

*THE RESOURCE ADEQUACY  
REQUIREMENT IN SMD:*

*RELATIONSHIP AMONG  
ENERGY CAPS, RESOURCE ADEQUACY,  
AND SYSTEM RELIABILITY*

*PRELIMINARY RESULTS OF  
RESEARCH AT JOHNS HOPKINS*

*SMD TECHNICAL CONFERENCE  
NOVEMBER 19, 2002*



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## *Introduction*

- ◆ **In a pure energy market, price caps below a certain level would not lead to sufficient generation investment to meet 1 day in 10 year Loss of Load Probability (1-in-10 LOLP).**
- ◆ **Research on relationship among price caps, installed capacity and reliability by Hobbs, Inon and Stoft, *Electricity Journal* (2001).**
- ◆ **New research by Inon and Boland updates prior work and evaluates the specific resource adequacy requirement in SMD.**

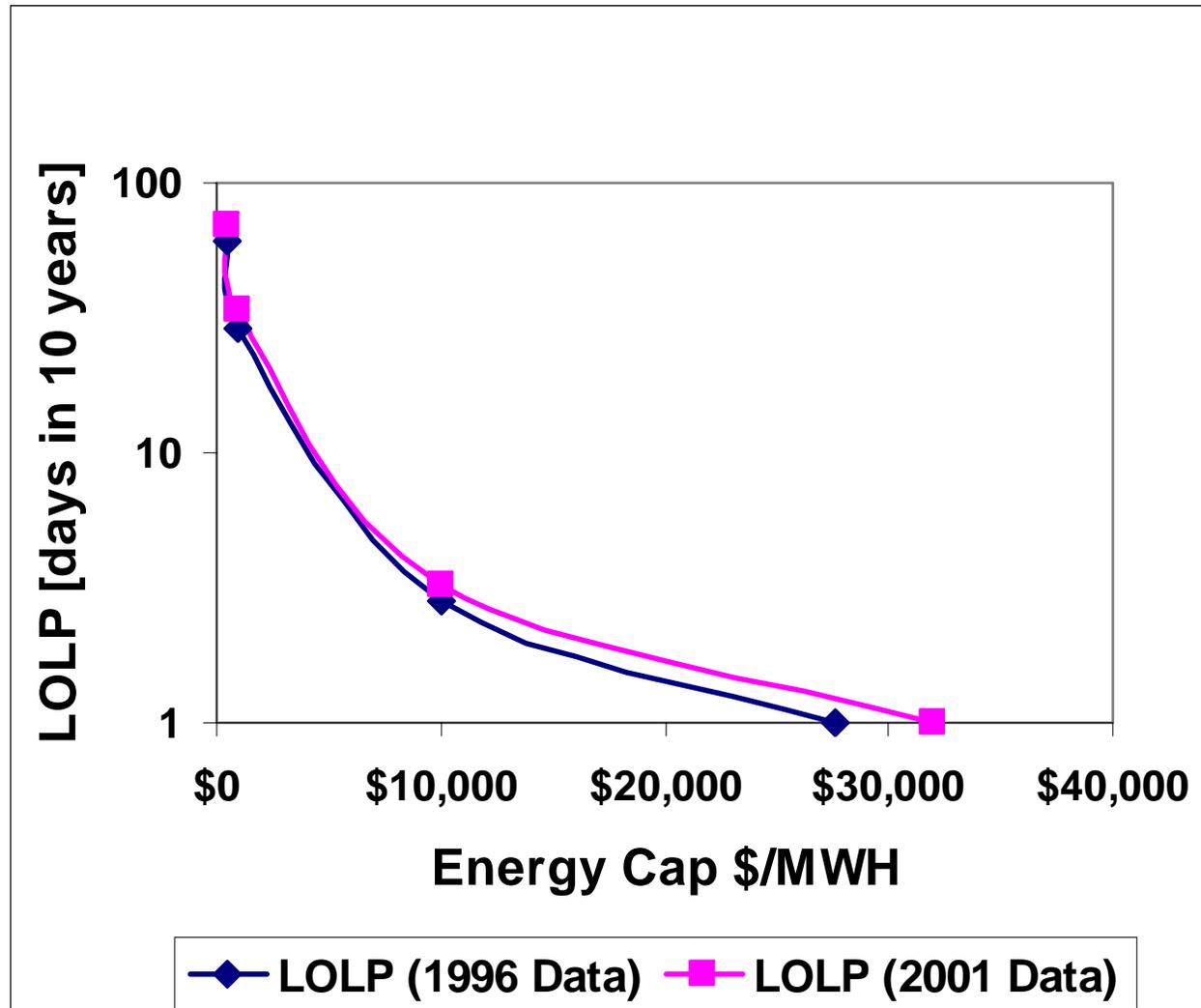


## *Research Approach*

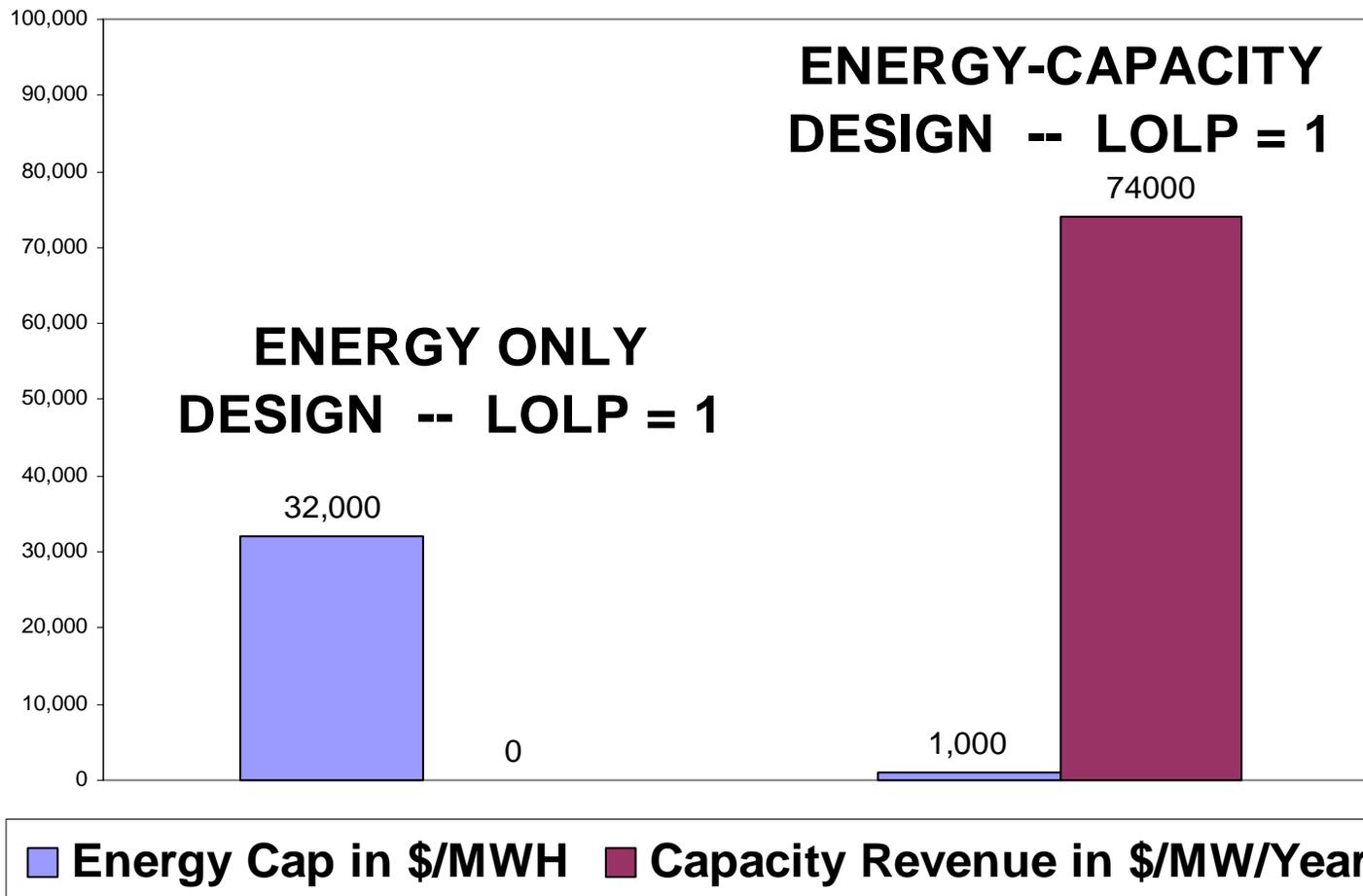
- ◆ **Simulate price distributions and generation investment in a market of buyers and sellers to determine equilibrium reliability levels.**
- ◆ **Use generation costs and load distribution data from PJM.**
- ◆ **Assume generation is added when expected revenue exceeds fixed and variable costs.**
- ◆ **Run model on alternative market designs: energy only with caps, energy + capacity, SMD's resource adequacy requirement.**



*In Energy-Only Market Need Energy Cap  $\approx$  \$30,000/MWH for 1-in-10 LOLP Reliability*



*Energy Cap Can Be Reduced But Only If There Is Capacity Revenue Commensurate with 1-in-10 LOLP Reliability*



# *Results on Energy Only and Energy-Capacity Market Designs*

- ◆ **In an energy only market, price cap must be in the \$30,000/MWH range to meet 1-in-10 LOLP reliability.**
  - (Note: If price goes above marginal cost (e.g., scarcity rent) when operating reserve impaired, then price cap could be less. Example: if price goes above marginal cost when operating reserve is less than 1,170 MW, then energy price cap could be \$16,000/MWH.)
- ◆ **In an energy-capacity market, if the price cap is set at \$1,000/MWH, then capacity revenue of about \$74,000/MW/year is necessary to meet 1-in-10 LOLP reliability.**

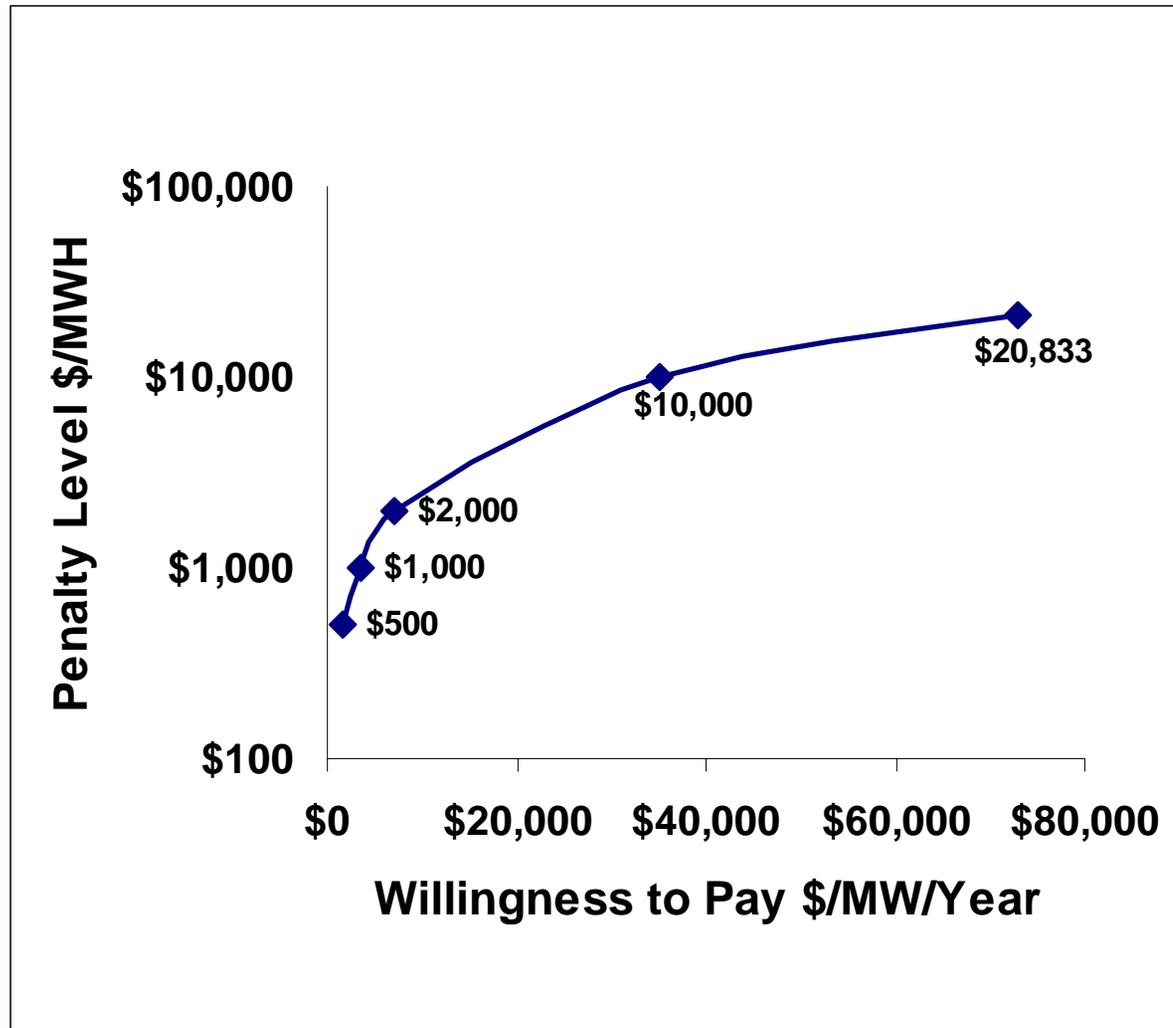


## *SMD's Resource Adequacy Requirement*

- ◆ **LSE faces a penalty when operating reserve falls below a specified level and LSE is short.**
- ◆ **Assume LSE minimizes costs in choosing between paying penalty or providing capacity.**
- ◆ **Model can equate a given penalty level with a price for capacity that LSE is willing to pay.**
  - **Penalty level of \$500/MWH equates to capacity price of \$1,754/MW/year.**
  - **Penalty level of \$2,000/MWH equates to capacity price of \$7,016/MW/year.**
  - **Penalty level of \$20,833/MWH equates to capacity price of \$73,000/MW/year.**



*If Capacity Costs \$73,000/MW/Year, Need Penalty Of At Least \$20,833/MWH*



## *Conclusions*

- ◆ **An energy only market design can meet 1-in-10 reliability only if caps are set very high.**
- ◆ **An energy-capacity design can be reliable with lower caps if there is adequate capacity revenue.**
- ◆ **SMD's specific resource adequacy requirement would not provide reliability unless penalties set at very high levels (and enforced).**
- ◆ **Tentative final form of SMD should be modeled to ensure long-run reliability.**

