**BEFORE THE CORPORATION COMMISSION OF OKLAHOMA**

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| IN THE MATTER OF THE APPLICATION OF | ) | |
| OKLAHOMA GAS AND ELECTRIC COMPANY | ) | |
| FOR AN ORDER OF THE COMMISSION | ) | |
| AUTHORIZING APPLICANT TO MODIFY ITS | ) | CAUSE NO. PUD 201700496 |
| RATES, CHARGES, AND TARIFFS FOR RETAIL | ) | |
| ELECTRIC SERVICE IN OKLAHOMA | ) | |

# Direct Testimony

of

Robert J. Burch

on behalf of

Oklahoma Gas and Electric Company

January 16, 2018

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

A. My name is Robert J. Burch. My business address is 321 North Harvey, Oklahoma City, Oklahoma 73102.

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

A. I am employed by Oklahoma Gas and Electric Company ("OG&E" or "Company") as Director, Power Supply Services. My duties entail managing the generation engineering group and operation of OG&E renewable generation assets. I began my career with OG&E in 2012.

Q. **Would you please summarize your professional and educational background?**

A. I have been employed by four electric utility companies, a specialty chemicals refinery and a nationwide food manufacturing company over the last 32 years in a number of positions of responsibility including engineering, maintenance and operations and encompassing various management and executive assignments. Prior to OG&E, I was employed by Duke Energy/Cinergy in several positions, the last of which was Director of Engineering, Edwardsport Integrated Gasification Combined Cycle ("IGCC") generation station at Edwardsport, IN. The Edwardsport IGCC generation station is a $3.6 billion state of the art, advanced coal facility that entered commercial operation in 2013. My duties on the project included leading the effort to obtain all of the required environmental permits, technical management of 27 engineers engaged in the review of the plant engineering design, including a $130 million zero liquid discharge system to treat process wastewater and project management responsibilities for an 8 mile, $32 million private rail spur into the facility.

I received a Bachelor's of Science degree in Mechanical Engineering in 1985 from Rose-Hulman Institute of Technology.

more detailed explanation of OG&E's capacity needs and expansion plans please refer to the Direct Testimony of Leon Howell.

**Required Operating Characteristics of the Replacement Capacity**

Q. **What did OG&E determine were the required operating characteristics for the replacement capacity for Mustang and why were those needs important to customers.**

A. OG&E routinely evaluates its generation assets and how those assets meet the needs of its customers. Over the course of many years those needs have evolved from traditional base load generation with peaking capacity that was designed to serve the native load of a utility, to a fully integrated economic market, encompassing multiple utilities and geographically diverse assets that stretch north to south from Texas to the Canadian border and east to west from nearly Illinois to central Montana. Adding to that change has been the influence of significant and growing amounts of non-dispatchable renewable generation, primarily in the form of wind generation. As an example, wind capacity in the SPP during 2016 grew by more than 30%, up from 12 GW to more than 16 GW.

As OG&E evaluated the need to replace the Mustang capacity in 2014 it recognized that new assets needed to be extremely flexible in order to maximize their value to customers in the evolving marketplace. Flexibility was considered to be the ability to start quickly to respond to system needs, ability to start multiple times per day if necessary and ideally be sized in smaller blocks of generation in order to better match demand. The selected units will meet all of those criteria while exhibiting better efficiencies and lower maintenance costs than typical peaking units.

The ability to start quickly is beneficial in a number of respects. Quick start units are ideal in support of non dispatchable resources. As generation from those resources can vary considerably, the ability to start units and have them on line and at full load within 10 minutes reduces any system impacts that variability may create. With the SPP seeing an increasing percentage of its total generation coming from wind, the ability to fill and smooth those gaps will be critical. As an example, the SPP footprint set a record of over 54% of the energy being generated coming from wind generation. The previous record was 48.3% in March 2016. In terms of total energy consumed within the SPP, the

contribution from wind generation has increased from 13.5% in 2015 to 17.07% or approximately 45.5 GW in 2016.

Quick start units are also better suited to respond to transmission system upsets and provide voltage support than other types of units. For a more thorough discussion of system reliability benefits provided by quick start units please see the Direct Testimony of Gregory McAuley.

Quick start units can also mitigate price spikes caused by the loss of another generating unit on the system. There are times where the loss of generation drives the local cost of electricity to high levels as other generating units either have to be started up or units already on line are ramped up to cover the loss. In this scenario, quick start units can come on line and replace that generation in a matter of minutes, covering the loss and tending to mitigate the price spike to customers.

The ability to start units multiple times per day in support of system demand is very beneficial in terms of controlling customer costs. It is common for system demand to have two definite peaks, particularly in colder months. Units that can start multiple times per day can cover the demand during those peaks but come off line when the system needs are lower and can be covered by other units with lower costs.

Smaller block of generation vs. larger capacity units also allow flexibility on the system. This allows units to be started and operated at lower minimum loads if necessary and in different services simultaneously. For example, a unit at OG&E's Redbud plant has a minimum load of 130 MWs and can either run based loaded or in regulation assist (following system load), it cannot do both at the same time. By contrast, two Mustang units can meet that need better. One unit could be in regulation assist between minimum load of 32 MWS and full load at 66 MWs while the other unit is at full load at 66 MWs. These two units essentially represent the same capacity on line, but in this scenario the Mustang units would be filling multiple roles while the Redbud unit can only operate in one role at a time.

The long term service agreement ("LTSA") with General Electric, the OEM for the CT, and changes to a starts based agreement when the units see 900 starts during the operating life of the combustion hardware. Once 900 starts are achieved, this hardware must be replaced. Instituting the minimum 35 hours run time keeps the units from

achieving 900 starts before it sees 32,000 hours of service. Avoiding a starts based LTSA spreads the downtime and expense of the combustion hardware outages over a longer interval and spreads the customer spend over a longer timeframe. By contrast the units at Mustang are not limited to starts and can be cycled on and off to optimize customer value with respect to real time pricing.

Q. **Do CTs make up a large percentage of OG&E's capacity?**

A. No. That is one of the drivers that led OG&E to conclude the required operating characteristics provided by quick start CTs was lacking in its generation fleet. Presently, only a very small percentage of OG&E's generating capacity is filled by CTs and the majority of those units are not registered with the SPP as a quick start resource. Those consist of four units (Tinker 5A & 5B and Horseshoe Lake Units 9 & 10) totaling 154 MWs based on the 2017 SPP capacity report. This is down from the 2014 IRP update where the number was 176 MWs. The difference is driven by the retirement of Seminole GT1 and small seasonal fluctuations on unit capacities at the time they were tested. These CT capacities are out of a generation fleet totaling nearly 7000 MW of capacity.

## Evaluation and Selection of the Replacement Capacity

Q. **What technologies did OG&E evaluate to meet its need for flexible generation?**

A. OG&E continually evaluates and maintains resource planning level information on types of generation available, their overnight capital and operating costs and their performance characteristics. This information is included in IRPs that the Company submits every three years or when there are major changes, as was the case when the 2014 IRP update was submitted. Page 30 of that document lists the options considered. Simply based on overnight price the decision was made to install natural gas fired generation. The Company did not consider renewable generation as a viable alternative in this case, for a number of reasons. First, this generation had to count as capacity toward our capacity planning margin. As discussed on pages 31 and 32 of the 2104 IRP update, neither wind nor solar technologies would allow full accreditation. Second, the overnight price for both technologies in 2014 was on the order of twice the cost of gas generation. And finally, based on the necessary operating characteristics stated above, quick start and

multiple starts per day, renewables did not meet this need. For a more thorough discussion of OG&E's generation selection process please see the Direct Testimony of Leon Howell.

Q. **After OG&E concluded that natural gas generation would be the optimal replacement for the capacity need, what types of natural gas generation were evaluated?**

A. OG&E considered conventional and advanced combined cycle units and traditional and aero derivative simple cycle combustion turbines and screened those types of generation against the required operating characteristics described above. As a result of that screening, OG&E concluded that aero derivative combustion turbines were the best choice based on their quick start capability, ability to start multiple times per day and the fact that they were sized in smaller sized smaller blocks of generation. These units are able to meet all of these criteria with good efficiency and lower maintenance costs.

Q. **Did OG&E's decision to install quick start CTs come at a premium cost over installing a combined cycle unit?**

A. No. OG&E's Resource Planning group evaluated the life cycle costs of various combined cycle and simple cycle alternatives. The aero derivative CTs at Mustang had a lower life cycle cost than a combined cycle unit. These evaluations are based on the lowest revenue requirement from the customer over the life of the asset and include evaluation of costs such as capital costs, fuel and maintenance costs. This lower price combined with the ability for aero derivative CTs to better meet OG&E's required operating criteria drove the decision to select aero derivative CTS for the Mustang project. For a more thorough discussion of OG&Es economic analysis related to revenue requirements please see the Direct Testimony of Leon Howell.

Q. **Are there any other benefits to the customer that the new units at Mustang could provide?**

A. Yes. The new Mustang units are eligible to receive payments for providing operating reserves. Operating reserve payments can take the form of spinning reserves, regulation and supplemental reserves. Spinning reserves represents unloaded capacity on units that are on line but not fully loaded. The benefit is flexibility to respond to system needs. Regulation represents an on line units' capability to follow system demand, raising or lowering output as required to balance the system. Supplemental reserves represent off line capacity that can be started up in 10 minutes or less, meeting an unexpected need on the system. The new Mustang units would qualify for supplemental reserves. The only other units in the OG&E system that meet this criteria would be the approximately 70 MWs of capacity in the Tinker units (Mustang 5 A and B). From the start of the Market in March 2014 through December 6, 2017, OG&E customer share received payments totaling $1.3 million for supplemental reserves on the Tinker units.

In the SPP Marketplace, aging fossil fuel resources and extreme variability in renewable resources output is resulting in more occurrences in which there is not enough ramp-able generation capacity in the Marketplace to cover short-lived scarcity events. To address this challenge, highly flexible, faster responding resources can provide this ramp-able capacity and for this reason the Marketplace is discussing the addition of a ramp product market. A ramp product market represents rewarding units that can not only respond to system changes but do so quickly. This market would be well suited to the new Mustang units and be beneficial to the SPP Marketplace as a whole as it continually seeks to ensure system reliability. Should a ramp product market develop, OG&E would be well positioned with its new Mustang units to capture customer benefit in this area.

Q. **What methods did OG&E consider for obtaining aero derivative CTs?**

A. OG&E's Resource Planning Group was unaware of any quick start aero derivative CTs for sale or for contract in the market in the 2014 timeframe. Given that no CTs were available and the benefits to customers from re-using the Mustang site, as discussed below, OG&E concluded that a self-build option at Mustang was in the best interest of

customers. For a more thorough discussion of OG&Es efforts to source capacity that met its operating criteria, please see the Direct Testimony of Leon Howell.

Q. **How does OG&E's decision to install quick start CTs compare to decisions made by other utilities.**

A. OG&E asked two of our partners to relay their experience with regard to equipment and services they are being asked to quote and provide regarding new generation projects.

Siemens, who is providing the CT equipment on this project, and does so for numerous customers worldwide, has indicated that IHS and their own order history indicates that beginning in 2020 and beyond CTs are the preferred generation with more than 50% of the market being CTs.

Burns and McDonnell, who is a worldwide Engineering and Construction company with vast experience in the Power sector, was also contacted and responded that their experience indicates that the trend toward fast and flexible gas generation begin in 2010 making up approximately 2/3 of the simple cycle market with Aero derivatives accounting for more than half of the installations.

## Description of the Replacement Capacity

Q. **Please describe the aero derivative units OG&E intends to install at the Mustang site.**

A. The CTs being installed at Mustang are of a class known as Aero-derivative and can best be described as resembling a jet engine on a commercial aircraft. Many of the attributes that one would hope for in a commercial airline engine apply to the needs at Mustang. Fast starts, multiple starts per day, reliable operation, low operating and maintenance costs and low emissions. A form of the selected CT is in aviation service around the world with many installed on Boeing 777's.

Q. **How do CTs produce electricity?**

A. Much like airline engine operation, ambient air is introduced to the unit through a compressor that brings it to a higher pressure. Energy is then added by spraying fuel (natural gas) into the air and igniting it so the combustion generates a high pressure, high

temperature flow that expands through a turbine. The difference between the airline engine and the CTs at Mustang is that the turbine is connected by a shaft to a generator, which produces electricity. In the airline the hot exhaust exits the engine to propel the airplane.

Q. **Which aero derivative CTs are being installed at Mustang?**

A. OG&E conducted a comparative bidding event for aero derivative CTs and as a result selected and are installing seven Siemens Trent 60 units at the Mustang Plant site, with a nameplate rating of 66 MWs each.

## Why at Mustang Energy Center?

Q. **Why did OG&E select the Mustang site to locate new generating units?**

A. The Mustang site offers several clear and distinct advantages to OG&E's customers. Those advantages include being in close proximity to OG&E's largest load center, having an established infrastructure in place, having a trained and experienced workforce and having existing environmental permits and strong community support. Each of these advantages saves customers money.

Q. **Please explain the advantages the existing Mustang site has with respect to its proximity to the load center.**

A. Maintaining generation at this location is very important to OG&E system operations. The Mustang site already has an existing, robust high voltage transmission system in place consisting of nine different transmission lines on two separate voltage systems. This results in better reliability of the transmission grid as opposed to locating the new generation at a more remote location. Generation close to the load source reduces line losses, reduces line congestion and cost, supports voltage control, and facilitates our system restoration plan. Witnesses McAuley and Nickell discuss the reliability benefits of CTs at the Mustang site.