Energy and Ancillary Services Offsets
Numerical Calculations

by Mark Reeder
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Note: These calculations were performed by me only for the "Rest of State"capacity market. Steve Keller used a similar approach, and some of the same numbers, to calculate energy and ancillary services offsets for the New York City and Long Island capacity markets.

Overall ROS Offsets

Energy

➢ 2002 estimate of actuals[1]	$ 7.50 per kW-year	
➢ adder for rules changes[2]	13.00	
➢ adder for move from 23% 2002 actual reserve margin to 18% target reserve margin[3]	10.00	
Total energy	$30.50	$30.50
Ancillary Services[4]		12.00
Total Offsets		$42.50 per kW-year

ROS GT Value, Adjusted for Energy and Ancillary Services Net Revenues

The $42.50 per kW-year value is our best estimate of energy and ancillary services offsets for a GT operating in the upstate part of the New York market. For purposes of setting the height of the demand curve, we prefer to be conservative, i.e., err on the side of a demand curve that is more likely to be too high than too low. This is accomplished by offsetting only half of the estimated energy and ancillary services net revenues in the calculation.

Annual net cost of GT = (annual carrying charges)
- (1/2 of energy and ancillary services net revenues)
= $85.00 – (.50)($42.50)
= $85.00 - $21.25
= $63.75 per kW-year

An alternative approach to estimating a GT cost value that is designed to be slightly too high is to acknowledge only the energy and ancillary services offsets associated with the year 2002, a year in which a 23% reserve margin was projected. In other words, ignore the energy offsets associated with the tighter 18% reserve margin.

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1 Provided by David Patton, applicable upstate, for a Frame 7A GT with a 12,000 Btu per kWh heat rate. These are net revenues, 12 months ending August 31, 2002.
2 Provided by David Patton, covers changed market rule to allow demand response (EDRP) to set price and changed rule to allow an operating reserve shortage to set a real-time scarcity price.
3 Estimated by Mark Reeder, using David Patton’s parameters for the relationship between peak load levels and frequency of price spikes.
4 Provided by David Patton, discussed by Andrew Hartshorn. For 12 months ending August 31, 2002.

Alternate annual net cost of GT = (annual carrying charges)
- (2002 energy and ancillary services offsets, i.e., a year with a 23% reserve margin)
= $85.00 - $32.50
= $52.50 per kW-year

Calculation of Adder for 23% vs 18% Reserve Margin

The energy and ancillary services offsets numbers provided by David Patton were for the 12 months ending August 31, 2002. According to the NYISO's 2002 Load and Capacity Data publication, the installed reserve margin for summer 2002 was expected to be 23%. As such, the 2002 numbers provided by Dr. Patton are assumed to come from an electric market that has a 23% reserve margin. The energy offsets value that sets the height of the Resource Demand curve needs to be stated in terms of an electric market that has an 18% reserve margin. The calculation described below provides an estimate of the increase in energy prices caused by a decrease in the reserve margin from 23% to 18%.

In both 2000 and 2002, David Patton's annual reports provided estimates of how an increase in load creates an increase in price spikes. This information is used in the analysis below to relate reduced reserve margins to increased price spikes, which are then translated into an increase in energy prices.

Delta Price Spike Hours Per Delta Load:

From 2000 Patton report, price spike hours with Indian Point 2 in-service equal 8 hours; with Indian Point 2 out-of-service equal 33 hours (page 20). The delta price spike hours per delta 100 MW of load is

(33-8) / 1,000 MW = 2.5 price spike hours per delta 100 MW.

From 2002 report, price spike hours with normal load equal 2; with extreme load (900 MW higher) equal 16 (page 25). This yields

(16-2) / 900 MW = 1.55 price spike hours per delta 100 MW.

A simple average of the above two values yields

price spike hours per delta 100 MW load = 2.025.

The methodology used by Dr. Patton in his reports freezes imports and exports. Relaxing this assumption would allow external power to enter New York to respond to added load, and would moderate, somewhat, the price increases caused by added load. The following downward adjustment is made to reflect this effect.

Adjusted price spike hours per delta 100 MW load
= (2.025) x (0.80)
= 1.62, rounded to 1.60

<u>Net Energy Revenue Per Price Spike Hour</u>:

Dr. Patton's 2002 report defines price spike hours to be "hours with projected prices greater than $500 MWh" (page 25).

Given the $1000 bid cap, this means the price is in the $500 to $1,000 range. The midpoint of that range, $750, is used as the price that prevails, on average, during a price spike.

A running cost of $100 is assumed for a GT. This will obviously depend on gas prices, but $100 is a reasonable proxy. The net energy revenues per price spike hours are

$750 - $100 = $650 per hour.

<u>Added Price Spike Hours for 23% to 18%</u>:

The change in load associated with a move from a 23% reserve margin to an 18% reserve margin is calculated as follows:

23% - 18% = 5% change in reserve margin

5% change in reserve margin = (.05)(30,000 MW)
= 1,500 MW

delta price spike hours = (1,500 MW) x (2.0 per 100 MW)
= (15 x 2)
= 30 hours

<u>Total Increase in Net Energy Revenues</u>:

Total increase in net energy revenues = (30 hours)($650 per hour)
= $19,500 per MW-year
= $19.50 per kW-year
= $20.00 (rounded)

An adjustment is made to be sure this parameter isn't overstated. This is accomplished by cutting it in half. As such, we err on the side of underestimating net energy revenue offsets.

Adjusted increase in net energy revenues
caused by difference between 23% and 18%
reserve margin = (1/2) ($20.00)
= $10 per kW-year