

# Energy Efficiency Valuation as a Financial Hedge

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## Presentation Outline

- Summary
- Background
- Study Objectives
- Methodology
- Analysis
- Key Findings
- Conclusions/ Implications



## Summary of the Concept

- Deregulation has exposed utilities (and their customers) to price volatility
- Regulators are mandating that utilities need to hedge (or insure) against such price risk
  - ❖ Hedging adds cost
- Energy Efficiency (EE) can cost-effectively reduce price risk by:
  - ❖ Reducing exposure
  - ❖ Reducing volatility
- The hedging advantages of EE are in addition to other advantages



## Background and Context

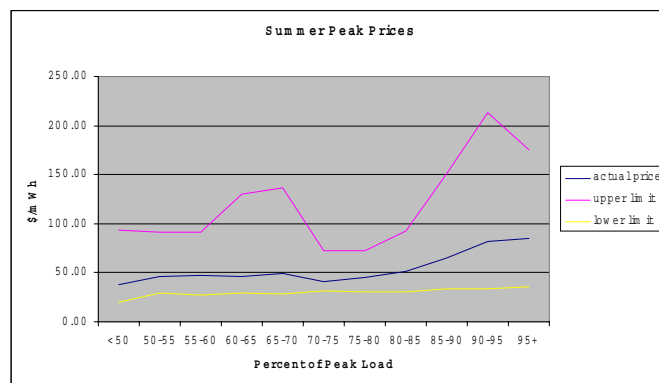


## Background: Energy Price Volatility

- Deregulation has introduced significant price risk to the energy industry
- Supply pressures have led to more volatile electric prices
  - ❖ Spot prices ranged by several orders of magnitude in a single day
- Utilities have not fully adjusted their strategy to manage increased uncertainty



## Summer On-Peak Prices



## Background: What is Hedging?

- Hedging as risk insurance
- Used in financial markets for decades
- Example: Futures options for Energy
  - ❖ Insurance/ derivative product
  - ❖ Physical delivery option
- Hedging is a necessary part of utility risk management, and the cost is material



## Background: Risk Management

- Managing Risk in Energy Procurement:
  - ❖ Build more power plants
  - ❖ Buy additional supply—long-term contracts
  - ❖ Buy additional supply —spot market
  - ❖ Diversify supply
  - ❖ Invest in renewable energy
  - ❖ Actively control loads (producing call option)
  - ❖ Reduce demand by EE (reducing hedging exposure and hedging costs)





# Study Objectives



## Objectives of this Study

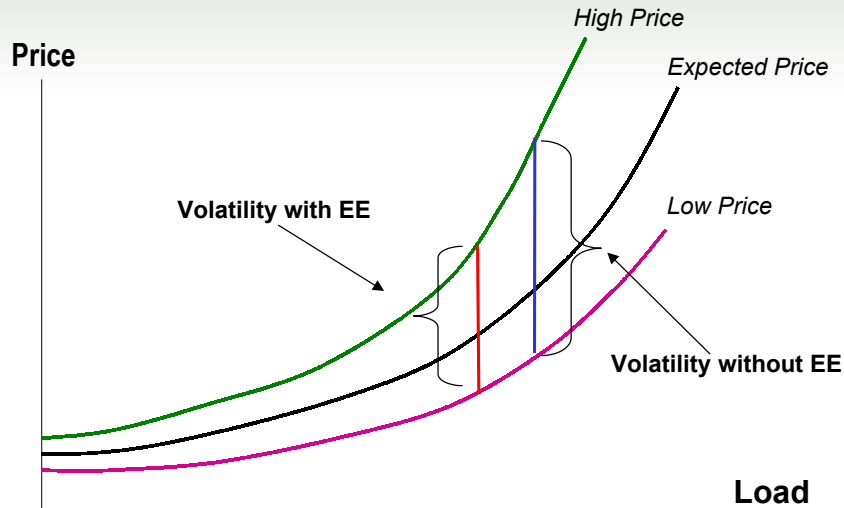
- Examine the value of energy efficiency as an offset to financial hedging
- Present benefits of reducing system demand in a competitive and volatile wholesale market
- Develop numeric estimates of the hedging component associated with energy efficiency
- Encourage inclusion of demand reduction through EE as part of risk management portfolio

# Analysis

## Analysis

- Estimate the relationship between the energy supply curve and price volatility
- Estimate the cost of hedging against price volatility
- Estimate the change in the cost of hedging for a reduction in price volatility
- Determine the demand impact of energy efficiency programs
- Determine the economics of the proposition:
  - Cost of EE versus
  - Avoided Energy Cost (including capacity) +
  - Reduced hedging cost \* reduced hedging exposure

## EE Can Reduce Volatility



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## Calculation of VAR Reduction

$$\blacksquare HV = (\sum (P_{.975} - P_{.025}) * M * \text{mWh}) / \text{mWh}$$

Where

- HV = Hedge Value
- $P_{.975}$  = Upper limit of confidence interval
- $P_{.025}$  = Lower limit of confidence interval
- M = Average price per load level
- MWh = load times hours

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## Key Findings



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## Key Findings

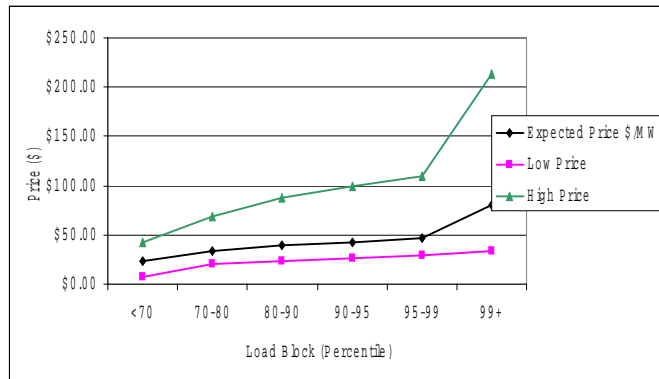
- Volatility decreases as demand decreases (for a constant supply)
- EE reduces hedging cost
- EE can be more valuable than previously considered and should be given credit for the reduction in hedging cost



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# Key Finding #1

*Volatility decreases as demand decreases*

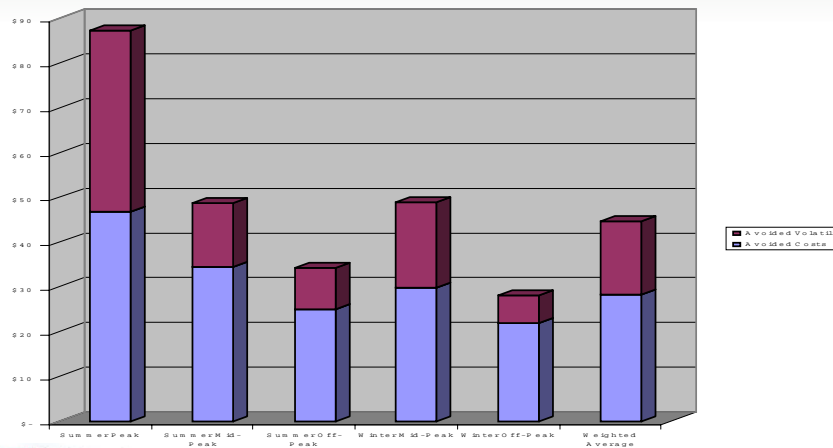


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# Key Finding #2

*High hedge values are associated with peak periods.*

1999 Hedge Values

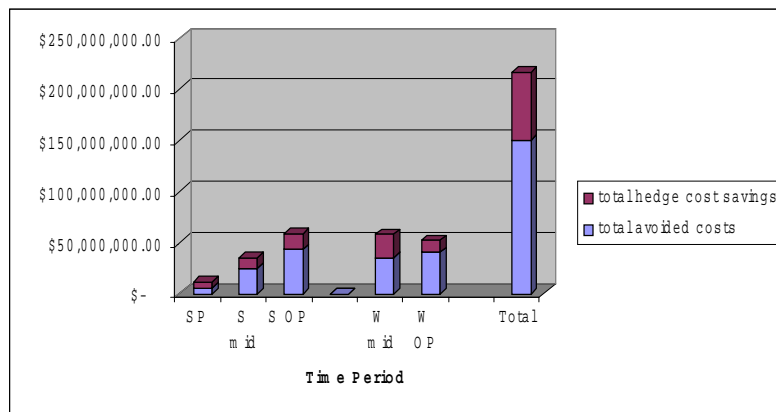


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## Key Finding #2

*Reduced volatility results in lower cost to the utility and its customers.*

### Hedge Savings – 1000 MW EE



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## Key Finding #3

*Lowered hedging cost should be credited to demand reduction strategy*

- Price volatility is a function of kw demand and supply at a given time
- Hedging is a cost incurred to manage volatility
- Less demand = less volatility = less hedging
- Therefore, lowered hedging cost should be credited to the demand reduction strategy

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# Implications

# Implications

- Utilities/power procuring entities in deregulated markets must reduce risk by hedging in some fashion
- Crucial to include demand side -- EE, Demand Response (DR) -- as part of an integrated procurement portfolio
- More research needed to --
  - ❖ Develop more comprehensive models beyond pilot
  - ❖ Must also include not only EE but also DR, together with diverse supply options



## Next Steps

- **Improve VAR Calculations**
  - ❖ **Model determinants of risk**
  - ❖ **Consider alternate models**
  - ❖ **Project into future markets**
  - ❖ **Include lower cost hedging options**
- **Examine multi-year risk**
  - ❖ **Develop monte carlo model of future**
  - ❖ **Reflect possible supply and demand states**
- **Analyze alternative specific EE options**

