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

October 28, 2014

MEMORANDUM

TO: **Power Committee**

FROM: **Ben Kujala**

SUBJECT: **RPM Redevelopment Project Discussion and Demo**

BACKGROUND:

Presenter: Ben Kujala and Cory Welch, Navigant Consulting

Summary There has been significant progress on the Regional Portfolio Model (RPM). Council staff received a preview version of a version of the RPM that identifies the lowest risk resource strategies for alternative levels of risk. The current version of the rebuilt RPM creates these "optimizations" by testing automatically generated resource strategies across 750 futures. The model also has the capability to create graphics to help users interpret and visualize its results.

Two major redevelopment tasks remain. The first is to create the function and logic required to generate an updated set of futures for the model (the current version uses 750 futures based on the 6th Plan RPM). The second is to create the model logic that will parallel processing (i.e., running the RPM on simultaneously on multiple computers) to reduce the model run-time. Staff anticipates that the project will continue to deliver on or ahead of the contract schedule.

This presentation will demonstrate some of the rebuilt RPM's functionality. The demonstration will focus on a few of key inputs to the RPM that have been identified as having a significant influence in the RPM results. Navigant consulting staff who were contracted to redevelop the RPM will

be on-site to demonstrate the model's operation and answer questions about the redevelopment process thus far.

Relevance The Regional Portfolio Model will be used to provide analytics for the Resource Strategy in the Seventh Power Plan.

Workplan: 1.E. Redevelopment of Regional Portfolio Model

Background: Navigant is redeveloping the Regional Portfolio Model for the Seventh Power Plan. The project is scheduled to be completed in three phases. The first phase is scheduled to be completed by October 1st, the second phase is scheduled to be completed by December 19th and the third phase is scheduled to be delivered to the Council by February 12th with Council acceptance and signoff scheduled for March 13th. Council staff is supported on this project by contractors Doug Logan and Michael Schilmoeller.

More Info: Summary information and updates are available at http://www.nwcouncil.org/energy/rpm/home/.

Key Inputs and Parameters Used in Regional Portfolio Model (RPM)

Systems Analysis Advisory Committee
November 3, 2014

RPM Inputs/Parameters Presentation Purpose

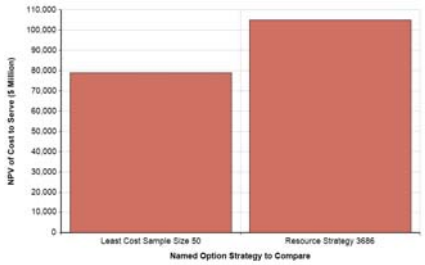
This presentation is intended to:

- Identify the inputs to RPM that *most significantly* impact the model's results
- Explain how and why these inputs influence the model's results
- Identify those model parameters that significantly impact the model results to prepare for future evaluations when the final RPM is delivered

This is not intended to:

- Request Council Member decisions on the inputs/parameters for the 7th Plan
- Represent an exhaustive list of significant inputs, but simply reflects staff's current assessment

How We Assessed What Makes a Resource Strategy Expensive or Risky?



- Using 6th Plan data and the re-built RPM, compare two resource strategies, one with a lower cost/higher risk and one with a higher cost/lower risk
- Optimization was performed using a limited number of futures

What Assumptions/Inputs Are Major Determinants of a Resource Strategy Cost and Risk?

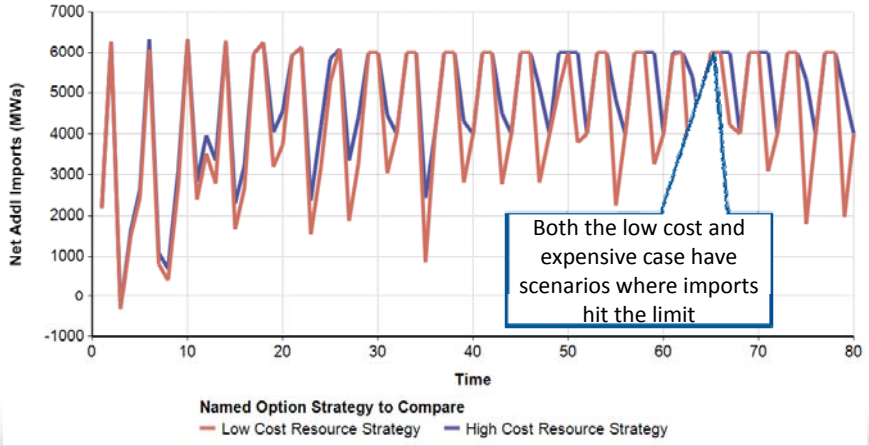
- Limits on Electricity Imports/Exports
- Wholesale Electricity Market Prices
  - Including *Market Price Caps* on Wholesale Electricity Market Prices
- Annual Limits on Retrofit Conservation Resource Acquisition
- Fuel (especially natural gas) price forecast range
- Amount and Cost of Energy Efficiency Resource Potential

These inputs we control

Maximum Import/Export

- This parameter in the RPM limits the amount of resources from outside the region that can be imported
- Depending on imports may reduce the demand for construction of new in region generation and/or conservation

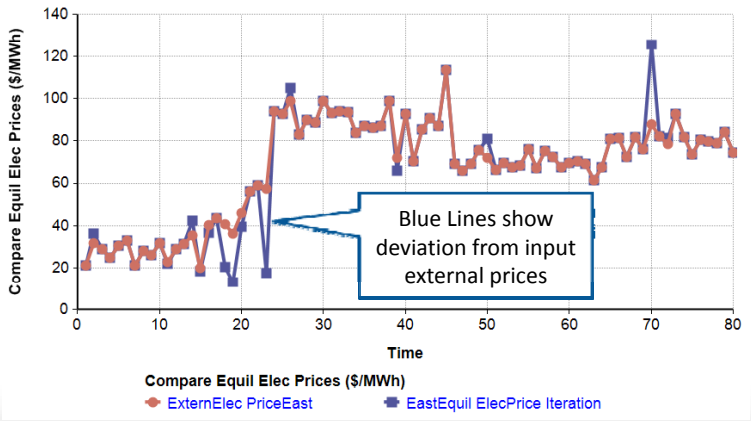
Maximum Electricity Imports Reach 6000 aMW



Wholesale Electricity Market Prices

- The RPM establishes the economic value all resource alternatives based on the wholesale electricity market price.
  - Dispatch of generation is a function of wholesale electricity market price
  - The costs of new generating and conservation resources are compared to the cost of additional market purchases to serve the region.
- Market prices are posititively correlated with the load forecast, likely impacts model outputs more than any other input forecast

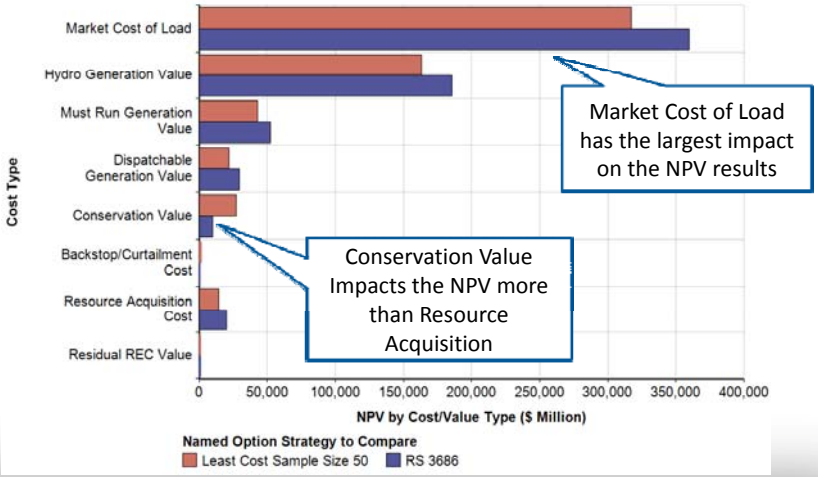
Extra-Regional Market Prices Are Highly Correlated with Regional Market Prices



Cost To Serve the Region

- The cost of serving the regional load in RPM includes both costs that are incurred and value that offsets those costs
  - Costs include
    - Market Cost of Load: Market Price * Regional Load
    - Resource Acquisition Cost: Capital Cost of Resource Strategy (options and builds)
    - Backstop/Curtailment Costs: Emergency Cost of Energy
  - Values include
    - Value of Generation: Period aMW * (Market Price - Variable Costs + Production Tax Credits)
    - Value of Conservation: Avoided Market Purchase Cost – Total Cost of Conservation
    - REC Value: Value of RECs produced by qualifying generators

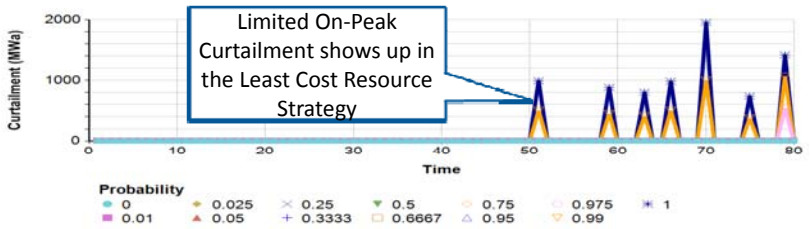
Average Contribution to NPV by Cost/Value Type



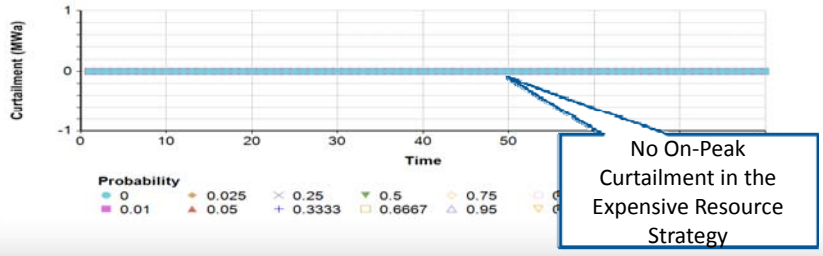
Upper Bound (Backstop) Electricity Price

- Wholesale Electricity Price is capped at a $325/MWh ceiling
- Capping the wholesale electricity market price may not reflect cost of curtailment (Value of Lost Load)
- This cap limits the risks represented in the resource strategies
  - $325/MWh is the maximum that would be paid to reduce risk
  - Is this the worst outcome we should expect?

Least Cost On-Peak Curtailment Probability



Expensive On-Peak Curtailment Probability



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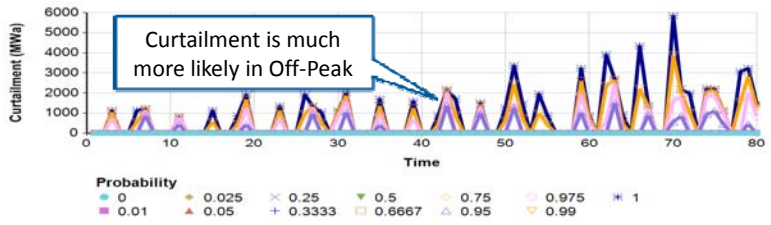

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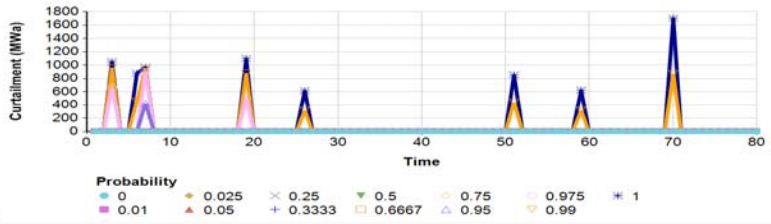
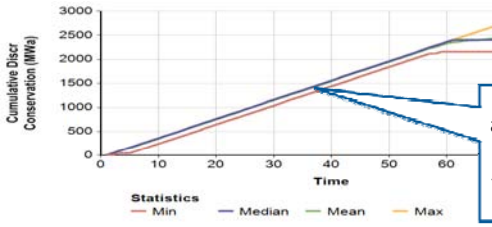


Maximum Discretionary Conservation Rate

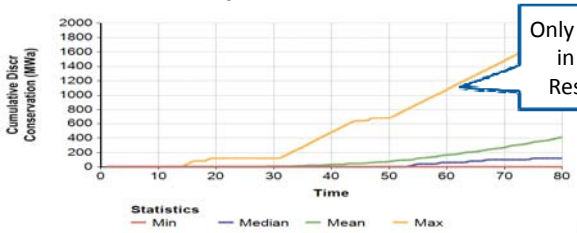
- 6th Plan assumed an acquisition limit of 40 aMW per quarter (160 aMW/yr) for "retrofit" measures
- Near-term limits should impact results more because of discounting

Least Cost Discretionary Conservation Statistics



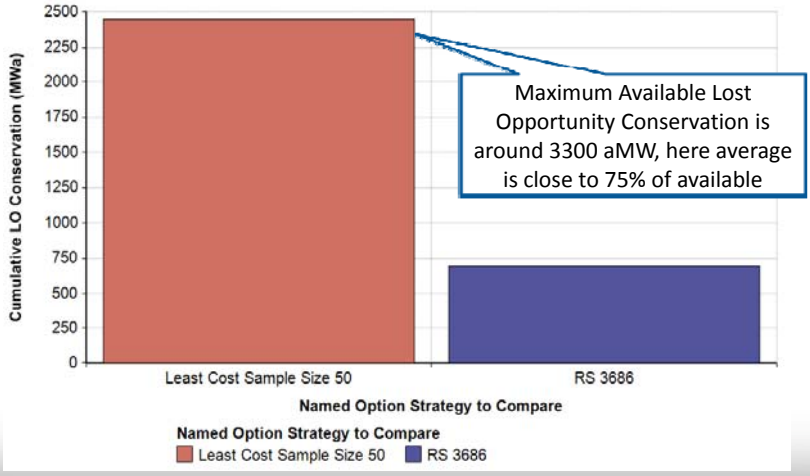
Max, Median and Mean are all increasing close to the maximum 40 aMW rate

Expensive Discretionary Conservation Statistics



Only impacts the Max in the Expensive Resource Strategy

Average Cumulative Lost Opportunity Conservation



Maximum Available Lost Opportunity Conservation is around 3300 aMW, here average is close to 75% of available

Possible Future Advisory Committee Work

- Should RPM model uncertainty in the size of external market?
- Should the maximum discretionary conservation be adaptive?
- Does the current upper bound on electricity price capture appropriately tail risk events?

Navigant Model Demonstration and Q&A