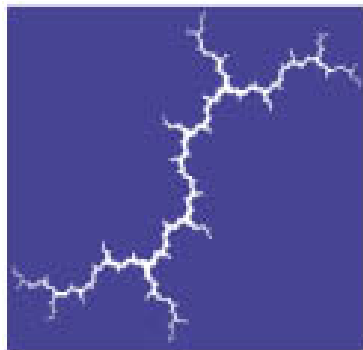


# Incorporating Renewable Generation into a Risk Management Strategy

Bruce Biewald

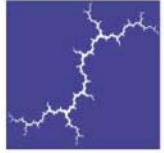
New England Conference of Public Utility Commissioners  
Brewster, Massachusetts  
May 25, 2004



Synapse  
Energy Economics, Inc.

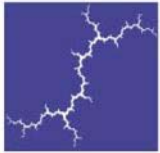
22 Pearl Street  
Cambridge, MA 02139  
617.661.3248  
bbiewald@synapse-energy.com  
www.synapse-energy.com

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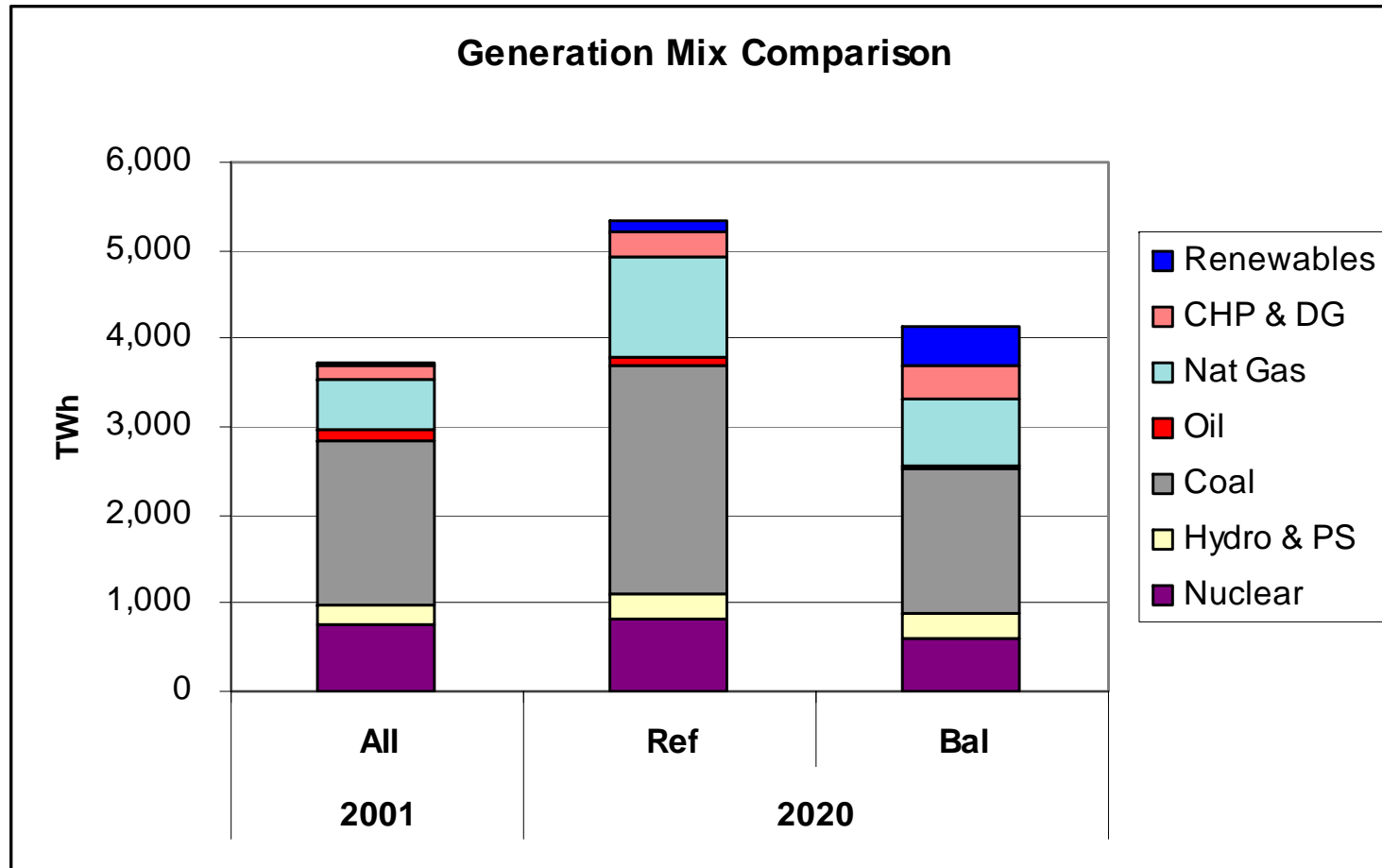


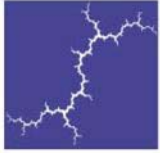
# Portfolio Management - Why?

- Hedging – Prices go up and down!
- Reliability
- Market power
- Environmental impacts
- It makes sense (and is prudent)

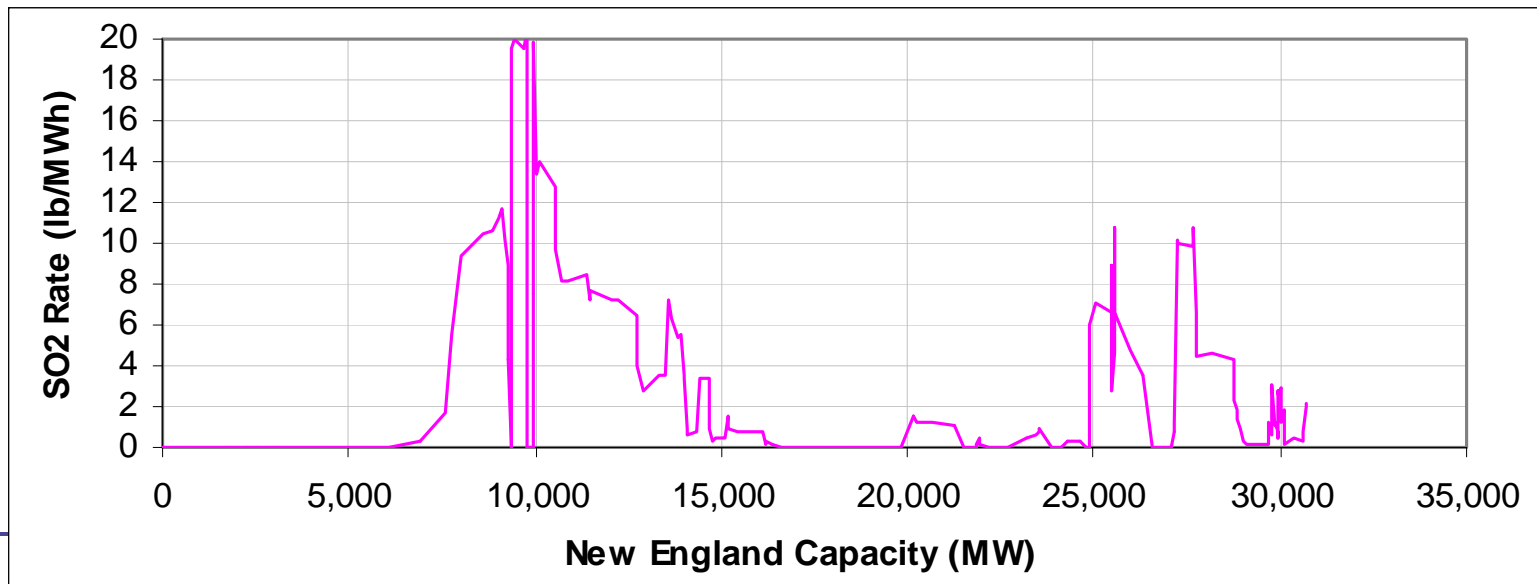
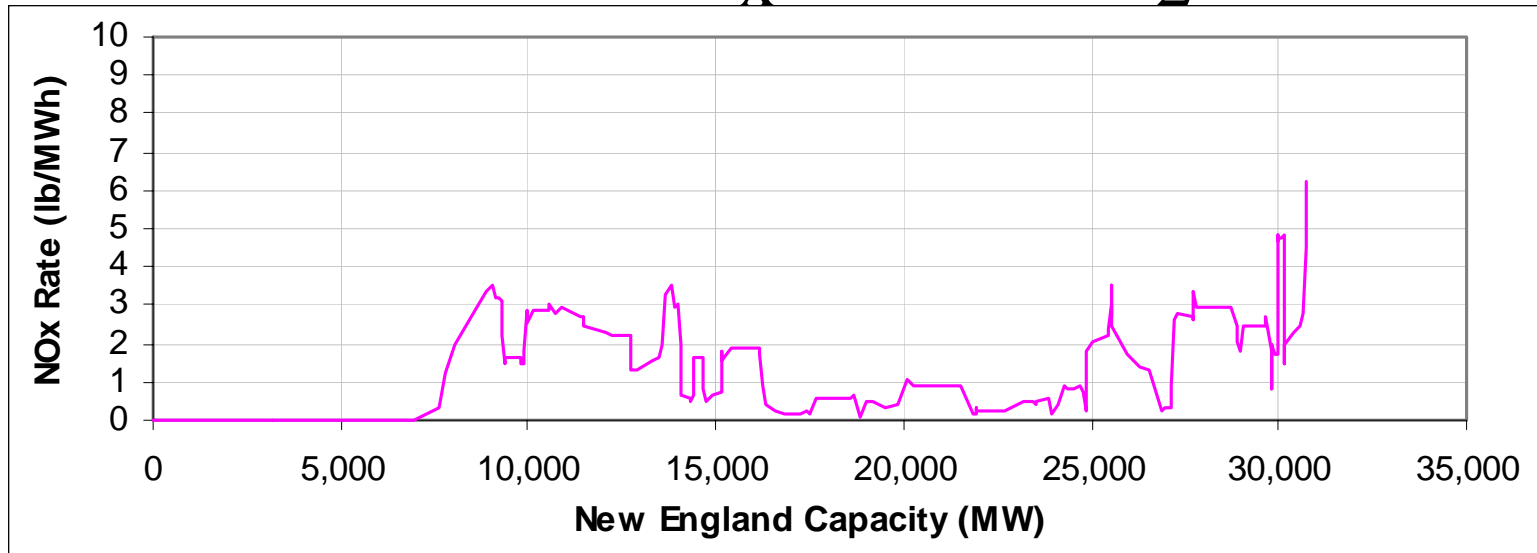


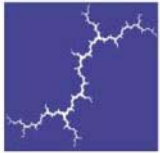
# A Balanced Electricity Future





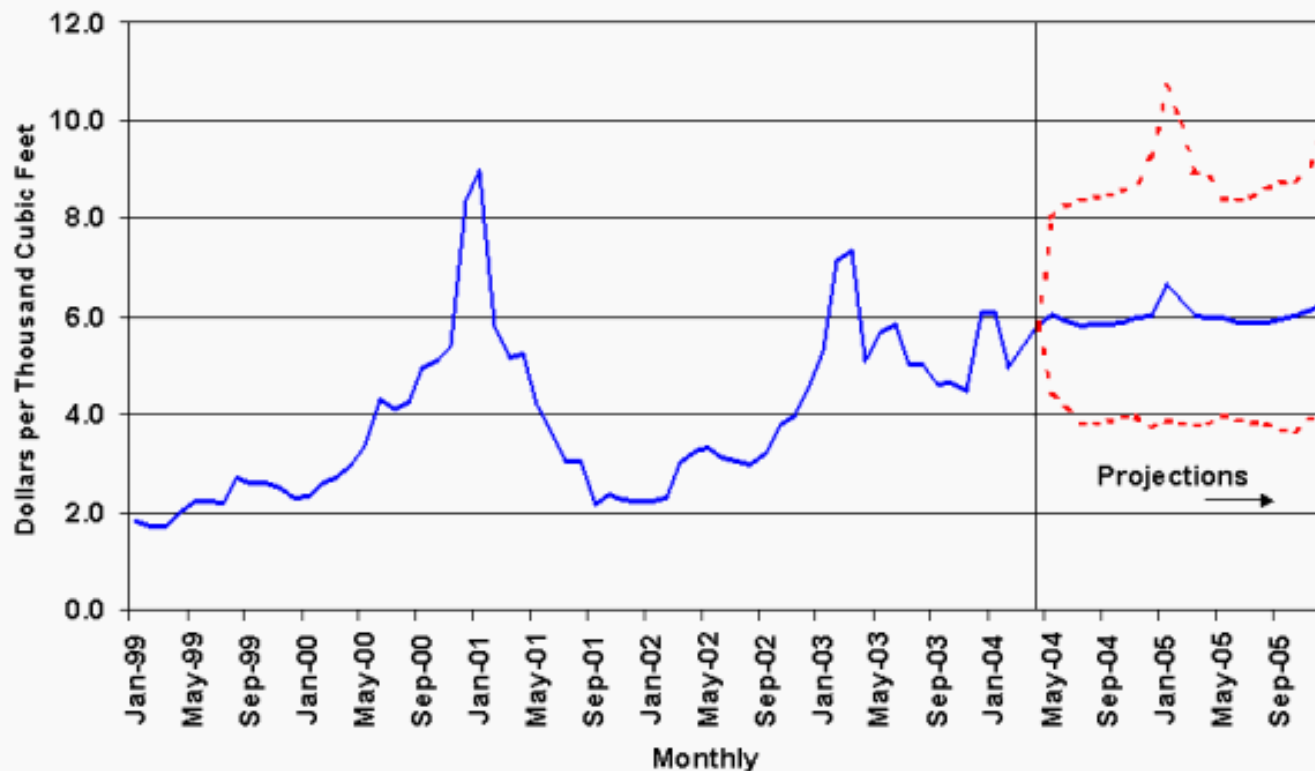
# NEPOOL NO<sub>x</sub> and SO<sub>2</sub> Curves





# Natural Gas Prices

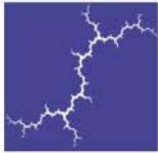
**Figure 9. U.S. Natural Gas Spot Prices  
(Base Case and 95% Confidence Interval\*)**



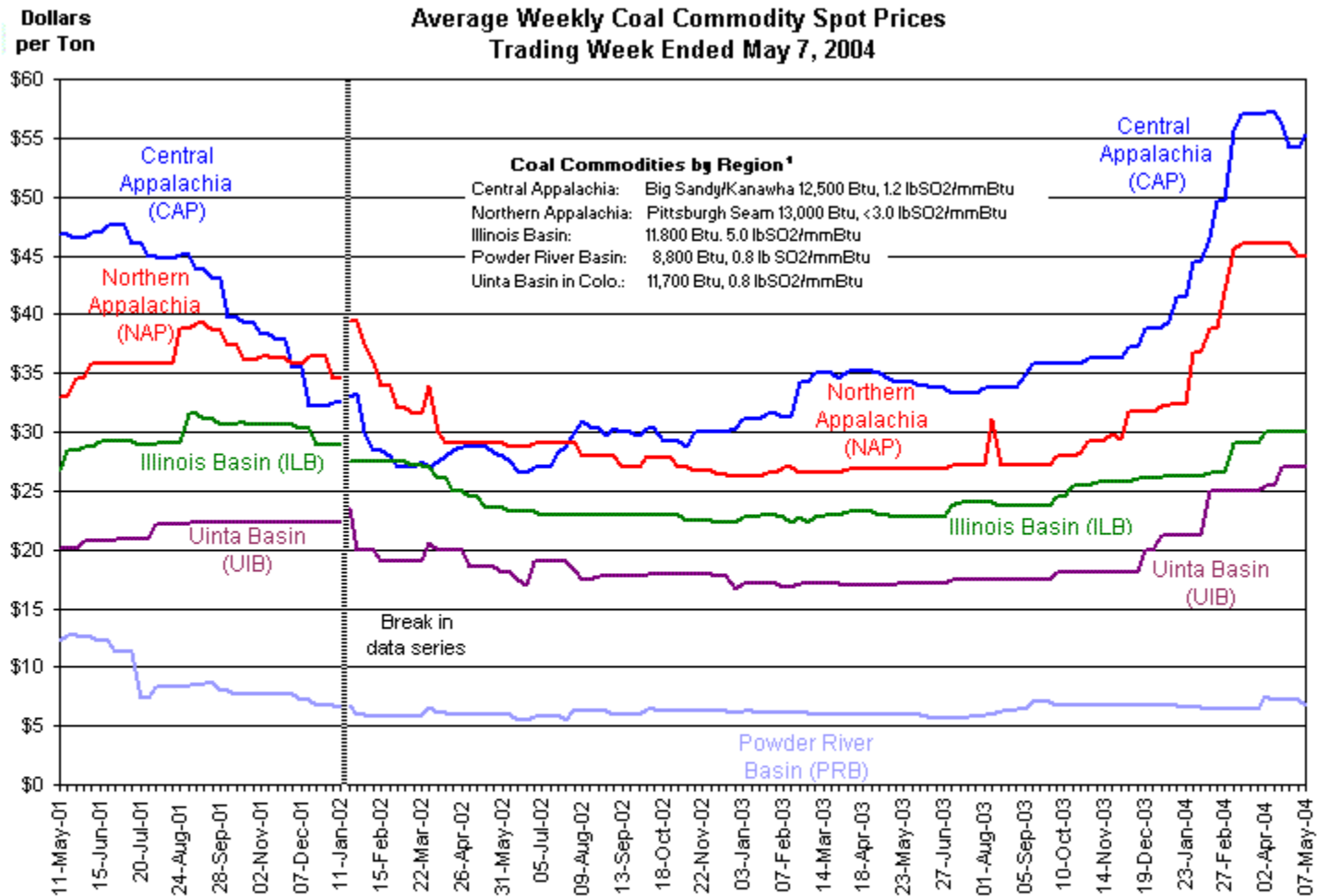
\*The confidence intervals show  $\pm 2$  standard errors based on the properties of the model. The ranges do not include the effects of major supply disruptions.

Sources: History: Natural Gas Week; Projections: Short-Term Energy Outlook, May 2004.



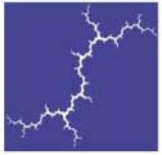


# Coal Prices Rising

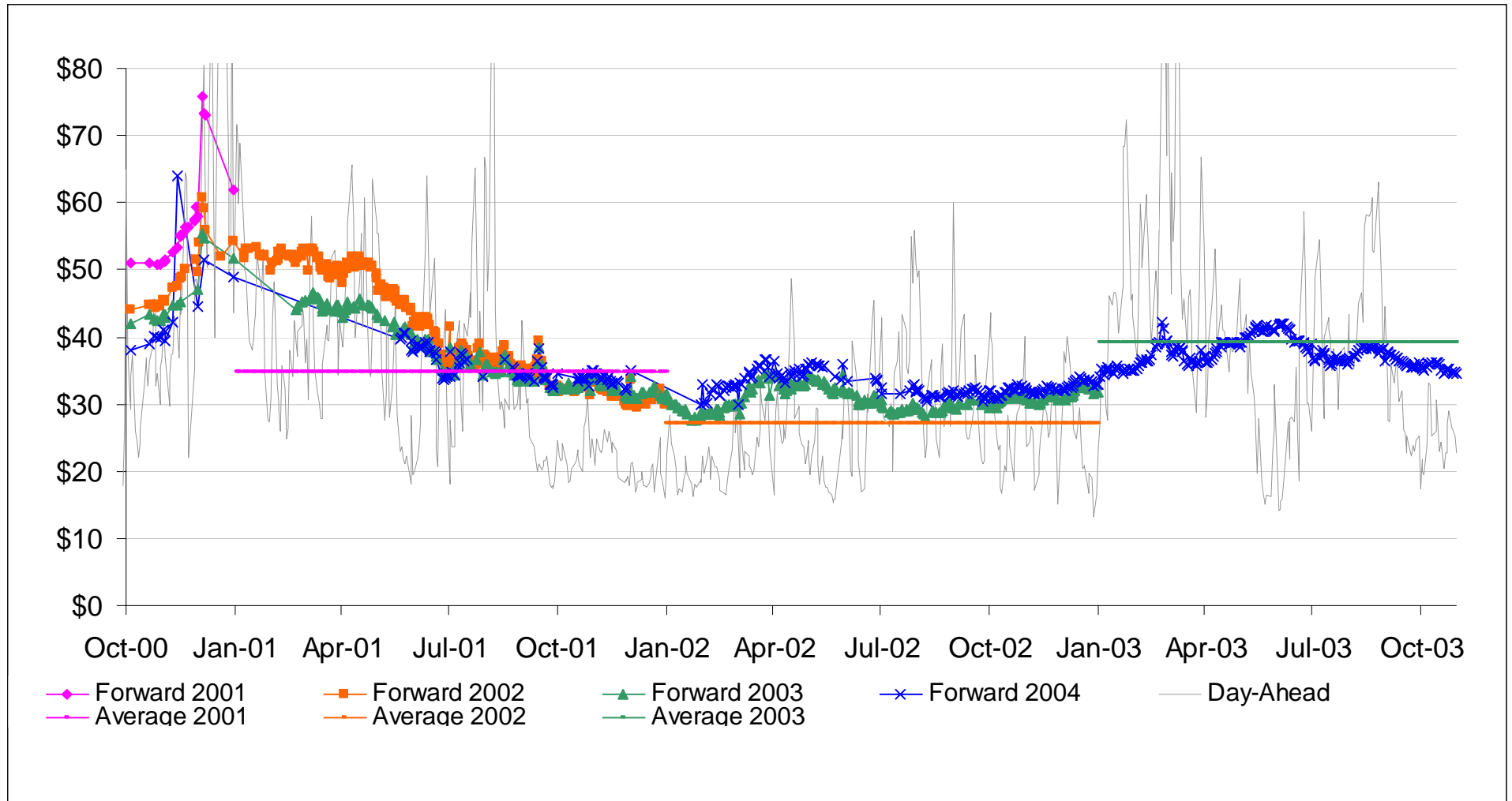


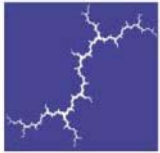
\*Prior to January 11, 2002, EIA averaged 12-month "forward" spot prices for several coal specifications; after that date, coal prices shown are for a relatively high-Btu coal selected in each region, for delivery in the "prompt" quarter. The "prompt quarter" is the next calendar quarter, with quarters shifting forward after the 15th of the month preceding each quarter's end.

Source: with permission, selected from listed prices in Platts Coal Outlook, "Weekly Price Survey."

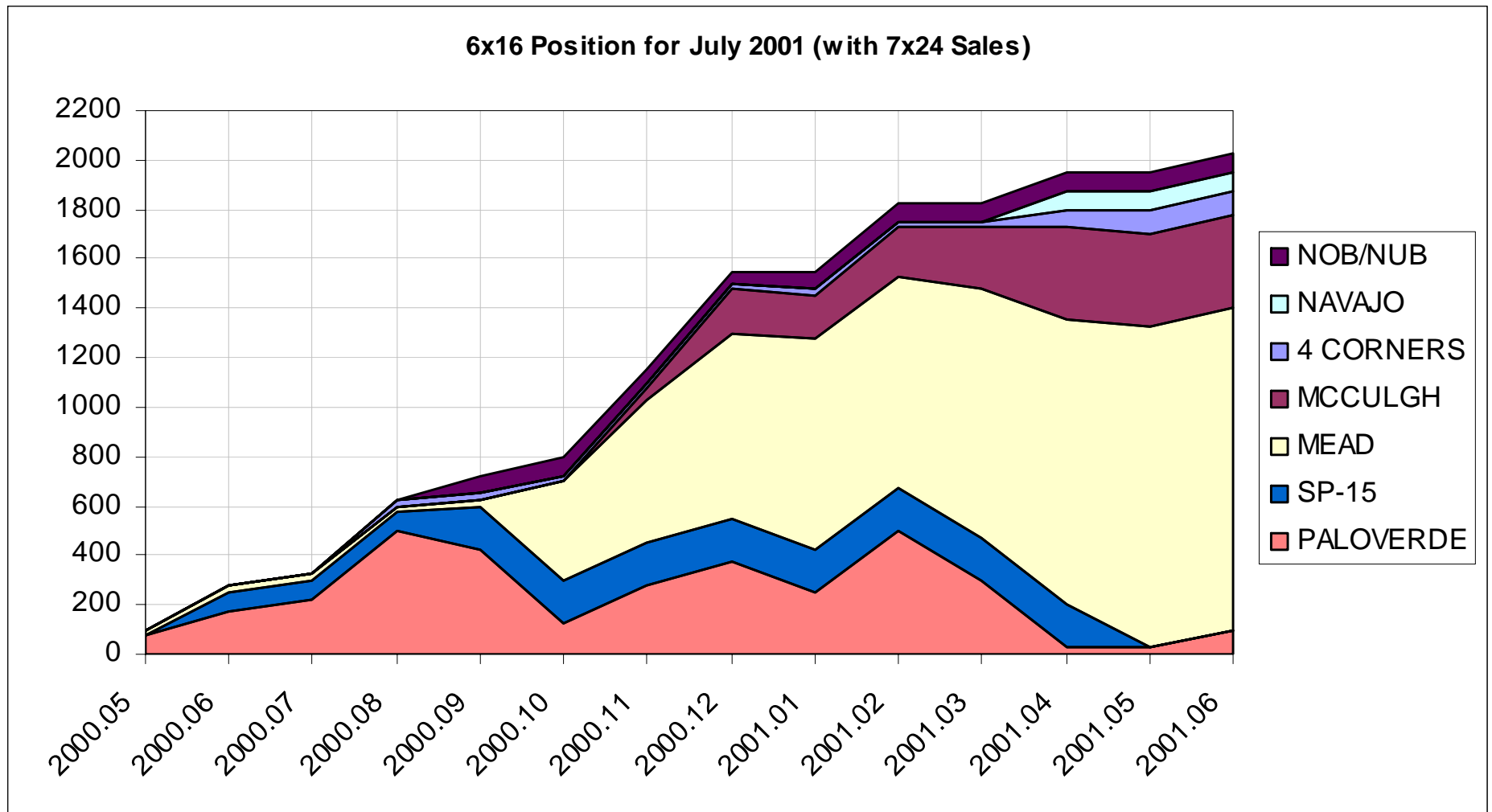


# Cinergy Day-Ahead and Calendar Forward Prices (\$/MWh on-peak)





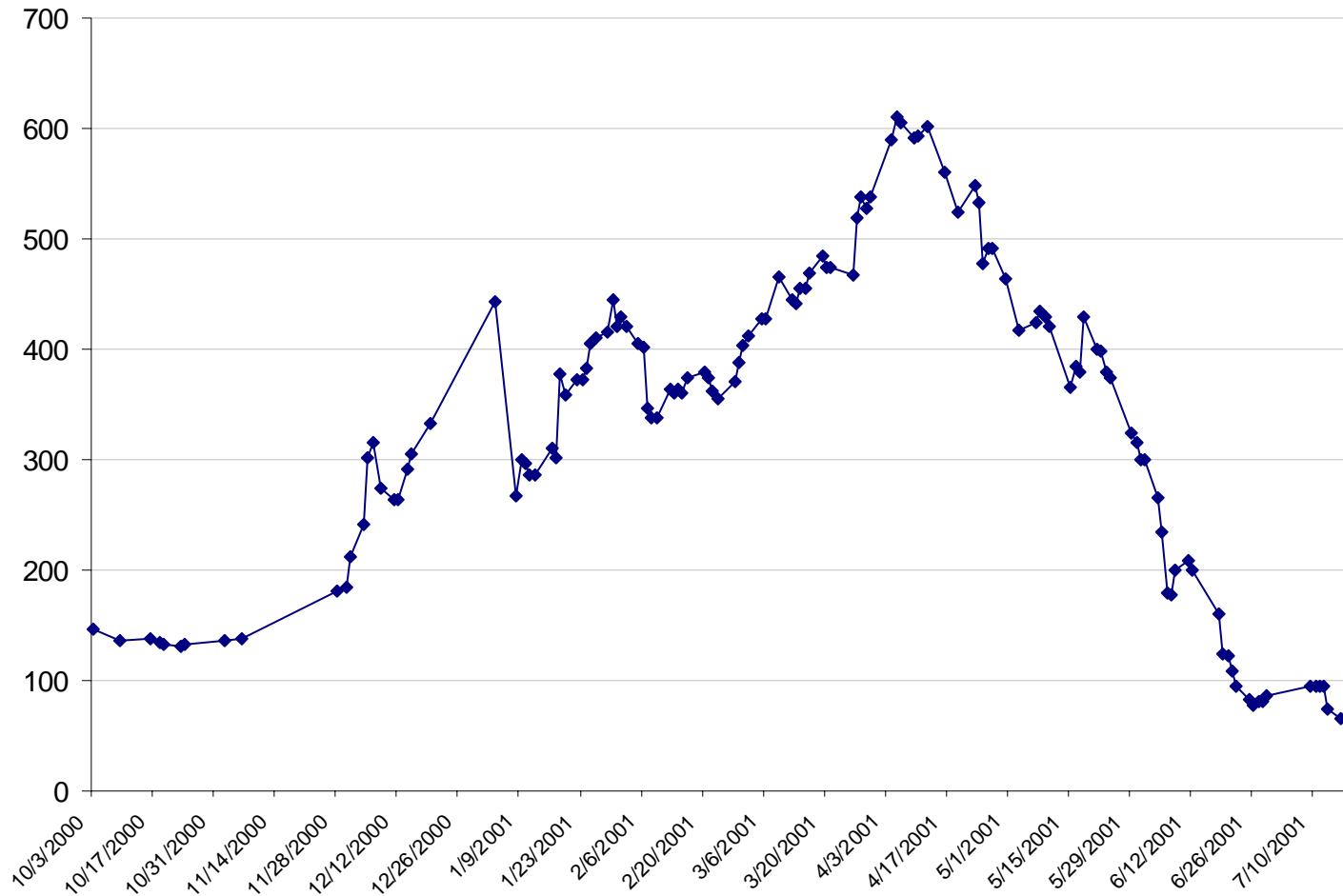
# Nevada Purchasing

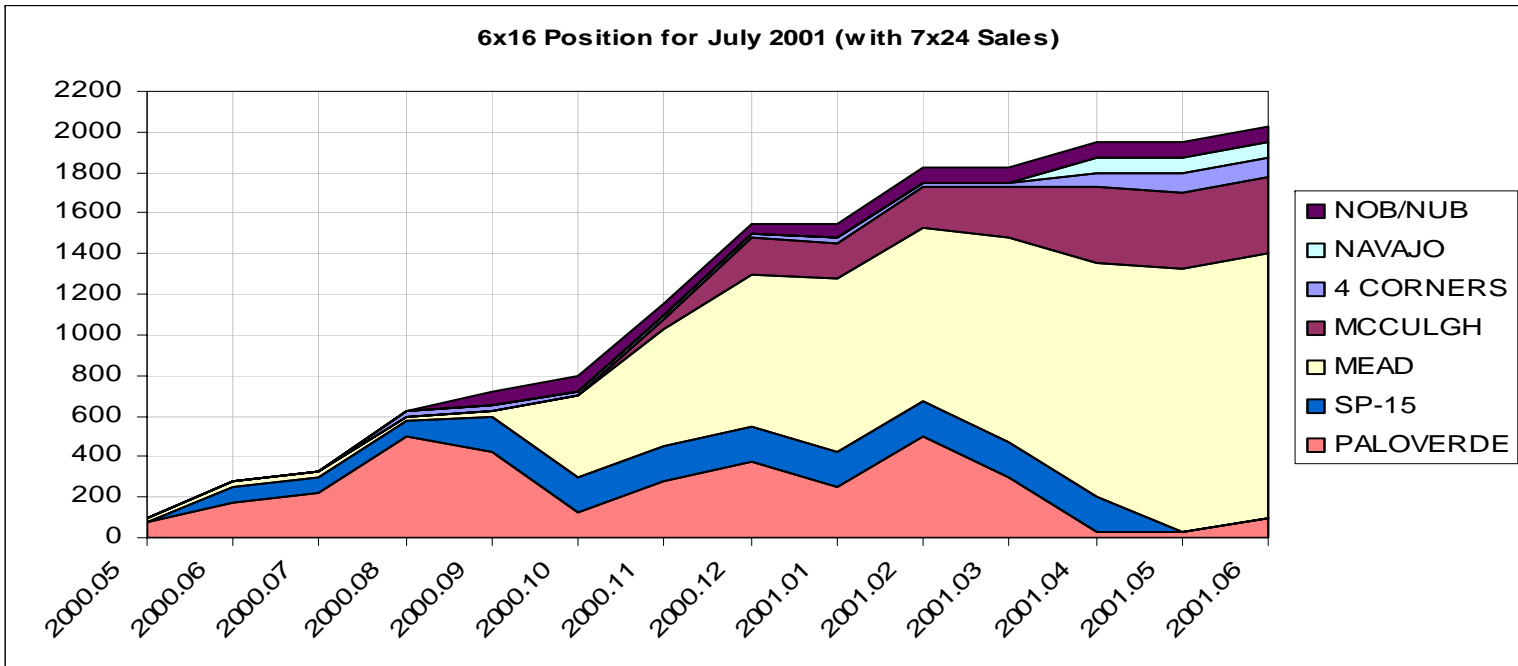
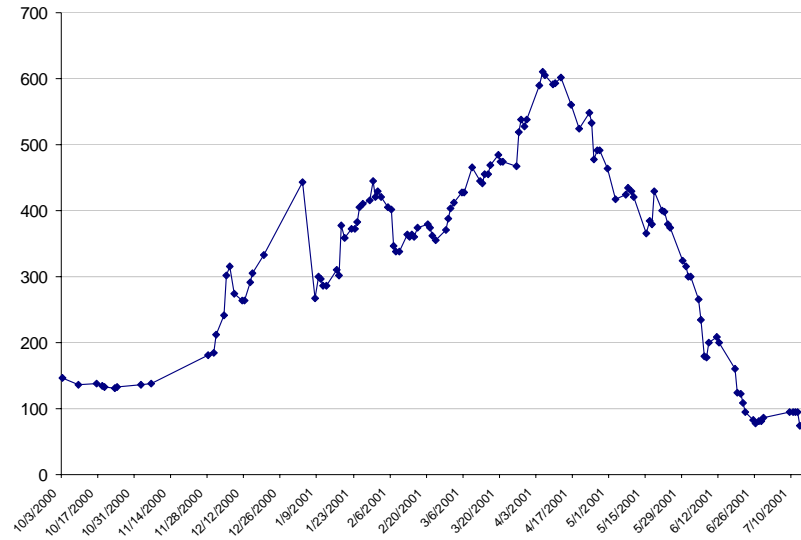
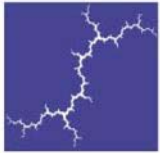






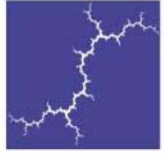
# Price for Delivery in July 2001 at Palo Verde (\$/MWh)











# Portfolio Management – How?

Own and contract

Long term and short term

Mix of resource types

Balance of supply and demand resources

Mix of instruments

Central and distributed

Laddering

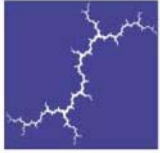
Procure over time



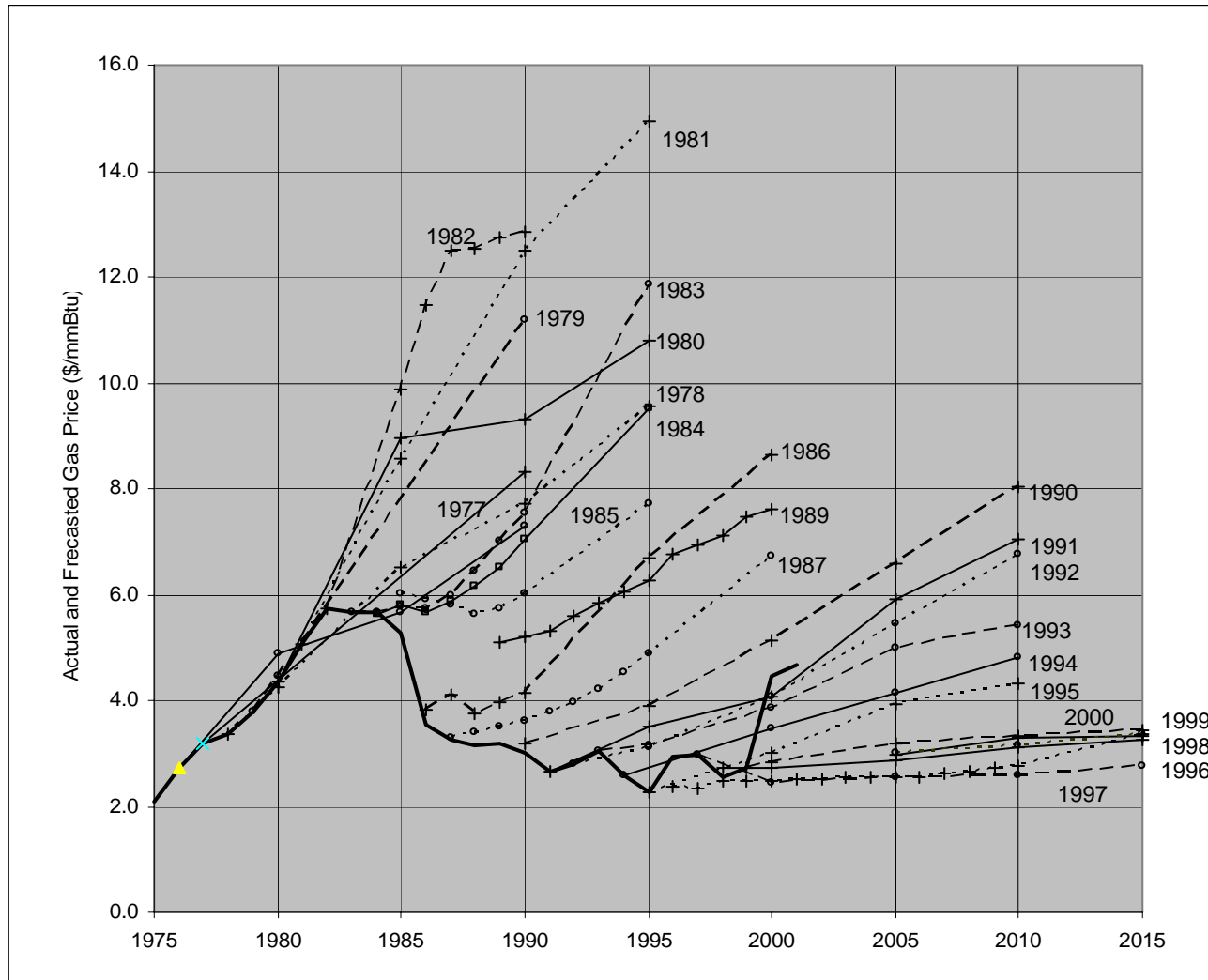
# A 3 Year Laddering Approach

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11
33%	Original Contracts	Rollover Contracts	Rollover Contracts	Rollover Contracts	Subsequent Contracts	Subsequent Contracts	Subsequent Contracts	Subsequent Contracts	Subsequent Contracts	Subsequent Contracts	Subsequent Contracts
33%	Original Contracts	Original Contracts	Rollover Contracts	Rollover Contracts	Rollover Contracts	Subsequent Contracts	Subsequent Contracts	Subsequent Contracts	Subsequent Contracts	Subsequent Contracts	Subsequent Contracts
33%	Original Contracts	Original Contracts	Original Contracts	Rollover Contracts	Rollover Contracts	Rollover Contracts	Subsequent Contracts	Subsequent Contracts	Subsequent Contracts	Subsequent Contracts	Subsequent Contracts

Original Contracts	Original Contracts
Rollover Contracts	Rollover Contracts
Subsequent Contracts	Subsequent Contracts



# Gas Price Projections Since 1975





# Contracts for Renewables







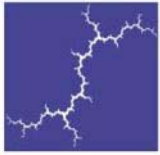
# Benefits of Renewables

Price stability

Regional system reliability

Environment

Economic development

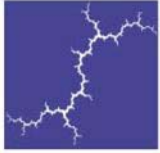


# Illustrative Portfolio Approach

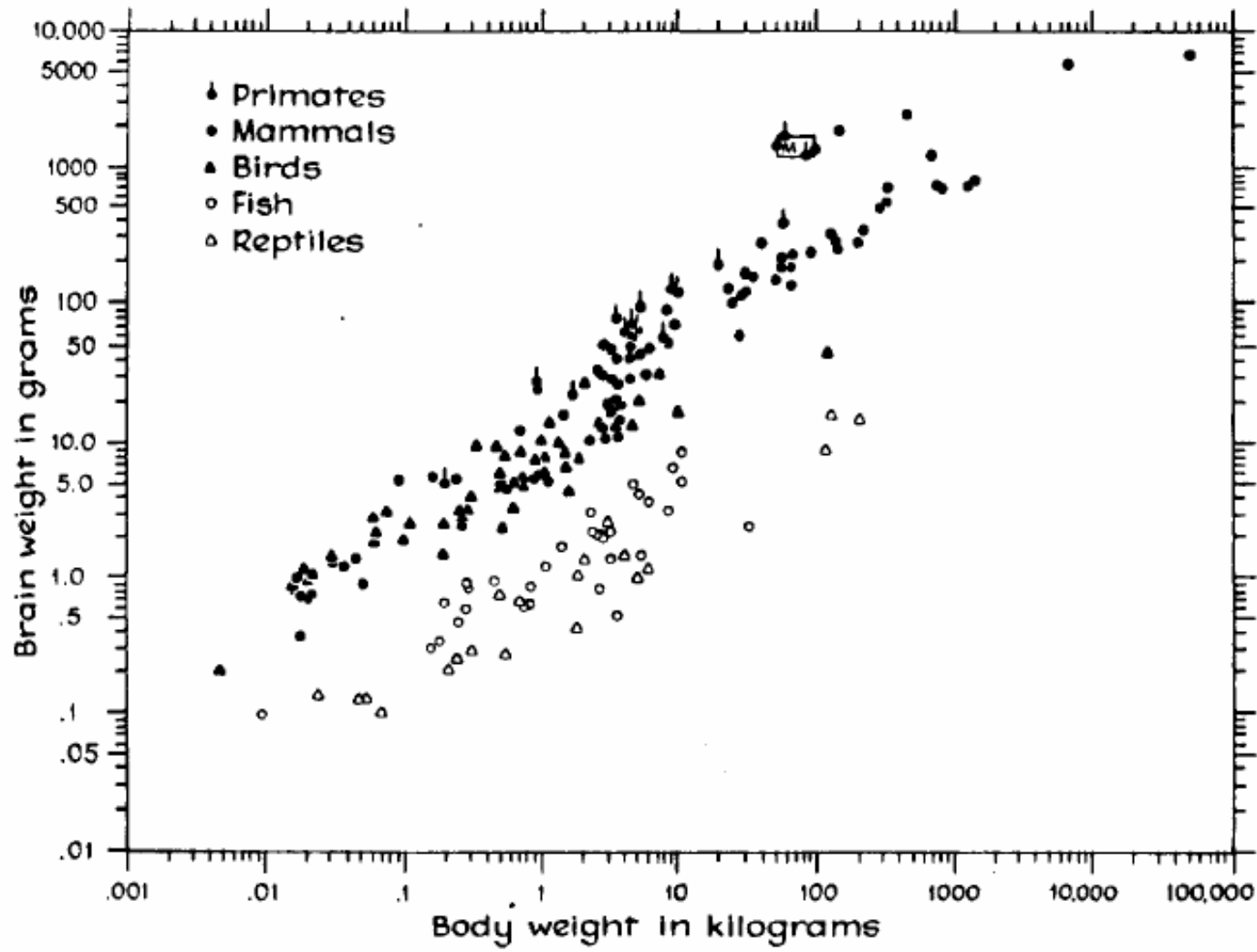
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11
20%	Discretionary/Short Term	Discretionary/Short Term	Discretionary/Short Term	Discretionary/Short Term	Discretionary/Short Term	Discretionary/Short Term	Discretionary/Short Term	Discretionary/Short Term	Discretionary/Short Term	Discretionary/Short Term	Discretionary/Short Term
20%	Original Ladder Contracts	Rollover Ladder Contracts	Rollover Ladder Contracts	Rollover Ladder Contracts	Rollover Ladder Contracts	Rollover Ladder Contracts	Rollover Ladder Contracts	Subsequent Ladder Contracts	Subsequent Ladder Contracts	Subsequent Ladder Contracts	Subsequent Ladder Contracts
20%	Original Ladder Contracts	Original Ladder Contracts	Original Ladder Contracts	Rollover Ladder Contracts	Rollover Ladder Contracts	Rollover Ladder Contracts	Rollover Ladder Contracts	Rollover Ladder Contracts	Rollover Ladder Contracts	Subsequent Ladder Contracts	Subsequent Ladder Contracts
20%	Original Ladder Contracts	Original Ladder Contracts	Original Ladder Contracts	Original Ladder Contracts	Original Ladder Contracts	Rollover Ladder Contracts	Rollover Ladder Contracts	Rollover Ladder Contracts	Rollover Ladder Contracts	Rollover Ladder Contracts	Rollover Ladder Contracts
20%	Long-Term (Renewables)	Long-Term (Renewables)	Long-Term (Renewables)	Long-Term (Renewables)	Long-Term (Renewables)	Long-Term (Renewables)	Long-Term (Renewables)	Long-Term (Renewables)	Long-Term (Renewables)	Long-Term (Renewables)	Long-Term (Renewables)

Original Ladder Contracts	Original Ladder Contracts
Rollover Ladder Contracts	Rollover Ladder Contracts
Subsequent Ladder Contracts	Subsequent Ladder Contracts

Discretionary/Short Term	Discretionary/Short Term
Long-Term (Renewables)	Long-Term (Renewables)



# Brain v Body Size: 198 Species



# **Portfolio Management**

How to Procure Electricity Resources  
to Provide Reliable, Low-Cost,  
and Efficient Electricity  
Services to All Retail Customers

**October 10, 2003**

prepared by:

**Synapse Energy Economics, Inc.**