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Rhonda Whiting
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Melinda S. Eden
Oregon

Joan M. Dukes
Oregon

May 27, 2009

MEMORANDUM

TO: Council Members

FROM: Terry Morlan

SUBJECT: Proposed Resource Portfolio for the Sixth Power Plan

Staff recommends a resource portfolio for the Sixth Power Plan that minimizes risk as well as cost of the regional power system. We will describe the resource portfolio and contrast it with other alternatives that minimize cost, but at higher levels of risk. We will provide additional information about the nature of the risks of alternative plans that minimize power system costs.

The recommended resource portfolio (plan) includes aggressive pursuit of energy efficiency as the least cost and least risk resource available to the region. This finding is true regardless of the scenarios evaluated or the point chosen on the efficient frontier of power plans.

It also assumes that current state renewable portfolio standards (RPS) are achieved. Unlike the cost-effective level of conservation, this is forced to occur in the analysis, rather than being a choice based on cost and risk. However, initial analysis showed that a similar level of renewable resource development would occur even without the RPS requirements given the risk of uncertain carbon costs.

The recommended resource strategy includes optioning (being ready to start construction) additional natural gas-fired resources by 2017, well beyond the 5-year action plan period. We are careful to clarify that individual utility situations may be different than the regional perspective of the Council's Power Plan.

Staff will describe the recommended plan and our reasons for the recommendation. We will answer Council questions and seek guidance on the draft plan resource strategy.

I have attached a brief summary of the Regional Portfolio Model by Ken Corum that may be helpful.

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Council Portfolio Model

The Council's portfolio model was conceived and developed largely to incorporate uncertainty into power system planning. It is documented in detail at www.nwcouncil.org/energy/powerplan/plan. For the purposes of this paper, it is enough to know that the model simulates the development and operation of the region's power system, for several thousand potential resource portfolios. Each resource portfolio is evaluated over a set of 750 possible 20-year futures, which incorporates variation in fuel and electricity prices, demand for electricity, availability of hydroelectric power, generator outages, demand for electricity by aluminum smelters, CO_2 taxes, and incentives for electricity from renewable energy.

An important feature of the model is that while each simulation is based on a potential resource portfolio, the decisions to build and operate each resource are simulated within each future, based on the recent experience in that future. The effect is that the model simulations include "mistakes" in development, like overbuilding after a period of fast load growth, only to experience slow load growth in a succeeding period. The result of subjecting each portfolio to 750 futures is a set of 750 net present values (NPVs) of the costs of the system. Each portfolio thus has a distribution of NPVs that can be characterized by the distribution's mean and a measure of risk called TailVar90 (the mean of the highest 10 per cent of NPVs).

Each portfolio can then be represented as a point on a graph with expected costs on the horizontal axis and TailVar90 on the vertical axis. If the results for all the analyzed portfolios are plotted, the result is a "feasibility space," illustrated by the results of an analysis done for the Council's 5th Power Plan, shown in Figure 2.

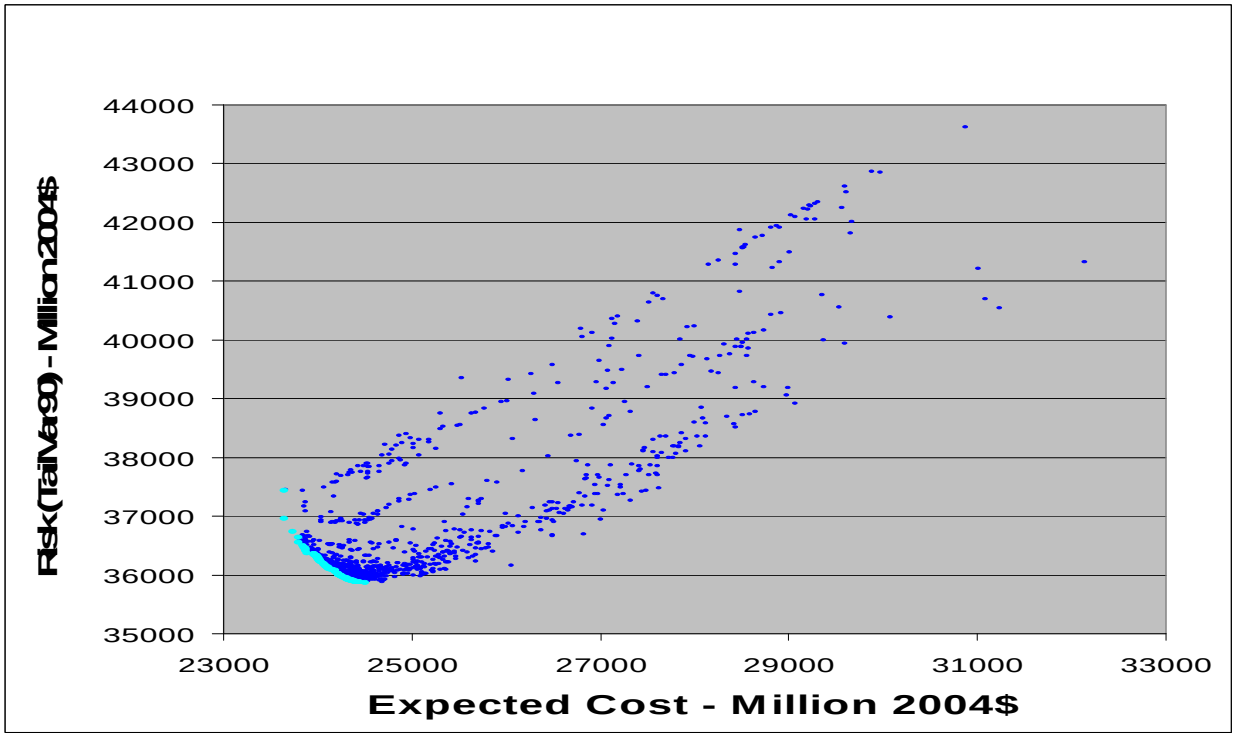

Figure 2 - Feasibility Space and Efficient Frontier

While all the points plotted in the feasibility space are possible, the lighter points at the lower-left boundary of the feasibility space (the "efficient frontier") are preferable to the rest -- the efficient frontier is made up of portfolios that minimize expected cost for each level of risk. For any portfolio not on the efficient frontier, it is possible to find a portfolio that reduces expected cost at the same risk, or reduces risk at the same expected cost, or reduces both expected cost and risk. Any decision-maker, regardless of their preferences for expected cost vs. risk, can find some point on the efficient frontier that is preferable to any point that is not on the frontier.[1]

The Council's portfolio model is arguably at the cutting edge of analytical design and comprehensive treatment of uncertainty in power planning. Its design also simulates the interaction of a new generator with the rest of the power system. As a result we can say that the portfolio model remedies the important shortcomings of the "stand-alone peaker" and "system simulation" approaches. But it does so at the cost of considerable complexity -- at the Council, the model uses ten personal computers coordinated by a server, and an analysis commonly requires several days' run time. In addition, acquiring the skills and understanding needed to exercise the model requires a considerable investment of time for the analyst.

[1] While all decision-makers will prefer to be somewhere on the frontier, they will not prefer the same point on the frontier. Choosing among portfolios on the frontier requires trading expected cost for risk. These trades require subjective weighting of expected cost vs. risk. Different decision-makers will apply different weights and arrive at different portfolio choices.