BEFORE THE STATE CORPORATION COMMISSION
OF THE STATE OF KANSAS

In the Matter of the Application of The Empire District	**)**	
Electric Company for Approval to Make Certain Changes	**)**	**19-EPDE-223-RTS**
in their Charges for Electric Services.	**)**	

STAFF DIRECT TESTIMONY

PREPARED BY

TIM W. STRINGER

UTILITIES DIVISION

KANSAS CORPORATION COMMISSION

May 13, 2019

STATEMENT OF QUALIFICATIONS

Q. Would you please state your name and business address?

A. My name is Tim W. Stringer. My business address is 1500 Southwest Arrowhead Road, Topeka Kansas, 66604.

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

A. I am employed by the Kansas Corporation Commission (Commission) as an Energy Engineer.

Q. Please state your educational and employment background.

A. I received an Associate's Degree from Neosho County Community College; a Bachelor of Science Degree in Electrical Engineering from Wichita State University, Wichita, Kansas; and a Master of Science in Management from Friends University, Wichita, Kansas. I worked as an electrical engineer and Training Department Manager with Westar in Wichita and Topeka for 18 years and, for the past 21 years prior to joining the Staff at the Kansas Corporation Commission, have worked as an electrical engineer for Black and Veatch, Kansas City, Missouri; AECOM/URS, Overland Park, Kansas; and Kiewit, Lenexa, Kansas.

Q. Do you have experience in roadway lighting and area lighting design?

A. Yes. At Westar, I was the responsible engineer in charge of generating High Pressure Sodium (HPS) street light design and construction standards when the conversion was made from Mercury Vapor (MV) to HPS. In subsequent engineering positions, I designed high mast lighting and security cameras for a railroad intermodal station in Laredo, Texas; Light Emitting Diode (LED) and HPS roadway lighting at coal generating stations; and interior and exterior architectural lighting.

SUMMARY OF TESTIMONY

Q. What is the purpose of your testimony?

A. My testimony looks at the installation and maintenance costs associated with the new LED streetlights throughout the life of the fixtures. I also look at the current cost to install and maintain MV and HPS streetlights for the purpose of determining whether Empire's LED conversion project should be approved. Staff witness Dr. Lana Ellis discusses the methodology that Staff used to calculate the streetlight tariff amounts.

BACKGROUND REGARDING TARIFF MODIFICATION

Q. Which Empire witness sponsored the proposed tariff changes?

A. Empire witness Jeffrey Westfall sponsored the proposed streetlight tariff modifications as shown in Section 18 of the Application.

Q. Is Empire proposing to replace all MV and HPS streetlights with LED streetlights?

A. No, Mr. Westfall's Direct Testimony indicates Empire is proposing only to replace all (approximately 1,000) MV streetlights within its Kansas jurisdiction with LED streetlights.[1]

Q. What are the advantages of using LED streetlights to replace the MV streetlights according to Empire?

A. Mr. Westfall states in his Direct Testimony, "LED Municipal Street Lights will be more energy efficient than Mercury-Vapor lights and will have reduced maintenance costs and a longer life."[2]

[1] Direct Testimony of Jeffrey L. Westfall, p. 8, ln 1.
[2] Direct Testimony of Jeffrey L. Westfall, p. 9, lns. 18-19.

Q. Does Staff agree with Mr. Westfall's statement?

A. Yes. Based on manufacturers' current LED fixture data, the life of the LED streetlight is approximately 20-years.[3] Once installed, there should be no additional maintenance required for the life of the streetlight.

Q. How does the life of the MV and HPS streetlights compare with LED streetlights?

A. The MV and HPS streetlight fixtures have a 20-year expected life as well. However, the MV and HPS lamp and photo control (device that turns the streetlight off and on) have a life expectancy of four years and the HPS starter has a life expectance of eight years. Therefore, the MV and HPS streetlights require a certain degree of maintenance every four years throughout their service life.

Q. Does the life expectancy of MV and HPS streetlight components affect the installation costs?

A. No, however, there are maintenance costs associated with MV and HPS streetlights projected every four years throughout their life. Staff calculated the present value of the maintenance costs over each streetlight's 20-year life as shown in **Table 1 NPV Maintenance Cost** and Fuel Costs over the streetlight's 20-year life shown in **Table 2 NPV Fuel Costs** below.

Table 1 NPV Maintenance Cost

Status Quo		HPS Alternative		LED Alternative	
175W MV	$276	**70W HPS**	$345	**N/A**	
200W MV	$280	**150W HPS**	$320	**150W Equivalent LED (ATB0)**	-
400W MV	$383	**250W HPS**	$314	**250W Equivalent LED (ATB2)**	-
1000W MV	$320	**400W HPS**	$342	**400W Equivalent LED**	-
		1000W HPS	$389		

[3] Direct Testimony of Jeffrey L. Westfall, p. 9, lns. 18-19.

Table 2 NPV Fuel Costs

Status Quo		HPS Alternative		LED Alternative	
175W MV	$197	**70W HPS**	$80	**N/A**	
200W MV	$273	**150W HPS**	$184	**150W Equivalent LED (ATB0)**	$88.89
400W MV	$435	**250W HPS**	$285	**250W Equivalent LED (ATB2)**	$138.10
1000W MV	$1,036	**400W HPS**	$425	**400W Equivalent LED**	$201.40
		1000W HPS	$1,063		

Q. How does the Annual kWh of each type of streetlight compare with equivalent Watt LEDs?

A. Table A-1, Appendix A shows the nominal Wattage (kW) and annual kiloWatt hour (kWh) of each type and size of streetlight identified in the tariff. Actual numbers vary by manufacturer. Shown in Table A-2, Appendix A are the Staff calculated energy savings by using the LED streetlights instead of the MV streetlights. Those savings show a 52% to 81% reduction in kWhs using the LED streetlights.

Q. Why is the term "Equivalent Watt" used to describe LEDs?

A. Historically, lights are rated by the amount of electricity they consume as measured in Watts. This method of identifying lights by the wattage continued through MV, HPS, and Metal Halide street lights. With the advent of LEDs, the wattage consumed for the same amount of lumens produced is substantially less than other streetlights. In the case of MV, for example, a 175W fixture produces the equivalent amount of light as a 92W LED. Thus, industry uses the term "Equivalent Watt" for LED lights in order for individuals to readily compare LED streetlights with MV and HPS.

Q. How do the installation costs vary from MV and HPS street lights to LED streetlights?

A. The initial installation cost of the MV and HPS fixtures range from 24% to 66% less than the initial installation cost of the LED fixture. As a side note, new MV streetlights are becoming more difficult to purchase and some HPS manufacturers are reporting that they are uncertain as to how much longer they will manufacture HPS streetlights.

Q. If the initial installation cost is much higher for LED streetlights, where do the savings come from?

A. The savings come from no maintenance being required for the LED streetlights and the reduction of annual kWhs for each LED in lieu of MV streetlights.

Q. Did Staff analyze the net effect of the offsetting cost over the 20-year service life?

A. Yes**,** Staff calculated the Net Present Value (NPV) of the installation, maintenance, and energy costs over the 20-year life of all the streetlights which indicates the LEDs are the least cost streetlight option as shown in **Table 3 NPV Total Cost with Fuel** below.

Table 3 NPV Total Cost with Fuel

Stay with MV		Install HPS		Install LED Equivalents	
Total Cost MV	$2,117,124	**Total Cost HPS**	$2,388,796	**Total Cost LED**	$2,098,419

Q. Is the NPV analysis the basis for Staff's recommendation?

A. Yes. The NPV allows the future anticipated costs for each streetlight to be reflected back to the present. Comparing the NPV of the total cost of all Kansas streetlights shows LED equivalent streetlights to be least expensive and the preferred streetlight.

Q. How would you describe the difference between Empire's approach to estimating LED costs and your approach?

A. I would describe Empire's approach as a top-down estimation of LED costs, while my approach was more of a bottom-up approach. Empire started with the assumption that

existing HPS rates are cost-based and then used Empire's filed Class Cost of Service (CCOS) to allocate the costs between fixed and variable costs. Next, Empire incorporated the Missouri Pilot Study estimate of the LED reduction in fixed and variable costs. Finally, Empire combined the fixed and variable cost allocations from the CCOS with the Pilot Study estimates of LED costs to develop Kansas estimates of LED fixed and variable costs.

Conversely, I investigated the costs of particular aspects of the LED transition and combined my results with Empire's cost estimates of other aspects to arrive at an LED cost estimate for Kansas. While I believe that a bottom-up cost based estimate more accurately reflects the actual costs, the results of the two approaches are very similar.

CONCLUSION

Q. What are your conclusions?

A. The initial cost of LEDs is more expensive than MV or HPS, but because of the savings from the lack of maintenance and reduction in annual kWhs, LED streetlights are more cost effective than MV or HPS and are the preferred type of street lighting. For these reasons, Empire's LED Conversion Project is prudent and, therefore, I recommend Commission approval of the Project. The actual proposed tariff for each streetlight will be addressed in testimony by Staff witness Dr. Lana Ellis.

Q. Does this conclude your testimony?

A. Yes.

Appendix A

Streetlight Size and Type	Input kW	Annual kWh*
175W MV	0.205 kW	841 kWh
200W MV	0.285 kW	1,169 kWh
400W MV	0.454 kW	1,861 kWh
1000W MV	1.080 kW	4,428 kWh
70W HPS	0.084 kW	343 kWh
150W HPS	0.191 kW	785 kWh
250W HPS	0.297 kW	1,218 kWh
400W HPS	0.443 kW	1,817 kWh
1000W HPS	1.108 kW	4,544 kWh
150W Equivalent LED (ATB0)	0.093 kW	380 kWh
250W Equivalent LED (ATB2)	0.144 kW	590 kWh
400W Equivalent LED	0.210 kW	861 kWh

Table A-1. Input kW and Annual kWh grouped by Type

- Annual kWh = Input kW x 4100 hours (annual lamp burning time)

Streetlight Size and Type	Input kW	Annual kWh		
175W MV	0.205 kW	841 kWh	54.79%	Annual kWh decrease from 175W MV to 150W Equivalent LED
200W MV	0.285 kW	1,169 kWh	67.48%	Annual kWh decrease from 200W MV to 150W Equivalent LED
150W HPS	0.191 kW	785 kWh	51.59%	Annual kwh decrease from 150W HPS to 150W Equivalent LED
150W LED Equivalent (ATB0)	0.093 kW	380 kWh	NA	
400W MV	0.454 kW	1,861 kWh	68.28%	Annual kwh decrease from 200W MV to 250W Equivalent LED
250W HPS	0.297 kW	1,218 kWh	51.52%	Annual kwh decrease from 250W HPS to 250W Equivalent LED
250W LED Equivalent (ATB2)	0.144 kW	590 kWh	NA	
1000W MV	1.080 kW	4,428 kWh	80.56%	Annual kwh decrease from 400W MV to 400W Equivalent LED
400W HPS	0.443 kW	1,817 kWh	52.61%	Annual kwh decrease from 400W HPS to 400W Equivalent LED
400W LED Equivalent (ATBX)	0.210 kW	861 kWh	NA	

Table A-2. kW and kWh Comparison of LED Equivalent Fixtures to MV and HPS Fixtures

STATE OF KANSAS)
) ss.
COUNTY OF SHAWNEE)

VERIFICATION

Tim Stringer, being duly sworn upon his oath deposes and states that he is a Utility Engineer in the Utilities Division of the Kansas Corporation Commission of the State of Kansas, that he has read and is familiar with the foregoing *Direct Testimony*, and attests that the statements contained therein are true and correct to the best of his knowledge, information and belief.

Tim Stringer
Tim Stringer
Utility Engineer
Kansas Corporation Commission
of the State of Kansas

Subscribed and sworn to before me this 13th day of May, 2019.

VICKI D. JACOBSEN
Notary Public - State of Kansas
My Appt. Expires 6-30-22

Vicki D. Jacobsen
Notary Public

My Appointment Expires: 6-30-22

CERTIFICATE OF SERVICE

19-EPDE-223-RTS

I, the undersigned, certify that a true and correct copy of the above and foregoing Direct Testimony was served via electronic service this 13th day of May, 2019, to the following:

JAMES G. FLAHERTY, ATTORNEY
ANDERSON & BYRD, L.L.P.
216 S HICKORY
PO BOX 17
OTTAWA, KS 66067
Fax: 785-242-1279
jflaherty@andersonbyrd.com

JOSEPH R. ASTRAB
CITIZENS' UTILITY RATEPAYER BOARD
1500 SW ARROWHEAD ROAD
TOPEKA, KS 66604
Fax: 785-271-3116
j.astrab@curb.kansas.gov
Hand Delivered

TODD E. LOVE, ATTORNEY
CITIZENS' UTILITY RATEPAYER BOARD
1500 SW ARROWHEAD RD
TOPEKA, KS 66604
Fax: 785-271-3116
t.love@curb.kansas.gov

DAVID W. NICKEL, CONSUMER COUNSEL
CITIZENS' UTILITY RATEPAYER BOARD
1500 SW ARROWHEAD RD
TOPEKA, KS 66604
Fax: 785-271-3116
d.nickel@curb.kansas.gov

SHONDA RABB
CITIZENS' UTILITY RATEPAYER BOARD
1500 SW ARROWHEAD RD
TOPEKA, KS 66604
Fax: 785-271-3116
s.rabb@curb.kansas.gov

DELLA SMITH
CITIZENS' UTILITY RATEPAYER BOARD
1500 SW ARROWHEAD RD
TOPEKA, KS 66604
Fax: 785-271-3116
d.smith@curb.kansas.gov

JILL SCHWARTZ, SR. MGR, RATES & REGULATORY AFFAIRS
EMPIRE DISTRICT ELECTRIC COMPANY
602 S JOPLIN AVE
JOPLIN, MO 64801
Fax: 417-625-5169
jill.schwartz@libertyutilities.com

COLE BAILEY, LITIGATION COUNSEL
KANSAS CORPORATION COMMISSION
1500 SW ARROWHEAD RD
TOPEKA, KS 66604
Fax: 785-271-3354
c.bailey@kcc.ks.gov

BRIAN G. FEDOTIN, DEPUTY GENERAL COUNSEL
KANSAS CORPORATION COMMISSION
1500 SW ARROWHEAD RD
TOPEKA, KS 66604
Fax: 785-271-3354
b.fedotin@kcc.ks.gov

ROBERT VINCENT, LITIGATION COUNSEL
KANSAS CORPORATION COMMISSION
1500 SW ARROWHEAD RD
TOPEKA, KS 66604
Fax: 785-271-3354
r.vincent@kcc.ks.gov

CERTIFICATE OF SERVICE

19-EPDE-223-RTS

JANET BUCHANAN, DIRECTOR- REGULATORY AFFAIRS
KANSAS GAS SERVICE, A DIVISION OF ONE GAS, INC.
7421 W 129TH ST
OVERLAND PARK, KS 66213-2713
Fax: 913-319-8622
janet.buchanan@onegas.com

JUDY JENKINS HITCHYE, MANAGING ATTORNEY
KANSAS GAS SERVICE, A DIVISION OF ONE GAS, INC.
7421 W 129TH ST
OVERLAND PARK, KS 66213-2713
Fax: 913-319-8622
judy.jenkins@onegas.com

SARAH B. KNOWLTON, GENERAL COUNSEL
LIBERTY UTILITIES CORP
116 North Main Street
Concord, NH 03301
sarah.knowlton@libertyutilities.com

/s/ Vicki Jacobsen
Vicki Jacobsen