Exhibit No.
Issues: Revenue Adjustments and Weather Normalization
Witness: Stephen C. Williams
Type of Exhibit: Direct Testimony
Sponsoring Party: Empire District Electric Co.
Case No: ER-2014-0351
Date Testimony Prepared: August 2014

Before the Public Service Commission
of the State of Missouri

Direct Testimony

of

Stephen C. Williams

August 2014

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STEPHEN C. WILLIAMS
ON BEHALF OF
THE EMPIRE DISTRICT ELECTRIC COMPANY
BEFORE THE
MISSOURI PUBLIC SERVICE COMMISSION
CASE NO. ER-2014-0351

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INTRODUCTION

Q. PLEASE STATE YOUR NAME, TITLE, AND BUSINESS ADDRESS.

A. Stephen C. Williams. I am a Planning & Energy Efficiency Analyst for The Empire District Electric Company ("Empire" or "Company"). My business address is 602 South Joplin Avenue, Joplin, Missouri.

Q. PLEASE DESCRIBE YOUR EDUCATIONAL BACKGROUND AND PROFESSIONAL EXPERIENCE.

A. I graduated from Missouri Southern State University in 1976 with a Bachelor of Arts Degree in History and in 1978 with a Bachelor of Science Degree in Business Administration with an emphasis in Accounting. I passed the Uniform Certified Public Accountant examination in 1979 and currently hold Missouri certificate number 006728. After graduating, I worked for Baird, Kurtz & Dobson, a regional public accounting firm, for 17 years and reached the position of manager. Afterwards, I spent two years at TRISM, Inc., a publically-traded national motorcarrier, as Director of Budget & Planning. I worked the next 14 years at Leggett & Platt, Incorporated, a Fortune 500 manufacturing company, where I reached the position of Director of Domestic Taxes. I have worked for Empire for approximately two years in the Planning and Regulatory Department.

Q. WHAT ARE YOUR PRIMARY DUTIES AT EMPIRE?

A. During my tenure with Empire I have worked on planning-related projects such as Empire's annual demand and energy forecast, as well as Empire's annual sales and revenue forecast. I am also responsible for the annual sales and revenue forecast for The Empire District Gas Company, a wholly owned subsidiary of Empire. In addition, I prepare monthly and quarterly revenue variance and weather analyses for management and external financial reporting. I have testified before the Arkansas Public Service Commission on behalf of Empire in Docket No. 13-111-U on the topic of weather normalization

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY THIS CASE?

A. I will support the adjustments to test-year revenues for customer growth, customer expansions and contractions, unbilled sales and weather normalization for Empire in this case.

REVENUE ADJUSTMENTS

Q. PLEASE IDENTIFY THE REVENUE ADJUSTMENTS THAT HAVE BEEN MADE TO MISSOURI JURISDICTIONAL REVENUE.

A. Missouri jurisdictional revenues included in the test year have been adjusted to reflect customer growth, normalized weather, and unbilled sales and revenues. In addition, kilowatt-hour ("kWh") sales and revenues were adjusted to reflect the effect of significant load changes for Empire's large commercial and industrial customers. Each area of adjustment is discussed in greater detail below.

Q. PLEASE EXPLAIN THE ADJUSTMENT RELATED TO CUSTOMER GROWTH AND WHY IT IS NECESSARY.

A. Missouri jurisdictional revenues have been adjusted to reflect the amount of revenue that would have been generated if the number of Empire customers existing at April 30, 2014 had been served by the Company for the entire test year. For each customer class except the large power ("LP") class (i.e., large industrial customers), differences between the April 30, 2014 customer counts and the average number of customers billed in each month of the test year were multiplied by the average weather-normalized kWh per customer for that month. The resulting change in kWh sales was multiplied by the class average weather-normalized rate per kWh to obtain the revenue adjustment related to customer growth. The LP class was reviewed on a customer-by-customer basis to calculate the impact of customer growth on revenue. LP customers have a higher usage-per-customer, and changes in LP customer load patterns due to anomalies can have a significant impact on revenue. In total, the customer growth adjustment to revenue resulted in an increase of 1,512,859 kWh in sales and $168,894 in revenue, on a Missouri jurisdictional basis.

Q. WAS CONSIDERATION GIVEN TO FORESEEABLE CHANGES IN LOAD DUE TO CUSTOMER EXPANSIONS OR CONTRACTIONS?

A. Yes. Several large facilities destroyed in the tornado that hit Joplin, Missouri on May 22, 2011 are in the process of being rebuilt and are expected to be placed into service in the coming twelve months. In addition, several customers also have major projects coming on line within that time period. Empire's customer service representatives provided estimates of changes in customers' demand and energy sales where anticipated projects would change demand by 500 kW and/or sales by 100,000 kWh per month. Adjustments were made to remove test year attributes where the

expansions would replace existing temporary facilities. Sales and revenue were also adjusted to remove sales and revenue for customers terminating or curtailing operations during the test year. On a net basis, significant customer expansions and contractions increased demand by 86,356 kW, sales by 39,521,670 kWh, and revenue by $3,132,506.

Q. WAS THE REVENUE ADJUSTED FOR THE EFFECT OF WEATHER?

A. Yes. The test year sales and revenue were adjusted to account for the impact of non-normal weather. The methodology employed to calculate weather-normalized kWh sales is discussed below. The difference between weather-normalized sales and actual sales for a monthly revenue cycle is multiplied by the proforma average monthly rate per kWh computed for normalized sales to arrive at an adjustment to revenue to remove the effect of test period temperatures. The adjustment for weather normalization resulted in a sales decrease of 103,960,082 kWh and a Missouri jurisdictional revenue decrease of $11,279,390. This reduction is primarily related to the abnormally cold weather in the winter of 2013/2014 and the related increase in electric sales.

Q. PLEASE DESCRIBE THE ADJUSTMENT RELATED TO UNBILLED REVENUE.

A. Revenue in the test year should be "calendar correct", including both the amount actually billed to customers and a provision for kWh used by customers but not billed during the test year. While the amount of revenues actually billed to customers is readily determinable, the unbilled portion must be estimated. This estimate is calculated by taking the difference between weather-normalized energy sales per

billing month and per calendar month. This difference is multiplied by the proforma average monthly rate per kWh computed for normalized sales to arrive at estimated unbilled revenue. Estimated unbilled sales and revenue are calculated separately for each pricing plan. Computations for all pricing plans resulted in a total adjustment increasing Missouri jurisdictional revenue by $1,051,989.

WEATHER NORMALIZATION

Q. WHAT IS WEATHER NORMALIZATION?

A. Weather Normalization is the process of determining how historical (actual) usage would have changed had normal weather conditions existed.

Q. PLEASE DESCRIBE THE WEATHER NORMALIZATION PROCESS.

A. The process for weather normalization involves using a statistical model to determine the variation in sales from what would have happened under normal weather conditions to what did happen under actual weather conditions. The fundamental equation used in the process is shown below.

$$NormalSales_{month} = \frac{ModelNormalSales_{month}}{ModelActualSales_{month}} \times ActualSales_{month}$$

In this equation, a factor is created dividing model-predicted normal-weather sales by model-predicted actual-weather sales and then multiplying actual sales by the factor.

Q. HOW DID YOU OBTAIN MODEL-PREDICTED ACTUAL SALES?

A. To obtain model-predicted actual sales, a multivariate regression model was created for each rate class using Metrix ND, a regression analysis software program. The model estimated actual sales by using actual weather data over the test period. Each regression model is developed using the class sample means created from load

research data. Independent variables include: weather splines for heating and cooling responses; day-of-the-week and holiday binary variables to flag load differences on traditional non-working days; monthly binaries to match loads with seasons; annual binaries to identify long-term trends; lagging variables to measure the effect of multiple days of temperatures on load; and sunlight variables to account for the impact of the number of daylight hours on consumption. Weather splines were created to reflect the nonlinear interaction between consumption and weather.

Q. HOW DID YOU OBTAIN MODEL PREDICTED NORMAL SALES?

A. To obtain modeled predicted normal sales, I used the same multivariate regression model mentioned above and reforecasted the sales levels using normal weather data through the test period.

Q. HOW DID YOU DEVELOP NORMAL WEATHER CONDITIONS FOR THE SALES MODEL?

A. Normal weather conditions have been developed using a 30-year average of daily historical weather from May 1984 through April 2014, the most recent 360 months corresponding with the test year, from the National Oceanic and Atmospheric Administration ("NOAA") statistics for the Springfield-Branson Regional Airport (SGF) weather station. This is the closest first-order weather station to Empire's service territory. The daily averages are obtained by a Rank-and-Average method. In this method, historical daily average temperatures are ranked from the highest value to the lowest value in each month. For each historical day, the corresponding heating degree day ("HDD") and cooling degree day ("CDD") values are calculated for multiple temperature reference points. For example, a CDD with a 65° F

reference point would be calculated by subtracting 65° from the actual temperature on the condition that the actual temperature was above 65° F. For a HDD with a 65° F reference point, a calculation would be made that would subtract the actual temperature from 65° F. This procedure allows the model to check load response to different temperature reference points as well as create autonomous slopes for both heating and cooling conditions. Next, the normal HDD and CDD values are calculated as the average across the 30 historical years within a month. The final step in this method is to map the ranked averages to the test year actual weather. This allows for the assignment of the largest CDD for each particular month in the 30 year historical database to be mapped to the hottest day in the actual month of the test year. Likewise this allows for the assignment of the largest HDD for each particular month in the 30 year historical database to be mapped to the coldest day in the actual month of the test year.

Q. IS THERE ANY ADVANTAGE TO CREATING HDD/CDD PRIOR TO AVERAGING THE 30 YEARS OF HISTORICAL WEATHER?

A. Yes. Performing non-linearities before linearities allows for a more accurate portrayal of historical weather by precluding heating and cooling variables from canceling out their historical influence. For example, if the database consisted of a ranked day that displayed 15 years of daily 70° F temperature reads and 15 years of daily 60° F temperature reads, averaging the temperatures prior to assigning a HDD/CDD would fail to produce a single degree day, even though historically the weather produced 15 years of 5 CDD (assuming a 65° F reference point) and 15 years of 5 HDD (assuming a 65° F reference point) **[**((15*70°)+(15*60°))/30 = 65°**].** If the

HDD/CDD is calculated prior to averaging the temperatures, the historical signature in terms of HDD/CDD is not lost **[(**15 x 5 CDD)/30 = 2.5 CDD**] [**(15 x 5 HDD)/30 = 2.5 HDD**]**.

Q. WHICH RATE CLASSES WERE NORMALIZED FOR WEATHER IN THIS PROCESS?

A. Five rate classes were weather normalized: Residential (RG), Commercial (CB), General Power (GP), Small Heating (SH), and Total Electric Building (TEB).

Q. IS THE WEATHER NORMALIZATION PROCESS USED BY EMPIRE FOR THIS CASE CONSISTENT WITH THE METHODOLOGY USED BY EMPIRE IN PRIOR CASES?

A. Yes.

Q. PLEASE DESCRIBE THE RESULTS OF EMPIRE'S WEATHER NORMALIZATION FOR THIS CASE.

A. The normalized values I calculated are shown in Tables 1 through 5 for each class, after applying the aforementioned methodology.

Table 1: RG Normal Values

Month	Actual Billed Sales (kWh)	Normal Billed Sales (kWh)	Normal Calendar Sales (kWh)
May 2013	110,312,772	97,192,652	100,286,313
Jun 2013	104,791,693	102,595,438	125,531,508
Jul 2013	151,761,768	146,859,098	158,759,381
Aug 2013	148,899,859	161,604,098	160,200,944
Sep 2013	149,212,236	143,542,714	115,535,091
Oct 2013	108,585,716	117,620,906	103,996,404
Nov 2013	104,742,251	110,767,232	132,099,896
Dec 2013	173,728,918	158,498,961	191,268,847
Jan 2014	223,937,623	206,209,528	196,739,674
Feb 2014	209,995,788	184,745,393	166,231,520
Mar 2014	174,823,179	156,185,230	145,845,072
Apr 2014	121,007,386	113,276,583	103,386,531

Table 2: CB Normal Values

Month	Actual Billed Sales (kWh)	Normal Billed Sales (kWh)	Normal Calendar Sales (kWh)
May 2013	22,530,538	21,947,536	22,413,245
Jun 2013	22,708,191	22,638,395	25,805,653
Jul 2013	29,091,957	28,356,468	29,547,875
Aug 2013	28,725,225	30,409,091	30,830,099
Sep 2013	29,104,647	28,292,235	25,040,614
Oct 2013	23,887,790	24,275,339	22,059,630
Nov 2013	21,093,026	21,921,563	23,606,173
Dec 2013	26,486,277	25,552,763	29,100,467
Jan 2014	30,829,266	29,824,100	29,512,112
Feb 2014	29,838,788	28,401,419	25,957,074
Mar 2014	27,327,337	26,278,259	26,401,186
Apr 2014	22,848,217	22,357,889	22,376,358

Table 3: GP Normal Values

Month	Actual Billed Sales (kWh)	Normal Billed Sales (kWh)	Normal Calendar Sales (kWh)
May 2013	66,138,812	66,164,090	64,902,497
Jun 2013	68,188,295	68,367,354	69,223,401
Jul 2013	79,457,902	79,126,681	83,738,529
Aug 2013	80,886,590	81,735,511	83,034,495
Sep 2013	80,442,129	79,142,837	75,267,387
Oct 2013	70,791,526	70,800,141	67,181,461
Nov 2013	63,335,936	64,212,765	65,420,181
Dec 2013	68,909,011	68,566,509	72,444,538
Jan 2014	74,514,598	73,992,516	70,787,589
Feb 2014	69,283,111	68,560,223	67,234,382
Mar 2014	65,701,933	65,226,737	67,736,826
Apr 2014	62,239,865	61,975,971	62,494,336

Table 4: SH Normal Values

Month	Actual Billed Sales (kWh)	Normal Billed Sales (kWh)	Normal Calendar Sales (kWh)
May 2013	6,178,616	5,855,826	5,919,820
Jun 2013	5,985,376	5,976,524	6,702,987
Jul 2013	7,361,804	7,251,485	7,441,436
Aug 2013	7,371,292	7,669,681	7,587,540
Sep 2013	7,459,096	7,233,893	6,502,719
Oct 2013	5,946,106	6,127,677	5,585,539
Nov 2013	5,791,830	6,157,927	6,835,817
Dec 2013	8,643,142	8,069,597	9,313,413
Jan 2014	11,568,527	10,760,237	10,629,076
Feb 2014	11,405,815	10,184,649	9,033,560
Mar 2014	9,424,730	8,523,650	8,181,921
Apr 2014	6,801,037	6,498,435	6,285,693

Table 5: TEB Normal Values

Month	Actual Billed Sales (kWh)	Normal Billed Sales (kWh)	Normal Calendar Sales (kWh)
May 2013	26,230,421	24,865,674	25,927,531
Jun 2013	27,120,559	27,087,907	30,338,235
Jul 2013	31,617,392	31,092,742	32,024,632
Aug 2013	33,160,497	34,569,721	34,430,517
Sep 2013	33,225,914	32,123,511	29,271,601
Oct 2013	27,721,949	28,386,054	25,875,792
Nov 2013	26,858,452	28,385,979	31,339,058
Dec 2013	34,311,883	32,157,557	35,308,187
Jan 2014	40,403,345	37,838,776	36,452,957
Feb 2014	37,145,511	33,580,829	30,740,734
Mar 2014	32,831,655	30,261,195	30,291,187
Apr 2014	28,152,832	27,034,106	26,555,151

Q. DOES THIS CONCLUDE YOUR DIRECT TESTIMONY?

A. Yes.

AFFIDAVIT OF STEPHEN C. WILLIAMS

STATE OF MISSOURI)
) **ss**
COUNTY OF JASPER)

On the 26th day of August, 2014, before me appeared Stephen C. Williams, to me personally known, who, being by me first duly sworn, states that he is a Planning Energy Efficiency Analyst of The Empire District Electric Company and acknowledges that he has read the above and foregoing document and believes that the statements therein are true and correct to the best of his information, knowledge and belief.

Stephen C. Williams

Subscribed and sworn to before me this 26th day of August, 2014.

ANGELA M. CLOVEN
Notary Public - Notary Seal
State of Missouri
Commissioned for Jasper County
My Commission Expires: November 01, 2015
Commission Number: 11262659

Notary Public

My commission expires 11/01/2015