KANSAS PAYS THE PRICE

A Comparison of Coal Plants and Renewable Energy for Electric Consumers of Evergy, KCP&L, and Westar

August, 2019

SIERRA CLUB

TABLE OF CONTENTS

INTRODUCTION

A transition is underway in Kansas, and across the United States, to replace power generated by dirty fossil fuels — a primary cause of climate change — with power generated by clean energy. Coal power, which once provided over half the country's electricity, now accounts for less than one third of the power generated in the US.[1] As part of this energy transition, Kansas has seen a huge boost in wind power: In 2018, Kansas was one of the top wind-producing states in the country, and had a larger percentage of its power generated from wind — 36% — than any other state.[2] Meanwhile, the amount of electricity generated from coal in Kansas dropped by almost fifty percent between 2008 and 2018. The overall capacity of Kansas's coal plants only fell by about 6% over the same period, however, indicating that utilities are hanging on to increasingly under-utilized coal plants.[3]

2018 also saw the merger of Kansas City Power & Light (KCP&L) and Westar Energy into Evergy, Inc., a combined company that now provides power across eastern Kansas and western Missouri under the KCP&L and Westar brands. Yet as other utilities across the country are embracing the shift from coal to clean energy, Evergy continues to be heavily dependent on coal. In fact, as a result of this merger, Evergy is now one of the top fifteen owners of coal power plant capacity in the United States, with 5,800 MW of operating coal in Kansas and Missouri that the utility has not yet announced plans to retire.[4]

As a result of the merger between KCP&L and Westar to form Evergy, utility regulators in Kansas at the Kansas Corporation Commission wisely required Evergy to undergo its first Integrated Resource Plan (IRP) process.[5,6] In gaining approval of the merger from the Missouri Public Service Commission, Evergy committed to conducting a similar analysis of the combined KCP&L and Westar power plant fleet as part of its 2019 Integrated Resource Plan Update in Missouri.[7]

These IRP processes are an opportunity to examine how Evergy plans to provide electricity in the coming years, and to analyze the financial consequences of those plans. As this report will show, Evergy's commitment to coal power is both an environmental concern and an economic loser; while Evergy doubles down on dirty fossil fuels, Kansans pay the price.

KEY FINDINGS

- Evergy's Kansas coal fleet lost $267 million from 2015 through 2018 relative to market energy pricing.
- Future projections show that Evergy's La Cygne and Jeffrey plants combined are expected to lose $847 million over the next 20 years.
- Air pollution from Evergy's Kansas coal plants are responsible for nearly 20 premature deaths and more than 100 asthma attacks every year.

RECOMMENDATIONS

As part of a new long-range planning process, the Kansas Corporation Commission should require Evergy to:

- Conduct transparent and robust economic analyses of its coal units;
- Seek out cleaner and less-expensive energy options through an all-source Request For Proposals (RFP); and
- Be held accountable: When market prices are lower than the costs of its coal fleet, Evergy should be purchasing market energy — not operating its costly coal plants.

KANSAS IS READY FOR WIND POWER, IS EVERGY?
PHOTO: ZACK PISTORA

EVERGY'S COMMITMENT TO COAL

Evergy remains committed to coal, even as many utilities plan to transition from dirty fossil fuels to clean renewable energy.[8] In Kansas, decades-old coal plants — operated under the KCP&L and Westar brands — pump out millions of tons of carbon dioxide (CO^2) and millions of pounds of sulfur dioxide (SO_2) and nitrogen oxides (NOx) every year. As a result, Evergy's Kansas coal plants are responsible for nearly 20 premature deaths and more than 100 asthma attacks every year.[9] Evergy now accounts for almost ninety percent of the remaining coal power in Kansas, meaning the utility's older and outdated plants have a disproportionate health impact on eastern Kansas.

While Evergy doubles down on coal, wind power in Kansas only continues to grow — in Kansas, like much of the country, the demand for clean energy continues to rise and desire for dirty fossil fuels continues to fall. Highlighting this trend, the average annual capacity factor (the ratio of a plant's average power capacity to its peak operating capacity over a given year) of Evergy's Kansas coal units has fallen from 71% in 2009 to 50% in 2018, an indication that the plants are becoming less and less competitive over time in the regional electric marketplace.[10] Wind and solar power are now more affordable than the majority of Evergy's coal units, which means that adding more renewable energy to Evergy's portfolio provides opportunities to lower monthly electric bills for all consumers. In fact, Evergy is responsible for almost all Kansas coal power, as shown in Figure 1. Any IRP prepared by Evergy and its subsidiaries, KCP&L and Westar, must take these factors into account.

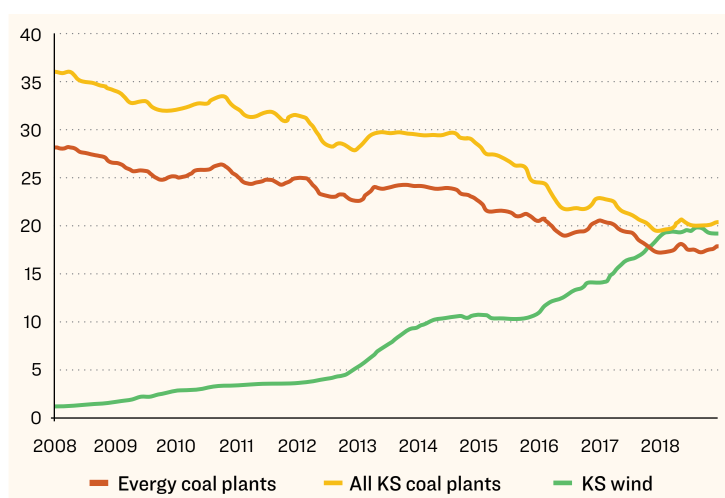

FIGURE 1: ELECTRICITY GENERATION IN KANSAS FOR COAL AND WIND POWER — ROLLING ANNUAL TOTAL (MILLION MEGAWATT HOURS). NOTE THAT THE VAST MAJORITY OF KANSAS COAL POWER COMES FROM EVERGY PLANTS.

THE COST OF COAL

To help inform ratepayers and regulators, Sierra Club modeled both recent and expected future costs and revenues of Evergy's Kansas coal fleet, first to determine whether Evergy's coal plants are operating at a profit or a loss, and second to compare those costs to clean energy. For our review of Evergy's historic net revenues, we compared the reported production cost of the coal units (i.e., fuel and variable operations costs like water and chemicals) to the reported energy market price for each hour in which the coal units operated, and then accounted for the fixed costs of operation (e.g., labor and maintenance costs). We repeated this process for each year from 2015 to 2018.

For our assessment of forward-looking costs, we projected the market price of energy at the relevant Southwest Power Pool (SPP) nodes, as well as the cost of coal, operations and maintenance expenses, and incremental capital required to keep the coal plants operational.[11] We projected costs forward from 2020 to 2039, and assessed the annual net revenues to each unit. A more detailed methodology, along with data sources for both historic and forward-looking analyses, can be found in the appendix.

Our historical assessment, outlined in Table 1, shows that **Evergy's Kansas coal fleet lost $267 million from 2015 through 2018** relative to market energy pricing, with peak losses in 2017. The greatest losses, by a wide margin, were at La Cygne units 1 and 2 which together lost nearly $170 million across the four year span. The Jeffrey Energy Center and Lawrence units also saw significant loses over this time span, albeit less substantial than at La Cygne.

TABLE 1: Market energy net revenues at Evergy Kansas coal plants, 2015-2018, $ millions

	2015	2016	2017	2018	TOTAL
Jeffrey Energy Center 1	$(2.8)	$(12.6)	$(9.2)	$2.2	$ (22.3)
Jeffrey Energy Center 2	$(10.0)	$(17.3)	$(10.6)	$1.9	$ (36.1)
Jeffrey Energy Center 3	$(9.2)	$(11.9)	$(12.6)	$(1.7)	$ (35.4)
La Cygne 1	$(26.4)	$(19.9)	$(32.7)	$(11.0)	$ (90.1)
La Cygne 2	$(25.9)	$(21.2)	$(30.0)	$(0.8)	$ (77.9)
Lawrence 4	$(2.8)	$(1.6)	$(0.4)	$4.6	$ (0.2)
Lawrence 5	$(6.8)	$(4.8)	$(1.7)	$8.5	$ (4.7)
TOTAL	$(83.9)	$(89.2)	$(97.2)	$3.7	$ (266.7)

While the costs to operate Evergy's coal units are borne entirely by ratepayers, market energy revenues can provide a benchmark for the economic performance and relative merit of those coal units. If Evergy's coal units were owned by a merchant entity — i.e. one that had to survive on revenues from energy market sales alone, as opposed to passing costs on to captive ratepayers — that entity would have taken substantial losses. An analysis of historical net revenue data provides an opportunity to assess the money that could have been saved had ratepayers been provided energy from market-based sources rather than energy from Evergy's coal units.

Even the uptick in revenues in 2018 are relatively marginal, and should provide little comfort for the long-term financial viability of Evergy's coal plants. In particular, an analysis focused purely on historic net revenue does not account for the incremental capital costs required to keep these coal units operational. While our analysis includes the fixed costs of operation (e.g., labor and maintenance costs) it does not include large, irregular, difficult-to-predict capital expenditures for large steam boilers, such as those in a coal plant that require periodic replacement or upgrades (superheaters, economizers, turbines, coal processing equipment, coal ash handling, and water treatment equipment). Likewise, we did not take into account other large expenditures such as environmental equipment or the cost of complying with new regulations. These periodic costs quickly overshadow the marginal energy revenues in 2018.

On the flip side, our analysis does not seek to assess the capacity (i.e. peak) benefit of these power plants. SPP does not operate a capacity market, and thus the capacity value is at best notional. With a reserve margin of 32% in 2019, the North American Electric Reliability Corporation (NERC) does not anticipate reliability issues in SPP,[12] and thus the capacity value of these units is not likely to be substantial.

A review of the operations of Evergy's units does show that there are few times of the year in which some coal units are more economic than market energy pricing, but not consistently enough to be economically viable. For example, Figure 2 compares the annual production cost of La Cygne unit 1 against monthly average market energy prices. To be consistently profitable, La Cygne would have to maintain production costs well below the average energy price, as during the first few months of 2014. However, over the last four years, the average cost of La Cygne has been approximately equal to the average market price. Therefore, La Cygne makes minimal market revenue, while still incurring the substantial fixed costs of labor, maintenance, and ongoing capital improvements.

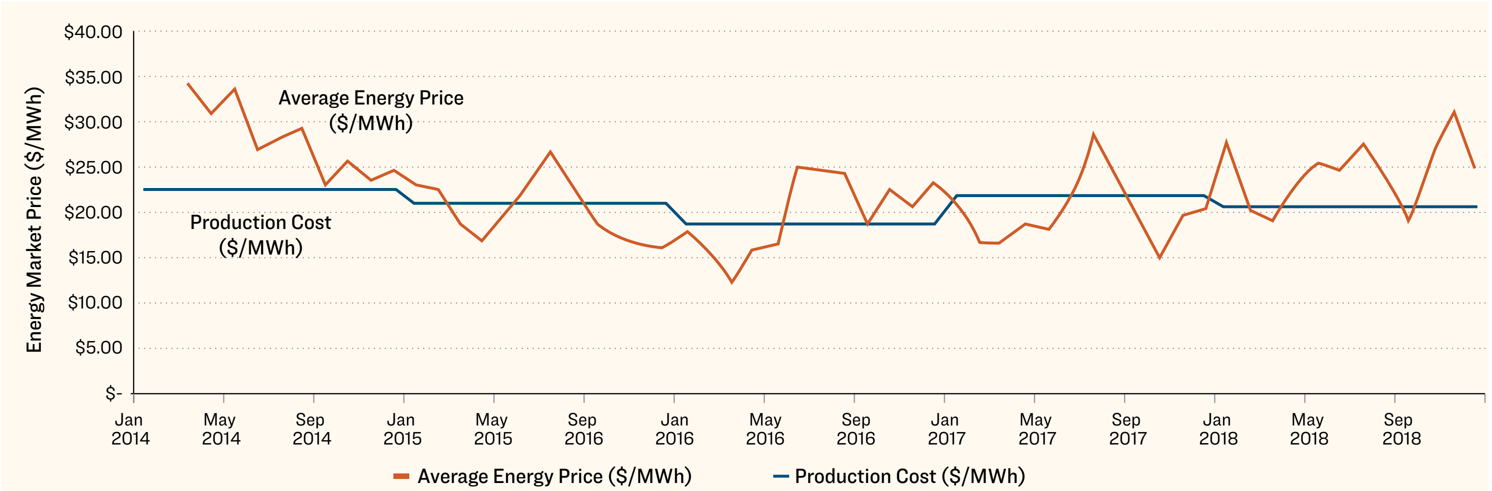

FIGURE 2: COMPARISON OF AVERAGE MONTHLY MARKET PRICE TO ESTIMATED ANNUAL PRODUCTION COSTS FOR LA CYGNE 1 ($/MEGAWATT HOUR)

As a consequence, there are very few months in which La Cygne makes positive market revenues. As shown in the Figure 3, La Cygne has generally been able to operate only in months where market energy prices substantially exceed the cost of production. In recent years, it has operated seasonally, turning on for the winter peak in January and the summer months of June-August, while remaining off for the rest of the year. In prior years, when it failed to turn off during low-priced months, the power plant effectively lost revenue. If La Cygne were a privately owned and operated market participant or independent generator, it would not be able to sustain these losses or justify ongoing operations.

Looking ahead, as is done in Table 2, the financial loses at Evergy's coal units are even more dramatic. As in the historical revenue assessment, both La Cygne and Jeffrey are expected to incur substantial net losses, for a combined **$847 million loss over the next two decades.** Lawrence is not expected to fare dramatically better, with only marginally positive outcomes of $54 million. Notably, these results are absent any future environmental regulations, including possible prices or caps on carbon emissions. In addition, the analysis assumes that the marginal cost of energy in SPP remains linked to the cost of gas, which may be an overly conservative assumption. The rapid increase in renewable energy in SPP suggests that marginal energy costs may in fact continue to be depressed relative to the cost of gas. If either of these risks transpire (environmental regulations or a decoupling of market revenues and gas prices), the economic outcome for Evergy's coal units will be substantially worse than what is shown here, and our results already show that Evergy's Kansas coal plants are financial losers on a forward-looking basis.

In short, Evergy could purchase less expensive power from the SPP market. And since renewable energy continues to be market competitive in SPP, it implies that Evergy could build and sustain renewable energy at far lower costs than those of the company's existing coal plants.

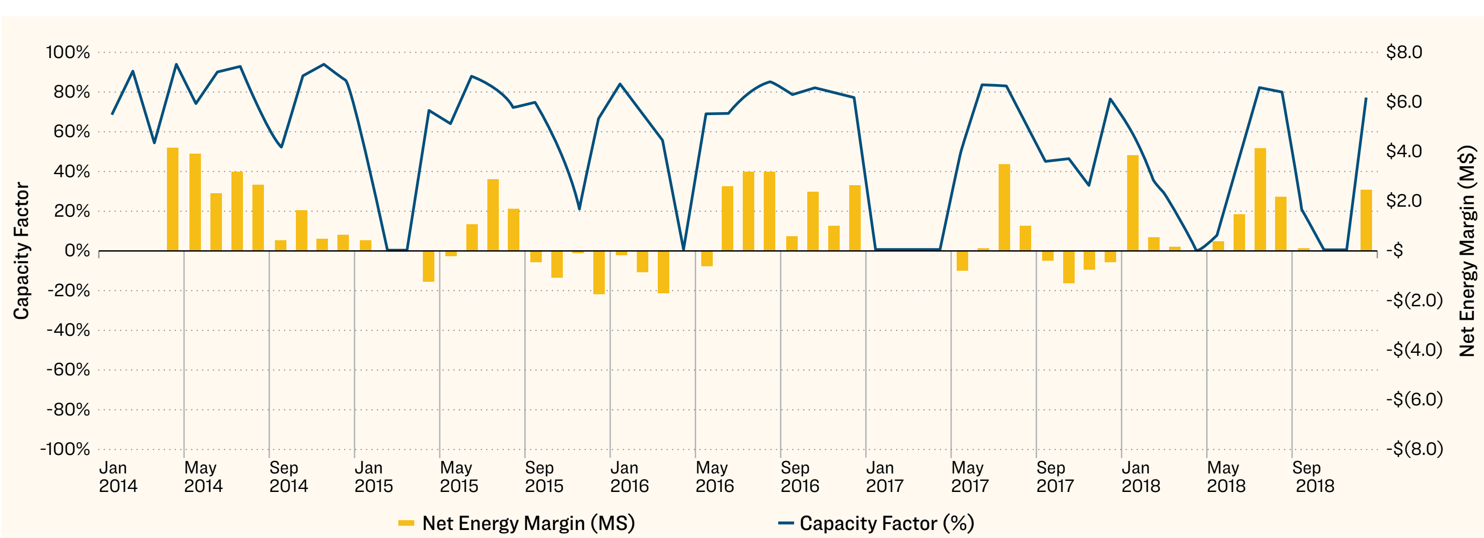

FIGURE 3: MONTHLY CAPACITY FACTOR (%) AND NET ENERGY MARGIN ($ MILLION) FOR LA CYGNE 1, 2014-2018

TABLE 2: Net Present Value (NPV) and Levelized Cost of Energy (LCOE) for Coal Units

Unit	NPV (2020-2039, 2020$)	NPV ($/kW-year)	LCOE ($/MWh)
La Cygne 1	-295m	-$20	$57
La Cygne 2	-242m	-$18	$54
Jeffrey 3	-147m	-$10	$44
Jeffrey 2	-89m	-$6	$40
Jeffrey 1	-74m	-$5	$40
Lawrence 4	9m	$4	$37
Lawrence 5	45m	$6	$36

Again, as Evergy's coal plants are not merchant and do not operate in a competitive market, Evergy's customers bear the entire cost of Evergy's coal fleet. As such, net market performance is strongly indicative of how much Kansas ratepayers are losing, and no rational third party would acquire Evergy's coal plants — at least not at a positive value.

Our analysis also provides insight into the levelized cost of energy (LCOE) of these coal plants, as shown in the right-most column of Table 2. LCOE indicates the necessary revenue per megawatt hour (MWh) of generation sold for a power plant to break even, given the cost of fuel, operations and maintenance, and capital expenses. Typically, the LCOE of a given technology is indicative of the price that a buyer and seller would settle on for a long-term generation contract, also commonly referred to as a power purchase agreement (PPA). We track new wind PPA's at approximately $20/MWh and competitive solar pricing in the region at $35/MWh.[13] A Q1 2019 PPA price index report found that the latest prices in SPP were as low as $14/MWh and $24/MWh for wind and solar, respectively.[14] In contrast, every one of Evergy's coal units has a higher levelized cost of operation, once again indicating that Evergy is unnecessarily overpaying to generate power, and passing those costs onto Kansas ratepayers.

Not only are there less expensive alternatives to the Evergy coal plants today, but independent analysts are projecting sustained low prices for wind, and a continuing drop in solar prices. Even as the tax credits for wind and solar projects sunset, the absolute cost of these projects are expected to remain well below the cost of Evergy's coal plants. Figure 4 shows a projection of new wind and solar project costs in the SPP. Given that these projections are below market energy costs, and demand for clean energy continues to grow, we expect new wind and solar projects to continue coming online and further bring down the cost of wind- and solar-generated power.

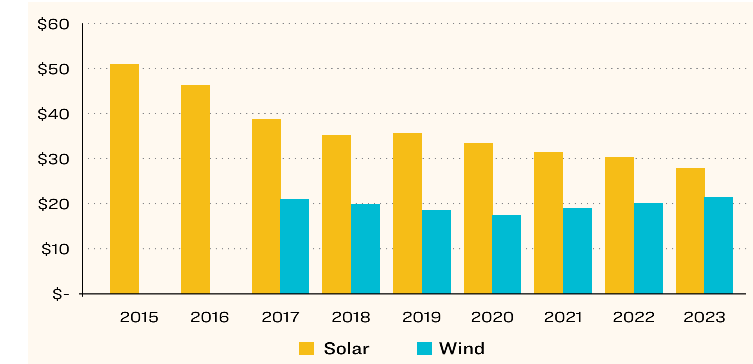

FIGURE 4: LEVELIZED COST OF ENERGY PROJECTIONS FOR SOLAR AND WIND IN THE SPP REGION — BLOOMBERG NEW ENERGY FINANCE ($/MEGAWATT HOUR)

Figure 5 shows the cumulative net present value (NPV) for each coal unit over the time period analyzed from 2020-2039.[15] All of Evergy's coal units are uneconomic today, and the impact of poor economics only accumulates over time for all units except Lawrence 4 and 5. The slight improvement for the Jeffrey units in the late 2030s is a function of increases in revenues that are the result of projected year over year electricity price inflation in the model inputs. Even with the revenue increases in the late 2030s, however, the units as a set are still performing at a loss, and the losses will be greater than projected if electricity revenues are even more suppressed than our model suggests.

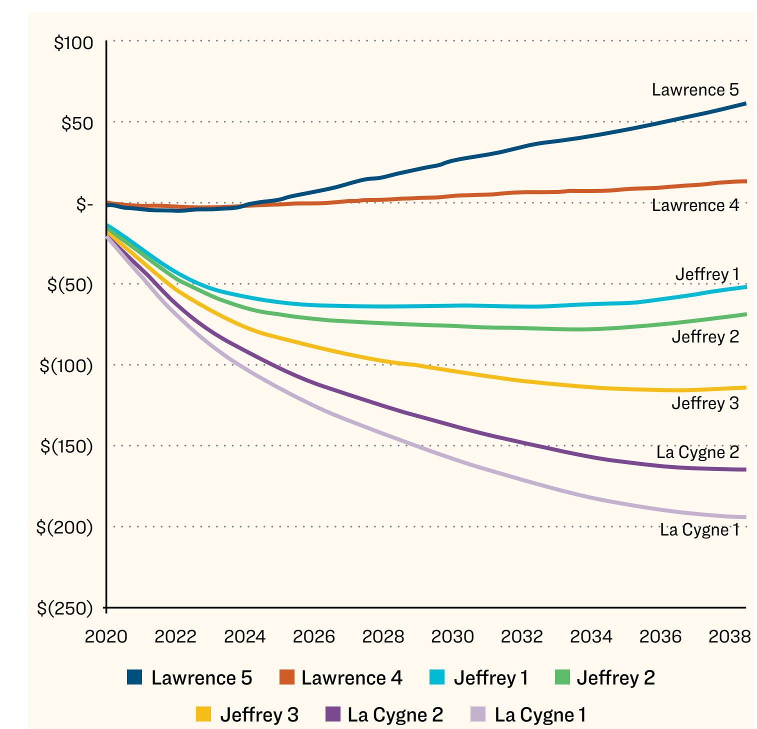

FIGURE 5: CUMULATIVE NET PRESENT VALUE OF EVERGY'S KANSAS COAL UNITS 2020-2039 ($ MILLIONS, 2020 DOLLARS)

Notably, the cost of Jeffrey's future coal supply is less clear today than it was just weeks ago. On July 3rd, 2019, Blackjewel coal declared bankruptcy and abruptly ceased operations, firing all 700 employees without notice.[16] According to public records collected by the Energy Information Administration, Jeffrey held a long-term (and exclusive) coal supply agreement with a single coal supplier in Wyoming's Powder River Basin, a coal mine at Eagle Butte, owned by Blackjewel. Due to Blackjewel's bankruptcy, it is unclear if Evergy will be able to procure coal at a cost competitive with the contract it held with Eagle Butte. Any cost increases will result in a further degradation of revenues at Jeffrey, and further losses to Kansas ratepayers.

THE EFFECT ON EVERYDAY KANSANS

Our analysis demonstrates that the majority of Evergy's coal power results in unnecessarily high energy costs for families, businesses, and other electric consumers. Consumers would benefit from the utility phasing out its coal plants and replacing that power with energy purchased at SPP market prices, as well as with less expensive sources of energy like wind and solar power.

This analysis is particularly timely, as there has been recent concern by Kansas lawmakers over high electric bills.[17] Our analysis shows that rates and bills have been increasing at a rapid pace. Based on Kansas electricity sales and revenue data submitted by Westar and KCPL over the past ten years, revenue collected per unit electricity sold (a good proxy for rates) has increased by an average of 6.1% per year for residential customers (by 5.6% per year for the aggregate of all customers) between 2007 and 2017, for a total increase of approximately 80% over the course of the decade. Average residential bills increased by 4.7% per year during the same period, for a total increase of almost 60% over the course of a decade.[18] These increases can be seen in Figure 6.

If Evergy continues to rely on its costly Kansas coal operations, especially at a time that the industry as a whole is transitioning to clean energy, its customers will experience substantially higher energy bills than necessary. Evergy's

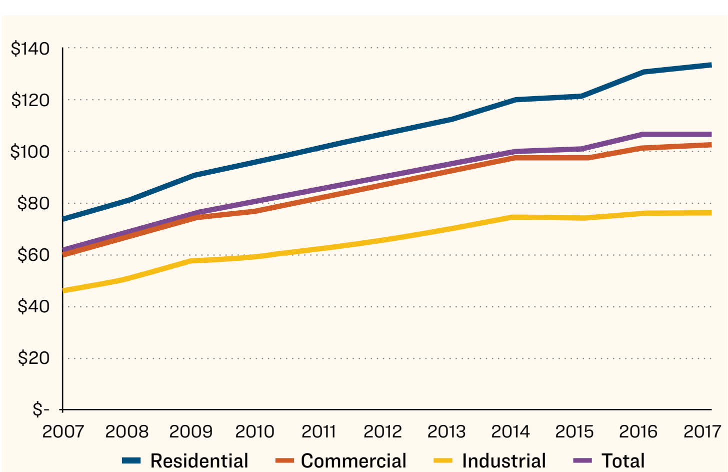

FIGURE 6: UTILITY REVENUE COLLECTED PER UNIT OF ELECTRICITY SOLD ($/MEGAWATT HOUR) BY CUSTOMER SEGMENT FROM 2007 TO 2017, AGGREGATE DATA OF KCPL, WESTAR, AND KGE AS REPORTED TO EIA

continued reliance on this uneconomic coal financially harms both Kansas households and Kansas businesses. Evergy's failure to plan in the past, and reticence to perform comprehensive planning today, has hurt and will continue to hurt the utility's captive customers.

Evergy's customers are already paying a higher cost for Evergy's coal units than they should be: from 2015 to 2018, Evergy's customers lost $267 million relative to the market, exclusive of new capital. Adding insult to injury, Evergy's customers are only now just starting to pay for $1.23 billion dollars of capital retrofits at La Cygne,[19] retrofits that were completed in 2015,[20] and cost more than new peaking capacity today. The Sierra Club questioned the economic analysis of these retrofits at the time,[21] and continuing to operate these coal plants over the next 20 years will cost Kansas ratepayers another $847 million more than if Evergy purchased energy from the Southwest Power Pool or invested in new wind and solar generation. This direct economic harm to Kansas ratepayers is unnecessarily burdensome to Kansas homes and businesses, as less expensive alternatives exist. Transitioning away from dirty coal power would also provide Evergy with opportunities to invest in Kansas communities and support their shift away from fossil fuels.

For years, Westar and KCP&L — now under the combined Evergy brand — have relentlessly pursued coal, ignoring the external costs of fossil fuels and placed the burden of those costs on the people of Kansas.[22] Pollution from these coal plants causes nearly 20 premature deaths and more than 100 asthma attacks every year.[23] Factoring in the external costs of pollution and climate change — including lost work, medical expenses, increasingly extreme weather, and more — makes Evergy's coal plants even less economically viable.

WHAT IS EVERGY THINKING?

Kansas is not a coal-producing state. In fact, it is one of the richest wind resource states, with the second-highest opportunity for wind power in the country,[24] and the ability to potentially serve nearly one-third of all US electricity requirements.[25] So why has Evergy continued to invest in coal?

Sometimes utilities find it easier to stick with the status quo, particularly if profits are at risk. **While Evergy's customers are losing money relative to the market, Evergy's shareholders have done quite well for themselves.** Evergy touts to its investors that it is "focused on delivering consistent and superior total shareholder return," and "plan[s] to invest over $6 billion in Cap[ital] Ex[penditures] from 2019 through 2023," resulting in an earnings growth of "5-7% through 2023."[26]

If Evergy owns up to the true cost of coal, the utility faces the risk that consumers would be (rightfully) irritated that Evergy just invested substantial dollars in retrofitting its coal fleet only to now find them not financially viable. And since regulators have the authority to remove "non-useful" assets from rates, Evergy might perceive that some of those investment dollars are at risk.[27] Instead, by ignoring the conversation around its coal plants, or even casting them in a positive light, Evergy stands to continue making a healthy return on those plants, courtesy of their ratepayers. Until Kansas ratepayers and regulators make clear that the most substantial risk to the utility lies in continuing to operate clearly non-economic plants, this pattern is likely to continue.

RECOMMENDATIONS

Thankfully, our analysis indicates there are actions that can be taken to reduce Kansans' monthly electric bills in the short-term, and ways to prevent poor spending and capital decisions that could keep electric bills unnecessarily high in the long-term.

Through its new Integrated Resource Planning process for Evergy, the Kansas Corporation Commission (KCC) should make clear that **Evergy must start planning with transparency**, and the KCC should provide stringent oversight of that planning process. Unlike the vast majority of large electric utilities, Evergy, under its existing Westar brand, had no established planning process in Kansas. Instead, Evergy/Westar made decisions behind closed doors, issued their decisions as unquestionable edicts, and then requested relief (i.e. a rate hike) at the KCC. Stakeholders rarely, if ever, have had an opportunity to look under the hood during the planning process, and Evergy/Westar was typically only required to justify its decisions after the fact, a risky premise for both the utility and ratepayers.

Good planning is fundamental to keeping customers' rates down. Comprehensive, transparent, stakeholder-engaged resource planning processes, such as an Integrated Resource Plan helps ensure that utilities are acting competitively and in the best interests of their customers. Because Evergy operates in both Kansas and Missouri, regulators in both states should hold the company accountable to developing strong long-range plans and to making sound decisions based on the economics of coal compared to clean energy. While the KCC is considering new regulations that would require a comprehensive planning process, Evergy's customers can also demand that Evergy make the process transparent and robust, and hold regulators to their responsibility to critique, probe, and shape a state-of-the-art plan.

First, Evergy must be required to conduct a unit-by-unit assessment of its coal fleet to evaluate both the costs and market conditions facing those units so the utility can identify the retirement date for each unit that is economically optimal for captive customers. The assessment offered in this paper is a first attempt at such an analysis, but is conservative in nature (i.e. it errs on the side of caution) and is based primarily on public information, much of it reported by Evergy themselves. Evergy should use its energy models to comprehensively and transparently test each of their coal units. Customers should demand that not a dollar more be spent on existing generation until Evergy demonstrates, conclusively, that such dollars are in the best interests of customers, reducing both cost and long-term risk.

Second, Evergy must issue a competitive, all-source Request for Proposal ("RFP") for capacity and energy, including wind, solar, storage, and demand-side resources such as energy efficiency and demand response. All-source RFPs are invaluable for testing the local market and ensuring that resource planning is tuned to market conditions. In 2017, Xcel Colorado issued an all-source RFP, and rapidly determined that it needed to shift its entire planning process, acquiring a substantial amount of new renewables and proposing a rapid fleet transition schedule.[28] In 2018, Northern Indiana Public Service Company issued an all-source RFP prior to engaging in an IRP, and found the results so surprising[29] that it restructured its entire IRP process, proposing to replace aging coal units with clean energy options. The first wind procurement resulting from that IRP was approved by the Indiana Commission in the summer of 2019.

Third, Evergy must be held accountable: When market prices are lower than the costs of its coal fleet, Evergy should be purchasing market energy - not operating its coal plants. In fact, when one of Evergy's companies — KCP&L — joined the regional SPP market, it understood that a decrease in wholesale market prices could mean a reduction in KCP&L's costs: In 2006, KCP&L Vice President of Transmission testified that "lower [wholesale energy] prices may allow KCP&L to purchase power for less than the cost of production."[30] In other words, when the market is cheaper, buy off the market, don't operate inefficient plants. Our assessment shows that a substantial portion of Evergy's losses in 2016, 2017, and 2018 were because Evergy operated its coal plants non-economically during extended low market price periods.

Ultimately, a regulated monopoly utility is meant to act as if it were a competitive enterprise, continuously searching for mechanisms to reduce ratepayer costs while maintaining or improving service. If Kansas was a deregulated energy market, a customer faced with Evergy's higher-than-average costs would reasonably be expected to find a lower cost option elsewhere. Evergy's ratepayers are captive, and the utility's past performance and forward-looking projections suggest that Evergy has failed to act competitively, both in operations and planning, with no sign of changing course on its own. And without a substantial change in Evergy's fleet, the result is substantial and unnecessary costs for customers.

The KCC should not allow Evergy to be rewarded for operating coal plants at times they are uneconomic compared to market prices by allowing Evergy to pass those costs on to its captive customers. Other entities should also play a role in helping to improve this situation in Kansas including the Executive and Legislative branches of the Kansas government. Finally, Evergy's customers can demand better transparency and accountability from the company.

The problems Evergy is facing are not insurmountable, and collaboration between the utility, Kansas regulators, and the rate-paying public could easily result in power that is more affordable, more environmentally friendly, and more forward-thinking. Such collaboration can only happen, though, if Evergy acknowledges that there is room for improvement. In the meantime, **Evergy continues to profit while Kansas pays the price.**

APPENDIX

HISTORIC PERFORMANCE 2015-2018

Production costs were sourced via S&P global Market Intelligence, from data Evergy reported on the EIA Form 923 (fuel receipts) and FERC Form 1 (operations and maintenance). Hourly day-ahead market prices were sourced from S&P based on reported hourly hub pricing for SPP in order to calculate market revenues. Gross hourly generation was sourced from EPA's Air Markets Program Data (AMPD). Figure 3 shows the comparison of production costs to average monthly on-peak and off-peak pricing at bus-bar nodes for La Cygne, Jeffrey, and Lawrence stations in the years 2015 to 2018.

FUTURE PERFORMANCE 2020-2039

In order to estimate the net present value of Evergy's operating coal units for the period 2020-2039, we constructed a model to project future costs and revenues. To do so, we created starting assumptions or built projections for the following values:

- Capacity factor
- On- and off-peak generation
- Fuel costs
- Variable operations and maintenance expenses
- Fixed operations and maintenance expenses
- Annual capital expenses
- On- and off-peak prices

Table 3 presents a summary of many of those starting assumptions, with additional details provided below.

TABLE 3: Summary of capacity factor, fuel, operations and maintenance, and capital cost assumptions by unit

Plant	Capacity factor	Fuel costs 2017 ($/MWh)	Variable O&M costs 2017 ($/MWh)	Fixed O&M costs 2017 ($/kW-year)	Capital costs 2015 ($/kW-year)
Jeffrey 1	55%	$18.97	$1.78	$22.80	$27.00
Jeffrey 2	55%	$19.32	$1.78	$22.80	$27.00
Jeffrey 3	48%	$20.22	$1.78	$22.80	$27.00
La Cygne 1	37%	$19.71	$2.20	$37.87	$27.00
La Cygne 2	41%	$20.50	$2.20	$37.87	$27.00
Lawrence 4	64%	$19.39	$1.53	$19.10	$27.00
Lawrence 5	63%	$18.75	$1.53	$19.10	$27.00

CAPACITY FACTOR

We used the average capacity factor for 2017-2018 as our starting assumption for capacity factor in 2020. The capacity factor for each unit then falls by 1 percentage point per year out to 2039.[31] The weighted average capacity factor for all of Evergy's coal units has fallen from 69% in 2011 to 52% in 2018, or an average decrease of 2.4% per year. Our analysis is relatively conservative in this respect, given that we expect coal units to continue to face increasing competition from wind, solar, and gas.

FUEL COSTS

Fuel costs were based on data from the EIA 923 sourced via S&P Global Market Intelligence as shown in Figure 7. Costs were higher in the 2011-2014 for some plants, but have remained relatively stable over the past decade. 2017 costs were used as a starting proxy and inflated by 2% per year. In EIA's 2019 Annual Energy Outlook, delivered coal costs (for the electric power sector) rise by an average of 2.7% per year out to 2039, so our assumption is conservative.

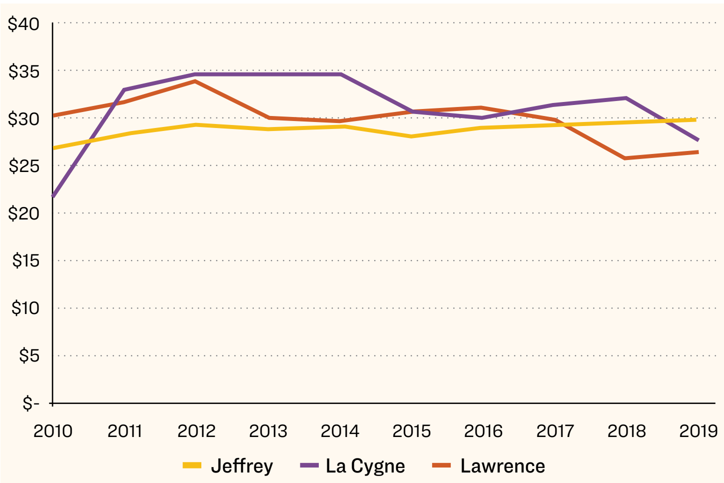

FIGURE 7: AVERAGE ANNUAL COAL COSTS BY PLANT ($/TON)

VARIABLE AND FIXED OPERATIONS AND MAINTENANCE COSTS

Variable and fixed operations and maintenance costs were based on data from FERC Form 1 via S&P Global Market Intelligence. 2017 costs were used as a starting proxy and inflated by 2% per year.

CAPITAL COSTS

Ongoing annual capital additions were assumed to be $20/kW-year for plants under 30 years old and $27/kW-year for plants over 30 years old (2015 costs), inflated by 2% per year. This is in line with assumptions that EIA makes in their Annual Energy Outlook using the National Energy System Model (NEMS).[32] Hawthorn 5 and Iatan 2 have costs of $20/kW-year, while all of the other units have costs of $27/kW-year; the annual costs of Hawthorn 5 and Iatan 2 are lower due to their more recent construction.

ON– AND OFF-PEAK PRICES

In order to forecast on and off peak power prices between 2020 and 2039, we multiplied EIA's forecast (from Annual Energy Outlook 2019) for gas delivered to SPP North electric sector customers[33] by the implied heat rate of each unit, since gas is commonly the marginal, price-setting resource in most markets. The implied heat rate for each plant was calculated by looking at historic on and off peak prices (monthly average day ahead on and off-peak strips) for each plant's respective node and dividing by the average monthly delivered gas price to the Kansas electric sector as reported by EIA.[34] Then, the average of those implied heat rates during the years 2017 and 2018 was taken to represent the heat rate going forward. On-peak implied heat rates ranged from 4.75 to 5.45 mmbtu / MWh while off-peak implied heat rates ranged from 6.84 to 8.19 mmbtu / MWh. The resulting on-peak prices range from $31 to $38/MWh in 2020 (and grow over time), while the resulting off-peak prices ranged from $22 to $25/MWh in 2020. This data is visualized in Figures 8 and 9.

GENERATION AND ENERGY REVENUE

Annual energy revenue was calculated by multiplying off-peak and on-peak generation by our annual off-peak and on-peak price forecasts. For our analysis, if the capacity factor was over 40%, then the unit was assumed to be generating on-peak for 40% of the year and off-peak for X% of the year where X = capacity factor minus 40%. If the capacity factor was under 40%, then it was assumed to be generating only during on-peak hours. This choice of assumption is a fairly conservative one; even units that are primarily targeting generation during on-peak hours will not exclusively be able to generate during those hours, given various operational constraints such as the time it takes to ramp a facility's capacity up and down.

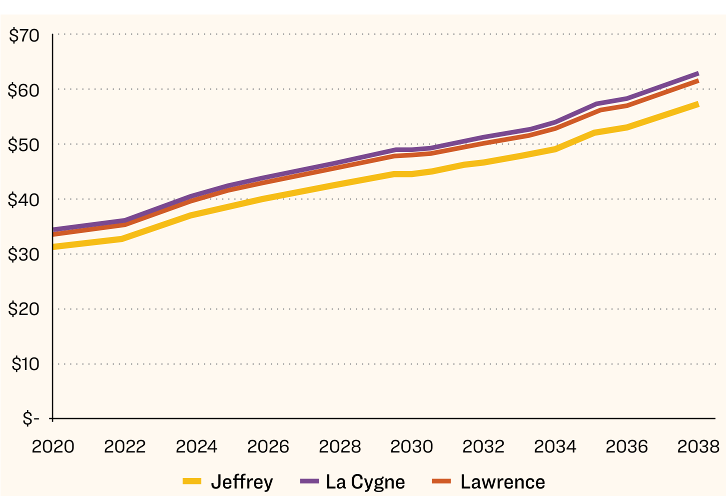

FIGURE 8: ON-PEAK PRICE PROJECTIONS BY PLANT ($/MEGAWATT HOUR)

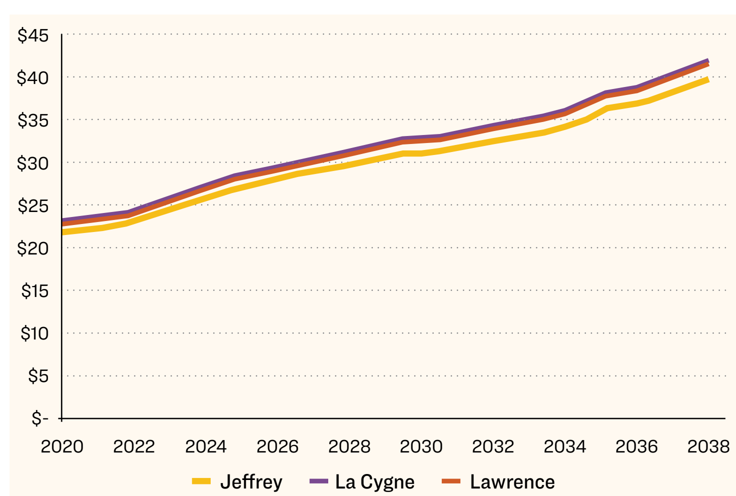

FIGURE 9: OFF-PEAK PRICE PROJECTIONS BY PLANT ($/MEGAWATT HOUR)

CALCULATING NET PRESENT VALUE AND LEVELIZED COST OF ENERGY

The sum of energy revenues minus the costs (fuel, variable and fixed O&M, capital) was calculated for each year. The net present value of those annual sums was calculated using a discount rate of 8%. The levelized cost of energy was calculated by taking an annualized payment of the net present value of all costs (also using a discount rate of 8%) and dividing it by annual generation.

RENEWABLE ENERGY PRICING

Forecasts for the levelized cost of energy (LCOE) for onshore wind and solar photovoltaic (with single axis tracking) projects came from Bloomberg New Energy Finance's 2018 (BNEF) 2nd half release using their EPVAL model. As described by BNEF: "EPVAL is BNEF's primary model for estimating the value of assets and assessing the economics of project financing for all types of power plants as well as for storage assets that are added to generation. EPVAL is a discounted cash flow model that calculates net present values (NPVs), internal rates of return (IRRs), payback periods, buyout values and the LCOE. The model is used internally by BNEF analysts to value project acquisition deals, to assess existing and prospective projects and to value whole portfolios of energy assets. Fully loaded with current and forecast BNEF technology analyst estimated project data, allowing users to produce current LCOEs or 10 to 40 year LCOE forecasts, with forecasting availability for a select number of markets and technologies," the markets for which include all US major markets such as SPP. Solar pricing assumes the 30% investment tax credit rate is safe harbored for all projects commissioned before 2024. Wind pricing adjusts for the ramp down of the production tax credit.

While the LCOE projections are very low, they are aligned with market experience. Lawrence Berkeley Lab's price index for wind power purchase agreements (PPA) have shown that average prices in the central plains are roughly around $20/MWh (see 2017 Wind Technologies Market Report). While there are few indexed PPA prices for solar in the Midwest, prices in Texas have gone as low as $20/MWh in Texas (see Berkeley Lab data portal or 2018 Utility Scale Solar report). Additionally, Northern Indiana Public Service Company (NIPSCO) issued a request for proposals (RFP) ahead of their IRP and received bids for solar with an average price of $35.67/MWh (see NIPSCO IRP appendix A page 336). Kansas has higher levels of solar insolation than Indiana, so prices would likely be lower if Evergy were to issue a similar RFP.

ENDNOTES

1 "What is U.S. electricity generation by energy source?" 1 Mar. 2019, https://www.eia.gov/tools/faqs/faq.php?id=427&t=3. Accessed 24 Jun. 2019.

2 "Kansas - State Energy Profile Overview - US Energy Information" 21 Mar. 2019, https://www.eia.gov/state/?sid=KS. Accessed 24 Jun. 2019.

3 Between 2008 and 2018, only 4 coal units retired totaling 319 MW out of a total nameplate capacity of 5,146 MW to begin with. Data calculated using EIA data, sourced via S&P Global Market Intelligence

4 Author's calculation using EIA data, sourced via S&P Global Market Intelligence

5 An IRP is a proposal for how a utility plans to meet their energy demands in a cost-efficient and responsible way. More than thirty states require utilities to regularly file IRPs with state regulatory and oversight bodies, to ensure the utilities will be able to meet future commitments while being financially and environmentally responsible.

6 Order Approving Merger, The State Corporation Commission of the State of Kansas, Docket No. 18-KCPE-095-MER, *available at* http://estar.kcc.ks.gov/estar/ViewFile.aspx/20180524155136.pdf?Id=4ab19c7e-9957-40f1-8fb6-dd49aad0966f. Accessed 2 Jul. 2019.

7 Report and Order, The Public Service Commission of the State of Missouri, File No. EM-2018-0012 - EFIS *available at* https://www.efis.psc.mo.gov/mpsc/commoncomponents/view_itemno_details.asp?caseno=EM-2018-0012&attach_id=2018019561. Accessed 2 Jul. 2019.

8 "IEEFA update: Heartland US utilities continue to move away from coal." 8 Jun. 2018, http://ieefa.org/ieefa-update-ignoring-washington-heartland-utilities-continue-to-move-away-from-coal/. Accessed 1 Jul. 2019.

9 Author's calculation using data from "Toll From Coal." https://www.tollfromcoal.org/. Accessed 24 Jun. 2019.

10 Capacity factor data sourced from EIA via S&P Global Market Intelligence.

11 According to the Federal Energy Regulatory Commission, the Southwest Power Pool works to ensure "reliable power supplies, adequate transmission infrastructure, and competitive wholesale electricity prices for its members" across fourteen states in the central and southern United States.

12 North American Electric Reliability Corporation (NERC). June 2019. Summer Reliability Assessment. https://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/NERC_SRA_2019.pdf

13 Bloomberg New Energy Finance 2018 H2 LCOE assessment. Additional information in Figure 4 and the last section of the appendix.

14 Level 10 Q1 2019 PPA Price Index: https://leveltenenergy.com/blog/ppa-price-index/q1-2019/ Accessed July 9, 2019.

15 Net Present Value is the difference between the present value of revenues and the present value of expenditures; it is used to analyze the profitability of a project.

16 "Blackjewel CEO resigns as judge approves $5 million in emergency ...." 3 Jul. 2019, https://trib.com/business/energy/blackjewel-ceo-resigns-as-judge-approves-million-in-emergency-financing/article_0370bd12-a921-5438-a59a-e9d99e5af7ed.html. Accessed 5 Jul. 2019.

17 "Minutes for SB69 - Committee on Utilities." http://kslegislature.org/li/b2019_20/measures/minutes/agenda_item_2019021441153922391. Accessed 2 Jul. 2019.

18 Average revenue collected per unit of electricity sold (a good proxy for rates) rises at a different rate than average bills (revenue collected per customer), due to changes in electricity usage over time.

19 KCP&L Media Release, 2011. https://www.kcpl.com/about-kcpl/media-center/2011/august/la-cygne-to-receive-environmental-upgrades

20 EPA Clean Air Markets Data (CAMD) Air Markets Program Data

21 "Evaluation of Prudence of Environmental Retrofits at KCP&L's La ...." https://www.synapse-energy.com/project/evaluation-prudence-environmental-retrofits-kcpl%E2%80%99s-la-cygne-plant. Accessed 5 Jul. 2019.

22 "The Hidden Costs of Fossil Fuels | Union of Concerned Scientists." https://www.ucsusa.org/clean-energy/coal-and-other-fossil-fuels/hidden-cost-of-fossils. Accessed 27 Jun. 2019.

23 Author's calculations using data from "Toll From Coal." https://www.tollfromcoal.org/. Accessed 27 Jun. 2019.

24 Kansas Department of Commerce. https://www.kansascommerce.gov/the-kansas-edge/utilities/wind-energy/

25 Author's calculation based on a 2018 US electricity consumption of 4.178 TWh (https://www.eia.gov/tools/faqs/faq.php?id=427&t=3) and NREL calculated potential of 506 GW of wind at 80 meter hub height in Kansas (at an assumed 30% capacity factor).

26 Evergy Investor Update, April 2019. Access 3 July 2019. http://www.greatplainsenergy.com/static-files/64d7e0d5-cbd8-458d-9905-a68345570b14

27 See, for further discussion, Lehr and O'Boyle, 2018. Depreciation and Early Plant Retirement. https://energyinnovation.org/wp-content/uploads/2018/12/Depreciation-and-Early-Plant-Retirements-Brief_12.3.2018.pdf

28 Greentech Media. August 29, 2018. "Xcel to Replace 2 Colorado Coal Units with Renewables and Storage." https://www.greentechmedia.com/articles/read/xcel-retire-coal-renewable-energy-storage#gs.o001fq

29 Forbes. July, 2019. In Conservative Indiana Utility Choses Renewable Over Gas as it Retires Coal Early. https://www.forbes.com/sites/jeffmcmahon/2019/07/02/mike-pences-indiana-chooses-renewables-over-gas-as-it-retires-coal-early/#22b386443b40

30 wDirect Testimony of Richard Spring in Missouri Docket EO-2006-142, page 8.

31 Our analysis has the capacity factor falling a full percentage point per year (e.g. from 70% to 69%), as opposed to falling by a relative amount of 1% of the existing capacity factor (e.g. one percent of 70% is 0.7%, which would result in a new capacity factor of 69.3%).

32 "NEMS Modeling of Coal Plants - EIA." 14 Jun. 2016, https://www.eia.gov/outlooks/aeo/workinggroup/coal/pdf/2016_EMM%20Coal%20Workshop%20Presentation%20(6-13-16).pdf. Accessed 1 Jul. 2019.

33 The data was pulled using EIA's Excel data browser using the following tag: AEO.2019.AEO2018NO.PRCE_NA_ELEP_NA_NG_NA_SWPPNO_NDLRPMBTU.A

34 The following nodes were identified for pulling on and off-peak prices for Hawthorn, Iatan, Jeffrey, La Cygne, and Lawrence respectively: KCPLHAWTHORNUNHAW5, MO.KC.ITAN2.MP, WRJEFFLDSTMRY_KEPCO, WRLACY_KGELDAUX_LACYGNE1, WRLAWHLD5

Sierra Club National
2101 Webster Street, Suite 1300
Oakland, CA 94612
(415) 977-5500

Sierra Club Legislative
50 F Street, NW, Eighth Floor
Washington, DC 20001
(202) 547-1141

facebook.com/sierraclub
instagram.com/sierraclub
twitter.com/sierraclub

EXPLORE, ENJOY, AND PROTECT THE PLANET. **SIERRACLUB.ORG**

SIERRA CLUB