Generating Resources Advisory Committee

Webinar

April 29, 2015

Agenda

9:30 AM	**Welcome, Introductions**
9:35 AM	Draft Seventh Power Plan – Generating Resources Action Plan Items • Preliminary review and discussion of potential action plan items
10:20 AM	Emerging Technologies Matrix • Review emerging technologies and cost/potential estimates for consideration in the future PNW power system; particularly when faced with a low/no carbon future scenario – what are some alternatives?
10:45 AM	Natural Gas Peaking Modeling in the RPM • Follow-up from SAAC meeting on April 17
10:55 AM	Wrap up • Draft → Final process, ability to update significant changes to resources • Meeting minutes – please review before we post to the website
11:00 AM	Adjourn

Draft Seventh Power Plan

POTENTIAL ACTION ITEMS FOR GENERATING RESOURCES

What is the Action Plan?

- Describes actions to support implementation of the power plan
- Focuses on first 5 years of power planning period (2016 – 2020)
- Broken out by major topics – incl. energy efficiency, generating resources, adequacy, future role of BPA, demand response, monitoring implementation, etc.
- Some actions have a recommended entity primarily responsible for the action

Sixth Plan Action Plan

- Verrrry long! Lots of action items!
- Generating Resources
  - 13 action items broken out by resource acquisition, system adequacy, and analytical/modeling enhancements
  - Fairly generic; hard to measure progress

Today's Discussion

- Talk about potential action items we could include in gen res section
- Develop ideas for action items to:
  - Monitor development of Seventh Plan
  - Set us up for the mid-term assessment and next power plan

Rough cost and potential estimates for 2020, 2025, 2030, 2035

EMERGING TECHNOLOGY MATRIX

Purpose (1)

- **Scenario 3a**: explores the minimum carbon emissions that are feasible with current commercially available technologies
  - Idea is to retire all gas plants with heat rate >8500 and all coal plants, and let the model select new resources to fill the void
- **Scenario 3b**: explores how to "beat" carbon emissions from 3a using emerging technologies
  - Idea is to compare costs and benefits of existing system gas plants and see what potential ET would be available – and at what cost – to replace the generation and capabilities NG provided

Purpose (2)

- Develop portfolio of potential emerging technologies and energy efficiency measures that could potentially help fill resource void
  - **Estimate** resource potential, earliest availability, current and projected cost estimates
- Assume availability for wide spread deployment by 2020, 2025, 2030, 3035
- These technologies will not be modeled directly in RPM – used as proxies to determine magnitude and estimated cost to fulfill scenario 3b

Potential* ET Gen Resources

Emerging Tech	Earliest commercial availability	Resource Life	2020|2025|2030|2035 MW/aMW	2020|2025|2030|2035 LCOE ($/MWh)
Distributed Solar PV				
Utility-scale Solar PV				
Small Modular Nuclear				
Enhanced Geothermal Systems				
Wave				
Offshore Wind (Floating)				
Battery Storage – break out further				
Pumped Storage**				
Combined Heat and Power				
Fuel cells?				

* Not comprehensive; in no particular order

** While not an emerging technology, the future use of pumped storage could be considered new

Emerging Technology – Utility Scale Solar PV in the Northwest

Considerations for large scale solar pv development in the Northwest

1. Cost
   A. Capital cost estimate at the low range
      - Around 35 to 45% less expensive capital cost $/kW ac
   B. Investment Tax Credit to continue at 30%
   C. Continued efficiency improvements
2. Location & Size
   A. Eastern/Central Oregon, large scale plants with new transmission required
   B. Western OR & WA – smaller plants scattered up and down valley – would the cost reductions make less attractive solar resource areas buildable?

Emerging Technology - EGS in the Northwest

Year	MW	Price $/MWh 2012$	Notes
2015	0		
2020	5	178	Newberry EGS Site initial cost based on MIT Report estimate for a Sisters OR site
2025	275	84	further development at Newberry site cost decline based on learning curve
2030	1,000	66	cost decline based on learning curve
2035	3,100	53	mature technology - development poised to take off

Emerging Technology – Wave Energy

- Potential – 10's of GW raw resource off OR and WA coast
  - Realistically only a fraction developable
- Seasonal resource – min availability in summer, max availability Nov → March
- While no single technology has become dominant, demo projects have shown capacity factors between 15% - 50%
- Life estimated at 25 years
- Demo projects and pilot technologies being tested now; full commercial availability within 5 years
- Current LCOE estimates at $300/MWh; long-term goals to cut number in half over next 10 years

* Thank you to the Oregon Wave Energy Trust for the information and estimates *

FOLLOW-UP: NATURAL GAS PEAKERS

Gas Peakers modeled in RPM

Currently in RPM we have two basic types of gas plant options:

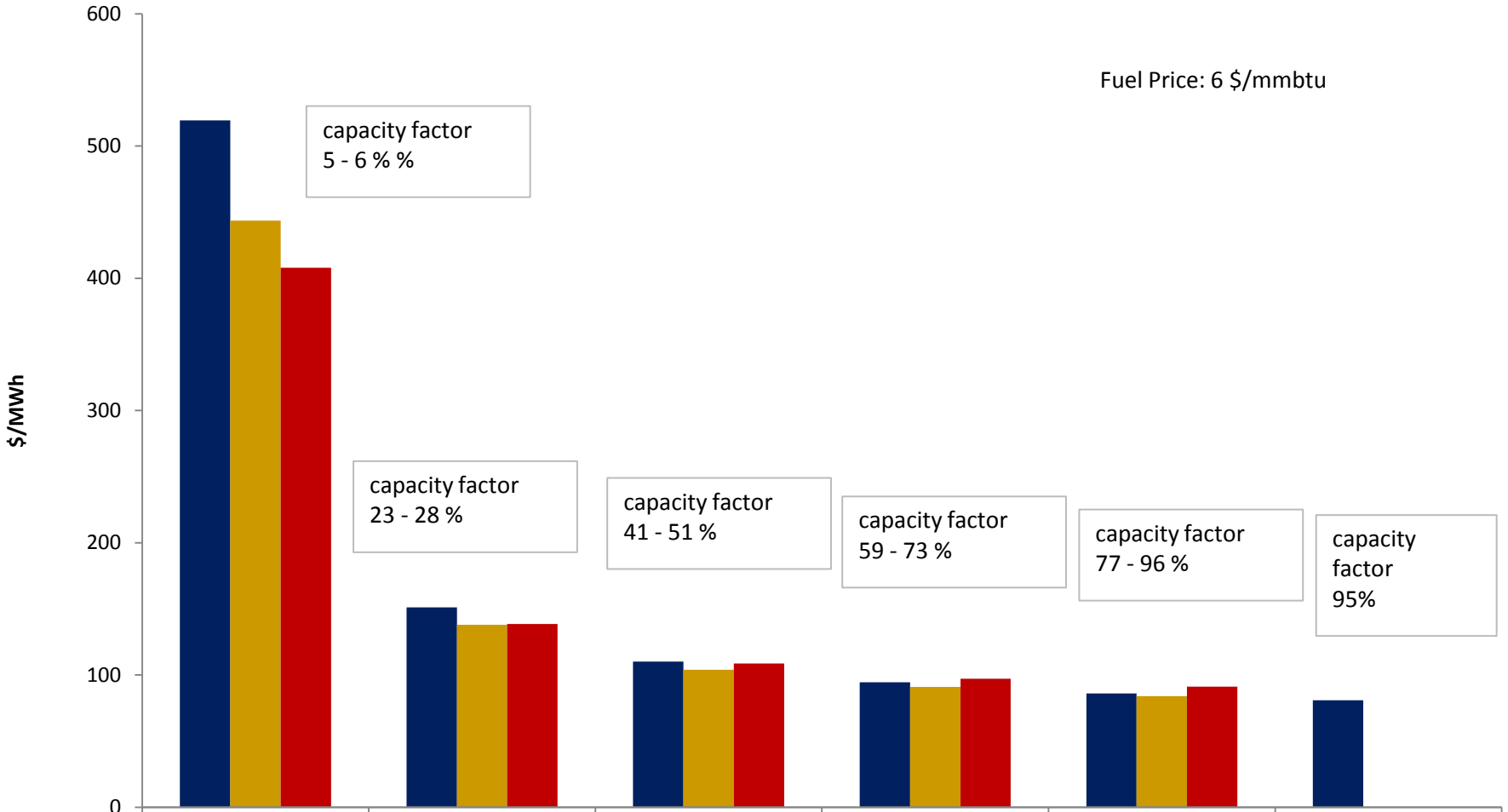
1. Combined Cycle Combustion Turbines for larger scale, highly efficient generation
2. Reciprocating Engines for peaking, but also flexibility (quick ramps...but not captured in RPM)

SAAC meeting on April 17 – raised the question – why Recips? Why not Frame GTs or Aero GTs?

Staff Options

1. Leave as is
2. Add Aero or Frame option (East or West) – replace East or West side Recips

Natural Gas Peakers Technologies: Example of Cost by Production



	10	50	90	130	170	210
RECIP ENG	519	151	110	94	86	81
AERO CT	444	138	104	91	84	
FRAME CT	408	139	109	97	91	

Annual Production - aMW

WRAP-UP, NEXT STEPS

Environmental Methodology

- Technical support document for draft plan analysis – "Regulatory Compliance Issues Affecting Existing Northwest Generating Plants"
  - Now available - http://www.nwcouncil.org/media/7149177/draft7p_regulatorycomplianceandcosts_042415.pdf

Draft → Final Seventh Plan

- Draft plan ~ September 2015
  - Comment period and public hearings around region
- Between draft and final, opportunity to:
  - Refine inputs and assumptions based on significant changes and/or public comments
  - Potential re-running of some scenarios through the RPM, based on changes to inputs
- Not anticipating holding another GRAC meeting before draft release, possibly one between draft and final

Meeting Minutes

- We need to approve past GRAC meeting minutes and post them to the GRAC webpage and make available for the admin record
  - Please review and respond with any revisions by May 8

Thank You

Advisory committees play a very important role in the development of the analysis for the power plan

Thank you for your guidance, feedback, and expertise!