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MISSOURI PUBLIC SERVICE COMMISSION

FILE NO. ER-2019-0335

REBUTTAL TESTIMONY

OF

MATT MICHELS

ON

BEHALF OF

UNION ELECTRIC COMPANY
d/b/a Ameren Missouri

St. Louis, Missouri
January, 2020

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REBUTTAL TESTIMONY

OF

MATT MICHELS

FILE NO. ER-2019-0335

Q. Please state your name and business address.

A. Matt Michels, One Ameren Plaza, 1901 Chouteau Avenue, St. Louis, Missouri 63103.

Q. By whom and in what capacity are you employed?

A. I am employed by Ameren Services Company as Director of Corporate Analysis. In that capacity, I provide services to Ameren Corporation's operating subsidiaries, including Union Electric Company d/b/a Ameren Missouri ("Ameren Missouri" or "Company").

Q. Please describe your professional background and qualifications.

A. I joined Ameren Services Company in 2005 as a Consulting Engineer in Corporate Planning. My responsibilities included coordination and monitoring of projects implemented in conjunction with the integration of processes and systems following the acquisition by Ameren Corporation of Illinois Power Company ("Illinois Power") in October 2004. I was subsequently involved in the integration of combustion turbine facilities acquired by Ameren Missouri in 2006. In September 2008, I was promoted to Managing Supervisor of Resource Planning with responsibility for long-range resource planning, including Ameren Missouri's Integrated Resource Plan ("IRP") filings a

associated analysis. In February 2013, I was promoted to Corporate Analysis Manager. In February 2014, I was promoted to Senior Manager of Corporate Analysis. In June 2017, I was promoted to Director of Corporate Analysis. My current responsibilities include long-range resource planning, load forecasting, environmental compliance planning, fuel budgeting, and other resource related analysis.

I earned a Bachelor of Science degree in Electrical Engineering from the University of Illinois at Urbana-Champaign in May 1990. I have been employed by Ameren or Illinois Power since June of 1990 in various positions related to resource and business planning. During most of that time, my responsibilities have included the development, use, and oversight of various planning models used for purposes such as production costing, acquisition evaluation, corporate restructuring, financial forecasting, and resource planning. I have previously testified before this Commission in proceedings involving resource planning, renewable energy standards compliance, and energy efficiency cost recovery.

I. Introduction and Summary

Q. To what testimony or issues are you responding?

A. I am responding to certain assertions made by Sierra Club witness Avi Allison in his direct testimony. Specifically, I will rebut findings 1-3 listed at pages 3-4 of his direct testimony and respond to his recommendations 1 and 2 listed at pages 4-5 of his direct testimony.

Q. Please summarize the findings and recommendations in Mr. Allison's direct testimony to which you are responding.

A. Mr. Allison lists the following among his findings:

1. That each of Ameren Missouri's Labadie, Rush Island, and Sioux generating units incurred net losses of over $20 million over the years 2016 through 2018;

2. That the Company's recent coal plant investments do not sufficiently account for the environmental compliance costs facing the Company's Rush Island and Labadie units; and

3. That the Company's 2017 IRP does not provide a reasonable basis to support continued investment in the Company's coal-fired units.

Mr. Allison recommends that 1) the Missouri Public Service Commission ("Commission") disallow recovery of capital costs incurred during and after 2018 at its Labadie, Rush Island and Sioux coal-fired energy centers, and 2) the Commission should require Ameren Missouri to present analysis by the end of 2020 of near-term retirement of its Labadie, Rush Island, and Sioux units in a docketed case with stakeholder review.

Mr. Allison notes other findings and recommendations, which are being addressed by other Company witnesses.

Q. Please summarize your response to Mr. Allison's findings outlined above.

A. Mr. Allison's evaluation is flawed, incomplete and untimely. The Company's recent and ongoing evaluation of investments in its coal-fired units is reasonable and appropriate, as were its 2018 and 2019 capital investments in these energy centers, given the following:

1. The Company's robust 2017 IRP analysis specifically included evaluation of early retirement for eight of the Company's ten coal-fired units.[1] That analysis showed that early retirement of the Rush Island Energy Center would result in increased costs to customers of over $1 billion and that early retirement of the Labadie Energy Center would result in increased costs to customers over $1.4 billion.[2] That analysis was found by the Commission to be in compliance with its IRP rules.[3]

2. As further buttressed by the rebuttal testimony of Company witness Jim Williams, the investments made in these plants were necessary for compliance with regulatory requirements and for safe, reliable, and efficient operation of the units in the near term, regardless of potential future environmental compliance costs or changes in retirement dates.

3. The Company's upcoming and required filing of a new triennial IRP by October 1, 2020, which will include specific Commission-required analyses of early coal unit retirements and potential environmental compliance costs that may be necessary for longer-term operation of the Company's coal-fired units.

Q. What do you recommend?

A. I recommend the following: 1) the Commission continue to evaluate

[1] See File No. EO-2018-0038.
[2] File No. EO-2018-0038; Ameren Missouri 2017 IRP, Chapter 10, page 16, Table 10.5. Cost differences reflect differences in present value of revenue requirements ("PVRR") without better information for plans M and N relative to plan A.
[3] Pursuant to Commission Rule 20 CSR 4240-22.080(16)(A), the Commission finds that the 2017 triennial Integrated Resource Planning filing made by Union Electric Company d/b/a Ameren Missouri complies with the requirements of this chapter, and that the utility resource's acquisition strategy meets the standards stated in 20 CSR 4240-22." File No. EO-2018-0038, Order Regarding 2017 Integrated Resource Plan, June 27, 2018, p. 3.

utility resource planning decisions using the robust and long-established process set forth in its IRP rules; and 2) the Commission should therefore find the investments made by the Company in its coal-fired units are consistent with the Company's IRP preferred plan and the Commission's IRP process, are necessary for the continued provision of safe, reliable, and efficient service to customers, and are therefore reasonable and appropriate for inclusion in rate base.

II. Sierra Club's Economic Evaluation is Flawed

Q. What kind of evaluation did Mr. Allison conduct to conclude that more analysis of the Company's investment decisions is warranted?

A. Mr. Allison implies in his testimony that he has conducted a profit and loss analysis of the Company's Labadie, Rush Island, and Sioux coal-fired energy centers.

Q. Is his analysis appropriate?

A. No. His analysis is oversimplified and flawed. As a result, it has no value in supporting even basic conclusions with respect to the economics of the Company's coal-fired units.

Q. Can you please elaborate?

A. Yes. First, Mr. Allison has essentially presented a limited short-term *cash flow* analysis. This is very different from a profitability analysis in one key respect – a proper analysis of profitability reflects the cost of investments over their useful life, rather than only in the year in which the investments are made. In doing so, Mr. Allison has presented a backward-looking and inappropriately truncated analysis that cannot be used to assess the economics of the units in question in even a cursory manner and certainly cannot be used to assess short-term "losses" as Mr. Allison purports. The

Commission's IRP rules appropriately recognize that resource evaluations are necessarily forward-looking for the simple reason that decisions can and will only affect results subsequent to when they are made and implemented. The IRP rules do not even suggest the presentation of backward-looking economic analyses as useful or relevant information, let alone require such analysis as relevant to resource decisions.

Second, Mr. Allison's analysis only compares the cost of operating and maintaining the coal-fired units to the market revenues earned by the units rather than to a true alternative to continuing these particular units' operation. The Company does not operate as a merchant generator but rather has service obligations a merchant generator simply does not have. Specifically, it must operate as a vertically integrated utility and must meet its obligation to serve. This is the very foundation of the Commission's IRP process and rules governing investor-owned utilities in Missouri. Ameren Missouri must ensure that it is operating sufficient resources to provide its customers with safe, reliable, and efficient service at just and reasonable rates. The IRP process includes consideration of all alternatives to meet this obligation.

Third, while the revenues earned by resources in the market have some relevance to an evaluation of resource economics, they are only a part of the picture. Moreover, even if market economics were the sole determinant of the viability of a generating unit or plant (they are not), it is important to make such an evaluation over a reasonable period of time and with a reasonable range of assumptions. Mr. Allison has analyzed a short, three-year historical period, from 2016 through 2018. Such an analysis provides no insight into the long-term economics of a generating unit. Mr. Allison effectively acknowledges this; however, his acknowledgement does not extend to his unreasonable

approach of using a very short time period in which prevailing market economics may bear no resemblance to longer-term market economics. The Midcontinent Independent System Operator, Inc. ("MISO") market is currently experiencing an excess of generating capacity relative to load and reliability reserve margin requirements. This is not likely to be sustained over the long term, and changes in supply and demand balance could substantially impact market prices for electric energy and capacity. The IRP process accounts for such long-term market dynamics.

Q. Can Mr. Allison's analysis be readily modified to yield useful conclusions?

A. No. An entirely different kind of analysis, the kind performed as part of a robust IRP process, is necessary to draw any useful conclusions regarding the economics of electric generating resources. That is exactly the kind of analysis the Company presented less than two years ago when its 2017 IRP filing was found to be in compliance with the Commission's IRP rules, and is exactly the kind of analysis the Company will be filing less than one year from now. As I mentioned previously, the analysis in the Company's 2017 IRP showed that costs to customers would increase as a result of early retirement of the Rush Island or Labadie Energy Centers by over $1 billion and over $1.4 billion, respectively.

Q. You mentioned that Mr. Allison included the cost of capital investments in his analysis. What would his analysis show if these capital costs were excluded?

A. It would show that the operation of the units over the period 2016-2018 resulted in net benefits to customers of approximately $209 million. This is calculated by removing the $556 million in capital investment from Mr. Allison's calculation of a net $347 million cost as presented in Table 3 on page 10 of his direct testimony. In essence, the resultant $209 million benefit can be considered the contribution by the operation of the units to the recovery of fixed asset costs. Once again, I should note that while this may be interesting, it is no substitute for the kind of forward-looking analysis like that performed in the preparation of an IRP, which is the appropriate framework for evaluating unit retirement decisions.

Q. Does Mr. Allison acknowledge that long-term resource planning decisions cannot be based on short-term analyses of the kind he presents?

A. He does. In that regard, his evaluation seems to be more of a distraction than a productive analysis. In the end, he acknowledges the fact that resource decisions are appropriately supported through the kind of analysis conducted through a robust IRP process by recommending the Commission require exactly that kind of analysis, which as I just noted, the Company will perform as part of its 2020 IRP analysis and filing.

III. Ameren Missouri's IRP Process Provides a Reasonable and Appropriate Basis for Generation Investments

Q. Mr. Allison asserts that Ameren Missouri's 2017 IRP analysis is not a reliable basis for supporting continued (i.e., 2018-2019) investments in the Company's coal-fired units. What is your response?

A. The Company's 2017 IRP has in fact provided a reasonable basis for ongoing investments in the Company's units since it was filed and found in compliance

with the IRP rules by the Commission, just as it has for the Company's investment in energy efficiency programs and new renewable energy resources during that same time period. As noted earlier, just approximately 18 months ago – on July 27, 2018 – the Commission found that the Company's 2017 IRP complied with the Commission's IRP rules and that the Company's resource acquisition strategy (including both supply-and-demand side resources) meets the standards set forth in the Commission's IRP rules. The IRP rules define an explicit process that accounts for all relevant factors that may affect resource economics and decisions, including uncertainty regarding key assumptions and the comparative economics of viable alternatives, including the retirement of existing resources such as the Company's coal-fired generators. The investments about which Mr. Allison complains were made – and in fact were being made – at the same time the Commission found the 2017 IRP in compliance with the Commission's IRP rules.

Q. Mr. Allison specifically cites an Eastern District Court case regarding environmental compliance. Should the Company have included analysis for potential remedies that might ultimately be required from that case in its 2017 IRP?

A. No. Because the case was still pending and the court had yet to determine the remedy, it would have been inappropriate to prejudge the outcome and use that as the basis for resource decisions. In fact, this exact argument has already been reviewed and rejected by the Commission. The Sierra Club raised this same argument as an alleged and unresolved deficiency in the Company's 2017 IRP filing and the Company responded that such analysis would be inappropriate just as I have done here. Significantly, the Commission declined to recognize the Sierra Club's allegation as a deficiency in its order regarding the Company's 2017 IRP and, in fact, found that the Company's IRP filing and

resource acquisition strategy met the requirements and standards set forth in the Commission's IRP rules. Sierra Club's argument now is nothing more than an attempt to re-litigate a position it took in the 2017 IRP docket that was already rejected.

Q. Will the Company be evaluating this issue as part of its 2020 IRP filing?

A. Yes. Ameren Missouri will be evaluating the cost of complying with the court's specified remedy (which was not even ordered until August 2019) as part of its 2020 IRP analysis, even as the District Court's original January 2017 order and its August 2019 ruling which specified a remedy are reviewed by the 8th Circuit Court of Appeals.[4] Because the specific remedy the District Court believes appropriate is now known, it is appropriate to include that remedy in the Company's 2020 IRP analysis, although considerable speculation still exists as to whether that remedy would actually be required. It is also worth noting that the Commission has recognized the appropriateness of now evaluating this issue by including it in its order on Special Contemporary Issues (issued on October 30, 2019, after the District Court's remedy had become known) to be addressed by the Company in its 2020 IRP filing.

Q. Do you know what the results of that analysis will show?

A. I do not. We are still in the process of preparing our 2020 IRP analysis at this time. This includes consideration of Sierra Club's positions in this case, expected positions of parties including Sierra Club in the 2020 IRP case, and a complete review and update of all the assumptions that go into a complex and robust IRP analysis that

[4] I should note that all portions of the District Court's judgment that if eventually implemented years from now could require additional expenditures at Rush Island and Labadie have been stayed during the pendency of the appeal to the Eighth Circuit.

complies with the Commission's rules. Only after this analysis is performed will we be able to draw any conclusions.

Q. Will the Company also be evaluating early retirement of its coal-fired units as part of its 2020 IRP analysis?

A. Yes. We will evaluate early retirement of the coal units at Labadie, Rush Island, and Sioux. A decision to retire the remaining two coal units at Meramec by the end of 2022 has already been made.

Q. Do you know what the results of those early retirement analyses will show?

A. No. As with the environmental compliance analysis noted above, we will only be able to draw conclusions once the assumptions and analysis are completed.

Q. Are there any constraints the Company must consider in determining when a unit could or should be retired?

A. Yes. In general, there are two major considerations when evaluating unit retirements, and they both get to the heart of the need for a full IRP analysis. First, if replacement generation resources are needed, after consideration of energy efficiency and demand response, there must be sufficient time for siting, contract negotiation, engineering, procurement, construction, and testing. The time needed to execute these steps depends in part on the type of resource, which itself may be constrained by the nature of the need. Second, if new transmission infrastructure may be required as a result of closing a plant, as is typically the case with retirements of large generators, that additional cost must be considered, and any possible retirement date of the generator must also account for the lead time needed to plan and construct the required

transmission facilities. For example, the Company's planned retirement of its Meramec Energy Center by the end of 2022, a decision made by the Company in 2014, necessitates the construction of over $240 million in new transmission infrastructure, which is on track to be placed into operation prior to retirement of the generating units.

In the case of replacement generation, it is also important to understand whether new resources are needed to replace generating capacity, energy production, or both. This is especially critical in determining the role of wind, solar, and storage resources to replace retiring generation. Wind resources provide significant energy (generally with capacity factors of 40% or more), but do not provide significant reliable capacity at times of peak demand. Storage resources provide significant capacity but no energy – in fact, they consume energy because they are not 100% efficient. Solar resources provide some capacity benefit and some energy benefit. These and any other replacement resources may themselves require the development and construction of transmission infrastructure.

In the case of needed transmission infrastructure to support grid reliability in the absence of retired units, MISO has a process – called the Attachment Y process – that must be followed to determine whether and to what extent new transmission infrastructure is required. MISO may also determine that the units in question may be needed as so-called System Support Resources until such time as new infrastructure is in place and operational. Upon such a determination, new transmission facilities must be designed, constructed, and placed into service before the units in question may be retired.

Because the process for identifying and implementing transmission system infrastructure necessitated by the retirement of generating units can take 7-10 years, it is very unlikely that such unit retirements could be carried out in the next 3-5 years.

Q. Aside from new transmission infrastructure needed to support reliability of the system once a large unit is retired, are there other transmission issues posed by retiring large units such as the plants discussed by Mr. Allison?

A. Yes. Mr. Allison spends time in his testimony discussing replacement of coal-fired generation with renewables, such as wind or solar. However, those resources often require new transmission facilities, and as has recently been evident in the addition of wind resources by Ameren Missouri, there can be significant challenges in getting those necessary transmission facilities in place. Ameren Missouri and the Commission have experienced this first-hand in recent months, as evidenced by the cancellation of the 157 megawatt Brickyard Hills wind project in Atchison County, Missouri, which the Commission approved in File No. EA-2019-0021. As the Commission likely recalls, while the project was otherwise on track, it had to be cancelled because the MISO transmission studies resulted in estimated interconnection costs that were simply too high to support the project's economics. This is but one example of the real world issues the Company would have to grapple with if it simply discarded its coal-fired resources in favor of renewables, as Mr. Allison seems to suggest is possible and warranted. The Company will grapple with those issues in its 2020 IRP.

Q. How does Ameren Missouri address such considerations as part of its IRP analysis?

A. The Company assesses the potential for early retirements through integrated analysis and consideration of the replacement infrastructure, both generation and transmission, that may be needed as a result of the retirements. For example, the Company determined as part of its 2014 IRP evaluation that its Meramec steam units

should be retired by the end of 2022. Included in that decision was the consideration of the need for transmission system infrastructure, which is currently in process and expected to be completed prior to the scheduled retirement date for the generators. The decision to retire Meramec was conveyed to MISO through the Attachment Y process, and the transmission system analysis conducted as part of MISO's review determined the need for the specific infrastructure upgrades now in process. That analysis demonstrated a need for over $240 million in new transmission infrastructure, which is expected to be completed by the time the units are retired in late 2022.

Likewise, we will include such considerations in our 2020 IRP analysis of early retirement of the other eight coal-fired units in Ameren Missouri's fleet. Mr. Allison did not consider these realities in his assessment.

Q. Other than the constraints you just discussed, are retirement decisions a simple matter of evaluating the economics of retirement vs. continued operation?

A. No, although that is obviously a major consideration. The economic analysis includes consideration of, to the best of our ability, all of the various factors that can be quantified in economic terms, including ranges of values for key uncertainties. However, our IRP process includes consideration of other important factors as well, such as customer affordability, economic development, portfolio diversity, and financial and regulatory risks. We use a scorecard approach that incorporates all these considerations to evaluate alternatives and support the selection of our preferred resource plan. In conjunction with this, we also have to consider that a retirement decision, once fully committed, is effectively irreversible. If a generator is likely, under certain circumstances, to continue to provide benefits to customers, retirement permanently

forecloses on such a possibility. So, while Mr. Allison notes that continued investment in coal units carries with it some risk, so too would a decision to abruptly end continued investments in and operation of assets that support the provision of safe, reliable, and cost-effective service to our customers. A particular risk may even be significant, but it cannot in and of itself be determinative in decisions to retire an existing generator. Such decisions must be reached through the kind of thoughtful analysis and evaluation that is employed in our IRP process.

IV. Sierra Club's Criticisms of Ameren Missouri's 2017 IRP Assumptions are Unfounded and Untimely

Q. Setting aside for a moment that the Company's IRP process, filing and plans provide a firm basis for its resource and investment decisions, Mr. Allison takes issue with some of the specific assumptions used in the Company's 2017 IRP analysis. Please describe the concerns expressed by Mr. Allison with respect to the Company's 2017 IRP assumptions.

A. Mr. Allison takes issue with three specific categories of assumptions – capacity prices, environmental compliance costs, and costs for renewable resources. He asserts that the Company's assumptions for capacity prices are unreasonably high. He asserts that the Company's assumptions for the cost of renewable generation are unreasonably high. Finally, he asserts that potential environmental compliance costs have not been fully considered.

Q. Has Sierra Club raised these same issues in prior Ameren Missouri cases?

A. Yes, as to two of them – renewable costs and environmental compliance. As stated above, despite the fact that the Sierra Club claimed that these two items were deficiencies in the 2017 IRP docket, the Commission declined to find them as such. Sierra Club is simply attempting to relitigate these issues. This is the first time Sierra Club has taken issue with the Company's capacity price assumptions.

Q. Has Sierra Club had opportunities to take issue with the Company's capacity price assumptions in the past?

A. Yes, including the Company's 2017 IRP docket and the 2019 IRP Annual Update docket.

Q. Are the capacity price assumptions used for the Company's 2017 IRP reasonable?

A. Yes. The assumptions for capacity prices were developed using a planning model that has been used for utility resource planning analyses for decades. They are the result of assumptions for several key driver variables that the Company identified as part of its 2017 IRP analysis. These key driver variables are natural gas prices, load growth and coal plant retirements. These assumptions were applied by the model, which simulates the entire Eastern Interconnect of the United States electric grid to calculate prices for both electric energy and capacity. In short, the Company's assumptions for capacity prices were developed in a manner that was completely consistent with its other assumptions and using a well-accepted model that simulates the function of the electricity markets in detail.

Q. Mr. Allison asserts that the Company's capacity price assumptions are too high given the recent results of MISO capacity auctions. How do you respond?

A. The short answer is that recent market conditions cannot be relied upon as being representative of long-term, future market conditions. In recent years, MISO has had more generating capacity than is needed for load and reserve margin requirements. This has generally resulted in relatively low capacity prices in MISO. However, as existing units are retired, MISO will be less and less likely to enjoy a capacity surplus, and the resultant capacity prices will reflect this. As the Commission knows, integrated resource planning is a long-term (20 years or more) planning process, and the assumptions used must cover those long planning horizons.

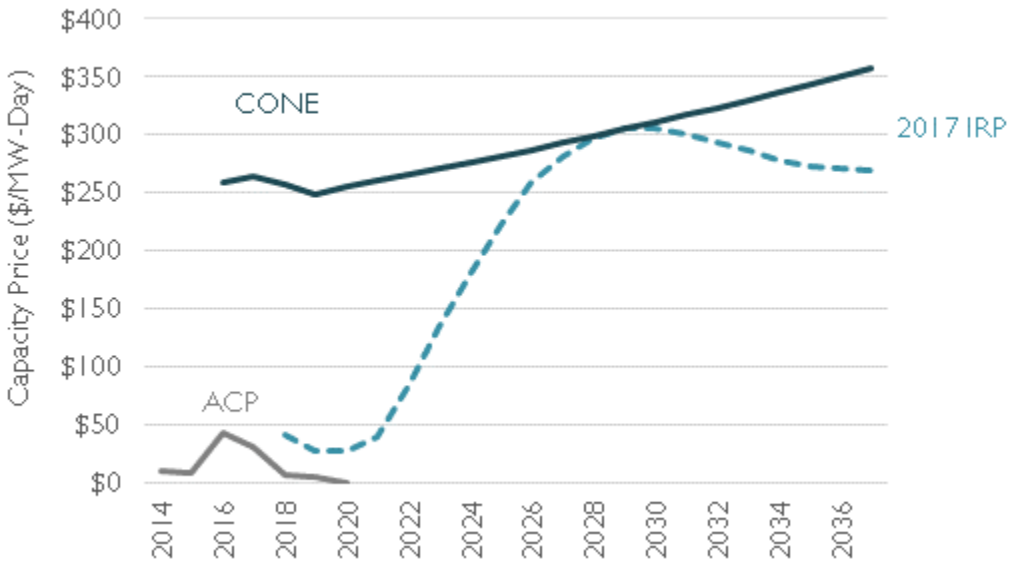
Q. Wouldn't it take a rather large number of coal unit retirements to result in significantly higher capacity prices than MISO has experienced in recent years?

A. Not at all. Capacity prices can be extremely sensitive to relatively small changes in the balance of supply and demand. For example, taking the 2019-2020 MISO Planning Year auction results and removing Ameren Missouri's Rush Island and Labadie Units (i.e., acting as though they had been retired) would have resulted in a capacity price of over $240/MW-day compared to the actual auction clearing prices of $1.5-10.00/MW-day in the last three auctions. These units collectively represent less than 4% of total generating capacity in MISO, but their absence would have resulted in a very large increase in capacity prices.

Q. Mr. Allison notes that the clearing price for capacity is capped at MISO's value for the Cost of New Entry ("CONE") and that the Company's future capacity price assumptions exceed recent values for CONE. How do you respond?

A. The Company's forward-looking price assumptions for capacity are at or below the value for CONE once future inflation is accounted for. Including future inflation is essential over the long, 20-year planning horizon because some level of inflation will be a reality over that period of time. To illustrate this, I have taken Mr. Allison's Figure 1 from his direct testimony, I added the 2020/21 value for CONE recently published by MISO, and I added future estimates of CONE using a 2% annual inflation value, the same value we used for general inflation in our recent IRP analyses. The result is shown in Figure 1 below. As is apparent, the future capacity price assumptions used in Ameren Missouri's 2017 IRP reach the value of CONE in one year – 2029 – and are otherwise below the value of CONE.

Figure 1



Q. Mr. Allison criticizes the assumptions used for renewable resource costs used in the Company's 2017 IRP filing. How do you respond?

A. The Company's assumptions for wind and solar resource costs were consistent with actual project bids at the time of the 2017 IRP. These cost assumptions are regularly revisited as new information becomes available. In the case of wind resource costs, a key difference between the Company's assumptions and generic public information is that the generic public information fails to account for transmission network upgrade costs while the Company includes estimates for those upgrade costs. Our estimate was based directly on the cost of wind projects under negotiation at the time the 2017 IRP was prepared. As the Commission knows, transmission network upgrade costs for wind projects can be significant and can directly affect the viability of a particular project. As I noted above, the Commission and the Company have seen that first-hand.

Regarding solar resource costs, Sierra Club's assertion that the Company's estimates were based on 2013 costs is erroneous. The Company noted in its response to Sierra Club's comments on its 2017 IRP that this perception is based on a mistaken reading of information in the Company's IRP workpapers. In its response, the Company further noted that:

> Ameren Missouri updated the 2013 solar cost assumption in 2016 with its subject matter experts as it was preparing the draft reports for the 2017 IRP filing. The overnight capital cost for solar from the 2013 study was $3,777/kW in 2013 dollars, which equates to $4,008/kW in 2016 dollars. The solar cost for 2016 used in Ameren Missouri's 2017 IRP is $1,863/kW, which clearly accounts for a sharp decline in solar costs, contrary to Sierra Club's allegation.

For its 2019 IRP Annual update, the Company again updated its estimates of wind and solar resource costs, again basing them on the most recent available information.

Q. Mr. Allison contends that the Company's evaluation of early retirement of coal-fired units in its 2017 IRP was skewed because of what he claims were inflated cost estimates for wind and solar resources. How do you respond?

A. This is simply not true. A key in understanding why is knowing that wind and solar resources receive credit for their capacity that is well below their maximum rated output – typically around 15% of maximum output for wind and 50% for solar. Another key consideration is the logistics of rapidly deploying wind and solar resources at sufficient scale to replace the capacity and energy output of large conventional generation resources. Taken together, these key considerations make evident that near-term replacement of coal-fired generators with wind and/or solar resources alone is infeasible.

Q. Please explain why.

A. For example, replacement of the capacity of Labadie Energy Center, which is roughly 2,400 MW, would require 4,800 MW of solar generation or 16,000 MW of wind generation. Replacement of the energy production from Labadie, which is roughly 16 million MWh annually, would require over 8,000 MW of solar resources costing over $10 billion and require over 80 square miles of land area or over 4,500 MW of wind generation costing over $6.5 billion and require over 450 square miles of land area. The numbers cited in the previous sentence reflect costs in line with the estimates Mr. Allison cites, but does not include significant transmission network infrastructure additions which, as noted above, Mr. Allison's estimates omit but which are likely to be required, in order to obtain generator interconnection approval from the regional transmission operator ("RTO"). It should also be noted that additional integration costs to

mitigate short-term reliability issues that often arise in systems with high renewable penetration (e.g., the so-called "duck curve" issues seen in California) are not reflected in these costs. [5]

Q. Do these facts mean that there is no place for significant additions of wind and solar as part of Ameren Missouri's long-term resource portfolio?

A. Not at all. It simply serves to illustrate the logistical infeasibility of retiring and replacing large amounts of coal-fired generation entirely with renewable generation in the next several years, as Mr. Allison theorizes might be possible. In actual fact, the Company's IRP analysis accounts for the need for new resources, or lack thereof, as part of an integrated analysis of the Company's entire portfolio.

Q. Mr. Allison asserts that the Company's assumptions regarding the costs of environmental compliance are deficient and therefore bias the evaluation of early retirements of coal-fired units. How do you respond to his assertion?

A. Mr. Allison's assertion relies primarily on the recent court ruling involving the Rush Island Energy Center. Not to be repetitive, but the Company's consideration of the results of that case are best addressed in its upcoming 2020 IRP, and any evaluation of speculative outcomes for that case in prior IRP analyses would have been premature. As I also mentioned previously, this issue was raised by the Sierra Club in Ameren Missouri's 2017 IRP case, rebutted by the Company in its response report in that case, and not found to be a deficiency in the Company's IRP filing by the Commission in its order on the 2017 IRP. The Commission recently recognized that the appropriate forum

[5] The "duck curve" is a graph of power production over the course of a day that shows the timing imbalance between peak demand and renewable energy production.

for addressing this issue is in the Company's 2020 IRP by including it as a Special Contemporary Issue for that IRP filing.

V. Conclusion

Q. Please summarize your testimony.

A. Sierra Club's assertion that the Company's continued investment in its coal-fired units is imprudent is unfounded. The Company has appropriately conduced a robust IRP process on which it has based its resource decisions and investments, and the Commission has recognized such by finding that the Company's IRP and resource acquisition strategy meet the requirements and standards set forth in the Commission rules. The Company's 2017 IRP assumptions were appropriate and provided a reasonable basis for analysis. The Company will be filing its 2020 IRP in less than nine months and this is the appropriate forum in which to address long-term resource planning decisions. I recommend that the Commission continue to rely on its robust and long-established IRP planning process to address just these kinds of issues. Because of the foregoing, I further recommend that the Commission find that the Company's investment in its coal-fired resources is reasonable and appropriate and should be included in rate base.

Q. Does this conclude 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 Decrease Its Revenues for Electric Service.	)))	File No. ER-2019-0335

AFFIDAVIT OF MATT MICHELS

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

COMES NOW Matt Michels, and on his oath declares that he is of sound mind and lawful age; that he has prepared the foregoing *Rebuttal Testimony*; and that the same is true and correct according to his best knowledge and belief.

Further the Affiant sayeth not.

Matt Michels

Subscribed and sworn to before me this 21ST day of January, 2020.

Notary Public

My commission expires:

GERI A. BEST
Notary Public - Notary Seal
State of Missouri
Commissioned for St. Louis County
My Commission Expires: February 15, 2022
Commission Number: 14839811