

Generating Resources Advisory Committee

1/27/15

Steve Simmons & Gillian Charles

Agenda

9:30 AM **Welcome, Introductions**

9:45 AM Overview of Pumped Storage – Rick Miller (HDR, Inc.)

10:15 AM J.D. Pool Pumped Storage Project – Brian Skeahan (Klickitat PUD JD Pool Project), Nate Sandvig (MWH)

10:45 AM Banks Lake North Dam Pump/Generation Plant – Lloyd Reed (GCPHA/Reed Consulting)

11:15 AM Value Stream of Pumped Storage – Miller, Skeahan, Sandvig

12:00 PM Lunch – on your own

1:00 PM Overview of Small Modular Reactors – Christopher Colbert (NuScale Power), Jim Gaston (Energy Northwest)

2:15 PM Preliminary Resource Evaluation of Enhanced/Engineered Geothermal – Steve Simmons

2:50 PM Wrap up, Discussion of Next GRAC Mtgs

3:00 PM Adjourn

Role of GRAC

- Advisory committee established to assist in development of Council's Power Plan
- Two year charter
 - Renewed March 2014
 - Members appointed May 2014
- GRAC serves in advisory capacity
 - No votes are taken
 - Role is to review information, vet assumptions and information, and provide feedback to the Council
- Aim for active participation and exchange of ideas and information

Environmental Methodology

- Request for GRAC assistance in identifying regulatory compliance costs for existing plants

Follow up to 12/18/14 GRAC meeting on Wind

- Capacity Factors
 - Reference Plants – Columbia Gorge (32%), Central Montana (40%)
 - Institute a capacity factor efficiency improvement curve (similar to heat rate efficiency) of 0.5% annually to the reference CF in RPM to capture improving capacity factors

Status on defining transmission for Wind Resources

1. Columbia Basin Wind – BPA point to point fixed transmission (20 \$/kW-yr) and integration (14.76 \$/kW-yr)
2. Montana Wind 1: NWES + BPA
3. Montana Wind 2: NWES with new line +BPA
4. Montana Wind 3: NWES + M2W expansion + BPA

Where we are in the analysis process for the draft Seventh Plan (1)

Resource	GRAC	P4	Council	RPM?	Narrative?
Utility-scale Solar PV	X	X	Feb/Mar	X	X
Combined Cycle Combustion Turbine	X	X	Feb/Mar	X	X
Gas Peakers – Single Cycle and Recips	X	1/29	Feb/Mar	X	X
On-Shore Wind	X	1/29	Feb/Mar	X	X
Hydropower – New, Upgrades	X	X	X	--	X
Conventional Geothermal	Apr?			--	X
Biomass Technologies	Apr?			--	X
Storage – Batteries	?			?	X
Storage – Pumped Hydro	1/27			?	X

Where we are in the analysis process for the draft Seventh Plan (2)

Resource	GRAC	P4	Council	RPM?	Narrative
Small Modular Reactors	1/27			?*	X
Conventional Nuclear	--			--	X
Engineered/Enhanced Geothermal	1/27			--	X
Offshore Wind	X			--	X
Carbon Capture and Sequestration	--			--	X
Solar Thermal	--			--	X
Conventional Coal	--			--	X
Wave and Tidal	?			--	X

Demand response, distributed generation (rooftop solar PV) treated as separate inputs to the RPM; will have narratives in the draft as well

Next GRAC Mtg(s)

- Meetings TBD – possibly one in early April
 - Biomass, Conventional Geothermal
 - ET - Battery Storage, Wave/Tidal?? (TBD)
 - Draft Action Plan items for generating resources
 - Wrap-up of misc. resources or updates to existing draft assumptions

Thank You

Advisory committees play an important role in the Council's power planning process and we appreciate your participation and expertise.

Please don't hesitate to contact us with any questions or comments.

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Why focus on emerging technologies?

- “Low or no” carbon future power system scenarios for the draft Seventh Plan
 - Which resources are potential candidates to fulfill this future (or what **proxy characteristics** need to be met by potential candidate resources?)
 - Which emerging technologies would compliment existing non-CO₂ producing renewable technologies (wind, solar)?
- What generating resource technologies are mature enough to be developed first?
 - In what time frame?
 - At what lead time?
 - At what cost?

Proposed Treatment of Emerging Technologies in Draft Seventh Plan

- Prioritize emerging technologies based on economics, beneficial characteristics to region (e.g. renewable integration), development potential within next 20 years
- Provide limited cost estimates and narratives in power plan for high priority emerging technologies
 - Potential action items in the Action Plan – further research, hosting informational meetings
- Run “low or no” carbon emissions scenario in the RPM with proxy generating and storage technologies (tentative)

Objective of today's presentations

- Discuss a few emerging technologies* that may fulfill (or be used as proxy resources) a “low or no” carbon power system scenario
- Not intended to be advocating for one resource over another
 - Technical and information gathering session, with opportunity for discussion and Q&A with experts in these technologies
 - Just because a resource is discussed, does not mean it will be an automatic input into the power plan analysis

* While pumped hydro storage is not by definition an emerging technology, its potential uses and benefits are changing and emerging to fit new generation challenges

Technology overview, cost estimates, barriers and challenges to development, potential in the PNW, example projects, capturing full value stream of a resource

PUMPED HYDRO STORAGE

Background

- Council's recent regional hydropower potential scoping study highlighted ~2,600 MW pumped storage projects that were “realistic and reliable” within the next 20 years (compared to 400 MW in upgrades to existing projects and 200 MW in new/small hydro)
 - John Day Pool Project, Swan Lake, Banks Lake were identified
 - Study cited cost range of \$1,800 - \$3,500/kw capital cost
- A lot of buzz about pumped storage recently – worth taking a deeper look at its cost, development potential, beneficial characteristics to the region
 - Potential resource to fulfill “low or no” carbon scenario

Welcome Presenters

- Rick Miller – HDR, Inc.
 - Lloyd Reed – GCPHA/Reed Consulting
 - Brian Skeahan – Klickitat PUD JD Pool Project
 - Nate Sandig – MWH Global
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- All others welcome (and encouraged!) to join discussion and share knowledge and experience
 - Remain focused on Council's objective – independent analysis of generating resource alternatives

Technology overview, cost estimates, barriers and challenges to development, potential in the PNW, example projects, capturing full value stream of a resource

SMALL MODULAR REACTORS

Background

- **Sixth Power Plan**
 - SMRs briefly mentioned in narrative
 - No cost estimates or defined reference plant
- **Proposed treatment in draft Seventh Power Plan**
 - More detailed inclusion in narrative, including cost estimates - if available

Welcome Presenters

- Christopher Colbert – NuScale Power
- Jim Gaston – Energy Northwest
- All others welcome (and encouraged!) to join discussion and share knowledge and experience
- Remain focused on Council's objective – independent analysis of generating resource alternatives
- This discussion is not intended to be a debate; rather it should remain a professional discourse focused on the task at hand – technically assessing SMRs as a potential resource alternative in the future PNW power system