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Issue(s):	Production Cost Modeling
Witness:	Mark J. Peters
Sponsoring Party:	Union Electric Company
Type of Exhibit:	Rebuttal Testimony
File No.:	ER-2016-0179
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MISSOURI PUBLIC SERVICE COMMISSION

FILE NO. ER-2016-0179

REBUTTAL TESTIMONY

OF

MARK J. PETERS

ON

BEHALF OF

UNION ELECTRIC COMPANY
d/b/a Ameren Missouri

St. Louis, Missouri
January 2017

REBUTTAL TESTIMONY

OF

MARK J. PETERS

FILE NO. ER-2016-0179

Q. Please state your name and business address.

A. Mark J. Peters, Union Electric Company d/b/a Ameren Missouri ("Ameren Missouri" or "Company"), One Ameren Plaza, 1901 Chouteau Avenue, St. Louis, Missouri 63103.

Q. What is your position with Ameren Missouri?

A. I am Manager, Asset & Trading Optimization in the Corporate Planning Function.

Q. Are you the same Mark J. Peters who filed direct testimony in this case?

A. Yes, I am.

Q. What is the purpose of your rebuttal testimony in this proceeding?

A. The purpose of my rebuttal testimony is to address certain differences between Staff's production cost model results and Ameren Missouri's.

Q. Did you compare the net results of Staff's production cost model with Ameren Missouri's modeling results?

A. Yes. Staff estimated what they termed "the variable fuel and purchased power expense for Ameren Missouri for the update period" to be $581 million, including off-system sales.

The equivalent value for Ameren Missouri's model filed in our direct case was $585 million.

Q. What differences have you identified between Staff's and Ameren Missouri's modeling?

A. I have identified the following areas where our models differ:

1) Normalization period for determining forced outage rate assumption;
2) Hourly price shape applied to the market price assumptions;
3) Normalized output assumption associated with the Keokuk and Osage Energy Centers;
4) Normalized output assumption associated with the Pioneer Prairie wind purchased power agreement ("PPA"); and
5) Random selection of forced outage periods for generating units.

Q. Please discuss the difference regarding the normalization period for forced outage rates.

A. Ameren Missouri's forced outage rate assumptions for its direct filing are based on a six-year average of unplanned outages that occurred between April 1, 2010, and March 31, 2016. Staff's Report indicates that its assumption was based on data for the period of January 2010 through June 2016. It is my understanding that for the true-up process, both the Company and Staff will use the same six-year normalization period ending December 31, 2016.

Q. Please discuss the difference regarding the hourly price shape applied to the market price assumptions.

A. Both Staff and Ameren Missouri utilize normalized market prices based on 36 months of data ending December 31, 2016, adjusted for the Polar Vortex period. Actual data through April 2016 was used along with forward price data for the remaining months of the true-up period (May to December, 2016). Those forward prices will be replaced by actual data in the true-up process.

The resulting normalized block prices by month must be shaped into prices for each hour of the 12 month true-up period. To avoid unintended distortions in the modeling results, it is important to maintain a relationship between the hourly loads and the hourly prices. Ameren Missouri accomplishes this by using actual prices for the same period used for hourly loads to shape the normalized block prices by month.

A review of Staff's work papers indicates that Staff uses a similar process to Ameren Missouri to shape its normalized loads. Differences were noted for the months of January through June. It appears that Staff may have utilized price shaping that reflected the number of hours in the peak/off-peak periods for January-June 2015 rather than that for the same period in 2016. It is my understanding that both the Company and Staff will utilize the same time period (calendar year 2016) for shaping for the true-up process which will likely resolve this concern. Ameren Missouri intends to work with Staff to confirm this.

Q. Please discuss the difference regarding the output assumptions associated with the Keokuk and Osage Energy Centers.

A. Ameren Missouri models the output of these resources using an annual output target developed by our Hydro Operations group, which is then divided into monthly targets. We also establish minimum and maximum hourly generation levels by month. The model optimizes the output of the units on the basis of hourly market prices.

A review of Staff's work papers indicates that Staff developed normalized monthly outputs using actual historical data – 14 years for Osage and 17 years for Keokuk. These normalized monthly values were then shaped into an hourly profile.

I believe both methodologies can provide a reasonable representation of the resource's normalized output. Ameren Missouri would not oppose using an approach similar to that used by Staff to determine what the normalized monthly totals should be, provided that adjustments may be required to reflect current capabilities (in particular for upgrades at Keokuk). Ameren Missouri's assumptions are higher than those developed by Staff, in part due to having already reflected these capabilities.

I cannot, however, recommend shaping these normalized monthly values into a prescriptive hourly shape rather than allowing the production cost models to optimize the output on the basis of price. While the output of these hydro units is obviously driven in no small part by the availability of water, there is an ability to adjust their output up or down in response to price. Allowing the models to reflect this ability more closely aligns the model with normal operations.

Ameren Missouri intends to work with Staff to gain a greater understanding of Staff's methodology and to reach an agreement on how to reflect Keokuk and Osage in the modeling.

Q. **Please discuss the difference regarding the output assumptions associated with the Pioneer Prairie wind PPA.**

A. Ameren Missouri has a PPA for a portion of the output of the Pioneer Prairie wind farm. This resource does not respond to price signals in the Midcontinent Independent System Operator, Inc. ("MISO") market to determine its output. Rather, its output is basically a simple function of the amount of wind at a given point in time. Neither Ameren Missouri nor Staff attempts to model the output of this resource by normalizing wind speeds or other similar weather factors.

Ameren Missouri models this resource using an average hourly output by month profile – that is each day in a given month has the same hourly shape.

Staff's Report indicates that it modeled the resource by normalizing hourly energy from January 2010 through June 2016. Staff then shaped this normalized output into hourly values.

I believe both methodologies provide a reasonable representation of the resource's output. Ameren Missouri would not oppose using an approach similar to that used by Staff. Alternatively, since this resource is not dispatched by the model on the basis of price, it may be appropriate to remove it from the model entirely and simply normalize the actual MISO settlements for output of the resource and for the PPA over a specified time period (e.g. 3 years).

Ameren Missouri intends to work with Staff to reach an agreement on how to reflect the Pioneer Prairie PPA in the modeling.

Q. Please discuss the difference regarding the random selection of forced outage periods for generating units.

A. Unlike the other differences discussed above, this difference is directly related to the way that the model itself is set up. Both Ameren Missouri and Staff run their models to obtain a reasonable representation of Ameren Missouri's system. One feature of these models is how the models represent forced outages, in particular, what time period is selected or "drawn" for these outages to occur. This must be done for both partial outages – when a unit is available to produce energy but is limited below its full capability (derated) – and full outages when the unit is not available.

Ameren Missouri ran the model for its direct case using a configuration that required the model to converge to the forced outage rate for a given unit for each month.

An average down time was also specified, so that when the unit was removed from service it was unavailable for a specific time. This is the same methodology used in past rate cases. This methodology results in each unit being made unavailable at least once in each month. Ameren Missouri has historically used this method to avoid the situation where the model's random draw would concentrate the forced outages into a particular month – for example, in a worst case packing the forced outages all into July or August. While that it certainly not outside the bounds of possibility, it is not reasonable to believe that this would represent a normalized condition.

An alternative method for reflecting these outages would be to simply reduce the unit rating in every hour by the assumed forced outage rate. While this method would ensure that the outages are evenly distributed, it would distort the representation of the cost of those outages. This distortion would occur because the units would never be forced off line, and thus we would not capture the cost to restart the unit. Additionally, the cost of the outage would only be reflected in the most expensive part of the unit's cost curve. For those reasons, Ameren Missouri has rejected this method.

Having the model converge the forced outage rate monthly results in each unit being taken out of service (made unavailable) at least once a month. For must run units, this means the unit is forced off line and when the forced outage period ends, the model returns the unit to service. For units that are not must run, the situation is a little different depending on when the forced outage draw occurs. If the forced outage period begins when the unit is operating, it is forced off-line, just like a must run unit. If the period begins when it would not be operating anyway due to economic considerations, it simply stays off-line and it is not available for commitment until after the forced outage draw ends. When the period ends, the unit will only be committed if it is economical to do so. For the unit to be started, it must overcome its startup and operating costs.

Q. Can you expand on this last point?

A. Yes. Each generating unit has minimum up and down times (how long a unit is required to stay on-line once started, or stay off-line once de-committed, respectively). Each unit also has a cost to start the unit once taken off-line, and a minimum level of cost each hour to remain on-line. A production cost model must take all those items into consideration (and many more) when dispatching units.

Q. How does this relate to the difference noted between Ameren Missouri’s and Staff's model?

A. The situation we found when trying to determine the difference between Ameren Missouri’s model and Staff’s model related to the level of generation produced at the Meramec Energy Center (in particular), was that the frequency and distribution of the random forced outage draws for the Meramec units (which are not must run in the model) were resulting in the units not being committed with the frequency that they were in Staff’s model. The combination of Meramec’s forced outage rate and the specified outage length parameter in our model resulted in Meramec being made unavailable multiple times in each month. In each of those instances, the model would only commit the unit if it could overcome its startup and operating costs.

In simple terms, if the model took a Meramec unit out of service, the amount of profit margin in the hours following its return to service was not sufficient to overcome the cost of restarting the unit, in some instances because the amount of time the unit was required to stay on-line once it was started meant having to operate in hours which were so unprofitable that it wiped out the profit from the first hours of bringing the unit back.

This was particularly true given the relatively low margins available to Meramec with its higher incremental cost. While this resulted in a noticeable difference in the megawatt-hour output of the units between the models, it has a much lower impact on the net energy costs.

Q. Does that mean that this is an issue that does not need to be addressed?

A. No. This is an issue which warrants attention.

Q. Have you identified a means of addressing this issue?

A. Yes. After talking with Staff, we have determined that a change to the parameters provided to the model for forced outage draws is appropriate. These changes include:

1) having the model converge on the forced outage rate annually; and
2) using a 10-iteration run parameter to minimize the possibility that the model could cluster the forced outages together in a manner that distorted the model results.

Q. Did these changes address the issue?

A. We believe they have. Our discussions with Staff focused on Meramec Unit 3 since it exhibited a significant difference in output between the models. When we made these changes to the Company's model (i.e., the model used for our direct case), we obtained results that were much more closely aligned with Staff's results.

Q. It appears that the remaining modeling differences are minor and that you do not expect them to be disputed. How will you resolve any modeling minor differences?

A. We will continue to work with Staff and I expect we will resolve the remaining differences. We will then each perform a true-up model run. It is my expectation that the true-up in the case, which will be reflected as part of surrebuttal testimony, will include either the results of the Company's true-up run or the Staff's. Either way, I expect the models to be so close that the modeling results used will make little difference. If for some reason there remains a true dispute, we will outline it in surrebuttal testimony.

Q. Does this complete your rebuttal testimony?

A. Yes, it does.

BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MISSOURI

In the Matter of Union Electric Company	)	
d/b/a Ameren Missouri's Tariffs to	)	Case No. ER-2016-0179
Increase Its Revenues for Electric Service.	)	

AFFIDAVIT OF MARK J. PETERS

STATE OF MISSOURI)
) ss
CITY OF ST. LOUIS)

Mark J. Peters, being first duly sworn on his oath, states:

1. My name is Mark J. Peters. I work in the City of St. Louis, Missouri, and I am employed by Union Electric Company d/b/a Ameren Missouri as Manager, Asset & Trading Optimization in the Corporate Planning Function.

2. Attached hereto and made a part hereof for all purposes is my Rebuttal Testimony on behalf of Union Electric Company d/b/a Ameren Missouri consisting of 9 pages, and Schedule(s) NA, all of which have been prepared in written form for introduction into evidence in the above-referenced docket.

3. I hereby swear and affirm that my answers contained in the attached testimony to the questions therein propounded are true and correct.

Mark J. Peters

Subscribed and sworn to before me this 20th day of January, 2017.

Mary Hoyt
Notary Public

My commission expires: 4-11-2018

Mary Hoyt - Notary Public
Notary Seal, State of
Missouri - Jefferson County
Commission #14397820
My Commission Expires 4/11/2018