



# 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

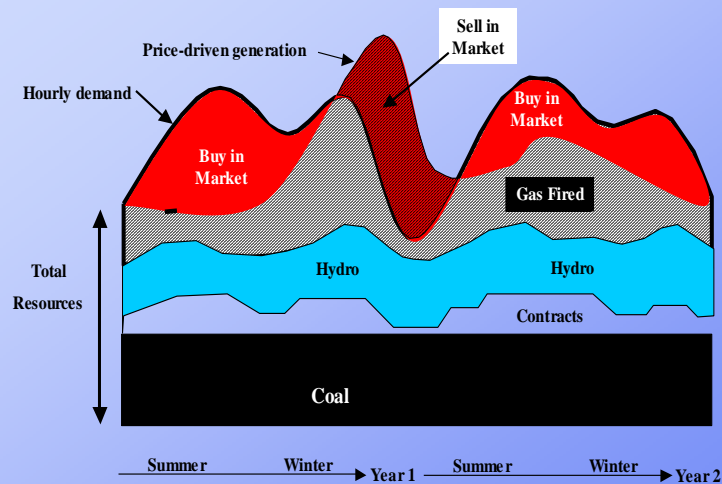
- Planning Principles
- Selection of Resource Plans
- Load Representations
- Treatment of Conservation



## 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

## Operating Costs



## 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

## Most Elements of the Resource Plan Are Options To Construct

Additions in Megawatts							
Beginning of year	2008	2010	2012	2014	2016	2018	2020
CCCT	0.00	0.00	0.00	0.00	0.00	610.00	1,220.00
SCCT	0.00	0.00	0.00	0.00	0.00	100.00	800.00
Coal	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Demand Response	500.00	750.00	1,000.00	1,250.00	1,500.00	1,750.00	2,000.00
Wind_Capacity	0.00	100.00	1,500.00	2,400.00	4,400.00	5,000.00	5,000.00
IGCC	0.00	0.00	425.00	425.00	425.00	425.00	425.00
Conservation cost-effectiveness premium over market	10.00	5.00					
avg New Conservation	443	746	1071	1416	1774	2020	2198

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

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

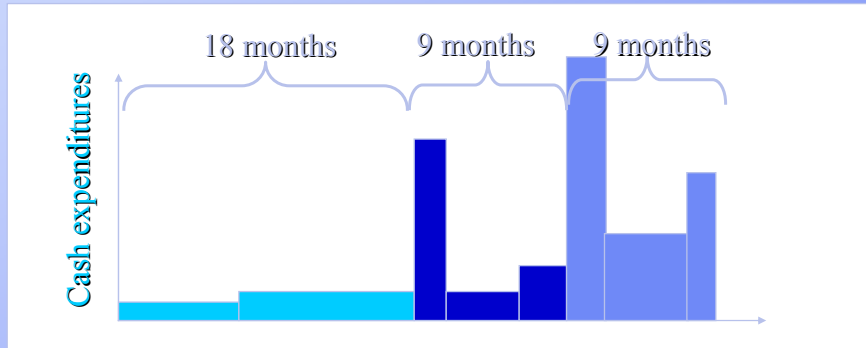
## Power Resource Risks

### Costs and Considerations

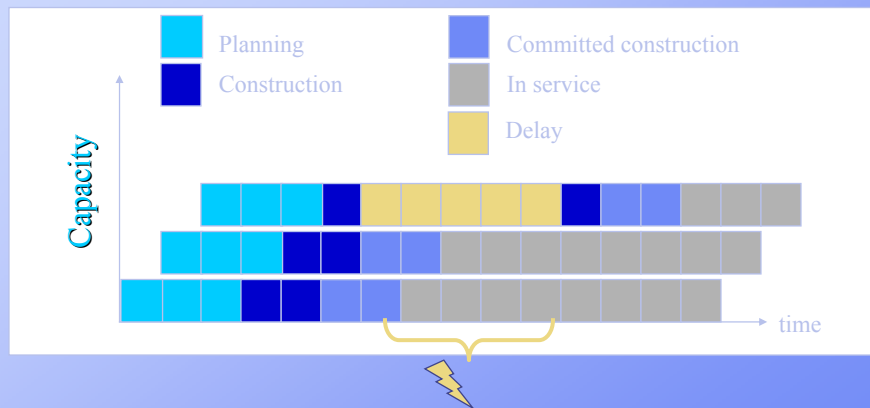
- Commercial Availability Risk
- Construction Risk
  - Responding fast enough to capture value
  - Sunk siting and permitting costs
  - Construction materials cost
  - Mothball and cancellation costs
- Operation Risk
  - Fuel, maintenance, and labor costs
- Retirement Risk
  - Carrying the forward-going 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.



# Construction Optionality



## 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

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Selection of Resource Plans

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## Spinner Graphs

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

Model Overview

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## Overview

- Planning Principles
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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

Selection of Resource Plans

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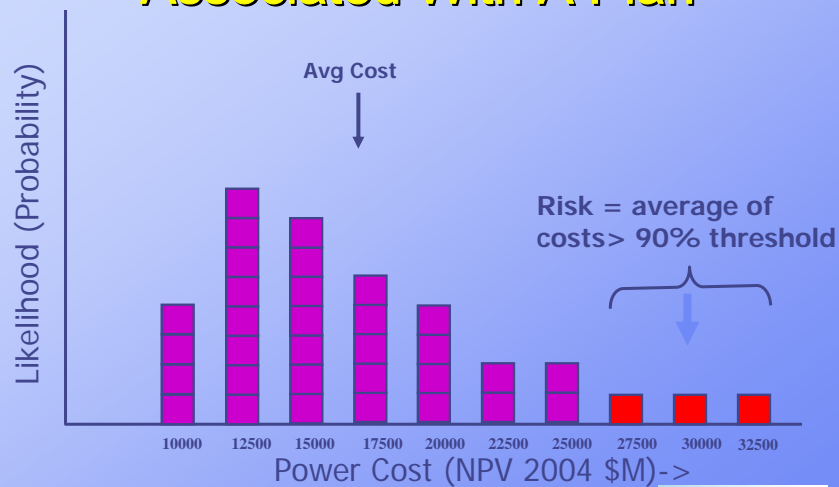


## Risk: Importance of Multiple Perspectives

- 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

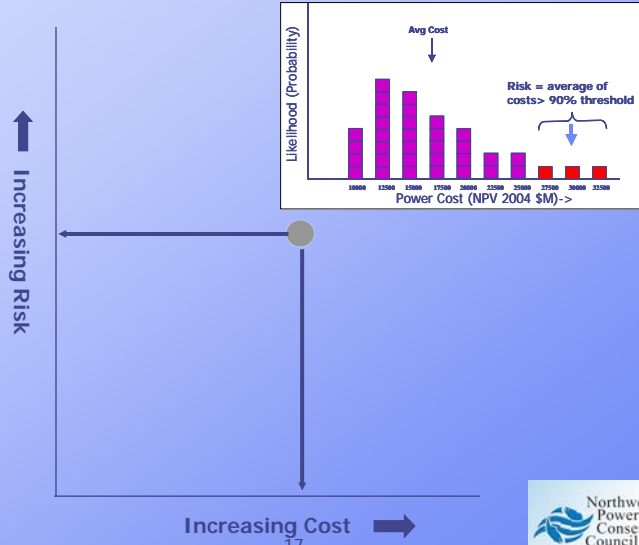


## Risk and Expected Cost Associated With A Plan





# Feasibility Space

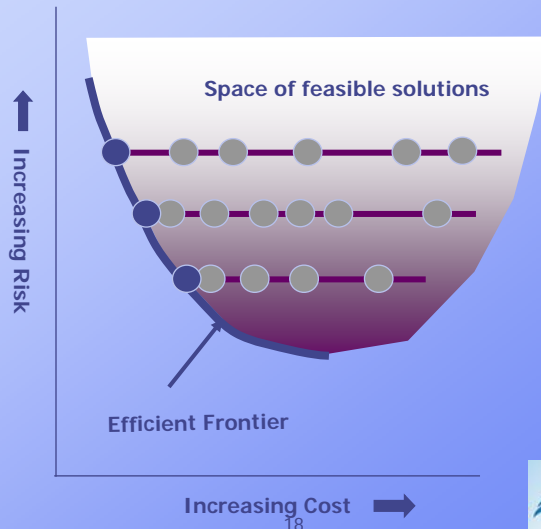


Selection of Resource Plans

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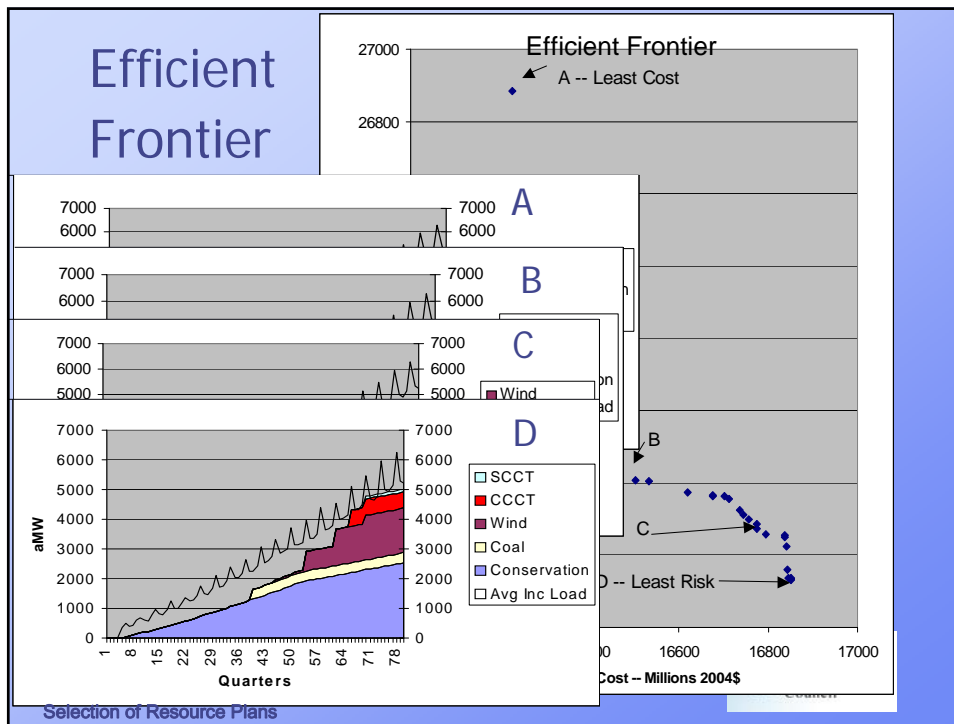
# Feasibility Space



Selection of Resource Plans

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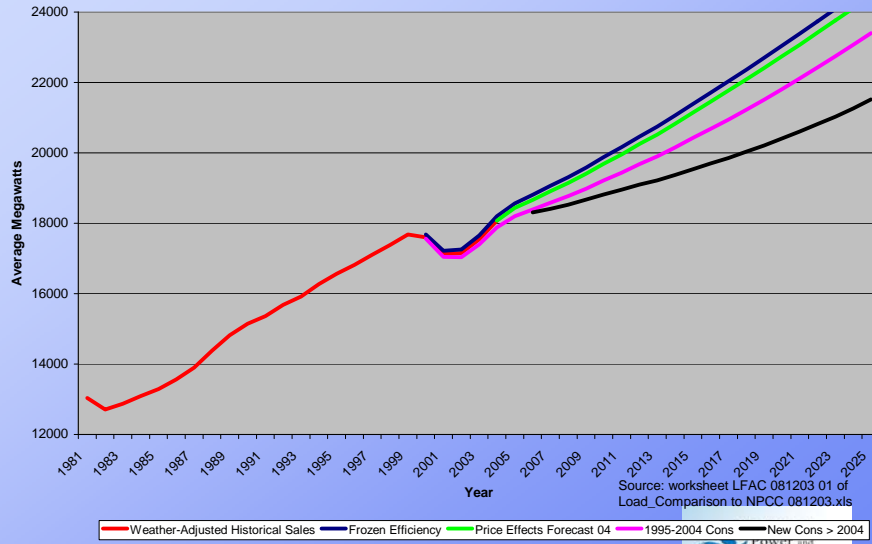




## Overview

- Planning Principles
- Selection of Resource Plans
- **Load Representation**
- Treatment of Conservation

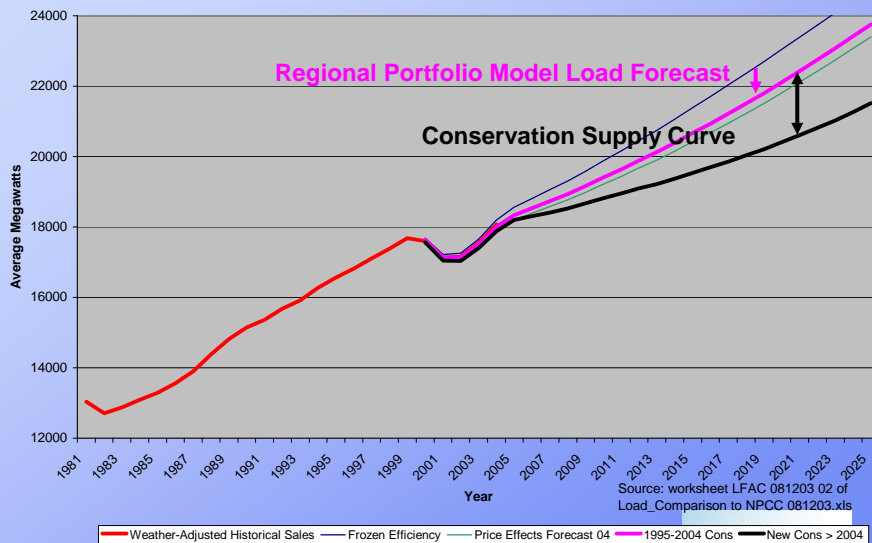
## Fifth Power Plan Energy



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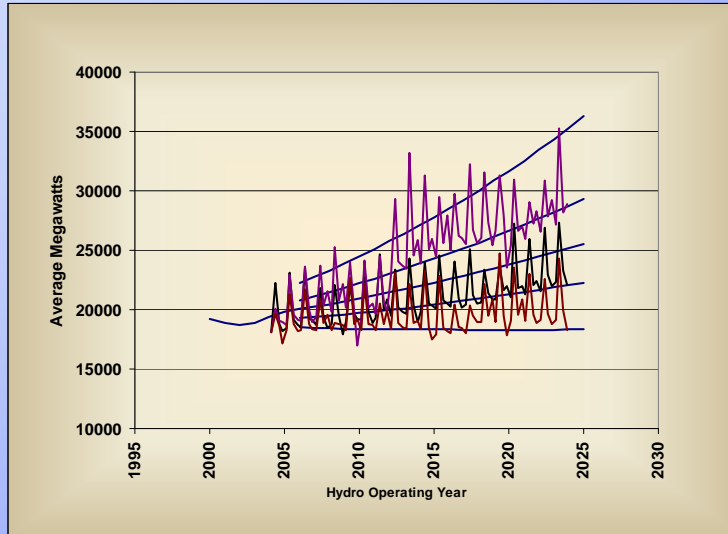
## RPM Load and Conservation



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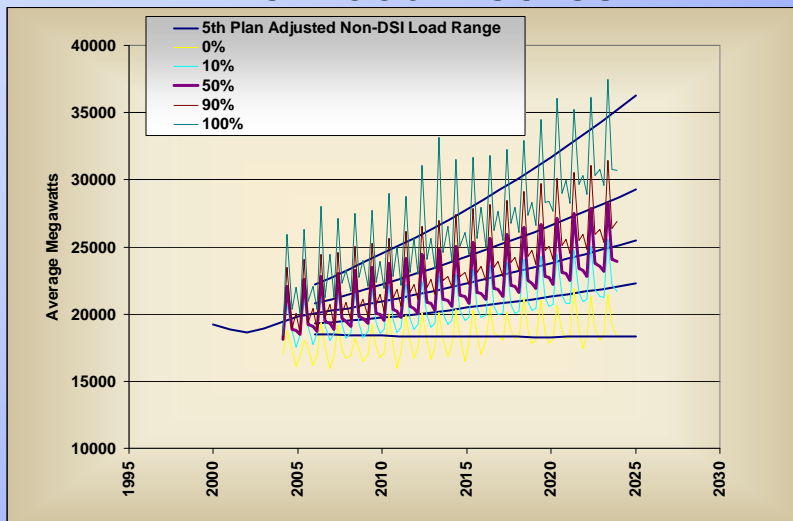
# Load Futures



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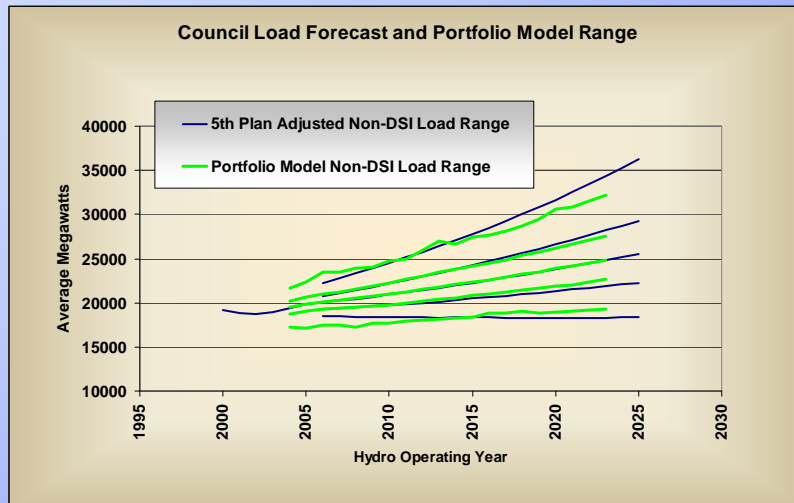
# Likelihood Deciles



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## Comparison to Council's Forecast



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## Overview

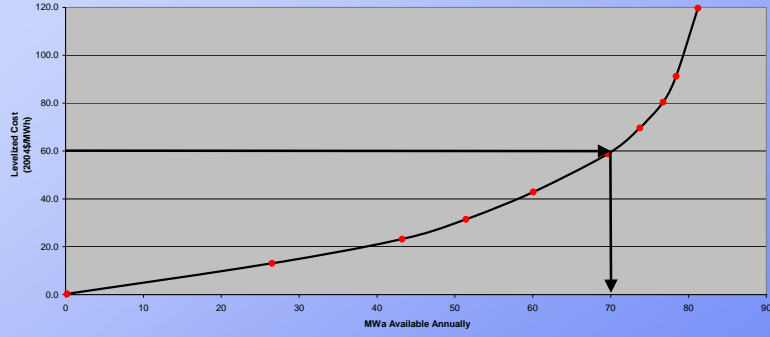
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# Supply Curves

Supply Curve



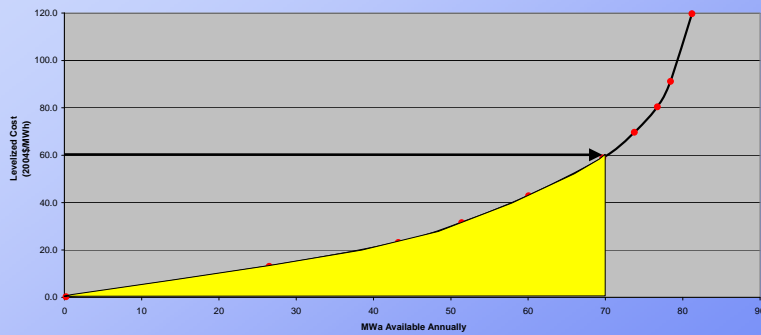
Supply curves

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# Supply Curves

Cost Assuming No Producers' Surplus  
Supply Curve

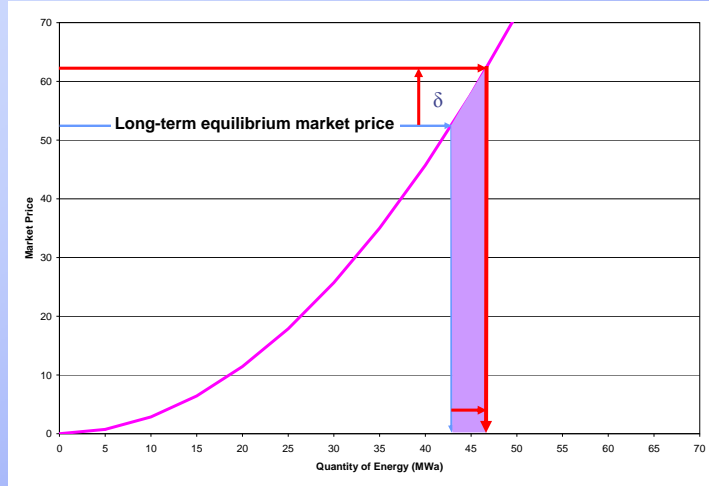


Supply curves

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# Conservation Supply Curve

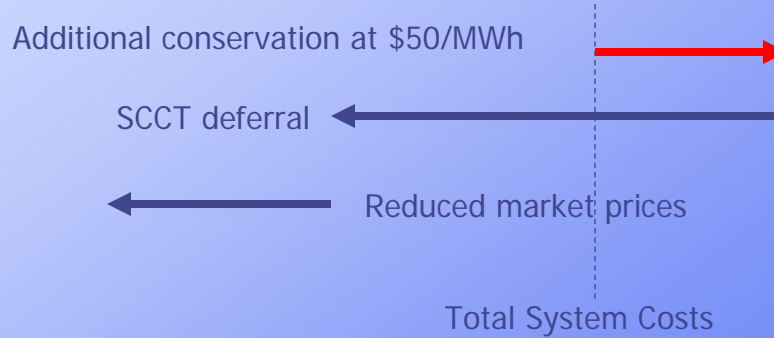


Supply curves

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# Components of Cost Reduction

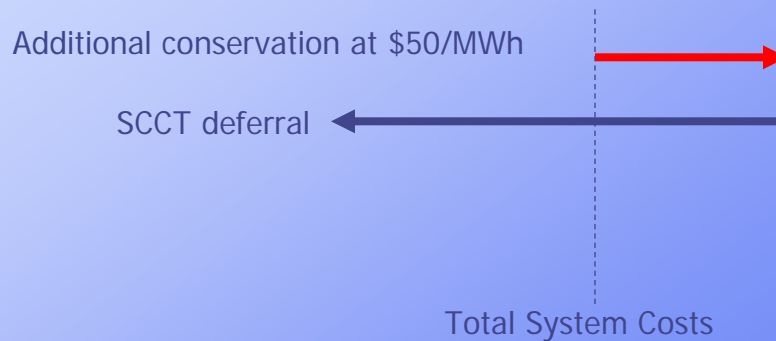


Supply curves

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## Price-takers Still See Benefits



Supply curves

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## 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?

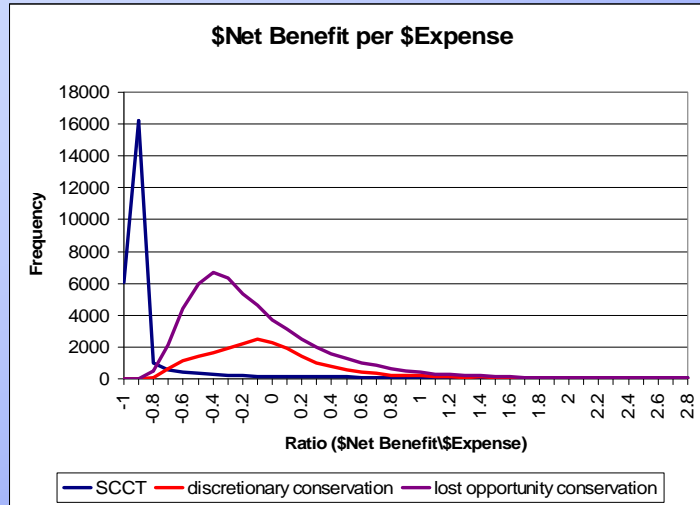
Supply curves

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# SCCT Deferral



Supply curves

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# End

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