

Bruce A. Measure  
Chair  
Montana

Rhonda Whiting  
Montana

W. Bill Booth  
Idaho

James A. Yost  
Idaho



Dick Wallace  
Vice-Chair  
Washington

Tom Karier  
Washington

Melinda S. Eden  
Oregon

Joan M. Dukes  
Oregon

## Notes from the System Analysis Advisory Committee December 2, 2010

9:00AM call to order and introductions. The agenda appears as the final attachment to these notes.

*The meeting started with a round of introductions and an outline of expectations for those who, during their service to the Council on the SAAC, might encounter a potential conflict-of-interest situation. Stating their conflict of interest and recusing themselves from related SAAC decisions will protect them from any potential action.*

*Then the meeting turned to a discussion of the purpose of the committee. Some expected the committee to focus on the Council's Regional Portfolio Model, but others expected a more general purpose addressing all of the Council's models and what models would be needed to address expected future issues facing the regional power system and the next Council power plan.*

*There was a discussion of what some of the issues might be. It was noted that real time operations are becoming important, not so much average energy anymore. Other topics mentioned included the Council's plan not being directly aimed at the Bonneville Administrator, the portability of the model, dealing with transmission constraints, shareholder value versus consumer costs, efficiency uncertainty, smart grid deployment and its implications, demand response, storage technologies and other potential sources and costs of reserves. It was noted that it is becoming important to be able to quantify the value of flexibility. Discussion about the relevance of the Council's plan to individual utilities was also discussed.*

*It was agreed that committee members would send their thoughts on issues that should be considered and a list compiled for further discussion. Council staff also agreed to working with the PNUCC System Planning Committee to refine the list of issues. The intent would be to use the possible issue to assess whether the Council's models can address the issues or whether changes or new approaches might need to be developed.*

*The committee discussed future meetings. Schilmoeller suggested meeting about once every two months, with the next meeting planned for February. This appears to be agreeable to the committee. The committee agreed to use Doodle<sup>®</sup> to schedule meetings, but suggested narrowing down the choices to maybe one week. Schilmoeller will try to send out a preliminary and a final survey in quick succession to narrow down the choices.*

*Schilmoeller presented the basics of the RPM structure and the nature of risk and its treatment in the RPM analysis. Key elements of the RPM are the lack of a perfect foresight assumption, a wide scale of variation in future conditions, and modeling of actors' responses to changing future conditions. The model is able to value optionality because of this approach. A discussion ensued about whether it is now necessary to value optionality explicitly in the model. Options were more important when long-lead-time coal and nuclear plants were the resources of choice. Now most resources are far shorter in lead time. Maybe the concept of options has served its purpose and model complexity to address it can be reduced. It was noted that the structure that allows quantification of the value of optionality also provides information on potential errors that can be made at various decision points in resource development. Issues were raised about the practicality of putting options in place. One utility representative noted that they are trying to put optionality in place on their system.*

*Schilmoeller observed that options reflect how utilities actually make decisions, even when they announce firm plans and may not think in terms of options. Decisions are revisited when new information arrives. Ratepayers ultimately bear the costs of changing direction. This is as true for resources with short lead-time as otherwise. While this "decision uncertainty" is probably of greater concern for resources with longer lead-lines, it is also the case that long lead-time actions have not entirely disappeared. Advanced nuclear; integrated coal gasification, combined-cycle turbines (IGCC); and transmission expansion for imported wind generation were all candidate resources in the draft Sixth Power Plan.*

*There was a discussion of conservation risk. What aspects of risk are we concerned about? Schilmoeller noted that we have implemented conservation price and availability risk in the model. It was done after the power plan. It may be a topic for future discussion. There was agreement a more complete discussion about the risks associated with conservation is warranted.*

*The RPM treatment of market purchases and sales was discussed at length. Who is buying the energy assumed to be sold in the market when the region is surplus, and where does the energy in the market come from? Is it outside the region? How does the money going to and from the market enter into the regional power system cost? These are to be addressed in more detail in a future meeting.*

*In response to apparently contradictory conclusions from the model that overbuilding is the most costly error and that the model overbuilds to reduce risk, there was a question about how much is overbuilding. Where is the line between buying insurance to reduce risk and ensuring an adequate and reliable system? These questions arose in examining some specific futures and there may be a need to continue that inspection in a future meeting. (Please see the endnote that summarizes discussion around the specific future in question.)*

*Schilmoeller described how the model treats decisions during the development of a resource from optioning to deciding to build. There was a question about whether a utility or other resource developer would really follow such decisions. It was noted that such behavior does occur in utility planning. The discussion led into how relevant the Council's planning is for individual utilities and Bonneville in particular. Some reasons utilities might come to other decision about continuing resource development were described as relating to a utility's concern*

*for reliability. Schilmoeller described how the model treats adequacy and reliability from an economic perspective. However, he noted that the model will force-build a resource if the regional adequacy standards are not being met. In general however, the model's approach always yields an adequate and reliable system.*

*The risk measure chosen was described. There were questions about why a particular measure was chosen and Schilmoeller described the properties of the TailVaR<sub>90</sub> measure. However, he noted that the model computes several other measures of risk. These are available to provide alternative perspectives on the risks associated with each plan. For example, net present value, the basis for the TailVaR<sub>90</sub>, fails to capture annual cost volatility, so there is a measure to capture this feature of risk. (Appendix P of the Fifth Power Plan, Section 2, Risk Measures, describes the risk measures carried along with each plan evaluation and compares their performance.) There were questions about how the optimizer in the RPM searches for minimum cost solutions. It controls the choice of plans and their characteristics such as timing, amount, and technologies.*

*One of the topics of discussion was, what if the model's assumption about decision rules are wrong? Two kinds of errors were described, deciding to build if not needed and not deciding to build when needed. The model captures both kinds of errors. There was a question whether the frequency with which the model commits these errors reflects the performance of the industry. If not, the value that the model places on options will be inaccurate. The Council started study along this line, but that work remains incomplete.*

*The concept of building additional resources as an insurance policy was described. The costs incurred in the model were compared to auto, liability and some other types of insurance and found to be comparable.*

*The assessment of the reliability of the RPM's strategies was discussed further. It was suggested that several ways of assessing reliability and adequacy should be considered. When the model results have been assessed using LOLP or the adequacy standards developed by the Regional Adequacy Forum they have been found to meet the standards. A stronger link between the model and the Adequacy Forum approach to adequacy may be needed. Schilmoeller pointed out that a utility may appear adequate from a loads and resource perspective, but be inadequate from an economic perspective, for example if they rely on coal and a high carbon tax were imposed. That is, the utility would have adequate capacity (steel in the ground), but the utility would likely remain dependent on the wholesale power market. It would economically perform like an inadequate utility with respect to wholesale market prices: higher prices would mean higher, not lower cost.*

*Given that resources are built to mitigate risk, as a type of insurance the question of regulatory treatment was raised. Would the extra resources be considered used and useful? It was pointed out that various kinds of insurance have been approved so it isn't out of the question.*

*Schilmoeller then presented the computational challenges any model must consider in attempting to address uncertainty and risk on the scale the Council envisions. He presented estimates for the number of futures the model needs to use. He showed the performance of the optimizer in finding least-risk plans and the implication to the number of plans the model needs. This led to*

*execution time estimates for the requisite hourly, 20-year cost simulations on alternative kinds of computers.*

*Presentation on the finer aspects of risk modeling yielded to a more general discussion of issues. In particular, a discussion developed on how to show model results in a way that could be understood by decision makers. The use of such a detailed model was questioned when it couldn't be grasped by the Council for example.*

*The meeting concluded with some discussion of future meeting directions and focus. There was a very brief description of Olivia, the model to create resource portfolio models. There was a great deal of interest in when that would be available and whether the RPM could be adapted by other users without the availability of Olivia, which the Council has not been able to complete so far. Schilmoeller discouraged other from trying to adapt RPM directly.*

*Schilmoeller presented a list of issues for the RPM that need improvement or could be limitations on its use. Some had already been discussed.*

*Interests of the committee were solicited for future discussion. Some interests included finding ways to simplify the model to make it more easily understood and therefore more useful. Alternatives included fewer or simpler risk measures, a model for a single future, and a model for a single plan under multiple futures.*

*It was noted that the RPM differs from utility IRP models in at least two significant ways: (1) it does not use perfect foresight; and (2) it uses futures that are allowed to be radically different from historic experience. It is important to communicate why these differences are important and should be used when developing a power plan. The lack of perfect foresight means that the preferred resource plan is not optimized to any one particular future, but performs well over the entire range of futures. The use of radical variation in input variables accounts for systemic changes in the power industry. The RPM approach bears greater similarity to the deterministic scenario analysis utilities perform than it does to the stochastic analysis utilities perform. Making this similarity clearer may provide the Council, state utility regulators, and other policy makers with a better understanding of these key features of the RPM.*

*It was suggested again that the Council should step back and ask what the future issues are likely to be, and then examine its modeling tools to see if they are appropriate. Some time should be devoted to defining the problem carefully. Several participants expressed interest in extending the transmission representation capability of the model. Some wanted to see the capability to model energy storage and demand response, in particular to evaluate enabling technologies like SmartGrid. There were questions about the extension of the metrics to reflect utility concerns, like shareholder value.*

*It was also suggested that some participants in the SAAC would like a more hands on demonstration of the RPM model. There did seem to be two types of interest within the SAAC; some interested in the details of the RPM and its availability for use by other, and another group that was more focused on whether it is the best tool for the Council to be using and assessing how the results can be communicated and used by decision-makers. ♦*

<b>Attendance</b>	<b>Organization</b>
Shauna Reynolds for Dick Adams	PNUCC
Peter F. Brooks	US Army Corps of Engineers
Mark Dyson	Rocky Mountain Institute
Lauren Miller Gage	BPA
Maury Galbraith	OR Public Utility Commission
Villamor B Gamponia	Puget Sound Energy
Nicolas Garcia	Tacoma Power
Mike Hoffman	Pacific Northwest National Laboratory
Marty Howard	EPIS, the Aurora <sup>®</sup> model vendor
Jim Litchfield	Litchfield Consulting
Kevin Nordt	Grant County PUD
Hossein Parandvash	City of PDX, Bureau of Water Works
Robert Petty	BPA
Michael Schilmoeller	NWPCC
John Scott	EPIS, the Aurora <sup>®</sup> model vendor
Horace Tso	Portland General Electric Co
Barbara Miller	US Army Corps of Engineers
Ken Dragoon	NWPCC
Sylvia Melchiori	PGE
John Ollis	PGE
David Nightingale	WUTC
Ryan Dyer	WUTC
Michael McCoy	Becker Capital
Rob Diffely	BPA
Shelly Saylor	PGE
Terry Morlan	NWPCC
<b>By Phone</b>	
Charlie Black	Charles J. Black Energy Economics
Eric M Hiaasen	Eugene Water & Electric Board
Mark Stokes	Idaho Power Company
John Bushnell	Northwestern Energy
Todd Guldseth	Northwestern Energy
Cathy Carruthers	Tacoma Power
Joanne Whitmore	David Suzuki Foundation, Montreal Canada
Greg Nothstein	WA Dept. of Commerce
Howard Schwartz	WA Dept. of Commerce
Katherine Bailey	PGE
Shirley Lindstrom	NWPCC, Idaho

## Endnote on an Overbuilding Future

*Schilmoeller provided some explanation for apparent overbuilding in the particular future under consideration (see graphics below). The need for the option to build 3230 MWa (3735 MW) of CCCTs stems largely from the potential for large carbon penalties and the resulting loss of coal-fired generation. These CCCTs are completed in 2023 and 2024, when expectations for severe carbon penalties are high from today's perspective.*

*Second, the decision to exercise the option is consistent with the run-up of electricity prices and moderate gas prices that preceded the completion of the unit. The turn-down in electricity price in 2022 and prior to the CCCT's completion is dampened by a persistence in belief – reflected in the model logic – that prices could remain higher. (The \$122/MWh electricity price in 2021 is an annual average over all hours, incidentally, so half of the hours will have prices above this level.) If the turn-down in wholesale electricity price occurs during the committed phase of construction, all investment in the CCCT will have been completed in any case and construction would continue to recover the investment. This is consistent with economic principles and utility practice.*

*[We also note that loads begin to rise more rapidly in 2019-2022 than in previous years. While not the principal reason for the size of the CCCT option, it would have lent greater support for the decision to exercise the option.]*

*Third, the model must “get it wrong” a sufficient number of times to estimate the corresponding risk associated with building any power generation or demand-side resource. Without these events, the amount of CCCT constructed might have been closer to the 5100MWa (6000 MW) of regional coal that could be shut down in a future with high carbon penalty. We do not have perfect foresight and the model reflects this fact. We have to look at the number of futures in which the CCCT was constructed, and whether such construction was “fortunate” or “unfortunate,” to determine whether the recommended option level is prudent and reasonable.*

*This last point will be the least intuitive for planners versed in “perfect foresight” planning. It may therefore be among the most important to understand.*

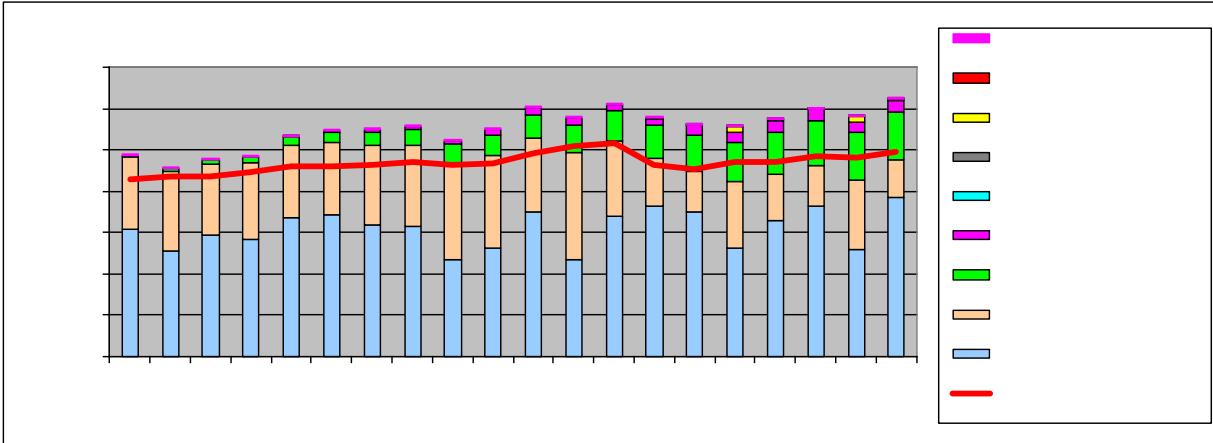
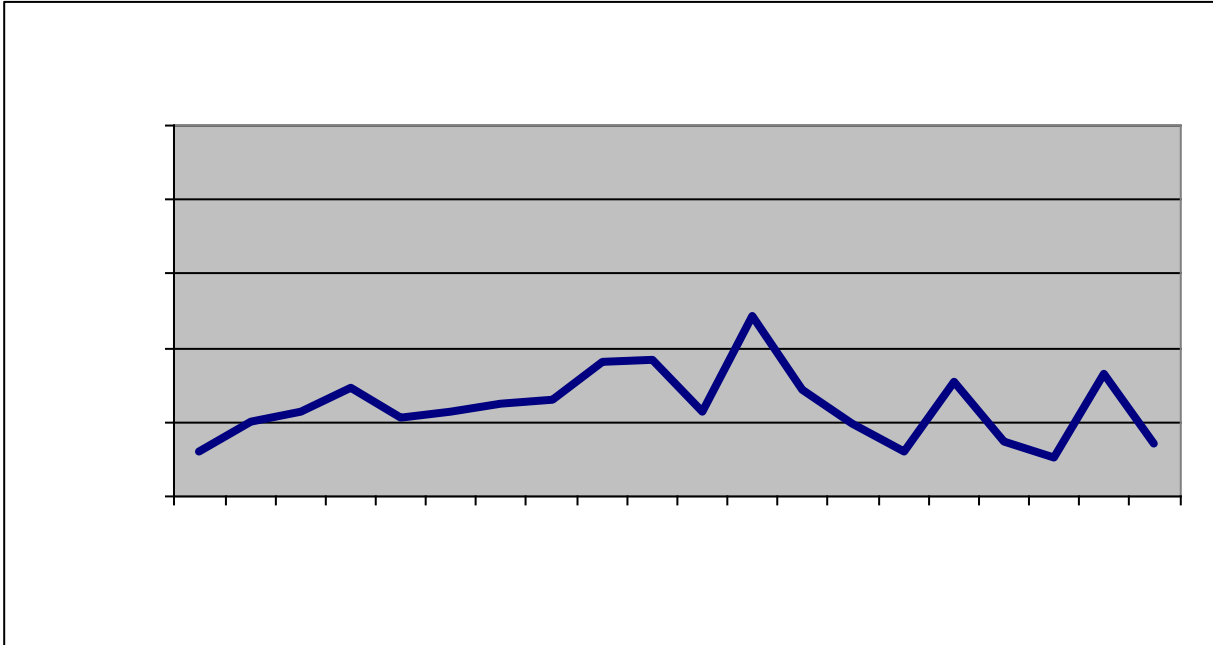
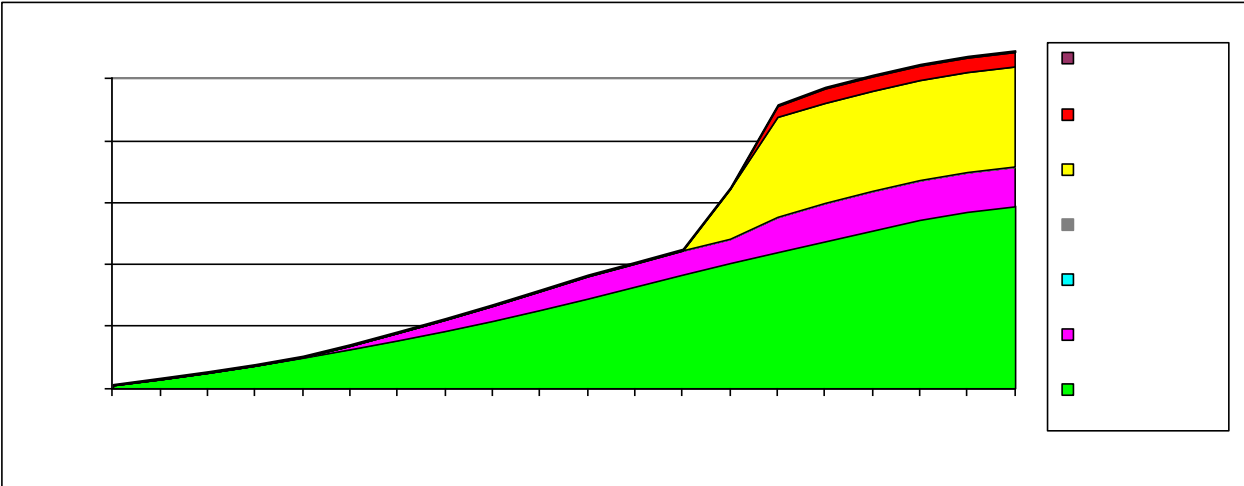


Figure 1: Spinner\_L813LR\_EUCI.xls, Future 750

## Agenda

The following is the published agenda for the meeting. In order to encourage discussion and because of limited time, Schilmoeller skipped almost all of the section, *Design of the Council's RPM*. He did briefly describe the performance of the RPM, the subsection labeled *Achieved Accuracy*.

- Introductions and accommodations
- A few words from my attorney
- Orientation and objectives
- **Plan for the day**
- Selection of the next meeting date

### Plan for the day

- Brief introduction to the Regional Portfolio Model (RPM) and to Olivia (45 minutes)
- Discussion on the general nature of risk (30 minutes)
- break
- Attributes of a risk model (60 minutes)
  - Considerations for the ACT
  - Computational requirements
- break for lunch (on your own)
  
- Design of the Council's RPM (90 minutes)
  - Techniques for better performance
  - Achieved accuracy
  - The choice of platform
- Issues and problems with the RPM (45 minutes)
  - Concerns and interests of the SAAC
- Discussion of next steps (15 minutes)

Adjourned at 3:30pm

---

q:\tm\ww\saacnotes.docx