Exhibit No.
Issue: Modeling and Portfolio Analysis
Witness: James McMahon
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Sponsoring Party: The Empire District Electric Company
Case No: EA-2019-0010
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BEFORE THE PUBLIC SERVICE COMMISSION OF THE STATE OF MISSOURI

SURREBUTTAL TESTIMONY

OF

JAMES MCMAHON

March 5, 2019

Liberty Utilities®
EMPIRE DISTRICT

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I. INTRODUCTION

Q. PLEASE STATE YOUR NAME, EMPLOYER AND TITLE.

A. My name is James McMahon. I am a Vice President in the energy practice of Charles River Associates ("CRA").

Q. HAVE YOU TESTIFIED PREVIOUSLY IN THIS PROCEEDING?

A. No. However, I did provide testimony before the Missouri Public Service Commission ("Commission") in support of The Empire District Electric Company's ("Empire" or "Company") Customer Savings Plan ("CSP") in EO-2018-0092.

Q. PLEASE DESCRIBE CRA AND YOUR JOB FUNCTION.

A. CRA is a professional services firm that provides economic, financial, and strategic expertise to support our clients in business decisions, regulatory and litigation matters, and market and policy analysis. CRA's energy practice advises electric utilities, power developers, investors, and other energy market participants in the areas of strategy, market analysis and forecasting, asset transactions and valuation, resource planning, and regulatory support and compliance. I currently oversee many of CRA's projects and client relationships, working on a broad range of topics related to resource planning, market price forecasting, and electric rate analysis.

Q. WHAT EXPERIENCE DO YOU HAVE IN ENERGY CONSULTING?

A. I have been a consultant to electric utilities for the last 20 years, including 7 years at CRA. I have been in my current role at CRA since 2014.

Q. WHAT IS YOUR EDUCATION?

A. I hold a Juris Doctor and Masters of Business Administration from the College of William and Mary, and a Bachelor's degree in Economics from Tufts University. A copy of my resume is attached to my testimony as **Schedule JM-1.**

Q. WOULD YOU PLEASE SUMMARIZE THE PURPOSE OF YOUR SURREBUTTAL TESTIMONY?

A. Yes. I respond to issues raised in the rebuttal testimony of Office of the Public Counsel ("OPC") witnesses Geoff Marke and Lena M. Mantle. I also respond to one item raised in the rebuttal testimony of Ms. Natelle Dietrich of Commission Staff ("Staff").

II. <u>RESPONSE TO OPC WITNESS GEOFF MARKE REBUTTAL TESTIMONY</u>

Q. HAVE YOU REVIEWED THE REBUTTAL TESTIMONY SUBMITTED BY OPC WITNESS MARKE?

A. Yes.

Q. DOES OPC WITNESS MARKE SUPPORT EMPIRE'S APPLICATION?

A. No, not in its current form.

Q. WHAT CONCERNS DOES OPC WITNESS MARKE RAISE WITH EMPIRE'S APPLICATION?

A. OPC Witness Marke raises several concerns with Empire's application. He orients his concerns around the Tartan factors, which I understand the Commission has in the past used to analyze utility requests for a Certificate of Convenience and

Necessity ("CCN"). His opinion is that Empire does not have a need for 600 MW of wind, that the wind projects are not economically feasible, and that the wind projects are not in the public interest.

OPC Witness Marke's concerns are similar to the concerns he raised in Case No. EO-2018-0092.

Q. WHAT IS YOUR OVERALL IMPRESSION OF OPC WITNESS MARKE'S REBUTTAL?

A. I find OPC Witness Marke's testimony to be short on the analysis that would generally support a position like the one he and OPC advance. Expertly evaluating the need for a new power plant in a utility's portfolio is complex. It involves simulating how a new plant would perform in a utility's portfolio under conditions that range from the expected to the unexpected. OPC Witness Marke points to Empire's reserve margin, the SPP wind queue, and the fact that other utilities are also building wind as conclusive evidence that Empire's customers will be harmed by Empire's application. While this information, where accurate, may be relevant to the development of a robust portfolio analysis, presenting it in isolation to buttress the claims brought by OPC is misleading.

In my opinion, OPC has not presented any information that, when modeled and evaluated appropriately, would lead to an outcome that is antithetical to Empire's application and Preferred Plan. The bottom line is that the CSP demonstrated that the proposed wind additions lower expected customer costs and customer cost risk.

Q. WHAT ARE THE TARTAN FACTORS?

A. I have been advised by counsel that the Commission will generally consider what have been referred to as the *Tartan* factors in determining whether to grant a utility's request for a CCN. Those five factors are as follows: (1) whether there is a need for the service; (2) whether the applicant is qualified to own, operate, control, and manage the facilities and provide the proposed service; (3) whether the applicant has the financial ability to provide the service; (4) whether the proposal is economically feasible; and (5) whether the facilities and service promote the public interest.

TARTAN FACTOR #1: THE "NEED" FOR 600 MW OF WIND IN EMPIRE'S PORTFOLIO

Q. DOES OPC WITNESS MARKE BELIEVE THAT EMPIRE HAS ESTABLISHED "NEED" UNDER THE FIRST PRONG OF THE TARTAN TEST?

A. No. OPC Witness Marke states the "requested CCN is not necessary to meet Empire's native load, meet statutorily mandated RES, or necessary to provide service at just and reasonable rates."[1] He points to Empire's planning reserve margin of 33.2% as dispositive of this issue.[2]

[1] Rebuttal Testimony of Geoff Marke Submitted on Behalf of the Office of the Public Counsel. (February 5, 2019) Case No: EA-2019-0010. Page 3, Lines 8-9.
[2] Ibid. Page 2, Lines 25-26.

Q. DOES OPC WITNESS MARKE INDICATE THAT HE BELIEVES EMPIRE'S PLANNING RESERVE MARGIN IS TOO HIGH?

A. Yes. He states, "Empire has an excessive planning reserve margin of 33.2%."[3] This would seem to indicate that he believes Empire's planning reserve margin should be lower. However, he does not suggest what he believes to be the appropriate planning reserve margin.

Q. ON WHAT BASIS DOES OPC WITNESS MARKE DESCRIBE EMPIRE'S PLANNING MARGIN AS "EXCESSIVE"?

A. OPC Witness Marke only refers to the fact that Empire's planning reserve margin is 21% higher than SPP's minimum required reserve margin.[4] He does not share any analysis to support his claim that the reserve margin is excessive.

Q. TO YOUR KNOWLEDGE, DO OTHER UTILITIES HAVE PLANNING RESERVE MARGINS SIGNIFICANTLY ABOVE THE MINIMAL REQUIREMENT?

A. Yes. Figure 1 illustrates the 2018 planning reserve margins from SPP's Resource Adequacy Report[5] for each of the load serving entities ("LSE"), including Empire, in SPP. As shown in Figure 1, planning reserve margins in 2018 for SPP LSEs range from 10.6% to as high as 220%.[6] Empire's planning reserve margin is

[3] Ibid. Page 2, Lines 25-26.
[4] Ibid. Page 2, Lines 26-27.
[5] SPP 2018 Resource Adequacy Report. Published on June 29th, 2018. https://www.spp.org/documents/58196/2018%20spp%20june%20resource%20adequacy%20report.pdf
[6] Ibid.

33.2%, while the median planning reserve margin is 32.8% for all of the LSEs in SPP.[7]

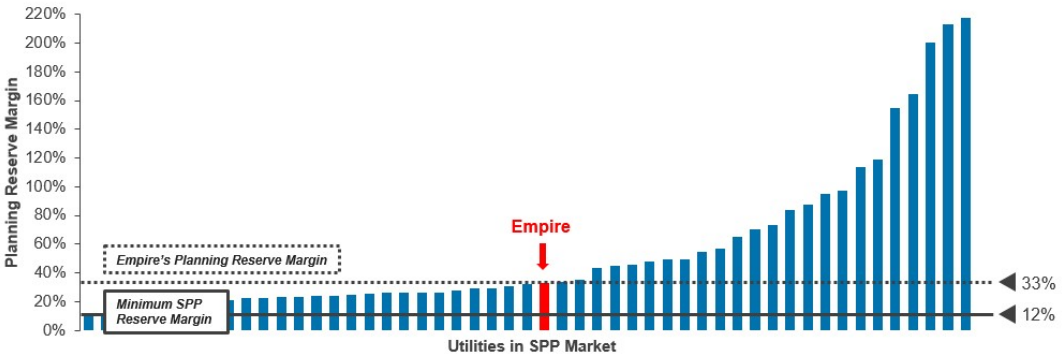


Figure 1. Planning Reserve Margin for Utilities in SPP Market

Q. WHY WOULD IT BE APPROPRIATE FOR DIFFERENT LOAD SERVING ENTITIES ("LSE") TO HAVE DIFFERENT PLANNING RESERVE MARGINS?

A. How an LSE decides to best meet its load should reflect the LSE's unique situation, opportunities, and risks. No two LSEs are the same, thus the portfolios, and hence planning reserve margins, should be distinct.

Q. WHY WOULD IT BE APPROPRIATE FOR AN LSE TO HAVE A PLANNING RESERVE MARGIN SIGNIFICANTLY ABOVE THE REQUIRED MINIMUM?

A. LSEs often procure well beyond a required minimum for several reasons: (1) to avoid the risk of falling short of meeting their requirements; (2) as a result of the block size of new resources they procure; (3) to provide flexibility in decision-

[7] Ibid. Median excludes the City of Poplar Bluff Municipal Utilities' planning reserve margin, which is 2044%.

making; and (4) as a result of a transformation that may require investment and divestment that cannot practically happen all at once.

Q. WHY IS IT NECESSARY FOR EMPIRE TO ADD 600 MW OF ADDITIONAL WIND RESOURCES TO ITS PORTFOLIO IF IT WILL FURTHER INCREASE ITS PLANNING RESERVE MARGIN?

A. Empire assessed the need for 600 MW of wind on the basis of a portfolio analysis that looked at many factors, including the minimal required reserve margin. Empire's analysis, which formed the basis for its Change in Preferred Plan filing on October 17, 2018,[8] showed that adding 600 MW of wind to its portfolio had significant benefits for its customers. These benefits included substantially lowering the net present value revenue requirement of the Empire generation portfolio and significantly reducing portfolio cost risk.

Q. COULD THESE BENEFITS HAVE BEEN ACHIEVED WITHOUT INCREASING THE PLANNING RESERVE MARGIN?

A. No. The phase out and expiration of federal production tax credits for wind necessitated that Empire move quickly to add wind to its portfolio. To capture the full production tax credit, a qualifying wind project must enter service by the end of 2020. The full production tax credit incentive is expected to reduce the effective capital cost of the Empire wind projects by more than half. During the CSP modeling, the wind projects had an effective capital cost of $711/kW, putting

[8] Empire's Notice of Change in Preferred Plan. In the Matter of the Empire District Electric Company's Change to its 2016 Utility Resource Filing Pursuant to 4 CSR 240 – Chapter 22. (October 17, 2018).

the projects on a parity with a new combined cycle gas plant, but without any fuel costs.[9]

In its CSP modeling, Empire identified the optimal amount of wind to support its objectives of lowering customer costs and reducing portfolio cost risk, while simultaneously improving the overall environmental attributes of the portfolio. Empire's analysis showed that adding 800 MW of wind and retiring the Asbury coal plant would reduce cost and cost risk to Empire's customers. Empire agreed to reduce its wind request to 600 MW as part of a stipulation with certain stakeholders, and review the retirement of Asbury in its 2019 IRP, which is currently underway.

Notwithstanding the demonstrated benefits of rebalancing the portfolio with *more* wind, Empire's application presents a low cost opportunity to replace 255 MW of wind associated with the Elk River and Meridian Way Power Purchase Agreements, expiring in the mid to late 2020s[10].

Q. DOES EMPIRE EXPECT TO MAINTAIN THIS HIGHER PLANNING RESERVE MARGIN INDEFINITELY?

A. Empire is currently developing its 2019 IRP, which will address the timing of retirements and additions beyond the planned 600 MW of wind. As shared with stakeholders at the February 6, 2019 stakeholder meeting, Empire is evaluating

[9] Affidavit in Support of Non-Unanimous Stipulation and Agreement of James McMahon. (April 24, 2018) Case No: EO-2018-0092. Page 4.
[10] The Elk River wind PPA for 150MW expires in 2025. The Meridian Way wind PPA for 105 MW expires in 2028.

three retirement concepts in its modeling: (1) age based; (2) retiring Asbury early; and (3) retiring Asbury, Riverton 10+11, and Energy Center 1+2 early[11]. The latter two concepts would, on their own, reduce Empire's planning reserve margin.

Figure 2 illustrates the overall framework that Empire is using to develop its Preferred Plan in the 2019 IRP.

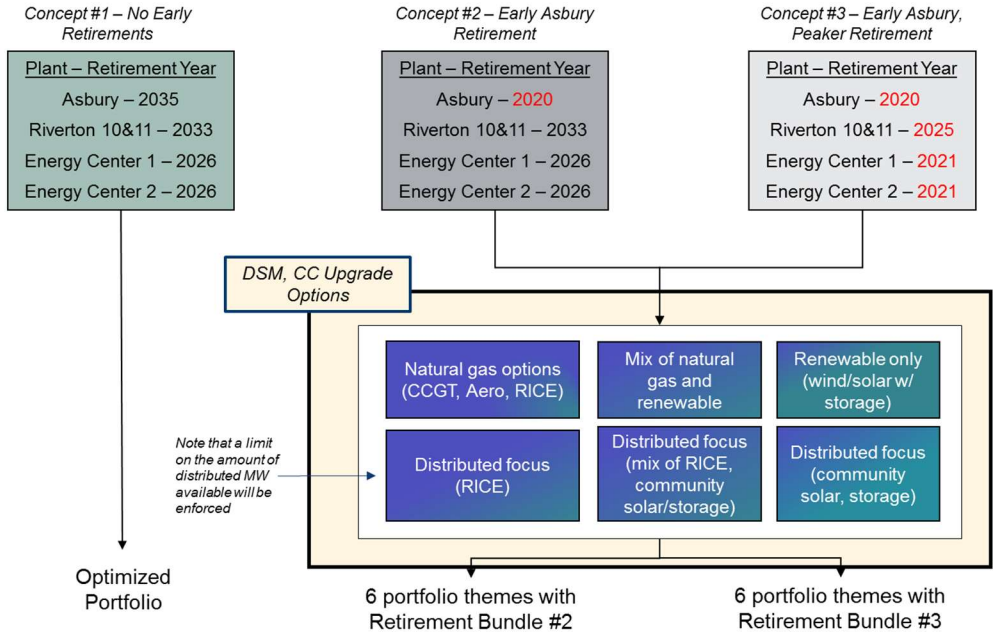


Figure 2. Empire's Portfolio Modeling Approach in the 2019 IRP

Q. IN YOUR OPINION, HAS EMPIRE ESTABLISHED THE NEED FOR 600 MW OF WIND CONSISTENT WITH THE FIRST TARTAN FACTOR?

A. Yes, for the reasons stated above. Please also see Mr. Merten's Surrebuttal Testimony on the need for 600MW of wind.

[11] Asbury is a 200 MW coal-fired steam unit; Energy Center 1 and 2 are two steam units located at the Empire Energy Center plant, sized 82 and 80 MW respectively; Riverton 10 and 11 are two steam units totaling 28 MW.

TARTAN FACTOR #2: THE ECONOMIC FEASIBILITY OF EMPIRE'S PROPOSED 600 MW OF WIND

Q. DOES OPC WITNESS MARKE BELIEVE THAT EMPIRE HAS ESTABLISHED THE ECONOMIC FEASIBILITY OF ADDING 600 MW OF WIND TO ITS PORTFOLIO UNDER THE TARTAN TEST?

A. No.

Q. WHAT IS THE BASIS FOR OPC WITNESS MARKE'S OPINION?

A. OPC Witness Marke states that Empire's modeling and, in turn, the results of the Company's analysis, are speculative and based on outdated assumptions. He claims that Empire has "no economically rational thesis" to its application.[12]

Q. ARE THESE SIMILAR ARGUMENTS AND CONCLUSIONS TO WHAT OPC WITNESS MARKE DESCRIBED IN CASE NO. EO-2018-0092?

A. Yes.

Q. WHAT EVIDENCE DOES OPC WITNESS MARKE PROVIDE THAT EMPIRE'S ASSUMPTIONS ARE OUTDATED?

A. OPC Witness Marke states that Empire's worst case scenario accounted for less wind coming online in SPP than what has "already been sanctioned with interconnection agreements by SPP today."[13] OPC Witness Marke states that Empire assumed only 6.5 GW of additional wind capacity in SPP over the study

[12] Rebuttal Testimony of Geoff Marke Submitted on Behalf of the Office of the Public Counsel. (February 5, 2019) Case No: EA-2019-0010. Page 3, Lines 10.
[13] Rebuttal Testimony of Geoff Marke Submitted on Behalf of the Office of the Public Counsel. (February 5, 2019) Case No: EA-2019-0010. Page 15, Lines 1-4.

period, yet 10 GW has already signed interconnection agreements.[14] OPC Witness Marke also points to an additional 50 GW pending wind generation interconnection requests in SPP.[15]

Q. DO YOU AGREE WITH OPC WITNESS MARKE'S CHARACTERIZATION OF THE WIND THAT IS LIKELY TO BE BUILT IN SPP?

A. No. OPC Witness Marke leaves out an important statement from the SPP presentation that he cites. On the same page where OPC Witness Marke references 10 GW of already signed interconnection agreements, SPP states that it is forecasting **6.5 GW to 11.5 GW** of additional wind capacity by 2025.[16] This important fact illustrates that even where a generator has a signed interconnection agreement, other reasons may prevent that plant from being built.

Moreover, a review of SPP's historical interconnection queue illustrates that wind projects in SPP's interconnection queue are frequently cancelled. Figure 3 shows the disposition of all the SPP wind interconnection requests made from 2002 to February 19, 2019.[17] All of the projects are classified as either withdrawn, pending (study stage), or fully executed. According to the data published by SPP, the majority of these interconnection requests were withdrawn.[18]

[14] Ibid. Page 14, Lines 5-6.
[15] Ibid. Page 14, Lines 7-8.
[16] Ibid. Page 14, Lines 6-7.
[17] Data is obtained from SPP GI Active Requests, last updated on 2/19/2019. http://opsportal.spp.org/Studies/GIActive

[18] Note that the chart excludes 6582MW of wind due to unavailable data on date of completion. However, 6,052MW out of 6582MW is listed as withdrawn or terminated and only 527MW is fully executed.

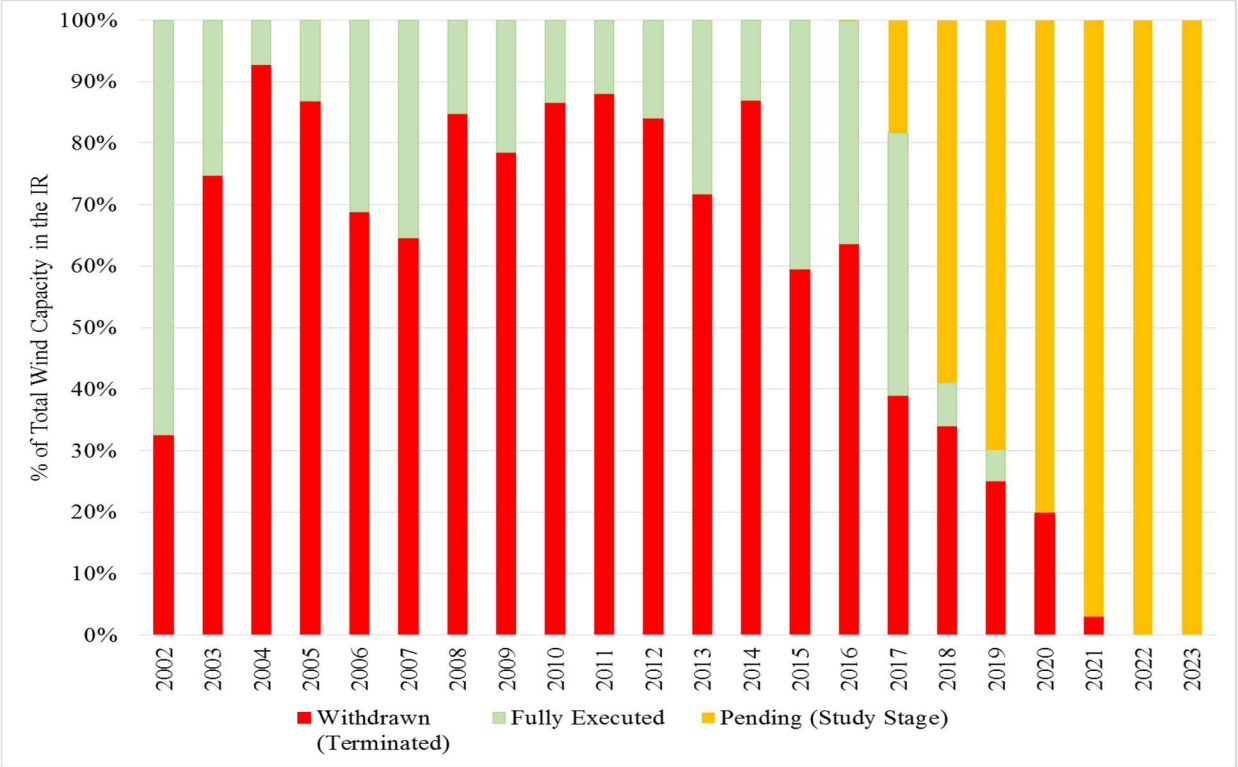


Figure 3. Interconnection Requests Queue

Q. HOW MUCH WIND DID EMPIRE ASSUME WOULD BE BUILT IN SPP IN THE CSP BETWEEN 2017 AND 2025 WHEN FORECASTING POWER PRICES IN THE BASE CASE?

A. Empire assumed 6.4 GW of wind would be built in SPP between 2017 and 2025 in the base case scenario of its CSP.

Q. DID EMPIRE RUN SCENARIOS IN THE CSP TO CAPTURE THE POSSIBILITY THAT MORE WIND WOULD BE BUILT IN SPP THAN CONTEMPLATED IN ITS BASE CASE?

A. Yes. Empire ran two types of scenarios in the CSP to address this uncertainty. First, Empire ran a scenario specifically at the request of OPC that increased the amount of wind additions through 2020 to 8.2 GW. OPC Witness Marke states

that Empire assumed 6.5 GW of wind added over the entire study period in this "high wind" case. This is not accurate. Empire's "high wind" scenario added 8.2 GW from 2018-2020 only. Beyond this period, ABB assumes that "generic" wind will be built every year. This amounted to about 24 GW of wind in SPP by the end of 2020. This compares to the 21.5 GW of wind in SPP today. This scenario resulted in market prices falling on average 5% to 7% from the base case.[19] Empire also ran a low market price scenario, where market prices were reduced by 20% to 30% from the base case.[20]

Q. WHAT DO THE RESULTS OF THOSE SCENARIOS SAY ABOUT THE ECONOMIC FEASIBILITY OF EMPIRE'S APPLICATION TO BUILD 600 MW OF WIND?

A. Empire's analysis showed that even under the low market price scenario (20% to 30% price reduction), Empire's customers would save $67 million on a 20 year net present value basis.[21] I would expect the net present value revenue requirement savings to be significantly higher for the OPC scenario because market prices were reduced by only a *fraction* of the amount in the low market scenario. For perspective, in the CSP, Empire estimated the 20 year base case savings at $169

[19] Surrebuttal Testimony of James McMahon Submitted on Behalf of Empire District Electric Company. (March 13, 2018) Case No: EO-2018-0092. Page 27, Lines 9-10, Table 2.
[20] Ibid.
[21] Affidavit in Support of Non-Unanimous Stipulation and Agreement of James McMahon Submitted on Behalf of Empire District Electric Company. (April 24, 2018) Case No: EO-2018-0092. Page 5, Figure 2.

million,[22] as shown in Figure 4. Based on these results, Empire's proposed wind additions are clearly economically feasible.

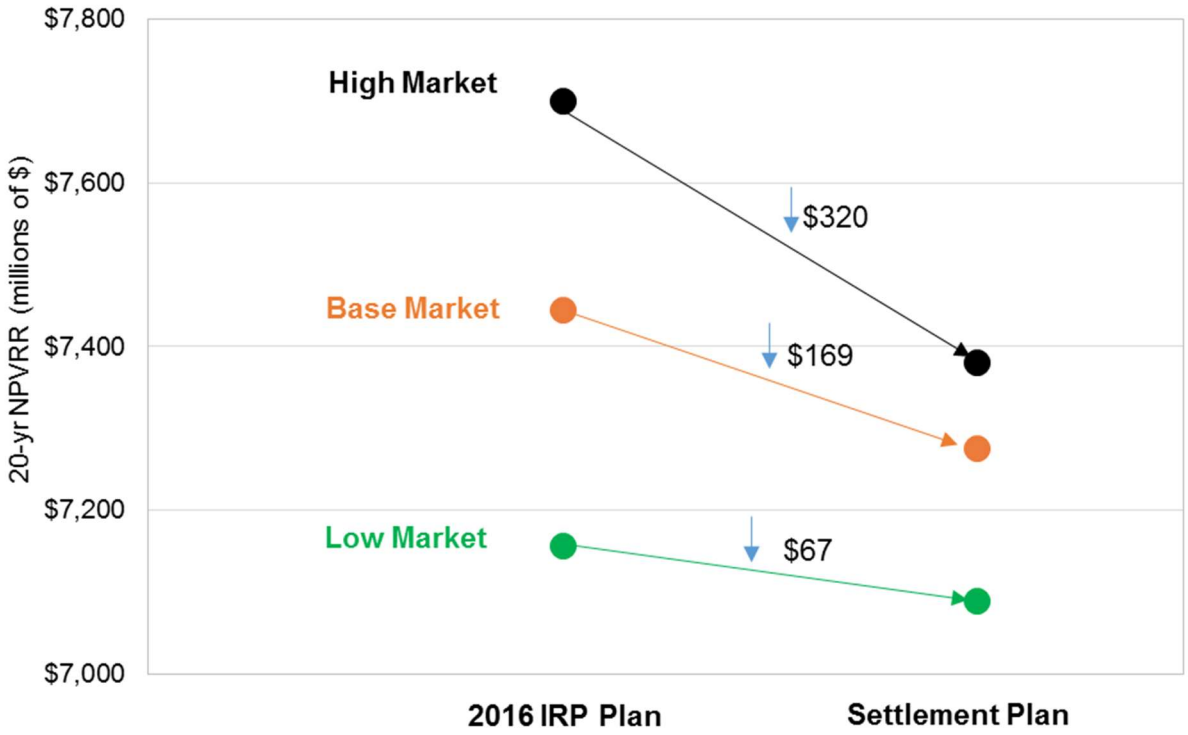


Figure 4. Twenty Year Present Value Revenue Requirement: Base, High, and Low Market[23]

[22] Ibid.
[23] Affidavit in Support of Non-Unanimous Stipulation and Agreement of James McMahon. (April 24, 2018) Case No: EO-2018-0092, Page 5.

TARTAN FACTOR #3: THE APPLICANT'S QUALIFICATIONS TO PROVIDE THE SERVICE

Q. DOES OPC WITNESS MARKE RAISE A CONCERN ABOUT EMPIRE'S QUALIFICATIONS TO PROVIDE THE SERVICE, UNDER THE THIRD TARTAN FACTOR?

A. No.

TARTAN FACTOR #4: THE APPLICANT'S FINANCIAL ABILITY TO PROVIDE THE SERVICE

Q. DOES OPC WITNESS MARKE RAISE A CONCERN ABOUT EMPIRE'S FINANCIAL ABILITY TO PROVIDE THE SERVICE, UNDER THE FOURTH TARTAN FACTOR?

A. Yes. Empire Witness Mooney responds to these concerns in his surrebuttal testimony.

TARTAN FACTOR #5: THE PUBLIC INTEREST

Q. DOES OPC WITNESS MARKE RAISE A CONCERN ABOUT WHETHER 600 MW OF ADDITIONAL WIND IN EMPIRE'S PORTFOLIO IS IN THE PUBLIC INTEREST?

A. Yes.

Q. WHAT IS OPC WITNESS MARKE'S CONCERN?

A. He argues that adding wind to Empire's portfolio shifts risk to customers and is therefore not in the public interest.

Q. DO YOU AGREE WITH OPC WITNESS MARKE'S OPINION?

A. No. As I stated and shared before the Commission in Case No: EO-2018-0092,[24] and as illustrated in Figure 4 above, OPC Witness Marke has it backwards. Adding wind to the portfolio reduces risk (in addition to decreasing cost) because wind performs much better than the status quo under most market conditions evaluated. This makes sense because, for example, when you introduce a carbon policy as Empire does in some scenarios, the benefits of owning the additional wind rise substantially over a portfolio without the additional wind. On the other hand, the status quo is not only more costly in the base case, it is more costly in most of the scenarios that were evaluated.

Q. DO YOU BELIEVE 600 MW OF WIND ADDITIONS IS IN THE PUBLIC INTEREST, CONSISTENT WITH THE TARTAN FACTORS DESCRIBED ABOVE?

A. Yes.

THE LEVELIZED COST OF ELECTRICITY

Q. OPC WITNESS MARKE DEVOTES A SECTION OF HIS REBUTTAL TESTIMONY TO THE LEVELIZED COST OF ELECTRICITY ("LCOE"). IN YOUR OPINION, WHAT IS THE PURPOSE OF THIS TESTIMONY?

[24] Surrebuttal Testimony of James McMahon Submitted on Behalf of Empire District Electric Company. (March 13, 2018) Case No: EO-2018-0092, Page 5.

A. I believe OPC Witness Marke's principal argument is that LCOE is not a suitable measure in itself for evaluating whether an asset addition to a portfolio is cost effective.

Q. DO YOU AGREE WITH HIM ON THIS POINT?

A. Yes.

Q. DOES OPC WITNESS MARKE ARGUE THAT EMPIRE USED LCOE TO EVALUATE WHETHER THE 600 MW OF WIND WAS COST EFFECTIVE?

A. Yes.

Q. DID EMPIRE USE LCOE AS THE BASIS FOR SELECTING 600 MW OF WIND, AS OPC WITNESS MARKE SUGGESTS?

A. No. Empire selected 600 MW of wind on the basis of a detailed portfolio analysis using industry standard modeling software and detailed and wide-ranging scenarios to test risk. As was described extensively in Case No: EO-2018-0092,[25] that analysis included evaluating alternative portfolios across scenarios that flexed fuel and market prices, CO2 policy, nodal basis, load, and the build out of wind in SPP.[26] All in all, Empire ran 54 scenario combinations, as well as the high wind case requested by the parties.

[25] Surrebuttal Testimony of James McMahon Submitted on Behalf of Empire District Electric Company. (March 13, 2018) Case No: EO-2018-0092. Page 8, Line 1-2.
[26] Ibid. Page 27, Lines 9-10.

Q. DID EMPIRE DISCUSS OR PROVIDE A COMPARISON OF THE WIND LCOE IN PRIOR TESTIMONY OR PRESENTATIONS TO STAKEHOLDERS?

A. Yes.

Q. WHAT WAS THE PURPOSE OF PRESENTING LCOE IN THESE CONTEXTS?

A. The purpose of these communications was to illustrate simplistically that wind is highly competitive with other technologies, especially where tax incentives are involved.

Q. WAS LCOE USED BY EMPIRE TO DETERMINE WHETHER UPDATED MODELING WAS NEEDED FROM THE CSP TO SUPPORT THE CCN APPLICATION?

A. Yes, it was one of the considerations. As Empire Witness Mooney stated in response to OPC DR-2001, "no update has been performed since the ultimately executed contracts' LCOE's for the portfolio of wind projects (Kings Point, North Fork Ridge and Neosho Ridge) were at or below the $23.89 contemplated in that docket."[27]

Q. WHY WAS LCOE AN IMPORTANT CONSIDERATION IN THAT DECISION?

[27] Ibid. Page 9, Line 11. Table 1.

A. Because Empire had firmed up certain wind project costs and performance measures that could be compared to the preliminary estimates used in the CSP modeling. Had Empire assessed that the actual project cost was significantly different than its estimate, this may have been a reason to update the analysis.

Q. WHY DID EMPIRE UPDATE ITS WIND COST ESTIMATE BUT NOT ITS OVERALL MODELING?

A. Updating a wind project cost forecast with actual values is quite different than updating a complete market price forecast with another market price forecast, particularly where no significant event has triggered this need.

Empire produced an extensive economic analysis in support of the CSP that included forecasts of customer costs under dozens of wide-ranging scenarios. These scenarios included ABB's standard high and low market scenarios as well as scenarios proposed by stakeholders, including OPC. That analysis, completed over more than six months, demonstrated clearly that the CSP reduced costs and cost risk to Empire customers even under the "high wind" case proposed by OPC.

III. <u>RESPONSE TO OPC WITNESS LENA M. MANTLE REBUTTAL TESTIMONY</u>

Q. HAVE YOU REVIEWED THE REBUTTAL TESTIMONY SUBMITTED BY WITNESS LENA MANTLE FROM OPC?

A. Yes.

Q. DOES OPC WITNESS MANTLE SUPPORT EMPIRE'S APPLICATION?

A. No.

Q. WHAT CONCERNS DOES OPC WITNESS MANTLE RAISE WITH EMPIRE'S APPLICATION?

A. OPC Witness Mantle raises concerns about the accuracy of Empire's market price forecasts and Empire's reliance on projected SPP market prices for evaluating the benefits and costs of building the proposed wind as regulated assets.

Q. WHAT IS YOUR OVERALL RESPONSE TO OPC WITNESS MANTLE'S REBUTTAL?

A. It appears to me that OPC Witness Mantle does not fully understand how Empire produced the power price forecasts that were used in the CSP modeling. She spends a substantial portion of her rebuttal testimony describing why historical SPP pricing is not reliable for developing price forecasts, notwithstanding that Empire did not use this approach.

EMPIRE'S APPROACH TO PRICE FORECASTING

Q. WHAT APPROACH DID EMPIRE USE FOR FORECASTING THE SPP MARKET PRICES THAT WERE USED TO EVALUATE THE 600 MW OF WIND?

A. Empire used what is often termed a "fundamental" modeling approach, whereby the market price of electricity determined in a given hour of the forecast period reflects the marginal cost of the marginal unit producing electricity in that hour.

Q. IS THIS APPROACH CONSISTENT WITH HOW MARKETS ACTUALLY OPERATE?

A. Yes. The purpose of this approach is to emulate market operations and forecast a price of electricity in a given hour consistent with how the price will ultimately be determined.

Q. WHAT IS REQUIRED TO DEVELOP A FUNDAMENTAL FORECAST OF SPP POWER PRICES USING THE APPROACH YOU DESCRIBE?

A. A lot of information and a model that can handle the complex calculations in an efficient manner. For instance, every generator in the pricing area will need to be specified with heat rates, ramp times, planned and forced outages, fuel sources, and other information.

Q. HOW DOES EMPIRE HANDLE THIS FUNDAMENTAL MODELING OF POWER PRICES?

A. Empire contracts with ABB, who has a standardized product to which Empire subscribes. ABB maintains a highly detailed database of all the data needed to produce the fundamental price forecast.

OPC WITNESS MANTLE'S IMPRESSION OF EMPIRE'S APPROACH TO PRICE FORECASTING

Q. YOU STATED ABOVE THAT YOU THINK OPC WITNESS MANTLE BELIEVES THAT EMPIRE IS RUNNING HISTORICAL TIME SERIES ANALYSIS TO PRODUCE ITS MARKET PRICE FORECASTS. WHY IS THAT YOUR IMPRESSION?

A. OPC Witness Mantle's testimony is oriented around the use of historic data in the Empire power price forecast. She argues at various points in her testimony that it is questionable, if not impossible, to produce a forecast with the limited history of SPP pricing. Yet, as I stated above, Empire did not develop its price forecast using a historical time series analysis. Rather, Empire used a fundamental pricing model that evaluates how load is being served by supply in each hour. OPC Witness Mantle has nothing to say about Empire's actual approach to price forecasting in her testimony.

On page 9, OPC Witness Mantle states the following in her rebuttal testimony:[28]

Q. Is there any method that could more accurately forecast market prices?

A. I do not know of any. Review of actual SPP market price data and the underlying market points to reasons other than the method used to make the forecasts for the forecasts being so different from what actually occurred in the SPP market in the near-term. These include having a limited amount of data to work with, and an evolving market that makes it impossible for any forecast to be accurate.

On Page 10, OPC Witness Mantle states the following in her rebuttal testimony:[29]

Q. What leads you to believe that data constraints are leading to inaccurate forecasts?

[28] Rebuttal Testimony of Lena M. Mantle Submitted on Behalf of the Office of the Public Counsel. (February 5, 2019) Case No: EA-2019-0010. Pages 9 Line 16 and Page 10, Lines 1-5.
[29] Ibid. Page 10, Lines 8-24 and Page 11, Lines 1-7.

A. The SPP market has only been operating since March 2015, so when Empire filed this application there were only 43 months of actual historical data available for this new market. While this may seem like a lot of data, it really is not. The SPP market is an hourly market, and the price in each hour may respond to different variables specific to the hour including the time of the year and time of the day, the load requirements, and the probability of wind availability. This means that there were only three or four data points for each hour on which to determine a relationship that should include at least the time of the day, season of the year, day of the week, natural gas prices, and availability of other generating resources. In general, a forecast created from a small amount of historical data is questionable.

In general, a forecast created from a small amount of historical data is questionable. In the case of SPP market prices, an examination of the available data shows that in addition to having a limited amount of data to input into a forecast, the data that is available is erratic, which should result in greater skepticism regarding the accuracy of any market price forecast – short-term or long-term.

The graph below shows the average hourly market prices for the years 24 2015 through 2017 at one of the Empire SPP generation nodes, the Elk River wind farm,13 which Empire provided to OPC in its response to 1 OPC data request 8508.

With just these three data points, it looks as if the annual market price is easy to forecast, and the trend is definitely downward.

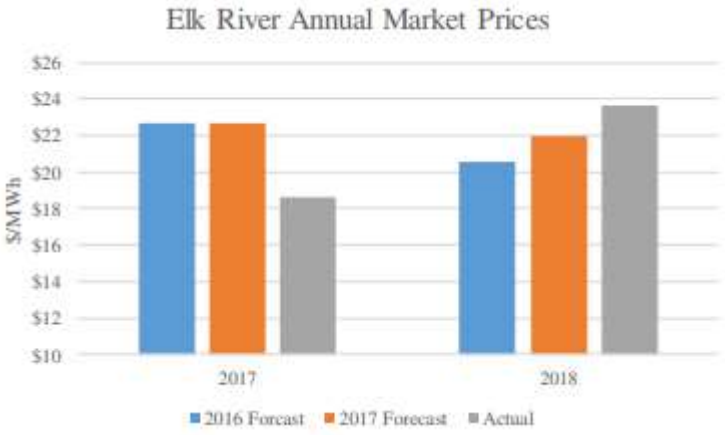
Q. IF EMPIRE DOES NOT USE HISTORICAL SPP PRICES TO FORECAST FUTURE PRICES, HOW IS THE SPP PRICE PRODUCED?

A. Similar to how the SPP day-ahead market settles, Empire, through its consultant ABB, effectively creates its own simulation of the SPP market to forecast hourly electricity prices.

Q. HAVE YOU REVIEWED THE BAR CHART PRODUCED BY OPC WITNESS MANTLE COMPARING EMPIRE FORECASTED POWER PRICES TO ACTUAL POWER PRICES FOR 2017 AND 2018, REPRODUCED BELOW?[30]

A. Yes.

[30] Rebuttal Testimony of Lena M. Mantle Submitted on Behalf of the Office of the Public Counsel. (February 5, 2019) Case No: EA-2019-0010. Pages 9, Line 1.



Q. WHAT ARE YOUR OBSERVATIONS ON THE GRAPHIC PRODUCED BY OPC WITNESS MANTLE?

A. The graphic shows that Empire's forecast of power prices at the Elk River generator node was lower than forecast in 2017, and higher than forecast in 2018.

Q. WHAT CONCLUSION DOES OPC WITNESS MANTLE DRAW FROM HER ANALYSIS?

A. OPC Witness Mantle states, "All forecasts will have uncertainties in the long-term, but short-term predictions are the hallmark of accurate forecasting. The information [in the graphic] indicates that the methodology Empire used to forecast 2017 and 2018 SPP market prices did not accurately estimate the near-term market prices."[31]

Q. WHAT ARE YOUR REACTIONS TO OPC WITNESS MANTLE'S CONCLUSIONS?

[31] Ibid. Page 9, Lines 11-12.

A. I find OPC Witness Mantle's premise seriously flawed. A power price forecast that is intended to support a long-range investment decision is not focused on predicting price volatility due to weather. Weather can drive prices up or down significantly in any hour, day, month, or year, but overall should not bias the results long term in one way or another. OPC Witness Mantle herself cites meaningful differences in weather in the two years that she compares actual and forecasted power prices.[32]

Q. IN YOUR EXPERIENCE WORKING WITH UTILITIES IN LONG-RANGE RESOURCE PLANNING AND ON GENERATION INVESTMENT DECISIONS, ARE YOU AWARE OF ANY UTILITY THAT ATTEMPTS TO FORECAST WEATHER AS PART OF ITS POWER PRICE FORECAST MODELING?

A. No. In my experience that is not industry practice. Also, because over the long-term weather effects are expected to balance out, it has no real value in resource planning and evaluating generation projects.

IV. <u>RESPONSE TO MISSOURI COMMISSION STAFF REBUTTAL TESTIMONY</u>

Q. IS IT YOUR UNDERSTANDING THAT ONE OF THE CONDITIONS THAT STAFF PROPOSES FOR COMMISSION APPROVAL IS THE COMPLETION, AND SUBSEQUENT FILING WITH THE COMMISSION,

[32] Rebuttal Testimony of Lena M. Mantle Submitted on Behalf of the Office of the Public Counsel. (February 5, 2019) Case No: EA-2019-0010. Pages 14, Line 16-23.

"OF A SENSITIVITY ANALYSIS ON CURTAILMENT AND THE DISPATCHING DOWN OF EACH WIND PROJECT."[33]

A. Yes.

Q. WHY DOES STAFF ARGUE A SENSITIVITY ANALYSIS ON CURTAILMENT IS APPROPRIATE?

A. Staff argues that wind in SPP is being curtailed at times, but that Empire did not include curtailment in its economic analysis[34].

Q. DO YOU AGREE WITH STAFF THAT WIND IS OCCASSIONALLY CURTAILED IN SPP?

A. Yes. In certain locations and under certain conditions this can occur.

Q. IS IT CERTAIN THAT THE WIND EMPIRE IS BUILDING WILL EXPERIENCE MEANINGFUL CURTAILMENT?

A. Not that I am aware.

Q. DID EMPIRE'S MODELING IN THE CSP SHOW ANY ECONOMIC CURTAILMENT OF THE PROPOSED WIND PROJECTS?

A. No, not directly. Empire, through its consultant ABB, forecasts plant operations based on day-ahead pricing, which is built from the supply and demand fundamentals I discussed earlier. Under these conditions, the proposed wind is a price taker and not expected to be curtailed. However, in the real-time market, curtailment can occur.

[33] Staff Rebuttal Report, Missouri Public Service Commission. (February 5, 2019) Case No: EA-2019-0010. Page 3, Lines 18-22.
[34] Ibid. Page 30, Lines 10-20.

Q. HOW DID EMPIRE ACCOUNT FOR CURTAILMENT IN THE REAL-TIME MARKET?

A. In the CSP, Empire ran scenarios that significantly lowered the price at the generator node where Empire's wind projects were expected to be located. These scenarios were intended to evaluate risk associated with locational challenges, like curtailment.

Q. WHAT DID EMPIRE'S SCENARIO ANALYSIS DEMONSTRATE?

A. Empire's scenario analysis overall demonstrated that adding 600 MW of wind to the portfolio significantly lowered overall cost risk to customers and provides material benefits for the next 30 years.

Q. DOES THIS CONCLUDE YOUR SURREBUTTAL TESTIMONY?

A. Yes, it does.

AFFIDAVIT OF JAMES MCMAHON

COMMONWEALTH OF MASSACHUSETTS)
) ss
COUNTY OF SUFFOLK)

On the 5th day of March, 2019, before me appeared James McMahon, to me personally known, who, being by me first duly sworn, states that he is Vice President, Charles River Associates, and acknowledged that he has read the above and foregoing document and believes that the statements therein are true and correct to the best of his information, knowledge and belief.

James McMahon

Subscribed and sworn to before me this 5th day of March, 2019.

Notary Public

My commission expires: 1/3/25

SUZANNE M. WALSH
Notary Public
Massachusetts
My Commission Expires
Jan 3, 2025

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C. James McMahon

Vice President

Juris Doctor
College of William and Mary

MBA
College of William and Mary

BA, Economics
Tufts University

C. James McMahon has been a strategic, economic, and financial consultant to the energy sector for over 20 years, working frequently with diversified energy companies, electric and gas utilities, merchant generators, private equity, and independent system operators. He specializes in strategy, business planning, and transaction support. For utilities, Mr. McMahon has advised on business strategy, integrated resource planning, grid modernization, and resiliency issues. In addition to advising on these topics, Mr. McMahon has supported and filed related testimony in federal and state regulatory settings, including at FERC and with the regulatory commissions of CA, WY, AR, MO, OK, KS, GA, and IN.

Mr. McMahon's energy market-related work has focused on commercial due diligence in electric and gas utility, power plant, and electric transmission assets. He has supported transactions involving more than 500 GW of power plants, and was lead commercial and regulatory consultant in two of the most recent private equity utility transactions. Mr. McMahon also works with ISOs on strategy, planning, and procurement.

Experience

2014 - Present	*Vice President*, Charles River Associates – Energy Practice
2011 - 2016	*Board of Directors*, Pennichuck Water Works
2012 - 2014	*Director*, Black & Veatch - Management Consulting Division
2010 - 2012	*Vice President,* Siemens Corporation - Management Consulting Division
2009 - 2010	*Vice President,* Ascend Analytics
2007 - 2009	*Principal*, Charles River Associates
1998–2007	Navigant Consulting

2007 *Director*, Energy Practice

2005 - 2007 *Associate Director*, Energy Practice

2003 - 2005 *Principal*, Energy Practice

2002 - 2003 *Senior Engagement Manager*, Energy Practice

1998 - 2002 *Senior Consultant*, Energy Practice

Selected Commercial Consulting Experience

For a utility with a significant coal portfolio, Mr. McMahon led the development of an integrated resource plan, including assumptions development, market modeling, stakeholder engagement, and report development.

For an IPP, Mr. McMahon led the annual valuation process for a combined cycle asset located in ERCOT that requires periodic mark-to-market valuation.

For an infrastructure fund, Mr. McMahon led a commercial analysis around a potential new combined cycle power plant development site located in PJM.

For an infrastructure fund, Mr. McMahon led a commercial analysis of the expected performance of a combined cycle power plant located in PJM, with consideration for a potential competitive generating asset development on the same price node.

For a turbine manufacturer and owner of power generation assets in the U.S., Mr. McMahon led a commercial analysis of the plants located in PJM.

For a utility with a significant coal portfolio, Mr. McMahon led an analysis of the company's generation options and how these options compared on a net present value revenue requirement basis across various scenarios.

For a utility that owned a portion of a nuclear power plant development impacted by the Westinghouse bankruptcy, Mr. McMahon led an engagement to analyze the methodologies and assumptions the company relied upon in their decision related to project completion or termination.

For an infrastructure fund, Mr. McMahon led the commercial due diligence around the fund's intended acquisition of a company that owns and operates waste-to-energy and simple cycle gas generating assets.

For an independent system operator, Mr. McMahon led an engagement focused on identifying best practices in competitive transmission procurement and how the ISO could become more efficient and quantitatively focused.

For an investment bank organizing a vehicle for a large industrial client to move deferred assets off the balance sheet, Mr. McMahon led the commercial due diligence around the expected performance of combined cycle power plants located across the U.S. and Canada tied to payments to the industrial through LTSA contracts.

For a large North American utility holding company, Mr. McMahon led a corporate portfolio strategy engagement focused on whether the company should consider diversifying away from electric and gas utilities toward midstream natural gas.

For an independent system operator, Mr. McMahon led an engagement to analyze the impact of a newly approved transmission project on the retail rates of customers in one particular state and how alternative cost allocation methods would impact rates.

For an integrated electric utility, Mr. McMahon led a project to develop bottom-up cost of service forecasts for 15 peer utilities in support of a client utility’s analysis of its investment headroom.

For an independent system operator, Mr. McMahon led an engagement to forecast transmission rates to different transmission regions and companies based on known and expected projects.

For an infrastructure investment fund, Mr. McMahon led a commercial due diligence engagement to support the fund's acquisition of a portfolio of combined cycle assets located in North Carolina and Ohio.

For three independent system operations separately, Mr. McMahon led multiple projects around competitive transmission solicitations to analyze bids on a cost of service basis and produce comparative analytics for the ISOs.

For an independent system operator, Mr. McMahon led an engagement to develop the framework and process for evaluating competitive transmission projects against the criteria specified by the system operator in its tariff.

For a Southeast utility with a significant coal-fired fleet, Mr. McMahon led the development of a carbon compliance strategy including physical and financial hedging, reallocation of capital and O&M between plants, and demonstration of customer rate impacts to policymakers.

For a large municipal utility, Mr. McMahon led an engagement to prepare a smart grid investment plan that was approved by the City Council.

For a Midwest utility, Mr. McMahon led an engagment to analyze and compare smart grid and traditional infrastructure replacement projects based on their impact on system reliability then support a program investment filing with the Commission.

For a Midwest utility, Mr. McMahon led the development of a $1.3 billion transmission and distribution replacement plan for filing with the state regulator, including enhancing the company's asset management program, analyzing the criticality of investment in classes of transmission and distribution assets, and preparing the regulatory filing and testimony.

For a large municipal utility, Mr. McMahon led an engagement to improve the resource planning and generation analytics capability, which included process development, considering new software and tools, and organizational realignment.

For a utility, Mr. McMahon led an engagement to support the shift to a new resource planning software, including training on applications and providing supporting analysis.

For a Midwest utility with a large coal portfolio, Mr. McMahon led an analysis of expected portfolio performance and consideration of alternative generation strategies, including portfolio divestiture and asset replacement.

For a Southwest utility with substantial coal assets, Mr. McMahon led an engagement to analyze how portfolios with varying amounts of coal performed under various future market conditions, and supported the company's resource plan with its regulator.

For a Midwest utility interested in expanding its regional footprint and taking advantage of Order 1000, Mr. McMahon led the development of a transmission strategy, including evaluating strategies of other transmission owners, analyzing the impact of investment on utility's rates, and developing recommendations for investment and partnership in MISO MVP projects.

For a utility attempting to optimize rate case timing as it relates to earnings, Mr. McMahon led a project to develop a detailed cost of service model to support a utility's strategic analysis of its capital investment, rate timing, and O&M spending options.

For a large generation and transmission cooperative facing rate pressures, Mr. McMahon supported the development of a strategy that reduced O&M costs and considered the impacts of future fuel costs on cooperative rates.

For a federally owned generation and transmission agency, Mr. McMahon analyzed alternative compliance options for the generation fleet with existing and expected environmental rules and how the company's fleet could comply overall at least cost.

For the State of California, Mr. McMahon led an engagement to develop a methodology for cost allocation of stranded costs and above market power costs related to the California Energy Crisis.

For the State of California, Mr. McMahon led an engagement to develop annual revenue requirements from 2002 to 2008 related to power costs incurred, and contracts entered into, during the California Energy Crisis.

Mr. McMahon led a generation strategy and integrated resource planning project on behalf of a Midwest utility that was considering significant portfolio changes including coal retirements and alternative capacity and energy additions.

Mr. McMahon led an initiative by a large utility holding company to consider alternative portfolio investments, including a natural gas midstream business.

Mr. McMahon led numerous projects on behalf of three RTO/ISOs to support procurement of competitive transmission under FERC Order 1000.

Mr. McMahon developed a carbon compliance strategy for a utility with a significant coal-fired fleet, including physical and financial hedging, reallocation of capital and O&M between plants, and demonstration of customer rate impacts to policymakers.

Mr. McMahon developed a resource strategy for an investor-owned utility with significant coal-fired assets and decreasing capacity factors, including evaluating net present value revenue requirements from alternative portfolios and developing real options analysis around retaining certain coal-fired assets and companion infrastructure.

Mr. McMahon developed a $1.3 billion transmission and distribution replacement plan for a Midwest investor-owned utility for filing with the state regulator, including enhancing the company's asset management program, analyzing the criticality of investment in classes of transmission and distribution assets, and preparing the regulatory filing and testimony.

Mr. McMahon developed a transmission strategy for an investor-owned utility interested in expanding regional footprint and taking advantage of Order 1000, including evaluating strategies of other transmission owners, analyzing the impact of investment on utility's rates, and developing recommendations for investment and partnership in MISO MVP projects.

Mr. McMahon led a project to evaluate the impact of a new combined cycle on nodal prices and assess the expected transmission interconnection costs for the development, including running detailed price simulations and evaluating market dynamics in PJM.

Mr. McMahon led a project to analyze whether a utility could acquire energy and capacity bilaterally, or whether the existing market was short capacity, including analyzing existing capacity in the market, new entrants, and potential counterparties.

Mr. McMahon supported the State of California to develop a methodology for cost allocation of stranded costs and above market power costs related to the California Energy Crisis.

Mr. McMahon supported the State of California in developing annual revenue requirements from 2002 to 2008 related to power costs incurred, and contracts entered into, during the California Energy Crisis.

Mr. McMahon led a project to develop a detailed cost of service model to support a utility's strategic analysis of its capital investment, rate timing, and O&M spending options.

Mr. McMahon led a project to develop bottom-up cost of service forecasts for 15 peer utilities in support of a client utility's analysis of its investment headroom.

Filed Testimony

Testimony before the Wyoming Public Service Commission on behalf of Cheyenne Light, Fuel and Power Company d/b/a Black Hills Energy. Docket No. 20003-__-EP-18. Power Cost Adjustment Proceeding. May 2018.

Testimony before the Missouri Public Service Commission on behalf of The Empire District Electric Company. MPSC File No. EO-2018-0092, Generation Fleet Savings Analysis. October 2017.

Testimony before the Arkansas Public Service Commission on behalf of The Empire District Electric Company. APSC Docket No. 17-061-U, Generation Fleet Savings Analysis. October 2017.

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Testimony before the Kansas Public Service Commission on behalf of The Empire District Electric Company. KCC Docket No. 18-EPDE-_____-PRE, Generation Fleet Savings Analysis. October 2017.

Comments of FirstEnergy Service Company, Docket No. RM18-1-000. Affidavit in support of Comments by FirstEnergy Service Company, related to the Department of Energy Notice of Proposed Rule on Grid Resiliency before the Federal Energy Regulatory Commission. October 2017.

Order Instituting Rulemaking to Implement Portions of AB. 117 Concerning Community Choice Aggregation. Rulemaking 03-10-003. Testimony on behalf of the Department of Water Resources, April 14, 2004.

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Reports and Publications

"The Impact of LNG on US Power Markets", CRA Insights, March 2018

"Investing in Stakeholder Strategy: How a Supportive Stakeholder Environment Can Drive Revenue and Profitability", CRA Insights, January 2018

"*Migration to Midstream: Strategic Considerations for Utilities Investing in Midstream Assets*", CRA Insights, August 2017

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"*The Growing Risks of Regulated Coal Ownership*", CRA Insights, May 2016

"*Driving Value Growth in the Evolving Electric Utility Landscape*", CRA Insights, May 2016

"*Why Utilities Need to Rethink Their Capital Programs: What Went Wrong in Indiana*", CRA Insights, June 2015

"*The Distributed Resource Plan*", CRA Insights, February 2015

"*An Uptick in Recent Electric Utility - Gas Utility Mergers. Expect More*", Energy Bar Association, Litigation Journal, fall 2015, Vol. 15 No. 1

"*Latent Risks in Utility M&A*", CRA Insights, May 2014

"*Risk Based Asset Investment Approaches to Improve System Resiliency*", Black & Veatch, September 2013

"*Strategic Issues Facing the Utility Industry: Perspectives on 2008 and Looking Forward*", CRA Insights, February 2009

"*Improving Capital Planning Process in Light of Today's Capital Crisis*", CRA Insights, January 2009

"*Valuation of Generation Assets: Why Modeling Matters*", CRA Insights, September 2008

"*Potential for Coal Plants' Hidden Value in a World of Carbon Costs*", CRA Insights, December 2007

Presentations

Exploring Models for Engaging Regulators and Stakeholders to Meet Near Term and Long Term Investment Objectives, EEI Strategic Issues Roundtable, April 20, 2018

Finding Investment Headroom in a Rising Rate Environment, CRA Webinar, March 21, 2017

Utility M&A Finding Investment Headroom in a Rising Rate Environment, S&P Power and Gas M&A Symposium , February 14, 2017

Clean Power Plan: Perspectives on Utility Strategy, SNL Energy Webinar Series, January 13, 2016

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Changing Energy Markets and the Evolving Generation Fleet, Utility Commissioners/ Wall Street Dialogue, May 10, 2016

Clean Power Plan: Implications for Utility Generation Strategy, EEI Strategic Issues Roundtable, September 30, 2015

Natural Gas Market Update: New England, Law Seminar International, August 27, 2014

Building a T&D Investment Program to Satisfy Utility Customers, Regulators, and Shareholders, SNL Energy Webinar Series, March 27, 2014

Sustainable Earnings Growth through Electric Utility Investment, EEI Strategic Issues Roundtable, October 9, 2013

Back to the Future or Back to the Past, EEI Strategic Issues Roundtable, February 18, 2011

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