

BEFORE THE CORPORATION COMMISSION OF OKLAHOMA

IN THE MATTER OF THE APPLICATION OF )  
OKLAHOMA GAS AND ELECTRIC COMPANY )  
FOR AN ORDER OF THE COMMISSION )  
APPROVING THE COMPANY'S 2016 DEMAND )  
PORTFOLIO AND AUTHORIZING RECOVERY )  
OF THE COSTS OF THE DEMAND PROGRAMS )  
THROUGH THE DEMAND PROGRAM RIDER )

CAUSE NO. PUD 201 500247

**FILED**  
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CORPORATION COMMISSION  
OF OKLAHOMA

Direct Testimony

of

Cristi Killian

on behalf of

Oklahoma Gas and Electric Company

July 1, 2015

Cristi Killian  
*Direct Testimony*

1 Q. **Please state your name, position, by whom you are employed and business address.**

2 A. My name is Cristi Killian. I am the Manager of Product and Service Implementation at  
3 Oklahoma Gas and Electric Company (“OG&E” or “Company”). My business address is  
4 321 N. Harvey, Oklahoma City, Oklahoma 73102.

5  
6 Q. **What are your responsibilities in this position?**

7 A. I have direct oversight of the Product and Service implementation team at OG&E which  
8 is responsible for the Integrated Voltage and Var Control program for the utility. I  
9 coordinate multiple areas of the business to achieve a successful IVVC implementation  
10 and have done so for 6 years.

11

12 Q. **Briefly summarize your education and professional qualifications.**

13 A. I have a bachelor’s degree in electrical engineering from Oklahoma Christian University  
14 and a Masters in Engineering and Technology Management from Oklahoma State  
15 University. I have been employed at OG&E for over 10 years in various areas of the  
16 business. I started my career in OG&E’s distribution engineering division and  
17 engineered large capital rebuild work, capacity upgrades, and large residential  
18 developments. In 2007, I moved to the Asset Management group within OG&E where I  
19 developed business cases for major maintenance programs and reliability upgrade  
20 programs. In 2009, I joined the Smart Grid deployment team leading the area of  
21 Distribution Automation. This area included implementation of the Integrated Volt Var  
22 Program, Distribution Feeder Automation, and a Distribution Management System. In  
23 2013, I became the Manager of Product and Service Implementation for OG&E where I  
24 lead OG&E’s effort to deploy new customer programs, equipment, and IT-based  
25 products. I have been a speaker at Distributech, a major industry conference and trade  
26 show, for three of the last five years regarding the IVVC program at OG&E. I have also  
27 played an integral role in reporting Distribution Automation deployment progress to the  
28 U.S. Department of Energy (“DOE”) as one of the requirements under the Smart Grid  
29 Investment Grant (“SGIG”) awarded to OG&E in 2009.

1 Q. **Have you previously testified before the Oklahoma Corporation Commission**  
2 **(“OCC” or “Commission”)?**

3 A. No.

4  
5 Q. **What is the purpose of your testimony in this proceeding?**

6 A. My testimony discusses the inclusion of the technology-enabled Integrated Volt Var  
7 Control Program (“IVVC”) in OG&E’s 2016-2018 Demand Portfolio. I will also discuss  
8 the proposed program costs, along with the benefits customers will realize as a result of  
9 the continued implementation.

10  
11 Q. **Please provide an overview of the Integrated Volt Var Control Program.**

12 A. The Integrated Volt Var Control (“IVVC”) Program is a system of devices, controls,  
13 software and communications products used to manage OG&E’s distribution system  
14 reactive power flow and voltage level. This technology is used to reduce energy demand  
15 during peak periods and minimize losses, while ensuring acceptable customer voltage  
16 levels. IVVC infrastructure can be installed on both 12.47kV and 34.5kV distribution  
17 circuits, and includes several key components as follows:

- 18 • Capacitor bank controllers
- 19 • Load Tap Changer (LTC) controllers
- 20 • Communication network
- 21 • Volt Var Optimization (VVO) application software

22 In most cases, capacitor controllers with radio communications are installed on existing  
23 capacitor banks and new capacitors are installed if loss minimization is required beyond  
24 the level provided by existing capacitor banks. Additionally, LTC Controls are installed  
25 or upgraded to support reliable voltage regulation. The VVO software automatically  
26 controls these devices to optimize voltage and reactive power flow.

27 The IVVC program will contribute to the Company’s deferral goals with an estimated  
28 additional 27 MW of demand reduction potential.

1 Q. **How will IVVC contribute to the goals of OG&E's 2016-2018 Demand Portfolio?**

2 A. IVVC supports reduction of customer demand and energy use during peak periods. The  
3 IVVC program provides control of line equipment to enable optimized voltage operation  
4 of enabled circuits. This optimized operation ensures voltages are maintained within  
5 acceptable ranges, while operating in the lower portion of the acceptable range.  
6 Operation in this portion of the acceptable range results in a reduction in the energy use  
7 of many customer loads, while maintaining voltage within the acceptable range ensures  
8 acceptable function of customer equipment.

9

10 Q. **Has IVVC contributed to the goals of OG&E's 2013-2015 Demand Portfolio?**

11 A. Yes, it has. IVVC is currently a part of OG&E's demand portfolio and has been  
12 successful at reducing customer demand and energy use during peak periods. The results  
13 have been verified through the current EM&V process.

14

15 Q. **Does the Integrated Voltage and Var Control program meet the requirements of a  
16 DPR program under the Commission's rules?**

17 A. Yes. IVVC meets the requirements as an energy efficiency program as peak demand  
18 and energy use during peak periods is reduced for customers on IVVC enabled circuits,  
19 supporting the goal of delaying new generation investment. IVVC meets the definition of  
20 an energy efficiency program as it is a "means of reducing electricity consumption on the  
21 customer's side of the meter while achieving substantially the same level of end use  
22 service."<sup>1</sup> IVVC provides simple customer participation as per OAC 165:35-41-4 (b)(3)  
23 as customers on an IVVC enabled distribution circuits participate in energy savings  
24 without requiring changes in customer behavior. IVVC contribution to peak demand  
25 reduction is included in the Company's integrated resource plan (IRP) providing  
26 consistency between the program and the IRP required by OAC 165:35-41-4 (b)(6).  
27 IVVC achieves energy efficiency and peak shaving in new construction (OAC 165:35-  
28 41-4 (b)(8)) and promotes comprehensive energy efficiency in buildings as the circuit  
29 voltage is optimized through operation near the lower end of the acceptable band for

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<sup>1</sup> OAC 165: 35-41-2, Definitions "Energy efficiency"  
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1 customers on an IVVC enabled circuit (OAC 165:35-41-4 (b)(9)). IVVC does not  
2 encounter barriers in reaching low income and hard to reach customers similar to other  
3 energy efficiency programs. Low income and hard to reach customers served from IVVC  
4 enabled circuits achieve energy efficiency benefits in a proportion similar to other  
5 customers since IVVC does not require customer enrollment, but is enabled on a circuit  
6 basis (OAC 165:35-41-4 (b)(10)). The Company's implementation of IVVC relieves  
7 geographic barriers to participation through the upgrade of service transformers and  
8 secondary conductor, secondary configurations and phase balancing which are  
9 specifically targeted to enable greater demand reduction and energy efficiency by  
10 increasing the scope for control of overall circuit voltage via the controllable elements of  
11 the IVVC deployment.

12  
13 **Q. Have you identified other utilities that included IVVC as a component of and**  
14 **approved energy efficiency or demand side management portfolio?**

15 **A.** Yes, Indiana Michigan Power Company filed an Electric Energy Consumption  
16 Optimization (EECO) program as part of its DEMAND SIDE MANAGEMENT AND  
17 ENERGY EFFICIENCY PROGRAM COST RIDER (CAUSE NO. 43827 DSM-3) with  
18 the Indiana Utility Regulatory Commission. The EECO program described in the Indiana  
19 Michigan Power Company direct testimony of Jon C. Walter is substantially similar to  
20 the IVVC program proposed by OG&E. The Indiana Michigan Power Company EECO  
21 program involves the installation and subsequent control of field devices for voltage  
22 control through the application of lower circuit voltages and tighter voltage control  
23 bandwidths across the entire length of the distribution circuits on which it is applied. The  
24 lower circuit voltages and tighter voltage control bandwidths result in reduced energy  
25 consumption on EECO enabled circuits when EECO is in operation. The Indiana Utility  
26 Regulatory Commission found that "the EECO program meets the requirements for DSM  
27 under 170 IAC 4-8, and we approve the EECO program as part of the 2014 DSM Plan."

1 Q. **How will the IVVC Program be operated?**

2 A. During non-peak periods, VVO will normally operate in loss reduction mode. In loss  
3 reduction mode, VVO compensates for inefficiencies caused by reactive loads such as  
4 electric motors. As a result, energy loss reductions (i.e. energy savings) are expected to  
5 be realized during non-peak periods. VVO will be placed in demand reduction or  
6 combined loss/demand reduction mode when needed to help reduce system peak energy  
7 demand. Demand reduction mode reduces voltage in order to achieve a corresponding  
8 reduction in peak energy consumption. Based on study results achieved to date, a peak  
9 demand reduction of approximately 2% has been achieved across the circuits on which  
10 this technology has been deployed.

11  
12 Q. **What benefits will be achieved from the IVVC program?**

13 A. OG&E has calculated that the deployment of this program from 2016 through 2018 will  
14 achieve estimated savings of 12 MW and 5 MWh in the year 2016 and 15 MW and 5.9  
15 MWh in the year 2017 as shown in Chart 1.

**Chart 1: Annual IVVC Savings**

Year	Annual Net Savings - kWh	Annual Net Savings - kW	Lifetime Net Savings - kWh
2016	5,090,800	12,120	76,362,000
2017	5,938,800	15,150	89,082,000
2018	0	0	0
<b>Total</b>	<b>11,029,600</b>	<b>27,270</b>	<b>165,444,000</b>

16 Q. **What is the annual cost of the IVVC program?**

17 A. The IVVC program annual costs are detailed in Chart 2 below. These costs consist of  
18 distribution installation, engineering labor, materials, substation load tap changer (LTC)  
19 work and radio equipment. OG&E plans to deploy IVVC across 132 circuits in the 2016  
20 to 2018 timeframe.

**Chart 2: Total IVVC Budget**

Program	2016		2017		2018		Total	
	Capital	O&M	Capital	O&M	Capital	O&M	Capital	O&M
IVVC	\$12,812,774	\$ 414,149	\$ 5,866,827	\$ 545,831	\$ -	\$ 651,798	\$18,679,601	\$ 1,611,778

1 Q. **What are your recommendations to Commission?**

2 A. I recommend approval of the IVVC program as an energy efficiency program to be  
3 incorporated in the Company's portfolio of demand programs. I recommend approval for  
4 recovery of all costs.

5

6 Q. **Does this conclude your direct testimony?**

7 A. Yes.