



MEMORANDUM

October 28, 2014

Analysis of Paducah Power System's Recent and Future Cost of Power from the Prairie State Energy Campus

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Summary:

Paducah Power System (PPS) ratepayers paid \$40 million more to buy electricity from the Prairie State Energy Campus power plant in Southern Illinois during the twenty month period starting in January 2013 than it would have cost to purchase the same amounts of power from the regional MISO wholesale markets. And even if Prairie State operates properly and its costs and performance are in line with the owners' current claims, PPS's ratepayers may pay \$150 million more over the next ten years (2015-2024) for power from the plant than it would cost to buy the same capacity and energy from the wholesale markets.

The purpose of this report is to investigate why electricity is so expensive in Paducah and what are the causes of the financial and fiscal stresses being felt by Paducah, its businesses and its residents. We have found that the reasons for PPS's high cost of power include extremely high monthly debt service costs due to Prairie State's \$5 billion construction cost, the plant's poor operating performance, and the failure by plant owners to deliver on the promise that the plant would provide stable, low cost power. Our analysis shows that as long as PPS continues to buy power from Prairie State there will be little relief for ratepayers anytime soon. This is true even if the plant operates better in coming years than it has in the more than two years since it began providing power to PPS.

Key Findings:

1. Buying power from Prairie State during the twenty month period between January 2013 and August 2014, cost PPS and its ratepayers \$40 million more than it would have cost to purchase the same amounts of capacity and energy from the MISO wholesale markets. This \$40 million figure would be even higher if it included the approximately \$6.8 million in debt service costs from March, April and May 2013 that Kentucky Municipal Power Agency (KMPA) has not yet billed to PPS or if it included the higher costs that PPS paid for Prairie State power in 2012.

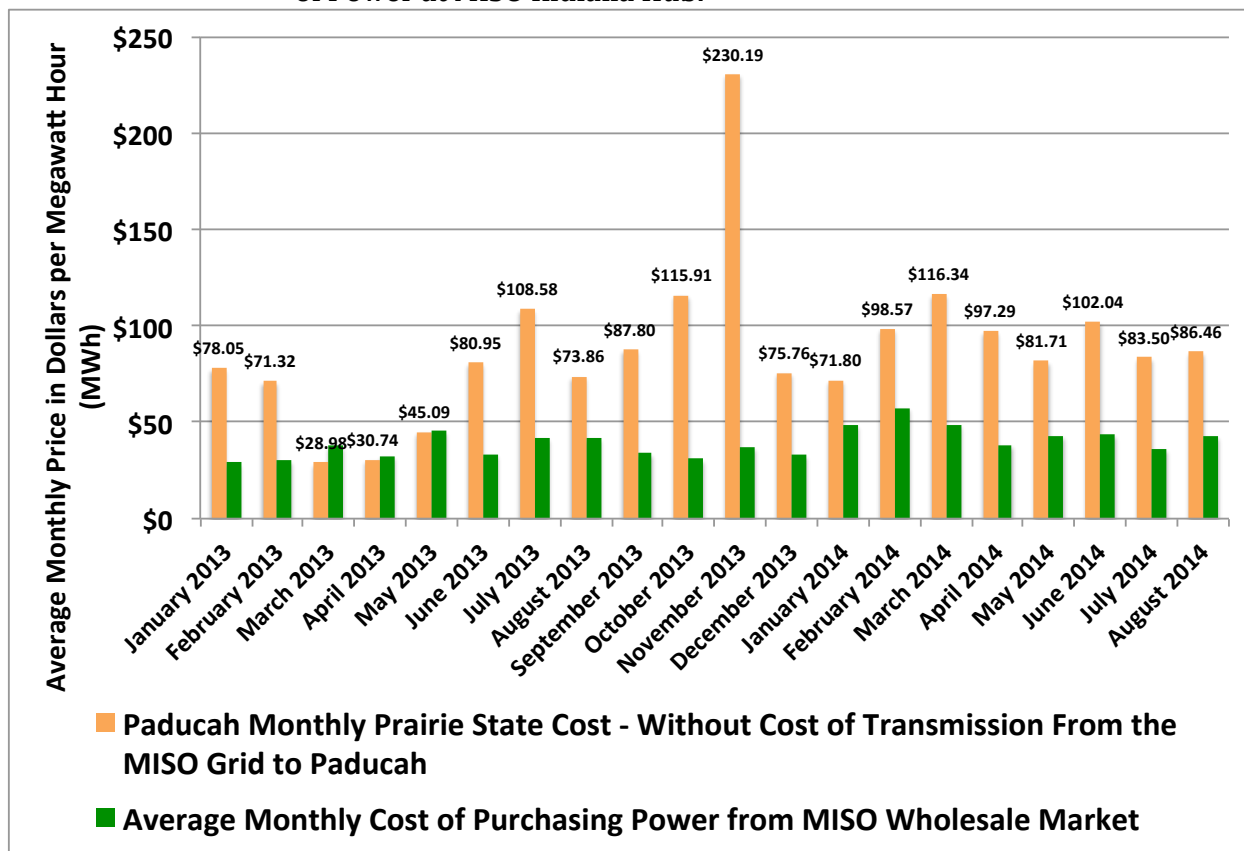
2. Even if the plant operates properly and its costs and performance are in line with the owners' current claims, PPS and its ratepayers may pay over \$150 million more over the next ten years (2015-2024) for power from Prairie State than it would cost to buy the same amounts of capacity and energy from the competitive MISO wholesale markets.
3. Moreover, the cost of power from Prairie State is likely to be more expensive than buying power from the competitive MISO wholesale markets beyond 2024.
4. Consequently, if PPS continues to buy power from Prairie State, there is no relief in sight in the foreseeable future for Paducah and its ratepayers even if there is a turnaround at Prairie State in the near future and the plant operates as advertised.
5. There are two major reasons why the cost of power from Prairie State has been so expensive: the debt service costs associated with KMPA's 7.835 percent ownership share of the \$5 billion it cost to build Prairie State and the plant's poor operating performance since it went into commercial service in June 2012.
6. Approximately 56 percent of what PPS paid for power from Prairie State during the period January 2013 through August 2014, excluding transmission costs, was for the high debt service costs associated with paying for KMPA's share of the plant's construction cost. Thus, it is hard to believe that there can be a major decrease in PPS's cost of power unless the high debt service costs can be reduced either by exiting the contract to buy power from Prairie State or by refinancing at lower interest rates.
7. Although they have recently denied it, Prairie State's owners did predict that the plant would operate at a high capacity factor during its early years of being in commercial service. For example, reports prepared by R.W. Beck, KMPA's consultant, in 2007, 2010 and 2012 all predicted that Prairie State would operate at a capacity factor of 85 percent, or higher, during its first 2 years of operation. In contrast, the plant's actual capacity factor through August 2014 (slightly longer than its first two years) was only 60 percent.
8. More recent forecasts by Prairie State's owners all have been wrong as the plant has operated worse and cost more to operate in 2013 and 2014 than the owners had predicted. Even though their recent forecasts of Prairie State's operating performance in 2013 and 2014 have been shown to have been wrong, the plant's owners continue to say that the plant will turn a corner during the next few years. However, there is no evidence to support this claim.

Discussion:

I have reviewed the bills that the Paducah Power System (PPS)) received from the Kentucky Municipal Power Agency (KMPA) for the months of January 2013 through August 2014. These bills show that, on average, during this twenty-month period, PPS paid \$81.39 per Megawatt Hour (MWh) to KMPA for power from Prairie State, without considering the

cost of transmitting the power to Paducah from a nearby MISO grid location.¹ As shown in Figure 1, below, PPS’s average monthly cost of power from Prairie State has been significantly higher than the MISO wholesale market cost for the same amounts of capacity and energy. The price of power from Prairie State also is much higher than the \$47-\$50 per MWh that KMPA’s consultant, R.W. Beck projected during construction.

Figure 1: PPS’s Monthly Cost of Power from PSEC versus Average Monthly Price of Power at MISO Indiana Hub.



Four main categories of costs contribute to the high prices that PPS has paid for the power it gets from Prairie State:

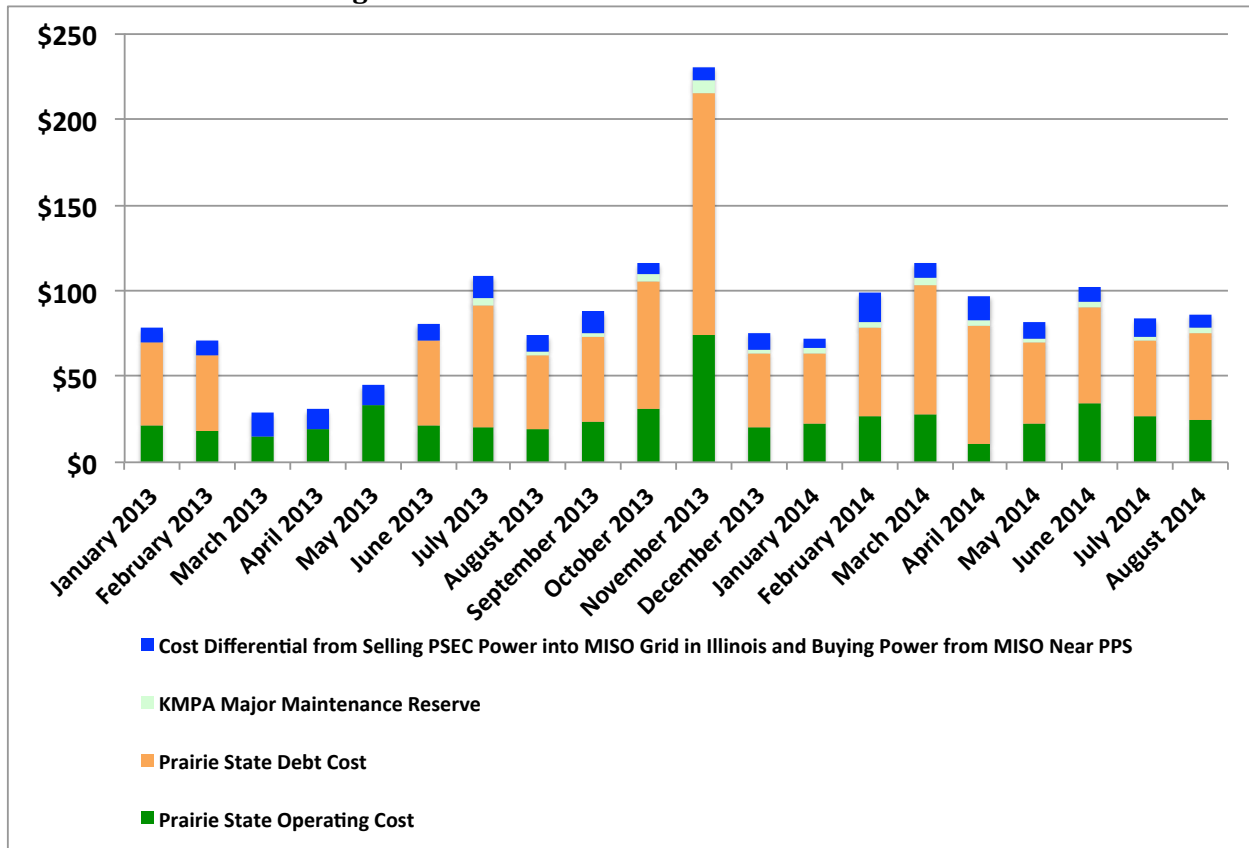
1. The plant’s *operating performance* has been worse than the owners claimed it would be and its operating costs have been higher.
2. PPS has had to pay for 83.87 percent of KMPA’s high *Prairie State-related debt* service costs.
3. KMPA decided to begin in July 2013 to collect a *major maintenance reserve*, presumably for Prairie State as that is KMPA’s only generating asset. PPS’s monthly share of this fund is almost \$147,000.

¹ PPS’s average cost of power from Prairie State would have been \$88.62 per MWh during this period if we had included the three months \$6.8 million of debt service costs (in March, April and May 2013) that KMPA has not yet passed along to PPS.

4. KMPA receives *lower prices from selling power* Prairie State into the MISO grid in Illinois than it must pay to buy the power back from the grid at a node closer to Prairie State.

Figure 2, below, shows the breakdown for each of these cost categories within the average monthly prices that PPS has paid for Prairie State power (again without the transmission costs).

Figure 2: PPS’s Monthly Cost of Power from PSEC Disaggregated Into Major Cost Categories.



As can be seen from Figure 2, PPS’s share of KMPA’s Prairie State debt is the biggest element of Prairie State-related cost in each month. In fact, debt service costs accounted for approximately 56 percent of the total amount (without transmission costs) that PPS paid for power from Prairie State during the period January 2013 through August 2014.

PPS pays more than \$30 million per year in Prairie State-related debt service costs from KMPA’s 7.835 percent share of the \$5 billion cost of building Prairie State. This \$5 billion cost was much higher than agencies (like KMPA) and communities like Paducah were told it would cost to build Prairie State when they were enticed to join as owners or to enter into long-term power purchase agreements.

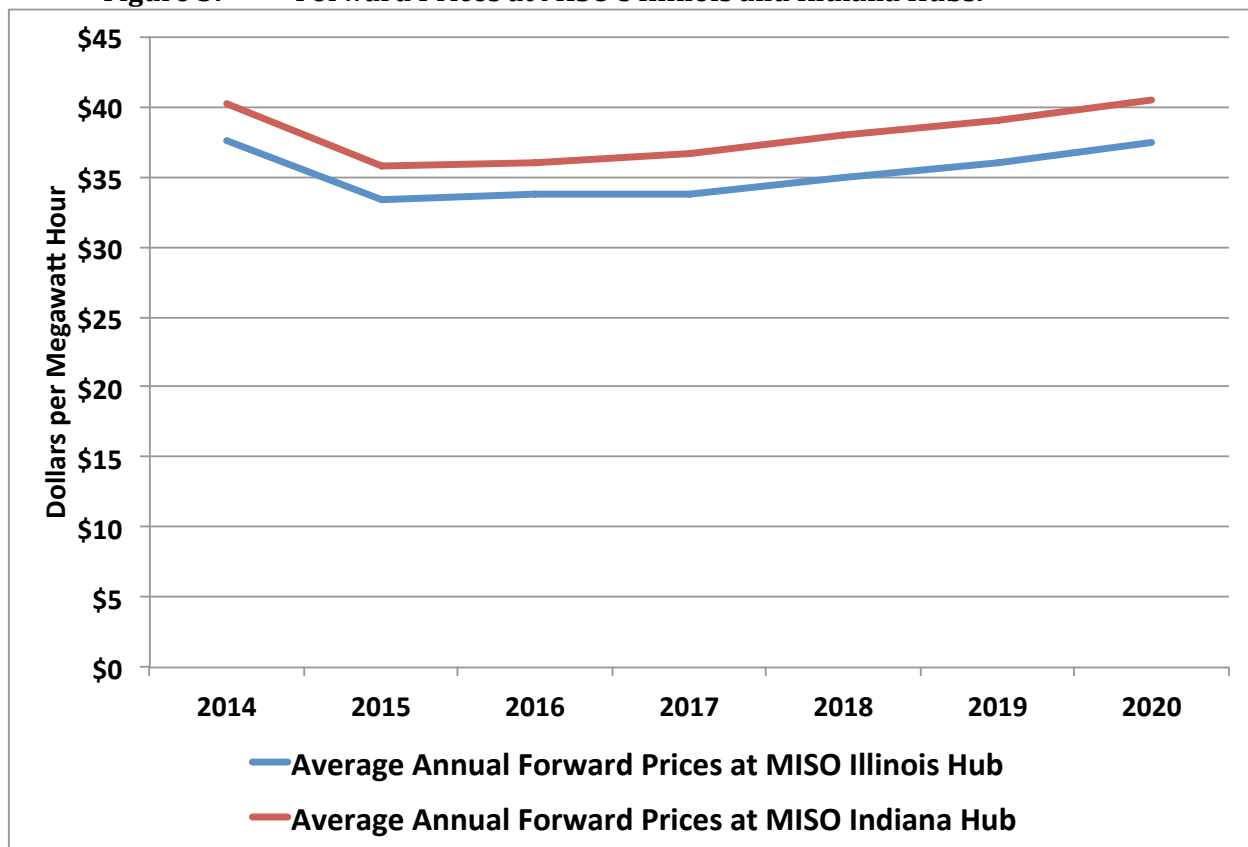
Consequently, it is hard to believe there will be any major reduction in PPS’s cost of power unless the extremely large debt service costs it is paying each month to cover KMPA’s Prairie State-related debt are substantially reduced, either by exiting the contract for

power from Prairie State or by refinancing KMPA's debt at a significantly lower interest rate.

PPS also has paid higher power prices because KMPA sells its share of the power generated by Prairie State into the MISO grid in Illinois and then buys the power back from the grid at a MISO location (called a hub or a node) that is closer to Paducah and Princeton, KY. This is required by MISO's rules and would be good for ratepayers if the prices that KMPA received for selling the power in Illinois were higher than the prices it paid for buying the power back at the MISO node nearer Paducah. Unfortunately, this has not been the case as shown in Figure 2, above, and this is unlikely to change anytime in the foreseeable future, as shown in Figure 3, below.

Figure 3 compares the forward (that is, currently expected future) power prices at MISO's Illinois and Indiana Hubs. The MISO Illinois Hub is where KMPA sells its share of the power generated at Prairie State. The MISO Indiana Hub is a proxy for where KMPA buys the power back from the MISO grid. As can be seen from this Figure, the price of power at the MISO Illinois Hub is likely to remain lower than the cost of power at MISO's Indiana Hub for the foreseeable future. This will hurt continue to PPS and its ratepayers and may be alleviated but likely not to be avoided entirely even if PPS hires a new, more effective power marketing consultant.

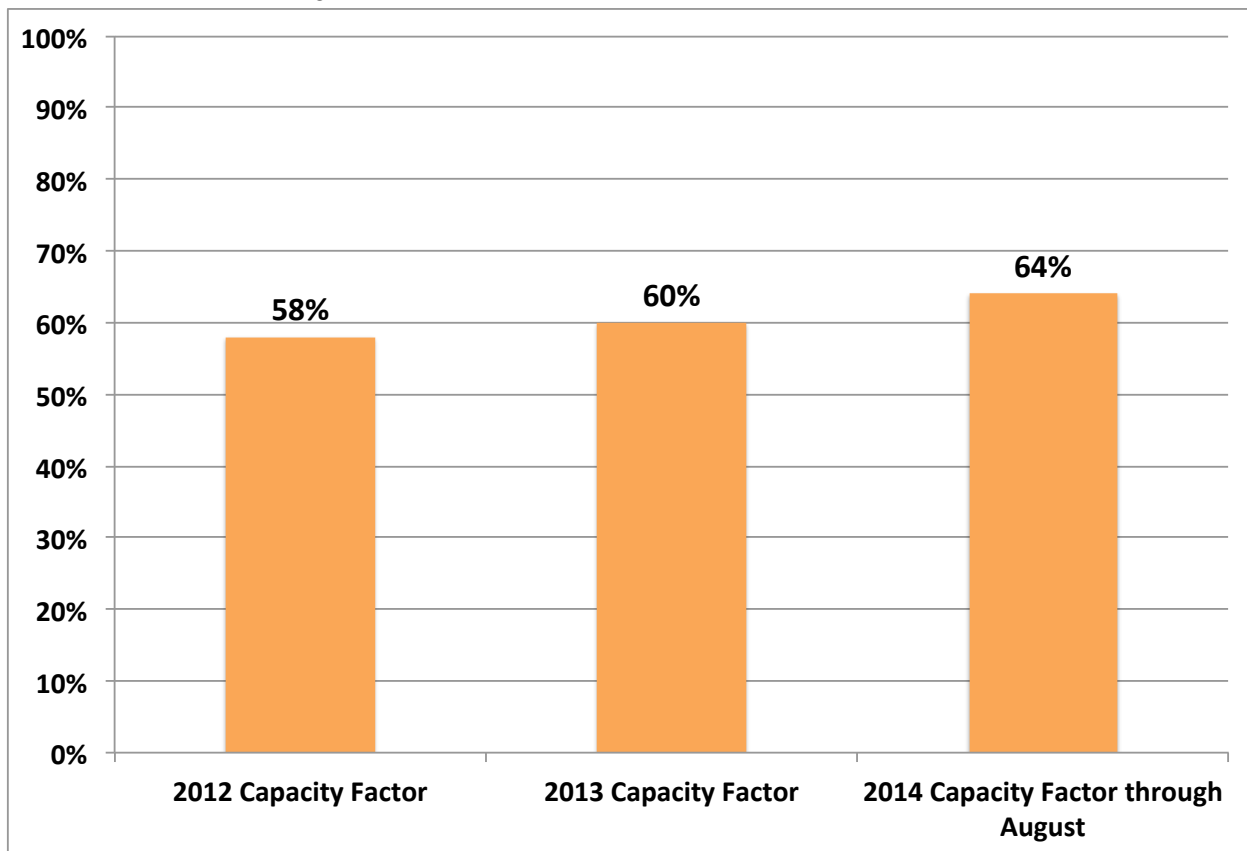
Figure 3: Forward Prices at MISO's Illinois and Indiana Hubs.



Prairie State's Owners Did Forecast that the Plant Would Operate Very Well in Its Early Years

A power plant's capacity factor is a measure of how well a power plant operates. It compares the plant's actual generation during a particular period (that is, a month or a year) with how much power it would produce if it operated at 100 percent power for 100 percent of the hours in the period. The higher the plant's capacity factor, the better it is operating. As shown in Figure 4, below, Prairie State has operated at only an overall 60 percent average annual capacity factor since its started commercial operations in June of 2012.

Figure 4: Prairie State's Capacity Factors in 2012, 2013 and First Four Months of 2014.



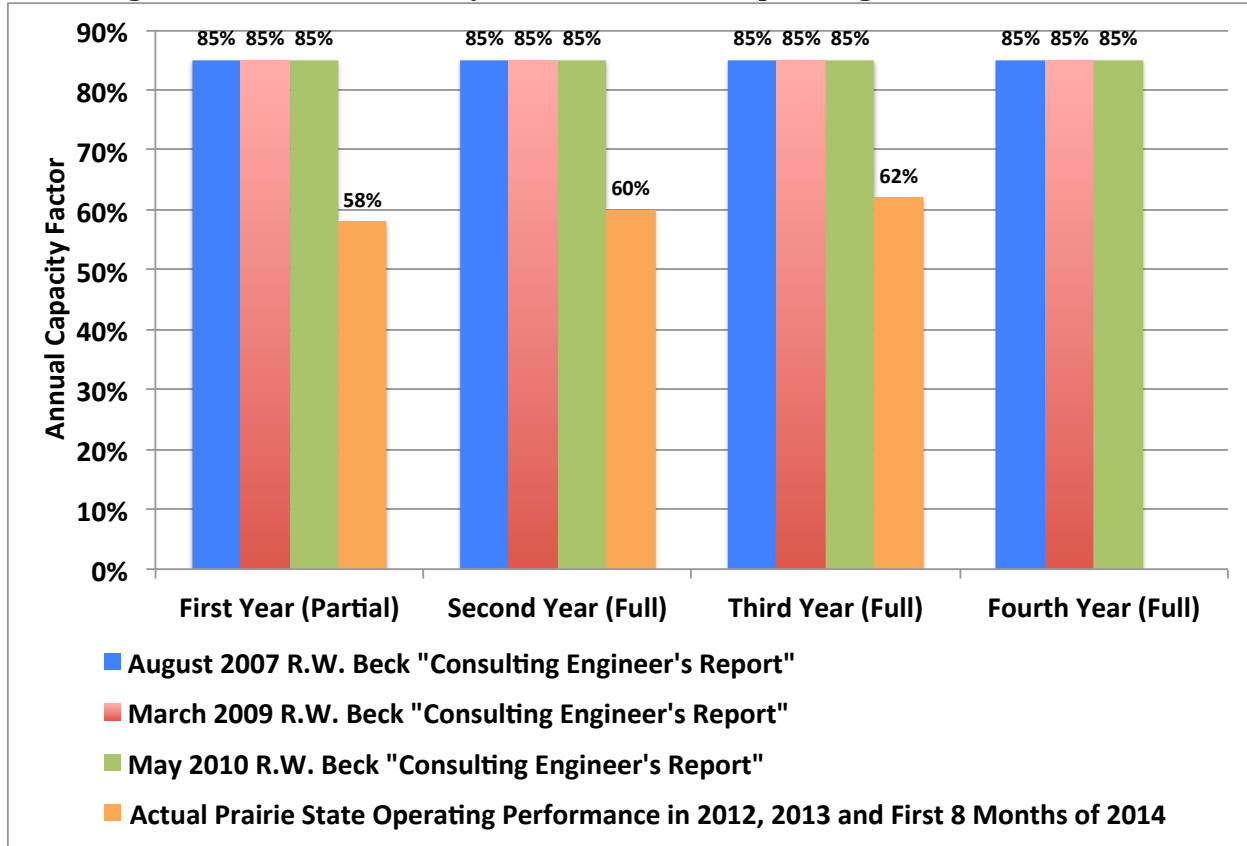
At the Paducah Commission's September 23, 2014 public hearing on Prairie State, Mark Gerken the President of AMP and the Interim CEO of Prairie State Generating Company implied that the plant's owners had never told communities that the plant would operate at a 85 percent capacity factor during its initial months or years of operation:

About a first year, the first 18 months, that plant should run at 77%...If we forecasted 85%, that's a bad forecast. No plant, no new coal plant is going to reach 85% that first 12 to 18 months.

However, a number of reports that were prepared for KMPA and the other plant owners and used to induce communities to enter into long-term contracts to buy power from Prairie State did, in fact, project that the plant would achieve at least an 85 percent capacity

factor as soon as it began commercial operations. This can be seen from Figure 5, below. Note that R.W. Beck, named in Figure 5, has been KMPA's consultant for several decades, at least. R.W. Beck is now owned by a larger company and has been renamed Leidos. Remarkably, R.W. Beck remains a consultant to KMPA as Leidos, even after all of its wrong forecasts and bad advice concerning Prairie State.

Figure 5: Forecast Early Year Prairie State Operating Performance.



In fact, in an August 2007 forecast for another Prairie State owner, AMP in Ohio, R.W. Beck actually projected an even higher capacity factor for the plant during its first two years of commercial service – a 91 percent capacity factor in the first year of commercial service and an 88 percent capacity factor in the second year. Figure 5 also shows that the plant's actual operating performance has been significantly worse than Beck (along with KMPA and other owners) told communities when they were soliciting them to enter into long-term power purchase agreements.

More Recent Owner Forecasts of Prairie State's Operating Performance and Operating Costs Also Have Been Wrong

More recent short-term projections of Prairie State's operating performance and operating costs also have been wrong, to the detriment of ratepayers, such as those in Paducah, who have been forced to bear the extremely high costs of power shown in Figure 1, above.

A power plant's Equivalent Forced Outage Rate (EFOR) measures the probability that the plant is not available to generate power due to forced (that is, unplanned) outages and

deratings. A derating means that the plant can't operate at full power. The lower the EFOR, the better.

Similarly, a plant's equivalent availability factor (EAF) measures the fraction of the operating period (that is, month or year) in which the plant is available to produce power without any outages or equipment or seasonal deratings. The higher the EAF, the better.

Figure 6, below, shows that Prairie State's actual EFOR in 2013 was so much higher than the owners had budgeted that they had to revise their forecast in October of 2013. Similarly, the plants EAF and capacity factor were much lower than had been budgeted.

Figure 6: Budgeted versus Revised Prairie State Operating Forecast in 2013.

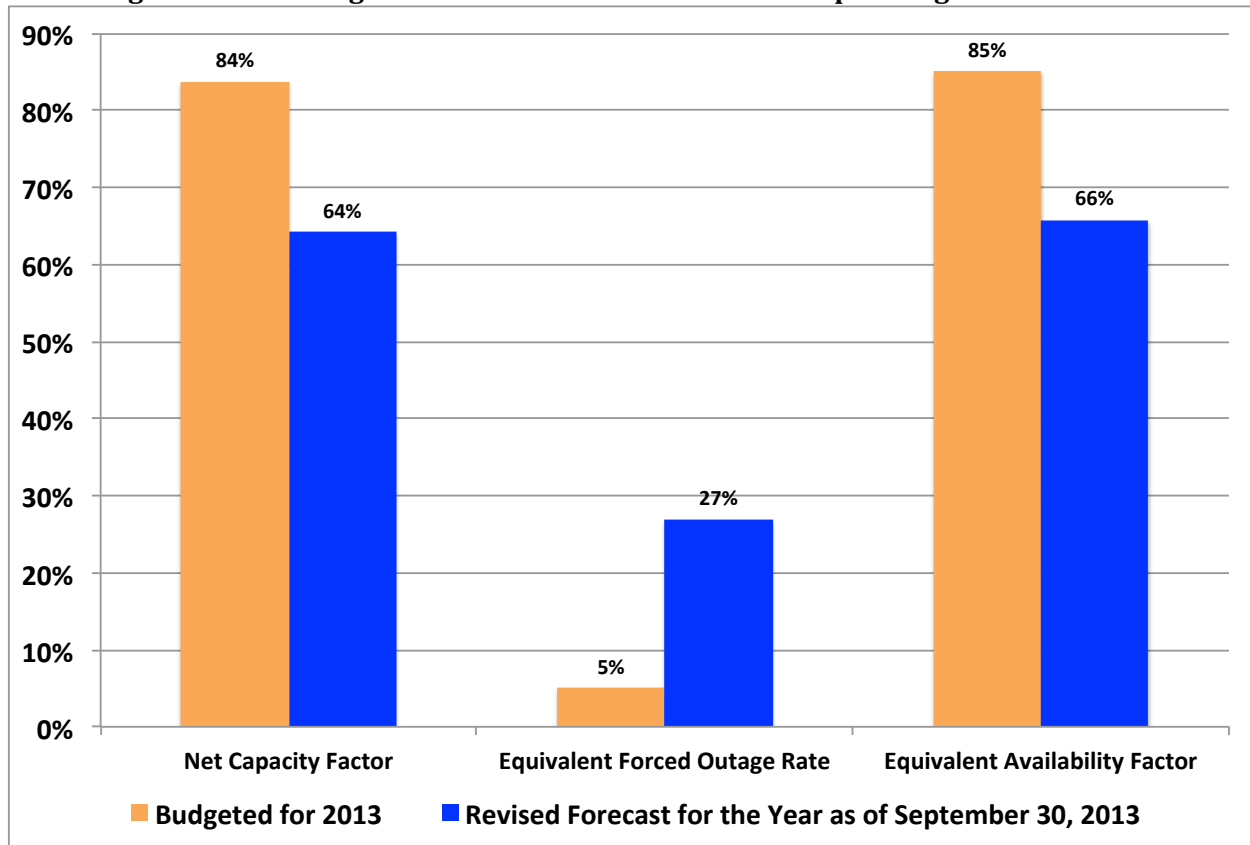
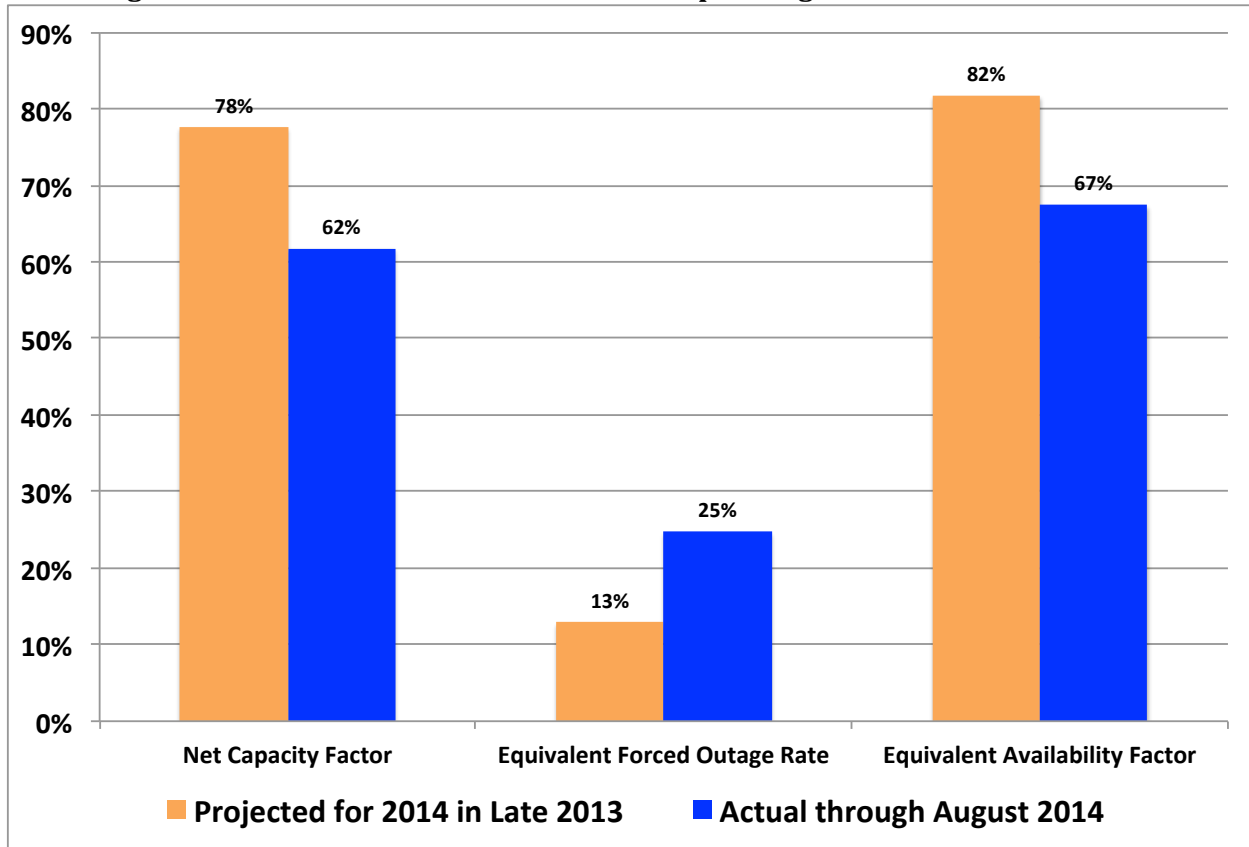


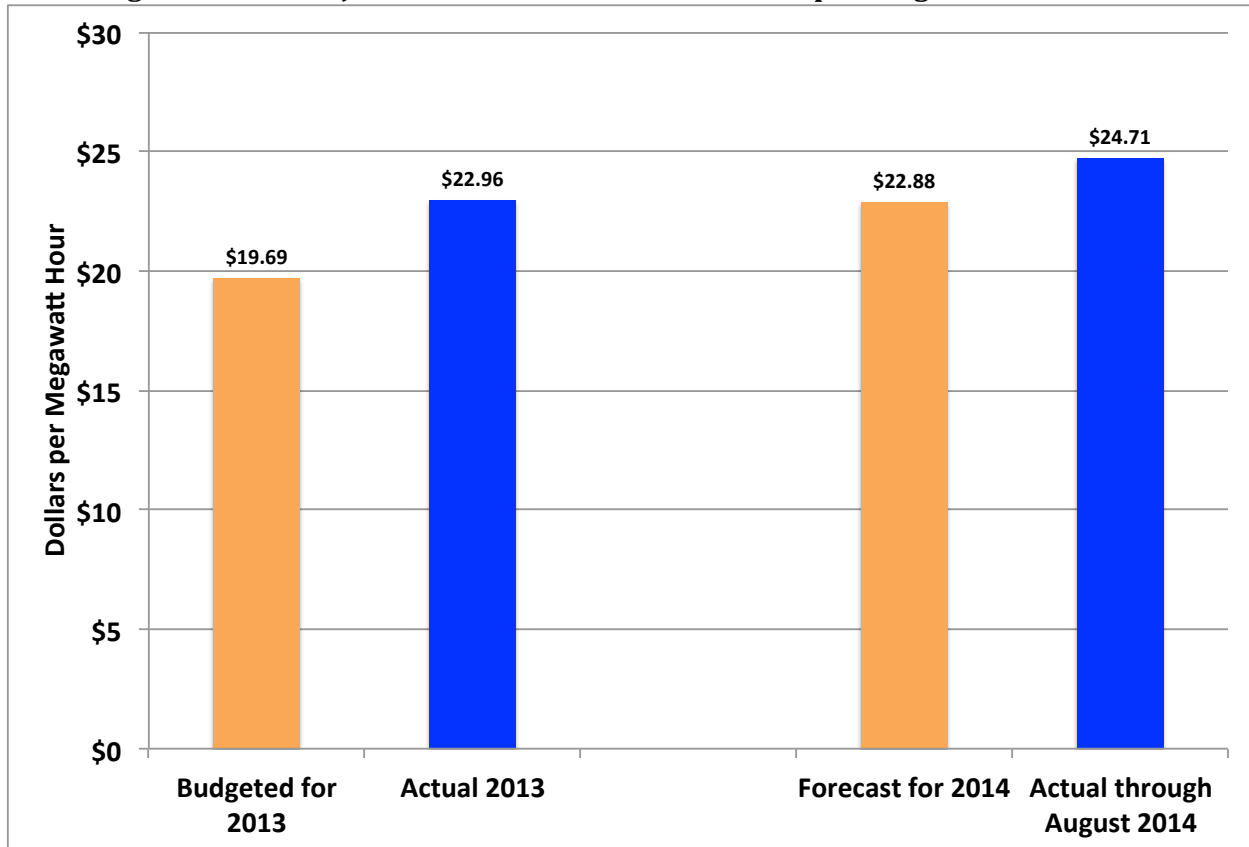
Figure 7, below, then shows that the owners' 2013 short-term expectations for Prairie State's operating performance in 2014 have also been wrong as the plant's operation during the first eight months of the year has been significantly worse than they projected.

Figure 7: Forecast versus Actual State Operating Performance in 2014.



This worse than expected plant operating performance has led to higher than projected plant operating costs in both 2013 and 2014, as shown in Figure 8, below:

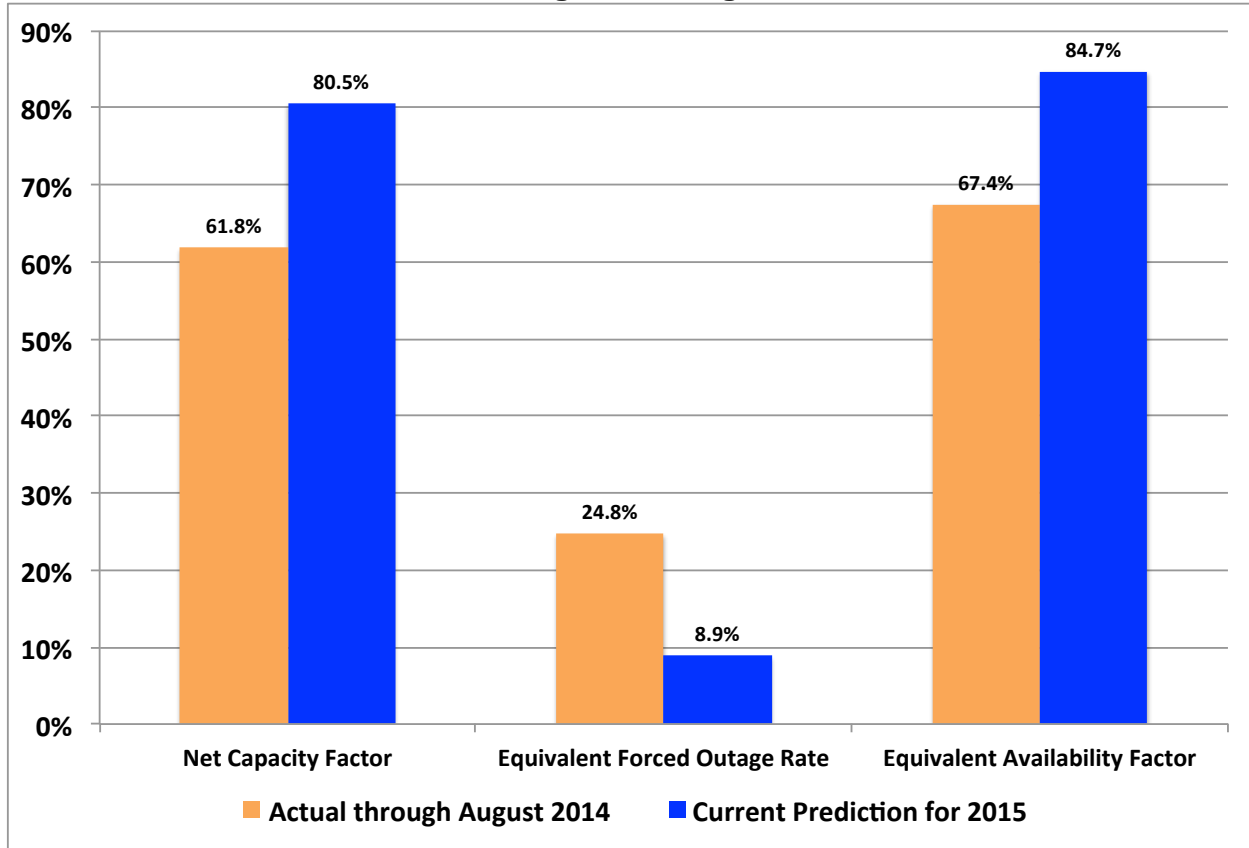
Figure 8: Projected versus Actual Prairie State Operating Costs.



Indeed, Prairie State’s actual operating costs for the entire twenty month period (in \$ per MWh) have been more than ten percent higher than the owners had forecast.

Even though their forecasts in 2012 and 2013 had been unreasonably optimistic, the Prairie State owners continue even now to forecast that the plant either has turned the corner or is just about to, as Figure 9 shows.

Figure 9: Forecast Operating Performance in 2015 versus Actual Operating Performance During the First Eight Months of 2014.

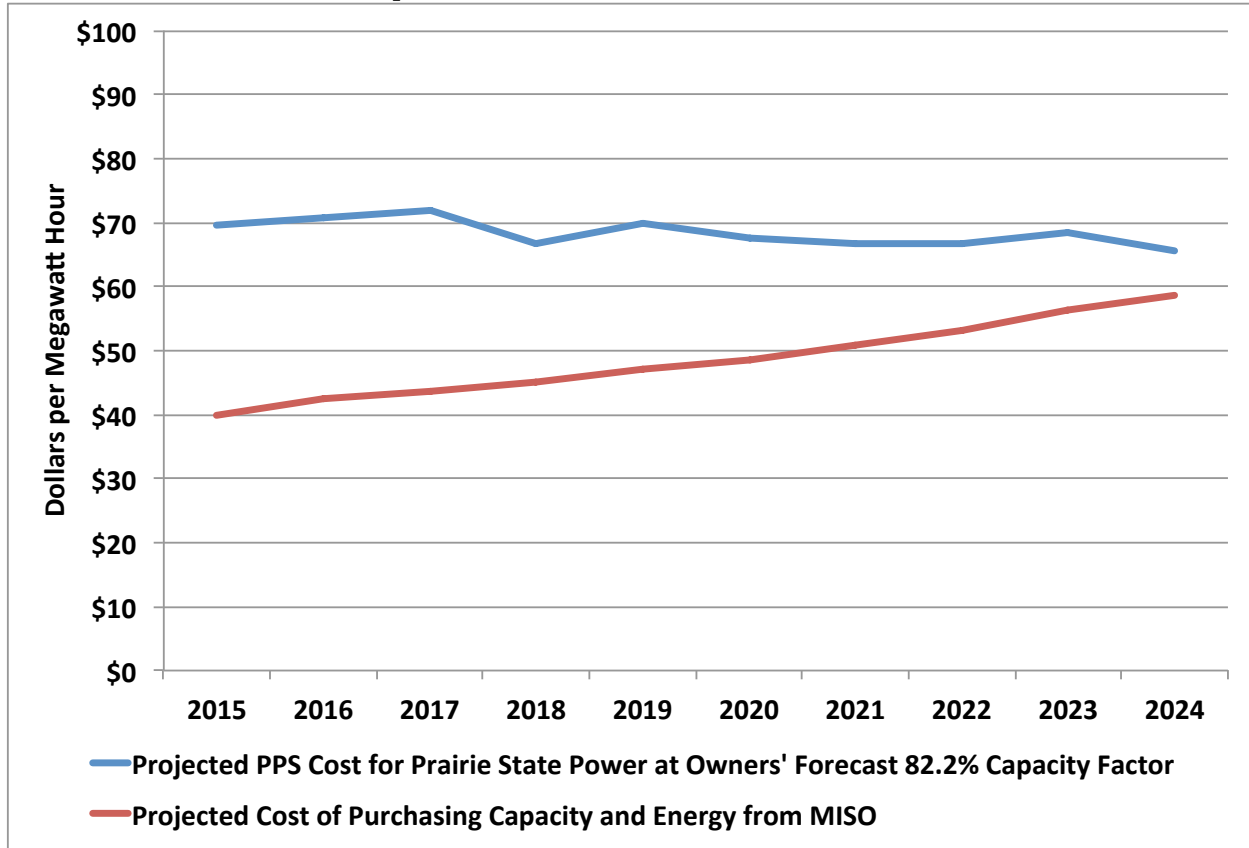


Prairie State’s owners now are claiming that the plant’s operating performance, as measured by its net capacity factor, equivalent forced outage rate, and equivalent availability factor, will be significantly better next year than they have been so far in 2014. It is very difficult, if not impossible, to give any credence to this claim given the owners’ failure to accurately predict the plant’s actual operating performance and costs during its initial in-service years and their inability to accurately forecast its actual operating performance over the short-term (in 2012 for 2013 and in 2013 for 2014).

The Future Cost of Prairie State Power to PPS

Even if Prairie State does operate in 2015 and subsequent years as the owners claim it will, power from the plant still will be expensive for PPS as compared to the cost of purchasing the same amounts of capacity and energy from the competitive MISO wholesale markets. This can be seen in Figure 10, below, which shows that the average annual cost of power from Prairie State, in dollars per MWh, will be much higher than market prices even in 2024 and later years.

Figure 10: Future Cost of Power from Prairie State vs. Market Prices Assuming the Plant Operates as the Owners Now Forecast.



In fact, as incredible as it may sound, even if the plant acts properly and its costs and performance are in line with the owners’ current claims, PPS and its ratepayers may pay over \$150 million more over the next ten years (2015-2024) for power from Prairie State than it would cost to buy the same amounts of capacity and energy from the competitive MISO wholesale markets. Moreover, as shown in Figure 10, above, even if the plant operates well and at low cost, the average cost of power from Prairie State is likely to remain higher than the cost of buying power in the MISO markets after 2024.

Consequently, if PPS continues to buy power from Prairie State, there is no relief in sight in the foreseeable future for Paducah and its ratepayers even if there is a turnaround in the near future and the plant operates as advertised. It is important to emphasize that Figure 10 reflects all of the plant owner’s claims for Prairie State’s future operating performance and costs as presented to plant owners in October 2013 and to the Paducah City Commission on September 23, 2014. It also reflects reasonable and conservative expectations for future MISO energy and capacity market prices.

However, if, as can be reasonably expected, Prairie State does not operate as well as the owners now claim, the cost of buying power from the plant will be even more expensive for PPS relative to market prices. This can be seen from Figure 11, below, which includes two scenarios of future Prairie State performance – one in which the plant operates at only a 74 percent average annual capacity factor, or approximately ten percent worse than the

owners now project. The second scenario assumes that the plant will continue to operate at the same 60 percent capacity factor it has achieved between June 2012 and August 2014.

Figure 11: Future Cost of Power from Prairie State vs. Market Prices Assuming the Plant Operates Worse Than the Owners Now Forecast.

