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Valuation of Exelon Illinois Nuclear Plant Margins

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Table of Contents

Introduction..... 1

Energy Prices and Plant Revenues..... 2

Plant Revenues and Gross Margins 3

Exelon Returns..... 4

Appendix A – Methodology for Energy Price Forecasts..... 7

Introduction

With integration of the Commonwealth Edison territory into PJM and with the move to energy markets, there is a potential for substantial increase in generating revenues for Exelon's existing Illinois nuclear plants, an increase which would likely be reflected as increased costs to customers due to the clearing price nature of the PJM markets. This memo attempts to estimate the magnitudes of those increases. To do so we will look both at production costs for these nuclear plants and likely prices in the new markets.

Currently Exelon owns and operates over 10,000 MW of nuclear generation in Illinois as shown in the following table.

<u>Plant Name</u>	<u>Capacity (MW)</u>	<u>Exelon Ownership %</u>	<u>2004 Capacity (MW)¹</u>
Braidwood	2,363	100%	2,363
Byron	2,336	100%	2,336
Clinton	1,030	100%	1,030
Dresden	1,742	100%	1,742
LaSalle County	2,288	100%	2,288
Quad Cities	1,579	75%	1,121
Exelon Illinois Nuclear Assets			10,880

Information from 2004 10-K report.

For the most recent four years under Exelon ownership, the capacity factors of these plants have been very high and production costs quite low.

Exelon Illinois Nuclear Fleet Averages

Year	Nuclear Fleet Capacity Factors	Nuclear Fleet Production Cost (\$ Per MWh)	Source
2001	94.4%	12.78	2003 10-K, Pg. 102
2002	92.7%	13.00	2003 10-K, Pg. 99
2003	93.4%	12.53	2004 10-K, Pg. 72
2004	93.5%	12.43	2004 10-K, Pg. 72

These operating results contrast starkly with operating results for the years 1998-2000 when these plants were operated by Commonwealth Edison and Illinois Power. During that earlier period, the capacity factors were lower, and the average production cost was about \$19/MWh.

¹ These values differ slightly from other data sources such as EIA, but are generally consistent with them.

Energy Prices and Plant Revenues

Although we do not know the actual revenue received for this generation in recent years because that depends on a number of contractual agreements, we can arrive at an approximation of its value based on known market prices. Since this region became part of the PJM market in May of 2004 we have hourly energy price data. For that eight month period of 2004, the average all-hours energy price was \$29.72/MWh. We calculate an equivalent price of \$30.81/MWh for all twelve months of 2004 based on relative full year prices in PJM West. (See Appendix A.) This is about 2 ½ times the 2004 production cost shown above.

We can make an estimate of pre-PJM gross margin for Exelon's Illinois nuclear fleet based on marginal power costs for the Company's entire system. For 2003 the average marginal generating cost (system lambda) for Commonwealth Edison was \$18.95/MWh². This is 51% greater than the nuclear production cost for that year. If 10% is added to this price to account for other factors such as capacity value and ancillary services³, that gives an overall revenue value of \$20.85/MWh as a benchmark. Of course actual revenue data would provide a better comparison.

Turning to the PJM markets that have applied in Illinois since May 2004, the main revenue streams available for Exelon's Illinois nuclear fleet are the energy and capacity markets. Price data is available for both of those markets in 2004, and future price projections are available as well.

For the period from May through December 2004, the all-hours PJM real-time energy clearing price at the Chicago Hub was \$29.72/MWh. Using the Western Hub to make a proportional adjustment for the remaining months, we calculate the 2004 equivalent all-hours energy market price to be \$30.81/MWh. By making use of electricity forward market data as reported in Megawatt Daily, we calculate energy prices to be \$33.57/MWh for 2005 and to increase to \$37.21/MWh in 2007. (See Appendix A.)

The PJM State of the Market (SOM) report indicated that the market price for capacity in the ComEd territory in 2004 was in the range of \$24.27 to \$32.26 per MW-day. Current proposals for a PJM Reliability Pricing Model (RPM) indicate that this is likely to rise gradually over the next number of years to an equilibrium value of \$68 per MW-day by 2010⁴. Even if the RPM is not implemented as currently proposed, by joining PJM these facilities will be most likely be eligible for capacity payments in addition to energy revenues.

² From FERC Form-714 data. This the average over the year of the variable cost of the last MWh generated each hour. Exelon's actual gross margin for this period was determined by contractual prices, not the system lambda, so this pre-PJM estimate is only useful as a rough comparison to the PJM market prices that will determine gross margins in the future.

³ In 2003 in PJM, ancillary and capacity markets provided an additional 7.5% revenue for all resources in addition to that of the energy markets. Thus a 10% value for baseload facilities is generous and is doubly conservative for the present purposes.

⁴ From the "Reliability Pricing Model Prototype Simulation" report presented by Mark Gilrain at the PJM RAM Stakeholder Working Group session on January 26, 2005.

Plant Revenues and Gross Margins

To arrive at some measure of gross margin, we need projections of revenue (and cost) impacts. For that purpose, we have constructed the following table which shows what revenues would be pre- and post-market implementation. Based on information we have been able to obtain, it appears that the PJM market prices in 2004 are considerably greater than historic system marginal costs for this region and will increase further in the future.⁵

For 2003 and 2004 we have estimated the revenues for the full year under pre-PJM conditions and what those revenues would be at full PJM market prices.⁶ The “2003” and “Pre Mkt 2004” rows in the following table presents the former result. The “PJM Mkt 2004” row in the following table contains an estimate of the revenue and gross margin for Exelon’s Illinois nuclear fleet as if the PJM markets had been in place for the full calendar year, instead of coming up in May. The difference is in the order of \$1 billion.

The rows for 2005 and on present projected revenues and gross margins for the same fleet using our best assumptions about future PJM energy clearing prices and capacity markets. The gross margin estimates begin at about \$1,750 million for 2005 and rise to about \$2,611 million in the later years. This reflects likely increases in Chicago area clearing prices as they more closely approach those in other parts of PJM, and as capacity prices rise as loads increase and reserve margins decline. Thus there are substantial gross margin benefits for the current Exelon nuclear facilities, benefits we estimate to be on the order of \$2 billion per year of gross margin after production cost.

Some of the numbers behind this calculation are more certain than others. Power plant capacity factors and production costs are based on the averages from the previous four years and may change in the future due to unexpected circumstances. PJM energy and capacity market prices are also based on recent observed values, and future year values are supported by electricity and natural gas futures markets, but could also differ from what we have forecast. We have the least information about current revenues but believe that our calculation based on system marginal costs with an added premium give a reasonable estimate.

⁵ System lambdas which are a reasonable estimator of system marginal costs have been about \$19/MWh, whereas recent market prices have been about 50% higher.

⁶ By “pre-PJM conditions,” we mean the revenues that Exelon would have obtained had it been paid its system marginal cost for all production. As pointed out above, this is not the same as its revenue under the bilaterals in existence, but is the best available comparative value available at this point for setting the 2004 PJM market revenues in context.

Exelon Returns

It may be helpful to consider Exelon's stock returns over the past few years. The values reported by Morningstar are: 2002: 14.1%; 2003: 30.2%; 2004: 37.6%. This increase may be due, in part, to rising margins on generating facility operations in Illinois and elsewhere. In 2004, the report ROE was 19.8%. In that year, the reported industry average was 11.8%.

Assumed 2005-2010 Exelon Nuclear Plant Fleet Characteristics

Plant Capacity	10,880	MW
Capacity Factor	93.5%	
Production Cost	12.69	\$/MWh

(Based on 2001-2004 averages.)

Estimated Nuclear Plant Revenue Impacts of New PJM Markets

Year	Annual Production Cost (M\$)	Average Energy Price	Annual Energy Revenue (M\$)	Capacity Value (\$/MW-day)	Capacity Revenue (M\$)	Total Revenue (M\$)	Gross Revenue Margin (M\$)
2003	1,115	20.85	1,856	n/a	n/a	1,856	741
Pre Mkt							
2004	1,111	20.85	1,863	n/a	n/a	1,863	752
PJM Mkt							
2004	1,111	30.81	2,753	28.0	111	2,864	1,753
2005	1,153	35.31	3,146	34.7	138	3,284	2,131
2006	1,176	39.81	3,547	45.6	181	3,729	2,552
2007	1,200	38.20	3,405	40.7	162	3,566	2,367
2008	1,227	38.97	3,482	40.3	160	3,642	2,415
2009	1,248	39.75	3,542	62.0	246	3,788	2,540
2010	1,273	40.54	3,613	68.2	271	3,884	2,611

5/26/2005

The above table gives two estimates of 2004 gross margin from those units, but only single estimates for years before and after that.⁷ The 2004 gross margin estimates are labeled “Pre Mkt 2004” and “PJM Mkt 2004,” referring to our two different assumptions about that year’s revenue source for Exelon, which estimates are (1) Exelon receives the ComEd annual average system lambda + 10%, i.e., the marginal energy cost for the ComEd system, and (2) Exelon receives the all-hours average PJM market price, respectively. The 2003 estimate is based on the system lambda assumption and is consistent with the Pre Mkt 2004 assumption, while the 2005-2010 estimates are based

⁷ The last column of the table is labeled “Gross Margin (M\$)” is an estimate of Exelon’s Gross Revenue from its Illinois nuclear plants minus our estimate of the Operating Expense of those units. It is “gross” because it does not reflect income taxes, depreciation, amortization, or interest expense, corresponding to the accounting concept of Gross Margin.

on estimates of PJM market clearing prices (mainly from published forward contract prices) and are consistent with the PJM Mkt 2004 assumption.

You will see from the table that the Post-2006 Gross Margin estimate is over \$2.25 Billion. Compared to our pre-PJM estimates for 2003 and Pre Mkt 2004, both about \$0.75 Billion, this is an increase of about \$1.50 Billion. After taxes at 27.5%, this translates to an additional \$1,088 million annually. As of Dec. 31, 2004 (according to Yahoo Finance) Exelon has \$7,598,000,000 in common stock equity. The extra \$906.25M translates to an *extra* 14% return on this equity in 2006 compared to 2003. While we believe that the Gross Margin estimates for 2005 and later are reasonable, the *difference in return* from earlier years is less certain.

The first reason is that the pre-PJM market 2003 and 2004 estimates of Gross Margin are based on the hypothetical market value of what would Exelon would have seen as the gross margin on operation of its Illinois nuclear fleet *if* the power had been sold into an imaginary power pool in which every generator was paid the clearing price in each hour it generated, but the clearing price was set by the actual variable cost of the most expensive unit dispatched, not by bid prices as in today's ISO energy markets. An additional 10% was added to these marginal generating costs to incorporate other factors such as capacity value. This cost-derived price is 67% above the average Exelon nuclear plant production costs reported for 2004. This represents a reasonable *illustrative* calculation of the value of the nuclear plants, but is not in any way the *actual* revenue in that period. Instead, the actual revenue for those plants was a complicated result of the imposed frozen retail rates, whatever bilateral contract was in place between ComEd and Exelon Generating, and perhaps other factors, none of which we have no values for.

The second reason for caution is that we have not done the analysis to say definitively what expense items might be legitimately subtracted from the Gross Margin estimate to derive an estimate of Net Revenue available for Return on Equity. As mentioned above, candidates might be interest on debt associated with these assets, along with depreciation and amortization on them. There may also have been capital additions. On the other hand, we have some reason to think that these items would be small. The Companies financial reports indicate that for *all* Exelon generating assets these items were only about 5% of total Revenue from those units in 2004. Also, we understand that these units were transferred to Exelon from ComEd at a very small value, and it is possible that Exelon could achieve further improvements in unit operating costs.

A third reason for caution is that some of the increase in Gross Margin was due to improved Operating Costs and average availability, factors that Exelon is generally credited with boosting through its own management efforts. Of course, it is an odd coincidence that Exelon suddenly found itself able to achieve those improvements only after the nuclear units were moved below the line and at a price that may not have recognized the potential for such improvement. Also, it is worth noting that generation is a small portion of Exelon's total profits.

In summary, it appears that Exelon will likely realize substantial additional return in 2006 (and future years) compared to its pre-PJM returns on equity from those plants due to the ability to reprice its Illinois nuclear fleet output at the PJM market clearing price and due to its own improved management. One estimate of that increase is about \$1.1 Billion, which would equate to an additional 14% ROE for the corporation, but many factors make it difficult to confirm that estimate.

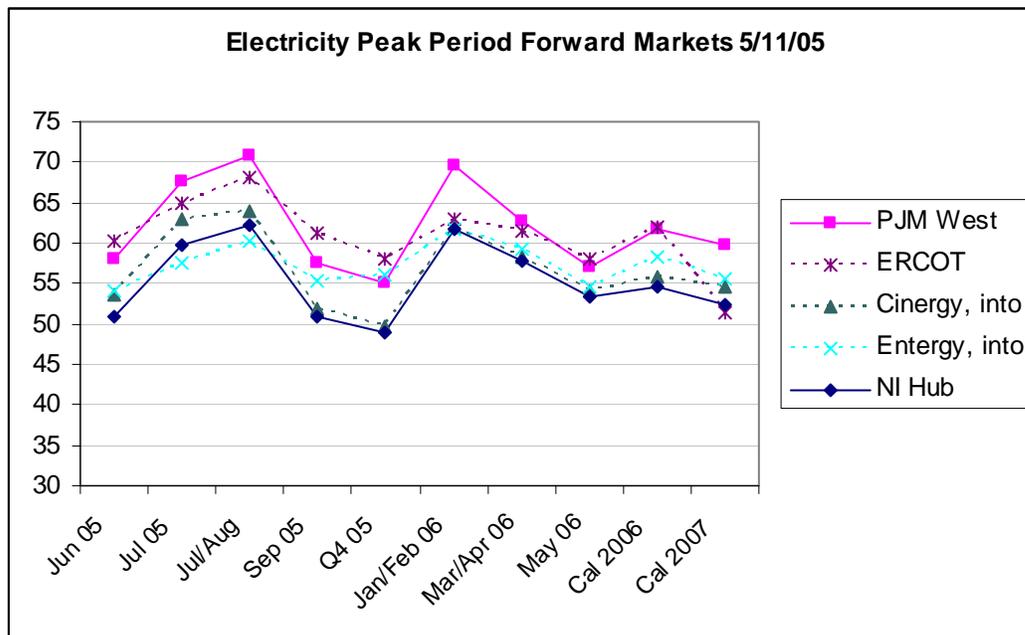
Appendix A – Methodology for Energy Price Forecasts

Our objective is to project the market energy price for generation from the Exelon nuclear power plants in Illinois. The primary basis for this prediction are the prices in the electricity forward markets. The Northern Illinois Hub indicated by “NI Hub” is the market of interest for the Exelon facilities. Although NI Hub prices are the lowest of the locations in this table, the ratio between NI Hub and PJM West prices is higher than observed in the past. In 2004 NI Hub peak prices averaged about 83% if those in PJM West. In the futures data shown below that ratio is a higher 88%. This may indicate a tendency towards greater price convergence in those two markets. Note also the slight decline in prices from 2006 to 2007.

Megawatt Daily Long-term Forward markets, May 11 2005

Period	Jun 05	Jul 05	Jul/Aug	Sep 05	Q4 05	Jan/Feb 06	Mar/Apr 06	May 06	Cal 2006	Cal 2007
NI Hub	51.00	59.85	62.25	51.00	49.00	61.75	57.75	53.45	54.60	52.40
PJM West	58.05	67.60	70.80	57.55	55.05	69.55	62.70	57.10	61.80	59.80
Cinergy, into	53.50	63.00	64.00	51.90	49.75	62.05	58.40	54.00	55.90	54.50
Entergy, into	54.20	57.55	60.25	55.40	56.00	61.65	59.15	54.70	58.30	55.50
ERCOT	60.30	65.00	68.05	61.15	58.00	63.00	61.40	58.10	61.95	51.35

All forward prices are in \$/MWh for on-peak delivery.



But these are peak period prices and they need to be translated into all-hours prices for the base load nuclear generators. From the existing hourly price data we can derive a relationship between all-hours and peak period prices. From the 2004 data we calculate this factor to be 0.729. This ratio is significantly lower than for the PJM Western Hub and represents the greater availability of less expensive baseload generation.

Year	2004	CHICAGO HUB
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Average of Price	Period		
	Off-Peak	Peak	All Hours
Month			
05	21.25	49.56	34.03
06	17.57	40.10	28.58
07	20.04	43.01	30.90
08	16.98	36.68	26.30
09	20.83	35.45	27.98
10	21.27	42.61	30.91
11	18.58	40.06	29.08
12	20.69	39.15	29.82
Grand Total	19.68	40.76	29.72

0.729 AH/Peak

Applying this adjustment factor to the peak price forwards we arrive at the following forecasts for the all-hours price.

Predicted All Hours Chicago Price

	<u>NI Hub</u>
Cal 2005	35.31
Cal 2006	39.81
Cal 2007	38.20