Northwest Power and Conservation Council

Wednesday, April 29, 2009

MEMORANDUM

TO: Power Committee

FROM: Michael Schilmoeller, Staff Analyst

SUBJECT: Discussion of Portfolio Model Results

Work proceeds with the Regional Portfolio Model (RPM). We have results for several special cases chosen to investigate:

- Carbon emissions under alternative control schemes
- The economic and carbon implication of Regional Portfolio Standards
- Cost, risk, and carbon emission considerations in plan selection
- Alternative rates of implementation for conservation
- The consequences of breeching the dams on the lower Snake river
- The impact of climate change on the choice of resources along the efficient frontier

We will summarize these results and discuss the implications for the selection of the Council's resource plan. We will also briefly discuss interpretation and implementation of the resource plan.

Results will evolve between now and the time of this presentation. We intend to present the most current results available. These may differ from the content of the packet containing this memo. We intend to use our web conference, scheduled for the preceding week, to introduce any significant, new results.

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Regional Portfolio Model Results

Michael Schilmoeller

for the

Council Work Session

Wednesday, May 13, 2009

rev 01

Overview

- Choosing from among the plans along the efficient frontier
- The issue of carbon
- Renewable Portfolio Standards

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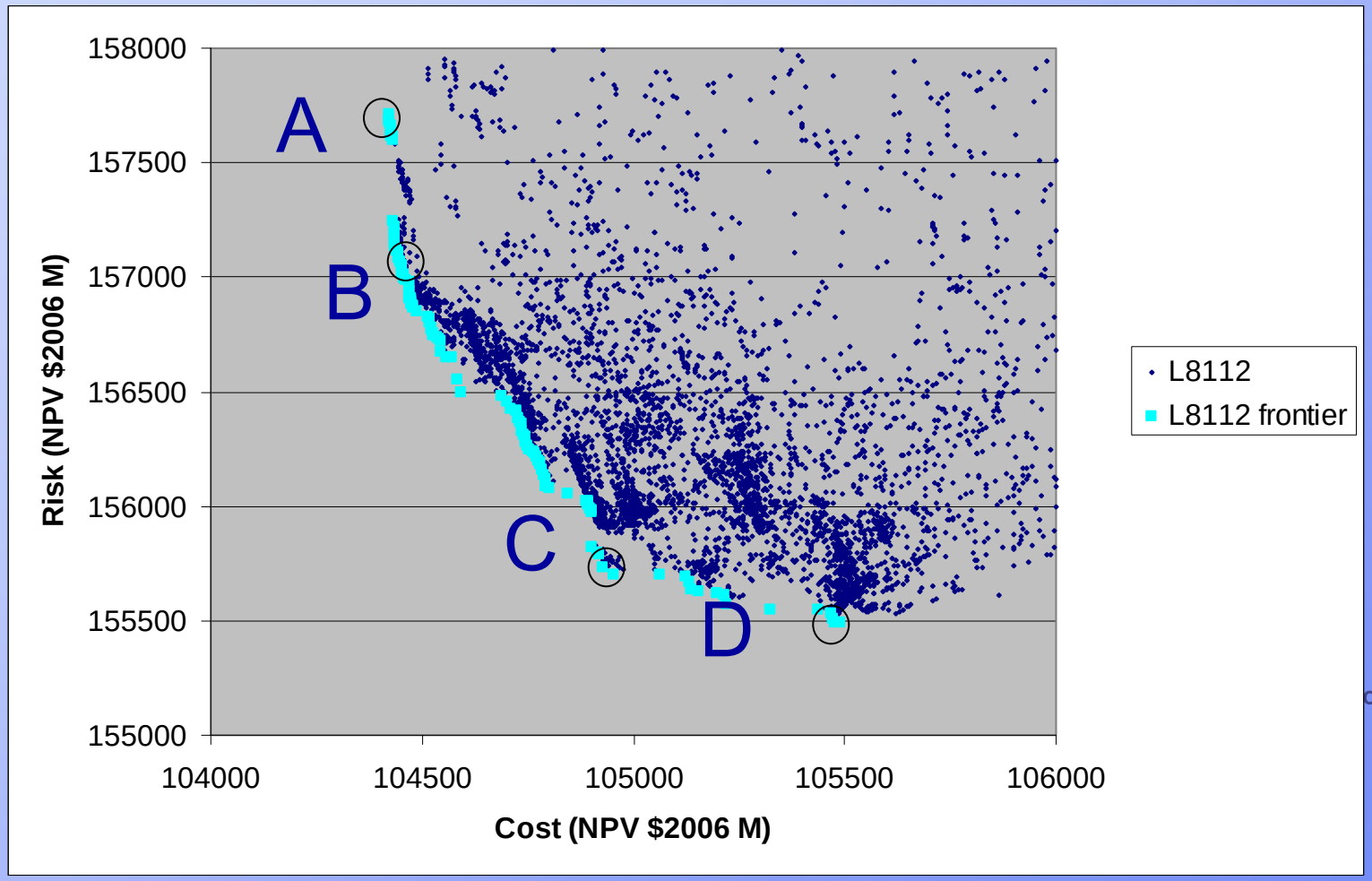
Efficient Frontier



Source: Analysis of Optimization Run_L811 090510 2101.xls

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The Efficient Plans

- Have significant amounts of conservation development
- Assume utilities meet their Renewable Portfolio Standard (RPS) energy targets
- Meets reliability and adequacy standards for energy and for winter and summer peak

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Plan A "Least Cost"

- Greater rate and cost volatility due to reliance on the wholesale electricity market

- Conservation
  - 160 MWa per year limit on discretionary conservation development
  - $10/MWh cost-effectiveness premium over wholesale electricity price (avoided cost)
  - Develops **5527** MWa by the end of the study

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Plan D "Least Risk"

- Less reliance on the wholesale electricity market means lower cost and rate volatility
- Conservation
  - Same limit on the rate of discretionary conservation development
  - $10/MWh cost-effectiveness premium over wholesale electricity price for discretionary conservation; $50/MWh premium for lost opportunity conservation
  - Develops **5827** MWa by the end of the study
- Recommends planning, siting, and permitting to support construction of
  - 415 MW CCCT in 2018
  - 170 MW SCCT in 2016
  - 52 MW of geothermal in 2018*
  - 1200 MW of wind generation in 2016*

* Unless utilities have already achieved this to meet their RPS requirements.

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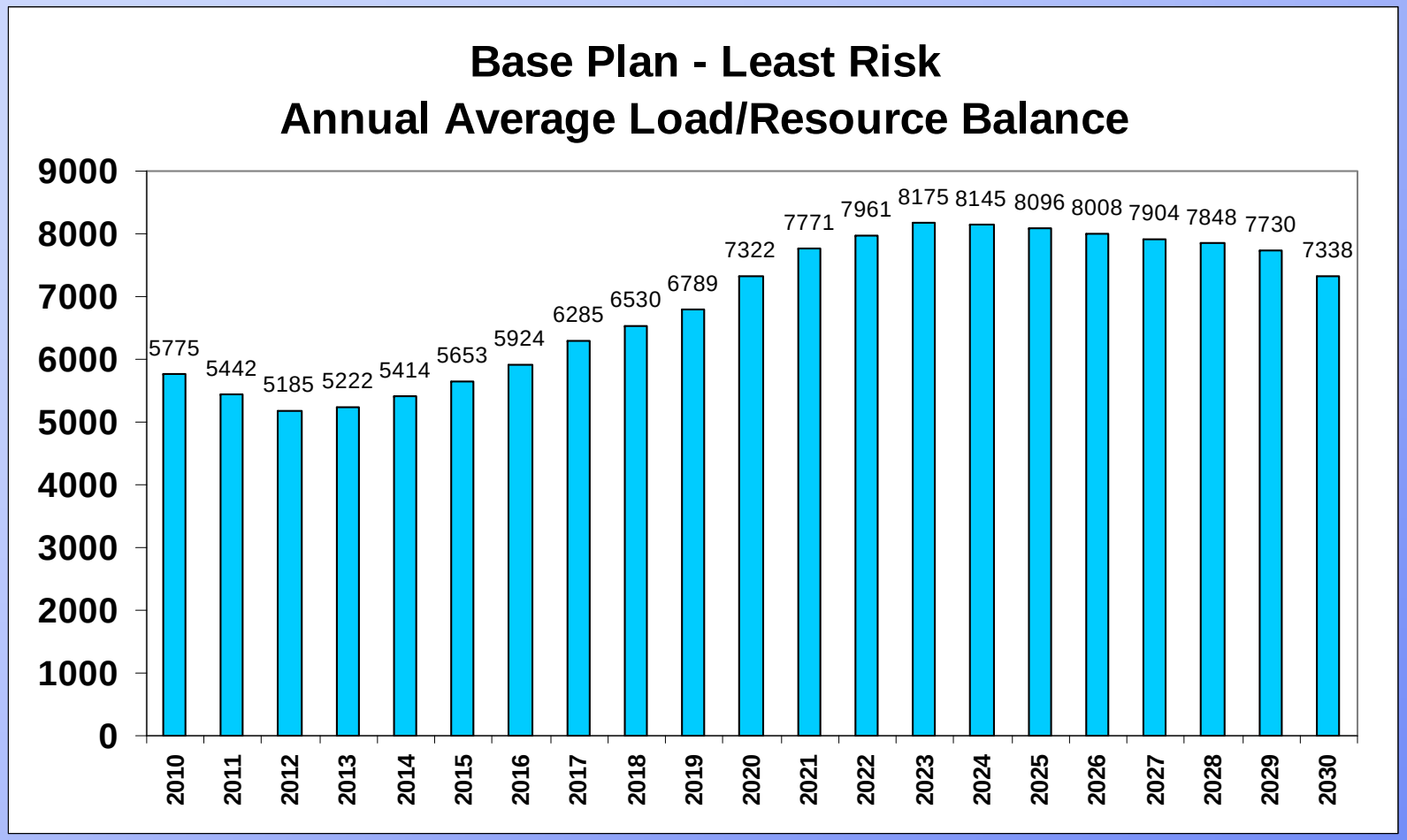
Be Prepared To Hear about the "Energy Surplus"



Source: Adequacy 6th Plan Base Case 050609_MJS.xls

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Discretionary Conservation Implementation Rate

Least-Risk Plan Results

Note: "Discretionary", "dispatchable", or "retroactive" conservation is referred to here by NLO ("non-lost op")

	Ramp rate (MWa/yr)	Selected premiums	NLO by end of study (MWa)	Total cons by end of study (MWa)	Plan Cost ($2006 B NPV)	Plan Risk ($2006 B NPV)
Low	100	50 for LO; NA for NLO	1996	4566	114.1	173.9
Base case	160	50 for LO; 10 for NLO	2573	5827	105.5	155.5
High	220	40 for LO; 10 for NLO	2657	5848	103.7	152.2

Source: Analysis of Optimization Run_L811 090502.xls, Analysis of Optimization Run_L811a.xls

L811c.xls (max case); summarized in “Effect of NLO ramp rate.xls”

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Other Considerations

- System flexibility
- Utilities not meeting their RPS or the consequences of states rescinding their RPS requirements
- Climate change
- Breaching the Lower Snake River dams
- Plug-in Hybrid Electric Vehicles

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Least Risk Plan and Carbon

- This plan is expected to reduce expected carbon emissions from around 60 M tons/year to 37 M tons/year by 2025. This achieves the goal of reducing Northwest power system's CO2 production to 1990 levels (44 million tons)*
- This conclusion, however, is driven by assumptions about future carbon penalties, electricity requirements, etc.
- There is still a 40 percent chance it would not meet the 1990 target and a 20 percent chance that the region would not reduce carbon emissions at all

* Source: NWPCC, "Marginal Carbon Dioxide Production Rates Of The Northwest Power System," June 13, 2008, page 10

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Mechanisms

- Displacement
  - Example: building renewables
- Dispatch penalty
  - Example: tax of fuels, emission; trading regimes
- Direct curtailment
  - Example: new source requirements

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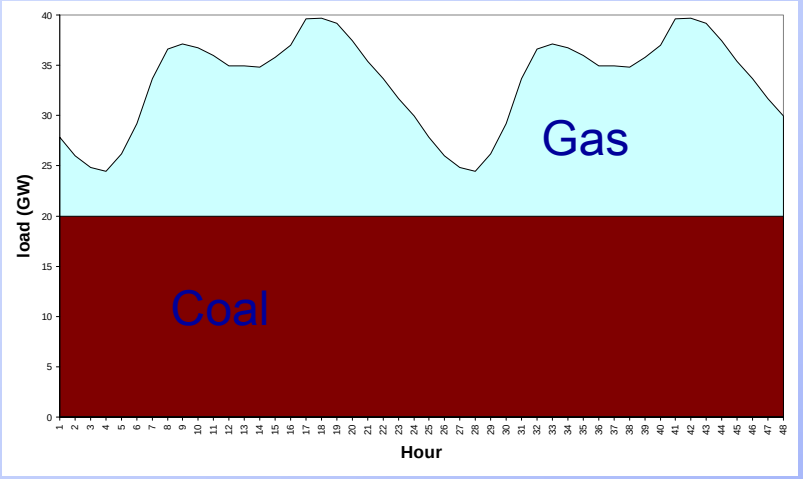
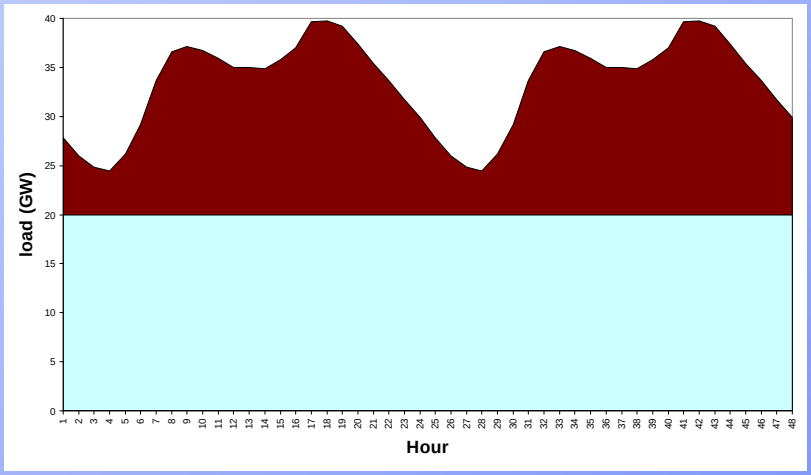
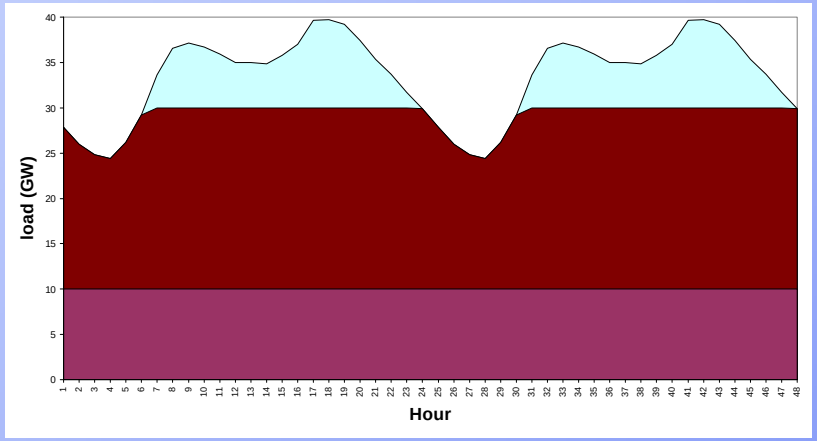
Mechanisms



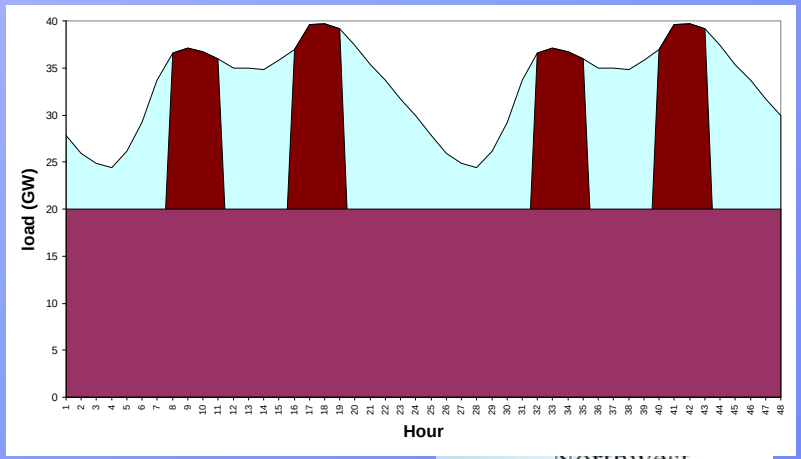
Normal order



Dispatch Order



Displacement



Curtailment

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Mechanisms

- Different Effects
  - Wholesale electricity price
  - Cost to ratepayers
  - Opportunities for wealth transfer
- Different Advantages and Disadvantages
  - Administrative control
    - Administrative boundary issues
    - Geographic boundary issues
    - Reversibility
  - Efficiency & Flexibility

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Conclusions

- The Least-Risk plan reduces expected carbon emission rates, but significant risk remains that regional coal plants would continue emitting carbon at nearly the same rates

- Investment in renewables and energy efficiency, coupled with arrangements for the direct curtailment of the six coal plants in the region, might provide a manageable, low-risk means for the region to meet its carbon emission standards

- If we curtail coal-fired generation too abruptly, we limit our options for replacing the energy. If we have to replace this energy with gas-fired generation, for example, our possible reductions would be cut by half. Curtailment must be tempered by prudence and our assessment of potential for carbon-free sources of energy.

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Overview

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Regional Portfolio Standards

- What should the region have done in the absence of RPS requirements?
  - Are the RPS requirements expensive relative to the "no-RPS" alternative?
- How effective is the RPS approach in reducing carbon emissions?

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RPS Conclusions

- In the absence of the RPS requirement, the region probably should have acquired about the same amount of renewables as the RPS statues require.
- Matching the schedule of renewable construction to economic requirements might have saved some money, but probably not much.
- Constructing renewables and other non-carbon producing resources is necessary but not, in itself, sufficient to guarantee reduced CO_2 emission rate.

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End

CO2 Penalty Distribution