123

Exhibit No.:	
Issue(s):	Need for the project/ PISA or RESRAM/ CCN for High Prairie Wind Project
Witness/Type of Exhibit:	Marke/Rebuttal
Sponsoring Party:	Public Counsel
Case No.:	EA-2018-0202

REBUTTAL TESTIMONY

OF

GEOFF MARKE

Submitted on Behalf of
the Office of the Public Counsel

UNION ELECTRIC D/B/A AMEREN MISSOURI

CASE NO. EA-2018-0202

August 20, 2018

BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MISSOURI

In the Matter of the Application of Union Electric d/b/a Ameren Missouri for Permission and Approval and a Certificate of Convenience and Necessity Authorizing it to Construct a Wind Generation Facility	)))))	Case No. EA-2018-0202 Tariff No. YE-2018-0158

AFFIDAVIT OF GEOFF MARKE

STATE OF MISSOURI)
) ss
COUNTY OF COLE)

Geoff Marke, of lawful age and being first duly sworn, deposes and states:

1. My name is Geoff Marke. I am a Regulatory Economist for the Office of the Public Counsel.

2. Attached hereto and made a part hereof for all purposes is my rebuttal testimony.

3. I hereby swear and affirm that my statements contained in the attached testimony are true and correct to the best of my knowledge and belief.

Geoff Marke
Chief Economist

Subscribed and sworn to me this 20th day of August 2018.

JERENE A. BUCKMAN
My Commission Expires
August 23, 2021
Cole County
Commission #13754037

Jerene A. Buckman
Notary Public

My commission expires August 23, 2021.

TABLE OF CONTENTS

REBUTTAL TESTIMONY

OF

GEOFF MARKE

UNION ELECTRIC COMPANY

d/b/a Ameren Missouri

CASE NO. EA-2018-0202

I. INTRODUCTION

Q. Please state your name, title and business address.

A. Geoffrey Marke, PhD, Chief Economist, Office of the Public Counsel ("OPC"), P.O. Box 2230, Jefferson City, Missouri 65102.

Q. What are your qualifications and experience?

A. I have been in my present position with OPC since 2014 where I am responsible for economic analysis and policy research in electric, gas and water utility operations.

Q. Have you testified previously before the Missouri Public Service Commission?

A. Yes. A listing of the cases in which I have previously filed testimony and/or comments before the Commission is attached in Schedule GM-1.

Q. What is the purpose of your direct testimony?

A. The purpose of this testimony is to respond to direct testimony regarding the:

- Need for the Project
  - Ameren Missouri witness Matt Michels
- RESRAM
  - Ameren Missouri witness Steven M. Willis
- CCN for High Prairie Wind Project
  - Ameren Missouri witness Ajay K. Arora

This testimony is limited solely to the direct filing of this case filed on May 21st 2018.

Q. Has the direct filing changed?

A. Yes. On Friday, August 17th at 4:28pm a nonunamious stipulation and agreement was filed by Ameren Missouri and the Missouri Public Service Commission Staff ("Staff"). On Monday, August 20th at 12:37 pm OPC filed an objection to that nonunamious stipulation and agreement. My understanding is that OPC will be seeking additional testimony from the Company and Staff as to the basis of the figures in the Stipulation, or in the alternative seek leave to file supplemental rebuttal testimony.

Q. Please state OPC's position on the direct filing of this case?

A. OPC supports the general proposition to acquire 400 MW of wind generation in order to meet future RES compliance standards. That being said, OPC is not in a position to presently recommend the Company's application as drafted for two primary reasons. First, OPC recommends that specific modifications be made to Ameren Missouri's proposed recovery mechanism in light of recently approved legislation. Second, OPC has concerns regarding the specific site selection as it pertains to endangered species. This includes the financial exposure to ratepayers, and the subsequent threat to Missouri's conservation and agriculture efforts as a result of the site selection. Assuming these two elements can be satisfied, OPC would support Ameren Missouri's application.

II. NEED FOR THE PROJECT

Q. Does Ameren Missouri need the 400MW of wind to serve its native load?

A. No.

Q. Does Ameren Missouri need the 400MW of wind for resource adequacy obligations under MISO?

A. No.

Q. Is Ameren Missouri currently long, short, or even, on generating capacity to serve its load?

A. It is long on capacity.

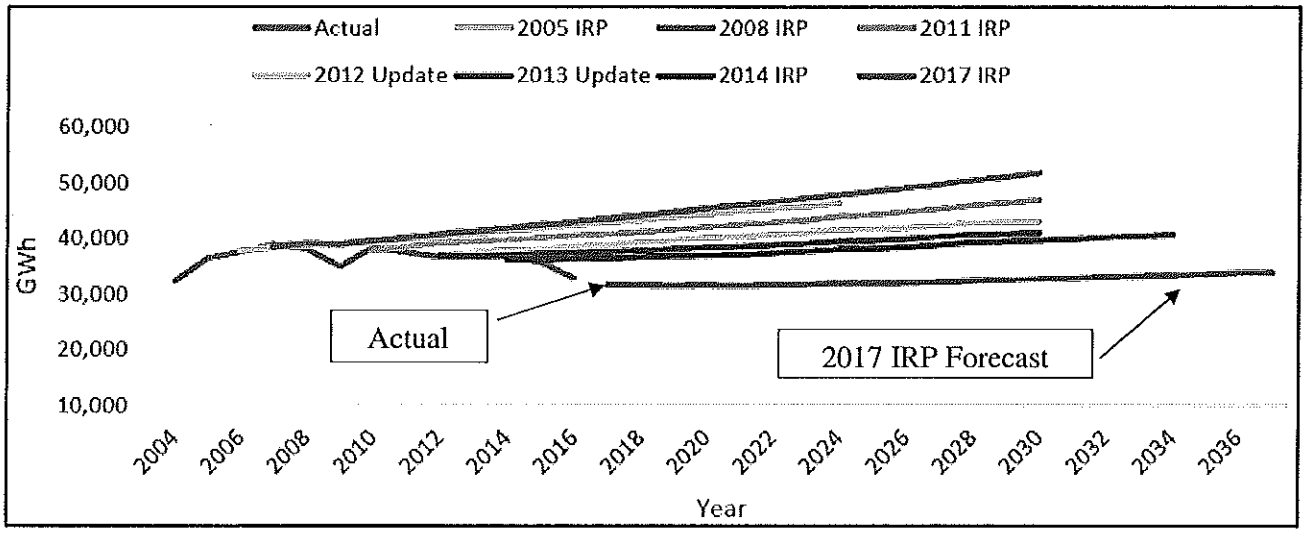
Q. What has been Ameren Missouri's recent and forecasted load growth?

A. Ameren Missouri's load growth has been flat or declined for several years, and it is not expected to grow within its planning period. According to Ameren Missouri's 2017 Integrated Resource Plan ("IRP"), Chapter 3—Load Analysis and Forecasting:

> Compared to Ameren Missouri's last IRP, filed in 2014, both the level and the growth rate of the forecasts are lower. The 0.30% growth rate in retail sales in this filing (between 2018 and 2037) is also lower than the 0.6% retail sales growth rate expected for the study period in the 2014 IRP forecast largely due to a combination of factors.[1]

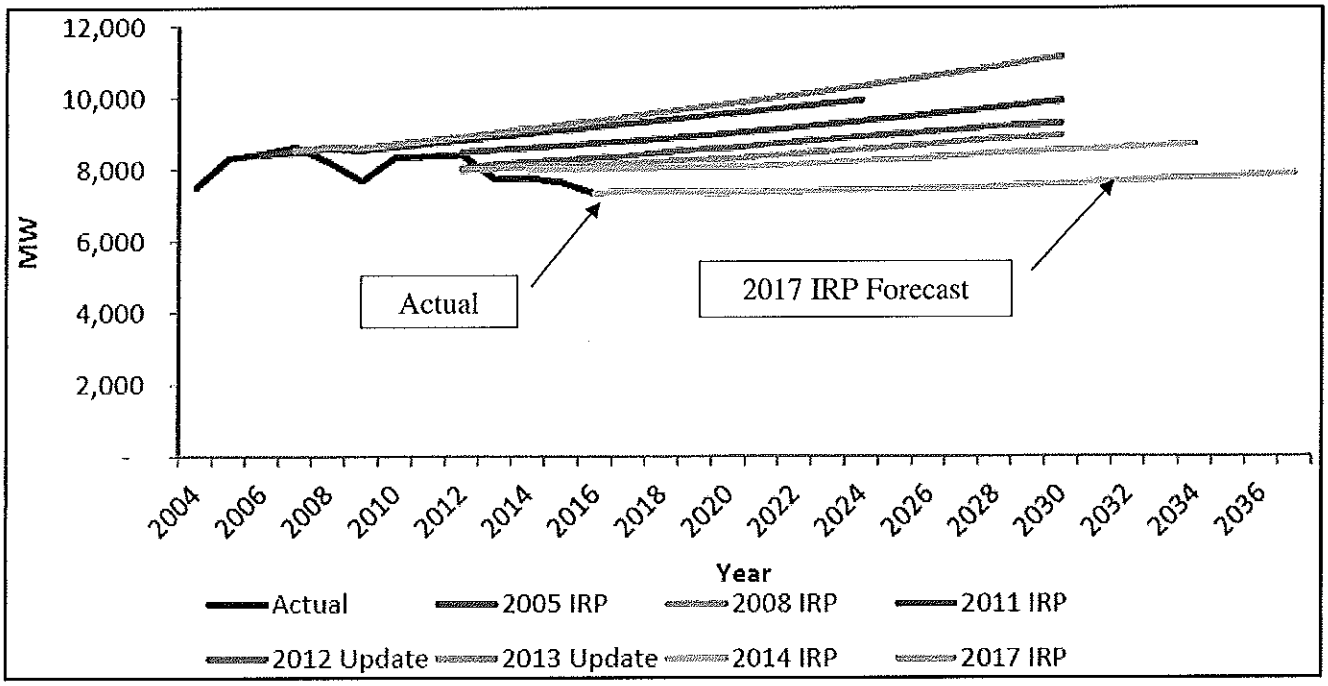
Figure's 1 and 2 provide a visual of Ameren Missouri's historical energy and demand IRP forecasts relative to its most recent 2017 forecast and clearly shows a lower expected load forecast than from any previous iteration.

Figure 1: Ameren Missouri actual historical energy sales and past IRP energy forecasts[2]



[1] EO-2018-0038 Chapter 3 Load Analysis and Forecasting, p. 2.
[2] Ibid. p. 5

Figure 2: Ameren Missouri actual historical peak demand and past IRP peak demand forecasts[3]

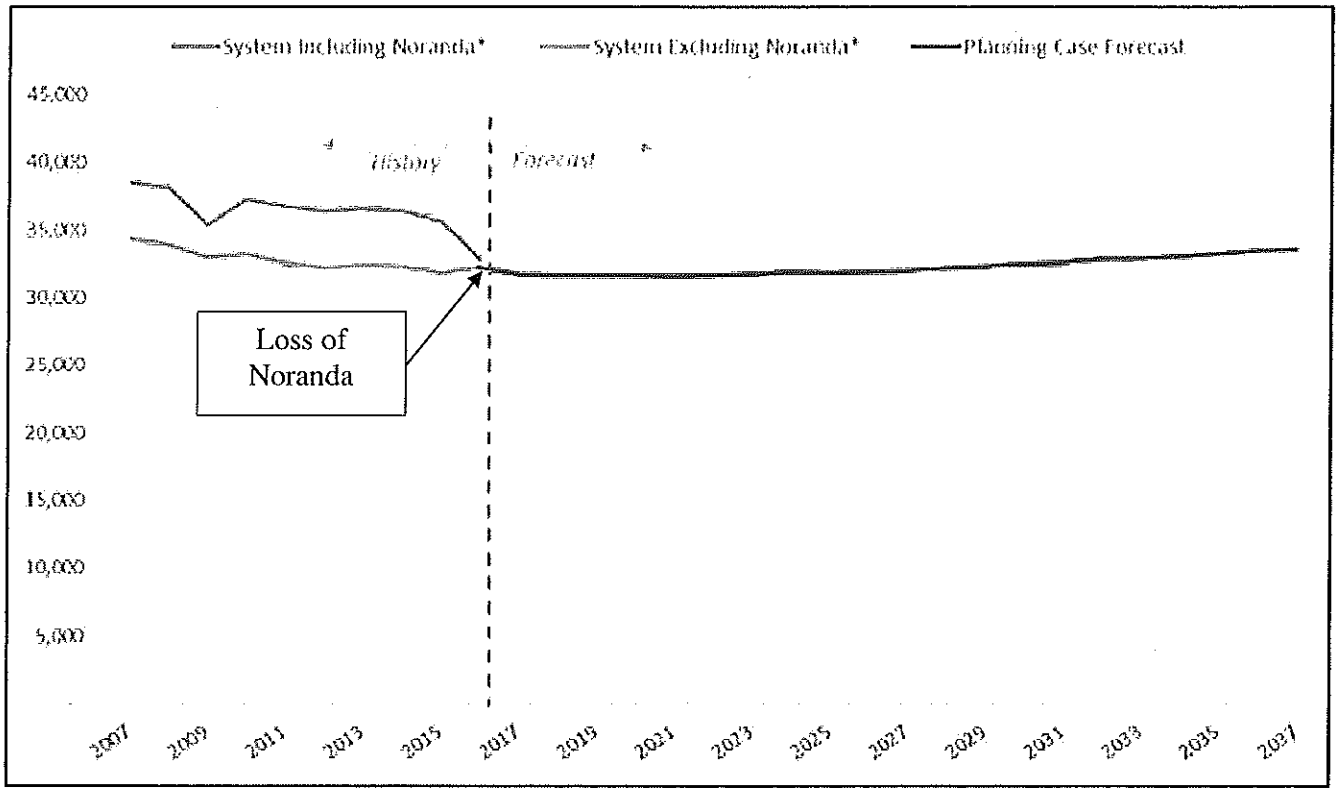


Q. What was the single biggest factor that contributed to the drop in historic and forecasted load?

A. That would be the loss of the New Madrid aluminum smelter. Noranda was Ameren Missouri's largest customer in the last decade, accounting for approximately 10% of Ameren Missouri's annual sales.[4] The impact of the loss of Noranda on Ameren Missouri's system can be seen in Figure 3.

[3] Ibid. p. 6
[4] Ibid. p. 37.

Figure 3: Ameren Missouri planning case energy sales forecast with and without Noranda[5]



Q. That is just one customer. What about the others?

A. Figures 4, 5 and 6 show historic and forecasted energy sales over a thirty-year period for residential, commercial and industrial classes reprinted from Ameren Missouri's most recent IRP. It also underscores how big of an impact the loss of Noranda was on energy sales.

[5] Ibid. p. 31.

Figure 4: Planning case forecast of residential class energy sales 2006 – 2036[6]

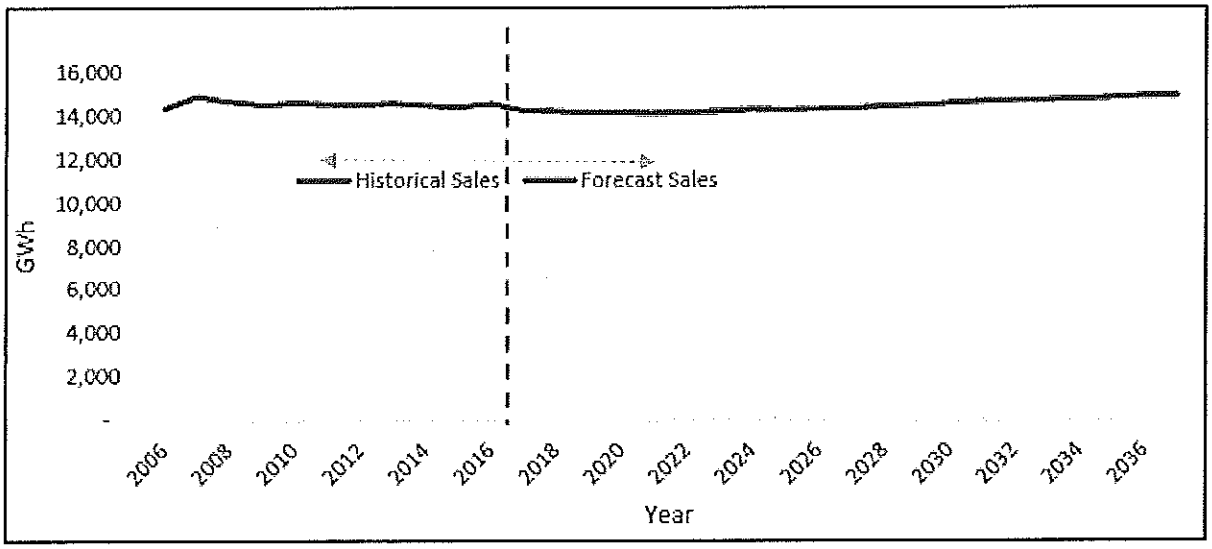
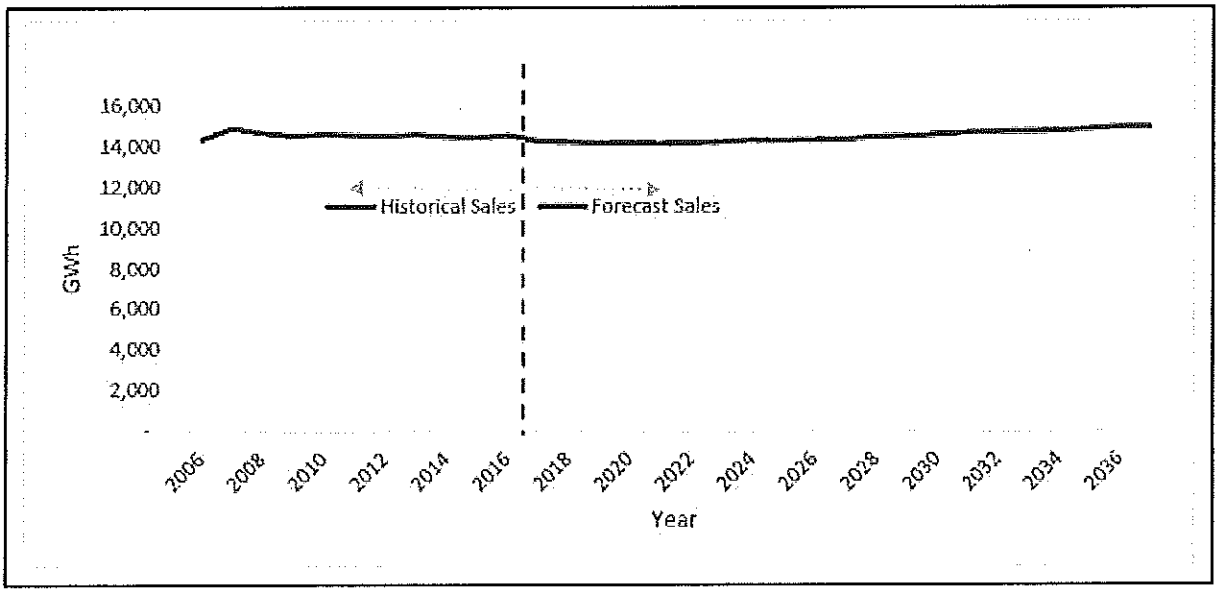
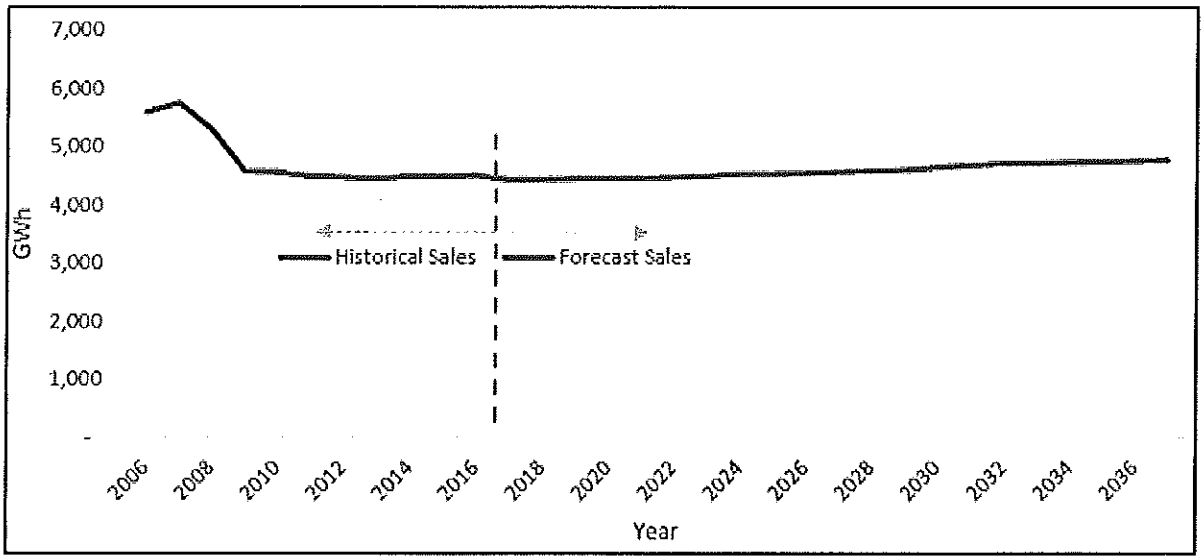


Figure 5: Planning case forecast of commercial class energy sales 2006 – 2036[7]



[6] Ibid. p. 33.
[7] Ibid. p. 35.

Figure 6: Planning case forecast of industrial class energy sales 2006 – 2036[8]



According to Ameren Missouri's recent IRP, the 2007-2009 economic recession and post-recession recovery likely impacted the historical growth rates, and demographic and economic trends are likely to meaningfully temper future sales.[9]

Q. Have Ameren Missouri's energy efficiency programs affected load?

A. Yes. The promotion of demand-side management techniques and naturally occurring efficiency adoption have likely impacted historic load and will continue to temper future load growth. However, context is important, the terms the parties entered into for both of Ameren Missouri's MEEIA applications were predicated on a future where Noranda was fully operational, and, therefore, the forecasted loads were much greater. On February 5, 2016, parties to Case No. EO-2015-0055 (MEEIA Cycle II) filed a non-unanimous stipulation and agreement, in which the earnings opportunity award was based on a supply side valuation of

[8] Ibid. p. 36.
[9] Ibid. 36-37.

"a 600 MW combined cycle gas generating plant to begin operation in the year 2023, at a capital cost of $948 million in 2023 dollars."[10]

Per the S&A:

> Ameren Missouri represents that pursuant to its internal modeling, achieving approximately 183 MW (including reserve margin and losses) of coincident-demand savings in the year 2022 pursuant to this MEEIA Cycle, approximately 191 MW (including reserve margin and losses) of coincident-demand savings in the year 2022 pursuant to a MEEIA Cycle 3, and approximately 61 MW (including reserve margin and losses) of coincident-demand savings in the year 2022 pursuant to a MEEIA Cycle 4 results in the deferral of that combined cycle generating unit to a point in the future that varies based on the assumptions of the number of MEEIA cycles and the level of persistent demand savings associated with each MEEIA cycle.[11]

In its MEEIA Cycle II application Ameren Missouri had to assume that it had a cycle III and IV portfolios in place and approved to justify Commission approval of its MEEIA Cycle II settlement. Exactly three days later, on February 8, 2016, Noranda filed for bankruptcy.[12] Stated differently, if the signatories to Ameren Missouri's MEEIA Cycle II settlement had waited just 72 hours before filing the S&A, it is very likely that the settlement terms would have been very different. As a result, Ameren Missouri ratepayers were locked into a suboptimal outcome for the next three years.

[10] Non-Unanimous Stipulation and Agreement EO-2015-0055 p. 12. 13 A.
[11] Ibid. p. 12. 13 B.
[12] Barker, J. (2016) New Madrid smelter to shut down next month after Noranda files for bankruptcy. *St. Louis Post-Dispatch*. http://www.stltoday.com/business/local/new-madrid-smelter-to-shut-down-next-month-after-noranda/article_b386f8cc-73a9-590e-8f1b-ebfcff6c6003.html

Q. Is Ameren Missouri planning on retiring its fossil fuel generating units earlier?

A. No. Ameren Missouri's planned fossil fuel retirement dates have mostly either remained the same or have been pushed out further. This can be seen by comparing Ameren Missouri's two most recent triennial IRP filings as shown in Table 1.

Table 1: Ameren Missouri fossil fuel retirement changes between triennial IRP's[13,14]

Site	Fuel Type	Retirement Date 2014 IRP	Retirement Date 2017 IRP	Retirement Change
Labadie	Coal	2042	2042	No
Meramec	Coal	2022	2022	No
Rush Island	Coal	2046	2045	Yes (-1 year)
Sioux	Coal	2033	2033	No
Kirksville	Natural Gas	2017	2021	Yes (+4 years)
Howard Bend	Oil	2015	Retired	No
Fairgrounds	Oil	2015	2021	Yes (+6 years)
Meramec CTG-1	Oil	2017	2021	Yes (+4 years)
Meramec CTG-2	Natural Gas	2020	2021	Yes (+1 year)
Mexico	Oil	2020	2023	Yes (+3 years)
Moberly	Oil	2020	2023	Yes (+3 years)
Moreau	Oil	2020	2023	Yes (+3 years)

The lone outlier is Ameren Missouri's one-year accelerated planned retirement date of its Rush Island Energy Center; it moved the date 2046 to 2045. To be clear, that is 27 years into the future. Why Rush Island Energy Center dates were accelerated from 28 years to 27 years is

[13] EO-2018-0038 Chapter 4 Existing Supply-Side Resources, p. 11-12. & EO-2015-0084 Chapter 4: Existing Supply-Side Resources, p. 12-13.
[14] This is not an exhaustive list of Ameren Missouri's supply side generation units. Furthermore, there may be more than one unit at a particular site; however, the Company has not indicated individual unit retirements for general sites.

unclear and will require further discovery. Regardless, this adjustment will have no material impact on the topic at hand.

Q. Are you surprised that Ameren Missouri has extended the retirement dates of its natural gas and oil plants in its 2017 IRP filing from those it had in its 2014 filing?

A. Somewhat. Although OPC has not fully explored why the retirement dates were extended, with the exception of Howard Bend, which was retired and was the oldest of the "peaker" plants listed, each of those plants are likely financially solvent and providing a net positive return to ratepayers.

Q. If Ameren Missouri is long on capacity, aggressively supporting demand-side management programs, extending the useful life of its supply-side investments, and is forecasting historically lower load growth, why is Ameren Missouri requesting approval for more generation?

A. As stated in the direct testimony of Ameren Missouri witness Matt Michels:

> But for the need to comply with the RES, Ameren Missouri would not pursue the Project.[15]

Q. Is there any risk to ratepayers if Ameren Missouri acquires more wind generation?

A. All investing involves some form of risk, even if it's not apparent. That being said, the decision to move forward and acquire wind now to meet the RES compliance would appear to be a low-risk investment.[16] According to Ameren Missouri, the investment produces favorable results in 10 out of 12 modeling scenarios (or 83%).[17]

Q. Does OPC support acquiring additional wind generation to meet the RES requirement?

A. Yes. Given the opportunity to take advantage of expiring Production Tax Credits ("PTCs"), the declining cost in wind generation and, most importantly, the need to meet statutorily

[15] EA-2018-0202 Direct Testimony of Matt Michels, p. 5, 1-2.
[16] § 393.1030 requires that no less than fifteen percent of an electric utilities generation be from renewable energy resources in calendar year beginning in 2021.
[17] EA-2018-0202 Direct Testimony of Matt Michels, p. 9, 7-11.

required RES requirements by 2021, makes the decision to pursue wind generation today an attractive investment.

III. PISA OR RESRAM

Q. What is Ameren Missouri proposing?

A. Ameren Missouri is proposing to utilize both the 85% depreciation deferral on all qualified electric plant (otherwise known as the plant in-service accounting or "PISA") as a result of the passage of SB 564 with the other 15% (and other applicable costs) collected through a RESRAM charge.

Q. What is OPC's position on this proposed recovery?

A. If Ameren Missouri intends to utilize the PISA provisions in the recently passed SB 564 then this application should be adjusted to allow deferral of *only* 85% depreciation expense and return for costs associated with its qualifying electric plant. If Ameren Missouri does not intend to utilize the PISA provision in the recently passed SB 564 then a RESRAM could be utilized for recovery. Ameren Missouri should not be able to have it both ways as that would run counter to the language of SB 564.

Q. What do you mean by the language of SB 564?

A. While I cannot speak definitively to legislative intent, I do observe that both the Senate and House introduced earlier versions of the bill that allowed for 100% deferral and did not include language marrying PISA in any manner with a RESRAM or the RES requirements.

Q. Can you provide some factual evidence to support your position?

A. Yes. When SB 564 was first introduced, the pertinent Section 393.1400 read:

> Notwithstanding any other provision of chapter 393 to the contrary, electrical corporations shall defer to a regulatory asset **all depreciation expense and return** associated with all qualifying electric plant[18] (emphasis added)

[18] § 393.1400, S.B. 564, 99th General Assem (Mo. 2018). https://www.senate.mo.gov/18info/pdf-bill/intro/SB564.pdf

The bill later endured a 24 hour-long filibuster when it came to the Missouri Senate Floor,[19] and was revised five times as Senate Substitute #5 for SB 564 which states:

> Notwithstanding any other provision of chapter 393 to the contrary, electrical corporations shall defer to a regulatory asset **eighty-five percent of all depreciation expense and return** associated with all qualifying electric plant[20] (emphasis added)

This substitute is the version that was ultimately truly agreed to and finally passed by the General Assembly.

Revisions in the House support the basis that 85% was the result of compromise between 100% and 50% deferral. The introduced House Bill (HB) 2265 provided PISA language that mirrored the introduced version of SB 564 in that it read:

> Notwithstanding any other provision of chapter 393 to the contrary, electrical corporations shall defer to a regulatory asset **all depreciation expense and return** associated with half of all qualifying electric plant[21] (emphasis added)

Once HB 2265 left the House Standing Utilities Committee as House Committee Substitute (HCS) for HB 2265 it read:

> Notwithstanding any other provision of chapter 393 to the contrary, electrical corporations shall defer to a regulatory asset **one hundred percent of all depreciation expense and return** associated with all qualifying electric plant[22] (emphasis added)

When HCS HB 2265 was later perfected on the House Floor, 393.1400 it read:

> Notwithstanding any other provision of chapter 393 to the contrary, electrical corporations shall, starting after the effective date of this section if the electrical

[19] Erickson, K. (2018) After 24 hour filibuster, Missouri Senate endorses electricity rate deal sought by Ameren. *St. Louis Post Dispatch.* https://www.stltoday.com/news/local/govt-and-politics/after-hour-filibuster-missouri-senate-endorses-electricity-rate-deal-sought/article_1663224f-37a0-5c7f-a678-2dc0e478eb80.html

[20] § 393.1400, S.S. #5 S.B. 564, 99th General Assem (Mo. 2018). https://www.senate.mo.gov/18info/pdf-bill/perf/SB564.pdf

[21] § 393.1400, H.B. 2265, 99th General Assem (Mo. 2018). https://house.mo.gov/billtracking/bills181/hlrbillspdf/6103H.02I.pdf

[22] § 393.1400, H.C.S. H.B. 564, 99th General Assem (Mo. 2018). https://house.mo.gov/billtracking/bills181/hlrbillspdf/6103H.04C.pdf

> corporation has made the election provided for by subsection 5 of this section by that date, or on the date such election is made if the election is made after the effective date of this section, defer to a regulatory asset **fifty percent of the depreciation expense and return on the electrical corporation's monthly gross investment** in qualifying electric plant[23](emphasis added)

As with the Senate, there were clear disagreements over how much deferral would be allowed throughout the legislative process.

Q. Are there any other examples that support your interpretation?

A. The definition for qualifying plant clearly made a point to exclude fossil fuel generation but not renewables. The definition states:

> (3) "Qualifying electric plant", **all rate base additions**, **except** rate base additions for new coal-fired generating units, new nuclear generating units, new natural gas units, or rate base additions that increase revenues by allowing service to new customer premises; (emphasis added)

Missouri's RES was also explicitly referenced in Senate Subsitute#5 SB 564, but noticeably not within the PISA statute. Instead, the Missouri General Assembly only saw fit to include an explicit reference to the RES or RESRAM within Senate Substitute #5 SB 564's solar energy provisions of 393.1665 and 393.1670.

Ameren's request to have it all also ignores that in the very same PISA depreciation deferral section it states:

> In each general rate proceeding concluded after the effective date of this section, the balance of the regulatory asset as of the rate base cutoff date **shall be included in the electrical corporation's rate base without any offset, reduction, or adjustment based upon consideration of any other factor**, other than as provided for in subdivision (2) of this subsection, with the regulatory asset balance

[23] § 393.1400, H.C.S. H.B. 2265, 99th General Assem (Mo. 2018). https://house.mo.gov/billtracking/bills181/hlrbillspdf/6103H.04P.pdf

> arising from deferrals associated with qualifying electric plant placed in service after the rate base cutoff date to be included in rate base in the next general rate proceeding.[24]

Again, the Legislature knew about the RESRAM, FAC, and other adjustments and instead chose to expressly exclude them from PISA.

Q. Is there a problem with spreading costs of this project through three separate regulatory mechanisms to reduce regulatory lag?

A. First, it would contravene the intent of SB 564. Second, it would create inaccurate price signals relating to the true costs and benefits of complying with the RES statute.

IV. CCN FOR HIGH PRAIRIE WIND PROJECT

Q. Does OPC support acquiring additional wind generation at the High Prairie Wind Project site, specifically the Terra-Gen build and transfer contract?

A. This is less clear. When constructed and fully commissioned, the High Prairie Wind site is expected to be the largest wind generation facility in Missouri.[25] OPC is also cognizant that more wind projects will likely be built in Missouri's future. Both of these points underscore the importance of making sure this high-profile site is constructed and sited correctly. As such, OPC submitted DR-2001 and received the following response that gave us pause:

> Please provide a list of all listed endangered and threatened species covered by the Endangered Species Act that are being evaluated by the Company for habitat and taking concerns.

[24] § 393.1400, SB. 564, 99th General Assem (Mo. 2018). https://www.senate.mo.gov/18info/pdf-bill/perf/SB564.pdf
[25] EA-2018-0202 Direct Testimony of Ajay K. Arora p. 4, 9-10.

Response:

Ameren is evaluating the Indiana bat (*Myotis sodalist*) and the northern long-eared bat (*Myotis septentrionalis*) for take authorization as provided under Section 10, of the Endangered Species Act.[26]

Q. What kind of risks would ratepayers face if the proposed wind farm results in fatalities to an endangered species?

A. If Ameren Missouri's project results in fatalities of vulnerable, endangered or protected species Ameren Missouri could be liable for financial penalties and potential enforced curtailment of generation, which in turn could raise future prudency concerns and would almost certainly include greater scrutiny of future wind projects.

Q. Is there a risk to taxpayers if the proposed wind farm results in fatalities to an endangered species?

A. Yes. Increased fatalities of vulnerable, endangered or protected species would undermine Missouri taxpayers overwhelming support for the provision of robust conservation efforts (manifest through the Missouri Department of Conservation ("MDC") an intervening party to this case), which would seemingly extend to preserving protected species such as the Indiana Bat and the Bald Eagle (as well as other vulnerable species). OPC's position is, in part, premised on the notion that our energy policy should not be undermining other Departments (and taxpayer dollar) historical efforts. This is especially pertinent when the need for this specific project is not necessary for providing safe and reliable service but instead is being utilized *solely* to meet *part* of a statutory requirement that is not due to be met for another three years.

Q. Do bats provide an economic benefit to farmers?

A. Yes. According to Boyle, et al (2011) bats provide clear economic benefits to agriculture via insect/pest control:

[26] See GM-2

> Bats are voracious predators of nocturnal insects, including many crop and forest pests. We present here analysis suggesting that loss of bats in North America could lead to **agricultural losses estimated at more than $3.7 billion/year.** Urgent efforts are needed to educate the public and policy-makers about the ecological and economic importance of insectivorous bats and to provide practical conservation solutions.[27] (emphasis added)

Q. In general, has wind generation had a damaging impact on bats?

[27] Boyle, et al. (2011) Economic Importance of Bats in Agriculture. Science. 332:6025, p 41-42. http://science.sciencemag.org/content/332/6025/41

A. Yes. [28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44]

---

[28] SmallWood, K.S (2013) Comparing bird and bat fatality-rate estimates among North American wind-energy projects. *Wind Energy and Wildlife Conservation*. 27:1, p.19-33. https://onlinelibrary.wiley.com/doi/pdf/10.1002/wsb.260

[29] Hayes, M. (2013) Bats killed in large numbers at United States wind energy facilities. *BioScience* 63:12, p. 975-979 https://academic.oup.com/bioscience/article/63/12/975/2365527

[30] Arnett, E.B. et al (2015) Impacts of wind energy development on bats: A global perspective. *Bats in the Anthropocene: Conservation of bats in changing world.* p. 295-323 https://link.springer.com/chapter/10.1007/978-3-319-25220-9_11

[31] Frick, W.F. et al (2017) Fatalities at wind turbines may threaten population viability of a migratory bat. *Biological Conservation*, 209, 172-177. https://www.fs.fed.us/psw/publications/weller/psw_2017_weller001_frick.pdf

[32] Rydell, J. et al (2016) Bats may eat diurnal flies that rest on wind turbines. *Mammalian Biology*. 81 p. 331-339 https://www.researchgate.net/profile/Jan_Pomorski/publication/293330163_Bats_may_eat_diurnal_flies_that_rest_on_wind_turbines/links/56f3deab08ae95e8b6cf3cf3/Bats-may-eat-diurnal-flies-that-rest-on-wind-turbines.pdf

[33] Martin, C.M. et al, (2017) Reducing bat fatalities at wind facilities while improving the economic efficiency of operational mitigation. *Journal of Mammalogy*, 98: 2 p. 378-385. https://academic.oup.com/jmammal/article/98/2/378/3064950

[34] Millon L, et al, (2018) Wind turbines impact bat activity, leading to high losses of habitat use in a biodiversity hotspot. Ecological Engineering 112, 51-54. https://docs.wind-watch.org/Millon-et-al-2018-bats.pdf

[35] Behr, O. et al (2017) Mitigating bat mortality with turbine-specific curtailment algorithms: A model based approach. *Wind Energy and Wildlife Interactions* p. 135-160. https://www.researchgate.net/profile/Oliver_Behr/publication/313263959_Mitigating_Bat_Mortality_with_Turbine-Specific_Curtailment_Algorithms_A_Model_Based_Approach/links/59cf9958aca2721f4361929b/Mitigating-Bat-Mortality-with-Turbine-Specific-Curtailment-Algorithms-A-Model-Based-Approach.pdf

[36] Beston, J.A et al (2015) Insufficient sampling to identify species by turbine collisions. *The Journal of Wildlife Management*. 79:3 513-517. https://onlinelibrary.wiley.com/doi/pdf/10.1002/jwmg.852

[37] Thaxter, C.B. et al (2017) Bird and bat species' global vulnerability to collision mortality at wind farms revealed through a trait-based assessment. *Proceedings of the Royal Society B:Biological Sciences* http://discovery.ucl.ac.uk/1574540/1/Newbold_Trait-based%20sensitivity%20to%20wind%20farms%2014%2007%202017.pdf

[38] Beston, J.A. et al (2016) Prioritizing avian species for their risk of population-level consequences from wind energy development. *PLOS One* http://journals.plos.org/plosone/article/file?id=10.1371/journal.pone.0150813&type=printable

[39] Erickson, R.A. et al (2016) Effects of wind energy generation and white-nose syndrome on the viability of the Indiana bat. *PeerJ Zoological Science* https://peerj.com/articles/2830/

[40] Johnson D.H. et al (2016) Avian fatalities at wind energy facilities in North America: a comparison of recent approaches. Human-Wildlife Interaction 10:1 p. 7-18. https://digitalcommons.usu.edu/cgi/viewcontent.cgi?article=1067&context=hwi

[41] Thompson, M. et al (2017) Factors associated with bat mortality at wind energy facilities in the United States. *Biological Conservation* 215, p. 241-245 https://www.researchgate.net/profile/Maureen_Thompson3/publication/320020951_Factors_associated_with_bat_mortality_at_wind_energy_facilities_in_the_United_States/links/5a6fb050aca272e425eb23df/Factors-associated-with-bat-mortality-at-wind-energy-facilities-in-the-United-States.pdf

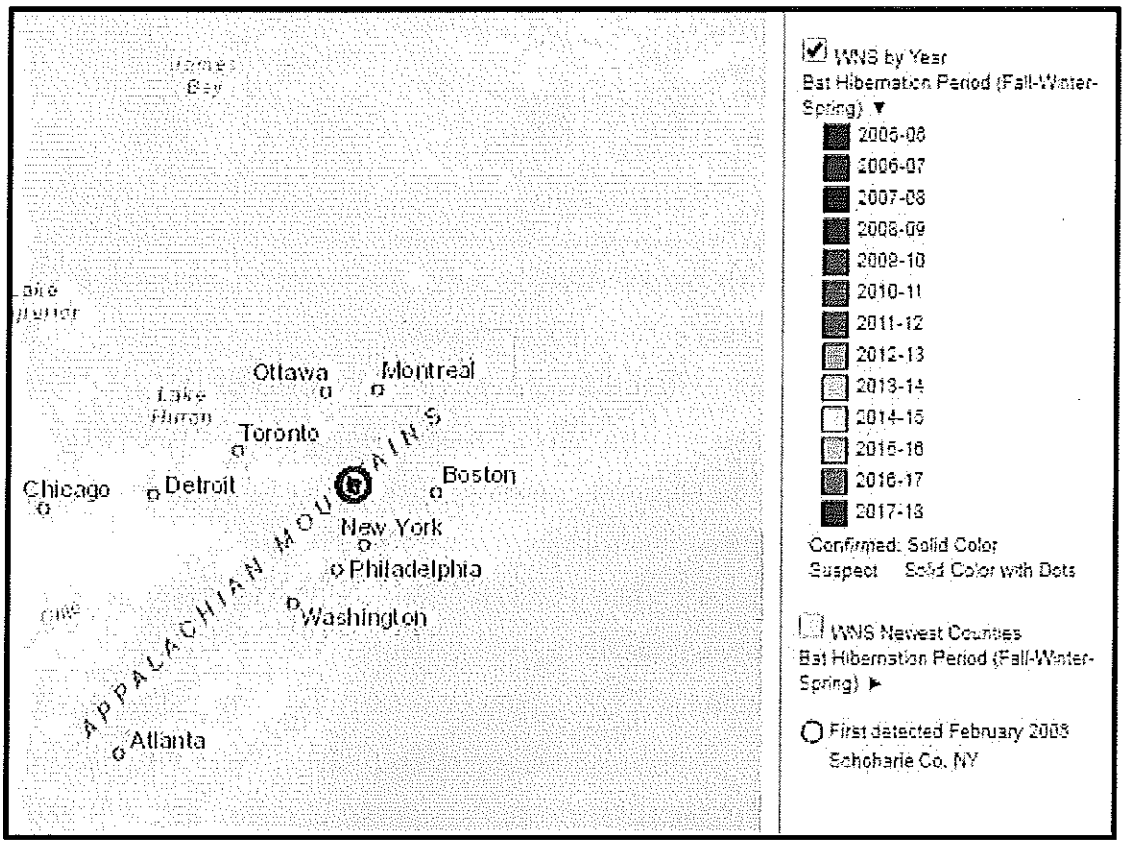
[42] Parise, J. & T.R. Walker (2017) Industrial wind turbine post-construction bird and bat monitoring: A policy framework for Canada. *Journal of Environmental Management*. 201 p. 252-259 https://www.sciencedirect.com/science/article/pii/S0301479717306436

[43] McCue D. (2011) Bats far more than birds, are falling victim to wind turbines, a US team seeks to find out why. *Renewable Energy Magazine*. https://www.renewableenergymagazine.com/interviews/bats-far-more-than-birds-are-falling

Q. Are bats currently experiencing significant declines in population?

A. Yes. In addition to the fatalities experienced from increased wind generation, white-nose syndrome ("WNS"), a fatal fungal disease of hibernating bats, has killed over six million bats since 2006 and may well lead to the extinction of certain bat species.[45] Since the winter of 2007-2008, WNS has spread from New York to 33 states, seven Canadian provinces (as of July 2018) and throughout Missouri. The spread of the disease is shown in Figure 7 and 8 respectively.

Figure 7: White-nose Syndrome 2005-2006 [46]

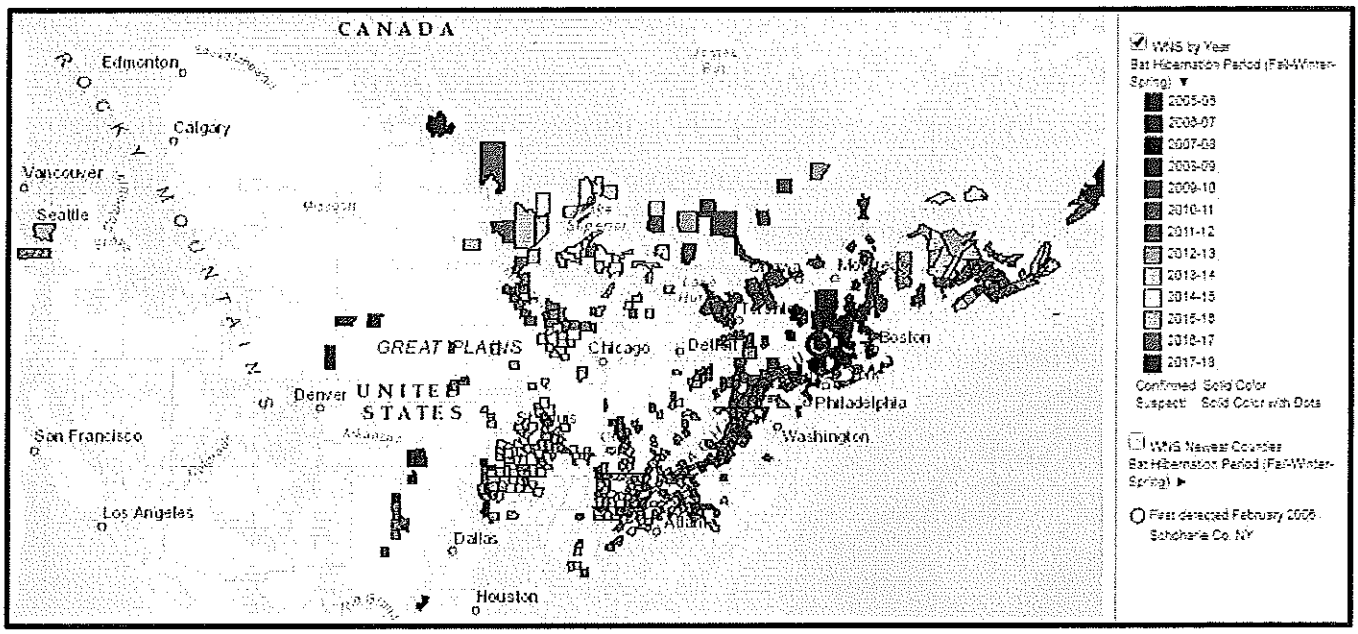


[44] Rydell, J. et al (2017) The effects of wind power on birds and bats: an updated report Vindval Report. https://www.naturvardsverket.se/Documents/publikationer6400/978-91-620-6791-5.pdf?pid=21758

[45] Lubeck, M. & E. Alpern (2017) USGS: Trick or Treat? The frightening threats to bats. https://www.usgs.gov/news/trick-or-treat-frightening-threats-bats-0

[46] White-nose syndrome response team (2018) White-nose syndrome occurrence by county or district (or portions thereof) 2005-2006. https://www.whitenosesyndrome.org/spreadmap

Figure 7: White-nose Syndrome 2005-2018 [47]



Q. Is Terra-Gen or Ameren Missouri performing an environmental impact analysis ("EIA") that is specifically accounting for the impact on bats?

A. Yes. According to a recently published article in the Kirksville Daily Express:

> Terra-Gen has contracted with Stantec for environmental studies and is developing plans to minimize the impact on native creatures. Because the area is home to endangered bat species, this is a critical and mandatory step.
>
> Terry VanDeWalle, senior biologist with Stantec, said the company has been studying local birds and bats for the last two years.
>
> "We use all this information to look at what is the risk to birds and bats in the project area. **Most people know and understand that wind turbines kill birds and bats. There are some things a project can do to reduce that**," he said. **Those include operational things, such as the time of day the turbines operate and the wind speed at which they are activated.**

[47] White-nose syndrome response team (2018) White-nose syndrome occurrence by county or district (or portions thereof) 2017-2018. https://www.whitenosesyndrome.org/spreadmap

It's something the company takes seriously. VanDeWalle noted the important role bats play in our ecosystem, explaining that one brown bat can eat 150 mosquitos in 15 minutes.

"None of us want to have bats in our house, but from the larger picture bats are very important," he said.

If the project comes to fruition, it will have to be good for bats, too.[48]

(emphasis added)

Q. What is OPCs response to the suggestion that "operational things" can be done to reduce mortality rates for birds and bats?

A. OPC believes that out of an abundance of caution those mitigating measures should be adopted from the onset and not adopted only after some fatality threshold has been exceeded; otherwise, ratepayers should be held harmless. As more information and technology advances on mitigating avian and mammalian mortality this project can learn and adapt accordingly. This preventative line of reasoning is made, in part, because there is no need for this project from a resource or reliability standpoint. It is being acquired merely to meet Missouri's RES requirement due in 2021. Ameren Missouri could meet that requirement under a variety of other ways that do not involve probable liability of future costs to ratepayers as a result of placing endangered species at risk. There is simply no reason why this application cannot be modified to preserve state and federal conservation efforts, support economic development and increase renewable generation in a manner that is cost-effective for ratepayers.

Q. What is OPCs response to the statement, "If the project comes to fruition, it will have to be good for bats"?

A. It is encouraging to hear that declarative statement, as OPC has concerns that any-given EIA may understate the long-term impact on bats due to inadequate measuring.

Q. What is the basis for that concern?

[48] Hunsicker, J. (2018) Proposed wind farm could drive economic development. *Kirksville Daily Express*. http://www.kirksvilledailyexpress.com/news/20180727/proposed-wind-farm-could-drive-future-economic-development

A. Researchers in the UK recently examined the accuracy of EIA studies related to bat populations and wind farms. They specifically assessed the effectiveness of pre-construction EIAs as a tool in determining the impact of wind energy on bats based on 46 wind farms across the UK (see also GM-3). According to the researchers:

> **We found they do not predict the risks to bats accurately, and even in those cases where high risk was correctly identified, the mitigation deployed did not avert the risk.** . . . In the future, greater emphasis should be placed on assessing the actual impacts post-construction and on developing effective mitigation strategies. . . . We highlight that although EIAs give the perception of rigorous safeguarding of environmental standards and may portray energy companies with an environmentally friendly public image, considerable time and expense goes into deploying bat detectors at pre-construction sites with little justification.[49] (emphasis added)

> The findings highlight the difficulty of establishing with certainty the effect of major developments before they occur," says Fiona Mathews of the University of Exeter, UK. "This is a real problem for the planning system. In most countries, the system of Environmental Impact Assessment is based on the assumption that accurate assessment of risks can be made in advance and so appropriate steps [can be] taken to avoid any adverse effects -- or if the bad effects cannot be mitigated, then the development should not be permitted to go ahead. Our work highlights that this can be difficult to achieve in practice, as animals do not always behave the way we might anticipate." . . . "Without [the dogs], locating bat casualties is like looking for a needle in a haystack," she says, noting that most of the bat species

[49] Lintott, P.R. et al (2016) Ecological impact assessments fail to reduce risk of bat casualties at wind farms. *Current Biology* https://www.sciencedirect.com/science/article/pii/S0960982216311885?via%3Dihub

weigh less than five grams. "Failure to survey adequately is a huge problem and explains why many wind farms apparently have 'no problem.'"[50]

Q. Isn't there a separate process involving U.S. Fish and Wildlife ("USFW")?

A. Yes. But the outcome and parameters of that process will not be decided on until after the Commission would rule on the CCN. One outcome of the USFW process could include an issuance of an incidental take permit ("ITP"), which would designate a certain number of "takes" (deaths) that could be allowed. However, according to Ameren Missouri Manager, Nancy Morgan this isn't required. Mrs. Morgan states:

> Further, under the Endangered Species Act, obtaining an ITP is not a mandatory requirement but rather is a protective measure to guard against potential enforcement in the event a take of a protected species occurs.[51]

Q. What would happen if an ITP was issued and the number of takes was exceeded?

A. My understanding of the process is that there is no single answer to that question as each scenario is assessed on a case-by-case basis (e.g., how many Indiana bats were killed over what period, etc…). A variety of mitigating and/or punitive orders could be enforced, including, the shutdown of the wind farm.

Q. What would happen if no ITP was requested/granted and a take of a protected species occurred?

A. Again, I don't know if there is a definitive answer, but my understanding of the process is that unless the wind farm agreed to full mitigation efforts (e.g., cut-in speed at 6.9 or greater, only operating at certain months, etc…), or there was no evidence that endangered species would be threatened by this project then it would likely not be a favorable outcome.

---

[50] *Science Daily* (2016) Bat fatalities at wind farms prove unpredictable https://www.sciencedaily.com/releases/2016/11/161108085459.htm

[51] See GM-4 for OPC DR-2017

Q. Is USFW the only entity that could apply punitive enforcement if an endangered species take occurred?

A. No. Private parties could file lawsuits for perceived or realized non-enforcement of the law.

Q. Can you provide an example?

A. In 2009, The Animal Welfare Institute, Mountain Communities for Responsible Energy and Dave Cowan brought claims against Beech Ridge Energy, LLC and its parent company (Invenergy Wind LLC) for past and future takes of endangered India bats as a result of the construction, turbine erection, and operation activities of an industrial wind facility without an ITP, arguing that such activities constitute violations of the Endangered Species Act, specifically Section 9 which makes it unlawful for any person to:

> "take any [endangered] species within the United States." 16 U.S.C. § 1538(a)(1)(B). The ESA defines "take" as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." 16 U.S.C. § 1532(19).

The US District Court for the District of Maryland found in favor of the plaintiffs on the issue of harm. It was not swayed by defendants' contention that Indiana bats do not fly at the height of turbine blades and instead agreed with the testimony provided by plaintiffs' experts. It ruled that

> "like death and taxes, there is a virtual certainty that Indiana bats will be harmed, wounded or killed imminently by the Beech Ridge Project in violation of [Section] 9 of the ESA, during the spring, summer, and fall."[52]

[52] Animal Welfare Institute, et al., v. Beech Ridge Energy LLC, et al., Memorandum Opinion. Case No.: RWT 09cv1519 https://awionline.org/sites/default/files/uploads/legacy-uploads/documents/Legal_beechridgeopinion_120809-1260372252-document-16987.pdf

Q. But wouldn't applying environmental mitigation efforts negatively impact the capacity factor of the wind farm?[53]

A. Not to the point where it would be materially detrimental. If Ameren Missouri's priority was on achieving greater capacity factors, then the project would be better sited in Iowa where wind speeds (and therefore capacity factors) are much greater.

Q. Would requiring environmental mitigation precautions on this project impact future wind development in Missouri?

A. I do not believe that concern has any merit. The CCN process is in place to critically examine the siting of any project in Missouri. If a utility wanted to build a nuclear power plant on a fault line or coal plant in flood zone regulators would no doubt have questions and concerns. In this case, Ameren Missouri is requesting to ultimately own an asset that has been well documented at killing avian and mammalian species. The asset will also be located at a habitat site for at least two federal endangered species. The fact that there could be financial repercussions in the future for that decision is absolutely germane and unique to this case and this case alone.

To be clear, OPC is not saying Ameren Missouri should not pursue wind in Missouri for RES compliance or not acquire wind at this proposed location. We are merely saying that ratepayers should be held harmless for future liability associated with the unintentional take of an endangered species. Again, there is simply no reason why this application cannot be modified to preserve state and federal conservation efforts, support economic development and increase renewable generation in a manner that is cost-effective for ratepayers.

Q. What are OPC's specific recommendations on this issue?

A. OPC's primary recommendation is that ratepayers should be held harmless from any future costs related to violations of applicable federal or state protected species acts (e.g., Endangered Species Act). As a secondary recommendation, OPC recommends that the Commission order Ameren Missouri to obtain an ITC and/or set its turbines cut in speed at 6.9 to mitigate the

[53] Capacity factor is the average power generated, divided by the rated peak power. E.g. a 5 MW generation plant produces power at an average of 2 MW, then its capacity factor is 40% (2/5 = 0.40)

unintentional take of endangered species. That an independent third-party contractor be utilized to collect post-mortality data from the site to inform both the Commission and better educate the siting of future wind projects and that the reports be submitted annually and made available to the public for the sake of good transparency and research value.

Q. Has Ameren Missouri ever agreed to specific site conditions, site evaluations or post construction data collection of a supply side asset?

A. Yes. GM-5 and GM-6 contain Appendix A and D respectively of the S&A entered into be parties to Case No: EA-2016-0207, Ameren Missouri's Community Solar Program. The fact that Ameren Missouri went to such great lengths to ensure proper siting of its future solar project underscores that OPC's concerns and recommendations are not out of the ordinary and fall under the Tartan Criteria of public interest. A public interest has been articulated by identifying these species as endangered and affording habitats with protections. Attendant to those protections are penalties for violating the law. Ratepayers need to be protected from those liabilities.

Q. Does this conclude your testimony?

A. Yes.

CASE PARTICPATION OF GEOFF MARKE, PH.D.

Company Name	Employed Agency	Case Number	Issues
Union Electric Company d/b/a Ameren Missouri	Office of the Public Counsel (OPC)	EA-2018-0202	**Rebuttal:** Renewable Energy Standard Rate Adjustment Mechanism / Conservation
Rule Making	OPC	EW-2018-0002	Comments on Solar Rebates
Kansas City Power & Light & KCP&L Greater Missouri Operations Company	OPC	ER-2018-0145 ER-2018-0146	**Direct:** Smart Grid Data Privacy Protections **Rebuttal:** Clean Charge Network / Community Solar / Green Tariff / Economic Development Rider / Customer Information System **Rebuttal:** Rate Design: TOU, EV, IBR
Union Electric Company d/b/a Ameren Missouri	OPC	ET-2018-0063	**Rebuttal:** Green Tariff
Liberty Utilities	OPC	GR-2018-0013	**Surrebuttal:** Decoupling
Empire District Electric Company	OPC	EO-2018-0092	**Rebuttal:** Overview of proposal/ MO PSC regulatory activity / Federal Regulatory Activity / SPP Activity and Modeling / Ancillary Considerations **Surrebuttal** Response to parties **Affidavit** in opposition to the non-unanimous stipulation and agreement
Great Plains Energy Incorporated, Kansas City Power & Light Company, KCP&L Greater Missouri Operations Company, and Westar Energy, Inc.	OPC	EM-2018-0012	**Rebuttal:** Merger Commitments and Conditions / Outstanding Concerns
Missouri American Water	OPC	WR-2017-0285	**Direct:** Future Test Year/ Cost Allocation Manual and Affiliate Transaction Rules for Large Water Utilities / Lead Line Replacement **Direct:** Rate Design / Cost Allocation of Lead Line Replacement **Rebuttal:** Lead Line Replacement / Future Test Year/ Decoupling / Residential Usage / Public-Private Coordination **Rebuttal:** Rate Design

			Surrebuttal: affiliate Transaction Rules / Decoupling / Inclining Block Rates / Future Test Year / Single Tariff Pricing / Lead Line Replacement
Missouri Gas Energy / Laclede Gas Company	OPC	GR-2017-0216 GR-2017-0215	**Rebuttal:** Decoupling / Rate Design / Customer Confidentiality / Line Extension in Unserved and Underserved Areas / Economic Development Rider & Special Contracts **Surrebuttal:** Pay for Performance / Alagasco & EnergySouth Savings / Decoupling / Rate Design / Energy Efficiency / Economic Development Rider: Combined Heat & Power
Indian Hills Utility	OPC	WR-2017-0259	**Direct:** Rate Design
Rule Making	OPC	EW-2018-0078	Comments on cogeneration and net metering
Empire District Electric Company	OPC	EO-2018-0048	Integrated Resource Planning: Special Contemporary Topics Comments
Kansas City Power & Light	OPC	EO-2018-0046	Integrated Resource Planning: Special Contemporary Topics Comments
KCP&L Greater Missouri Operations Company	OPC	EO-2018-0045	Integrated Resource Planning: Special Contemporary Topics Comments
Missouri American Water	OPC	WU-2017-0296	**Direct:** Lead line replacement pilot program **Rebuttal:** Lead line replacement pilot program **Surrebuttal:** Lead line replacement pilot program
KCP&L Greater Missouri Operations Company	OPC	EO-2017-0230	Comments on Integrated Resource Plan, preferred plan update
Working Case: Emerging Issues in Utility Regulation	OPC	EW-2017-0245	Comments on Emerging Issues in Utility Regulation / Presentation: Inclining Block Rate Design Considerations Presentation: Missouri Integrated Resource Planning: And the search for the "preferred plan." / Comments on DER modeling
Rule Making	OPC	EX-2016-0334	Comments on Missouri Energy Efficiency Investment Act Rule Revisions
Great Plains Energy Incorporated, Kansas	OPC	EE-2017-0113 / EM-2017-0226	**Direct:** Employment within Missouri / Independent Third Party

City Power & Light Company, KCP&L Greater Missouri Operations Company, and Westar Energy, Inc.			Management Audits / Corporate Social Responsibility
Union Electric Company d/b/a Ameren Missouri	OPC	ET-2016-0246	**Rebuttal:** EV Charging Station Policy **Surrebuttal:** EV Charging Station Policy
Kansas City Power & Light		ER-2016-0156	**Direct:** Consumer Disclaimer **Direct:** Response to Commission Directed Questions **Rebuttal:** Customer Experience / Greenwood Solar Facility / Dues and Donations / Electric Vehicle Charging Stations **Rebuttal:** Class Cost of Service / Rate Design **Surrebuttal:** Clean Charge Network / Economic Relief Pilot Program / EEI Dues / EPRI Dues
Union Electric Company d/b/a Ameren Missouri	OPC	ER-2016-0179	**Direct:** Consumer Disclaimer / Transparent Billing Practices / MEEIA Low-Income Exemption **Direct:** Rate Design **Rebuttal:** Low-Income Programs / Advertising / EEI Dues **Rebuttal:** Grid-Access Charge / Inclining Block Rates /Economic Development Riders
KCP&L Greater Missouri Operations Company	OPC	ER-2016-0156	**Direct:** Consumer Disclaimer **Rebuttal:** Regulatory Policy / Customer Experience / Historical & Projected Customer Usage / Rate Design / Low-Income Programs **Surrebuttal:** Rate Design / MEEIA Annualization / Customer Disclaimer / Greenwood Solar Facility / RESRAM / Low-Income Programs
Empire District Electric Company, Empire District Gas Company, Liberty Utilities (Central) Company, Liberty Sub-Corp.	OPC	EM-2016-0213	**Rebuttal:** Response to Merger Impact **Surrebuttal:** Resource Portfolio / Transition Plan

Working Case: Polices to Improve Electric Regulation	OPC	EW-2016-0313	Comments on Performance-Based and Formula Rate Design
Working Case: Electric Vehicle Charging Facilities	OPC	EW-2016-0123	Comments on Policy Considerations of EV stations in rate base
Empire District Electric Company	OPC	ER-2016-0023	**Rebuttal:** Rate Design, Demand-Side Management, Low-Income Weatherization **Surrebuttal:** Demand-Side Management, Low-Income Weatherization, Monthly Bill Average
Missouri American Water	OPC	WR-2015-0301	**Direct:** Consolidated Tariff Pricing / Rate Design Study **Rebuttal:** District Consolidation/Rate Design/Residential Usage/Decoupling **Rebuttal:** Demand-Side Management (DSM)/ Supply-Side Management (SSM) **Surrebuttal:** District Consolidation/Decoupling Mechanism/Residential Usage/SSM/DSM/Special Contracts
Working Case: Decoupling Mechanism	OPC	AW-2015-0282	**Memorandum:** Response to Comments
Rule Making	OPC	EW-2015-0105	Missouri Energy Efficiency Investment Act Rule Revisions, Comments
Union Electric Company d/b/a Ameren Missouri	OPC	EO-2015-0084	Triennial Integrated Resource Planning Comments
Union Electric Company d/b/a Ameren Missouri	OPC	EO-2015-0055	**Rebuttal:** Demand-Side Investment Mechanism / MEEIA Cycle II Application **Surrebuttal:** Potential Study / Overearnings / Program Design **Supplemental Direct:** Third-party mediator (Delphi Panel) / Performance Incentive **Supplemental Rebuttal:** Select Differences between Stipulations **Change Request:** EM&V **Rebuttal:** Pre-Pay Billing
The Empire District Electric Company	OPC	EO-2015-0042	Integrated Resource Planning: Special Contemporary Topics Comments
KCP&L Greater Missouri Operations Company	OPC	EO-2015-0041	Integrated Resource Planning: Special Contemporary Topics Comments

Kansas City Power & Light	OPC	EO-2015-0040	Integrated Resource Planning: Special Contemporary Topics Comments
Union Electric Company d/b/a Ameren Missouri	OPC	EO-2015-0039	Integrated Resource Planning: Special Contemporary Topics Comments
Union Electric Company d/b/a Ameren Missouri	OPC	EO-2015-0029	Ameren MEEIA Cycle I Prudence Review Comments
Kansas City Power & Light	OPC	ER-2014-0370	**Direct** (Revenue Requirement): Solar Rebates **Rebuttal:** Rate Design / Low-Income Weatherization / Solar Rebates **Surrebuttal:** Economic Considerations / Rate Design / Cyber Security Tracker
Rule Making	OPC	EX-2014-0352	Net Metering and Renewable Energy Standard Rule Revisions, Comments
The Empire District Electric Company	OPC	ER-2014-0351	**Rebuttal:** Rate Design/Energy Efficiency and Low-Income Considerations
Rule Making	OPC	AW-2014-0329	Utility Pay Stations and Loan Companies, Rule Drafting, Comments
Union Electric Company d/b/a Ameren Missouri	OPC	ER-2014-0258	**Direct:** Rate Design/Cost of Service Study/Economic Development Rider **Rebuttal:** Rate Design/ Cost of Service/ Low Income Considerations **Surrebuttal:** Rate Design/ Cost-of-Service/ Economic Development Rider
KCP&L Greater Missouri Operations Company	OPC	EO-2014-0189	**Rebuttal:** Sufficiency of Filing **Surrebuttal:** Sufficiency of Filing
KCP&L Greater Missouri Operations Company	OPC	EO-2014-0151	Renewable Energy Standard Rate Adjustment Mechanism (RESRAM) Comments
Liberty Natural Gas	OPC	GR-2014-0152	**Surrebuttal:** Energy Efficiency
Summit Natural Gas	OPC	GR-2014-0086	**Rebuttal:** Energy Efficiency **Surrebuttal:** Energy Efficiency
Union Electric Company d/b/a Ameren Missouri	OPC	ER-2012-0142	**Direct:** PY2013 EM&V results / Rebound Effect **Rebuttal:** PY2013 EM&V results **Surrebuttal:** PY2013 EM&V results **Direct:** Cycle I Performance Incentive **Rebuttal:** Cycle I Performance Incentive
Kansas City Power & Light	Missouri Public Service	EO-2014-0095	**Rebuttal:** MEEIA Cycle I Application testimony adopted

	Commission Staff		
KCP&L Greater Missouri Operations Company	Missouri Division of Energy (DE)	EO-2014-0065	Integrated Resource Planning: Special Contemporary Topics Comments
Kansas City Power & Light	DE	EO-2014-0064	Integrated Resource Planning: Special Contemporary Topics Comments
The Empire District Electric Company	DE	EO-2014-0063	Integrated Resource Planning: Special Contemporary Topics Comments
Union Electric Company d/b/a Ameren Missouri	DE	EO-2014-0062	Integrated Resource Planning: Special Contemporary Topics Comments
The Empire District Electric Company	DE	EO-2013-0547	Triennial Integrated Resource Planning Comments
Working Case: State-Wide Advisory Collaborative	OPC	EW-2013-0519	Presentation: Does Better Information Lead to Better Choices? Evidence from Energy-Efficiency Labels
Independence-Missouri	OPC	Indy Energy Forum 2014	Presentation: Energy Efficiency
Independence-Missouri	OPC	Indy Energy Forum2015	Presentation: Rate Design
NARUC – 2017 Winter	OPC	Committee on Consumer Affairs	NARUC – 2017 Winter Presentation: PAYS Tariff On-Bill Financing
NASUCA – 2017 Summer	OPC	Committee on Water Regulation	NASUCA – 2017 Summer Presentation: Regulatory Issues Related to Lead-Line Replacement of Water Systems
NASUCA – 2017 winter	OPC	Committee on Utility Accounting	NASUCA – 2017 Winter Presentation: Lead Line Replacement Accounting and Cost Allocation

Ameren Missouri's
Response to OPC Data Request
EA-2018-0202
Application for Wind CCN - Terra-Gen

Data Request No.: OPC 2001

Please provide a list of all listed endangered and threatened species covered by the Endangered Species Act that are being evaluated by the Company for habitat and taking concerns.

RESPONSE

Prepared By: Kevin Atkins CE, PWS, CESSWI,
Title: Career Environmental Scientist, Ameren Services Company
Date: August 7, 2018

Ameren is evaluating the Indiana bat (*Myotis sodalis*) and the northern long-eared bat (*Myotis septentrionalis*) for take authorization as provided under Section 10, of the Endangered Species Act.

Current Biology
Magazine

Correspondence

Ecological impact assessments fail to reduce risk of bat casualties at wind farms

Paul R. Lintott[1,3], Suzanne M. Richardson[1,3], David J. Hosken[2], Sophie A. Fensome[1], and Fiona Mathews[1,4]

Demand for renewable energy is rising exponentially. While this has benefits in reducing greenhouse gas emissions, there may be costs to biodiversity [1]. Environmental Impact Assessments (EIAs) are the main tool used across the world to predict the overall positive and negative effects of renewable energy developments before planning consent is given, and the Ecological Impact Assessments (EcIAs) within them assess their species-specific effects. Given that EIAs are undertaken globally, are extremely expensive, and are enshrined in legislation, their place in evidence-based decision making deserves evaluation. Here we assess how well EIAs of wind-farm developments protect bats. We found they do not predict the risks to bats accurately, and even in those cases where high risk was correctly identified, the mitigation deployed did not avert the risk. Given that the primary purpose of an EIA is to make planning decisions evidence-based, our results indicate that EIA mitigation strategies used to date have been ineffective in protecting bats. In the future, greater emphasis should be placed on assessing the actual impacts post-construction and on developing effective mitigation strategies.

The high legal protection of bats (e.g., Europe: EUROBATS 2014; North America: Endangered Species Act 1973), together with the known risks to bats from wind farms (e.g. [2]), means that detailed preconstruction ecological assessments are frequently undertaken. Acoustic surveys are widely used to provide an estimate of bat activity from which collision risk is inferred. However, bat activity is highly variable — both spatially and temporally. It is therefore unclear whether the survey protocols currently employed assess bat activity with sufficient precision and repeatability to be of practical value in inferring risk for developments. Determining the best methods to assess likely impacts on bats from wind turbines is regarded as a research priority by EUROBATS [3]. To our knowledge, there has only been one study (in North America) that investigates the value of using bat activity to predict the risk to bats from future wind turbines. This found that pre-construction bat activity was not a significant indicator of collision risk [4]; however, the value of EIAs in predicting risk was not assessed. We therefore assessed the effectiveness of pre-construction EIAs as a tool to aid decision-makers in determining the impact of wind energy on bats.

We surveyed 46 wind farms across the UK for bat fatalities as part of a separate field study investigating the impact of wind turbines on bats. We were able to obtain EcIAs for 29 of these sites; the remaining EcIAs could not be obtained from public sources or developers. Eighteen EcIAs concluded that a field assessment of bat presence/activity was not required (evidenced by statements in the EcIA such as "Surveys are unnecessary as the development does not affect any features likely to be used by bats"), or inferred based on field surveys that no significant effects on any protected species would occur (see also Table S1 in Supplemental Information, published with this article online). However, during our post-construction surveys we found that half of these sites contained casualties (ranging from one to 64 fatalities per month during the July–October survey period), and 97% had evidence of bat activity (ranging from one to 236 passes per night). The perception of risk to bats during EcIAs was not significant in predicting either bat casualty rates (Figure 1A) or activity levels post-construction (see also

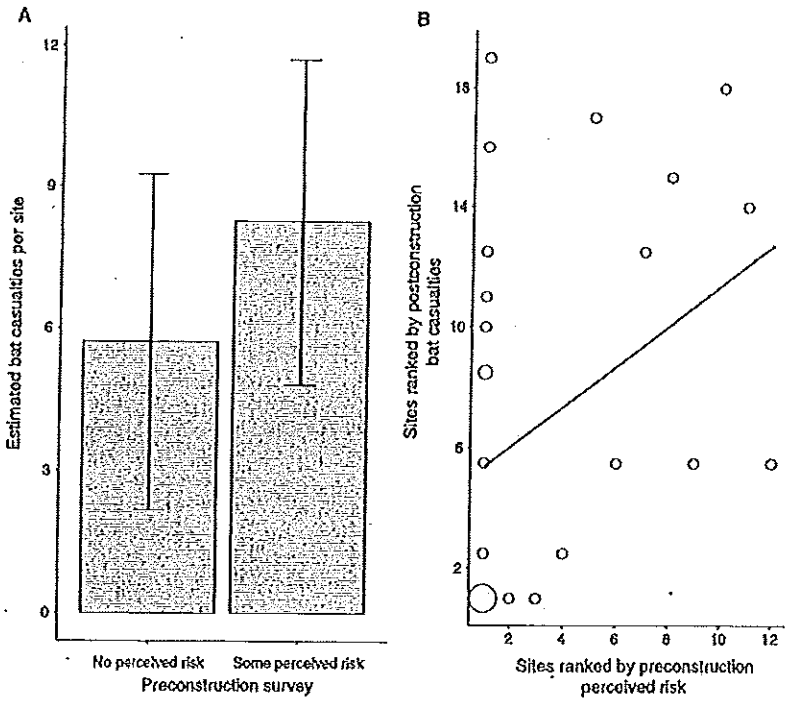


Figure 1. The relationship between pre-construction assessment of risks to bats and post-construction fatalities.
(A) The difference in the average number of bat casualties per site between wind farms where preconstruction surveys perceived different levels of risk. Error bars depict the standard error of the mean (n = 29). (B) The marginally significant relationship between ranked pre-construction assessment of risk to bats and ranked post-construction fatality estimates (ρ (29) = 0.36, p = 0.05). Sites are ranked in ascending order of perceived risk. Circle size is proportional to the number of sites at a particular ranking (range 1 to 3 sites).

Current Biology
Magazine

Figure S1). While there was a positive relationship between sites ranked by perceived risk to bat populations and the ranking of sites by casualties per month (Figure 1B), there was considerable scatter in the data, and 9 sites identified as having the lowest risk had more than 1 casualty per month.

Our results show that sites which may have been perceived as of poor quality for bats can contain casualties after wind turbine construction. Similarly, bat activity recording during pre-construction surveys may not accurately reflect activity levels post-construction. This may be due to bats changing their behaviour at turbines [5], as bats may be attracted to wind farm sites for a variety of reasons, including the emission of ultrasound from turbines [6] and increased prey availability [5]. It is therefore essential that future mitigation strategies are formed with an understanding of how bat behaviour differs at sites after turbines have been constructed. Additionally, surveying effort has to be adequate both spatially and temporally to assess risks to bats in the first place. Pre-construction surveys are conducted predominantly at ground level due to the difficulties and cost of surveying at height; however, where meteorological masts are in place (or as drone technology develops) then conducting acoustic surveys within the rotor-swept area may give a more accurate assessment of risk. But this relationship has yet to be tested.

Of those sites identified as posing a significant risk to bats in the EcIA surveys, risk does not appear to have been adequately mitigated. Indeed, one of these mitigated sites had the highest recorded casualty rate. In the UK, regulations state that "if significant harm cannot be avoided, adequately mitigated, or as a last resort, compensated for, planning permission should be refused" and similar legislation applies in many other countries. We conclude that significant harm was not avoided at these significant risk sites.

Given the economic cost of EcIAs, the value attached to their findings during planning applications, and the possible consequences to biodiversity of errors, it is vital that they are fit for the purpose. We highlight that although EIAs give the perception of rigorous safeguarding of environmental standards and may portray energy companies with an environmentally friendly public image, considerable time and expense goes into deploying bat detectors at pre-construction sites with little justification. Although the use of EIAs has evolved differently between nations [7], there is a pressing global need to identify the procedures which can accurately identify risk to bats (e.g., Brazil [8]). The precautionary principle indicates that sites perceived to contain little collision threat to bats should be treated with caution until there is a greater understanding of how to identify risk factors to bats. On occasions when mitigation is currently deemed unnecessary, post-construction surveys should still be conducted (e.g. carcass searches) to ensure that the predictions are accurate and bat behaviour has not altered from pre-construction levels. Establishing the species assemblage at a site may nevertheless have some value in identifying the presence of species at high collision risk and/or of particular conservation concern in the region. In mainland Europe, automated systems using weather variables and site-specific post-construction bat activity data have been used to trigger turbine curtailments to minimise bat collisions [9]. Pre-construction surveys may therefore still be useful as the data (e.g., nightly and seasonal peaks of activity) may provide an indication of the extent of curtailment that is required and therefore the economic viability of the project. Our results highlight the importance of longitudinal monitoring of major developments and a feedback mechanism for practitioners to share the success or failure of mitigation strategies.

SUPPLEMENTAL INFORMATION

Supplemental Information contains one figure, one table, and experimental procedures and can be found with this article online at http://dx.doi.org/10.1016/j.cub.2016.10.003.

AUTHOR CONTRIBUTIONS

Conceptualisation, F.M.; Methodology, F.M., P.R.L., S.M.R; Investigation, S.M.R, P.R.L, S.A.F; Data Curation, S.M.R, S.A.F; Statistics; P.R.L., F.M., Writing – Original Draft P.R.L., Writing-Review and Editing; F.M., S.M.R., D.J.H, Supervision, F.M., D.J.H.; Funding Acquisition, F.M.

ACKNOWLEDGEMENTS

The research was supported by NERC Innovation funding (NE/M021882/1). We thank the site owners and operators who allowed access to the wind farm sites and our field workers. The research drew on data collected as part of the separate National Bats and Wind Turbines project which was funded by Defra, Natural England, Natural Resources Wales, Scottish Natural Heritage, the Department of Energy and Climate Change and Renewable UK.

REFERENCES

1. Wang, S., and Wang, S. (2015). Impacts of wind energy on environment: a review. Renew. Sustainable Energy Rev. *49*, 437–443.
2. Arnett, E.B., and Baerwald, E.F. (2013). Impacts of wind energy development on bats: Implications for conservation. In Bat Evolution, Ecology, and Conservation, R.A. Adams and S.C. Pedersen, eds. (Springer: New York), pp. 435–456.
3. Rodrigues, L., Bach, M.-J., Dubourg-Savage, B., Karapandža, D., Kovač, T., Kervyn, J., Dekker, A., Kepel, P., Bach, J., Collins, C. *et al.* (2015). Guidelines for consideration of bats in wind farm projects – Revision 2014. EUROBATS Publication Series NO. 6 (English version). (Bonn: UNEP/EUROBATS Secretariat).
4. Hein, C.D., Gruver, J., and Arnett, E.B. (2013). Relating pre-construction bat activity and postconstruction bat fatality to predict risk at wind energy facilities: a synthesis. A report submitted to the National Renewable Energy Laboratory. Bat Conservation International, Austin, TX, USA.
5. Cryan, P.M., Gorresen, P.M., Hein, C.D., Schirmacher, M.R., Diehl, R.H., Huso, M.M., Hayman, D.T.S., Fricker, P.D., Bonaccorso, F.J., Johnson, D.H., *et al.* (2014). Behavior of bats at wind turbines. Proc. Natl. Acad. Sci. USA *111*, 15126–15131.
6. Kunz, T.H., Arnett, E.B., Erickson, W.P., Hoar, A.R., Johnson, G.D., Larkin, R.P., Strickland, M.D., Thresher, R.W., and Tuttle, M.D. (2007). Ecological impacts of wind energy development on bats: questions, research needs, and hypotheses. Front. Ecol. Environ. *5*, 315–324.
7. Glasson, J., Therivel, R. and Chadwick, A. (2013). Introduction of Environmental Impact Assessment: Fourth Edition. (Routledge: New York).
8. Valença, R.B., and Bernard, E., (2015). Another blown in the wind: bats and the licensing of wind farms in Brazil. Natureza & Conservação *13*, 117–122.
9. Behr, O., Brinkmann, R., Niermann, I., and Korner-Nievergelt, F. (2011). Fledermausfreundliche Betreibsalgorithm fur Windenergieanlagen. In Entwicklung von Methoden zur Untersuchung und Reduktion des Kollisionsrisikos von Fledermäusen an Onshore-Windenergieanlagen. *Umwelt und Raum*, eds R. Brinkmann., O. Behr., I. Niermann and M. Reich, eds. (Cuvillier Verlag: Göttingen), pp. 354–383.

[1]Hatherly Laboratories, Biosciences, College of Life and Environmental Sciences, University of Exeter, Prince of Wales Road, Exeter, EX4 4PS, UK. [2]Centre for Ecology and Conservation, University of Exeter, Cornwall, Tremough, Penryn, Cornwall, UK.
[3]Co-first authors
[4]E-mail: F.Mathews@exeter.ac.uk

Ameren Missouri's
Response to OPC Data Request
EA-2018-0202
Application for Wind CCN - Terra-Gen

Data Request No.: OPC 2017

If Terra-Gen and/or the Company does not obtain an incidental take permit, please describe whether the Company intends to operate the wind facility and how the company plans to operate the facility without an incidental take permit.

RESPONSE

Prepared By: Nancy Morgan
Title: Manager, Ameren Services Company
Date: August 7, 2018

Based upon studies conducted to date, ongoing discussions with USFWS and the Service's regulatory approach with other Midwest wind projects and public pronouncements, Ameren Missouri believes that with respect to this project, FWS will be able to issue an incidental take permit (ITP) for the post-construction, operational phase of the project. Ameren Missouri declines to speculate as to how it would operate in the absence of FWS issued ITP or an ITP containing conditions unacceptable to the Company. Ameren Missouri would be speculating as to facts and circumstances that are presently unknown and unknowable and contrary to what we believe to be the likely outcome of USFWS regulatory review. Further, under the Endangered Species Act, obtaining an ITP is not a mandatory requirement but rather is a protective measure to guard against potential enforcement in the event a take of a protected species occurs.

Appendix A – Site Documentation

CCN Application filing:

A. When filing its CCN application, Ameren Missouri will file the information required by 4 CSR 240-3.105(B) in File No. EA-2016-0207. This filing will also include an assessment that the identified site meets the Minimum Application Conditions listed below, as well as documentation regarding the Additional Considerations for Site Selection listed below.

B. Ameren Missouri will schedule a conference call within 7 calendar days of the filing of the information to answer questions.

C. Parties may issue data requests for additional information. The time to answer these data requests will be shortened to 7 calendar days, with 3 business days to object or notify the issuer that additional time will be needed to provide the information requested.

E. Consistent with expedited treatment of the CCN application, Staff will file a report in the CCN case that says they have verified that the site selected does (or does not) meet the agreed-upon criteria. Other parties may file a report at the same time, but are not required to do so.

Minimum Application Conditions to be met are as follows, in no particular order:

- Site is within the Ameren Missouri service territory
- Site provides a suitable location for solar (flat, minimal shading issues, accessible) minimum of eighty-five percent (85%) of the solar resource is available to the solar photovoltaic system. Near sub-transmission, distribution lines, or substations (12kV - 69 kV)
    - Interconnection must be at sub-transmission or distribution level
    - Interconnection must not require significant capacity upgrades
- Not in a flood plain

Additional Considerations for Site Evaluation, in no particular order:

- Price of Bid
- Price of Interconnection Cost and Upgrades
- Type of installation (Ground Mount, Rooftop, Canopy)
- Quality of site (risk of erosion, deterioration of structure, or quality of soil)
- Environmental risk of site
- Existing security at site location
- Safety risk at location
- Type of Facility: (Greenfield, Office, Educational, Industrial, Manufacturing, Retail, Data center, Warehouse, Healthcare, Military, Recreational, Other)
- Site Status: (Owned, Leased, Other)

APPENDIX D

Each report filed pursuant to paragraph 16 shall include at a minimum: a discussion of knowledge gained of each Learning Opportunity, a discussion of progress towards answering each Key Question to Explore, and the results of and documentation of Planned Activities to Gain Insight, to the extent the specified surveys have been conducted.

Learning Opportunities:

To gauge how customers will react to various pricing sensitivities, to evaluate the potential impacts on net energy metering structures and to determine the real or perceived value of increasing solar generation at the distribution level, as compared to adding solar generation at the transmission level.

In gauging customer reactions to pricing, Ameren Missouri will also determine customer sensitivity to program design aspects including, but not limited to: the timing, level, and refund limitation of the up-front "reservation fee;" the program length commitment; subscription transferability between customers; the 50 percent usage cap on subscription; and the potential for a portion of the monthly charge to increase following rate cases.

This program will assist Ameren Missouri in determining first-hand how best to structure supply options related to distributive solar generation. The intent is to engage customers, solicit their feedback and provide a basis to continually adjust the program offering in order to meet their expectations. The lessons learned through this pilot program should provide insights into the advantages and challenges associated with distributed generation resources on the Ameren Missouri grid. Testing the deployment, this small-scale pilot project may be helpful in developing real time solutions for distributed generation.

Key Questions to Explore and Planned Activities to Gain Insights:

Ameren Missouri will conduct a survey of the program participants after the first 18 months of program operation. The intent will be to gather customer feedback seeking answers to questions such as:

- What were customer's expectations coming into the program?
- Is the program meeting customer's expectations?
- What areas of the program need improvement?
- What aspects of the program do the customers like and dislike?
- Do participants find the timing, level, and refund limitation of the up-front "reservation fee" reasonable?
- Are current and potential subscribers willing to commit to a two-year subscription?
- Would a shorter mandatory subscription period (or no period at all) be more appropriate?
- Would current or potential subscribers be interested in the ability to transfer subscriptions to other customers without penalty?
- Is the block size appropriate?
- Do current or potential subscribers want to be able to subscribe to more than 50 percent of their usage? Should the limitation be relaxed or eliminated for customers exhibiting high load factors?

- Are customers aware of the potential for part of the subscription fee to increase with rate cases? With this knowledge, are they still willing to participate?
- Are there any aspects of the program that provide the customer with a greater understanding of solar energy generation?
- What is the impact of the program on non-participating ratepayers?

A similar survey will then be conducted after three years to determine if the program has provided enough value to be extended and/or what changes would be necessary to gain a higher level or a continued level of participation. In addition to surveying program participants, Ameren Missouri will solicit input from non-participants to determine reasons for non-participation and alternative program design provisions which might encourage participation. This survey shall be conducted every six years thereafter over the life of the solar resource.