Synapse
Energy Economics, Inc.

Energy Portfolio Management
Tools and Resources for Regulators

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Portfolio Management Tools Report

This presentation draws from ***Energy Portfolio Management: Tools and Resources for State Public Utility Commissions***, October 2006, which Synapse prepared for consideration by National Association of Regulatory Utility Commissioners (NARUC), The Energy Foundation, the Department of Energy, and NYSERDA.

The report is available at

www.naruc.org

and

www.synapse-energy.com

Contents of the Report

Energy Portfolio Management: Tools and Practices for State PUCs 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).

Choosing an Electric Portfolio: Trade-offs

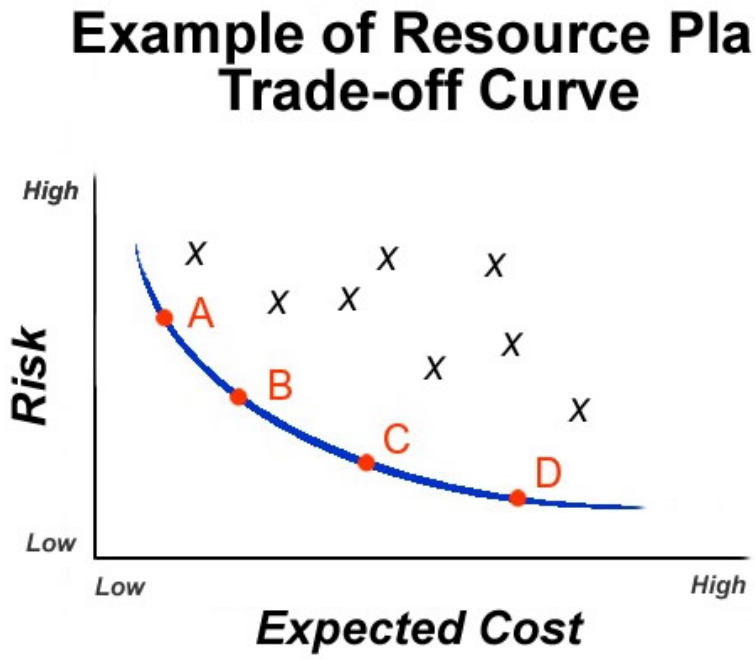
Parties are trying to choose the electric supply portfolio which offers the “best” combination of cost and risk under a range of possible future conditions.

Simplified 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

Choosing an Electric Portfolio: Trade-offs

There are numerous “optimal” portfolios. Each has an optimal expected cost for a given risk level:



Electricity Portfolio Basic Design Questions

Policy Issues

- What is a reasonable balance or trade-off between price stability and price volatility?
- What is the appropriate planning horizon?
- Should we measure electric price risk exposure and if so how?

Electric Portfolio Management: Context

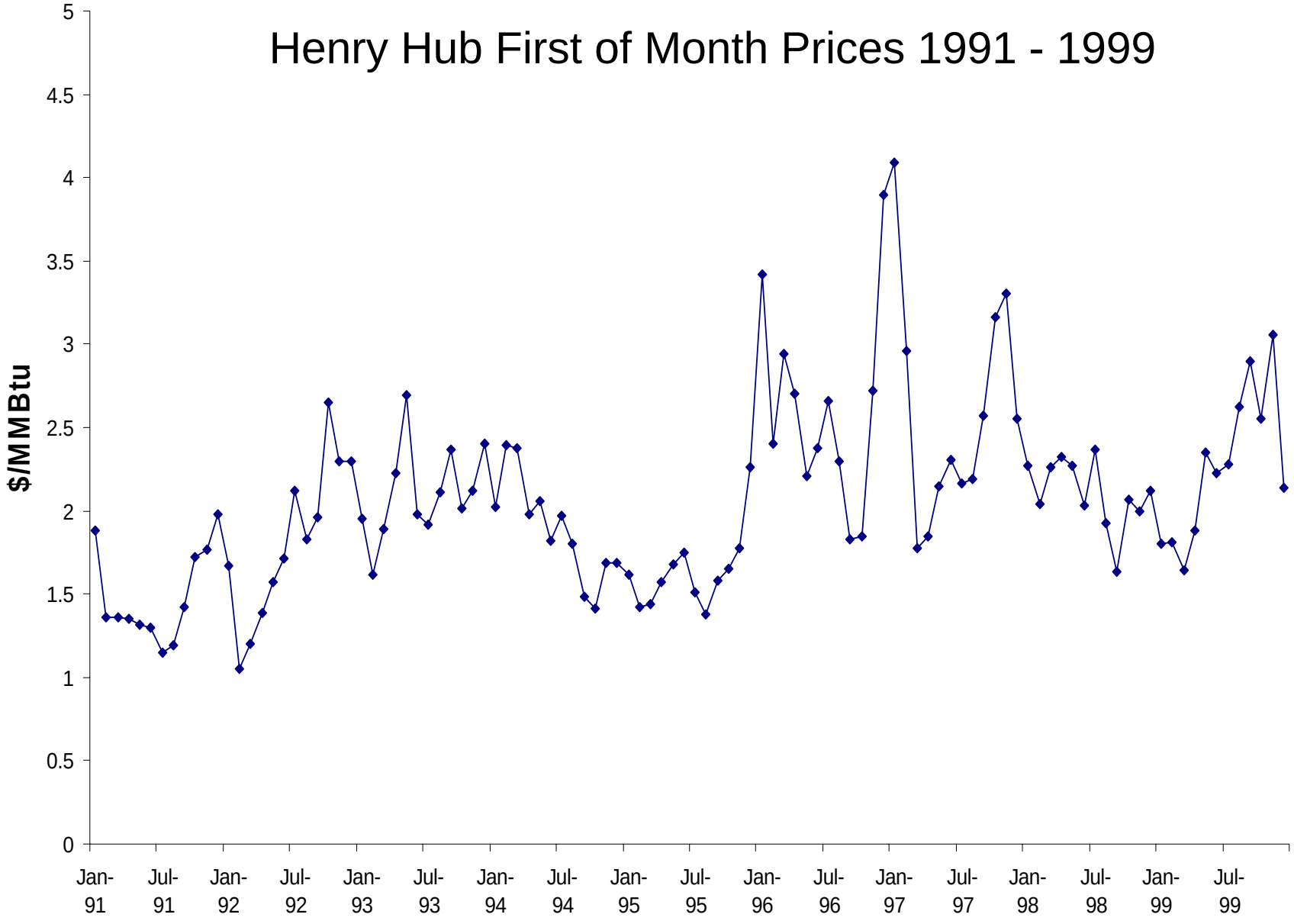
- The problem of addressing risk in supply portfolios, and the associated policy issues, are neither new nor unique to either the electric industry.
- In recent years stakeholders have begun placing greater emphasis on quantifying risk in order to improve transparency and decision-making.
- Attention to customer risks should be similar to attention to shareholder risks.
- The selection of a “reasonable” portfolio could be informed and assisted by empirical data on the risk tolerance of the retail customers to be served.

Uncertainty Creates Challenges

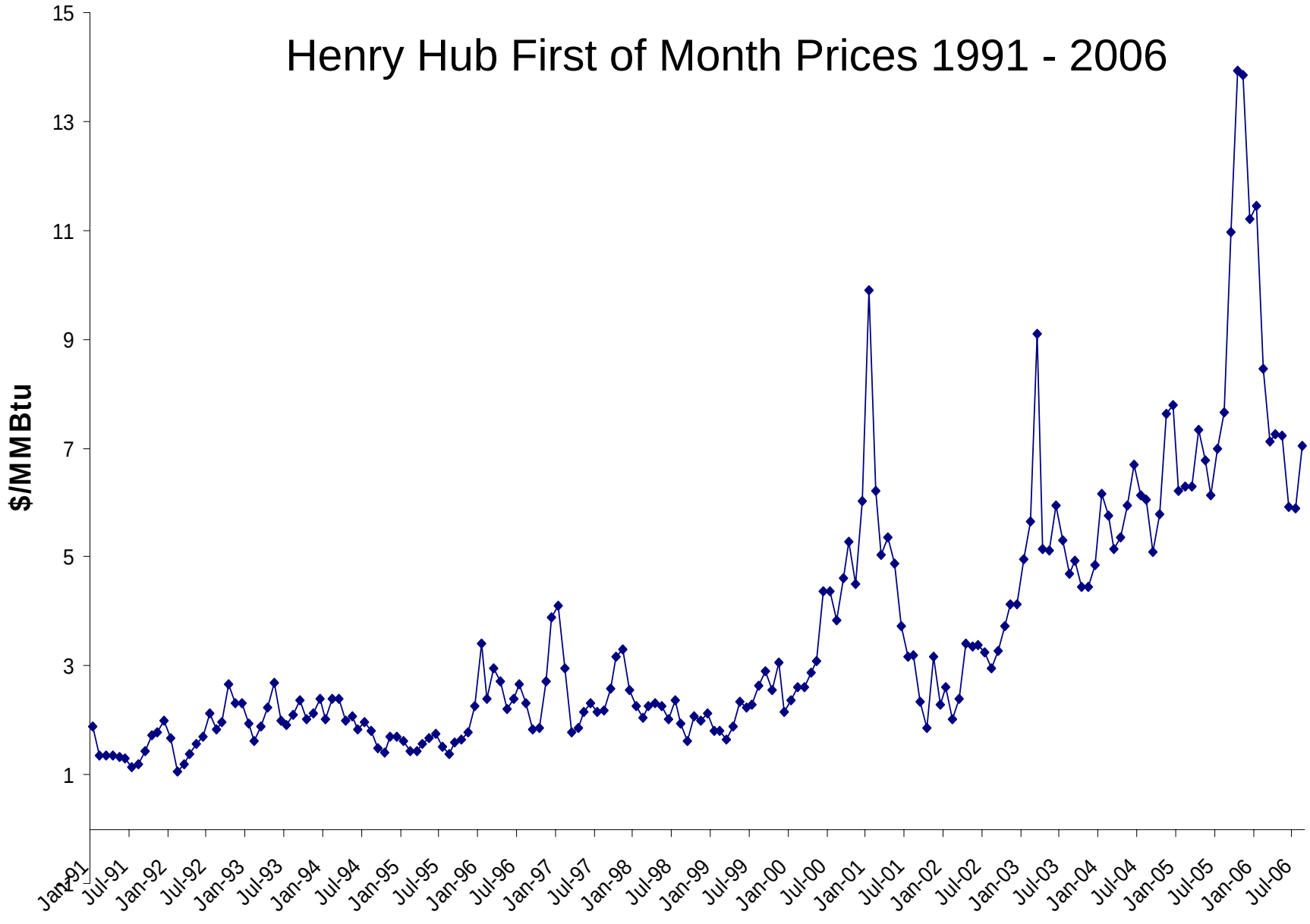
- The selection process is complicated by the fact that every aspect of the future is uncertain, e.g.,
  - Load
  - Fuel prices
  - Greenhouse gas regulations
  - Electricity market prices
  - In-service dates and costs of new capacity

- Moreover, some aspects are much more difficult to predict accurately than others. For example, past natural gas prices have not been good indicators of future natural gas prices. Neither have natural gas price forecasts.

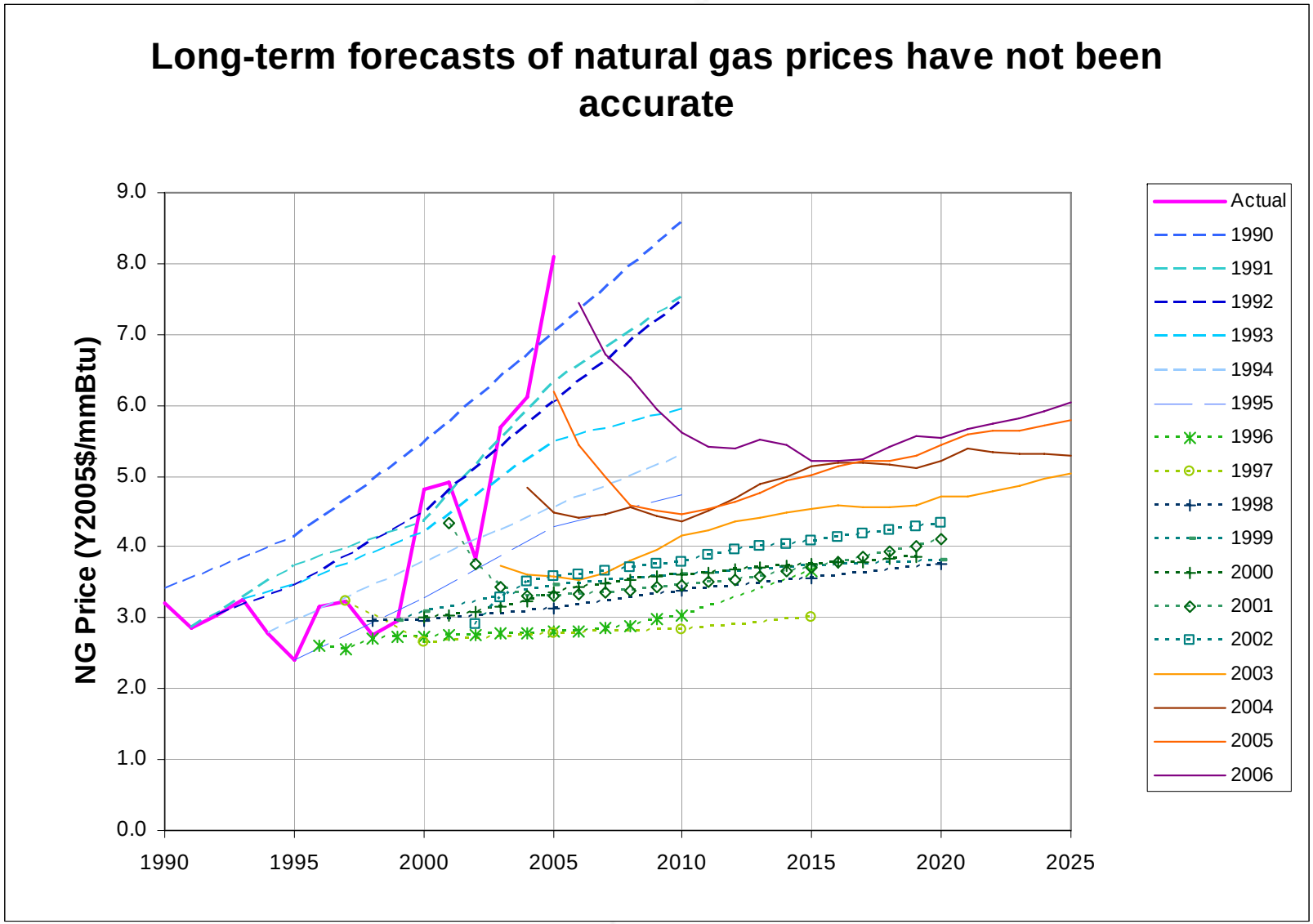
Gas Price Volatility in the Good Old Days



Gas Price Volatility and Trends

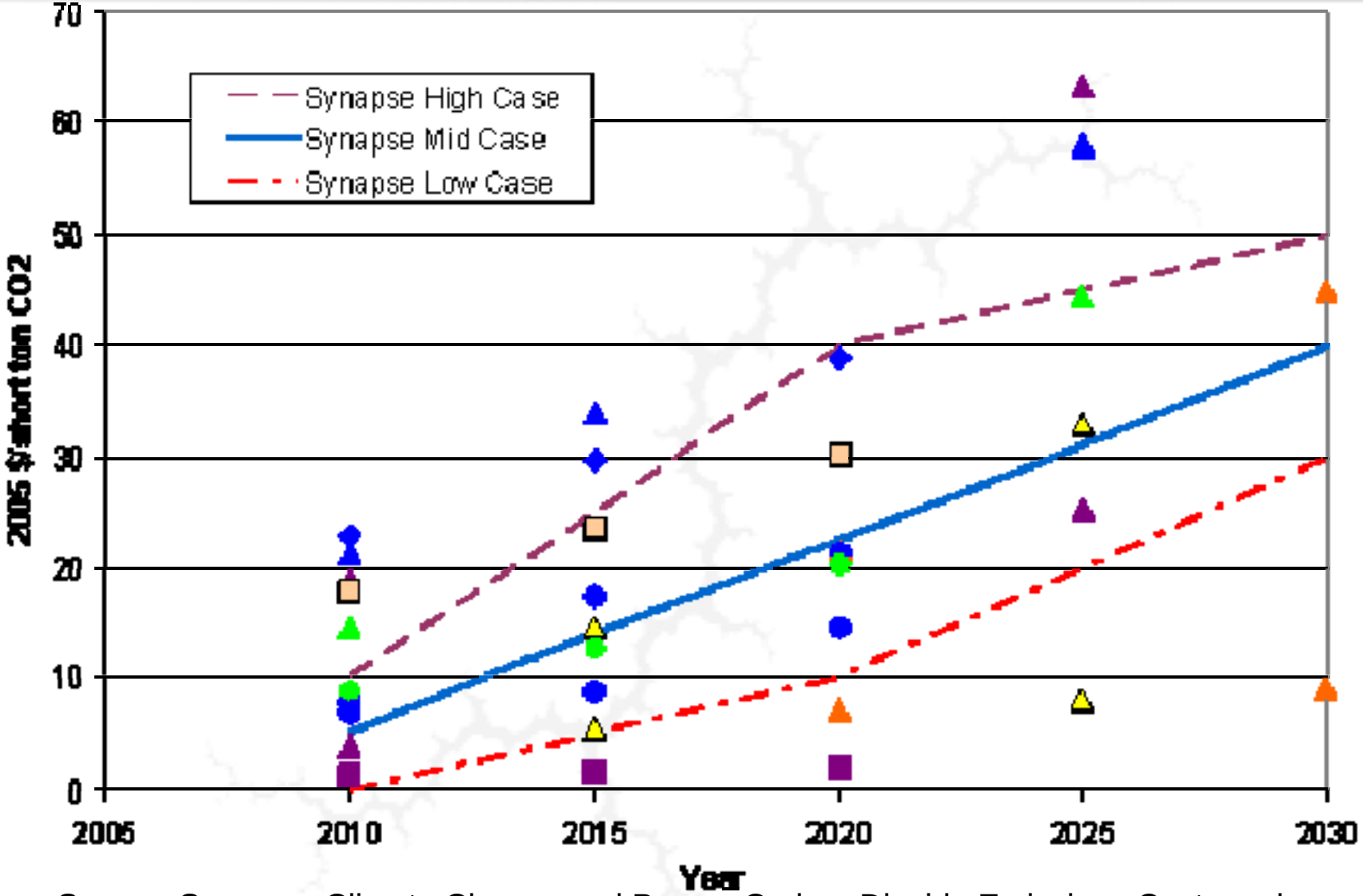


Natural Gas Price Forecasts Since 1990



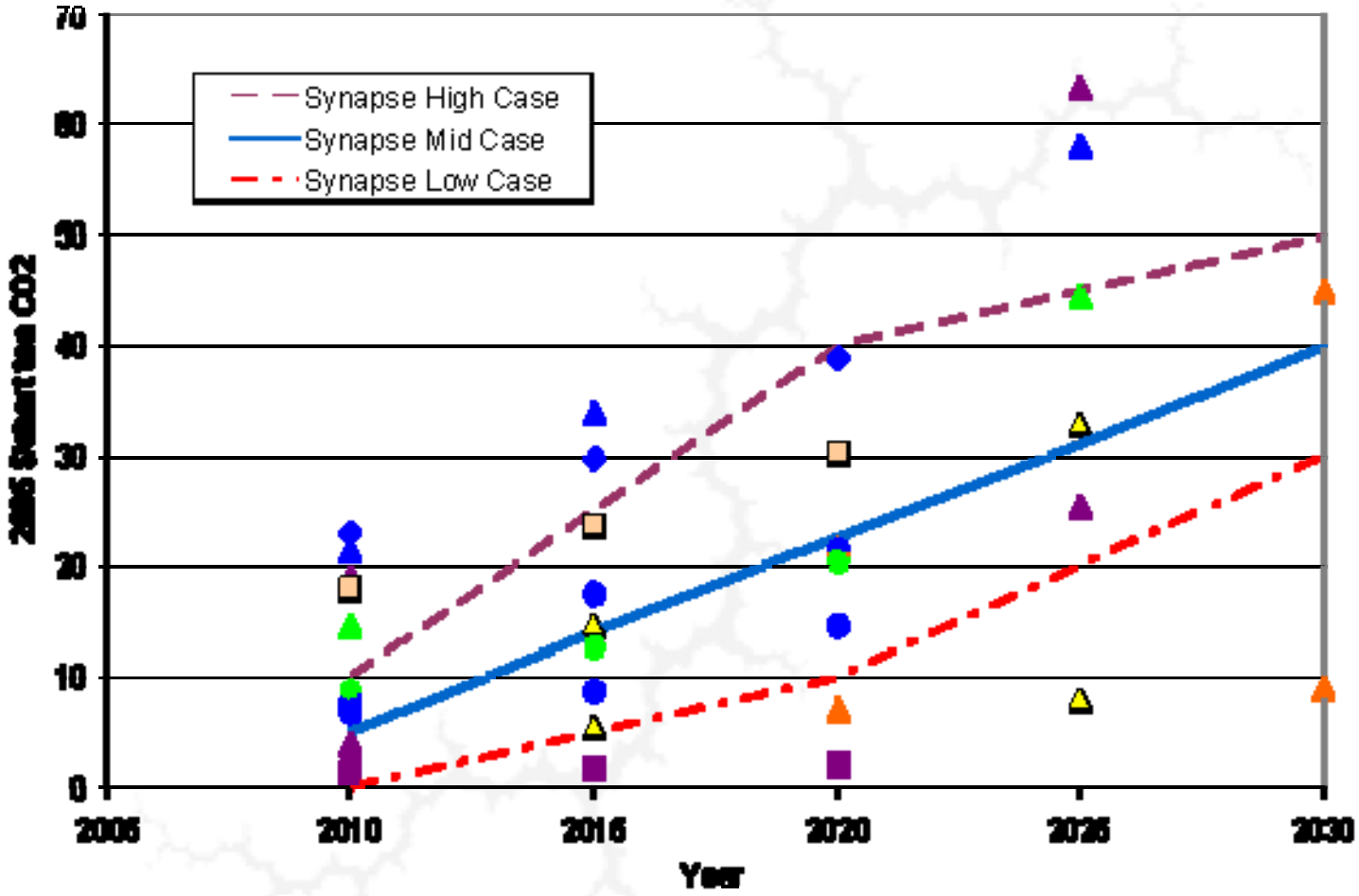
Source: Compiled by Synapse from EIA Annual Energy Outlook reports.

Forecasting Carbon Dioxide Prices



Source: Synapse, Climate Change and Power: Carbon Dioxide Emissions Costs and Electric Resource Planning, June 2006

Forecasting Carbon Dioxide Prices



Source: Synapse, Climate Change and Power: Carbon Dioxide Emissions Costs and Electric Resource Planning, June 2006

Risk Metrics for Electric Supply Portfolios

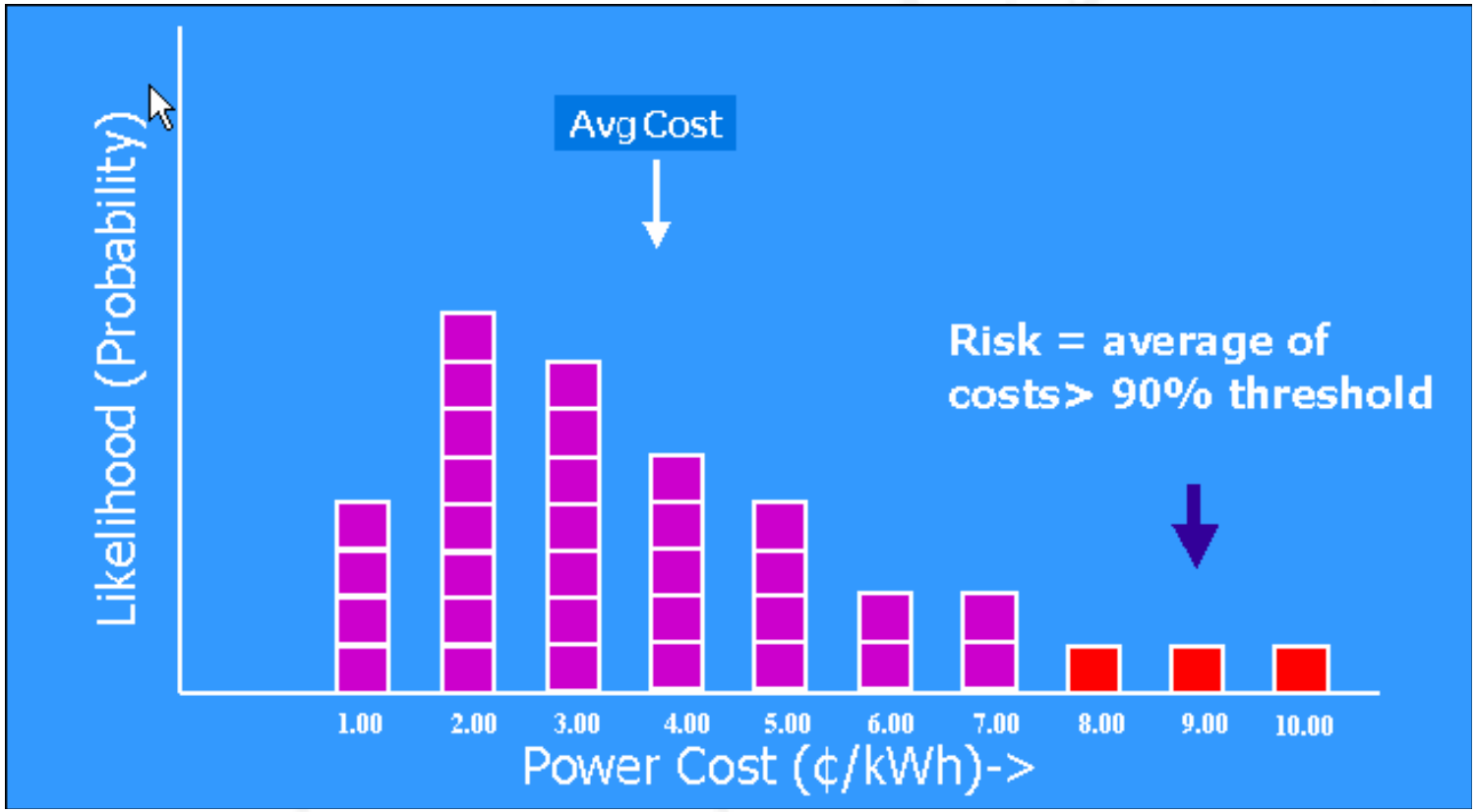
A Few of the Numerous Possible Measures of Risk	
Coefficient of Variation	Measures variation in price relative to mean price over a defined period. For example a fixed price would have a CV of 0.
Beta	Measures volatility of portfolio relative to volatility of an index. Does not capture risk of the portfolio independent of market risk.
Extreme Value	Measures the difference between expected cost and some estimate of worst-case cost.
Value at Risk	The maximum reduction in value (or increase in supply cost) that could occur over a specified period at a given confidence level.

Risk Metrics Example: VAR

- 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).

Risk Metrics Example: TailVaR

$TailVaR_{90}$ used in the Northwest



Software for Short-term Risk Management

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

See also Appendix C of the Report.

Software for Longer-term Risk Management

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

Conclusions

- There are multiple “optimal” supply portfolios.
- Risk metrics and software are available to identify and evaluate them.
- Metrics, software and their results are only as good as the input data.
- Regulatory focus on customer costs and risks.
- Clear communication about risks is helpful.

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