Market Pricing Working Group

Peak vs. Average: 'Off-Coal' Impacts

Power to Ontario. On Demand.

ISSUE 9: Peak versus Average Demand Forecast in Pre-Dispatch

Background & Summary

This report is a continuation of the analysis being conducted as part of MPWG Action Item 50-1. At issue is an assessment of the impact of the Ontario government's 'off-coal' program on the expected price increase[1] resulting from the use of an average demand forecast, instead of a peak demand forecast, in the pre-dispatch timeframe.

At the MPWG meeting on August 19, 2008, the IESO presented a description of the 'off-coal' issue and a framework for further analysis (see Additional Analysis paper, pages 6-8). The framework proposed that an analysis of the impact of 'off-coal' on the elasticity of the system supply curve could provide insight into the validity of projected price increases. In general, three resulting scenarios were envisioned:

1. slope of the system supply curve remains relatively unchanged → current 'price increase' analysis holds;
2. slope of the system supply curve becomes relatively steeper (less elastic) → current 'price increase' analysis potentially under-forecasts the price impact of moving to an average demand forecast;
3. slope of the system supply curve becomes relatively flatter (more elastic) → current 'price increase' analysis potentially over-forecasts the price impact of moving to an average demand forecast.

Average System Supply Curves

Using the most recent existing generation offer data from 2007/2008, OPA IPSP[2] supply mix data, and a set of assumptions; the IESO constructed average system supply curves for the years 2009, 2011, 2013 and 2015. These 'future' supply curves were then compared with historical supply curves for 2006[3] to determine if supply curve elasticity changes significantly as the 'off-coal' program is implemented.

It is important to note that these 'future' domestic supply curves should not be interpreted as forecasts of the future supply/demand balance upon which market clearing prices will be set. No attempt was made to forecast the effects of future changes in fuel prices, potential changes to the structure of the electricity market, forecast increases in conservation, demand response and embedded generation, as well as other important supply/demand variables. The intent in constructing these supply curves was simply to gain insight into a potential change in the shape (elasticity) of the system supply curve associated with a

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[1] The IESO calculated an increase in annual average HOEP of $0.72 and an increase in Average Effective HOEP of $0.14, see IESO Report "Peak versus Average in Pre-Dispatch: Results of Analyses" (pages 9-11).

[2] Ontario Power Authority (OPA) Integrated Power System Plan (IPSP), filed with the Ontario Energy Board (OEB) on August 29, 2007.

[3] Price impact analysis for Peak vs. Average was conducted using 2006 data.

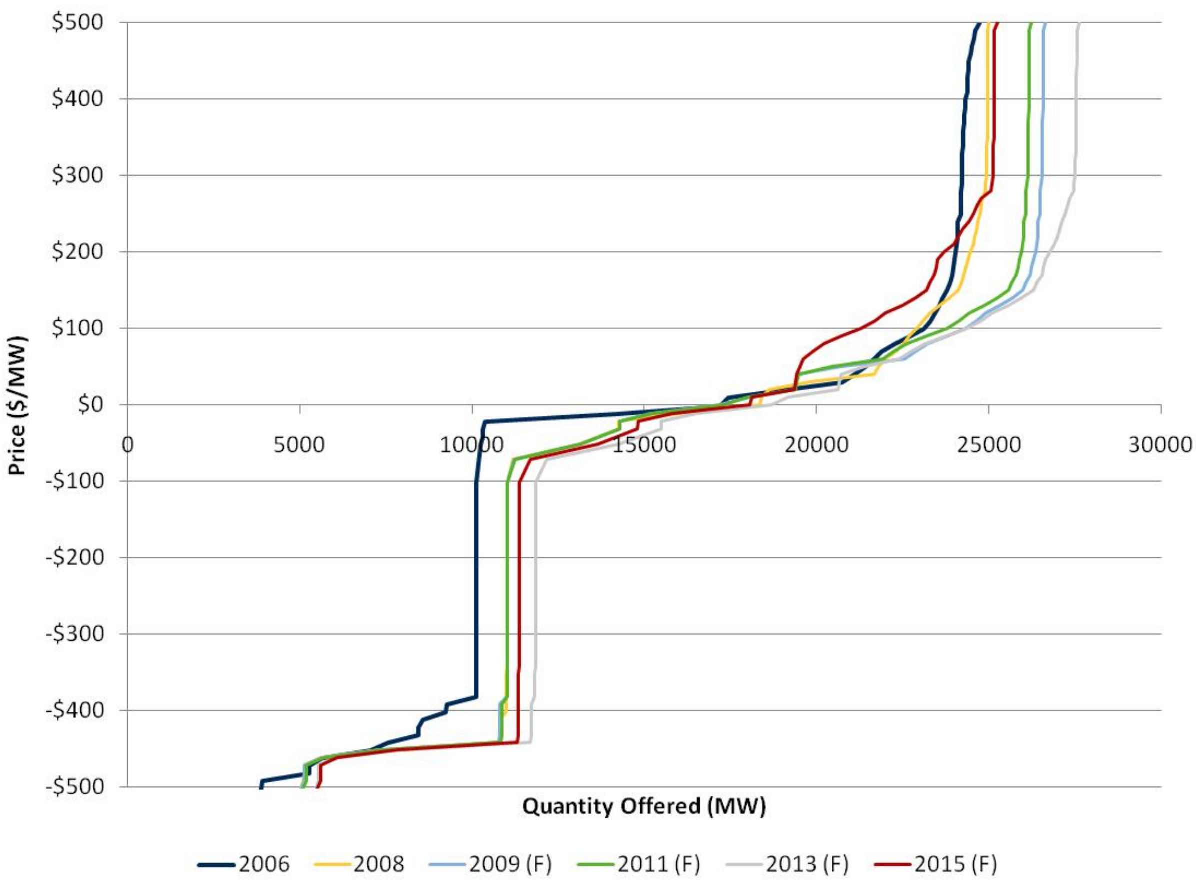
changing supply mix envisioned by the OPA's IPSP. Subsequent changes made to the IPSP after its August 2007 filing date have not been reflected in the supply curve data.

Further description of the inputs and assumptions used to construct the future supply curves is given in Appendix A.

Supply Curve Elasticity Comparison and Results

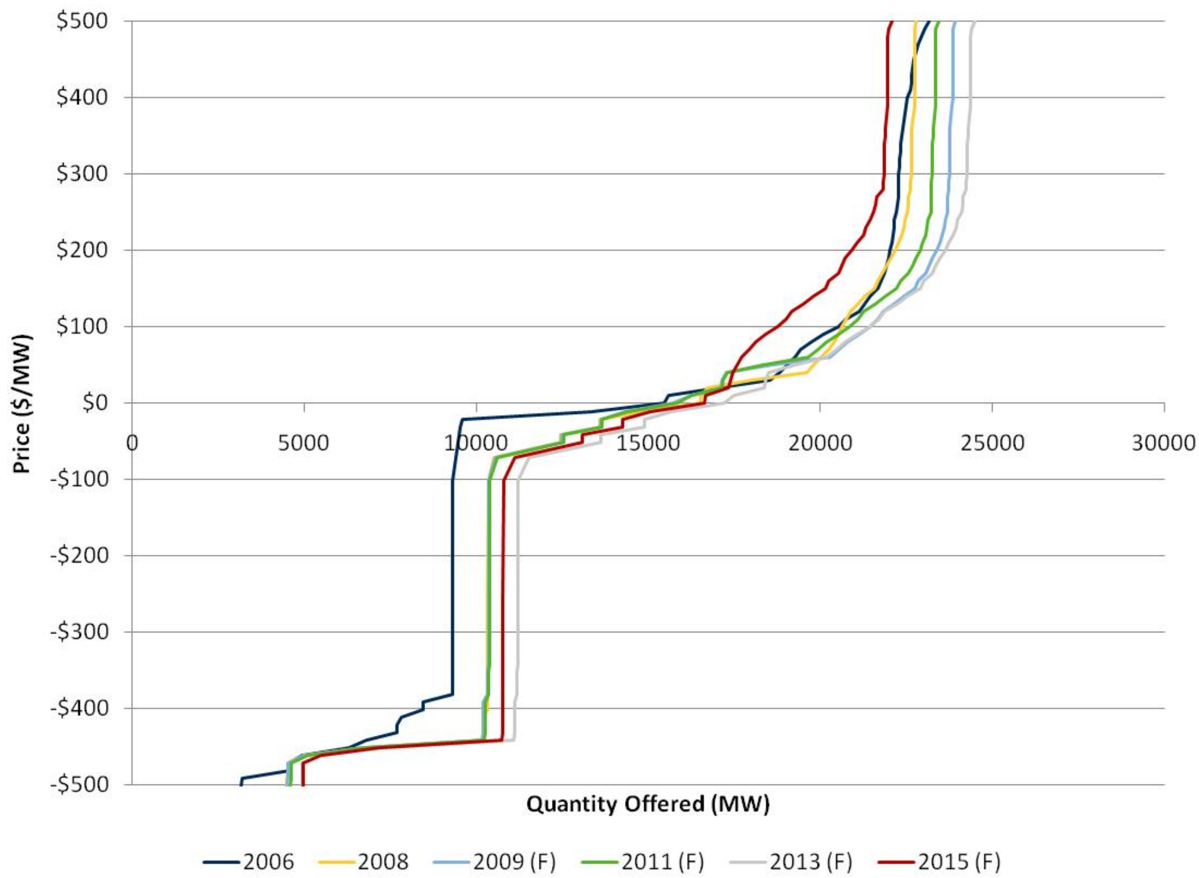
The following figures show the comparison between the 'future' supply curves (2009, 2011, 2013 and 2015), the 2006 supply curve (the year for which the Peak vs. Average price impact analysis was calculated), and the 2008 supply curve (from which the 'future' supply curves were derived). The supply curves are averaged over the summer months of June, July and August, and separated into on-peak and off-peak hours, excluding identified ramp-up hours[4].

Figure 1: Summer Peak Hour Supply Curves



[4] The 'ramp-up' hours of 6-9 and 16-19 are identified in the IESO Report "Peak versus Average in Pre-Dispatch: Results of Analyses" (page 7, footnote).

Figure 2: Summer Off-Peak Hour Supply Curves



While the system supply curves tend to shift from side to side; qualitatively, the slopes of the supply curves for the years 2009, 2011 and 2013 are relatively similar to the slope of the 2006 supply curve. This suggests that the estimated price impacts of moving to an average demand forecast, calculated using 2006, data are representative of the expected price impacts in the future as the 'off-coal' plan is implemented (Scenario 1, above). In 2015, the year that all coal-fired generation is scheduled to be removed from service, the slope of the system supply curve appears steeper over the region of the curve where the market price is expected to be set. This suggests that the price increases calculated using 2006 data potentially understates expected price increases once all coal-fired generation is removed from service (Scenario 3 above). At the same time, the IPSP calls for increasing contributions from 'demand-side' components such as conservation, embedded generation and demand response. As a result, the true nature of the peak versus average price impacts that far out into the future remains unclear as the supply/demand balance shifts.

Supply curves for the other three seasons exhibit similar characteristics as the summer supply curves described above. Supply curve figures for the other seasons can be found in Appendix B.

Concluding Remarks

Based on the above observations regarding the impact of the 'off-coal' supply mix on the elasticity of 'future' supply curves, the IESO is unable to find any evidence that the price impact calculations conducted using 2006 data would be appreciably different post-implementation of 'off-coal'. It appears that at least until all coal-fired generation is scheduled to be removed from service at the end of 2014; supply curve elasticity remains relatively unchanged from the 2006 supply curve. Post-2014, increasing demand-side components (conservation, embedded generation and demand response) may offset the steeper (less elastic) supply curve, but this result remains unclear at this time.

Appendix A: Construction of 'Future' System Supply Curves

Methodology

Average domestic system supply curves[5] were constructed for the years 2009, 2011, 2013 and 2015. On-peak and off-peak supply curves, averaged over each of the four seasons (summer, winter, spring and fall) were constructed in the following manner:

- Historical generator offer data from the past year (2007/2008) was aggregated for specified fuel types. Examples of fuel types are given below.
- The resulting offer curves by fuel type were linearly scaled up or down according to the forecast installed capacities of each fuel type as specified by the OPA IPSP supply mix data.
- The scaled offer curves by fuel type were aggregated to form domestic system supply curves for each of the specified years.

Fuel Type Examples

Biomass, Coal, Nuclear, Hydro, Dispatchable Combined Cycle, Other Gas-Fired (NUGs), CTU, Peaking Gas, Lennox.

Domestic Supply

Domestic supply consists of all dispatchable, intermittent and self-scheduling generators in Ontario that submit offers to the IESO-administered market. Variables that affect the supply/demand balance but were not included in the calculation of domestic supply curve are:

- import/export offers/bids
- wind generation
- conservation
- demand response
- embedded generation

The impact of these non-quantified variables on the supply curve analysis is relevant given their important role in the supply/demand balance that ultimately determines the market clearing price. The impact of conservation, demand response and embedded generation is especially noteworthy given their increasing importance in the OPA IPSP. As a result, it is important to consider (at least qualitatively) the impact these variables may have on the supply/demand balance going forward.

'Off –Coal' Program and 'Price Adder' Assumptions

The schedule for coal generation retirements used in constructing the supply curves is consistent with the schedule provided in the IPSP, and is provided in Table 1 below. In addition to this, the Ontario government has issued a directive for reduced coal-fired generation emissions over the coming years[6]. At the last MPWG meeting, a generator representative acknowledged that they would use a price "adder" to their offer prices for coal-fired generation. For the purpose of this analysis, the IESO assumed a price "adder" of $20/MWh to all coal-fired generation offers in constructing the 2009, 2011, 2013 and 2015 supply curves.

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[5] Historical average domestic supply curves are reported in semi-annual Market Surveillance Panel Reports (see MSP Report: May 2006 to October 2006, page 19).

[6] http://www.energy.gov.on.ca/index.cfm?fuseaction=english.news&body=yes&news_id=176

Table 1: Coal-fired Generation Capacity 2009-2015

Year	2009	2010	2011	2012	2013	2014	2015
Coal (MW)	6434	6434	4969	3293	3293	3293	0

Source: OPA
http://www.powerauthority.on.ca/Storage/69/6442_D-2-1_Att_2_corrected_080505__MM_.DOC.pdf
Table 5 (page 7)

Appendix B: Supply Curve Elasticity Comparison Diagrams (Winter, Spring, Fall)

Figure 3: Winter Peak Hour Supply Curves

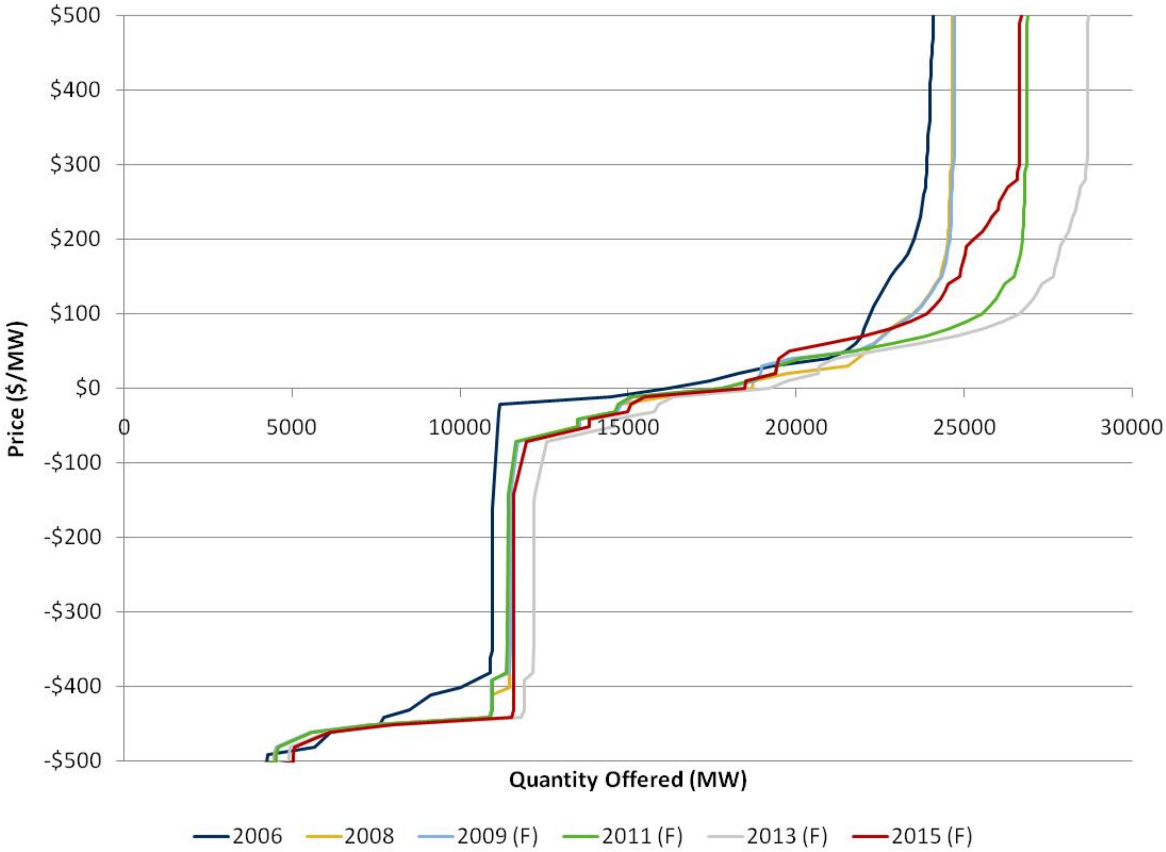

Figure 4: Winter Off-Peak Hour Supply Curves

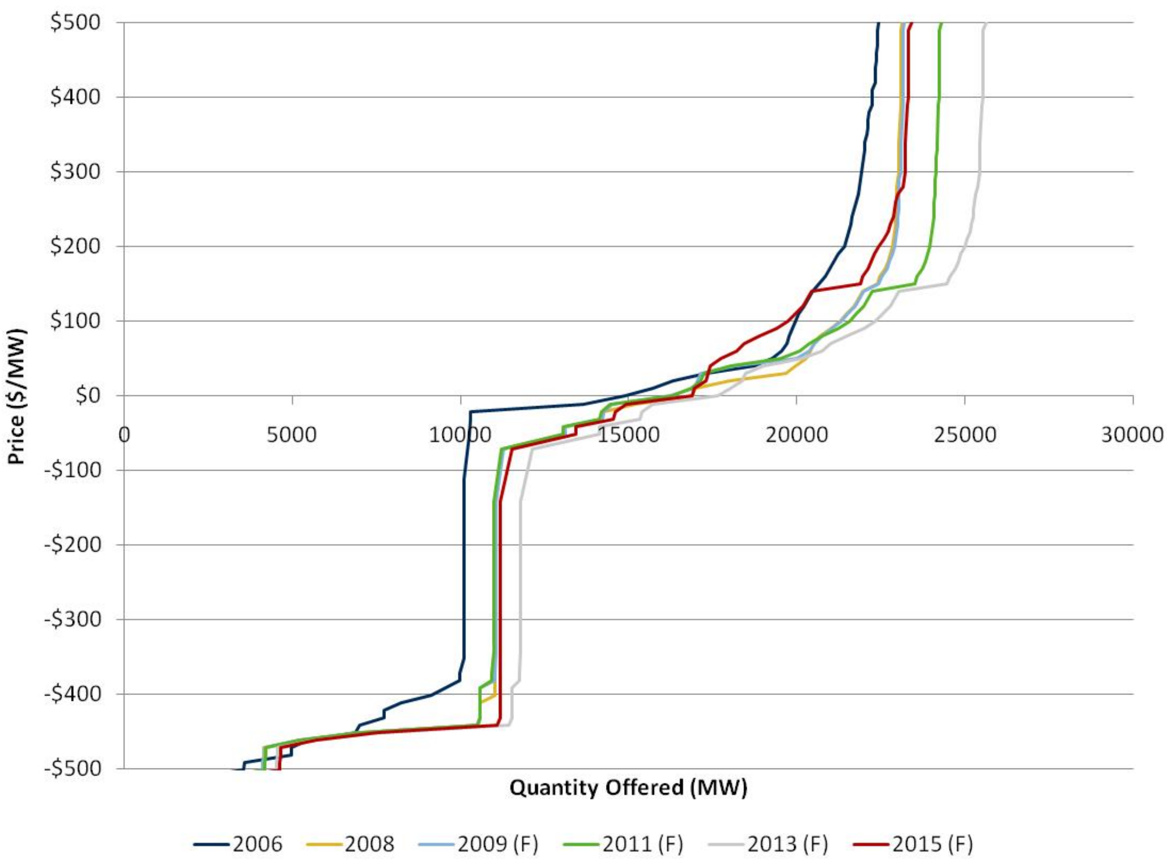

Figure 5: Spring Peak Hour Supply Curves

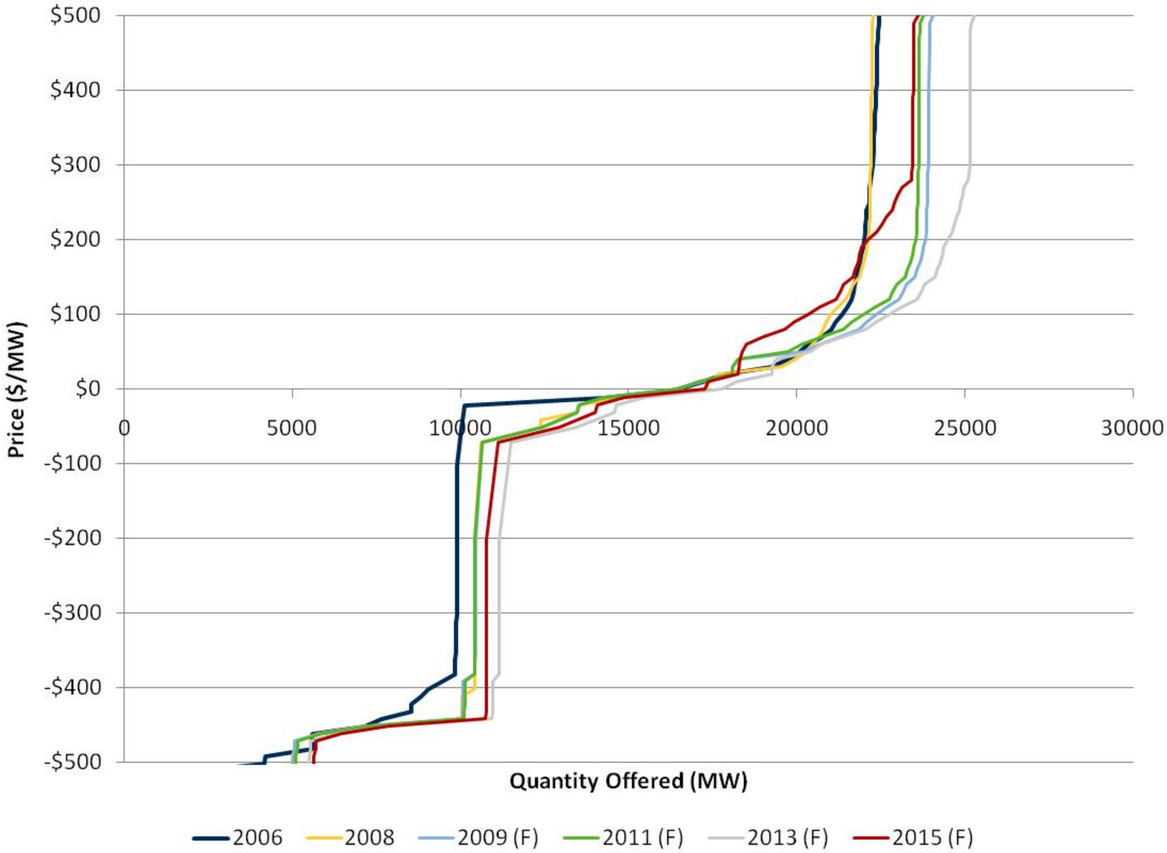

Figure 6: Spring Off-Peak Hour Supply Curves

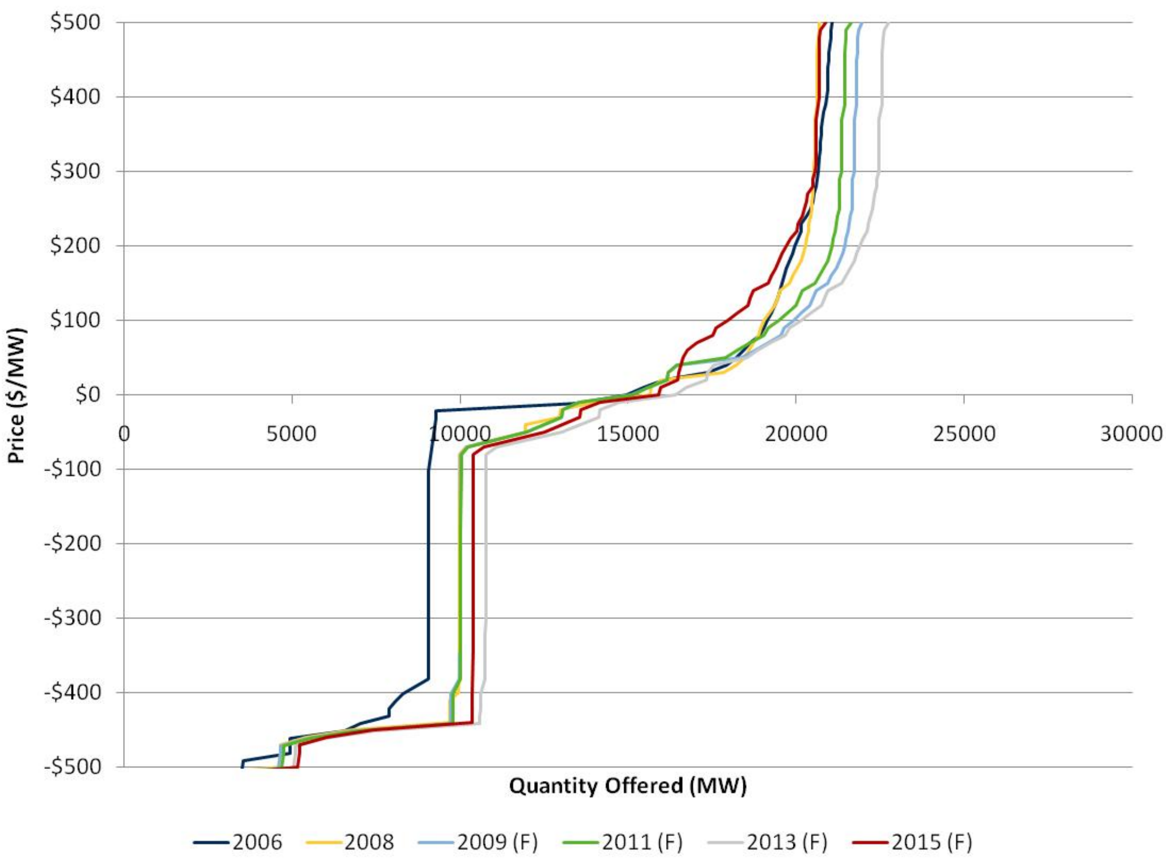

Figure 7: Fall Peak Hour Supply Curves

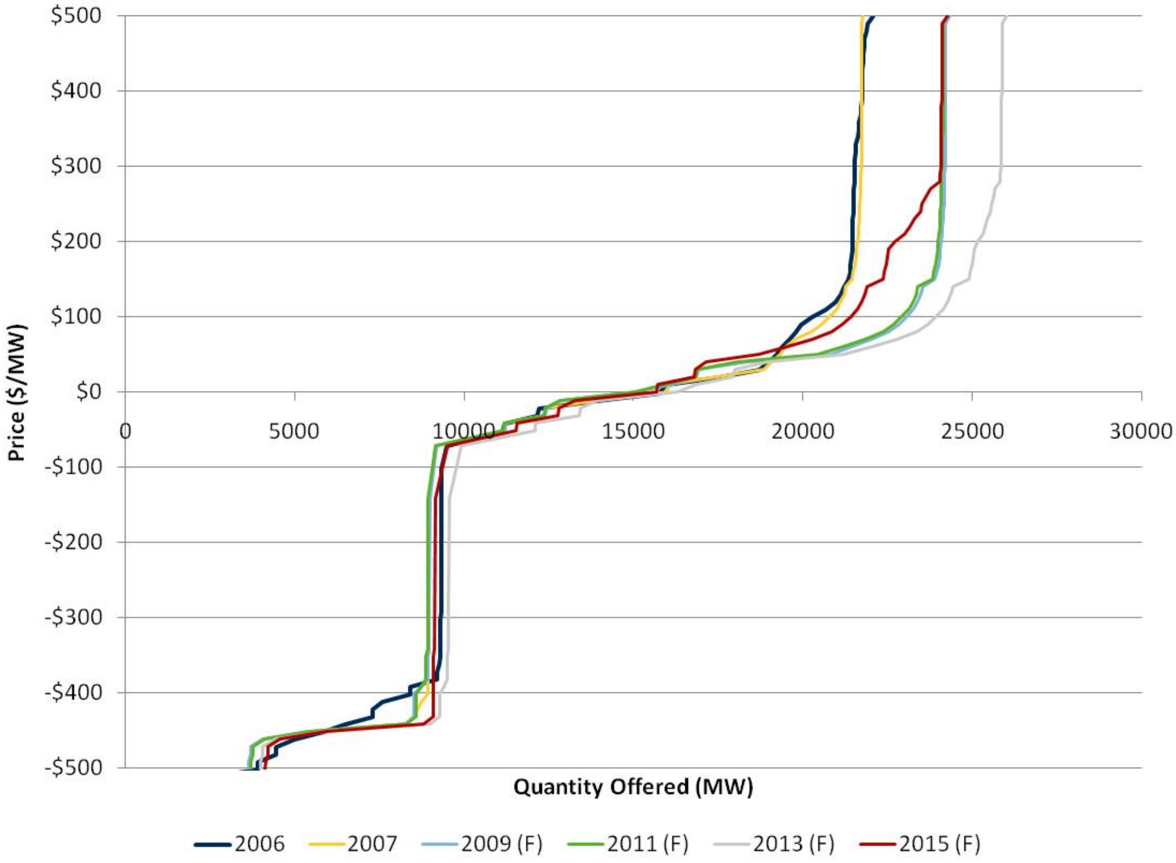

Figure 8: Fall Off-Peak Hour Supply Curves