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July 9, 2019

MEMORANDUM

TO: Power Committee Members

FROM: Gillian Charles

SUBJECT: Categorization of new generating resource options for 2021 Plan

BACKGROUND:

Presenter: Gillian Charles

Summary: At the May 2019 Power Committee meeting, staff reviewed the process for the development of a generating resource reference plant, including the categorization of new resource options into three categories – primary, secondary, and long-term. Since then, staff presented a proposed resource categorization for the 2021 Plan to the generating resources advisory committee (GRAC) for feedback. Staff made some revisions and will be presenting the proposed resource categorization to the Power Committee at the July meeting.

The resource categorization serves as a framework to determine the level of analysis a resource receives. As the development of the power plan progresses, the resource categorization can be revisited and revised by the Council at any point if necessary.

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

Categorization of new generating resource options for 2021 Power Plan

Power Committee | July 16, 2019

Gillian Charles



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FOR A SECURE & AFFORDABLE
ENERGY FUTURE

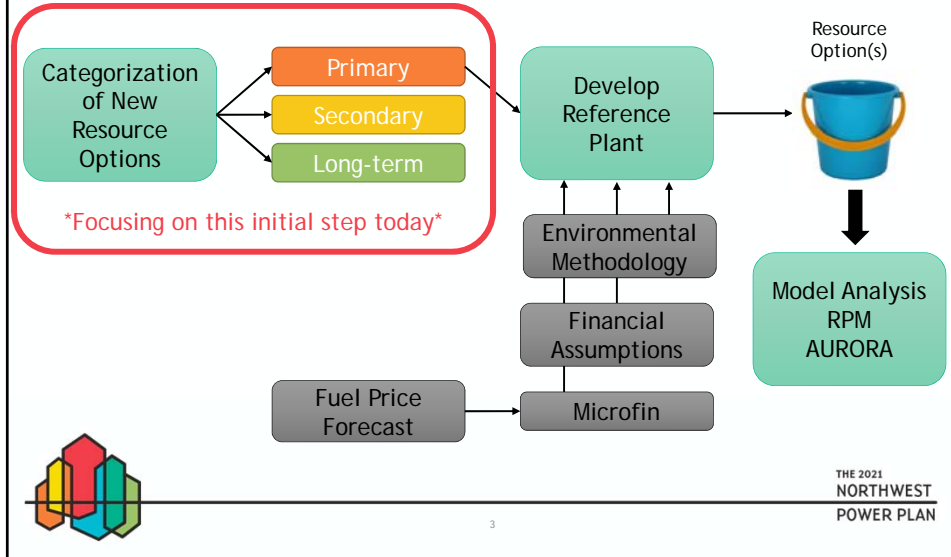
Setting the Stage...

- **May 7 Power Committee:** Staff reviewed the process for developing generating resource reference plants, including the categorization of new resource options
 - **May 14 GRAC Meeting:** Staff proposed resource categories for discussion
 - Robust discussion and feedback both during the meeting and after
 - **May-June:** Staff considered GRAC feedback and made a few modifications
 - **July 16 Power Committee (today!):** Seeking Power Committee feedback
- Important to remember that the categorization is meant to serve as a framework to determine the level of analysis a resource receives (a work plan of sorts); however it can be revisited and revised by the Council at any point in the development of the power plan

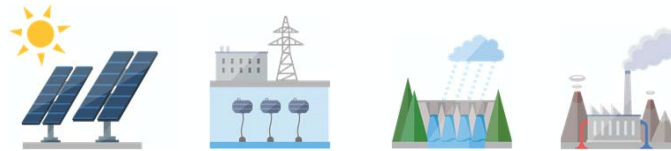


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Reminder: Developing a Reference Plant for 2021 Plan



Reminder: Defining 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.



Reminder: 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



Reminder: Resource Categories*

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



Primary; Significant: Resources that are fully commercial and 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.




***Note:** the categorization is a framework that helps determine the level of analysis (a work plan of sorts); however it can be revisited and revised by the Council at any point in the development of the power plan

“Final” Proposed Resources for 2021 Plan

Primary	Secondary	Emerging/Long-term
Solar PV 	Conv. Geothermal 	Enhanced Geothermal Systems
Onshore Wind 	Offshore Wind	Small Modular Reactors
Gas CCCT 	Distributed Generation*	Carbon Capture & Sequestration
Gas SCCT - Frame 	Biomass	Hydrogen Gas Turbine
Battery storage (Li-ion) 	Hydro Upgrades	Allam Cycle Gas
Solar + Storage 	Biogas	Wave, Tidal
Pumped Storage 	Power-to-Gas	
Reciprocating Engine	Small Hydro	
Gas SCCT - Aero-derivative	Combined Heat and Power	

*DG = Behind the Meter: Solar, Storage, and Solar + Storage; also included in the load forecast










 = reference plant
Omitted: Advanced nuclear, coal, large hydro

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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.

Primary
Solar PV 
Onshore Wind 
Gas CCCT 
Gas SCCT - Frame 
Battery storage (Li-ion) 
Solar + Storage 
Pumped Storage 
Reciprocating Engine
Gas SCCT - Aero-derivative

Highlights:

- Storage will be modeled as a resource option for the first time in a power plan
- Frame gas turbine selected as “proxy” gas peaker resource for other technologies; may expand to include reciprocating engine and/or aero as needed


GRAC discussion:

- General consensus that solar, wind, natural gas, and storage are significant primary resource options
- A lot of discussion regarding pumped storage; staff moved it from secondary to a primary resource




 = reference plant

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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.


Secondary
Conv. Geothermal 
Offshore Wind
Distributed Generation*
Biomass
Hydro Upgrades
Biogas
Power-to-Gas
Small Hydro
Combined Heat and Power


Highlights:

- Conventional geothermal is difficult to predict due to its site-specific nature and high-risk/low success exploration; however, it is a zero-carbon, baseload resource w/ potential in the region
- Offshore wind has development potential off the coast of Oregon and Washington, however the majority of the identified potential is in deep waters (depths >60m)


GRAC discussion:

- Staff considered feedback from the GRAC and moved offshore wind from emerging to secondary
 - Current operating projects primarily fixed-bottom devices; less-proven floating turbine technology will likely be necessary for the PNW coast topography



 = reference plant

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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.


Emerging/Long-term
Enhanced Geothermal Systems
Small Modular Reactors
Carbon Capture & Sequestration
Hydrogen Gas Turbine
Allam Cycle Gas
Wave, Tidal


Highlights:

- Small modular reactors (SMR)– while there is an active first-of-its-kind project in development phase in the region, it does not meet the scope and definition of commercially available
- Hydrokinetic technologies are still evolving and in the research & development and testing phases
 - Full-scale, 20MW test facility (PacWave South) planned off coast of Newport; expected to be operational by 2022

GRAC discussion:

- Some discussion around SMR, with members offering different viewpoints. Staff considered feedback and opted to move SMR from secondary to emerging as it does not meet the scope and definition of commercially available
 - With an active project in-region, staff will rely on stakeholders and advisory committee members to help us as we provide the best analysis with the information available at the time



 = reference plant

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Further Opportunities for Emerging Tech

- Per the Power Act, the Power Plan is to include recommendations for research and development
 - Section 9 in the proposed 2021 Plan table of contents
- Opportunity to highlight promising emerging technologies with potential in the region
 - Identify gaps in R&D

Proposed 2021 Plan Table of Contents

DRAFT Table of Contents 2021 Power Plan

<p>Section 1: Executive Summary and Introduction</p> <ul style="list-style-type: none"> • Executive summary • State of the system • Power Act requirements and the Power Plan • Streamlined down and high-level action plan <p>Section 2: Demand Forecast</p> <ul style="list-style-type: none"> • Regional demand forecast • Bonneville's demand forecast <p>Section 3: Forecast of Regional Reserve and Reliability Requirements</p> <ul style="list-style-type: none"> • Operating and planning reserves • System needs assessment <p>Section 4: Energy Conservation Program</p> <ul style="list-style-type: none"> • Regional conservation targets • Model Conservation Standards • Surcharge methodology <p>Section 5: Resource Development Plan</p> <ul style="list-style-type: none"> • Resource strategy (generation and conservation) • Analysis of alternative resource strategies • Input and analysis: <ul style="list-style-type: none"> ○ Existing resources and retirements ○ Economic and Financial Assumptions ○ Electricity and Fuel Price Forecasts ○ Transportation forecast ○ End-use natural gas forecast ○ Conservation resources (supply curves) ○ New generating resources potential ○ New demand response resources potential 	<p>Section 6: Forecasts of Power Resources Required to meet BPA's Obligations</p> <ul style="list-style-type: none"> • Council's forecast of BPA's load resource balance • BPA's White Book <p>Section 7: Recommendation for Amount of Power BPA Should Acquire</p> <ul style="list-style-type: none"> • Conservation • Renewable resources • Other generating resources • Demand response • Market power <p>Section 8: Analysis of Cost-Effective Methods for Providing Reserves</p> <ul style="list-style-type: none"> • Define cost-effective methods for providing reserves • Result of study of reserves and adequacy requirement <p>Section 9: Recommendations for Research and Development</p> <p>Section 10: Methodology for Determining Quantifiable Environmental Costs and Benefits for Cost Effectiveness</p> <ul style="list-style-type: none"> • Environmental methodology and due consideration for environmental quality and fish and wildlife • Environmental effects of electric power production <p>Section 11: Fish and Wildlife Program</p>
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Feedback and Next Steps

- July 2019 – Early 2020: Staff to develop generating resource reference plants
 - Review estimates and assumptions with GRAC for feedback
 - Present reference plant analysis to Power Committee

