Southwest Power Pool

Helping our members work together to keep the lights on... today and in the future

Net Benefits Test
SPP EIS Market
May 2012

Southwest Power Pool

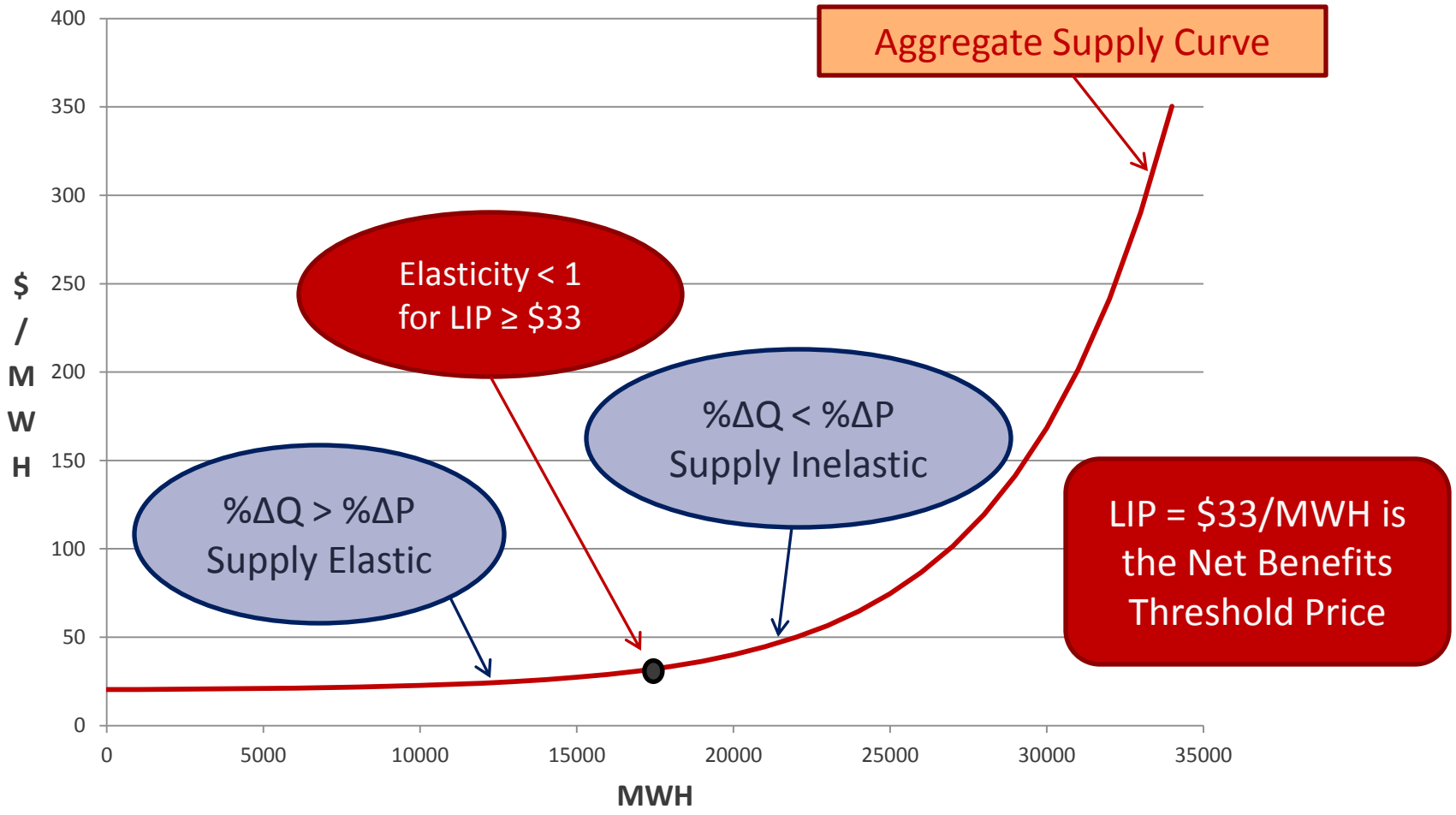
Topics

- Net Benefits Test Threshold
- Steps for Determining Net Benefits Test Threshold
- Results for May 2011 through May 2012

Net Benefits Threshold Price

- The Net Benefits Threshold Price is the price that corresponds to the point on the Supply Curve where the net benefit first exceeds the cost to Load (see accompanying Appendix for more details)
- Equivalently, Point on the Supply Curve where the
  - % Change in MWH Consumed < % Change in LIP
  - Elasticity of Supply < 1

Net Benefits Test Threshold Price



Net Benefits Test

- By the 15th on each month, SPP will post the NBT Threshold Price that will be in effect for the next month; for example, by June 15th, SPP needs to post the NBT Threshold Price for the month of July.
- Terminology
  - Study Month – Month for which NBT Threshold Price applies
  - Reference Month – Calendar month from the preceding year that corresponds to the Study Month.
  - Example: July 2012 is the Study Month, July 2011 is the corresponding Reference Month

Net Benefits Test

- Step 1 – Retrieve Generator Offers for Reference Month
- Step 2 – Apply Fuel Cost Adjustment Factors to the Offers
- Step 3 – Aggregate Offers into Representative Supply Curve
- Step 4 – Apply Smoothing Methods to Obtain Smooth Supply Curve
- Step 5 – Compute the Price Elasticity of Supply
- Step 6 – Determine the Net Benefits Threshold Price

Net Benefits Test – Step 1

- Retrieve Generator Offers for Reference Month
  - For Resources in Available & Quick Start Status
  - For the hour corresponding to the Daily Peak for each day of the month (excluding weekends and holidays)

Net Benefits Test – Step 2

- **Apply Fuel Cost Adjustment Factors to the Offers**

  - **Adjustments made for Coal, Natural Gas, and Oil**

  - **Fuel Adjustment Factor (FAF)**

    FAF = (Futures Price for Study Month / Average Spot Price for Reference Month)

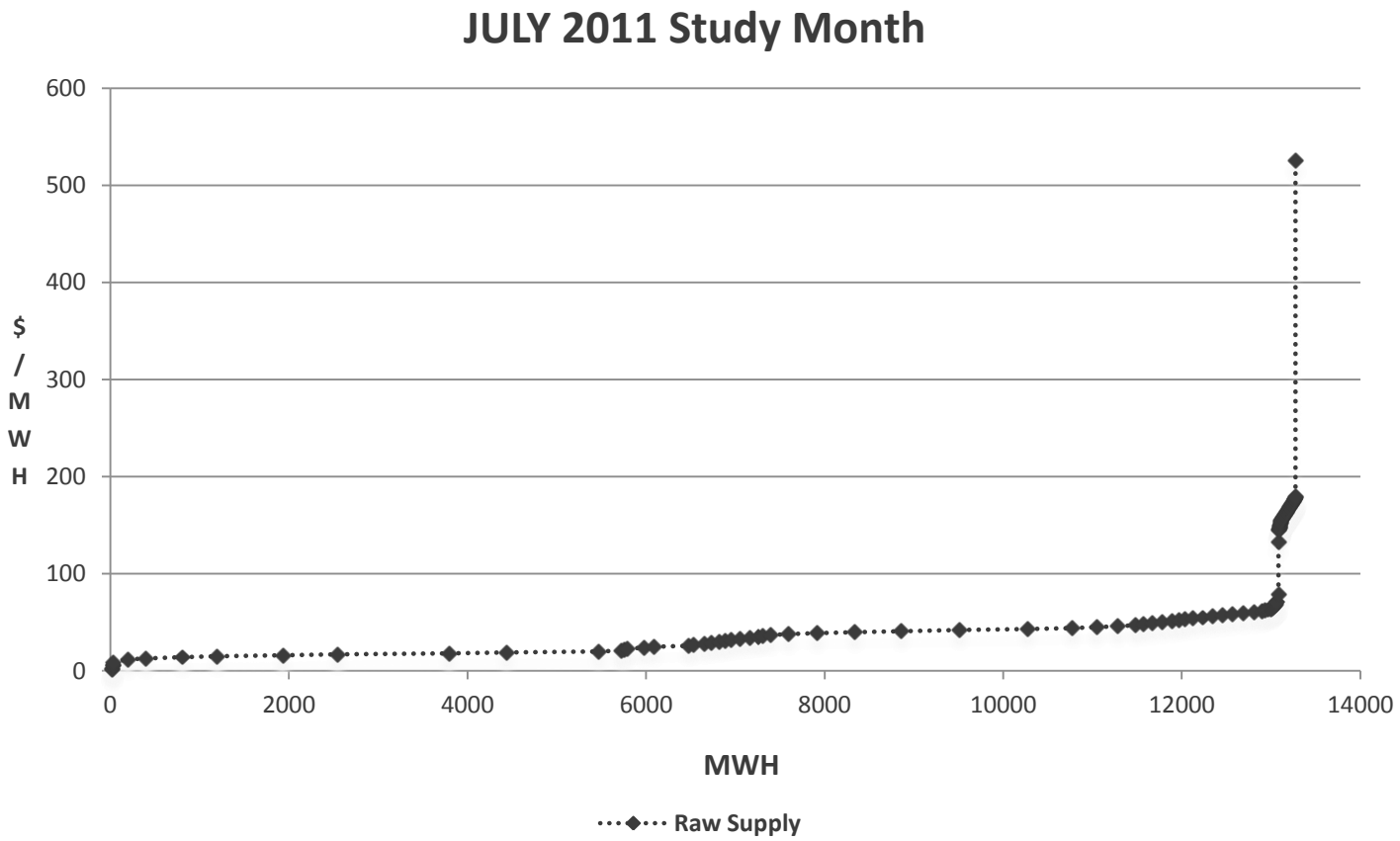
  - **Fuel Adjusted Offer (FAO)**

    FAO = 10% x Reference Month Offer Price

    + 90% x FAF x Reference Month Offer Price

Net Benefits Test – Step 3

- Form an Aggregate Supply Curve

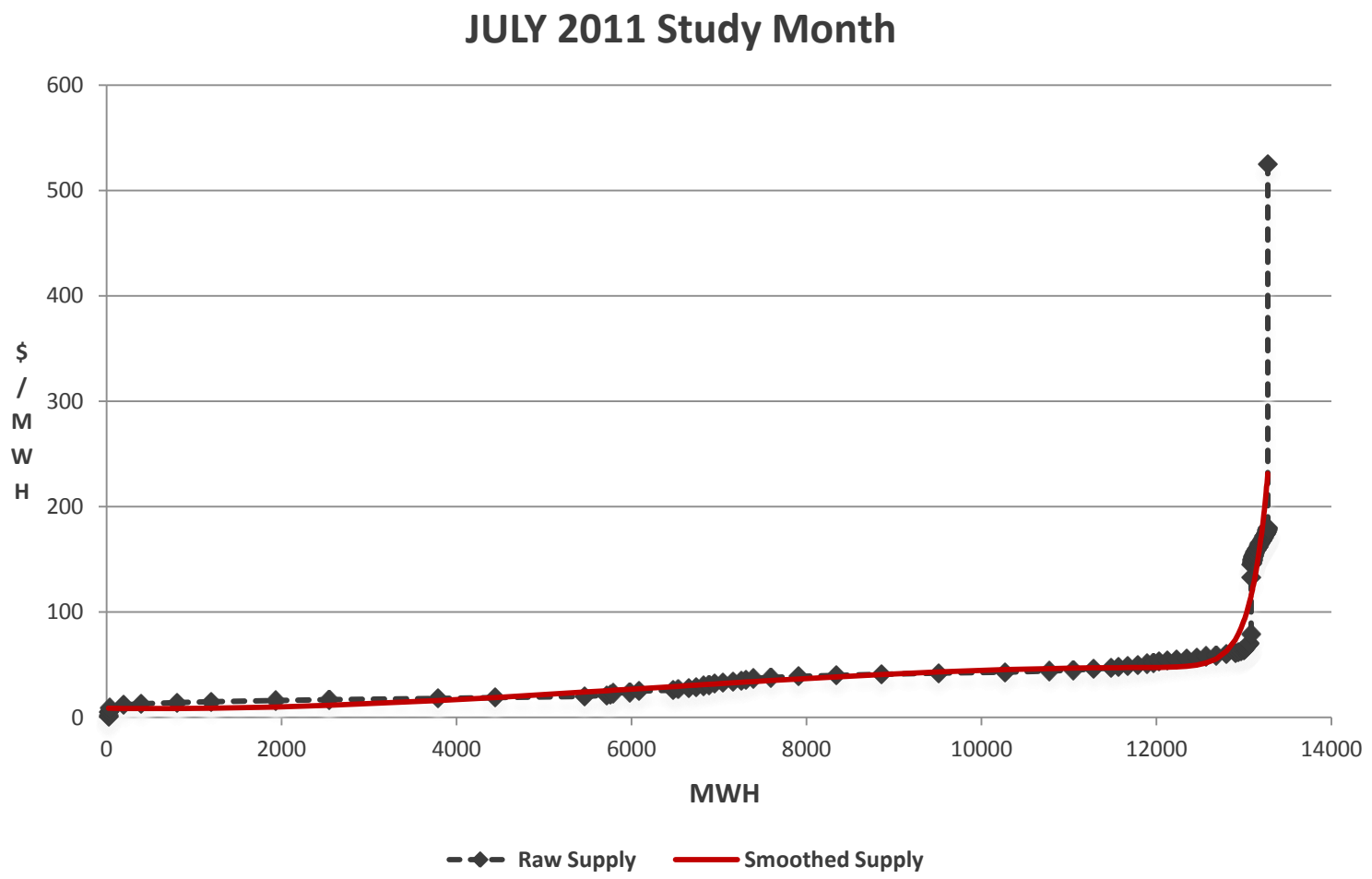


Net Benefits Test – Step 4

- **Apply Smoothing Methods to Obtain Smooth Supply Curve**
  - **We fit each representative supply curve to the following form:** $P(x) = A + Bx + Cx^2 + Dx^3 + e^{(Fx + G)}$

    where
    - **x represents MWH**
    - **P(x) is the corresponding price on the Supply Curve**
    - **A, B, C, D, F and G are coefficients determined by the a non-linear regression model**
    - **e ≈ 2.718281828 (the 'natural' exponential base)**

Net Benefits Test – Step 4



Net Benefits Test – Step 5

- Compute the Supply Elasticity for the Smoothed Curve
  - This is simple step once you have the smoothed supply function

Net Benefits Test – Step 6

- Determine the Price for which the Elasticity changes from greater than 1 to less than 1 (in other words, the price where supply changes from elastic to inelastic)
- This Price is the Net Benefits Test Threshold Price

Net Benefit Test Results

Reference Month	Study Month	Demand Reduction Threshold Price ($/MWH)
May 2010	May 2011	43.62
June 2010	June 2011	42.83
July 2010	July 2011	42.61
August, 2010	August, 2011	33.73
September 2010	September 2011	34.30
October 2010	October 2011	33.41
November 2010	November 2011	28.18
December 2010	December 2011	28.90
January, 2011	January, 2012	27.59
February, 2011	February, 2012	25.94
March 2011	March 2012	24.18
April 2011	April 2012	20.64
May 2011	May 2012	20.01

Appendix

- The following slides explain the derivation of the NBT formula

Appendix* - Net Benefits Test Formula

- In formulaic terms, the net benefit is ***deemed to be realized at the price*** point on the supply curve where **(Delta LIP x MWh consumed) > (LIP_{NEW} x CLR)** where LIP_{NEW} is the market clearing price after the ***CLR*** is dispatched and Delta LIP is the price before ***CLR*** is dispatched minus the LIP_{NEW}

*** The material in this appendix was originally presented at the April 2012 MWG meeting**

Appendix - Billing Unit Effect Example 1

- Load without Demand Response (DR) is 90 MW and the LMP is $40/MWH
- Assume 5 MWH of DR will reduce LMP to $38/MWH
- Is the DR a Net Benefit or Cost?

Gens Paid	85 x $38 =	$3,230
DR Paid	5 x $38 =	190
		$3,420
Load after DR		85
Load Pays Total		$3,420
Load Pays $/MWH		$40.24

- Net Cost because $40.24 > $40

Appendix - Billing Unit Effect Example 2

- Load without Demand Response (DR) is 100 MW and the LMP is $50/MWH
- Assume 5 MWH of DR will reduce LMP to $45/MWH
- Is the DR a Net Benefit or Cost?

Gens Paid	95 x $45 =	$4,275
DR Paid	5 x $45 =	225
		$4,500
Load after DR		95
Load Pays Total		$4,500
Load Pays $/MWH		$47.37

- Net Benefit because $47.37 < $50

Appendix - Relate Example 2 to Protocol Language

Gens Paid	**95 x $45 =**	**$4,275**
DR Paid	**5 x $45 =**	**225**
		$4,500
Load after DR		**95**
Load Pays Total		**$4,500**
Load Pays $/MWH		**$47.37**

MWH Consumed

CLR

LIP_{NEW}

- **Net Benefit because $47.37 < $50**

$$\frac{\text{MWH Consumed} \times LIP_{NEW} + \text{CLR} \times LIP_{NEW}}{\text{MWH Consumed}}$$

LIP_{NEW} + Delta LIP

Appendix - Net Benefits Test Formula

- Net Benefit if the following holds:

$$\frac{\text{MWH Consumed x } LIP_{NEW} + \text{ CLR x } LIP_{NEW}}{\text{MWH Consumed}} < LIP_{NEW} + \text{Delta LIP}$$

- Equivalently (after some algebra)

$$\text{CLR x } LIP_{NEW} < \text{Delta LIP x MWH Consumed}$$

Appendix - Net Benefits Test Formula

- From Last Slide, Net Benefit if the following holds:

$$\text{CLR x } \text{LIP}_{\text{NEW}} < \text{Delta LIP x MWH Consumed}$$

- Equivalently Stated as

% Change in MWH Consumed < % Change in LIP

- And in terms of Elasticity

(% Change in MWH Consumed / % Change in LIP) < 1