BEFORE THE CORPORATION COMMISSION OF OKLAHOMA

IN THE MATTER OF THE APPLICATION OF	)	
OKLAHOMA GAS AND ELECTRIC COMPANY	)	
FOR AN ORDER OF THE COMMISSION	)	CAUSE NO. PUD 201100087
AUTHORIZING APPLICANT TO MODIFY ITS	)	
RATES, CHARGES, AND TARIFFS FOR RETAIL	)	
ELECTRIC SERVICE IN OKLAHOMA	)	

Direct Testimony

of

Tammy W. Turnipseed

on behalf of

Oklahoma Gas and Electric Company

July 28, 2011

QUALIFICATIONS, EXPERIENCE, PURPOSE

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

A. My name is Tammy W. Turnipseed. I am employed by Oklahoma Gas and Electric Company ("OG&E") and my business address is 321 N. Harvey, P. O. Box 321, Oklahoma City, Oklahoma 73101.

Q. **What position do you hold with OG&E?**

A. I hold the position of Leader of System Integrity in the Power Delivery department.

Q. **Please state your educational qualifications and employment history with OG&E.**

A. I graduated with a Bachelor of Science in Electrical Engineering from the University of Arkansas in 1983 and I received my Masters in Business Administration from Oklahoma City University in 1990. I am a licensed professional engineer in the State of Oklahoma. I joined OG&E in 1983 as an Engineer in the System Lab in Oklahoma City. After this initial position, I held various jobs in Relay and Control Engineering before becoming Manager of Relay and Control Engineering in 1994. In 1998, I became Manager of Transmission and Substation Engineering and served in that position until 2002 when I became Process Leader of Metrics and Design. In 2004, I was named to my current position.

Q. **Have you previously submitted testimony before this Commission?**

A. Yes. I submitted direct and supplemental testimony in Cause No. PUD 200800387[1].

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

A. The purpose of my testimony is to request an extension of the current System Hardening Program through December 31, 2013. First, my testimony describes the impact of extreme weather on a utility's distribution system and the importance of system hardening. Second, my testimony provides a brief background of OG&E's System Hardening Program approved by this Commission and discusses the performance to date regarding the two components of OG&E's system hardening efforts: aggressive vegetation management and circuit hardening. Third, I describe the specific amounts of funding needed to extend the program through 2013 and why the extension is in the public interest.

I. SIGNIFICANCE OF WEATHER IMPACTS

Q. **How can weather impact OG&E's distribution system?**

A. Each utility in the United States faces unique weather conditions depending on its location and the season. OG&E is certainly no different and there is evidence that our exposure to severe weather is greater than most other utilities. Since utility equipment is generally located outdoors and overhead it is especially vulnerable to damage. Storms and heavy winds can cause trees to collapse on electric lines which cause outages and damage to utility equipment. While the immediate aftermath and impact of the storm

[1]APPLICATION OF **OKLAHOMA GAS AND ELECTRIC COMPANY** FOR AN ORDER OF THE COMMISSION GRANTING THE RECOVERY OF COSTS ASSOCIATED WITH ITS SYSTEM HARDENING PROGRAM AND AUTHORIZING A RECOVERY RIDER

attracts the most attention, there is a latent weakening effect to the structural and electrical integrity of the distribution system caused by repeated or prolonged exposure to weather events. There are two primary types of weather conditions that can damage a distribution system and affect system reliability: high winds and ice accumulations on power lines. Although ice is most often only a threat during the winter months, thunderstorms and high winds may occur at any time. Therefore, there is a year round threat to the integrity of the utility's distribution system.

Q. **Did Oklahoma experience a severe weather event which prompted a closer look at how storms impact the electrical distribution systems in the state?**

A. Yes. Between December 8 and 10, 2007, Oklahoma experienced a catastrophic ice storm with extraordinarily severe effects on electric utility systems throughout the state. The ice storm crippled OG&E's system and resulted in outages to more than 300,000 OG&E customers. Many of those customers were without electricity for significant periods of time.

Q. **Has the Company conducted any studies related to vulnerability to severe ice storms and high winds?**

A. Yes. In October 2009, OG&E conducted a study entitled "*Electric System Reliability and Weather Factors in Oklahoma City"*. The study compared Oklahoma City with forty-nine other cities in the United States. Based on historical weather data, Oklahoma City ranked number one as the most vulnerable overall when wind, lightening and ice are taken

together. The study also stated that the state of Oklahoma historically places in the first quartile of the most severe weather likely to impact electric reliability.

Q. **Why is the impact of severe weather on electric service reliability important?**

A. Maintaining high levels of reliability despite potential severe weather conditions is important to electric utilities in order to improve customer satisfaction and meet customers' expectations for electric service. Electric service reliability indices are key performance indicators for electric utilities. Traditional indices such as SAIFI ("System Average Interruption Frequency Index") and SAIDI ("System Average Interruption Duration Index") are useful for measuring relative reliability among distribution systems over time. Later in my testimony, I will provide OG&E's SAIFI and SAIDI data for vegetation management and circuit hardening. Also, electric service reliability has an impact on the economy. The most comprehensive and recent study to quantify the economic impact of power outages by Lawrence Berkley National Laboratory concluded that power interruptions cost the United States a total of about $80 billion per year. [2]

Q. **How can utilities minimize the impact of severe weather events on the electrical distribution systems?**

A. Implementing system hardening options can improve the reliability, durability and resiliency of the power delivery system by protecting that system from outages caused by trees, ice and wind. System hardening options vary depending on a specific utility's operating standards, infrastructure characteristics, and historical construction standards.

[2] Hamachi-LaCommare, Kristina and Joseph H. Eto, "Understanding the Cost of Power Interruptions to U.S. Electricity Consumers." Ernest Orlando Lawrence Berkley National Laboratory, September 2004.

Q. **Please define "system hardening".**

A. System hardening is a systematic approach to improve the durability and resilience of the power delivery infrastructure during major weather events. It generally includes more aggressive vegetation management and upgrading the strength of overhead structures and circuits. The concept of system hardening has been around for decades, but gained traction as a viable methodology after the 2004-05 Florida hurricanes. Following the inquiry into system hardening by the Florida Public Service Commission[3], commissions throughout the United States undertook similar inquiries after severe weather damaged utility infrastructure in their regions. In Oklahoma, the Commission considered system hardening after the severe ice storm in 2007.

Q. **What does it mean to make the power delivery system more durable and resilient?**

A. Durability as related to system hardening refers to the ability of the electric infrastructure to withstand the impacts of storms without damage, or at least to avoid major damage. This can be accomplished by using materials or equipment that resist damage, arranging current equipment to resist or avoid damage and using technologies that help protect the system from damage. Resilience is the ability to continue to operate despite damage to some parts of the system. Some of these efforts include vegetation management, increasing pole strength, improving pole loading and undergrounding.

Q. **What is the intent of OG&E's System Hardening Program?**

A. The National Electric Safety Code ("NESC") is the foundation upon which utility standards are built. Utilities use the NESC's safety requirements to develop standards

[3] "Tough Enough", Miki Deric, Tom Kirkpatrick, Calvin Stewart, Electric Perspectives March/April 2010.

which are then used to design lines that meet normal and (when applicable) extreme wind and loading conditions for specific regions of the country. Because the OG&E electric delivery system has been built over a long period of time, the Company's System Hardening Program is intended to bring OG&E's electric circuits up to the Company's current construction standards so that the system will be less affected by severe weather conditions.

II. OG&E'S SYSTEM HARDENING PROGRAM

Q. **Did OG&E determine that system hardening could benefit its distribution systems?**

A. Yes. On December 2, 2008, OG&E filed an Application with the Commission seeking approval for a six-year System Hardening Program to begin in 2009 and requesting recovery of the costs associated with the program through a rider. The System Hardening Program involved capital expenditures for infrastructure strengthening and increased O&M expenses related to aggressive vegetation management in order to provide a more storm hardened system to better withstand the force of storms. On May 13, 2009 the Commission issued Order No. 567670 ("Final Order") approving the Joint Stipulation and Settlement Agreement ("Settlement Agreement") executed by all parties on March 9, 2009 that recommended a three year program to the Commission. Absent further action by the Commission, the program will end on June 30, 2012.

Q. **How did OG&E develop its System Hardening Program?**

A. OG&E retained Davies Consulting Inc. ("Davies Consulting") in April 2008 to assist the Company in developing a strategy to harden its electric delivery system to withstand

extreme weather. At that time, Davies Consulting had worked with a number of electric utilities[4] to evaluate various hardening options and to conduct cost-benefit analyses in preparation for presentations by those utilities to their regulators. Most of the recommendations proposed in Davies Consulting's August 20, 2008 report to OG&E were included in the System Hardening Application.

Q. **Please briefly address the terms of the System Hardening Program approved by the Commission.**

A. The 2009 Commission Order approved a three-year System Hardening Program ending June 30, 2012 which included circuit hardening, aggressive vegetation management and pilot programs to install breakaway connectors between poles and customers' service equipment, and the undergrounding of certain customer service drops. OG&E was authorized to incur O&M expenses of $33.2 million for aggressive vegetation management and associated non capitalized labor, and $35.3 million in capital expenditures for circuit hardening. The Settlement Agreement approved by the Commission further provided for the recovery of costs associated with the System Hardening Program through a System Hardening Program Rider ("SHPR").

Q. **Did OG&E complete the two pilot projects approved in PUD Cause No. 200800387?**

A. No. The Commission authorized OG&E to proceed with a breakaway pilot and an undergrounding pilot. The breakaway pilot was cancelled after OG&E determined that necessary components for the pilot created safety issues. There were no expenditures or devices installed in conjunction with this pilot. The undergrounding pilot was

[4] Progress Energy Florida; Florida Power & Light; Toronto Hydro

discontinued following the cancellation of the breakaway pilot because the pilots were designed for comparison against each other. OG&E fulfilled commitments to 70 customers participating in the undergrounding pilot with a capital cost of $143,998 which is included in OG&E's circuit hardening expenditures for 2010. Staff agreed with the Company's decision to discontinue the pilots once they were informed of the safety concerns.

Aggressive Vegetation Management

Q. **What is the general purpose of vegetation management?**

A. Vegetation management plays a key role in the protection and reliability of power lines and is designed to limit, remove or control the growth of vegetation in, around and under electric distribution lines. Methods of vegetation management include trimming, removal and control of woody plant material around OG&E's utility lines and equipment.

Q. **Why is it important to perform vegetation management?**

A. Vegetation growth around distribution lines is one of the key causes of outages for most utilities. For example, during storm events, trees or tree limbs in the vicinity of distribution facilities can become uprooted or break off and fall on power lines which then results in a service interruption. Heavy vegetation growth also increases restoration time during ice and wind storms.

Q. **Please describe the types of aggressive vegetation management measures utilized by OG&E in urban areas.**

A. In urban areas, OG&E removes trees with a diameter of less than 8 inches at chest height during the trim cycle. This segment of the aggressive vegetation management program focuses on OG&E's lateral lines which are generally the lines that run directly behind customer homes. Removal of these trees will help reduce momentary outages or blinks on the circuit by better protecting the secondary conductor. Most tree related outages are caused by tree limbs pushing the secondary wires together during windy days. From summer 2009 to date, 8 inch tree removal has impacted about 31% of our system. This will help to mitigate the amount of tree trimming required in future years.

Also in urban areas, OG&E removes larger trees that pose a threat to feeder lines. Feeder lines provide the bulk electric power from a distribution substation to the customers on a circuit. The large tree removal segment of the program targets trees that are located directly under or just to the side of main feeder lines from the substation. Tree related outages caused by these trees usually result in the loss of power to hundreds or even thousands of customers. These faults on the circuit usually lock out the entire circuit from being energized, whether it is caused by growing into the lines, ice load on the limbs, or heavy winds. From summer 2009 to date, large tree removal has impacted about 23% of the system in the Oklahoma City area. Also, additional trimming was pursued as necessary on circuits susceptible to outages from existing large overhanging vegetation to reduce occasional pockets of repeated outages during ice storms or periods of heavy wind.

Q. **Please describe the types of aggressive vegetation management measures utilized by OG&E in rural areas.**

A. OG&E uses herbicide treatments and mowing (mechanical removal of trees) in rural areas where those measures are more economical than trimming trees. Mowing is generally done prior to herbicide treatments to clear the area so the herbicides will be more effective. Herbicide treatment applications are sprayed and generally control or eliminate vegetation growth.

Q. **What is OG&E's actual and budgeted aggressive vegetation management spend during 2009 to 2012?**

A. Chart 1 below provides the aggressive vegetation management spend for 2009 to 2012, including the targeted amount, budgeted amount and the actual cost. In 2009, the Company spent all but $57,770 of the $7.3 million recommended target amount. In 2010, the Company's targeted budget amount was $12.8 million and the actual spend was $11,682,186. OG&E's 2011 budget is approximately $10.5 million and includes the $9.2 million recommended target amount, plus the unspent amounts in 2009 and 2010. OG&E's forecasted total spend at the end of the rider in June 2012 is $33,193,416. The level of O&M expense for vegetation management authorized in PUD Cause No. 200800387 was $33,200,000.

Chart 1
Aggressive Vegetation Management

Year	Targeted	Budget	Actual	Deferred
from July 2009	$7,318,000		$7,260,230	(57,770)
2010	$12,701,000		$11,682,186	(1,018,814)
2011	$9,201,000	$10,450,000		
to June 2012	$3,801,000	$3,801,000		

Q. **Please explain why approximately $1 million was deferred from 2010 to 2011.**

A. There are two main reasons why the targeted work was not completed in 2010 and therefore deferred to 2011. The herbicide contractor was suspended due to the non-performance of the contract. Due to the unavailability of contractors and the seasonal nature of work, the work was rescheduled for 2011. Also, OG&E's major bid contractor was experiencing critical staffing issues and was not able to complete the awarded work in 2010; as a result, $1 million was deferred to 2011.

Q. **Have OG&E's customers paid for work that was not performed in 2009 or 2010?**

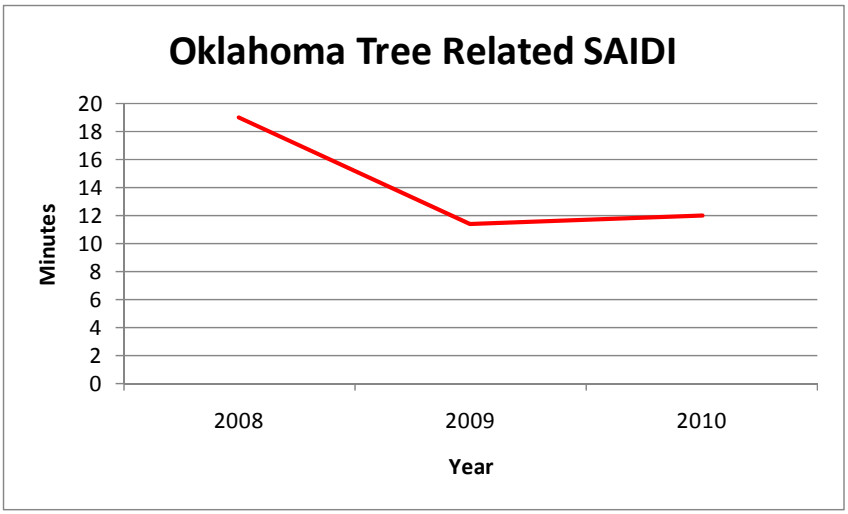
A. No. Only costs actually expended are recoverable through the SHPR.

Q. **Has OG&E seen the benefits of its aggressive vegetation management measures in Oklahoma?**

A. Yes. The benefits of aggressive vegetation management efforts in Oklahoma were seen almost immediately as related to the frequency and length of outages. SAIDI, which measures the average time per year OG&E customers are without service, shows that OG&E experienced a 44% reduction in tree related outages and a 49% reduction in OG&E customers affected by those outages. This means there was a reduction of seven

minutes in the average time customers were without service from 2008-2010, as demonstrated in Chart 2.

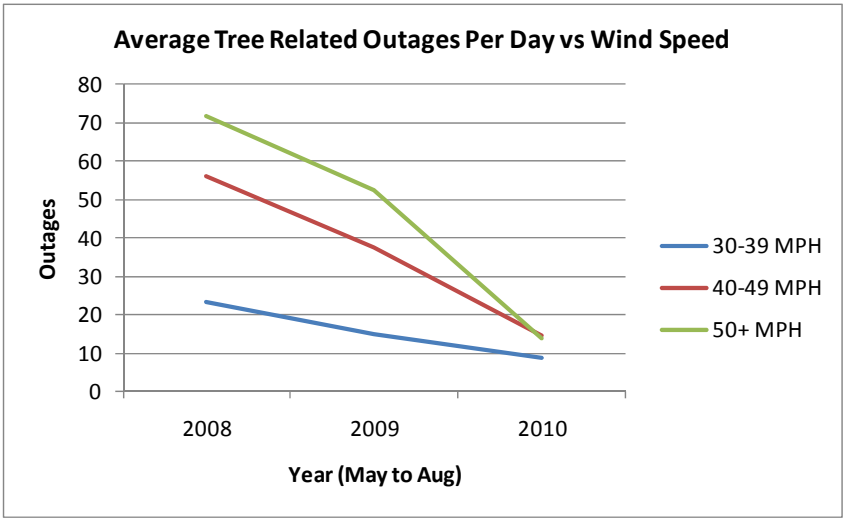
Chart 2



Q. **Has OG&E's aggressive vegetation management efforts contributed to a more wind resilient system?**

A. Yes. The Company's electric distribution system has become more resilient to heavy winds due to the increase in aggressive vegetation management. The Oklahoma City metropolitan area has seen a significant reduction in outages as a result of storms with high wind spends and high wind gust days. Chart 3 below provides data on days with wind speeds over 30, 40, and 50 MPH during Oklahoma's typical storm season (May to August). The average number of tree related outages during days of wind speeds over 50+ MPH were over 5 times less in 2010 than in 2008. For wind speeds between 40 and 49 MPH there were over 3.5 times less and between 30 and 39 MPH there were over 2.5 times less outages.

Chart 3



Circuit Hardening

Q. **What is the intent of OG&E's circuit hardening efforts?**

A. Circuit hardening is intended to strengthen the OG&E distribution system to help withstand major ice and wind storms, minimize the amount of damage sustained during such storms, and minimize the duration of any subsequent outages. This can be accomplished by upgrading circuits to current design standards, strengthening support structures, replacing certain wire conductors, upgrading the grade of construction for certain distribution facilities, and targeting undergrounding of certain lateral sections of distribution lines.

Q. **Please describe the Company's electric distribution system.**

A. OG&E's customers are served by over 384 OG&E owned distribution substations, more than 1,000 circuits throughout the electrical system, more than 28,500 route miles of overhead distribution lines and over 9,250 miles of underground distribution cable.

Circuit lengths range from 0.1 mile to over 216 miles due to the wide range of urban and rural territory. Each of these circuits serves from one to nearly 4,000 customers and an average circuit serves approximately 800 customers. Given the expansive distribution system, damage to an OG&E circuit has the potential to cause disruption to a substantial portion of OG&E customers.

Q. **How does OG&E determine which circuits on its system should be hardened?**

A. OG&E considers a number of criteria, such as the cost of the circuit hardening option, the number of customers affected by that circuit, critical customers on the circuit, the peak load associated with that circuit, the vegetation density around that circuit, the age of the circuit infrastructure, the accessibility to the circuits, and the possible reductions in the number and duration of outages for that particular circuit. These and other factors are assessed through program modeling in order to allocate limited capital expenditures and O&M expenses to select projects that will provide the greatest value to customers.

Q. **What is OG&E's actual and budgeted circuit hardening spend during 2009 to 2012?**

A. Chart 4 below provides the circuit hardening spend for 2009 to 2012, including the targeted amount, budgeted amount and actual cost. OG&E's circuit hardening target was $35,287,000, but due to the termination of the overhead to underground conversion pilot and breakaway pilot, the target amount was reduced to $33,980,988. The level of capital expenditures for circuit hardening authorized in PUD Cause No. 200800387 was $35,300,000.

Chart 4
Circuit Hardening

Year	Targeted	Budget	Actual	Deferred
from July 2009	$3,000,000		$998,303	(2,001,697)
2010	$15,000,000		$8,484,535	(6,515,465)
2011	$15,000,000	$18,000,000		
to June 2012	$0	$6,498,150		

Q. **Please explain why a portion of the costs were deferred.**

A. Costs have been deferred each year since 2009 due to the time it took to refine the review process between OG&E and Staff, and the time it took OG&E to obtain and streamline the contractor process.

Q. **Has OG&E experienced any successes as a result of the circuit hardening efforts as related to the number of outages?**

A. Yes. Through January 2011, the Company has performed circuit hardening on 62 circuits. Overall, there has been a 37% reduction of outage incidents and a 47% reduction of customer minutes of interruption during the same annual time periods before construction compared to those annual time periods after construction was completed.

Q. **Do you have any specific examples of how circuit hardening has proven successful during a recent weather event?**

A. Yes, the system experienced a major wind event on April 15, 2011. In Oklahoma City, the daily average wind speed for that date was 26.2 miles per hour compared to an average daily wind speed for the month of April of 13.2 miles per hour. Oklahoma City experienced gusts up to 67 mph while areas outside the metro experienced gusts around

47 mph. The Company analyzed 59 circuits that had circuit hardening projects completed. The performance of the hardened circuits was compared to 123 non-hardened circuits that were served from the same substations as the hardened circuits. Of the 59 hardened circuits, 3 circuits (5%) experienced 4 incidents for an average outage time of 3,223 Customer Minutes of Interruption ("CMI") per incident. Of the 123 non-hardened circuits, 26 circuits (21%) experienced 55 incidents that averaged 16,008 CMI per incident. Non-hardened circuits were four times as likely to experience an outage and those outages had five times the amount of CMI per incident. In addition, one circuit, Sara 71, had received both circuit hardening and aggressive vegetation management. The Sara 71 circuit had no outages on April 15, 2011.

III. RELIEF REQUESTED

Q. **Please describe what the Company is requesting for its System Hardening Program in this cause.**

A. OG&E is requesting that the System Hardening Program be extended an additional eighteen months through December 31, 2013. During this extension period the Company proposes to harden an additional six circuits serving approximately 9,000 customers on approximately 80 miles of distribution lines at a capital cost of $15 million. Using the model, these six circuits were next on the list as providing value to the customer. In addition, OG&E would spend an additional $10.95 million for aggressive vegetation management.

Q. **Please describe how OG&E proposes to spend the $10.95 million requested for aggressive vegetation management.**

A. On an annual basis, the Company proposes to spend an additional $4.8 million for eight-inch tree removal. For rural herbicide applications, OG&E proposes to incur an annual investment cost of $1.25 million and an additional annual investment of $1.25 million for large tree removal.

Q. **What has OG&E accomplished thus far in implementing aggressive vegetation management authorized by the Commission?**

A. There are seven parts of aggressive vegetation management. Of the seven current parts of aggressive vegetation management, the two segments for the urban and rural catch-up to 4-year cycle are completed. The two segments for overhang and additional clearance segments will be incorporated in OG&E's regular vegetation management operations.

Q. **What segments are intended to continue during the extension period?**

A. The three remaining segments to be continued are the 8-inch tree removal, the large tree removal and the rural herbicide applications. They are expected to yield the most value for customers on a moving forward basis. This program will be further evaluated at the end of 18 months.

Q. **Will the additional funding for aggressive vegetation management enhance system reliability and resiliency?**

A. By continuing aggressive vegetation management, OG&E will continue with the plan to target and reduce the overall vegetation canopy that could interfere with electric service to OG&E's customers. These additional efforts will help maintain and improve upon the resiliency and reliability of the distribution system which has been achieved over the last two years. In addition, the Company expects to be able to maintain a 4-year cycle and our regular vegetation management operations without increasing the budget through 2013.

Q. **Have other utilities increased budgets for vegetation management?**

A. Yes. For example, in August, 2010, Potomac Electric Power Company ("PEPCO") outlined a six-point reliability plan as a result of July thunderstorms that left over 300,000 customers without power. PEPCO also stated 90% of their outages were a result of trees. One of the 6 points made was to increase their "Enhanced Vegetation Management" by nearly 60% or by $3 million per year. When OG&E conducted a peer utility survey on vegetation management all the utilities that replied[5] had increased their budget, and six of the nine increased their budget to either reduce their cycle length or start an aggressive/enhanced vegetation management program.

IV. CONCLUSION

Q. **What were the objectives in establishing a System Hardening Program?**

A. OG&E's objectives, and I believe they were shared by all the parties to the Stipulation, were to (i) build a hardening plan that could be implemented over a period of time to

[5] Ameren Illinois, DTE Energy, Northeast Utilities, South Carolina Electric and Gas, Dominion Virginia Power and AEP Public Service of Oklahoma

reduce the impact of storms on the OG&E system; (ii) ensure prudent allocation of hardening dollars and minimize cost to customers; (iii) leverage the existing data and knowledge of the Company's delivery system; and (iv) employ a collaborative approach to address the concerns highlighted by the 2007 ice storm.

Q. **Do you believe that OG&E has accomplished the objectives described above?**

A. Yes, and the relief OG&E is requesting regarding the System Hardening Program in this cause is intended to continue those objectives and maintain the success of the System Hardening Program. Due to system hardening and other efforts the Company has undertaken, the reliability for OG&E customers has improved as shown by the charts below. Chart 5 shows that OG&E's SAIDI has improved over 35 minutes from 2008 through 2010. Chart 6 illustrates a 25% improvement in SAIFI from over 1.3 outages to less than 1.0 outages per customer per year.

Chart 5

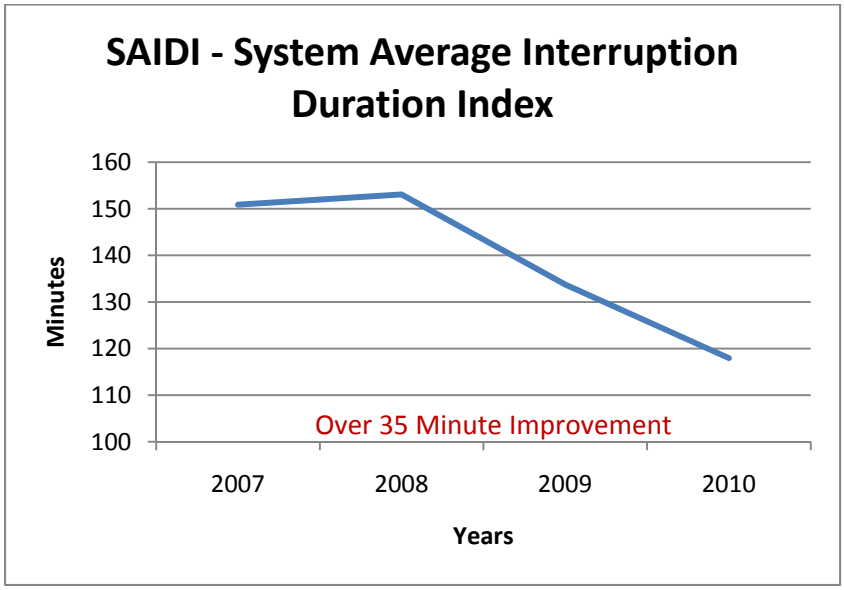
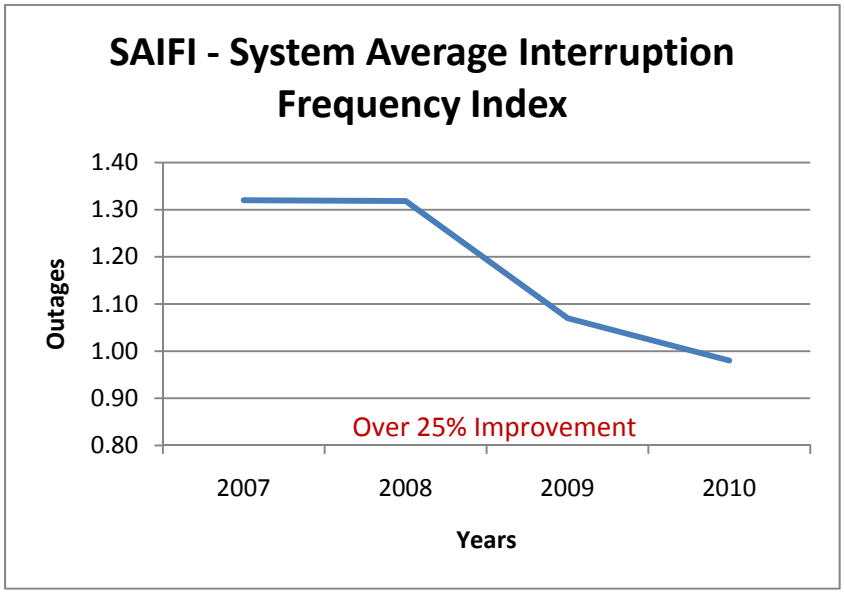


Chart 6



As demonstrated by these charts, the resilience and reliability of the system has been improved. Additionally, the Company believes that the reduction in outages has improved customer satisfaction. For these reasons, OG&E is requesting to extend this program, which will maintain these positive results and expand its benefits to a greater portion of the system.

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

A. Yes.