## **March 9 Meeting Agenda**

+ Introductions

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- + Project Timeline
- + Regional Capacity Needs
  - Outline + Expected Highlights
- + RESOLVE Modeling
  - Overview
  - Hydro inputs
  - Scenarios
- + Next steps

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# Team



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## **Project Timeline**



Tasks 1-3 are preferred by April 1 but could be by April 15 Task 4 is due by June 1

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### **Regional Capacity Need Assessment**

#### + Outline

- Executive Summary
- Review of State Policy (CA, OR, WA)
- · Overview of Market Structures and Trends
- · E3 View on Market Evolution in the Northwest
- Capacity Outlook (CA, PNW)
- Summary
- Appendix

#### Expected key highlights:

- The NW faces a continued RA capacity need
- Significantly higher annual resource additions are required to meet IRP plans
- State policy goals place high value on GHGfree energy and could limit natural gas capacity additions
- Hydropower is an eligible source of GHGfree energy for all existing state clean energy goals

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### PacNW RESOLVE Model Overview

- RESOLVE makes investment decisions for the Core NW zone while simulating the dispatch decisions for all zones modeled including the main Core NW zone and external zones
  - The investment decisions for external zones are predetermined based on the results of another WECC-wide capacity expansion model developed by E3.
- + Minimizes NPV of system investment + operational costs
- + Key constraints include:
  - Hourly load and resource balance including operating reserves (across 41 representative days)
  - Reliability (Peak + PRM vs. resource firm capacity contributions / ELCCs)
  - · Clean energy policy (RPS and/or GHG reduction targets)
  - Resource potential limits

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"Core NW" zone includes WA, OR, and the BPA + Avista portions of ID and MT  $\,$ 

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### **Hydro Inputs in RESOLVE**

+	Key Inputs	Needed by	y dam o	or aggr	egate	LSR	Dams
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- Installed capacity MW
- Daily hydro inputs\*
  - Pmin
  - Pmax
  - Daily MWh energy budget
- Hydro ramping capabilities: 1,2,3, and 4 hour ramp %'s
- Levelized fixed costs (\$/kW-yr)
  - Includes fixed O&M and any sustaining capital investments required for long-term retention
- Variable costs (\$/MWh)
- Reserve provision capabilities: frequency response, spinning, regulation, and load following
  - We currently assume NW hydro plants can provide all of these
- Firm capacity contribution (of nameplate)
  - Currently set at 66%

#### + Key hydro value streams captured in RESOLVE

- Energy value (avoided natural gas fuel burn, renewable integration i.e. ramping, etc.)
- Reserves (regulation, load following)
- Capacity value (avoided investments to meet peak + PRM needs)
- Clean energy value (either RPS/CES or GHG-reduction value)
- Avoided transmission from additional renewable additions

Northwest hydro currently modeled as an aggregate single hydro resource...

E3 will disaggregate the 4 LSR dams for this project

\* The daily hydro inputs are mapped to RESOLVE's 41 representative days. These days are sampled to capture statistically representative distribution of load, wind, and solar. The model includes 3 years of hydro data in the current set up: 2001 (low), 2005 (mid), and 2011 (high).

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### **RESOLVE Scenario Design Considerations**

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## **Next Steps**

#### + Goals for next Tuesday's meeting:

- · BPA to share the following LSR dam assumptions:
  - Retirement year in no LSR dam scenarios
  - Cost inputs

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- Ramp rates
- Anything else deemed useful to the E3 team
- · E3 to disaggregate NW hydro and LSR dam resources in RESOLVE
- E3 to review initial list of qualitative benefits and recommend other benefits as needed
  - Build off the list in the scope of work
  - BPA to advise any other transmission related benefits not in that list
- E3 to propose RESOLVE scenario design
- E3 to continue progress on RESOLVE model updates and documenting key assumptions for BPA review

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# Appendix



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#### **RESOLVE: Optimal Capacity Expansion Under Aggressive** Clean Energy Goals



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#### **RESOLVE Co-optimizes Investment and Operational Decisions**

- RESOLVE allows portfolio optimization across a longtime horizon (20-30 years)
  - Investments made in multiple periods
- Operational detail directly informs investment decisions to economically address primary drivers of renewable integration challenges
- Fixed costs capture capital, financing, and fixed O&M associated with new infrastructure and economically retiring resources
- + Optimization is constrained by many factors, including:
  - Hourly load
  - RPS target
  - Planning reserve margin
  - GHG limit

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#### New Resource Options Renewables

#### + Resource costs



#### Note: these costs are in the process of being updated for the BPA Lower Snake River Dam analysis

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