

UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

The People of the State of Illinois,)	
By Illinois Attorney General)	
Lisa Madigan,)	
Complainant,)	Docket No. EL15-
)	
v.)	
)	
Midcontinent Independent System Operator, Inc.,)	
Respondent.)	

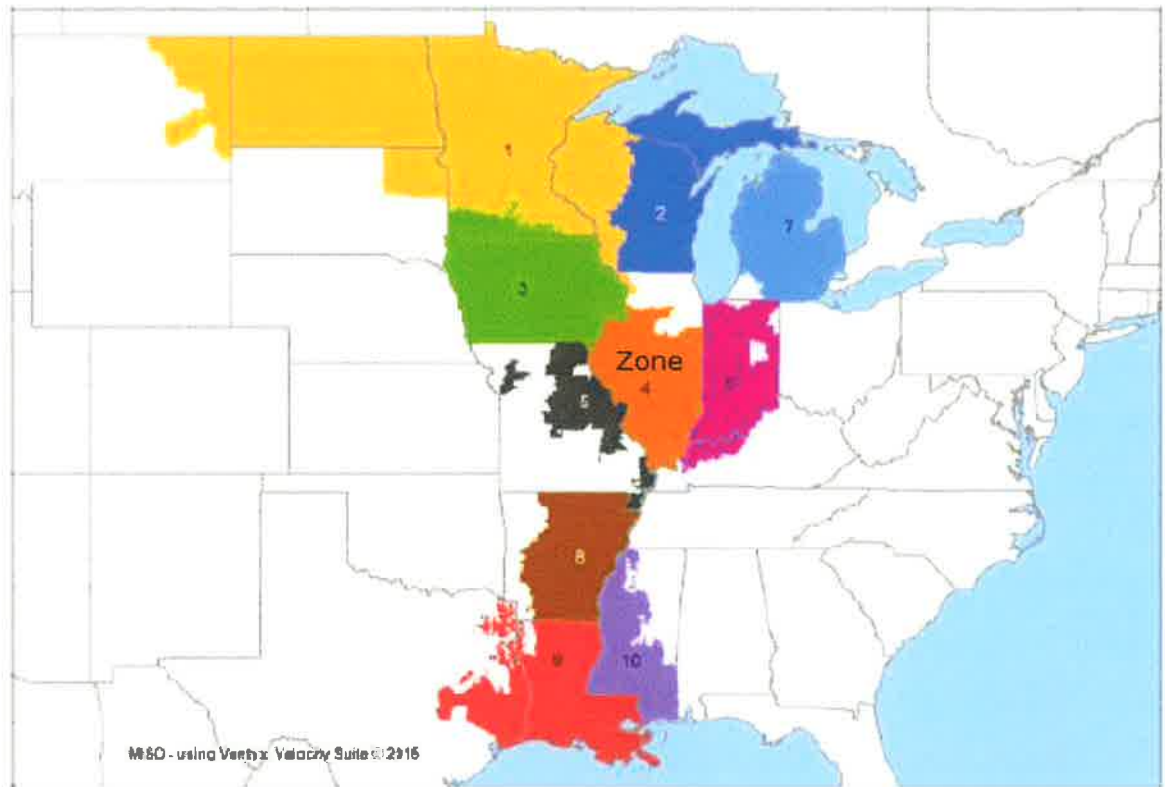
Affidavit of Robert McCullough

I, Robert McCullough, under oath, depose and state as follows:

1. My name is Robert McCullough. My address is 6123 S.E. Reed College Place, Portland, Oregon 97202. I am the principal of McCullough Research. I have worked on market power and manipulation issues in numerous cases including those in Alberta, British Columbia, Washington, Oregon, Nevada, Arizona, New Mexico, Illinois, Texas, and Louisiana. I have testified extensively on energy issues across the U.S. and Canada for the past thirty-five years. My curriculum vita is Attachment A to this affidavit. The statements and information in this affidavit are based on personal knowledge, my analysis of information obtained regarding the MISO Auction, and my years of experience.
2. On an annual basis, Midcontinent Independent System Operator (MISO) conducts an auction entitled the Planning Resource Auction (PRA) to find the price in dollars per

megawatt-day (\$/MW-Day) for electricity capacity. MISO conducts an auction for each of nine subregions in the MISO area.

3. MISO Zone 4 is limited to portions of central and southern Illinois that are within the MISO area, as shown below:



4. The first PRA was for the period June 1, 2013 to May 31, 2014 (the “2013/2014 year”) for seven zones in the MISO area. That auction produced a consistent capacity charge of \$1.05 for each of the zones.¹
5. The second PRA was for the period June 1, 2014 to May 31, 2015 (the “2014/2015 year”). The PRA included two additional zones (Arkansas and Louisiana, Mississippi

¹ Attachment B: 2013/2014 MISO Planning Resource Auction Results, available at: <https://www.misoenergy.org/Library/Repository/Report/Resource%20Adequacy/AuctionResults/2013-2014%20MISO%20Planning%20Resource%20Auction%20Results.pdf>.

and Texas), raising the number of zones to nine. That auction resulted in a price of \$16.75 for six of the nine zones, including Illinois.²

6. On April 14, 2015, MISO released its 2015/2016 Planning Resource Auction Results for the period June 1, 2015 through May 31, 2016. While the price in eight of the nine regions dropped to less than \$3.50/MW-day, the price per MW-day for Zone 4 increased to \$150/MW-day. MISO released the 2015/2016 Planning Resource Auction Results in the following table:³

Local Resource Zone	Z1 (MN, ND, Western WI)	Z2 (Eastern WI, Upper MI)	Z3 (IA)	Z4 (IL)	Z5 (MO)	Z6 (IN, KY)	Z7 (MI)	Z8 (AR)	Z9 (LA, MS, TX)	SYSTEM
CPDF (Coincident Peak Demand Forecast)	16,525	12,429	8,876	9,518	8,176	17,592	20,522	7,424	23,035	124,097
PRMR (Planning Reserve Margin Requirement)	18,321	13,566	9,768	10,420	8,910	19,409	22,678	8,118	25,170	136,359
LCR (Local Clearing Requirement)	15,982	12,332	8,695	8,852	6,527	14,677	21,442	7,850	23,609	N/A
Total Offer Submitted	4,867	3,071	5,922	11,156	7,926	14,832	14,103	9,562	26,193	97,632
Total FRAP (Fixed Resource Adequacy Plan)	14,494	11,817	4,113	838	0	4,853	9,456	397	2,261	48,229
Offer Cleared + FRAP	18,495	14,497	9,813	8,852	7,885	19,015	23,515	8,526	25,762	136,359
Import / (Export)	(175)	(931)	(45)	1,568	1,026	394	(837)	(408)	(592)	2,988
CIL (Capacity Import Limit)	3,735	2,903	1,972	3,130	3,899	5,649	3,813	2,074	3,320	N/A
CEL (Capacity Export Limit)	604	1,516	1,477	4,125	0	2,930	4,804	3,022	3,239	N/A
ACP (Auction Clearing Price) \$/MW-Day	\$3.48	\$3.48	\$3.48	\$150.00	\$3.48	\$3.48	\$3.48	\$3.29	\$3.29	N/A

7. MISO’s Executive Summary of the Auction Results reported:

² Attachment C: 2014/2015 Planning Resource Auction (PRA), available at: <https://www.misoenergy.org/Library/Repository/Report/Resource%20Adequacy/AuctionResults/2014-2015%20PRA%20Summary.pdf>.

³ Attachment D: 2015/2016 Planning Resource Auction Results, April 14, 2015, available at: <https://www.misoenergy.org/Library/Repository/Report/Resource%20Adequacy/AuctionResults/2015-2016%20PRA%20Results.pdf>

- a. The MISO region has adequate resources to meet its Planning Reserve Margin Requirements for the 2015/2016 planning year;
 - b. Zones 1-3 and 5-7 cleared at \$3.48/MW-day;
 - c. Zone 4 (much of Illinois), cleared at \$150.00/MW-day; and
 - d. Zones 8-9 (MISO South), cleared at \$3.29/MW-day.⁴
8. The dramatic price increase in Zone 4, central and southern Illinois, was not due to reliability concerns. In fact, the MISO Planning Resource Auction Results announcement makes it clear that the increase in Zone 4 was due to the bidding behavior within Zone 4:

Key Auction Takeaways

- Price differentials between 2014-15 and 2015-16 results were mainly driven by changes in market participant offers.
 - The 2015 price in Zone 4 was also impacted due to the binding of the zonal capacity requirement to procure a certain amount of capacity with the zone (LCR)
 - This requirement for Zone 4 was substantially the same as in the 2014/2015 Auction.⁵
9. The availability of sufficient capacity to meet MISO requirements was addressed in the North American Electric Reliability Corporation (“NERC”) 2015 Summer Reliability Assessment:

MISO does not foresee significant impacts to reliability during the 2015 summer season due to environmental or regulatory restrictions. MISO does anticipate that developing EPA regulations will impact MISO in the future, but the main impacts are anticipated beyond the 2015 summer season.⁶

⁴ *Id.* at page 2.

⁵ *Id.* at page 8.

⁶ 2015 Summer Reliability Assessment, North American Reliability Corporation, May 2015, page 23, available at: http://www.nerc.com/pa/rapa/ra/reliability%20assessments%20dl/2015_summer_reliability_assessment.pdf.

10. The following table shows the Zone 4 changes between the 2015/2016 auction and the 2014/2015 auction:

	2015/2016	2014/2015
Local Resource Zone	Z4 (IL)	Z4 (IL)
CPDF (Coincident Peak Demand Forecast)	9,518	9,680
PRMR (Planning Reserve Margin Requirement)	10,420	10,616
LCR (Local Clearing Requirement)	8,852	8,879
Total Offer Submitted	11,156	11,370
Total FRAP (Fixed Resource Adequacy Plan)	838	874
Offer Cleared + FRAP	8,852	9,316
CIL (Capacity Import Limit)	3,130	3,025
CEL (Capacity Export Limit)	4,125	1,961
ACP (Auction Clearing Price) \$/MW-Day	\$150.00	\$16.75

It should be noted that no major changes occurred between this auction and the previous auction. In fact, the few changes that did occur would have decreased the auction clearing price, not increased it.

11. The structure of the MISO capacity auction is established in its tariffs, approved by the Commission. Modules D and E-1 describe the auction process as including the following: MISO studies determine: (1) how much capacity the system needs to supply local needs, or the “Planning Reserve Margin Requirement;” (2) the capacity that is available, or the “unforced capacity” of MISO resources in each zone; (3) the local clearing requirement, meaning the amount of capacity that must be obtained from generators within the zone; (4) import and export limits, or the amount of capacity that can be imported and exported from the zone; and (5) the availability of transmission within and between zones. These determinations are made in advance of the auction and

are freely available to all participants. The following table⁷ shows these values for all nine MISO subregions:

Local Resource Zone (LRZ)	Z1 (MN, ND, Western WI)	Z2 (Eastern WI, Upper MI)	Z3 (IA)	Z5 (MO)	Z7 (MI)	Z4 (IL)	Z6 (IN, KY)	Z8 (AR)	Z9 (LA, MS, TX)	SYSTEM
Coincident Peak Forecast (CPF)*	18,525.1	12,371.6		37,574.4		9,518.1	17,592.3	30,458.9		124,040.4
Transmission Loss MW (TL) for CPF*	581.4	236.3		1,039.1		210.7	529.9	622.4		3,219.8
Planning Reserve Margin Requirements (PRMR)*	18,320.9	13,503.0		41,356.0		10,419.5	19,409.0	33,287.8		136,296.2
Installed Capacity (ICAP)*	23,957.8	16,843.7		50,375.3		15,559.9	22,947.9	46,184.0		175,868.6
Unforced Capacity (UCAP)*	19,896.5	15,415.9		41,984.3		13,481.8	21,433.7	43,037.5		155,249.6
Zonal Coincident Peak Forecast (ZCPF)*	17,145.5	12,936.3		39,025.2		9,658.2	17,811.0	31,389.2		127,963.4
Transmission Loss MW (TL) for ZCPF*	601.6	299.9		1,080.3		213.5	534.1	641.6		3,371.0
Local Resource Requirement (LRR)*	19,717.0	15,234.8		46,347.6		11,981.8	20,326.4	36,852.9		150,460.5
Capacity Import Limit (CIL)	3,735.0	2,903.0	1,972.0	3,899.0	3,813.0	3,130.0	5,649.0	2,074.0	3,320.0	N/A
Capacity Export Limit (CEL)	604.0	1,516.0	1,477.0	0.0	4,804.0	4,125.0	2,930.0	3,022.0	3,239.0	N/A
Local Clearing Requirement (LCR)*	15,982.0	12,331.8		36,663.6		8,851.8	14,677.4	31,458.9		N/A

12. As shown in the table in paragraph 6 above, the 2015/2016 PRA was based on and incorporated these data, values, and requirements.⁸
13. The auction data supports the statements of MISO and NERC that no shortage is present in central and southern Illinois (Zone 4).
14. As shown in the table in paragraph 6 above, for the 2015/2016 PRA, MISO required that 10,420 MW of capacity be available in Zone 4 to meet the Planning Reserve Margin Requirement for Zone 4.
15. As demonstrated in the table in paragraph 11 above, in Zone 4, available supply or “unforced capacity” of 13,481.8 MW is available to meet the 2015/2016 PRA Zone 4 Planning Reserve Margin Requirement of 10,420 MW.
16. While the “unforced capacity” or available supply in Zone 4 is more than sufficient to meet the Planning Reserve Margin Requirement for the zone, the ownership of supply in Zone 4 is highly concentrated. I calculated the Herfindahl-Hirschman Index of the Zone

⁷ 2015-2016 Preliminary Resource Adequacy Data, MISO, March 3, 2015, available at <https://www.misoenergy.org/Library/Repository/Report/Resource%20Adequacy/AuctionResults/2015-16%20Preliminary%20Planning%20Resource%20Auction%20Data.pdf>.

⁸ Attachment D, 2015/2016 Planning Resource Auction Results, MISO, April 14, 2015, page 6.

4 market using the 2015/2016 PRA bid data made available by MISO. The bid data made available by MISO shows a Herfindahl-Hirschman Index (HHI) of 2,562.⁹ Any score over 1,800 is considered “highly concentrated” by the Commission.¹⁰ I calculated the HHI using the standard formula on bid data, by market participant, using bids received in MISO Zone 4. The only adjustment I made to the bid data was to combine two Dynegy subsidiaries that are reported separately in the bid data.

17. It is MISO practice to assign masked bidder identification numbers to bids. Dynegy publicly released the total number of MWs it cleared in the auction by each subsidiary:

Dynegy Reports MISO Capacity Auction Results

Dynegy Inc. (NYSE:DYN) today reported its results from the MISO capacity auction for planning year 2015/16.

Zone 4 cleared the 2015/2016 MISO capacity auction at \$150 per megawatt-day. Dynegy's IPH segment cleared 1,864 megawatts (MW) at that price, including 1,709 MW that are estimated to cover retail load obligations. Dynegy's coal segment cleared 398 MW in the auction, also at that price.¹¹

18. Since the offer data identifies the amount of each bid that is awarded in the auction, the masked bidder IDs shown in the MISO spreadsheet can be matched with the Dynegy announcement. In this case, Illinois Power Holdings (IPH) matches masked market participant ID 2132 and Dynegy's coal segment matches ID 2424.

⁹ 2015-2016 PRA Detailed Report, available at: <https://www.misoenergy.org/Library/Pages/ManagedFileSet.aspx?SetId=2054>.

¹⁰ FERC Docket No. RM11-14-000, *Analysis of Horizontal Market Power under the Federal Power Act*, Order Reaffirming Commission Policy and Terminating Proceeding at 55 (Feb. 16, 2012), 138 FERC ¶61,109. available at: <http://www.ferc.gov/whats-new/comm-meet/2012/021612/E-2.pdf>.

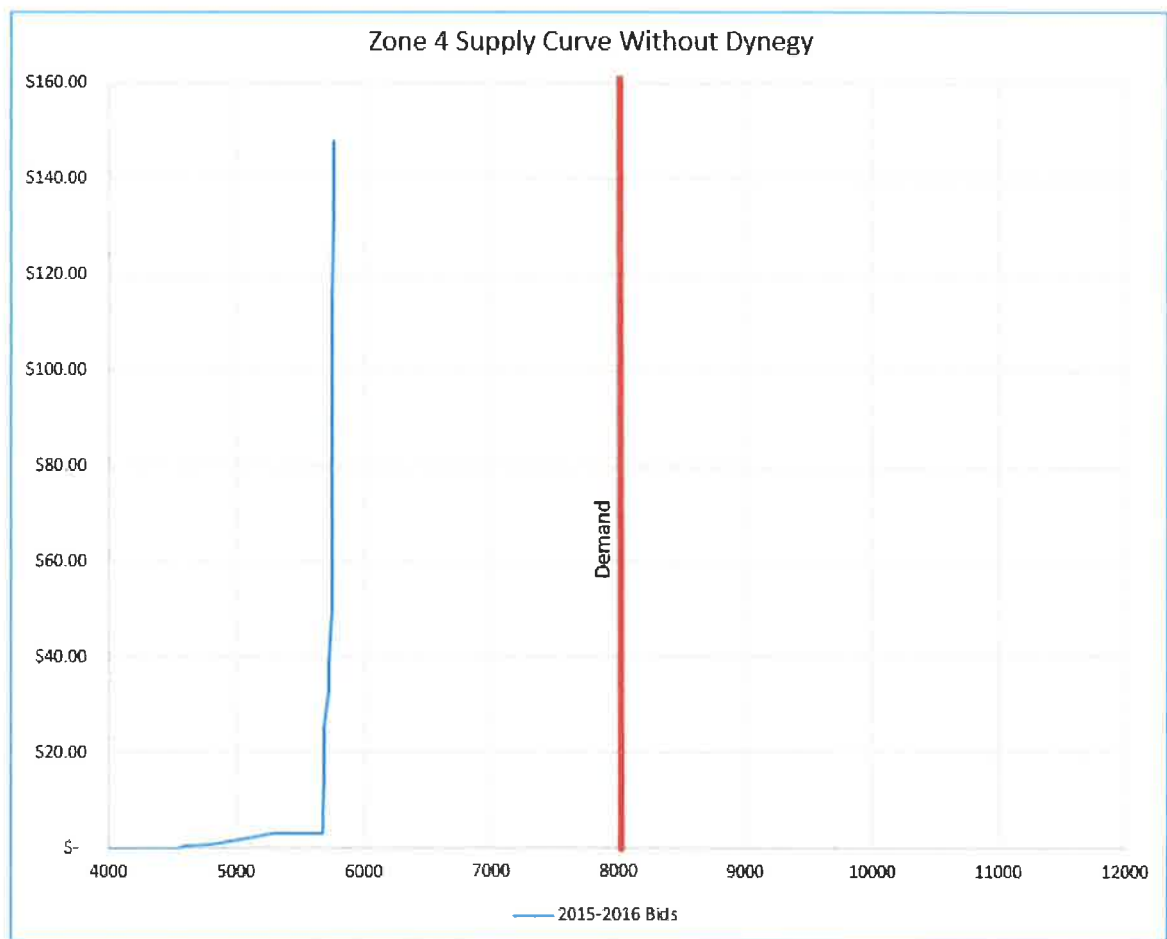
¹¹ Dynegy Reports MISO Capacity Auction Results, Dynegy, April 14, 2015, available at: http://phx.corporate-ir.net/phoenix.zhtml?c=147906&p=irol-newsArticle_Print&ID=2035099.

19. Illinois Power Holdings is the Dynegy entity that owns five power plants purchased from Ameren on December 2, 2013. The acquisition gave Dynegy roughly half of the capacity of Zone 4. Of the 11,156 MW of bids received in Zone 4, 5,404.5 MWs are owned by Dynegy.
20. Ownership of roughly half of the capacity in a specific zone is not material to MISO as a whole unless that zone is a distinct submarket. Zone 4 is a distinct submarket because Zone 4 is treated as a separate zone for capacity supply in the PRA design. In addition, there is limited transmission into Zone 4 – limited to 3,130 MWs of imported capacity – and MISO set a requirement that 8,852 MWs be procured from resources located within Zone 4.
21. It is often difficult to see the impact of overlapping constraints – breakfast when the wallet holds only \$10 and the waistline limits the choice to 500 calories. In this case, the interaction of three constraints – load requirements, import capacity, and required local generation – can be confusing.
22. The simplest way to understand this market is that regardless of other constraints, the local participants in Zone 4 must provide 8,852 MWs of local generation. Since Dynegy owns half the local generation, this requirement cannot be met without its participation. Dynegy is the pivotal supplier for Zone 4 – its participation in the market is required to meet the reliability standards set by MISO.
23. MISO has identified 13,481.8 MW of total unforced capacity in Zone 4. Dynegy has 6,400 MWs.¹² Without Dynegy’s capacity, there are only 7,081 MWs available to meet an 8,852 MW requirement. If all non-Dynegy unforced capacity was offered, a capacity

¹² Attachment E: Electricity Market Overview Competitive States, Dynegy, undated, page 2.

gap of (8,852 MW – 7,081 MW) 1,771 MW would remain. Not all unforced capacity was offered in the auction. Dynegy only offered 5,404.5 MW. Other suppliers also did not offer their full unforced capacity. Total offers for bidders not including Dynegy comprised 5,751.9 MW which left a gap of (8,014 MW – 5,751.9 MW =) 2,262.1 MW.

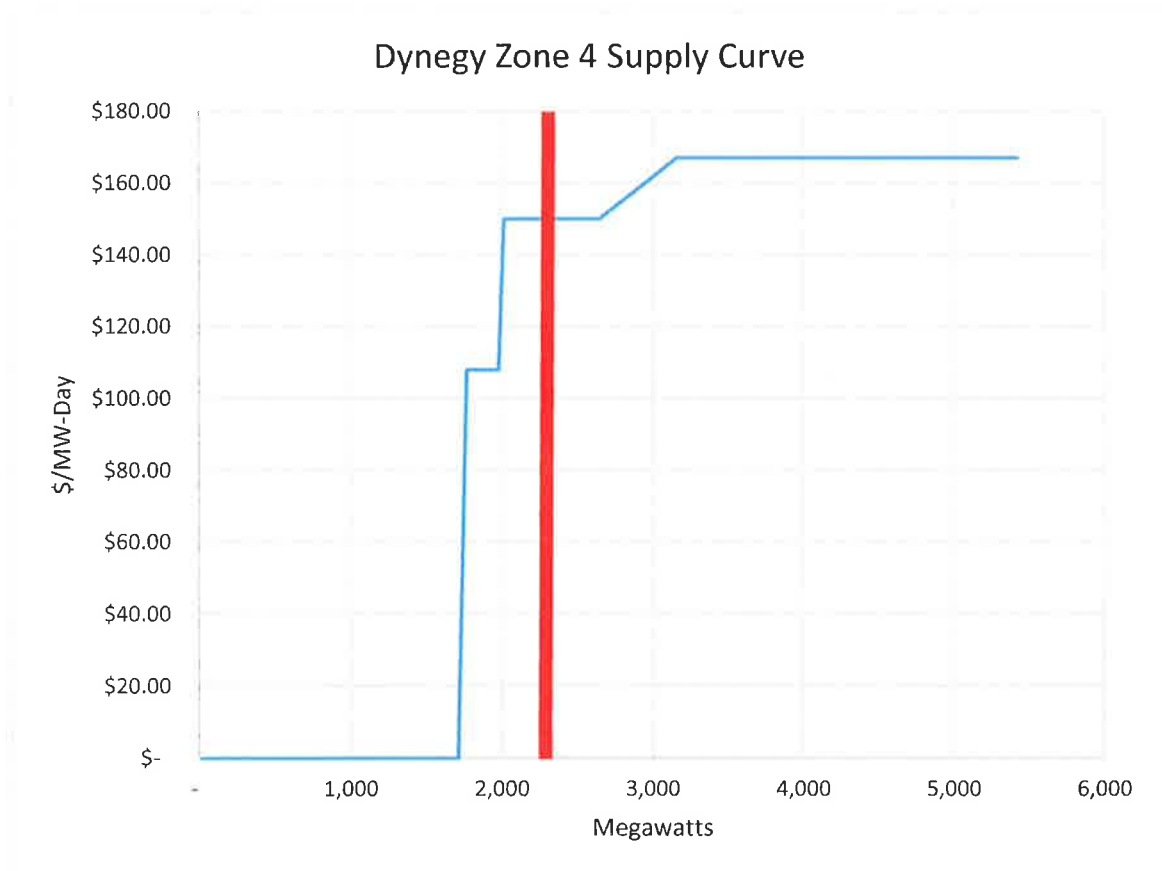
24. A pivotal supplier is effectively equivalent to a monopolist. Since the market cannot clear without its participation, it can set whatever price it chooses. The following chart shows the supply curve for bidders other than Dynegy in Zone 4 based on the bidding data MISO released on May 14, 2015:



Regardless of the price offered, the non-Dynegy bidders in Zone 4 cannot meet the local capacity requirement. No bids with prices over \$4.00/MW-Day represent more than 37.5

megawatts, so a rational pivotal supplier would set the price as high as possible for the megawatts required to fill the gap.

25. In this case Dynegy bid a price of \$150/MW-Day in Zone 4. Its supply curve effectively sets the clearing price at this level since it is where the 2,262.1 MW gap shown above crosses its offer:



26. Once the offers of the other Zone 4 bidders had been accepted, the only remaining supplier was Dynegy. The remaining demand of 2,262.1 MW crosses the Dynegy offer curve at \$150/MW-Day.
27. A critical question is why Dynegy chose to set the price at \$150/MW-Day instead of some other price. The choice of the price reflected a maximum threshold determined by MISO's Independent Market Monitor above which bids would be mitigated, or settled in the auction at a new price assigned by MISO as set out in Module D of MISO's FERC

Electric Tariff. Each year the market monitor sets a reference level based on the assumed opportunity cost of export to PJM.¹³ This year the reference level was \$155.79/MW-Day.

28. The optimal strategy for Dynegy, therefore, is to recognize the gap quantity after all other resources have been bid and develop a bidding strategy that will bid to fill the gap so that the price is close to, but not over, the market monitor's Reference Level threshold, which was set to reflect the estimate opportunity cost of exporting capacity to a neighboring region.

29. The reference level value has many doubtful features, not least of which is that it is supposedly based on a MISO generator's opportunity cost. The MISO Independent Market Monitor's study states:

The potential opportunity cost for MISO capacity suppliers to sell capacity to PJM participants as replacement capacity is based on the penalty a participant would pay if it is short of its required resources.¹⁴

30. The study also notes that actual bilateral data is not available. PJM, conversely, states that:

average MW-weighted cost to purchase replacement capacity across all IAs conducted to-date has been just above 20% of the BRA price.¹⁵

31. Dynegy's filings in the FERC EQR database indicate that its revenues from PJM are very significantly lower, casting doubt on the premise that the reference level represents a Zone 4 generator's actual opportunity cost. For the previous nine months, Dynegy's

¹³ Attachment F, *Initial Reference Level For Zonal Reserve Offers: 2015/2016 Delivery Year*, Potomac Economics, September 11, 2014, available at: <https://www.misoenergy.org/Library/Repository/Report/IMM/2015-2016%20Initial%20Reference%20Level%20for%20Zonal%20Resources.pdf>

¹⁴ *Id.*, page 2.

¹⁵ PJM, *Procurement of Replacement Capacity via Incremental Auctions*, August 26, 2013, page 11, available at: <http://www.pjm.com/~media/committees-groups/task-forces/cstf/20130826-rpm/20130826-item-02-cstf-replacement-capacity-in-the-incremental-auctions-education.ashx>.

subsidiary, Illinois Power Holdings, through its marketing arm Illinois Power Marketing Company d/b/a Homefield Energy, has offered capacity to PJM for \$25.51 and \$5.54 per MW-day.¹⁶

seller_company_name	customer_company_name	product_name	tr_begin_date	transaction_quantity	Price
ILLINOIS POWER MARKETING COMPANY	PJM INTERCONNECTION, L.L.C.	CAPACITY	3/1/2015	93	\$ 25.51
ILLINOIS POWER MARKETING COMPANY	PJM INTERCONNECTION, L.L.C.	CAPACITY	3/1/2015	2290.9	\$ 5.54
ILLINOIS POWER MARKETING COMPANY	PJM INTERCONNECTION, L.L.C.	CAPACITY	2/1/2015	2069.2	\$ 5.54
ILLINOIS POWER MARKETING COMPANY	PJM INTERCONNECTION, L.L.C.	CAPACITY	2/1/2015	84	\$ 25.51
ILLINOIS POWER MARKETING COMPANY	PJM INTERCONNECTION, L.L.C.	CAPACITY	1/1/2015	2290.9	\$ 5.54
ILLINOIS POWER MARKETING COMPANY	PJM INTERCONNECTION, L.L.C.	CAPACITY	1/1/2015	93	\$ 25.51
ILLINOIS POWER MARKETING COMPANY	PJM INTERCONNECTION, L.L.C.	CAPACITY	12/1/2014	93	\$ 25.51
ILLINOIS POWER MARKETING COMPANY	PJM INTERCONNECTION, L.L.C.	CAPACITY	12/1/2014	2290.9	\$ 5.54
ILLINOIS POWER MARKETING COMPANY	PJM INTERCONNECTION, L.L.C.	CAPACITY	11/1/2014	2217	\$ 5.54
ILLINOIS POWER MARKETING COMPANY	PJM INTERCONNECTION, L.L.C.	CAPACITY	11/1/2014	90	\$ 25.51
ILLINOIS POWER MARKETING COMPANY	PJM INTERCONNECTION, L.L.C.	CAPACITY	10/1/2014	2290.9	\$ 5.54
ILLINOIS POWER MARKETING COMPANY	PJM INTERCONNECTION, L.L.C.	CAPACITY	10/1/2014	93	\$ 25.51
ILLINOIS POWER MARKETING COMPANY	PJM INTERCONNECTION, L.L.C.	CAPACITY	9/1/2014	2217	\$ 5.54
ILLINOIS POWER MARKETING COMPANY	PJM INTERCONNECTION, L.L.C.	CAPACITY	9/1/2014	90	\$ 25.51
ILLINOIS POWER MARKETING COMPANY	PJM INTERCONNECTION, L.L.C.	CAPACITY	8/1/2014	93	\$ 25.51
ILLINOIS POWER MARKETING COMPANY	PJM INTERCONNECTION, L.L.C.	CAPACITY	8/1/2014	2290.9	\$ 5.54
ILLINOIS POWER MARKETING COMPANY	PJM INTERCONNECTION, L.L.C.	CAPACITY	7/1/2014	93	\$ 25.51
ILLINOIS POWER MARKETING COMPANY	PJM INTERCONNECTION, L.L.C.	CAPACITY	7/1/2014	2290.9	\$ 5.54

Second, the very significant debates in the course of Commission Docket EL14-503 indicate that the recently imposed restrictions on the export of capacity from MISO to PJM have had a very significant impact on the market:

The new rules, which FERC approved in April, created five export zones with a combined limit of 6,499 MW for the 2014 BRA. Cleared generation imports dropped to 4,526 MW in 2014, a reduction of almost 40% from 2013.¹⁷

32. The filings in EL14-503 included a debate between the market monitor of MISO and that of PJM. The MISO Independent Market Monitor (“MISO IMM”) filed comments saying:

While it may be true that allowing surplus external capacity resources to sell into the PJM capacity market will reduce capacity prices in PJM, this is efficient and is the virtue of competitive, seamless RTO markets. This is

¹⁶ Available at: <http://www.ferc.gov/docs-filing/eqr/data.asp>.

¹⁷ FERC Rejects Challenge on PJM Capacity Import Limit, RTO Insider, January 26, 2015, available at: <http://www.rtoinsider.com/ferc-pjm-import-limits-12722>.

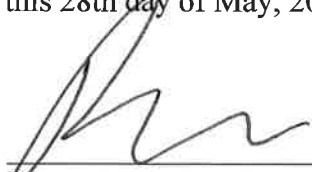
a benefit to which PJM's consumers are entitled, consistent with the stated goal of PJM to provide "reliable service at the lowest cost".¹⁸

33. In the 2015/2016 PRA for Zone 4, Dynegy was allowed to set the price without being subject to mitigation because the Reference Level was based on an assumption of unconstrained access to the PJM market. This was despite the MISO IMM's objection to PJM rules that limit MISO generators' access to the PJM markets. Given the constraints on selling capacity into PJM identified by the MISO IMM, it is not surprising that Dynegy (Illinois Power Holdings) reported actual revenues available from sales to PJM markets as significantly less than the opportunity cost assumption upon which the MISO IMM based the reference price.

34. Dynegy's additional revenues from the exercise in market power are equal to $(\$150.00/\text{MWh-Day} - \$3.48/\text{MWh-Day}) \times 2,258.9 \text{ MWs} \times 365$ or \$120,805,520.22. If the effect of the pivotal supplier in Zone 4 had been addressed, I expect that the Zone 4 capacity price from the 2015/2016 PRA would have been the same as in Zones 1-7.

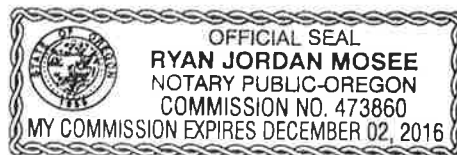
35. This completes my affidavit.

Signed and sworn under penalties of perjury this 28th day of May, 2015.


Robert McCullough

Signed and sworn before me
this 28 day of May, 2015.


Notary Public



¹⁸ FERC Docket No. EL14-503, Comments Of The Midcontinent ISO's Independent Market Monitor, March 11, 2014, page 7.