The Council’s Regional Portfolio Model

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for the Northwest Power and Conservation Council
Demand Forecasting Advisory Committee
Wednesday, December 03, 2008

Overview

- Planning Principles
- Selection of Resource Plans
- Load Representations
- Treatment of Conservation
Different Kind of Risk Modeling

- Imperfect foresight and use of decision criteria for capacity additions
- Adaptive plans that respond to futures
  - Primarily options to construction power plants or to take other action
  - May include policies for particular resources
- “Scenario analysis on steroids”
  - 750 futures, strategic uncertainty
  - Frequency that corresponds to likelihood

Planning Principles

Model Overview
Sources of Uncertainty

- **Fifth Power Plan**
  - Load requirements
  - Gas price
  - Hydrogeneration
  - Electricity price
  - Forced outage rates
  - Aluminum price
  - Carbon allowance cost
  - Production tax credits
  - Renewable Energy Credit (Green tag value)

- **Sixth Power Plan**
  - All of those to the left, except, perhaps, aluminum price
  - Power plant construction costs
  - Technology availability
  - Conservation costs

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Most Elements of the Resource Plan Are Options To Construct

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Why Use a Schedule of Construction Options for a Resource Plan?

- More realistic!
- Necessary for capturing construction risk
- Consistent with earlier Council Plans

Power Resource Risks
Costs and Considerations

- Commercial Availability Risk
- Construction Risk
  - Responding fast enough to capture value
  - Sunk siting and permitting costs
  - Construction materials cost
  - Mothball and cancellation costs
- Operation Risk
  - Fuel, maintenance, and labor costs
- Retirement Risk
  - Carrying the forward-going fixed cost of an unused plant
  - Undervaluing and retiring a plant that may have value in the future
The Construction Cycle

- After an initial planning period, there typically large expenditures, such as for turbines or boilers, that mark decision points.

![Graph showing cash expenditures and construction flexibility over time.]

Construction Optionality

![Bar chart showing capacity over time with different stages: planning, construction, committed construction, in service, and delay.]

Resource construction flexibility
How Do We Interpret and Use a Schedule of Construction Options?

- As a ceiling for what should be sited and licensed
- To develop signposts for re-evaluation

### Additions in Megawatts

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### Spinner Graphs

- Illustrates “scenario analysis on steroids,” one plan, across all futures
- Link to [Excel Spinner Graph Model](#)
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- Load Representations
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Resource Plan Selection

- Trade-off between economic cost and risk
- Rate impacts and volatility
- Exposure to market prices
- Non-economic costs and risks, including associated carbon emissions
- Meeting reliability standards
- Difficulties with changing the resource plan
Risk: Importance of Multiple Perspectives

- Standard deviation
- VaR90
- 90th decile
- Loss of load probability (LOLP)
- Resource - load balance
- Incremental cost variation
- Average power cost variation (rate impact)
- Maximum incremental cost increase
- Exposure to wholesale market prices
- Imports and exports

Risk and Expected Cost Associated With A Plan

Risk = average of costs > 90% threshold
Feasibility Space

Increasing Risk

Increasing Cost

Space of feasible solutions

Efficient Frontier

Selection of Resource Plans
Overview

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Fifth Power Plan Energy

![Graph showing energy trends over years]

Source: worksheet LFAC 081203 01 of Load_Comparison to NPCC 081203.xls

RPM Load and Conservation

![Graph showing load and conservation trends over years]

Source: worksheet LFAC 081203 02 of Load_Comparison to NPCC 081203.xls
Load Futures

Likelihood Deciles
Comparison to Council’s Forecast

Overview

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Supply Curves

Supply curves

Cost Assuming No Producers’ Surplus

Supply curves
Conservation Supply Curve

Components of Cost Reduction

- Additional conservation at $50/MWh
- SCCT deferral
- Reduced market prices
- Total System Costs
Price-takers Still See Benefits

Additional conservation at $50/MWh

SCCT deferral

Total System Costs

Supply curves

SCCT Deferral

- *Why* does conservation defer single cycle combustion turbines?
  - Low-capital cost resources are the traditional solution for risk management
  - SCCT have low capital cost
  - Conservation has *high* capital cost
- Under what conditions does conservation hold an advantage over SCCTs?
SCCT Deferral

$Net Benefit per $Expense

SCCT Deferral

End