

BEFORE THE STATE CORPORATION COMMISSION  
OF THE STATE OF KANSAS

In the Matter of the Application of )  
Westar Energy, Inc. and Kansas Gas and ) Docket No. 15-WSEE-532-MIS  
Electric Company for Approval of Interim )  
Budgets for Energy Efficiency Programs )

**NOTICE OF FILING OF EVALUATION, MEASUREMENT AND VERIFICATION BY  
WESTAR ENERGY, INC. AND KANSAS GAS AND ELECTRIC COMPANY**

COME NOW Westar Energy, Inc. and Kansas Gas and Electric Company (collectively referred to as “Westar”) and submits its evaluation, measurement and verification (EM&V) for the WattSaver program, the Energy Efficiency Demand Response (EEDR) program, and the SimpleSavings program pursuant to the Commission order in Docket No. 15-WSEE-021-TAR.

1. In its Order on Operating Budgets and EM&V Studies in Docket No. 15-WSEE-021-TAR, the Commission found that “Westar shall conduct EM&V studies, as defined by Docket 08-GIMX-442-GIV, of each of its energy efficiency programs: SimpleSavings, Watt Saver Air Conditioning Cycling, and Energy Efficiency Demand Response Rider. The cost of the EM&V shall not exceed 5% of the program's Commission-approved budget. The EM&V shall be available for review by the Commission, Staff, and CURB by September 1, 2015.” Order on Operating Budgets and EM&V Studies, Docket No. 15-WSEE-021-TAR, at Ordering Paragraph B (Jan. 6, 2015).

2. Westar has completed EM&V for these three programs and the results are attached hereto. The EM&V performed for the SimpleSavings, EEDR, and WattSaver programs indicates that these programs have met their objectives in a cost-efficient manner. For the two programs that will continue in the future – EEDR and WattSaver (in maintenance mode), the benefit-cost

analysis indicates that the programs continue to be cost effective and pass the benefit-cost tests the Commission applies when evaluating new programs.

WHEREFORE, Westar respectfully requests that the Commission accept its EM&V for the SimpleSavings, EEDR, and WattSaver programs.

Respectfully submitted,

WESTAR ENERGY, INC.  
KANSAS GAS AND ELECTRIC COMPANY

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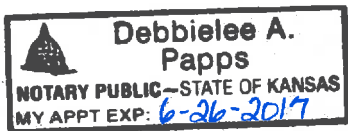
**VERIFICATION**

STATE OF KANSAS                    )  
  )  
COUNTY OF SHAWNEE            )        ss:

Cathryn J. Dinges, being duly sworn upon her oath deposes and says that she is the attorney for Westar Energy, Inc. and Kansas Gas and Electric Company; that she is familiar with the foregoing Notice that the statements therein are true and correct to the best of her knowledge and belief.

Cathryn Dinges  
Cathryn J. Dinges

SUBSCRIBED AND SWORN to before me this 15<sup>th</sup> day of September, 2015.



Debbielee Papps  
Notary Public

My Appointment Expires: June 26, 2017

**CERTIFICATE OF SERVICE**

I hereby certify that on this 1<sup>st</sup> day of September, 2015, the foregoing Notice was electronically filed with the Kansas Corporation Commission and an electronic copy was delivered to each party on the service list.

  
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Cathryn J. Dinges

Westar Energy, Inc.  
Energy Efficiency Programs  
Evaluation, Measurement and Verification (EM&V) Study  
September 2015

## **Introduction**

The following EM&V was performed for Westar Energy, Inc. (Westar) in accordance with the order in Docket 15-WSEE-021-TAR dated January 6, 2015. The scope of the EM&V was to assess the following three Energy Efficiency programs offered by Westar: SimpleSavings, Energy Efficiency Demand Response Rider, and WattSaver. An impact evaluation was performed for each program using the following criteria: A description of the program objectives as filed, determining if the objectives were met, and assessing the cost-effectiveness of the objectives.

## SimpleSavings

### Program Description

Westar's SimpleSavings program was designed to be a partnership with the Kansas State Energy Office's Efficiency Kansas Revolving Loan Program. The SimpleSavings tariff was the way for customers in Westar's service territory to participate in Efficiency Kansas. The major objectives of the program were to:

1. Produce cost-effective, firm energy savings,
2. Address efficiency improvements in a comprehensive manner using sound building science principles,
3. Implement the most cost-effective programs in a logical sequence to maximize the energy savings per dollar spent, and
4. Target customers residing in structures most in need of efficiency improvements.

The Efficiency Kansas program involved interested participants having a certified energy auditor develop an Energy Conservation Plan developed specifically for their premises. The applicant could then choose to stop after the energy audit, or apply for a loan to carry out the energy efficiency measures outlined by the audit. If a loan was approved, the program participant chose a contractor to perform the work. Upon completion, a post-audit was conducted and the work certified as completed.

This scope of this EM&V will be limited to looking at objectives 1 and 4. Objectives 2 and 3 are difficult for Westar to assess in the limited scope of this EM&V, as they were more specific to the portion of the program run by the Kanas Energy Office. Since Westar was only the conduit for the program, it only has the demographic and usage data to assess objectives 1 and 4.

### Demographic Data

Tables 1 and 2 below break down the participation rates for segments of Westar's customers. The data is grouped by Claritas<sup>1</sup> segmentation definitions.

**Table 1**  
**Participants with Energy Audit Only**

Lifestage Group*	% Westar Customers	% Simple Savings Customers	Participation Index
Affluent Younger Years	12.9	14.1	110
Mainstream Younger Years	11.4	17.4	153

<sup>1</sup> A more detailed description of Claritas segments can be found in Appendix A

Sustaining Younger Years	19.8	12.0	60
Affluent Family Life	2.3	2.2	93
Mainstream Family Life	13.9	13.0	94
Sustaining Family Life	4.4	0.0	0
Affluent Mature Years	5.2	9.8	186
Mainstream Mature Years	20.2	28.3	140
Sustaining Mature Years	9.7	2.2	22

**Table 2**  
**Participants with Energy Audit and Loan**

Lifestage Group	% Westar Customers	% Simple Savings Customers	Participation Index
Affluent Younger Years	12.9	17.8	138
Mainstream Younger Years	11.4	15.0	132
Sustaining Younger Years	19.8	12.8	65
Affluent Family Life	2.3	2.2	93
Mainstream Family Life	13.9	12.3	88
Sustaining Family Life	4.4	1.1	25
Affluent Mature Years	5.2	6.6	125
Mainstream Mature Years	20.2	27.0	134
Sustaining Mature Years	9.7	5.2	53

The participation index is a measure of how much more likely that segment was to participate in the program. For example, in Table 2, the Affluent Younger Years comprised 17.8% of total participants that received both an audit and loan. However, they are only 12.9% of Westar's total customer base. Therefore they were 38% more likely to participate in the program. ( $17.8/12.9 = 1.38$ ).

Operating under the assumption that lower income households are the ones most in need of energy efficiency improvements, the program did not achieve objective 4. This is not to suggest that the households that participated did not have any efficiencies to be gained, just that the participation rates of the lowest income segments were the lowest across the board. This suggests that if the program were ever offered again in the future, advertising and notification would be an area of focus in order to achieve the desired results.

### Energy Savings

The energy savings attributable to the SimpleSavings program were calculated by analyzing the energy use patterns of the participants over the life of the program. The results of the analysis are displayed in Table 3 below. A more detailed description of the model and techniques used can be found in Appendix B.

**Table 3**  
**SimpleSavings Program Benefits**

Customer Type	Per Customer Monthly Energy Savings (kWh)	Number of Participants	Total Monthly Energy Savings (MWh)
Energy Audit Only	34	92	3.1
Audit + Loan	231	366	84.6
Energy (kWh) Savings			87.7

The analysis of the energy savings indicates that firm energy savings were achieved by the program, satisfying objective 1.



## Energy Efficiency Demand Response Rider

### Program Description

The EEDR is designed for Westar largest users of energy that can shed load in a short period of time (10 minutes). Westar's other demand response rates require at least two hours' notice prior to interruption. In the case of an extreme system emergency, Westar may need to begin manual load shed in order to comply with the Southwest Power Pool's (SPP) requirements. The 10 minute call window allows the capacity to count as spinning reserves under the SPP requirements.

Currently, Westar has access to approximately 80 MW of interruptible load through this program. From program inception through June 2015, the incentive cost to procure the 80 MW of interruptible load has been \$22.6 million. It is difficult to perform an EM&V on the program, as there were no claimed savings; the objective was to gain access to interruptible load, which was met. Instead, an updated benefit cost analysis of the interruptible load purchased through the program will be calculated for comparison purposes.

### Updated Benefit-Cost Analysis

Table 4 below shows the inputs used in the calculation of the benefit cost tests, while table 5 displays the results of the analysis.

**Table 4**  
**Assumptions**

Assumptions	Numbers
Retail rate (\$ per kWh)	CONFIDENTIAL
Discount rate (Participant Test)	12.0%
WACC (RIM, TRC & PAC)	8.49%
Interruptible load	80 Megawatts
Production Losses (per hour)	CONFIDENTIAL
Demand response events per year	2
Duration of interruption	6 hours
Avoided Capacity Cost (\$/kW)	\$57/kW
Avoided Energy Cost	7.14 cents per kWh
Capacity incentive payments	\$4.00 per kW
Event incentive payments	\$0.075 per kWh
EUL	5 years
Attrition Rate	2.0%
Net-to-Gross Ratio	1.00

**Table 5**  
**Benefit Cost Results**

Cost-Effectiveness Tests	Benefit/Cost Ratios	Net Present Values (\$ millions)
Participant	13.20	\$15.05
Ratepayer Impact Measure (RIM)	1.15	\$2.76
Total Resource Cost (TRC)	15.22	\$19.43
Program Administrator Cost (PAC)	1.17	\$2.98

The updated benefit cost results indicate that the program still passes all of the tests the Commission uses to help determine whether a program is approved or not. The results suggest Westar's acquisition of interruptible load through the EEDR is still cost-effective.

## WattSaver

### Program Description

The WattSaver program is a voluntary air conditioning cycling program designed to reduce system peak load and thus defer the need for additional capacity. As with the EEDR, the objective of the WattSaver program is to obtain load control. Unlike the EEDR, the energy savings must be calculated using estimation techniques, as it is an aggregation program. This EM&V will measure the kW savings available due to the program, as well as analyze the participant demographics and satisfaction.

### Demographic Data

Table 6 shows the breakout of customer participation by Claritas segments. The data indicates that the participation in the WattSaver program was much more evenly distributed across all segments.

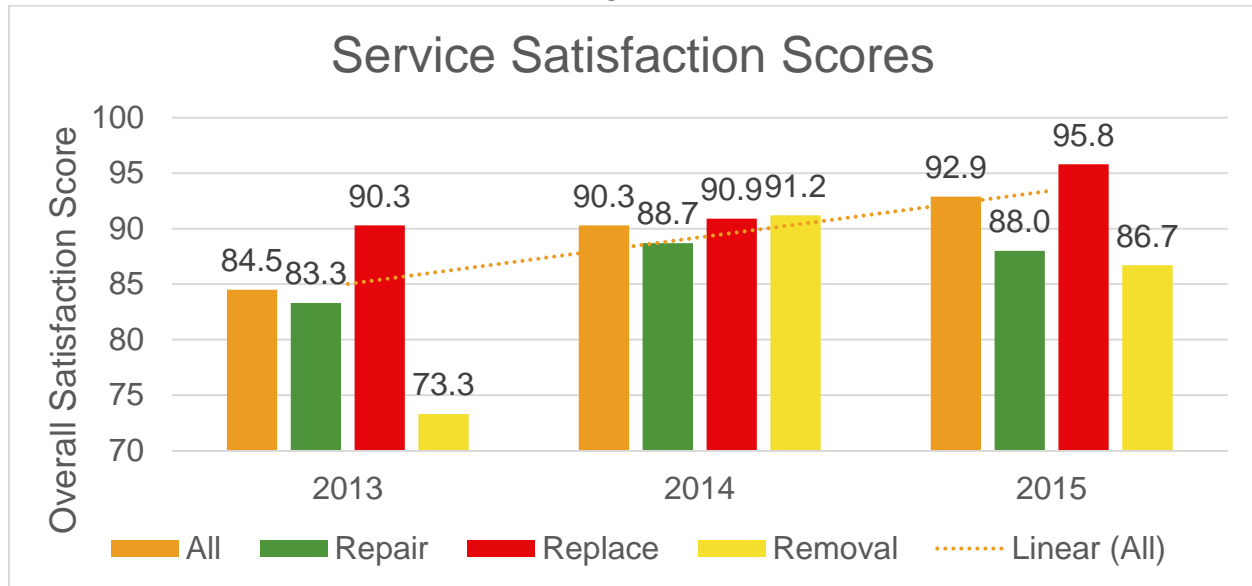
**Table 6**  
**WattSaver Participants**

Lifestage Group	% Westar Customers	% WattSaver Customers	Participation Index
Affluent Younger Years	12.9	15.9	124
Mainstream Younger Years	11.4	15.6	137
Sustaining Younger Years	19.8	7.2	37
Affluent Family Life	2.3	2.2	93
Mainstream Family Life	13.9	14.9	107
Sustaining Family Life	4.4	4.7	107
Affluent Mature Years	5.2	8.0	152
Mainstream Mature Years	20.2	21.7	108
Sustaining Mature Years	9.7	7.2	75

## Customer Satisfaction

Figure 1 and Table 7 detail the results of the customer satisfaction surveys performed after service calls and cycling events, respectively. Customers are randomly selected and answer questions on a scale of 1 (poor) to 4 (excellent). The 4-point scale is then converted to percent for analysis<sup>2</sup>.

**Figure 1**



**Table 7**  
**Post-Cycling Survey Results**

Questions	Results			
	2011	2012	2013	2015
Level of comfort during cycling events	72	72	68	69
Level of comfort upon returning home	81	80	77	81
Likelihood to refer	87	80	80	76
Overall Satisfaction Score	88	80	82	80
Used opt-out		4%	4%	3%
Used quick reference guide		40%	38%	28%
Used toll-free phone number	No data	19%	21%	19%
Used WattSaver website		18%	21%	15%
Used online programming feature		18%	16%	13%

<sup>2</sup> A more in depth detail of the calculation of the results can be found in Appendix C

## Energy Savings

The energy savings attributable to the WattSaver program were calculated by comparing the energy use patterns of participants in each customer class to the energy use patterns of a control group in each class during the cycling event window. The results of the analysis are displayed in Table 8 below. A more detailed description of the model and techniques used can be found in Appendix D.

**Table 8**  
**WattSaver Program Benefits**

Customer Type	Per Customer Load Reduction (kW)*	Brattle Group Study (kW)**	Number of Participants***	Total Peak Reduction (MW)
Single-Family	0.69	0.2 to 1.7	49,285	34
Multi-Family	0.57	0.2 to 1.7	7,579	4
Small Commercial	5.96	0.4 to 8.6	1,857	11
Composite	0.84		58,721	49

The analysis of the energy savings indicates that the WattSaver program has created 49 MW of controllable load, consistent with previous findings.

## Updated Benefit-Cost Analysis

Now that the WattSaver has been shifted into maintenance mode, the updated benefit cost analyzes the costs associated with continuing the program. Table 9 provides the assumptions for the ben-cost model, while Table 10 displays the results.

**Table 9**  
**Assumptions**

Assumptions	Numbers
Retail rate (\$ per kWh)	8.3 cents per kWh
Discount rate (Participant Test)	12.0%
WACC (RIM, TRC & PAC)	8.49%
Per Customer kW Savings	0.84 kW
Demand response events per year	6
Max Duration of interruption	4 hours

Avoided Capacity Cost (\$/kW)	\$57/kW
Average Fuel Cost	2 cents per kWh
Budgeted Annual Vendor Cost	\$1.5 Million
Attrition Rate	2.0%
Net-to-Gross Ratio	1.00

**Table 10**  
**Benefit Cost Results**

Cost-Effectiveness Tests	Benefit/Cost Ratios	Net Present Values (\$ millions)
Participant	56.62	\$3.47
Ratepayer Impact Measure (RIM)	1.20	\$2.15
Total Resource Cost (TRC)	1.86	\$5.96
Program Administrator Cost (PAC)	1.75	\$5.51

As with the EEDR, the updated benefit cost results indicate that the program still passes all of the tests the Commission uses to help determine whether a program is approved or not. The results suggest Weststar's transition of the WattSaver program into maintenance mode is still cost-effective.

## **Conclusion**

The EM&V performed for the SimpleSavings, EEDR, and WattSaver programs indicates that these programs have met their objectives in a cost-efficient manner. For the two programs that will continue in the future – EEDR and WattSaver (in maintenance mode), the benefit-cost analysis indicates that the programs continue to be cost effective and pass the benefit-cost tests the Commission applies when evaluating new programs.

# Appendix A

## Residential Segmentation





# Segmentation 101

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- **Nielsen classifies U.S. households into 66 PRIZM segments based on Census data & other sources of demographic & consumer information**
- **PRIZM operates on the principle that “birds of a feather flock together” meaning, people with similar cultural backgrounds, needs & perspectives naturally gravitate toward each other**



# Lifestage Groups

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- **PRIZM segments grouped into 11 Lifestage Groups based on affluence & a combination of householder age & household composition**
- **Younger Years (Y) - majority of households are young & childless**
- **Family Life (F) - middle age households with young children**
- **Mature Years (M) - older households; “empty nesters”**



# Lifestage Groups

	Younger Years	Family Life	Mature Years
High	Y1 Midlife Success	F1 Accumulated Wealth	M1 Affluent Empty Nests
\$	(Y2) Young Achievers	F2 Young Accumulators	M2 Conservative Classics
Low	(Y3) Striving Singles	F3 Mainstream Families	M3 Cautious Couples
		F4 Sustaining Families	M4 Sustaining Seniors



# Lifestage+ Groups

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	Younger Years	Family Life	Mature Years
Affluent	Y1	F1	M1
Mainstream	Y2	F2, F3	M2, M3
Sustaining	Y3	F4	M4



# **Appendix B**

## **Empirical Model to Estimate kWh Savings Directly Attributable to the Simple Savings Program**



# Objectives

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- **Estimate monthly customer energy usage (kWh) from 2010 to 2014**
- **Estimate monthly energy (kWh) savings directly attributable to the Simple Savings program**
- **Estimate monthly kWh savings for energy audit only & audit + loan participants**

# Data

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- **Data characteristics**
  - Panel data (cross-section & time series data)
  - 366 energy audit + loan participants; 92 audit only participants
- **Data variables**
  - Monthly CDD & HDD from Emporia, Hutchinson, Lawrence, Leavenworth, Manhattan, Olathe, Parsons, Salina, Topeka, Wichita & Winfield
  - Energy savings dummy (Post-Simple Savings Period=1; Pre-Simple Savings Period=0)



# Empirical Model

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**kWh = f(CDD, HDD, Energy Savings Dummy,**

**Customer (cross-section) Dummies;**

**Monthly (time-series) Dummies)**

- **Random Effects Model (SAS TSCSREG Procedure)**
- **Energy Audit only & Audit + Loan models**





# Results: Energy Audit Only

Dependent Variable: kWh

Parameter Estimates			
Variable	Estimate	t Value	Pr > t]
Intercept	1241.9***	10.26	<0.0001
CDD	0.457*	1.85	0.0644
HDD	-0.478***	-3.35	0.0008
kWh_Savings	-33.659	-0.76	0.4466

\*\*\* Significant at 1% level; \*\* Significant at 5% level; \* Significant at 10% level

# Results: Energy Audit & Loan Program

Dependent Variable: kWh

Parameter Estimates			
Variable	Estimate	t Value	Pr > t
Intercept	1031.5***	8.11	<0.0001
CDD	1.450***	4.71	<0.0001
HDD	0.385***	2.80	0.0052
kWh_Savings	-231.159**	-2.45	0.0143

\*\*\* Significant at 1% level; \*\* Significant at 5% level; \* Significant at 10% level

# Appendix C

# Transactions Satisfaction

# Survey



# Objectives

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- **Measure customer satisfaction scores using survey data from 2012 to 2015**
- **Identify various factors that drive customer satisfaction**
- **Develop a model that relates drivers with satisfaction**



# Data

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- **Use Voter/Consumer Research to conduct phone interviews**
- **Random sample of participants that recently transacted business with Westar; new customer installs & service calls**
- **Questions on a scale of 1 (poor) to 4 (excellent)**
- **4-point scale converted to percent scale**



# Methodology

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- **Factor Analysis**
  - **Minimize multicollinearity**
- **Regression**
  - **Measures the relationship between overall satisfaction & drivers**
  - **Basis for improvement efforts**



# Key Questions

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- **Overall satisfaction with the program**
- **CSR Assistance**
  - Knowledge
  - Politeness
  - Helpfulness
- **Appointment Schedule**
  - Convenience of scheduled time
  - Installer punctuality
- **Installation Process**
  - Politeness
  - Knowledge of program & equipment
  - Cleanliness
  - Professionalism
- **Post-Install Instructions\***
  - Instructions on how to adjust thermostat settings
  - Answers about the program & the new thermostat

\* new installs only

# Factor Analysis Results: Service Calls

Standardized Scoring Coefficients				
Contact	Installation	Assistance	Instructions	Appointment
Schedule				0.6395
CSR_Knowledge		0.2778		0.6646
CSR_Politeness		0.3395		
CSR_Helpfulness		0.3649		
CSR_Professionalism		0.3439		
Tech_Punctuality	0.2061			
Tech_Politeness	0.2871			
Tech_Cleanliness	0.2694			
Tech_Knowledge	0.2678			
Tech_Professionalism	0.2792			



# Regression Results: Service Calls

**Dependent Variable: Overall Satisfaction Score**

**No. of Observations: 755**

**F Value = 102.54\*\*\***

Parameter Estimates				
Variable	Parameter Estimate	t Value	Pr > t	Standardized Estimate
Intercept	-0.20362	-0.80	0.4241	0
CSR Assistance	0.24449***	3.56	0.0004	0.26143
Appointment & Scheduling	0.08921	1.47	<0.1426	0.10360
Service Process	0.69946***	9.17	<0.0001	0.40970

\*\*\* Significant at 1% level; \*\* Significant at 5% level; \* Significant at 10% level

# Post-Cycling Satisfaction Survey



# Objectives

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- **Measure comfort level during cycling events**
- **Measure use of program resources**
- **Compare survey results from 2011 to 2015**



# Data

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- **Use Voter/Consumer Research to conduct phone interviews**
- **Random sample of 100 participants per cycling event; 300 participants sampled in 2015**



# Key Questions

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- **Overall satisfaction with the program**
- **Likelihood to refer to a friend, neighbor or family member**
- **Comfort Level During Cycling Events**
  - **If at home, comfort during cycling events**
  - **If away, comfort upon returning home**
- **Use of program resources**
  - **Quick reference guide**
  - **Toll-free number**
  - **WattSaver website**
  - **On-line programming feature**



# **Appendix D**

## **Empirical Model to Estimate kW Savings Directly Attributable to the WattSaver Program**



# Objectives

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- **Estimate per customer peak load (kW) reduction for single-family, multi-family & small commercial customers for the 2015 cycling season**
- **Calculate a composite per-customer & total peak load reduction directly attributable to the program**
- **Compare kW savings with other DLC A/C programs**



# Data

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- **Data characteristics**
  - Panel data (cross-section & time series data)
  - Test & Control Groups; random sample of 300 for single-family, 50 for multi-family & 50 for small business
  - 3 data sets; single-family, multi-family & small business
- **Data variables**
  - Average hourly kW during cycling events
  - Hourly peak temperature (Emporia, Hutchinson, Lawrence, Leavenworth, Manhattan, Olathe, Parsons, Salina, Topeka, Wichita & Winfield)
  - Group Dummy (Participant Test Group=1; Non-Participant Control Group=0)



# Empirical Model

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**kW = f(temperature, group dummy,**

**customer (cross-section) dummies;**

**cycling event (time-series) dummies)**

- **Random Effects Model (SAS TSCSREG Procedure)**
- **Single-family, Multi-family & Small business models**



# PER CUSTOMER LOAD REDUCTION - SINGLE-FAMILY UNITS

Dependent Variable: kW

Parameter Estimates			
Variable	Estimate	t Value	Pr > t
Intercept	7.0432**	2.13	0.0335
Temperature	-0.03855	-1.12	<0.2614
kWh_Reduction	-0.6506***	-3.00	0.0027

\*\*\* Significant at 1% level; \*\* Significant at 5% level; \* Significant at 10% level

# PER CUSTOMER LOAD REDUCTION – MULTI-FAMILY UNITS

Dependent Variable: kW

Parameter Estimates			
Variable	Estimate	t Value	Pr > t
Intercept	1.562	0.39	0.6973
Temperature	0.0048	0.12	0.9083
kW_Reduction	-0.53719*	-1.89	0.0593

\*\*\* Significant at 1% level; \*\* Significant at 5% level; \* Significant at 10% level

# PER CUSTOMER LOAD REDUCTION - SMALL COMMERCIALS

Dependent Variable: kW

Parameter Estimates			
Variable	Estimate	t Value	Pr > t
Intercept	-19.5714	-1.33	0.1851
Temperature	0.3565**	2.45	0.0144
kW Reduction	-5.6641	-0.99	0.3241

\*\*\* Significant at 1% level; \*\* Significant at 5% level; \* Significant at 10% level