BEFORE THE STATE CORPORATION COMMISSION

OF THE STATE OF KANSAS

In the Matter of the Joint Application of Westar Energy, Inc. And Kansas Gas and Electric Company for Approval to Make Certain Changes in Their Charges for Electric Service	**)**	**Docket No. 18-WSEE-328-RTS**

DIRECT TESTIMONY OF

PAUL L. CHERNICK

ON BEHALF OF

SIERRA CLUB

PUBLIC VERSION

Resource Insight, Inc.

JUNE 11, 2018

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I. Identification & Qualifications

Q: Mr. Chernick, please state your name, occupation, and business address.

A: My name is Paul L. Chernick. I am the president of Resource Insight, Inc., 5 Water St., Arlington, Massachusetts.

Q: Summarize your professional education and experience.

A: I received a Bachelor of Science degree from the Massachusetts Institute of Technology in June 1974 from the Civil Engineering Department, and a Master of Science degree from the Massachusetts Institute of Technology in February 1978 in technology and policy.

I was a utility analyst for the Massachusetts Attorney General for more than three years, and was involved in numerous aspects of utility rate design, costing, load forecasting, and the evaluation of power supply options. Since 1981, I have been a consultant in utility regulation and planning, first as a research associate at Analysis and Inference, after 1986 as president of PLC, Inc., and in my current position at Resource Insight. In these capacities, I have advised a variety of clients on utility matters.

My work has considered, among other things, the cost-effectiveness of prospective new electric generation plants and transmission lines, retrospective review of generation-planning decisions, ratemaking for plants under construction, ratemaking for excess and/or uneconomical plants entering service, conservation program design, cost recovery for utility efficiency programs, the valuation of environmental externalities from energy production and use, allocation of costs of service between rate classes and jurisdictions, design of retail and wholesale rates, and performance-based ratemaking and

cost recovery in restructured gas and electric industries. My professional qualifications are further summarized in Exhibit PLC-1.

Q: Have you testified previously in utility proceedings?

A: Yes. I have testified over three hundred times on utility issues before various regulatory, legislative, and judicial bodies, including utility regulators in thirty-seven states and six Canadian provinces, and three U.S. Federal agencies. This testimony has included many reviews of the economics of power plants, utility planning, marginal costs, and related issues.

II. Introduction

Q: On whose behalf are you testifying?

A: I am testifying on behalf of Sierra Club.

Q: What is the scope of your testimony?

A: I address the extent to which Westar's ownership of coal plants increases revenue requirements and hence rates to its customers. I also discuss actions that the Commission should take to protect customers from excessive costs.

My testimony relies on a large amount of Westar documents and discovery responses, and especially the testimony of Westar witness John Bridson.

Q: Which coal plants are owned by Westar?

A: Westar owns all or part of four coal plants, as summarized in Table 1. The Westar share of plants include the ownership directly by Westar and by its affiliate, Kansas Gas & Electric (KG&E).[1] These data exclude the resources

[1] Westar sometimes includes KG&E resources in tabulations of Westar resources, but not always.

owned by Great Plains Energy (Great Plains) (including 8% of Jeffrey and the other half of La Cygne), with which Westar will be merging.

Table 1: Westar Coal Plants

	Year installed[a]	Rated Capacity (MW)[b]	Westar Net Generation (2017)[b]	Westar Share		Gas Capable[a]	Planned Retirement Date[c]
				Percent	MW		
Tecumseh	1957	66	**289,054**	100%	66	Yes	2018[d]
Jeffrey			**10,189,135**	*92%*			
JEC 1	1978	728			670		**[redacted]**
JEC 2	1980	730			672	No	**[redacted]**
JEC 3	1983	717			659	No	**[redacted]**
Lawrence			**2,477,673**	100%			
LEC 4	1960	111			111	Yes	**[redacted]**
LEC 5	1971	373			373	Yes	**[redacted]**
La Cygne			**1,899,505**				
LAC 1	1973	736		50%	368	Yes	**[redacted]**
LAC 2	1977	662		50%	331	Yes	**[redacted]**

Data sources:

[a] 2017 FERC Form 1, 2017ER EIA 860, 3_1 Generator

[b] DR CURB 3, Generating Statistics

[c] DR Sierra-1.02, Flexible Retirement Plan 2017 (Confidential)

[d] DR KCC 279, Timing for New Depreciation

The ownership of Jeffrey is complicated. Kansas City Power and Light Greater Missouri Operations (KCP&L GMO), which is a subsidiary of Great Plains, owns 8% of each unit, KG&E owns 20%, and Wilmington Trust owns 8% under a sale/leaseback arrangement with Westar. The Westar FERC Form 1 reports costs for the 72% that Westar owns or leases, while other documents report the 92% owned or leased by Westar and KG&E, while still other documents report 100% of the plant.[2]

Q: What is the status of these units?

A: Westar has announced that it intends to retire Tecumseh 7 and four Westar-owned gas-fired units (Murray Gill 3 and 4, Gordon Evans 1 and 2) following the merger with Great Plains.

[2] I will sometimes refer to Westar's "entitlements" to include the portion of the plants paid for and available to Westar, including the leased portion of Jeffrey and excluding the portion of jointly-owned plants not owned by Westar.

Westar has also projected that the other coal units will be retired in the next 17 years, as shown in Table 1, and its gas plants within the next 16 years, as shown in Table 2.

Table 2: Westar Proposed Post-Merger Gas Retirements

Unit	Installation Date[a]	Rated Capacity (MW)[b]	Retirement Plan with Merger[c]
Murray Gill			
MGL 3	1956	104	2018
MGL 4	1959	92	2018
Gordon Evans			
GEV 1	1961	154	2018
GEV 2	1967	376	2018
Hutchinson			
H1CT	1974	546	** [redacted] **
H2CT	1974	56	** [redacted] **
H3CT	1974	55	** [redacted] **
H4CT	1975	70	** [redacted] **
Spring Creek			
S1CT	2001	69	** [redacted] **
S2CT	2001	69	** [redacted] **
S3CT	2001	67	** [redacted] **
S4CT	2001	68	** [redacted] **

Data Sources
[a] *2017ER EIA 860, 3_1 Generator*
[b] *DR CURB 3, Generating Statistics; 2017ER EIA 860*
[c] *DR Sierra-1.02 Capacity Planning Presentation (Confidential)*

Q: What forward-going costs of the coal units are included in the revenue requirements presented by Westar in this rate case?

A: The rate base includes $62 million in CWIP for continuing investments in boilers for unidentified steam plants. (Westar Rate Case Deficiency ACOS, tab Deficiency ACOS). The rate base also includes nearly $900 million in net capital additions to steam plant (excluding asset retirement costs) since December 2014, as shown in Table 3.

Table 3: Westar Steam Plant in Service ($M)

	Total Steam Production Plant	Increase from Previous
12/31/2014	$3,189	
12/31/2015	$3,489	$301
12/30/2016	$3,977	$488
6/30/2017	$4,088	$111
Total		$899

Data from Westar Rate Case Deficiency ACOS, tabs Sect 4b and Deficiency ACOS

Nearly all of these increases in capital requirement would be to allow the continued operation of the coal plants. (Westar Rate Case Deficiency ACOS, tab Deficiency ACOS) This capital investment adds interest costs, equity return, and income taxes to the revenue requirements.

In addition, the expenses in this rate case include:

- $264 million in steam-plant fuel and $135 million in steam-plant non-fuel O&M, the vast majority of which would be for the coal plants. (ibid, cell CG291)
- $126 million in steam-plant depreciation, the vast majority of which would be for the coal plants. (ibid, cell CG306, minus fuel)
- $9 million in property insurance, $98 million in "ad valorem and real estate" taxes, $3 million in payroll taxes, $6 million in damages and injuries, and $40 million in employee pensions and benefits for the supply function, a substantial portion of which would be for the coal plants.[3] (DR CURB-33, Functions tab)
- About $80 million of other costs booked in administrative and general expense that provide general support (human resources, regulatory, legal, financial, outside services, management) and functionalized to the supply

[3] Steam plants account for 57% of the total supply non-fuel O&M, which is a reasonable proxy for the labor-related costs. Steam plants are 52% of plant in service, which is likely to correlate with property taxes.

function, a portion of which would be incurred for the coal plants. (DR CURB-33, Functions tab, cells I237 to I260)

In short, the coal units cost ratepayers hundreds of millions of dollars annually. Any such units that do not cover their costs, through sales into the energy market or avoidance of other costs that may need to be incurred if the units were to retire,[4] are a drag on ratepayers.

Q: Does it appear that continued operation of the Westar coal entitlements would be advantageous for ratepayers?

A: No. The costs of fuel, operating and maintenance (O&M), overheads, and ongoing capital additions for the plants appear to exceed the market value of energy from each of the plants. Once Westar has committed to operate a unit for a year (or other lengthy period), it makes sense to run the unit in each hour in which the market energy price exceeds the unit's fuel and variable O&M. Looking at only these short-run marginal costs, the coal plants are only marginally economic, as I detail in Section V.A. But the decision to keep a plant on line for one or more years constitutes a commitment to pay the fixed O&M, overheads, and capital additions needed to keep it running. Westar's coal plants all appear to be losing money going forward.

Replacement resources, especially solar and wind, appear to be less expensive than continuing to run the coal plants.

Q: How does Westar take economics into account in deciding whether to retire its plants?

A: Westar says that it has not considered the economics of continued operation:

[4] These could include the cost of replacement capacity, reactive power support, load following, and frequency control.

> Westar's internal capacity planning process is based on a flexible retirement plan which is reviewed annually and includes multiple factors as explained in Sierra-1.02. We haven't had a need for capacity for many years based on the position of being long. With our desire to maintain flexibility, fuel diversity, and optionality, our recent analysis as part of the merger has focused on those units closest to retirement (Tecumseh, Murray Gill, and Gordon Evans) through a combined company IRP conducted by KCP&L. *Prior to this we have not conducted an analysis to determine if we could source capacity at a lower cost than our existing units.* (DR Sierra-1.09b, emphasis added)

The confidential response to DR Sierra-1.02 lists a number of factors that are taken into consideration in some manner, but nothing in that brief discussion indicates that Westar has ever considered whether keeping existing units running is in ratepayers' interests. The language in DR Sierra-1.09b suggests that Westar has assumed that:

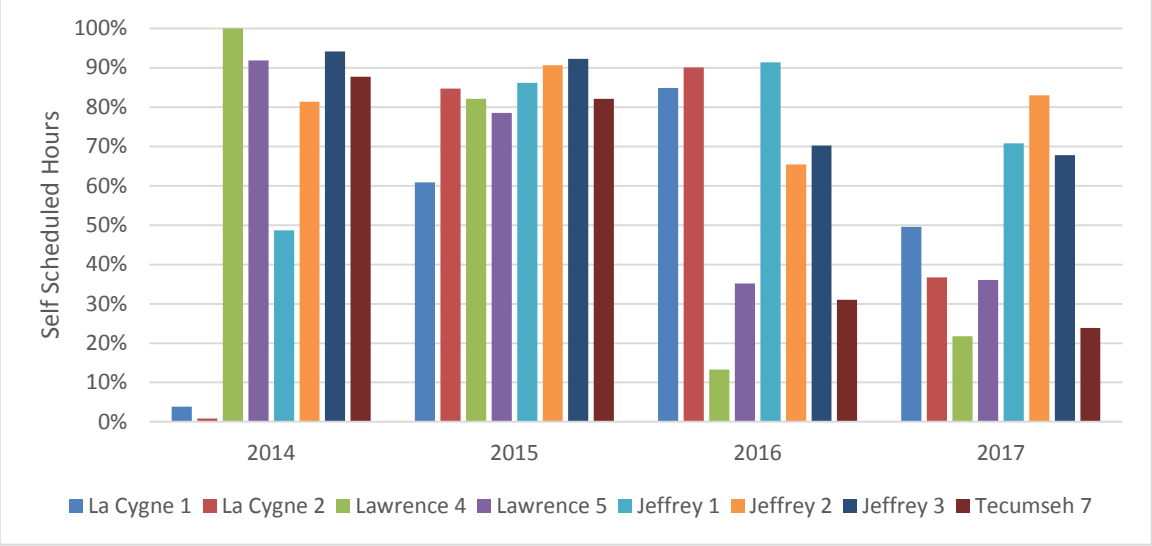
- it need not consider the economics of its generation fleet, so long as it has enough capacity, and
- when retirement of units is considered, the major factor in selecting the retirements is when the units were scheduled for retirement, rather than their value to ratepayers.

Westar has not even demonstrated that the generating units it has chosen to retire in 2018 are the ones that impose the greatest cost burden on customers.

Q: If the units are uneconomic, why are they still running?

A: There are three ways in which Westar has kept the plants running at relatively high capacity factors. First, rather than bidding its coal units into the market as resources to be dispatched economically, Westar has self-scheduled most of its coal plants to some significant extent, ensuring that Southwest Power Pool (SPP) will dispatch them, regardless of cost. Figure 1 provides the percentage of hours in which Westar self-scheduled plant operation for each year from 2014 through the beginning of 2018 (DR Sierra-1.07, Status 2014–2018).

Figure 1: Annual Steam Plant Self Scheduling



Westar notes that it has been gradually allowing coal units to respond to market conditions, which is directionally consistent with the data in Figure 1:

> For many years, the Westar coal units have operated when available and moved through the load range to meet demand requirements as needed. In 2016 Westar began cycling the small coal units at Tecumseh and Lawrence in response to changes in the day ahead market. Although many variables impact unit dispatch, Westar believes that new wind units in the Southwest Power Pool (SPP) and lower gas prices may have led to lower energy prices such that at times during the day the market price is below the variable cost of production. As a result the small coal units were placed in "market" status, which means that the SPP can take them off or call them on when it is economic to do so. Westar began cycling the larger units at Jeffrey Energy Center in 2017 and as of today all three units at that site may cycle in response to lower market prices. (DR Sierra-3.01)

It is clear from Figure 1 that, as recently as 2017, Westar was still forcing dispatch of all the coal units in many hours.

Second, when Westar bids the units into the SPP energy market, it appears to be bidding them in at prices below their short-run marginal costs of fuel and variable O&M.

Third, the coal plants incur costs that would not be included in the energy bids, but need to be covered by the profit in the energy market.

The first two mechanisms represent examples of Westar forcing the coal plants to run when they are not economic sources of energy for the region. Merchant generation owners usually do not engage in that behavior, since they would lose money on every MWh sold. Vertically-integrated utilities, on the other hand, can often count on recovering those losses from their retail (and in some cases, regulated wholesale) customers. I do not fully understand Westar's incentives to run the coal plants uneconomically, but the Company may be motivated by differences in cost-recovery mechanisms between fuel and non-fuel costs, or by an interest in avoiding scrutiny of the coal plants' economics until more of their costs have been depreciated.[5]

The third mechanism results from the difference between short-run (hourly or daily) costs and annual costs. Even a unit that can dispatch at costs below the market price in every hour (e.g., a hydro or nuclear plant), covering its variable costs by a wide margin, may not cover its fixed O&M, capital additions, and other going-forward costs. Many merchant power plants have retired due to the inability to cover their forward-going costs. Over time, the most expensive plants should be replaced by less-expensive resources.

Since Westar is not subject to market discipline, as it would be if it were a merchant generator, that role falls to the Commission.

Q: Does Westar's large concentration in coal assets impose costs on shareholders?

A: Westar apparently believes that it does:

[5] The latter possibility is consistent with Westar's default policy of planning to retire plants at age **[redacted]**, or **[redacted]** years after a major investment, rather than on an economic test. (KCC DR-112 Confidential, Capacity Planning Presentation, Slide 4)

> In general, highly capital-intensive generation assets, such as coal-fired … generation facilities, are subject to certain risks including changes in market structure related to low gas prices, the entry of smaller, more flexible units, and subsidized renewables. They also are susceptible to issues that arise from plant failure, such as the timely recovery of replacement power and repair costs in the event of extended or unplanned outage. In addition, federal environmental and safety regulations related to coal-fired…generation present a substantial risk of requiring investors to commit new capital to comply with new regulations, operation restrictions, or possibly closure. (Robert B. Hevert Direct Testimony at 34)

Yet when asked whether Westar shareholders were exposed to risks of disallowance for imprudently incurred costs or the failure to collect a return on assets that are no longer used and useful, Mr. Hevert responded:

> No. In Mr. Hevert's view, utility investors generally expect prudent investments to be allowed cost recovery. The primary business and financial risks faced by utilities with coal-fired generation are similar to those faced by other electric utilities such as, but not limited to: the supportiveness of the regulatory environment, regulatory lag, construction risk, operating risk, emerging competitive forces such as distributed energy resources, systematic financial market risk, operating leverage, capital access and liquidity risk, and financial leverage. As explained in his Direct Testimony, evolving environmental regulation creates uncertainty with regard to potential capital expenditure requirements which creates risk for investors in utilities with coal-fired … generation. (DR Sierra-1.19b)

This is a peculiar response since Mr. Hevert responds to a question about disallowance of *imprudent* costs by stating that investors expect *prudent* investments to be allowed cost recovery, and then complains that coal plants impose risks on shareholders of regulators failing to allow cost recovery, suggesting that he really means that coal plants create risks and that shareholders may bear some of that risk. He does not explain how he believes Kansas regulatory practice would force those costs onto the shareholders.

Mr. Hevert also answers the question "is a higher ROE associated with the risks incumbent in coal generation meant to compensate the Company for potential losses?" by saying "No….a higher ROE is required to compensate for the increased risks and disadvantages associated with coal-fired generation." (DR Sierra-1.19c) It is difficult to see how risks and disadvantages that impose no losses (even potentially) on shareholders require compensation.

Q: Do you agree with any part of Mr. Hevert's explanation?

A: Yes. I agree that owning and operating coal plants impose risk and disadvantages. Those risks should be considered in decisions regarding continuing expenditures on the coal plants.

Q: How do you suggest that the Commission deal with the considerations that Mr. Hevert raises?

A: Rather than increasing the return on equity, further increasing the burden on the customers (who already bear most or all of the excess cost of the coal plants), the Commission should assist Westar in making prudent decisions in the interest of ratepayers by requiring Westar to demonstrate the extent to which keeping the coal units operational is justified. Such Commission guidance would minimize the need for the future capital expenditures on coal plants that so concern Mr. Hevert, and also assure that Westar shareholders will be compensated better for prudently shutting down coal units than for imprudently spending to keep them open.

Q: How should the Commission deal with Westar's coal plants?

A: As I understand the situation, the Commission has already approved the retirement of Tecumseh 7. With respect to the remaining units, I recommend that the Commission:

- Put Westar on notice that any capital additions to the coal plants, other than to address immediate health and safety concerns, are subject to retrospective prudence review.
- Require Westar to file for approval of annual capital expenditures for its coal plants (as either part of or separate from the Capital Resource Plan established through the merger settlement).
- Instruct Westar to allow the Jeffrey lease to expire without extension or purchase of Wilmington Trust's 8% ownership, unless Westar can demonstrate to the Commission that acquiring the resource would be cost-effective.
- Require Westar to file a comprehensive analysis of the cost-effectiveness of each of the remaining coal units and a least-cost plan for replacing the uneconomic plants with purchases from existing resources and a portfolio of additional renewables, efficiency, demand response, and storage.
- Determine whether any Commission rules or practices need to be amended to provide Westar with reasonable assurance of recovery of the prudently incurred but undepreciated investments in plants that are retired.
- Require Westar to file quarterly statements of its strategy and practice in coal-unit dispatch, including decisions to self-schedule and the determination of bid prices in the SPP energy market, along with an economic justification for self-scheduling and bidding prices below marginal costs.

III. Performance and Costs of Westar Coal Plants

Q: What performance and cost components of the coal plants have you reviewed?

A: I have compiled data on capacity factor, forced outage rate, availability and heat rate. I have also assembled data on fuel costs, total short-term variable costs, total O&M, overheads, and capital additions.

A. Performance Measures

Q: Which performance measures have you compiled for the Westar coal plants?

A: Table 4 shows each coal unit's capacity factor, heat rate, forecast forced-outage rate and historical plant availability. While La Cygne has a slightly better heat rate than Lawrence or Jeffrey, it has lower availability and much lower utilization. None of Westar's coal entitlements have particularly good performance.

Table 4: Coal Plant Technical Performance

Plant	Unit	Operator	Capacity Factor[a]	Heat Rate[b]	Forced Outage Rate[c]	Plant Availability[d]
			(%)	(Btu/kWh)	(%)	(%)
La Cygne	1	KCP&L GMO	57%	10,692	9.2%	75%
La Cygne	2	KCP&L GMO	52%		9.8%	68%
Lawrence	4	Westar	52%	11,248	6.6%	93%
Lawrence	5	Westar	64%		8.4%	90%
Jeffrey	1	Westar	57%	11,103	7.1%	75%
Jeffrey	2	Westar	55%		7.7%	83%
Jeffrey	3	Westar	60%		7.6%	87%
Tecumseh	7	Westar	59%	12,054	2.4%	89%

[a] DR CURB 3, Generation Statistics, average 2014 through 2017

[b] 2017 EIA Form 923

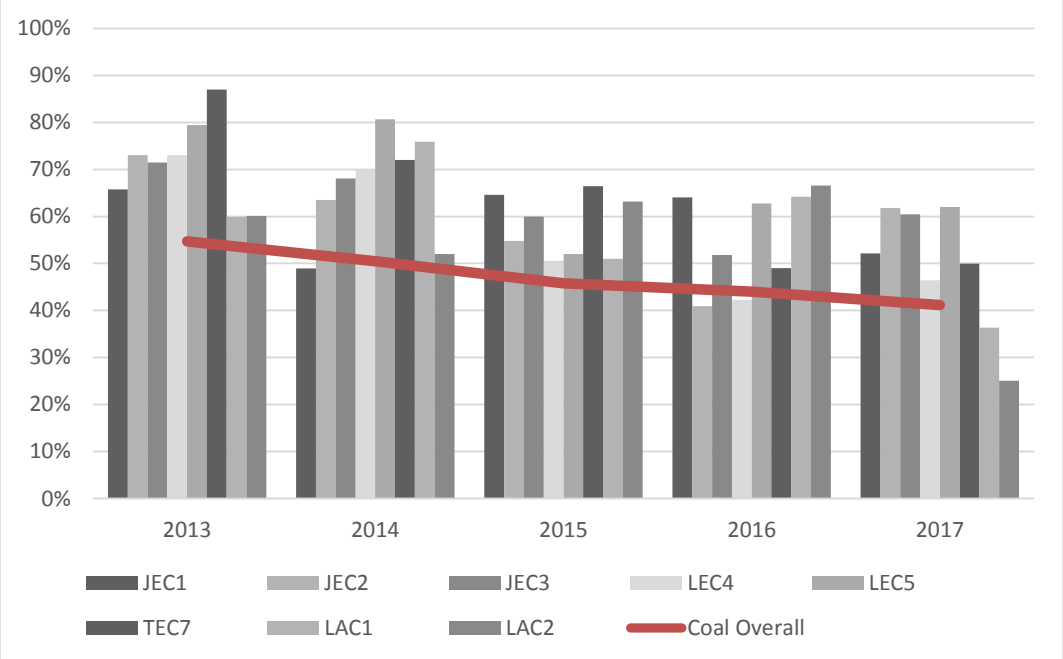
[c] DR CURB 11, Forced Outage Rate Forecast

[d] DR Sierra-1.07, EGU Participation Status, average 2014 through 2017

Q: How has coal utilization changed over the past five years?

A: Overall coal generation dropped by one-quarter from 2013 to 2017, with similar downward trends across the individual coal units. Figure 2 depicts capacity factors by plant (bars) and for the whole fleet (red line).

Figure 2: Capacity Factors by Unit and for the Westar Fleet (DR CURB-3)



In 2013, the fleet wide coal unit capacity factor was 55% which drops to 41% by 2017. Westar's highest coal capacity factor in 2013 was 87% (Tecumseh 7); by 2017 the highest capacity factor among coal units was just 62% (Lawrence 5) – a 30% decrease. Overall, Westar is generating less energy from its coal fleet, allowing capacity factors to fall across the board, rather than maintain some plants at high output rates and retire others.

B. Fuel and O&M

Q: What information do you have on the fuel and O&M costs of Westar's coal plants?

A: I have the following data on O&M:

- the data that Westar and its joint owners file in the FERC Form 1 reports for each plant (each unit of La Cygne),
- variable costs (the sum of fuel and variable O&M) by unit for 2015 to 2017 (DR KCC-258),
- fuel, variable O&M and fixed O&M by plant for 2008 to 2017 (DR Sierra-1.08),[6]
- a breakdown of Jeffrey non-fuel O&M for 2017 (DR KCC-293 Confidential) and forecast for 2018–2023 (DR KCC-285),
- Non-fuel O&M for Westar's share of La Cygne, actual for 2015 and 2016, forecast for 2017 to 2020 (DR KCC-16),
- the La Cygne actual O&M for 2015 and 2016, estimated for 2017, and budgeted for 2018 (DR DOD-9 Confidential), and
- the non-fuel O&M budget for Jeffrey for 2018 to 2023 (DR KCC-285).

Table 5 provides data on the fuel and total O&M costs for each of the Westar coal units, in dollars per megawatt-hour, from the various utilities' FERC Form 1 reports for those years, pages 402 and 403.

[6] These data are summarized in Table 8.

Table 5: Fuel and Non-Fuel O&M Costs by Coal Plant ($/MWh)

Unit		2012	2013	2014	2015	2016	2017
Jeffrey	**Total**	**$25.0**	**$24.4**	**$26.6**	**$23.1**	**$22.0**	**$23.0**
	Fuel	$19.7	$19.9	$20.3	$17.7	$14.2	$16.4
	O&M	$5.3	$4.5	$6.3	$5.4	$7.8	$6.6
Lawrence	**Total**	**$26.8**	**$25.3**	**$23.7**	**$26.0**	**$20.0**	**$21.5**
	Fuel	$21.0	$19.7	$19.2	$18.6	$14.5	$16.3
	O&M	$5.8	$5.6	$4.5	$7.5	$5.5	$5.2
Tecumseh	**Total**	**$29.6**	**$28.9**	**$28.1**	**$28.9**	**$37.1**	**$38.8**
	Fuel	$24.5	$20.2	$22.4	$18.0	$17.2	$20.6
	O&M	$5.1	$8.8	$5.7	$11.0	$19.9	$18.3
LaCygne 1	**Total**	**$30.2**	**$30.6**	**$26.6**	**$29.6**	**$26.1**	**$34.0**
	Fuel	$24.3	$24.5	$22.9	$21.7	$21.1	$24.6
	O&M	$5.9	$6.1	$3.7	$7.9	$5.1	$9.4
LaCygne 2	**Total**	**$24.0**	**$28.4**	**$28.4**	**$26.0**	**$25.5**	**$35.2**
	Fuel	$21.0	$22.8	$22.5	$21.8	$21.1	$23.9
	O&M	$3.0	$5.6	$5.9	$4.2	$4.4	$11.3

Q: Is there any indication that these prices will decline in the near future?

A: No. In DR DOD-9 Confidential, Westar reports that its 2018 O&M budgets for La Cygne and for its wholly-owned plants as a whole are comparable to, or higher than, the values in 2015 and 2016. In DR KCC-285, Westar projects stable Jeffrey non-fuel O&M budgets for 2018–2023.[7]

C. Capital Additions

Q: What information do you have regarding the ongoing capital costs for the Westar coal plants?

A: I have compiled the historical additions to capital plant in service for the Westar plants from the Westar, KG&E and KCP&L FERC Form 1 reports for 2012–2017. Westar provided historical data on expenditures for capital

[7] That response does not specify the percentage of Jeffrey for which costs are being reported, so it is not possible to directly compare the results to the historical data.

additions by plant for its managed coal plants in DR Sierra-1.08.[8] In addition, Westar has provided the following forecasts of capital additions:

- Westar's share of La Cygne in 2018 (DR DOD-9 Confidential).
- Westar's share of the plants it operates, including Tecumseh, Lawrence, and Jeffrey (DR KCC-35 Confidential, DR Sierra-3.08).
- Detailed information for Jeffrey, for the allocation of costs to Wilmington Trust for the 8% it owns in connection with a sale/leaseback arrangement. (DR KCC-285)

Q: What have been the historical capital additions for the Westar units?

A: Table 6 lists the net annual capital additions by plant, computed from the change in capital cost reported in the annual FERC Form 1 reports of Westar and KCP&L (for La Cygne).[9] These values represent the capital additions at the plant in the particular year, minus the retirements of equipment at that plant. The interim accounting retirements do not generally reduce revenue requirements, since an equal amount of accumulated depreciation is removed, leaving net plant in service unchanged, so the net additions understate the costs imposed on ratepayers. Where the capital cost declined from year to year, I left the line blank.[10]

[8] Expenditures generally occur before the project is completed and added to plant in service, so the expenditure data does not match the FERC Form 1 data.

[9] I eliminated the line for "Asset Retirement Costs," which are accounting allowances for future removal costs.

[10] Book capital costs would have declined in 2015 due to the retirement of Tecumseh Unit 8 and Lawrence Unit 3.

Table 6: Net Capital Additions ($ millions)

	Tecumseh	Jeffrey 72%	Lawrence	LaCygne 1 50%	LaCygne 2 50%
$ Million					
2013	$15.3	$10.3	$31.2		$36.1
2014	$5.4	$227.6		$13.0	$5.6
2015		$28.5		$209.4	$264.4
2016	$0.5	$38.7	$18.9	$16.8	$22.7
2017		$25.9	$3.3	$27.6	$26.4
$/kW-year					
2013	$251	$7	$65		$106
2014	$89	$145		$38	$16
2015		$18		$615	$776
2016	$8	$25	$40	$49	$67
2017		$17	$7	$81	$78
Average	$116	$42	$37	$196	$209
Median	$89	$18	$40	$65	$77.5
$/MWh at 60% capacity factor					
Average	$22.1	$8.0	$7.1	$37.3	$39.7
Median	$17.0	$3.5	$7.5	$12.4	$14.7

Some of these additions represent major environmental retrofits, which may not recur at the same level for many years, but most of the costs appear to be for smaller routine replacements and upgrades. In addition to the average cost over the five years, I present the median cost, which leaves out unusually high costs for individual years (Jeffrey in 2014, La Cygne in 2015).

Q: How do Westar's forecasts of capital additions compare to the historical data?

A: Westar has provided historical generation capital additions for 2015 and 2016, and a forecast through 2020 in DR KCC-35, broken down among turbine upgrades at Jeffrey, environmental investments at Jeffrey, environmental investments at La Cygne, other investments at La Cygne, other investments at Westar-managed plants, and environmental investments at plants other than Jeffrey and La Cygne. Similar breakdowns are provided for 2015–2018 (using different categories and sometimes different historical data) in DR DOD-9

Confidential. The only non-confidential projections are those for Lawrence and Jeffrey in DR Sierra-3.08, which shows about $310 million in additions for Jeffrey over 2018–2023.

Table 7: Westar Projection of Lawrence and Jeffrey Capital Additions ($M)

	Lawrence	Jeffrey
2018	$10.9	$74.1
2019	$5.8	$54.1
2020	$15.4	$54.1
2021	$10.5	$48.4
2022	$1.6	$41.6
2023	$5.1	$42.4

D. Overheads

Q: What other costs are associated with continuing operation of the marginal coal units?

A: In addition to the O&M costs reported in the FERC Form 1 (e.g., page 402) for each plant, running the coal units incurs other costs that are recorded in other accounts, including:

- Labor-related overheads, such as social security, unemployment taxes, pensions, benefits (e.g., health and life insurance, education assistance).
- Property insurance.
- Administrative costs, such as legal, human resources, supervision, regulatory and public affairs.
- Office expenses related to administration.
- Maintenance of the step-up transformers and other dedicated transmission equipment.

Q: How large are these indirect costs?

A: Two of Westar's coal plants are jointly owned: Jeffrey (owned 72% by Westar as the lead owner, 20% by KG&E, and 8% by Great Plains through KCP&L)

and La Cygne (50% each by KCP&L as lead owner and Westar). In general, the lead owner of a jointly owned plant carries most of the non-generation accounts on its own books and charges the point owners for their share of direct operating costs and of the indirect costs. From the 2017 FERC Form 1 data for the various owners, the O&M per kWh charged to the joint owners exceeds that reported by the lead owner for Jeffrey by 15% to 30%, for KG&E and KCP&L, respectively.[11] The La Cygne non-fuel O&M for KG&E is about twice that reported by KCP&L and total O&M (including fuel) is about 8% higher for KG&E than KCP&L.

From these comparisons, it appears that the indirect O&M costs are on the order of 8% to 30% of direct O&M, including fuel.

E. Cost Summary

Q: How do the cost components (fuel, O&M, overheads and capital expenditures) add up to a cost per megawatt-hour for continued operation?

A: I computed Table 8 from data that Westar provided in discovery. I included the costs from DR Sierra-1.08, and added 10% to fuel and O&M for overheads (towards the low end of the 8% to 30% range that I derived in Section III.D).[12] The actual overheads may be somewhat higher.

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[11] The JEC 8% non-fuel O&M (in DR KCC-285) indicates that the indirect non-fuel costs are even higher than 30% of direct non-fuel costs, although the data are confidential. The three utilities appear to report costs differently in their FERC Forms, with the extra costs of the minority owners distributed to both fuel non-fuel costs.

[12] Westar provides somewhat different cost and output data in various discovery responses, and in its FERC Form 1 reports. I believe that I have properly matched the share of Jeffrey included in the costs and energy sources.

Table 8: Short-Run Marginal Costs and All-In Costs Westar Coal Plants ($/MWh)

	2013	2014	2015	2016	2017	2018
Tecumseh						
Fuel				$23.98	$25.43	
Variable O&M				$3.37	$1.22	$2.79
Fixed O&M				$19.20	$19.79	
Capital Additions				$2.84	$2.92	
Total Cost				$49.38	$49.36	
+10% Overheads				$54.04	$54.00	
Lawrence						
Fuel	$21.50	$21.09	$22.45	$20.18	$20.17	
Variable O&M	$1.50	$1.63	$4.42	$1.02	$0.74	$0.88
Fixed O&M	$5.34	$4.12	$4.68	$4.99	$5.00	
Capital Additions	$5.60	$2.90	$8.22	$7.24	$5.21	
Total Cost	$33.94	$29.74	$39.76	$33.43	$31.12	
+10% Overheads	$36.78	$32.42	$42.91	$36.05	$33.71	
Jeffrey						
Fuel	$19.88	$20.12	$19.70	$19.81	$20.31	
Variable O&M	$0.92	$2.76	$1.61	$2.80	$1.49	$1.05
Fixed O&M	$3.36	$2.89	$3.16	$4.15	$4.20	
Capital Additions	$9.81	$15.21	$6.85	$7.32	$6.80	
Total Cost	$33.97	$40.97	$31.31	$34.08	$32.81	
+10% Overheads	$36.38	$43.55	$33.76	$36.76	$35.41	
La Cygne 1						
Fuel	$24.50	$22.90	$21.70	$21.00	$24.60	
Variable O&M						$3.30
Total O&M	$6.10	$3.70	$7.90	$5.10	$9.40	
Capital Additions		$13.00	$209.40	$16.80	$27.60	
Total Cost	$30.60	$39.60	$239.00	$42.90	$61.50	
+ 10% Overheads	$33.66	$42.26	$241.96	$45.51	$64.90	
La Cygne 2						
Fuel	$21.00	$22.80	$22.50	$21.80	$23.90	
Variable O&M						$1.09
Total O&M	$2.80	$2.80	$2.60	$2.60	$2.60	
Capital Additions	$36.10	$5.60	$264.40	$22.70	$26.40	
Total Cost	$59.90	$31.20	$289.50	$47.10	$53.80	
+ 10% Overheads	$62.28	$.33.76	$292.01	$49.54	$56.45	

Source: Computed from DR Sierra-1.08, DR CURB-3, except for La Cygne, from FERC Form 1 and Table 6. Variable O&M in 2018 from DR Sierra-3.01

Note: Fuel costs differ between Table 5 and Table 8 because Westar provides somewhat different cost and output data in various discovery responses and its FERC Form 1 reports. The La Cygne capital additions are as booked, while those for the other plants are as expended.

I omitted the much higher costs for Tecumseh in 2013–2015, when the costs included the much larger Tecumseh 8.

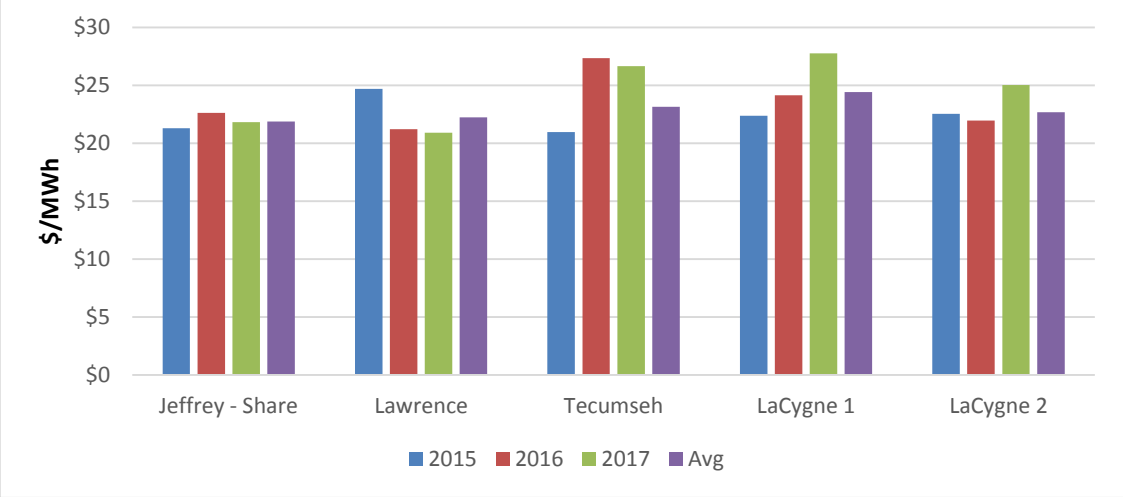
The short-run marginal costs (fuel plus variable O&M) of the various coal units range from about $21/MWh for Lawrence to about $28/MWh for La Cygne 1 in 2017 (using the 2018 variable O&M). The all-in cost of keeping Tecumseh operating has been around $50/MWh, while Lawrence and Jeffrey

have cost $30–$40/MWh in various years and La Cygne has cost $30/MWh to $60/MWh, even excluding the years with very large capital additions.

Q: What are your conclusions about the costs of the Westar coal plants?

A: Figure 3 depicts the variable production costs for the Westar coal plants for the period 2015 through 2017 (DR KCC-258). It indicates that the dispatch costs have been tightly clustered, with Tecumseh and the La Cygne units being generally more expensive than Lawrence and Jeffrey.

Figure 3: Variable Production Costs by Plant



As I discuss in Section V.A, these costs are high compared to market energy prices and do not support continued operation of the coal plants.

IV. The Trend in Coal-Plant Economics

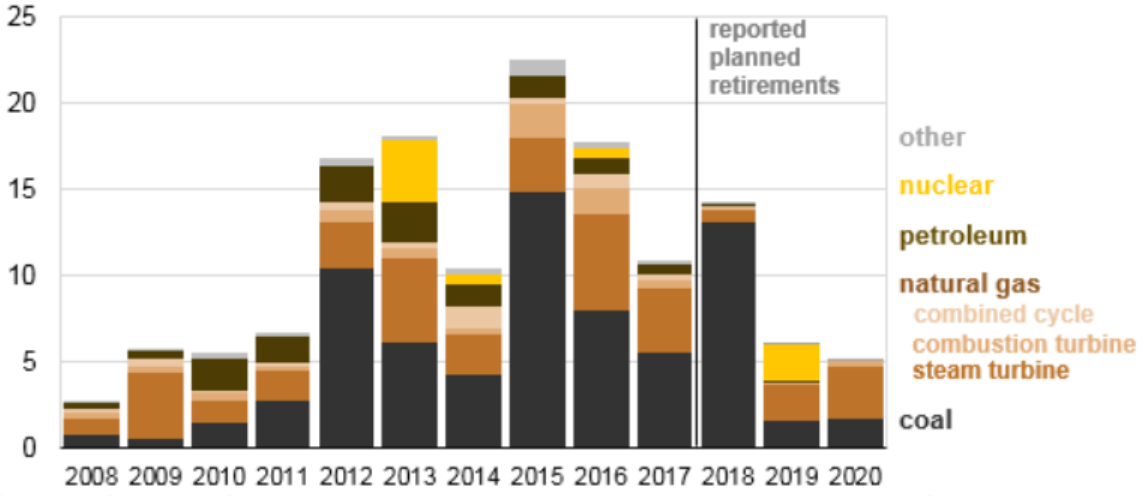
Q: How much fossil fuel retirement has the US seen over the past decade?

A: Over the past decade, United States generation owners have retired 117 GW of utility-scale generating capacity. Coal retirements have accounted for 47%

of the total.[13] In the Eastern Interconnection (which includes SPP and hence Westar), nearly 20% of coal generation has retired, generally replaced by natural gas generation and renewables.

Figure 4 plots retirements by year and fuel type. Notice both the overall increase in fossil fuel retirements and the increasing share of retirements coming from coal generation. Compared to the average coal unit, retired units are generally older (52 years versus 39 years) and smaller (105 MW versus 319 MW). Even aside from their poor economics, Westar's Lawrence 4 and Tecumseh 7 would be prime retirement candidates: they are old and small.

Figure 4: U.S. Electric Generation Retirements (GW)



Reproduced from Today in Energy, EIA, January 9, 2018

Q: At what age do coal plants tend to retire?

A: Nationwide, most coal plants have lifespans between 20 and 65 years. Figure 5 shows the age at retirement of each retired coal unit owned by a utility or an independent power producer (IPP) and the unit's summer capacity.[14] I have also included units with announced retirement dates and those that have been

[13] EIA, Today in Energy, Almost all power plants that retired in the past decade were powered by fossil fuels (Jan. 9, 2018), https://www.eia.gov/todayinenergy/detail.php?id=34452.

[14] Data are from EIA Form 860 database.

permanently taken out of service, with no expectation of renewed operation, or converted to another fuel (mostly natural gas or biomass). These EIA data include past retirements since 2002 and announced retirements through 2027.[15]

Figure 5: Coal-Plant Age at Retirement

Q: What inferences can be drawn from the data underlying Figure 5, regarding the historical distribution of coal-plant lifetimes?

A: Using the raw data from Figure 5, I calculate survivorship by vintage. Survivorship indicates the likelihood that a power plant will survive past a given age. Figure 6 plots plant survivorship by vintage, both for plants nationally (black curve) and for the plants in Kansas and surrounding states (blue curve).[16] The survivorship curves are computed in three steps:

[15] The data may exclude some units that have been retired and demolished, as opposed to being retired in place.

[16] The surrounding south-central states are Nebraska, Colorado, Oklahoma, Texas, and Missouri. All these states have access to inexpensive gas and ample wind resources.

1. Sorting the utility and IPP units for which data are available by lifespan, that is, current age if the unit is still operational, or the age at retirement for retired units. The data set includes all the coal plants in EIA's Form 860 database for 2003, and counts as retirements the units that EIA lists in 2017 as retired, scheduled for retirement, out of service (with no expectations of a return to service) or switched to other fuel (mostly natural gas and biomass).[17]
2. Dividing the capacity of the units retiring in a given year by the capacity that could have reached that age (i.e., units older than that age), to determine the mortality rate at that age.
3. Starting with 100% survivorship at age 1, multiplying the survivorship at each age (one minus mortality rate) by the cumulative survivorship in the previous month.

[17] Including the out-of-service units and fuel switches does not noticeably affect the shape of the curve.

Figure 6: Historical Coal Plant Survivorship, Westar Proposed Retirement Ages (Confidential)

** **

Overall, the dataset includes 327,252 MW of coal capacity. As lifespan increases, more plants have retired, making the survivorship lower. A quarter of all coal generation has retired before reaching the age of 50 years, half before 57 years, and three-quarters before 63 years. These results apply to our entire data set, which includes several years prior to the decline in gas prices and the cost of new renewables.

Coal plants in the south-central US have retired at younger ages than those in the US as a whole. Before plants turn approximately 40, both datasets track closely. Thereafter, a significant gap grows between the two curves. For example, a 50-year old plant has a 50% chance of survival in the south-central US but a 70% chance of survival in the US as a whole. The EIA data show that half of all coal capacity in the south-central US has been retired before turning 52 years old.

Q: Does Westar intend to keep operating its units longer than survivorship analysis would indicate that they would?

A: Yes. As noted in the Draft Flexible Retirement Plan (July 17, 2017), Westar's default assumption is that fossil units will retire when they are ** [redacted] ** (DR KCC-112 Confidential, Capacity Planning presentation, slide 4). This assumption leads to longer-lived plants than are generally seen in the central US. As discussed above, less than 40% of coal capacity survives to the age of 60.

Table 9 shows the likelihood of survivorship for each Westar coal plant based on its current age and its age at the retirement date proposed by Westar.[18]

Table 9: Westar Retirement Plans and US Coal Fleet Survivorship

Unit Name	Current Age	Proposed Retirement Year	Proposed Retirement Age	Survivorship at Current Age		Survivorship at Proposed Retirement Age	
				Central US	US	Central US	US
Tecumseh 7	61	2018	61	12%	30%	12%	30%
Lawrence 4	58	[redacted]	[redacted]	28%	43%	[redacted]	[redacted]
Lawrence 5	47	[redacted]	[redacted]	78%	83%	[redacted]	[redacted]
La Cygne 1	45	[redacted]	[redacted]	83%	88%	[redacted]	[redacted]
La Cygne 2	41	[redacted]	[redacted]	90%	95%	[redacted]	[redacted]
Jeffrey 1	40	[redacted]	[redacted]	90%	95%	[redacted]	[redacted]
Jeffrey 2	38	[redacted]	[redacted]	90%	96%	[redacted]	[redacted]
Jeffrey 3	35	[redacted]	[redacted]	97%	98%	[redacted]	[redacted]

Westar intends to operate most of its coal units longer than most other plants in the south-central US. Tecumseh, Lawrence 4 and 5, and La Cygne 1 are all expected to run for years longer than the median plant in the region. By the age of 60, 8 out of every 10 megawatts of capacity has been retired in the central US. If Lawrence 4 were to operate until ** [redacted] **, it will have

[18] Westar reports slightly different retirement dates in different documents; Table 9 relies on the dates in DR Sierra-1.02, Capacity Planning Presentation, p. 4, except for Tecumseh.

outlasted ** ** plants in the central US and ** ** of plants in the US as a whole.

Q: Is there reason to believe that coal plants around Kansas are being retired even earlier than the survivorship analysis would indicate?

A: Yes, for two reasons: first, the overall lifespan of plants is decreasing across the US; second, plants in the south-central US retire earlier than those in the country as a whole.

Over the past few years, younger and younger coal plants are being retired in the US. An analysis by Lawrence Berkeley National Laboratory indicated that the median retirement age for coal units projected to shut down between 2017–2023 would be 40–50 years old, rather than the 50–60 years for units retired between 2010 and 2016.[19]

M.J. Bradley & Associates also found that retirements are affecting larger and younger units over time:

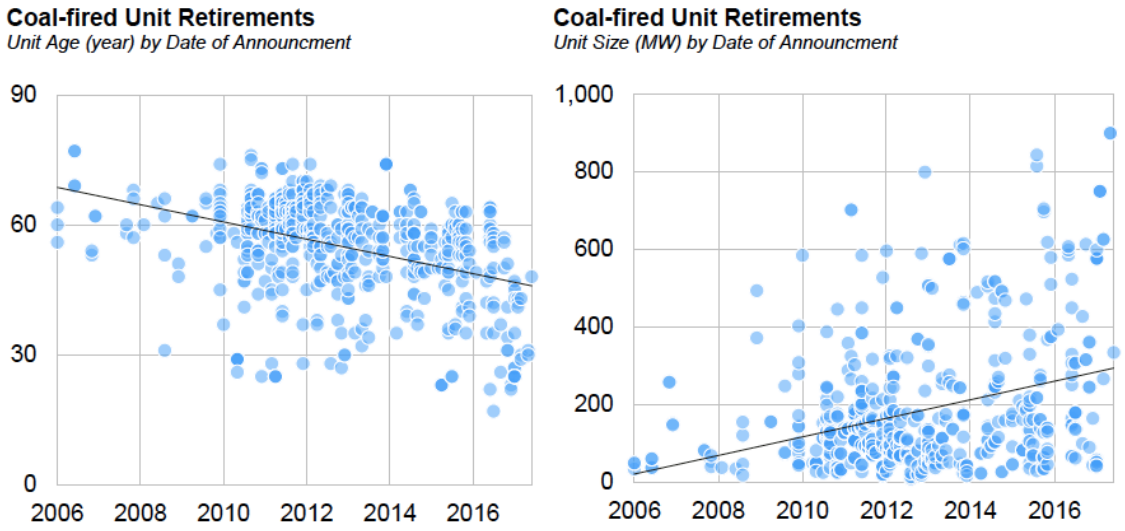
> On average, units that announced plans to retire between 2010 and 2015 were 57 years old and only 166 MW. By contrast, units that have announced plans to retire since 2016 are only 42 years old and 336 MW on average.[20]

Figure 7 reproduces M.J. Bradley's analysis of the time trends in size and age of coal retirements.

[19] Energy Analysis and Environmental Impacts Division, Lawrence Berkeley National Laboratory, "Power Plant Retirements: Trends and Possible Drivers," Fig. 3 (Nov. 2017), https://emp.lbl.gov/sites/default/files/lbnl_retirements_data_synthesis_final.pdf.

[20] "Coal-Fired Electricity Generation in the United States and Future Outlook," MJB&A Issue Brief, August 28, 2017.

Figure 7: Trends in Coal Unit Retirements: Age and Unit Size



Moreover, recent news from the south-central US indicates more aggressive retirement plans than would be expected from the historical survivorship curves. Over the past five years, Texas retired more than 10 gigawatts of fossil capacity. Until recently, gas steam units accounted for most of this activity.[21] Continued low prices in the ERCOT market have led coal plant operators to retire those plants as well. In 2018 alone, 5,583 MW of coal capacity will be retired in Texas, including the modern, highly efficient Sandow 5 coal plant built in 2009 and four units under 40 years of age.[22] The ERCOT plants are a particularly interesting study because they hint at what might happen if SPP had a more robust market structure without integrated utilities. In ERCOT, inexpensive wind, solar, and natural gas generation have dominated coal. Kansas has similar wind and solar resources, as well as lower-

[21] EIA, Almost all power plants that retired in the past decade were powered by fossil fuels (Jan. 9, 2018), https://www.eia.gov/todayinenergy/detail.php?id=34452.

[22] Ibid.

than-average natural gas prices.[23] These market forces may make the coal fleet sub-economic sooner for Westar than for coal plants nationally.

V. Costs of Replacing Aging and Uneconomic Coal Units

Q: What options are available to replace Westar's aging and uneconomic coal plants as they are retired?

A: Westar has several options, including combinations of running more economic coal plants more, running its gas plants more, purchasing energy from the SPP market (and selling less energy to the market at a loss), buying existing gas capacity, obtaining new renewable resources, and reducing energy and capacity requirements through energy efficiency and demand response. I discuss most of these options below.

A. Market Energy

Q: What are the market energy prices in SPP?

A: Between 2015 and 2017, energy prices in SPP averaged $20-$25/MWh. SPP itself is divided into regions with different hubs and different average prices. Westar (and the rest of Kansas) sits between the SPP South Hub (a set of about 530 nodes in Oklahoma, a handful in Texas, and one in Kansas) and the SPP North Hub (496 nodes, almost all in Nebraska). The average LMP for Westar in January 2015 through December 2017 was about $21/MWh. In this same period, SPP North averaged $20.11/MWh and SPP South averaged $25.51/MWh.

[23] EIA, Kansas Price Differences from U.S. Average, Most Recent Monthly (Feb. 2018), https://www.eia.gov/state/?sid=KS#tabs-5.

Table 10 provides descriptive statistics for the 2015 through 2017 period. The three zones have similar standard deviations ($8.62/MWh–$9.4/MWh) indicating that hourly prices fluctuate similarly across SPP. Westar's zone had a lower three-year maximum price than the other two, at $82/MWh. Prices were less than $20/MWh in 50% of hours, and less than $26/MWh in 75% of hours. As before, these values are considerably lower than those witnessed in SPP South and slightly higher than those in SPP North.

Table 10: Hourly Energy Prices ($/MWh) by Hub (2015-2017)

	SPP North_	SPP South_	WR_WR
Mean	20.11	25.51	21.01
Standard Deviation	9.24	8.62	9.40
Minimum	-16.56	-9.93	-32.92
25th Percentile	14.92	19.91	16.29
50th Percentile	18.59	23.98	19.83
75th Percentile	24.71	30.07	25.93
Maximum	99.02	132.64	81.89

Q: Is it difficult for coal plants to compete in this low price environment?

A: Yes. With prices barely above $20/MWh, it is difficult for coal plants to earn enough revenue to meet their variable cost of production, let alone their full forward-going costs. Figure 8 plots average energy prices in SPP's Westar (WR_WR) zone by month against the cost of production for three of Westar's coal plants. The solid lines represent the variable cost of production for each plant and the dashed lines represent the full cost (data are from Table 8). The black line plots the simple average market price in the Westar zone for each month.

Figure 8: Average Market Prices vs. Cost of Production

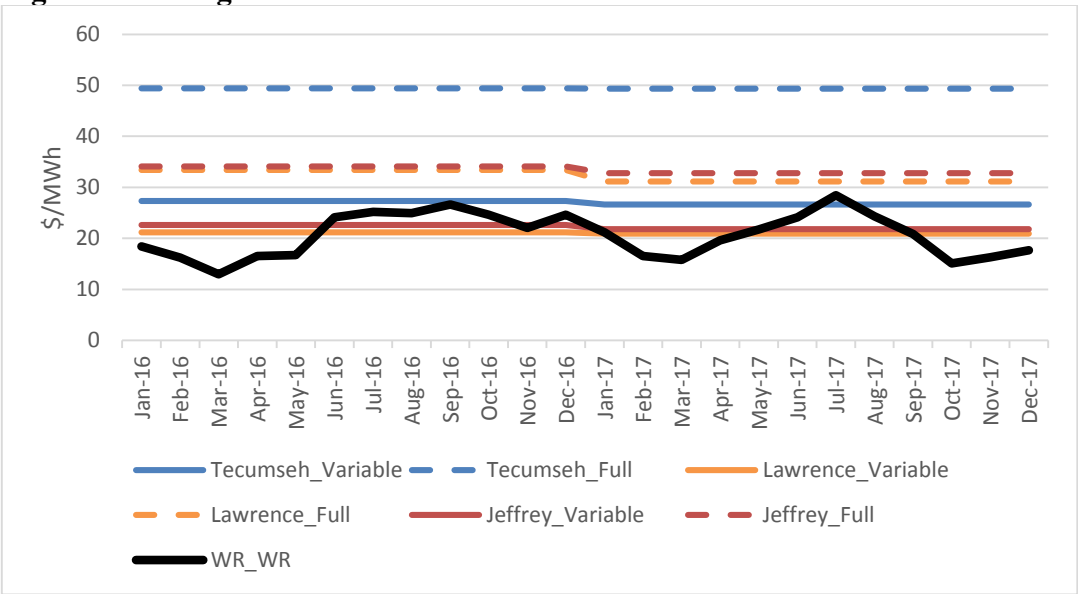


Figure 8 indicates that Jeffrey and Lawrence have been roughly breaking even on their marginal costs in the market, but not recovering their total costs which are higher than $30/MWh. Tecumseh does not even cover its running costs.

Q: Could more selective operation of Jeffrey and Lawrence plants improve cost recovery?

A: No. If Jeffrey and Lawrence could be operated only in the hours in which market revenues exceed running costs (which would be only about a quarter of hours, as shown in Table 10), those variable costs would easily be covered by market revenues. But covering total forward-going costs would be even less likely, since reducing the capacity factor from about 60% to about 30% would double fixed costs per MWh, adding over $10/MWh to the Jeffrey and Lawrence full cost per MWh.

B. Purchase of Existing Gas-fired Capacity

Q: Are there existing gas-fired resources in SPP that are not owned by utilities?

A: Yes. Table 11 provides readily-available information regarding IPPs in the SPP from the EIA Form 860 and 923 databases. The remaining IPPs comprise four combined-cycle plants totaling about 3,433 MW and one combustion turbine of 143 MW.

Table 11: Gas-fired IPPs in SPP

Plant	Type	State	Summer MW	Recent	
				Heat rate (MMBtu/MWh)	Capacity factor
Green Country Energy LLC	CC	OK	783	7.20	72%
Oneta Energy Center	CC	OK	809	7.30	60%
Kiamichi Energy Facility	CC	OK	1,104	7.45	33%
Hobbs Generating Station	CC	NM	747	7.44	49%
Valencia Energy Facility	GT	NM	143	12.08	5%

Data are from most recent year available: 2016 for Valencia, 2017 for the others.

It is not clear whether any of these plants are under long-term contract to utilities, or how useful the New Mexico generation would be for a Kansas utility. The 1,100 MW Kiamichi facility in Oklahoma is underutilized and may well be available for purchase of the plant, or energy and capacity. Additionally, Westar indicates that capacity will be available from the Dogwood Energy combined cycle power plant starting in 2021 (DR Sierra-3.23).

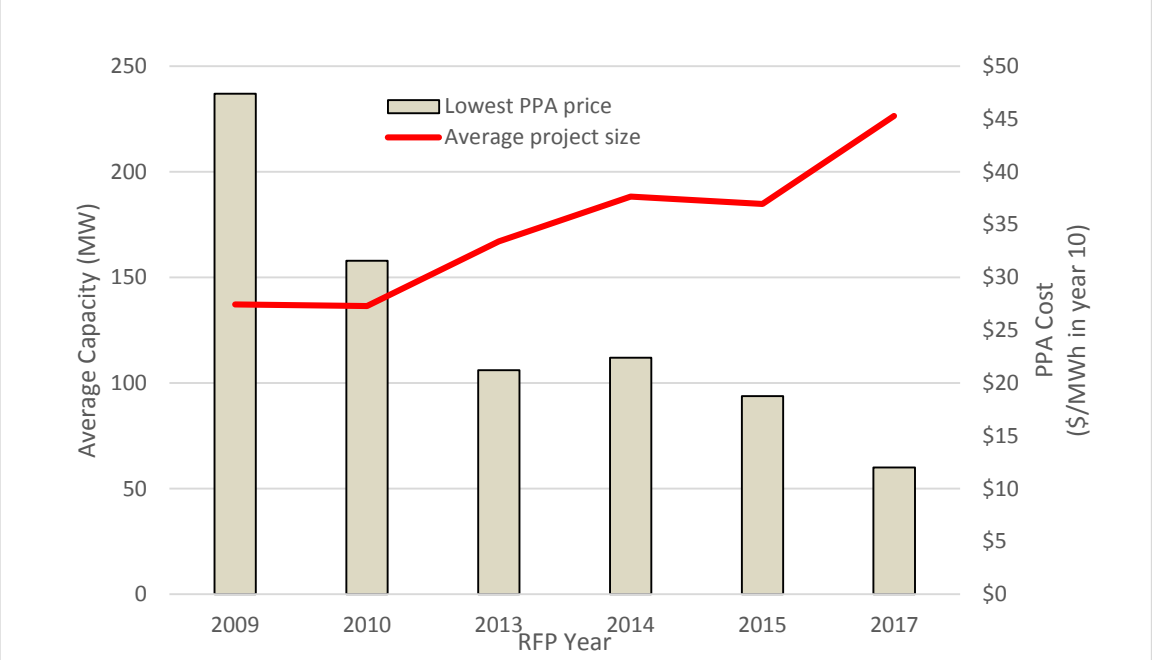
C. Wind Generation

Q: What would additional wind resources cost Westar?

A: In response to the 2017 RFP, Westar received offers of wind resources between $10/MWh and $17/MWh. The projects that Westar identified for additional consideration had bid prices of $12/MWh to $16/MWh. (DR Sierra-1.12)

Wind prices have been falling rapidly, as demonstrated in Figure 9, which shows the lowest-price offer (among those that Westar described as "short-listed" or "under consideration") falling from $47/MWh in 2009 to $12/MWh in 2017.

Figure 9: Westar RFP Results, Wind Offers Seriously Considered



These prices are consistent with those reported in a number of RFPs and contracts across the Plains states.

Mr. Bridson concedes that "at times, the all-in cost of wind energy has been even lower than our total fleet average annual production cost. In other words, adding these wind resources *reduces* our customers' all-in cost." (Bridson Direct at 7)

Q: Would additional wind energy be cost-effective for Westar customers?

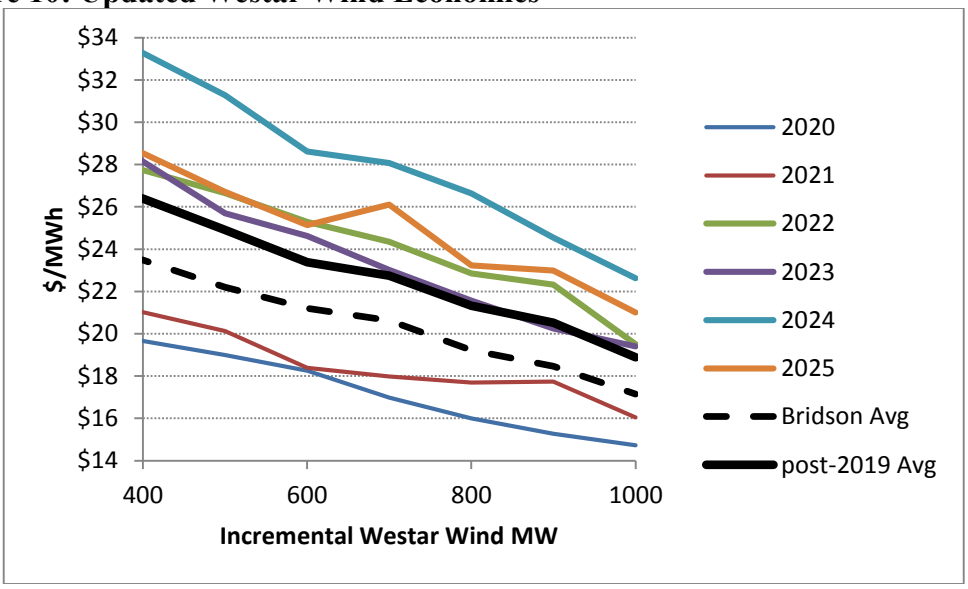
A: It appears so. In 2015, Westar compared "incremental wind prices" versus avoided power costs, for "expected" and "high" gas prices. (Bridson Direct, Figure 2). The wind resources being analyzed appear to be incremental to the 1,060 MW or so that entered service by the end of 2015. The study found that, with expected gas prices, another 700 MW of wind would be cost-effective. That 700 MW would match the four wind farms (Ninnescah, Kingman I, Kingman II and Western Plains) that Westar added in 2016 and 2017.

That analysis supports the prudence of Westar's acquisition of the 700 MW of post-2015 wind, but it needs to be updated to consider the economics of future acquisitions.

Q: How does the 2015 analysis need to be updated?

A: Two updates are required.[24] First, the 2015 analysis assumed that wind prices would be about $20/MWh for up to 500 MW of incremental wind, rising smoothly for additional purchases, to about $21/MWh by the time that 800 MW had been added. It also compared the cost of wind to the average avoided cost over 2016–2025, a period that includes three or four years that would not be served by a procurement launched in late 2018. In Figure 10, I show Bridson's average avoided-cost curve, the avoided cost curves for 2020 to 2025 (from DR Sierra-1.11), and the average for the post-2019 years, as a function of the post-2015 capacity procurements.

Figure 10: Updated Westar Wind Economics



[24] In addition, it may be appropriate to rerun the production-costing model.

As I note above, Westar appears to have been bidding its coal units into the market at prices below the running costs. If the 2015 analysis reflected that practice, the avoided costs would have been depressed.

Second, the wind costs assumed in the 2015 analysis turned out to be too high. In response to the 2017 RFP, Westar received offers as low as $12/MWh; in addition to projects that Westar eliminated for unspecified reasons, it was considering about 1,000 MW that bid under $13.50/MWh. While Westar only analyzed wind additions up to 1,000 MW above 2015 levels, or 300 MW over present levels, the trends in the avoided costs suggest that 700 MW or 800 MW of wind (above current resources) may be justified at current prices, using Westar's approach.

Q: Does the 2015 analysis include all the benefits of additional wind?

A: No. The analysis does not appear to reflect the avoidable fixed O&M and capital additions associated with the retirement of multiple coal units. More wind would be cost-effective if these benefits of retiring coal units were included in the analysis. In addition, the falling cost of storage resources[25] will tend to increase the value of wind and solar generation.

D. Solar Generation

Q: What are the costs of utility-scale solar generation?

A: In response to the 2017 RFP, Westar received almost 800 MW of solar offers at prices around $30/MWh. (DR Sierra-1.12) These prices were consistent with the offers received by Public Service Company of Colorado in November

[25] Lazard's Levelized Cost of Storage Analysis—Version 3.0, November 2017, https://www.lazard.com/media/450338/lazard-levelized-cost-of-storage-version-30.pdf.

2017 (13,400 MW at a median price under $30/MWh),[26] the contract Tucson Electric Power announced in May 2017 (under $30/MWh),[27] and Austin Energy's contract in December 2017 (about $25/MWh).[28]

The production pattern for solar generation matches the daily and seasonal variation in Westar and SPP load better than wind or baseload generation. The pattern of solar output is not highly correlated with wind output, meaning that the increase in wind capacity will not erode the value of additional solar to the same extent as its decreases the value of incremental wind (as illustrated in Figure 10 above).

VI. Westar's Capacity Requirements

Q: Are all of Westar's coal units required for their capacity?

A: No. The Capacity Planning Presentation indicates that, before retirements, Westar is long on capacity until **[redacted]**, depending on load growth and the extent to which wholesale customers extend purchase contracts (DR KCC-112 Confidential, slides 5–6).[29] Even with the retirement of Tecumseh 7 and the expiration of the Jeffrey lease, Westar would have about 750 MW of

[26] 2017 All Source Solicitation 30-Day Report, CPUC Proceeding No. 16A-0396E, December 28, 2017.

[27] TEP to Power 21,000 Homes with New Solar Array for Historically Low Price (May 2017), https://www.tep.com/news/tep-to-power-21000-homes-with-new-solar-array-for-historically-low-price/.

[28] Emma Foehringer Merchant, Austin Energy Signs Historic-Low Solar PPA Amid 201 Trade Case Uncertainty (Dec. 18, 2017), https://www.greentechmedia.com/articles/read/amidst-201-trade-case-uncertainty-austin-energy-signs-historic-low-solar-pp#gs.dPpkHeU.

[29] Given the low cost of natural gas and renewable energy, and the existence of a competitive wholesale energy market, Westar's wholesale customers may opt for other suppliers.

capacity above its native capacity obligation in the 2019/2020 time frame; depending on the rate of load growth, the surplus would last into the late 2020s or early 2030s. Thus, without any new resources, Westar could retire any of its coal unit entitlements, its entire share of La Cygne, or the entire Lawrence plant, for example.[30] With additional renewables, efficiency, demand response, and/or storage, Westar could retire additional coal units.

Q: Does Westar assert that all of its coal capacity is required for capacity?

A: Only superficially. Mr. Bridson asserts that "our existing plants are still quite necessary to provide *capacity*" (Bridson Direct at 7). When asked to "explain why each of the Company's fossil EGUs are 'quite necessary to provide capacity,'" Westar responded as follows:

> Westar's fossil resources sum to 5,461 MW in 2018 whereas the nuclear and wind resources sum to 790 MW. The reason that the [fossil] units are "quite necessary to provide capacity" is based on the fact that the 12% reserve margin requirement within the SPP is calculated to be 5,671 MW. Westar would be short of the SPP requirements by nearly 4,900 MW if the fossil units were not included. (DR Sierra-1.09a)

In other words, Westar says that it would not meet the SPP capacity requirements if it retired all of its fossil units in 2018, did not purchase any additional capacity, and did not procure additional renewables. Westar does not offer any support for its implication that each of the existing fossil units is needed. Indeed, Westar is planning to retire some, and the company has provided no evidence that capacity needs or economics make it unreasonable for the company to retire some more.

[30] I have not reviewed the capacity situation of Great Plains, so I cannot address the extent to which it could do without its coal entitlements.

VII. Conclusions and Recommendations

Q: What are your conclusions regarding the effects of Westar's coal plants on its retail rates?

A: It appears that Westar's coal plants are uneconomic, increasing the costs to Westar ratepayers. Those ratepayers would probably be better off if Westar stopped making major investments in the plants and developed a plan for the orderly and expeditious retirement and replacement of at least some of those plants over the next approximately three to seven years.

Westar's use of fixed unit lifetimes is inappropriate and will not minimize revenue requirements. Retirement dates should be computed based on the costs and performance of resources, rather than their age.

Q: What are your recommendations to the Commission with regard to these issues?

A: The Commission should initiate a proceeding to determine how much Westar should be willing to spend on each of its coal units, and what level of maintenance costs or capital additions should trigger prompt retirement of each unit. Any future capital additions to the coal plants, other than to address immediate health and safety concerns, should be subject to retrospective prudence review, with Westar bearing the burden of demonstrating that continued investments are cost effective. In conjunction with that analysis, the Commission should carry out a comprehensive review of the cost-effectiveness of each of the remaining coal units and a least-cost plan for replacing the uneconomic plants with purchases from existing resources and additions of renewables, efficiency, demand response, and storage.

To support rational and efficient retirement decisions, the Commission should ensure that Westar is not penalized for prudently retiring uneconomic

power plants. Ratepayers are better off paying for the undepreciated investment in an uneconomic plant, rather than paying for operating costs and capital additions to keep the plant open, as well as the depreciation and return on that investment.

At this point, the portion of Jeffrey owned by Wilmington Trust appears to have a negative value; unless Wilmington Trust pays Westar to take the capacity back, Westar should not acquire that 8% entitlement.

Westar should stop scheduling and dispatching its coal units uneconomically.

Q: Does this conclude your direct testimony?

A: Yes.