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October 4, 2023

### **MEMORANDUM**

**TO: Council Members**

**FROM: John Ollis**

**SUBJECT: Recommendation for New Capital Expansion Model**

### **BACKGROUND:**

**Presenter:** John Ollis, Manager of Planning and Analysis

**Summary:** Last month, staff presented on the capabilities of the Council's existing tools and alternative approaches to support regional portfolio modeling going forward. The presentation included a recommendation to change the approach to use the OptGen module with GENESYS, which staff believe enable the improvement of the Council's analytical capability in the lead up to the next power plan. The members asked staff to conduct additional follow-up conversations with regional stakeholders and, if possible, users of OptGen to help ensure buy-in and identify any concerns that need to be addressed in this transition. Staff have used the last month to conduct this additional follow-up, all of which continues to be generally positive and supportive of the staff recommendation.

This presentation will revisit the proposed recommendation and share stakeholder feedback. Staff is seeking a head nod from the Power Committee supporting this approach in advance of a Council decision authorizing a contract with PSR to acquire and develop out the OptGen module.

**Relevance:** While model enhancements allowed for completion of the 2021 Power Plan using the current model and modeling infrastructure, staff has identified considerable gaps in the current capability and scope of the Regional Portfolio Model (RPM) in exploring the risks faced by today's power system.

In April and September of 2023, staff engaged with the System Analysis Advisory Committee to discuss the perceived gaps of the model and found many throughout the region struggling with similar issues in maintaining the long-term analytical support for their respective organizations. Whether it be modeling the structure of changing markets, understanding locational value due to transmission limitations, or appropriately representing the attributes and economics around new resource types, most regional entities are changing the ways they consider the tools used to support long term integrated resource planning. Per those discussions and staff's research, staff recommends moving to the OptGen module in GENESYS as the best fit to meet our modeling needs. Feedback collected through the additional follow-up further supports this recommendation. Staff would like to move forward soon with this selection to provide enough lead time to develop and vet the model in advance of the next power plan.

**Workplan:** B.1.2 Tool Enhancement: Explore new capital expansion modeling approach to provide better optimization for future power system needs.

**Background:** In its regional power plans, the Council is responsible for developing a resource strategy based on independent analysis of the region's long-term energy needs and the costs and availability of a wide variety of energy efficiency and generating resources. In addition to minimizing system costs, the analysis addresses major uncertainties and strategies for mitigating risks.

The Regional Portfolio Model, or RPM, is a self-built, Council developed regional capital expansion and portfolio optimization model used by the Council to identify adaptive, least-cost resource strategies for the region. The RPM uses a sophisticated and unique risk analysis methodology, developed by the Council, which involves simulating numerous candidate resource plans across a broad range of possible futures to identify tradeoffs between expected cost and risk.

The RPM was created in the 5<sup>th</sup> Power Plan (2006) to understand the risks and tradeoffs of that time which primarily were associated with understanding the attributes of adding new thermal generation or energy efficiency to address regional needs. The model was enhanced and used again in the 6<sup>th</sup> Power Plan (2011). The model was ported to a new more transparent software platform that allowed for easier stakeholder access and review and additionally enhanced for the 7<sup>th</sup> Power Plan (2016). The

enhancements for the 7<sup>th</sup> Power Plan were substantial, as were the enhancements on the build up to the 2021 Power Plan.

While in past plans the RPM has been used successfully as the primary analytical tool for understanding strategy tradeoffs, in the 2021 Power Plan, many of the previous assumptions that made its underlying structure convenient and efficient for understanding regional risks were challenged. Through the advisory committee process it became clear that without significant overhaul there were some limitations to the RPM structure that made it difficult to rely on the model without the context of the other Council power system models. These limitations arose due to effects on regional operations due to policies both internal and external to the region. Significant model enhancements and assumption changes were implemented to try and incorporate information necessary to make reasonable regional resource strategy decisions, however many of these methods relied on iterative techniques which made it difficult to deliver analysis in the compressed timeline of the planning process.

More Info: [Historical Background on the RPM:](https://www.nwcouncil.org/regional-portfolio-model/)  
[https://www.nwcouncil.org/sites/default/files/7thplanfinal\\_appdxl\\_rpm\\_0.pdf](https://www.nwcouncil.org/sites/default/files/7thplanfinal_appdxl_rpm_0.pdf) (7th Plan Appendix associated with RPM modeling)  
[https://www.nwcouncil.org/sites/default/files/SixthPowerPlan\\_Appendix\\_J\\_1.pdf](https://www.nwcouncil.org/sites/default/files/SixthPowerPlan_Appendix_J_1.pdf) (6th Plan Appendix associated with RPM modeling)  
[https://www.nwcouncil.org/sites/default/files/Appendix\\_L\\_Portfolio\\_Model\\_1.pdf](https://www.nwcouncil.org/sites/default/files/Appendix_L_Portfolio_Model_1.pdf) (5th Plan appendix describing the RPM model)

[Recent Stakeholder Discussions on the RPM](#)  
[Revisiting Council's Analytical Tools and Gaps](#) (April 5, 2023 SAAC)  
[Council's Analytical Tools: Proposed Changes](#) (September 5, 2023 SAAC)

# Revisiting Staff's Recommendation for OptGen

October 11, 2023



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## Objective

- Seeking Power Committee support of staff's recommendation to move to OptGen for its regional capital expansion and portfolio optimization tool, while maintaining Aurora with a staff developed optimization tool as a back-up alternative

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## Reminder of Power Committee Discussion

- Reflecting on the GENESYS redevelopment process and how the lack of complete regional buy-in to that model caused challenges for power plan development, members asked staff to do more due diligence to inform the Council decision on moving forward:
  - Reach out to regional stakeholders for some additional discussions to get any concerns on the table
  - Connect with OptGen users to understand their experience (if possible)
- Members also asked other questions to better understand OptGen functionality around ability to test various risks, understanding hydro operations, etc.

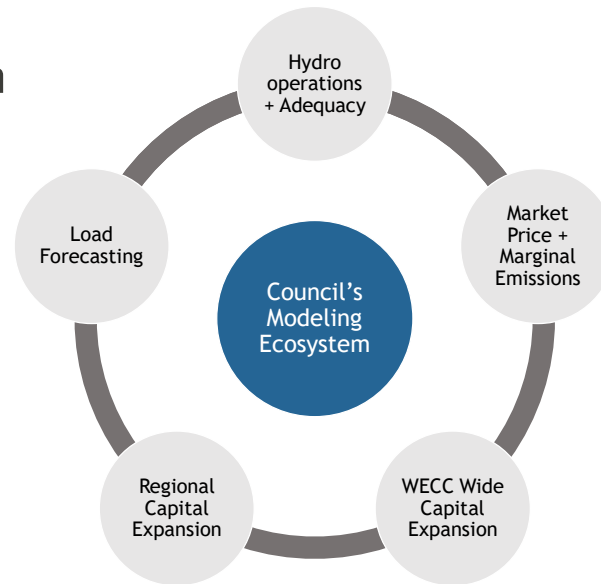
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## Regional Portfolio Optimization Modeling Needs

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## Modeling Ecosystem in Transition

- The Seventh Plan identified both GENESYS and the RPM as needing enhancements to address changing power system dynamics
- For the 2021 Power Plan, Staff focused on updating GENESYS and finding near-term fixes for the other models where needed
- 2021 Power Plan called on the Council and the region to revisit analytical approaches to broader modeling ecosystem
- For the 9<sup>th</sup> Plan, Staff is proposing major overall on the load forecasting and a new solution to regional capital expansion



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## 2021 Power Plan Recommendation for New Capital Expansion Model

- 2021 Power Plan recognized that the current capital expansion models try to identify resource options that minimize cost and meet an assumed demand
- The changing nature of the power system makes this assumption no longer valid, and new models need to:
  - Assess the trade-offs between different technologies on the demand-side as part of capital expansion (ex: hydrogen produced by electrolysis)
  - Dynamically adjust reserves and storage for different generation sources selected
- Recognizing the complexity of these challenges, the Plan also identified the need to focus future questions on those that will be most impactful going forward

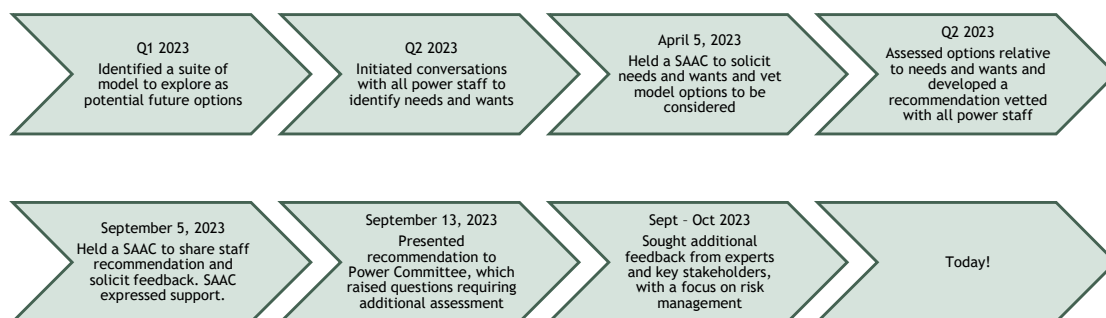
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## GENESYS Redevelopment Challenges

- Key themes: Timeline Pressures and Resource Limitations
- Getting regional buy-in was primarily difficult due to the novel approach to hydro modeling
  1. Throughout the project relevant staff expertise was spread thin due to other plan priorities and changing assumptions
  2. First-of-its-kind model in the region made for challenging validation requiring different expertise than normally populated in advisory committees
  3. Some assumptions made to align with the more accepted traditional model (HydSim) to expedite analysis for plan timelines did not work well with the new model, and entirely new data sourcing methods had to be developed on the fly
  4. In the latter stages of the project, shift to virtual meetings and more plan timeline pressure hindered communication about responsiveness to stakeholder feedback

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## Model Vetting Process



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## Reminder of Recommendation

- **Proposal: OptGen Module**

- Staff are recommending the OptGen module to be added to GENESYS
- This approach provides an off-the-shelf solution that includes the most of the modeling functionality being sought at a relatively low cost, while also fitting into the existing modeling ecosystem

- **Back-Up: Aurora with Staff Developed Optimization**

- Staff recommend using Aurora with a staff developed optimization as a back up plan
- While this approach does not have as much of the functionality being sought, it leverages an off-the-shelf tool that is widely accepted in the NW and requires only staff resources (no additional modeling cost)

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## Quick Comparison of Models – Functionality

| Ability to Assess:              | RPM<br>(as is, no upgrades) | OptGen | Aurora + Staff<br>Optimizer |
|---------------------------------|-----------------------------|--------|-----------------------------|
| Locational Modeling             | ✘                           | +      | +                           |
| DERs and Storage                | ✘                           | +      | ▲/+                         |
| Energy Efficiency               | ▲                           | ▲      | ✘                           |
| Generating Resource + Risk      | ✘                           | +      | ▲                           |
| Dynamic Reserves Modeling       | ✘                           | +      | ✘                           |
| Advanced Portfolio Optimization | +                           | +      | ▲                           |
| Customization Available         | +                           | ▲      | ▲                           |

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## Quick Comparison of Models - Resources

| Ability to Assess:           | RPM<br>(assuming upgrade) | OptGen | Aurora + Staff<br>Optimizer |
|------------------------------|---------------------------|--------|-----------------------------|
| Upfront Model Costs          | \$\$\$\$                  | \$\$   | \$                          |
| Annual License               | \$\$                      | \$\$   | \$                          |
| Long-Term Cost Trajectory    | ↔                         | ↓      | ↔                           |
| Staff Development Time       | ↑↑                        | ↑      | ↑                           |
| Data Preparation/Model Seams | ↑                         | ↓      | ↓                           |
| Northwest User Group         | ×                         | ×      | +                           |

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## Other Alternatives Considered, but Not Recommended at this Time

| Aurora + Aurora Portfolio Optimizer   | GENESYS w/o Aurora   | GridPath   | PLEXOS  |
|---|--|--|---|
| <p>Aurora has its own optimization module that staff could use instead of staff developing its own add on optimization</p> <p><b>Primary concerns:</b><br/>Regional entities, including Bonneville, are moving away from Aurora's built in portfolio optimization tool. Requires a lot of computation time, as well as significant staff time due to limited customization. It also does not meet our needs for risk assessment at this time.</p> | <p>GENESYS can be further enhanced to replace Aurora for the WECC wide capital expansion and market price studies</p> <p><b>Primary concern:</b><br/>While this might be a viable path in the long-term (high functionality and low fixed cost), moving away from Aurora for its current use case seemed too risky at this time. The need for staff time, data development, and increased outreach would all slow down implementation.</p> | <p>GridPath is a new, open-source model with functionality between that of OptGen &amp; Aurora with staff optimization</p> <p><b>Primary concern:</b><br/>Staff estimates that this model would require significant staff resources to develop and learn the model. Other being open source, it does not provide additional features. This model is also new to the entire user community. The time and risk of success felt too large at this time.</p> | <p>PLEXOS is modeling tool used by others in the region for hydro operations and capital expansion</p> <p><b>Primary concern:</b><br/>This would be a significant shift in our modeling ecosystem. It would replace both GENESYS and RPM. Staff does not feel it is prudent to undertake on this level of model development at this time.</p> |

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## Work Since September

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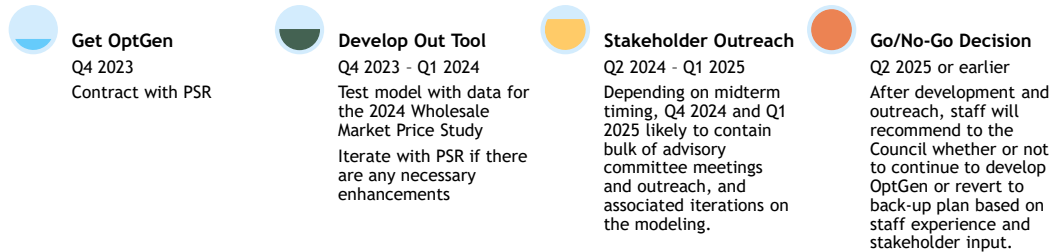
## Feedback and Follow Up Discussions

- BPA, PNUCC, PPC, NWECC...
- Overall feedback on the following topics:
  - Opinions range from generally comfortable to supportive of the approach of trying to improve modeling by choosing OptGen as the “plan A” with a viable backup plan of AURORA
  - Risks to manage:
    1. Ensuring any new assumptions and methodologies in new model are well-vetted with time to allow for stakeholder feedback
    2. Clarity on timeline for acceptance of OptGen

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## Recommended Next Steps

Assuming Power Committee support and Council authorization of the model, staff would undertake the following next steps:

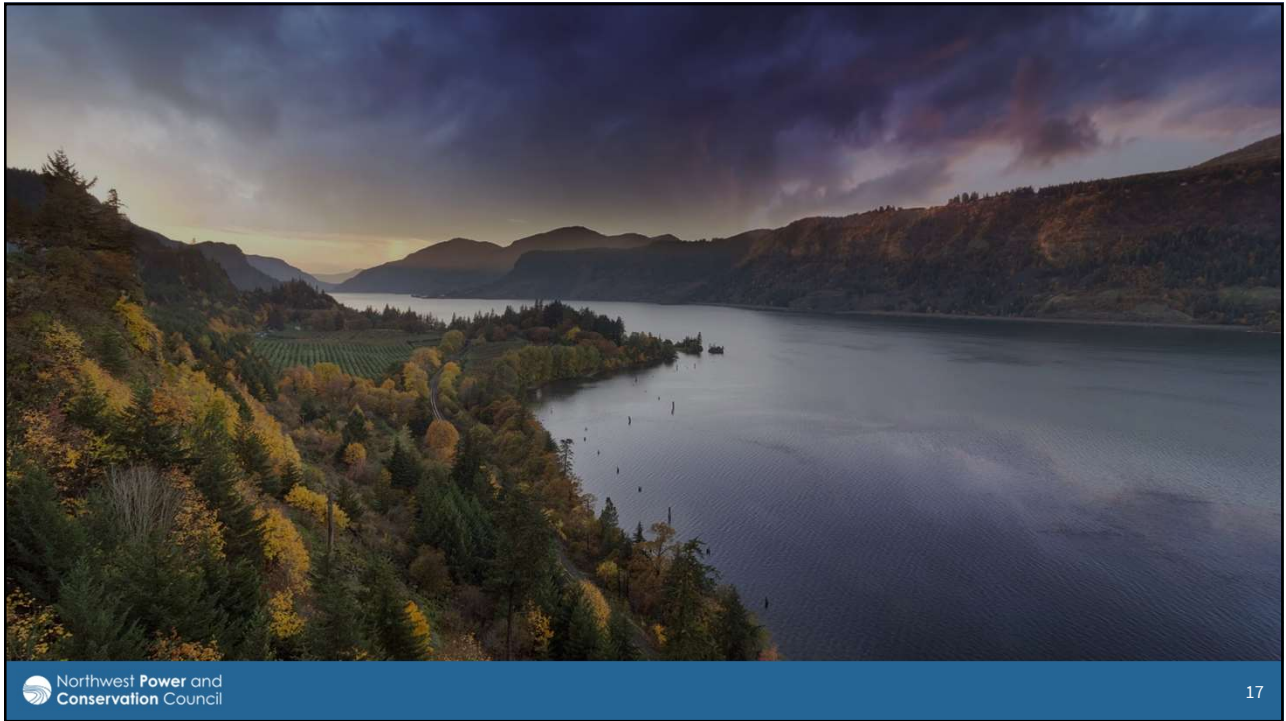


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## Seeking Committee Support

- After further review and discussion, is the Committee supportive of staff's recommendation to pursue the OptGen module as an add-on to GENESYS for its regional capital expansion and portfolio optimization, following the plan as described?

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