Synapse
Energy Economics, Inc.

Risk Metrics for Electric Supply Portfolios and their Application in Policy Making

New York DPS Workshop in Case 06-M-1017

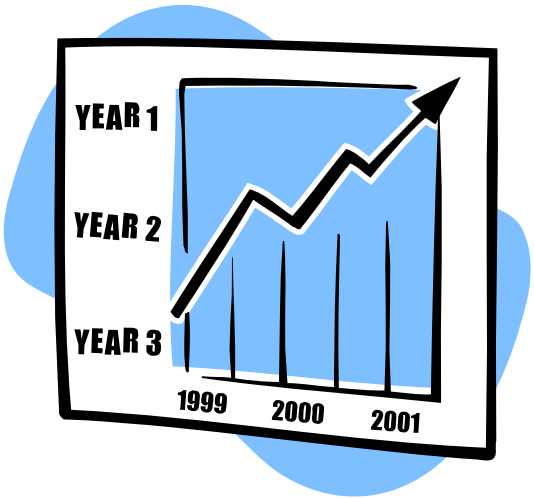
October 20, 2006

Rick Hornby

 | ©2006 Synapse Energy Economics Inc. All rights reserved.

Overview

1. Choosing an electric supply portfolio
2. Risk metrics for electric supply portfolios
   - Short-term (less than 3 years)
   - Long-term (more than 3 years)
   - Input data and assumptions
3. Conclusions



 ©2006 Synapse Energy Economics Inc. All rights reserved.

Overview

This presentation draws from ***Portfolio Management: Tools and Practices for Regulators***, September 2006, which Synapse prepared for the National Association of Regulatory Utility Commissioners (NARUC).

The report is available at www.synapse-energy.com.

 ©2006 Synapse Energy Economics Inc. All rights reserved.

Overview

Portfolio Management: Tools and Practices for Regulators describes:

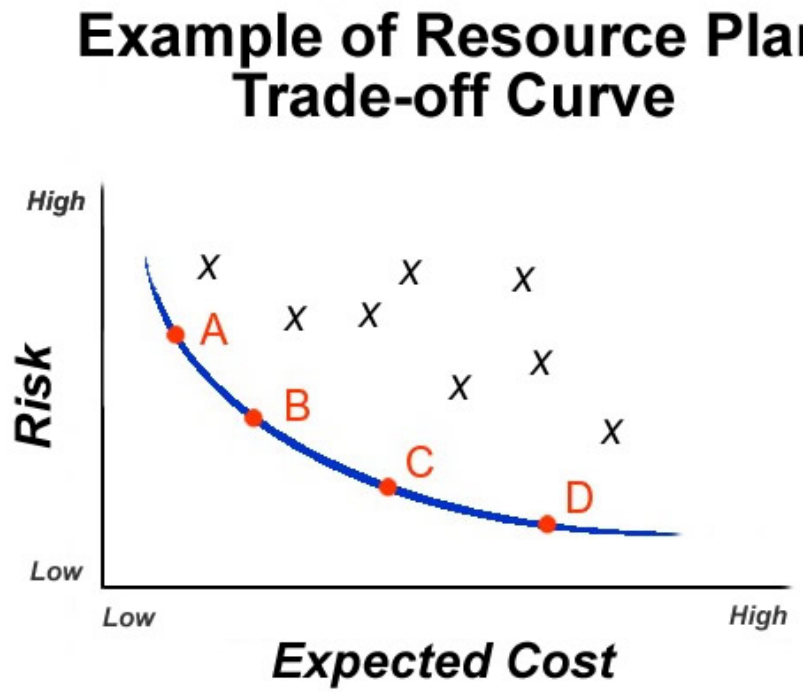
- Portfolio Management
- Data, Models, and Tools for Portfolio Management
- Expertise and Staffing for Managers and Regulators
- Next Steps for Regulators
- Portfolio Management Activities in Selected States

For the report Synapse reviewed selected jurisdictions with retail access (NJ, ME, IL, MD, DC, DE, MA, TX, NY) and with full regulation (AL, CA, FL, HI, ID, IN, KY, LA, MN, MT, NC, OR, SC, UT, WA, BC).

 ©2006 Synapse Energy Economics Inc. All rights reserved.

Choosing an Electric Supply Portfolio

There is a portfolio with an optimal expected cost for each level of risk:

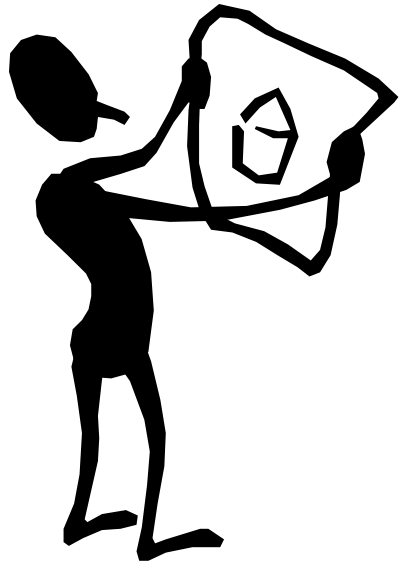


 ©2006 Synapse Energy Economics Inc. All rights reserved.

Choosing an Electric Supply Portfolio

Policy Issues

1. What is a reasonable balance or trade-off between price stability and price volatility? (e.g. issue 2, page 6 of August 28, 2006 order)
2. What is the appropriate planning horizon? (e.g. issue 6, page 7 of August 28, 2006 order)
3. Should we measure electric price volatility and if so how? (e.g. issue 3, page 6 of August 28, 2006 order)



 ©2006 Synapse Energy Economics Inc. All rights reserved.

Choosing an Electric Supply Portfolio

- The problem of addressing risk in supply portfolios, and the associated policy issues, are not new, nor are they unique to the New York electric industry.
- Electric industry has been developing long-term supply portfolios in the face of uncertainty for at least 30 years
- Gas utilities have been developing supply portfolios in the face of uncertainty for almost 20 years, including the use of hedging in the past 10 years

 ©2006 Synapse Energy Economics Inc. All rights reserved.

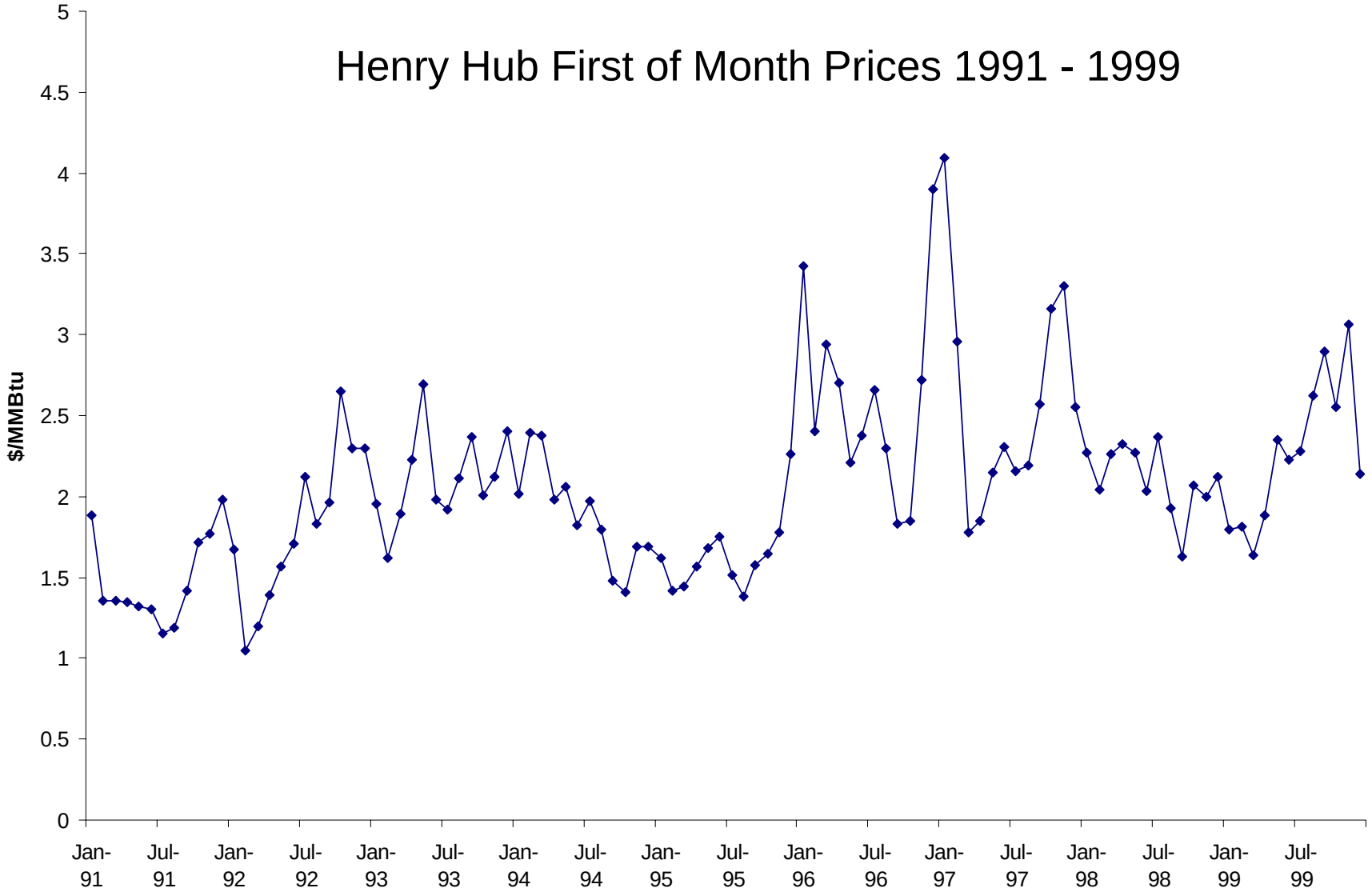
Choosing an Electric Supply Portfolio

- Every aspect of the future is uncertain, e.g.,
  - Load
  - Fuel prices
  - Greenhouse gas regulations
  - Electricity market prices
  - In-service dates and costs of new capacity

- Some aspects are more difficult to predict accurately than others. For example, past natural gas prices have not been good indicators of future natural gas prices.

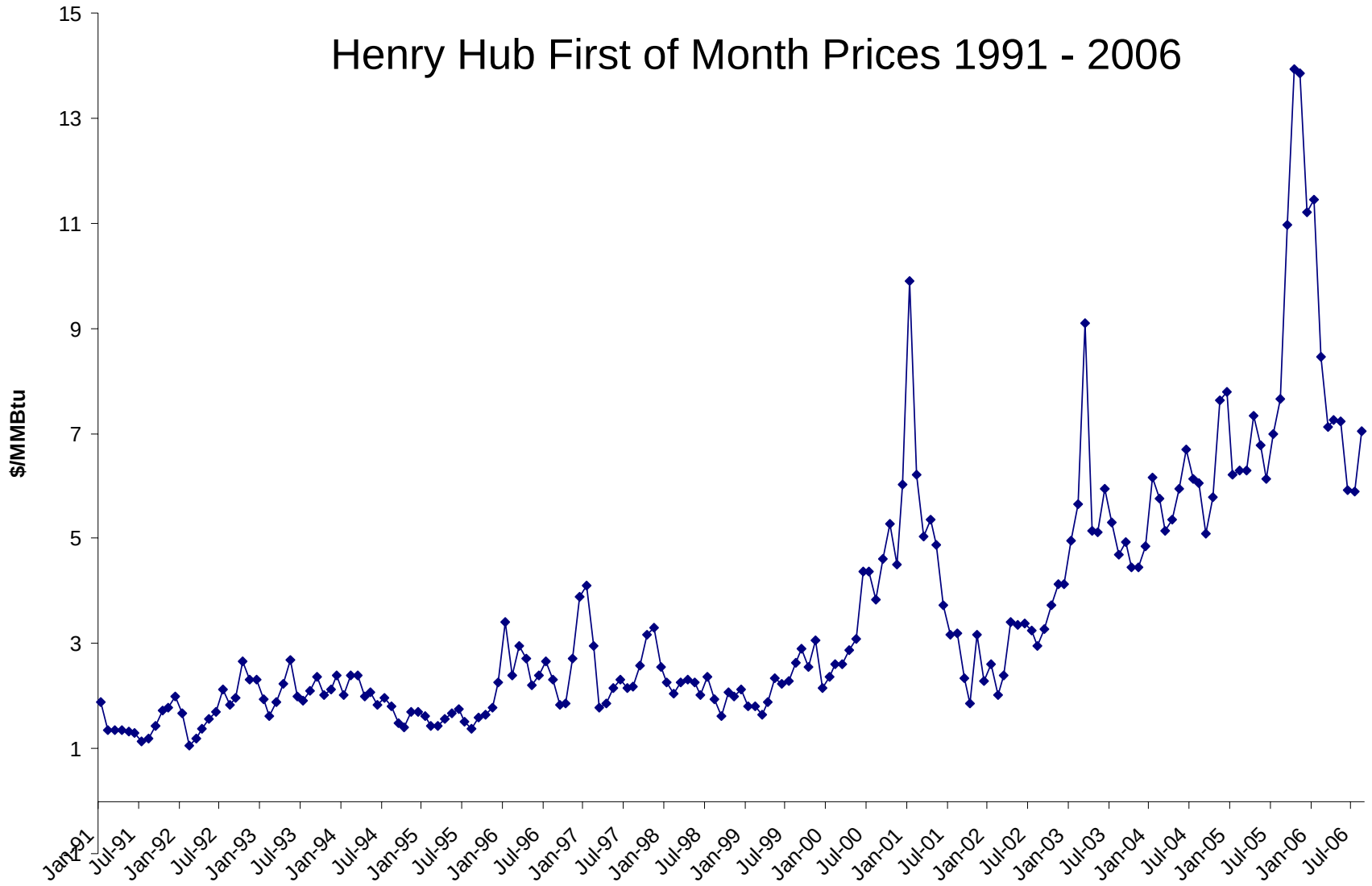
 ©2006 Synapse Energy Economics Inc. All rights reserved.

Risk Metrics for Electric Supply Portfolios



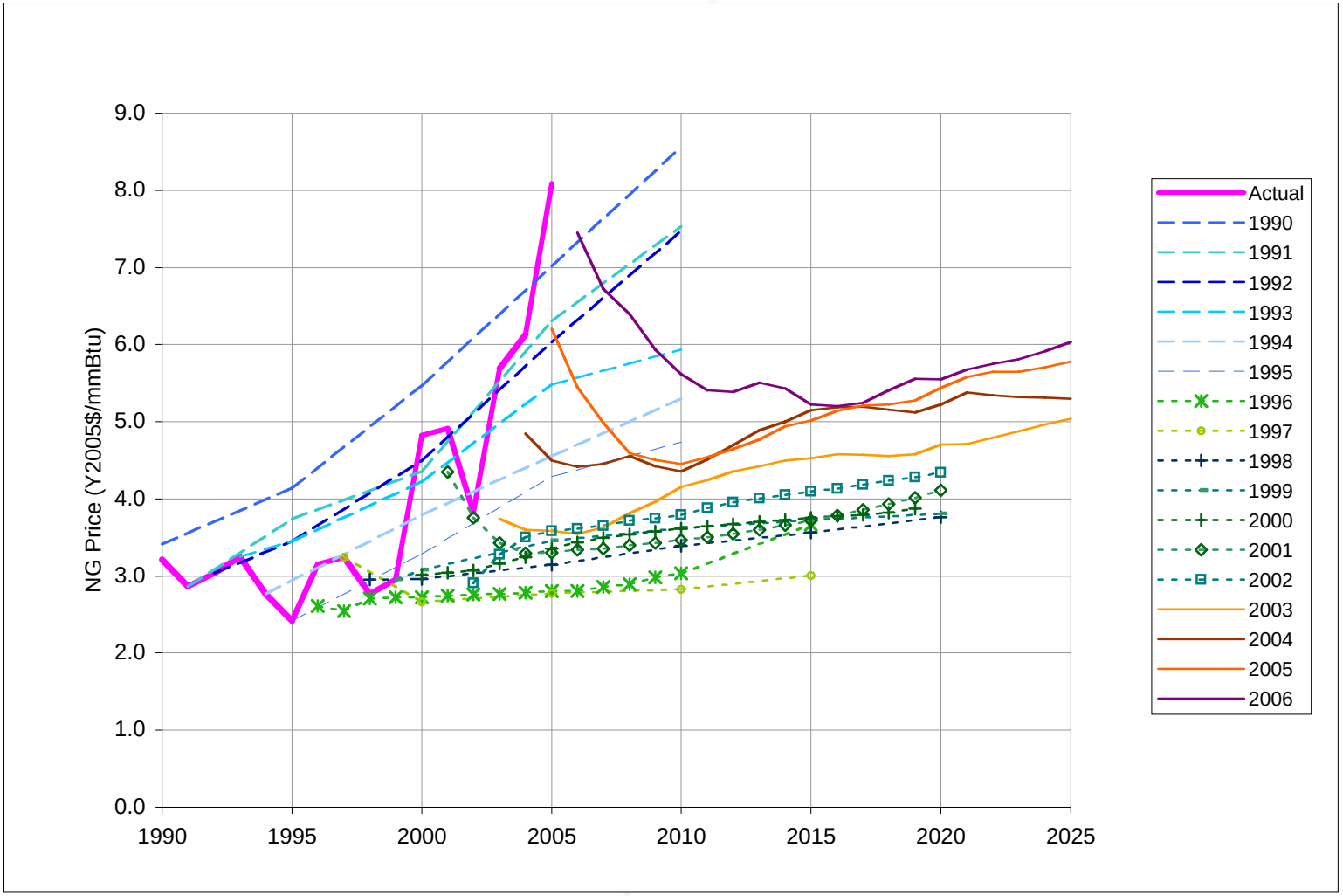
 ©2006 Synapse Energy Economics Inc. All rights reserved.

Risk Metrics for Electric Supply Portfolios



 ©2006 Synapse Energy Economics Inc. All rights reserved.

Forecasts of Natural Gas Prices Have Not Been Accurate



Source: Compiled by Synapse from EIA's Annual Energy Outlook reports.

 ©2006 Synapse Energy Economics Inc. All rights reserved.

Choosing an Electric Supply Portfolio

Parties are trying to choose the electric supply portfolio which offers the “best” combination of cost and risk under a range of possible future conditions.

Example:

- Plan A – high percentage of spot purchases
- Plan B – high percentage of hedges
- Plan B has a higher expected price but less exposure to extremely high prices

 ©2006 Synapse Energy Economics Inc. All rights reserved.

Choosing an Electric Supply Portfolio

Illustrative probability distributions

 ©2006 Synapse Energy Economics Inc. All rights reserved.

Risk Metrics for Electric Supply Portfolios

- General agreement on appropriate measure of cost - present value of expected revenue requirements

- No general agreement on appropriate measure of risk. For example, see *The Trouble with Risk Measures* by Andy Dunn in October 2006 Public Utilities Fortnightly.

 ©2006 Synapse Energy Economics Inc. All rights reserved.

Risk Metrics for Electric Supply Portfolios

Examples of Risk Measures From Finance That Could Be Applied to Supply Portfolios	
Value at risk	The maximum reduction in value (or increase in cost) that could occur over a specified period at a given confidence level.
Component value at risk	Measures the marginal contribution to value at risk of each element within the overall portfolio.
Credit value at risk	Measures potential credit exposure on individual transactions as well as the total credit value at risk for the portfolio.
Enterprise wide risk measures	Aggregates market, operational, credit, and regulatory risk.

 ©2006 Synapse Energy Economics Inc. All rights reserved.

Risk Metrics for Electric Supply Portfolios

Jurisdictions using quantitative measures of risk

	California	Montana, Oregon, Washington
Application (years)	Short (1 to 3 years)	Long (15 to 20 years)
Risk Measure	teVAR (value at risk to expiration of positions)	$TailVaR_{90}$ (Average NPV of worst 10% of outcomes)

 ©2006 Synapse Energy Economics Inc. All rights reserved.

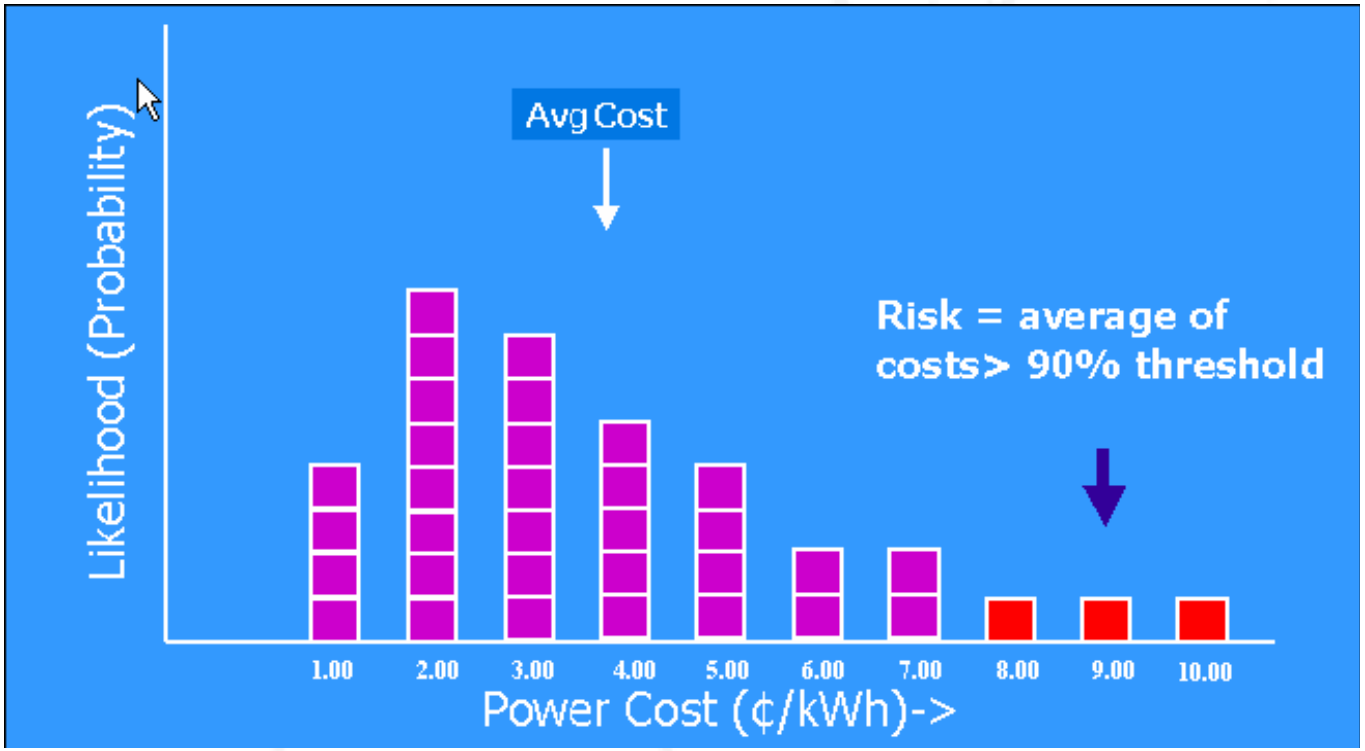
Risk Metrics for Electric Supply Portfolios

- VaR can be used to measure the cost increase that has a certain probability of occurring (risk level) during a certain time period.
- For example the VaR for a 1 year horizon at the 85% level is the extra cost a portfolio has a 15% chance of incurring over the next year.
- Inputs to calculation of VAR of a portfolio
  - Estimations of correlation and volatility
  - Probability distributions (Representative distributions can be created using Monte Carlo simulation and other methods).

 ©2006 Synapse Energy Economics Inc. All rights reserved.

Risk Metrics for Electric Supply Portfolios

$TailVaR_{90}$ example (Source – NWPCC)



Risk Metrics for Electric Supply Portfolios

Planning and Risk Management Software	
Primarily Risk Management in Short-term	
Model	Company
BookRunner	Risk Advisory www.riskadvisory.com
Edur	OpenLink www.olf.com/energy
Epsilon & Entegrate	SunGard www.sungard.com
ICTS Symphony	Trade Capture www.tradecapture.com

 ©2006 Synapse Energy Economics Inc. All rights reserved.

Risk Metrics for Electric Supply Portfolios

Planning and Risk Management Software	
Planning and Risk Management in long-term	
Model	Company
Electric Generation Expansion System (EGEAS)	Electric Power Research Institute www.epri.org
PowerBase Suite	New Energy – Siemens www.newenergyassoc.com
EnerPrise Capacity Expansion	Global Energy Decisions www.globalenergy.com
AURORA	EPIS www.epis.com
RISKMIN	Electric Power Research Institute www.epri.com
Planning and Risk	Global Energy Decisions www.globalenergy.com
Kiodex Risk Workbench	Sungard Kiodex www.sungard.com/kiodex
NWPCC Regional Portfolio Model	Northwest Power & Conservation Council www.nwcouncil.org
PLEXOS for Power Systems	Plexos www.plexossolutions.com
Energy 2020	www.energy2020.org

 ©2006 Synapse Energy Economics Inc. All rights reserved.

Conclusions

- More than 1 supply portfolio is “optimal”. There is a portfolio that has an optimal expected cost for each level of risk.
- Risk metrics and software are available.
- Some form of Value at Risk seems to be the most common metric currently in use.
- As always the metrics, software and results are only as good as the input data.

Thank you!

rhornby@synapse-energy.com
617-661-3248 x243

 ©2006 Synapse Energy Economics Inc. All rights reserved.