Power Smart Pricing Valuation Methods

Presentation to Illinois Smart Grid Collaborative

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Estimating Market Effects

- Our Objective
- Quick Tour of Available Options
  - What have others done?
- Our Proposed Methodology

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Our Objective

- By ICC Order, we are to estimate non-participant net benefits from the Power Smart Pricing program in these areas:
  - Reduction in LMP and Price Volatility
  - Electric Utility Cost Avoidance and Reductions
  - Reliability and Power Quality
  - Market Power Mitigation
  - Other benefits of DR

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References Reviewed

- Summit Blue IEA Report
- MADRI – Brattle Report
- Neenan Testimony in ICC RTP docket
- PSERC reports on simulation models

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Quick Overview – SBC IEA

- Summit Blue IEA Report
  - Resource planning model (Strategist)
  - Best model available 5 years ago
  - Selected DR based on least cost NPV RR
  - Used Monte Carlo to get Risk Assessment

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Quick Overview - Brattle

- MADRI – Brattle Report

  - ISO LMP market simulation model (Dayzer)
  - Reduction in LMP (compare base to DR case)
  - Gross Savings to All Customers =
    LMP reduction x All MWH in market
  - But, customer savings is offset by reduction in producer surplus (loss of FTR revenues)
  - So, Net Savings in Total Market =
    Gross Savings less the loss of FTR revenues
    (about 20% reduction in benefits)

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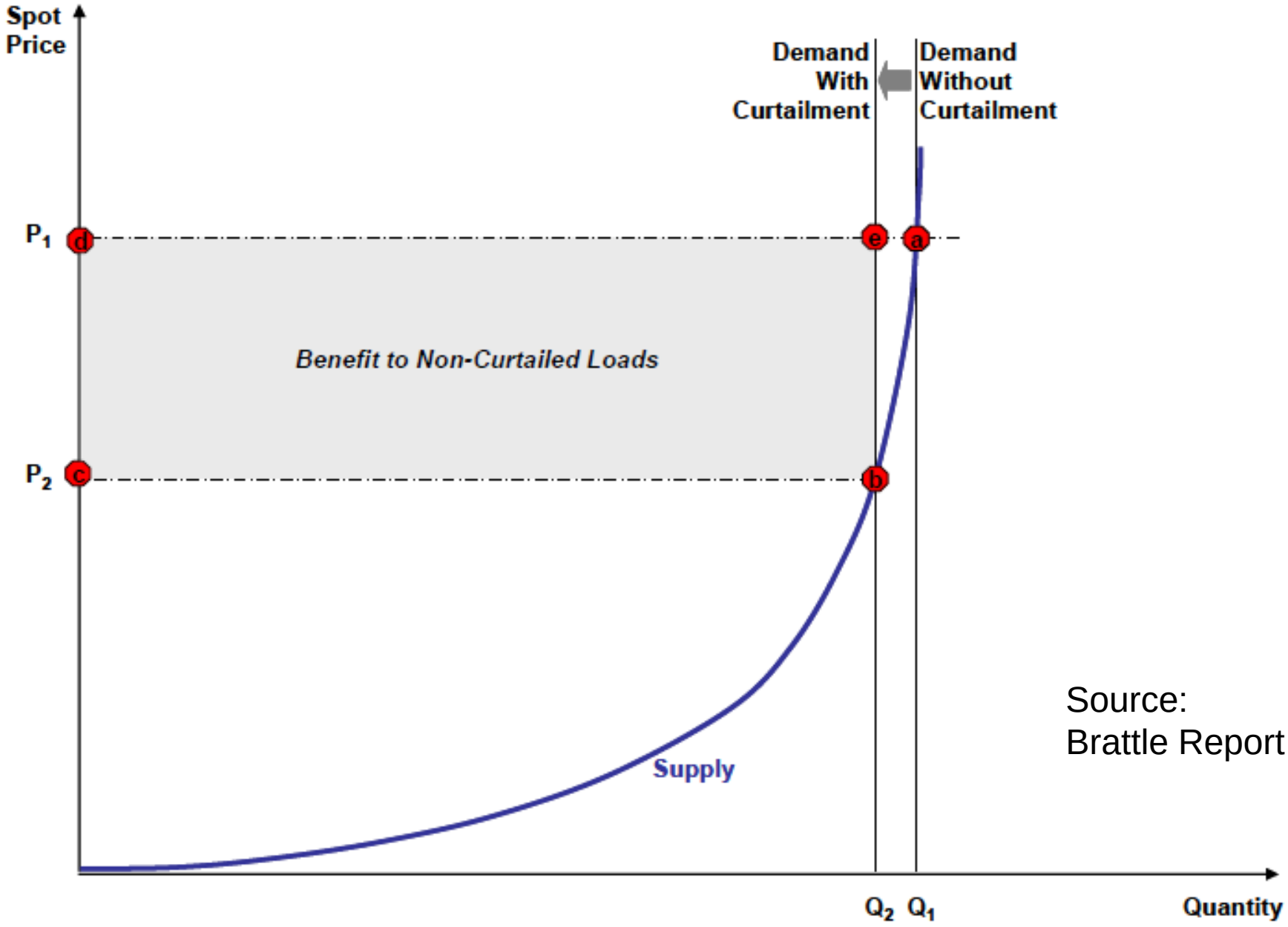
Figure 6. Conceptual Diagram of Direct Energy Benefits to Non-Curtailed Loads



Source:
Brattle Report

Quick Overview – Neenan Part 1

- Neenan's testimony hit the five ICC requirements for estimating benefits and presented pro forma benefit estimates for the RTP program.
  - Reliability and Power Quality
    - Qualitative, Not Easily Quantifiable
  - Market Power Mitigation
    - Qualitative, Not Easily Quantifiable
  - Other Benefits of DR
    - Qualitative, Not Easily Quantifiable

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Quick Overview – Neenan Part 2

- Neenan Testimony – Quantifiable Benefits

  - Reduction in LMP and Price Volatility
    - Estimate change in LMP
      - Supply Curve: LMP = f (Hourly Load, Prevailing Transmission Constraints, Weather, Operating Reserves)
      - Demand Curve: Elasticity of RTP customers
      - Constrain price response to 9 a.m. to Midnight
      - Only include hours where RTP > flat rate
    - Price volatility is measured as the no. of hours > price cut-off

  - Electric Utility Cost Avoidance and Reductions
    - Reduced purchases by LSE (load reduction * LMP)
    - Reduced capacity costs ($45 kW-year)

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Quick Overview - PSERC

- Power Systems Engineering Research Center
  - Iowa State University has a free open source 'test bed' simulation model for electric markets. Test bed is small and customizable, not a replication of a complete ISO system. Includes decision-makers and their ability to learn. Could be used to simulate how price-responsive demand bids can lower LMPs if the concept needs to be proven.
  - Cornell has MatPower, a larger simulation model, but not a complete market simulation model

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Our Proposed Methodology

What we won't do:

- Strategist is too expensive and complex
- Dayzer is too expensive and complex
- Small PSERC simulation models would not meet the needs of this study (unless there is a need to prove some benefit concepts with a detailed 'test bed' example)

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Our Proposed Methodology

Our recommendation:

- Follow Brattle method for estimating market benefits, but without adjusting for lost FTR revenues
- Substitute LMP regression model for Dayzer simulation model
- Use results from the evaluation to model demand reductions
- Add probabilistic approach to assess future market benefits based on weather and load risks

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Details on Proposed Methodology

- Reduction in LMP
  - Build predictive model using 2008-2010 MISO data on LMPs and system loads to build a supply curve
  - Use evaluation study results to estimate hourly demand reductions after RTP for x participants. Only use hours when RTP > flat rate.
  - Use predictive LMP model with demand reductions to estimate change in LMPs from RTP program
  - Multiply LMP change by all system MWh to calculate base year benefits
  - Use DSMore or a similar predictive model to create forecasts of base loads and prices for different weather scenarios with associated probabilities
  - Build simplified what-if model in Analytica for Ameren and ICC to test NPV net benefits of different participation levels and demand/price forecasts

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