of presentations on different aspects to developing the Plan. This presentation will be on the development of generating resources reference plants.

Relevance: A generating resource reference plant is a collection of characteristics that describe a realistic and likely implementation of a given technology within the region. It includes estimates of costs, operating and performance specifications, and developmental potential. These reference plants become resource options – along with energy efficiency and demand response - for the Council's power system models (e.g. the Regional Portfolio Model) to select to fulfill future resource needs.

Workplan: A.4.1 Develop generating resource reference plants for 2021 Power Plan

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Developing a Reference Plant: Generating Resources

Gillian Charles, Mike Starrett

Power Committee

May 7, 2019

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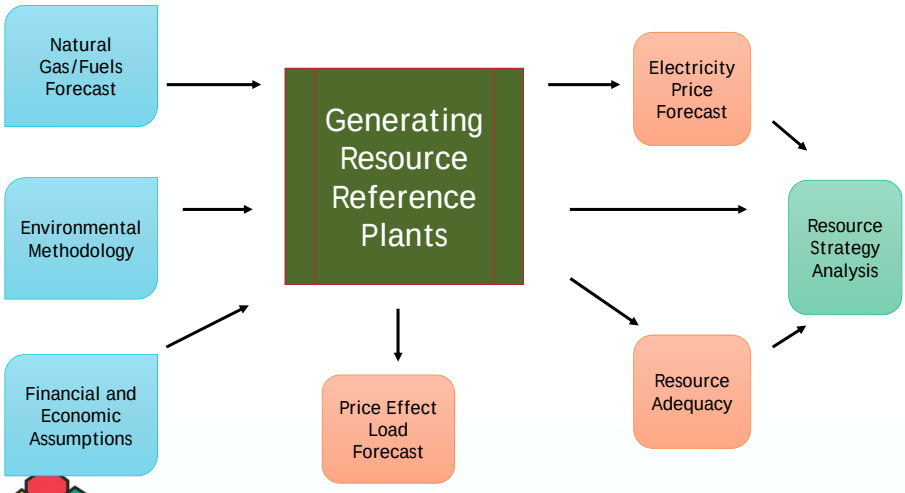
FOR A SECURE & AFFORDABLE ENERGY FUTURE

How Generating Resources Fit in the Power Plan Process...



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2

What is in scope?

Resources and technologies to be considered in the power plan analysis must be:

- Per the NW Power Act, §839a(4)(A)(i) "'Cost-effective', when applied to any measure or resource... must be forecast- to be **reliable and available within the time it is needed**..."
  - i.e. within the 20 year power planning horizon (2021-2040)
    - Typically applied through consideration of resources that are commercially available at the start of the planning horizon
- Utility-scale generation resources, proven technologies, with potential in the region
  - Includes energy storage
- Demand-side generation resources, proven technologies, with potential in the region

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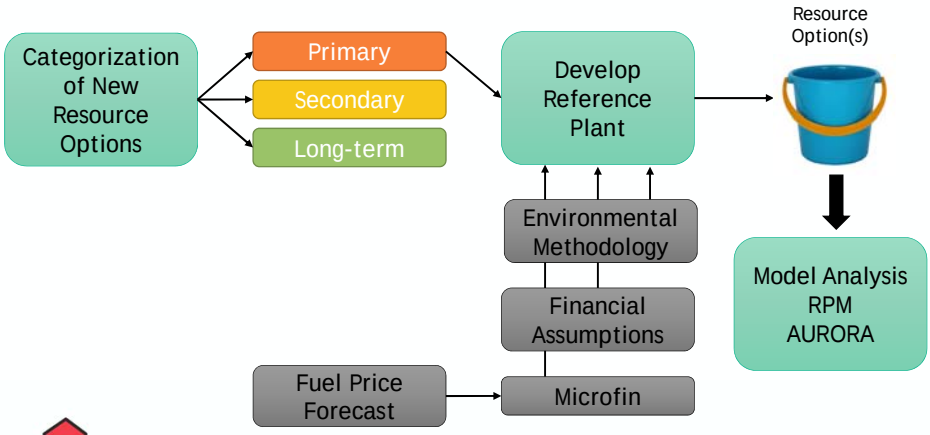
Developing a Reference Plant



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4

Resource Categories

Prioritization based on a resource's commercial availability, constructability, cost-effectiveness, and quantity of developable resource in the region

Primary; Significant: Resources that look to play a major role in the future PNW power system.

Assessment: In-depth, quantitative characterization to support system integration and risk analysis modeling. Will be modeled in RPM.

Secondary; Commercial w/ Limited Availability: Resources that are fully commercial but that have limited developmental potential in the PNW.

Assessment: Mix of qualitative and some quantitative analysis sufficient for potential modeling in the RPM.

Emerging/Long-term: Resources that have long-term potential in the PNW but that are not commercially available yet.

Assessment: Qualitative discussion of status & regional potential, quantify key numbers as available. Will not be modeled in RPM.

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5

What is a reference plant?

A **reference plant** is a collection of characteristics that describe a resource technology and its theoretical application in the region. It includes estimates of typical costs, logistics, and operating specifications.

Resource Attributes	Financials	Operating Characteristics	Development Potential
Technology Type	Financial Sponsor (IOU, IPP)	Capacity Factor	Location
Configuration (# of units x MW)	Overnight Capital Cost ($/MWh)	Heat Rate	Transmission/Gas Pipeline Access
Capacity (MW)	Fixed O&M ($/kW-yr)	Seasonal Shape	Maximum Build-out
Location(s)	Variable O&M ($/MWh)		
Operating Life (yrs)	Fixed Fuel Cost		
Development & construction schedule	Transmission Cost		
Earliest in operation date (year)			
Transmission access			

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6

Example Seventh Plan Ref Plant(s): Onshore Wind

Multiple wind reference plants based on

- Location
- Transmission availability
- Potential MW (maximum build-out)

… become resource options for RPM to select, based on*

- Resource need
- Cost
- Availability/location
- Seasonal shape

*simplified for presentation purposes!

Table H - 13: Wind Power Reference Plants

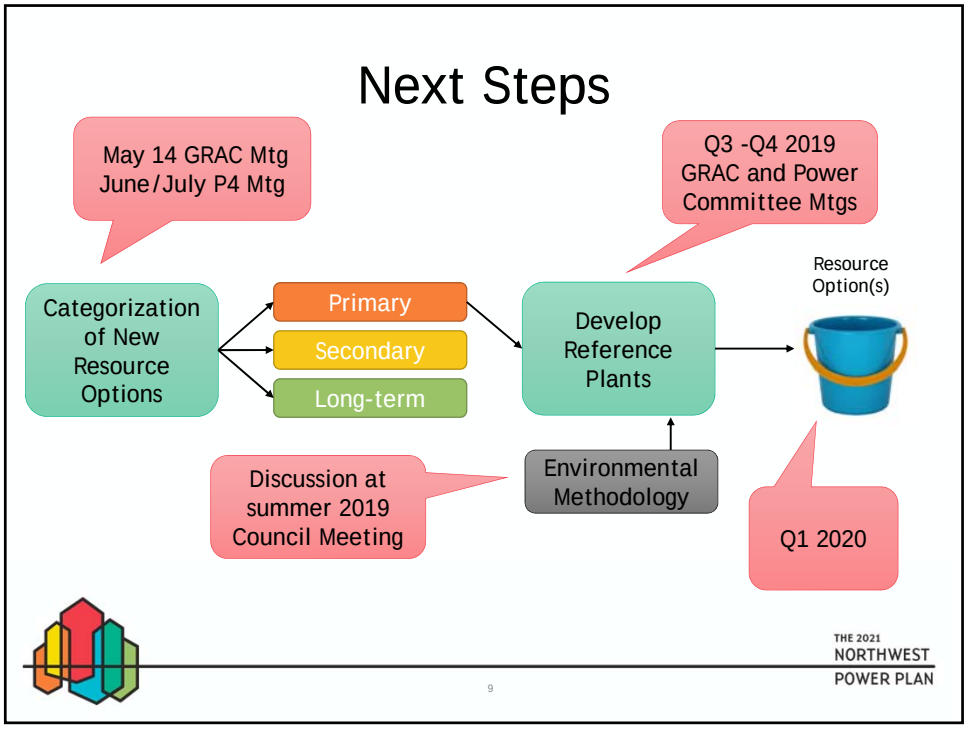
Reference Plant	Wind Columbia Basin	Wind MT w/existing Transmission	Wind MT w/ new Transmission	Wind MT w/ Transmission Upgrade	Wind MT w/ Colstrip Transmission
Configuration	40 x 2.5 MW wind turbine generators	40 x 2.5 MW wind turbine generators	40 x 2.5 MW wind turbine generators	40 x 2.5 MW wind turbine generators	40 x 2.5 MW wind turbine generators
Note		Very limited transmission available to bring to Western load centers	New 230kV transmission line rolled into capital cost	New 230kV transmission line and Path 8 Upgrade	Using Colstrip Transmission
Location	OR/WA	MT	MT	MT	MT
Earliest In-Operation Date	2019	2019	2020	2020	n/a
Development Period (Years)	2	2	2	2	2
Construction Period (Years)	2	2	2	2	2
Economic Life (Years)	25	25	25	25	25
Financial Sponsor	IOU	IOU	IOU	IOU	IOU
Capacity (MW)	100	100	100	100	100
Capacity Factor	0.32	0.40	0.40	0.40	0.40
Overnight Capital Cost ($/kW)	2,240	2,240	2,349	2,349	2,240
Fixed O&M Cost ($/kW-yr)	35.00	35.00	35.00	35.00	35.00
Variable O&M Cost ($/MWh)	2.00	2.00	2.00	2.00	2.00
Transmission	BPA point to point	NorthWestern Energy, Montana Intertie, BPA	NorthWestern Energy, Montana Intertie, BPA	NorthWestern Energy, Montana Intertie, BPA	Colstrip Trans. System, Montana Intertie, BPA
Maximum build-out (MW) as modeled	6,500	100	200	900	2000

Use of the Generating Resources Advisory Committee (GRAC)

Council staff presents its preliminary analyses to the GRAC for discussion and feedback on,

- Resource categorization into primary, secondary, and emerging/long-term
- Resource attributes and operating characteristics of a reference plant representative of a "typical" PNW configuration
- Estimated cost assumptions, especially the overnight capital cost and 20-yr cost curve

The GRAC is a valuable regional resource and we appreciate their participation in our process!


Next Steps
May 14 GRAC Mtg
June/July P4 Mtg
Q3 -Q4 2019
GRAC and Power
Committee Mtgs
Categorization of New Resource Options
Primary
Secondary
Long-term
Develop Reference Plants
Resource Option(s)
Environmental Methodology
Discussion at summer 2019 Council Meeting
Q1 2020
9
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