

The background of the slide is a photograph of a high-voltage electrical substation. The silhouettes of the metal structures, insulators, and power lines are set against a bright orange and yellow sunset sky. The sun is positioned in the lower center, creating a strong lens flare effect. The overall mood is industrial and energetic.

# chapter two

energy productivity

# CHAPTER 2: ENERGY PRODUCTIVITY

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## Our Situation

Energy is critical to our way of life. Without it, we could not fuel our homes, businesses, hospitals, or schools, and energy - oil and natural gas - has long been a pillar of our economy. Yet as Oklahoma City continues to grow, we cannot overlook the generation and use of our most fundamental form of energy: electricity.

In *Energy Productivity*, we examine our relationship with electricity and the economic and environmental implications of how it is used and generated. We propose both a vigorous commitment to renewable energy and a restored focus on energy efficiency. While the price of electricity may be low, we cannot afford to remain complacent about the costs of our consumption.

Oklahoma City's electricity generation needs are largely served by the investor-owned utility Oklahoma Gas and Electric (OG&E). While OG&E is a publicly traded company, it is not a unit of government or publicly-owned entity, which can limit the influence of municipalities on issues like renewable energy, energy efficiency, streetlights, and more.

Oklahoma City has immense potential to see economic and environmental benefits by embracing energy efficiency measures and implementing renewable energy. Those benefits can apply to both

City operations and to the residents and businesses across the city. A current benefit is a relatively low price of electricity. Nationally, Oklahoma was ranked fourth lowest for average electricity price in 2017. Locally, OG&E was similarly found to have the fifth lowest average electricity price among all 49 electric utilities within Oklahoma.

What low price overshadows, however, is the quantity of consumption. While total residential sector electricity consumption is below the national median, per capita residential electricity consumption in Oklahoma is in the top third of all states. In 2017, homes statewide paid the 6th lowest average electricity price in the U.S. yet were 13th for average monthly electricity use. We surpass Maryland, Colorado, Massachusetts, and Oregon in total electricity use despite the larger population of all four of those states.

Consuming more creates demand for the fuels used to make electricity. In Oklahoma City that means greater than 90% of those fuels are non-renewable fossil fuels in the form of coal and natural gas. Reliance on coal can keep the direct cost of electricity low, but indirect costs, like health outcomes, increase total costs to residents. Coal combustion results in several emissions that are harmful to human and environmental health. These emissions contribute to

climate change and cause respiratory illness and lung disease, as well as smog, haze, and acid rain.

Electricity use in Oklahoma City is highest in the three-month window of July, August, and September when regional temperatures peak. Oklahoma City's average annual temperature is projected to increase as much as 6°F with a decrease in precipitation through 2080. The number of days and nights of extreme heat will also continue to increase along with summertime electricity use and costs to residents.

Renewable energy such as solar and wind can insulate residents from volatile fossil fuel commodity values and negative health effects. Oklahoma is already a leader in wind energy production nationally, but has unrealized potential with solar and geothermal. As a recognized energy capital, we have the opportunity to embrace our most abundant and renewable energy assets.

We can harness these diverse resources to guarantee economic and environmental productivity, and we should do so now rather than await climbing costs that will hinder our ability to support the future of Oklahoma City and all its residents. We can work to increase the productivity of our energy use and align state law, municipal policies, and regulatory rules to support clean energy.

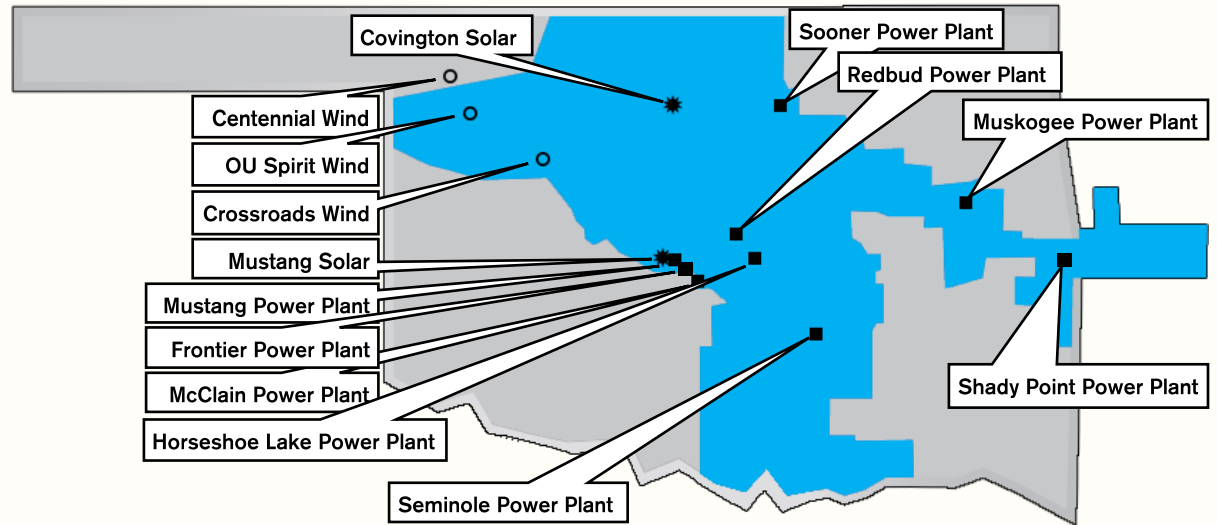
## Electric Utilities

Oklahoma City is served primarily by OG&E, an investor-owned utility that generates, transmits, distributes, and sells electricity to 268 communities with a combined population of about two million across 30,000 square miles in Oklahoma and western Arkansas. Small portions of Oklahoma City’s periphery are served by locally-owned electric cooperatives. There are also City facilities outside of our corporate limits, including Atoka pipeline booster pump stations and both the Deer Creek and Chisholm Creek wastewater treatment plants, who may be serviced by other electric utilities. None of these service territories overlap as Oklahoma law prohibits competition between utilities and instead grants exclusivity in service territories with regulation by the Oklahoma Corporation Commission (OCC) acting “as a surrogate for competition.”

OG&E is not a government entity but a publicly traded corporation overseen by a board of directors and beholden to shareholders. OG&E is just one of the investor-owned utilities in Oklahoma. The other major utility - American Electric Power (AEP), which operates as Public Service Company of Oklahoma (PSO) - serves much of the northeastern, southeastern, and southwestern portions of the state including the Tulsa metro, McAlester, and Lawton. Many rural areas are served by one of 33 electric cooperatives, which are private, non-profit corporations owned by ratepayers themselves.

While OG&E serves most of Oklahoma City, its service territory spans well beyond our city limits. This means any and all growth in population or economy – including our own – within the service territory impacts the electricity on which we rely. The facilities depicted in **Figure EP-1** are those that generate electricity used throughout OG&E’s service territory, meaning no facilities are dedicated to specific areas. Transmission infrastructure distributes the generated electricity throughout the service territory. Growth and development can require new transmission infrastructure and eventually the need for new generation facilities. These costly needs are paid for by all ratepayers within the service territory, meaning the price of Oklahoma City’s electricity is

Figure EP-1: OG&E Service Territory and Facilities, 2020



In 2019, OG&E purchased two additional power plants: the Shady Point plant near Poteau and the Oklahoma Cogeneration plant - renamed the Frontier plant - in western Oklahoma City.

OG&E is tied to what occurs not just within our city limits but in the whole of the OG&E service territory.

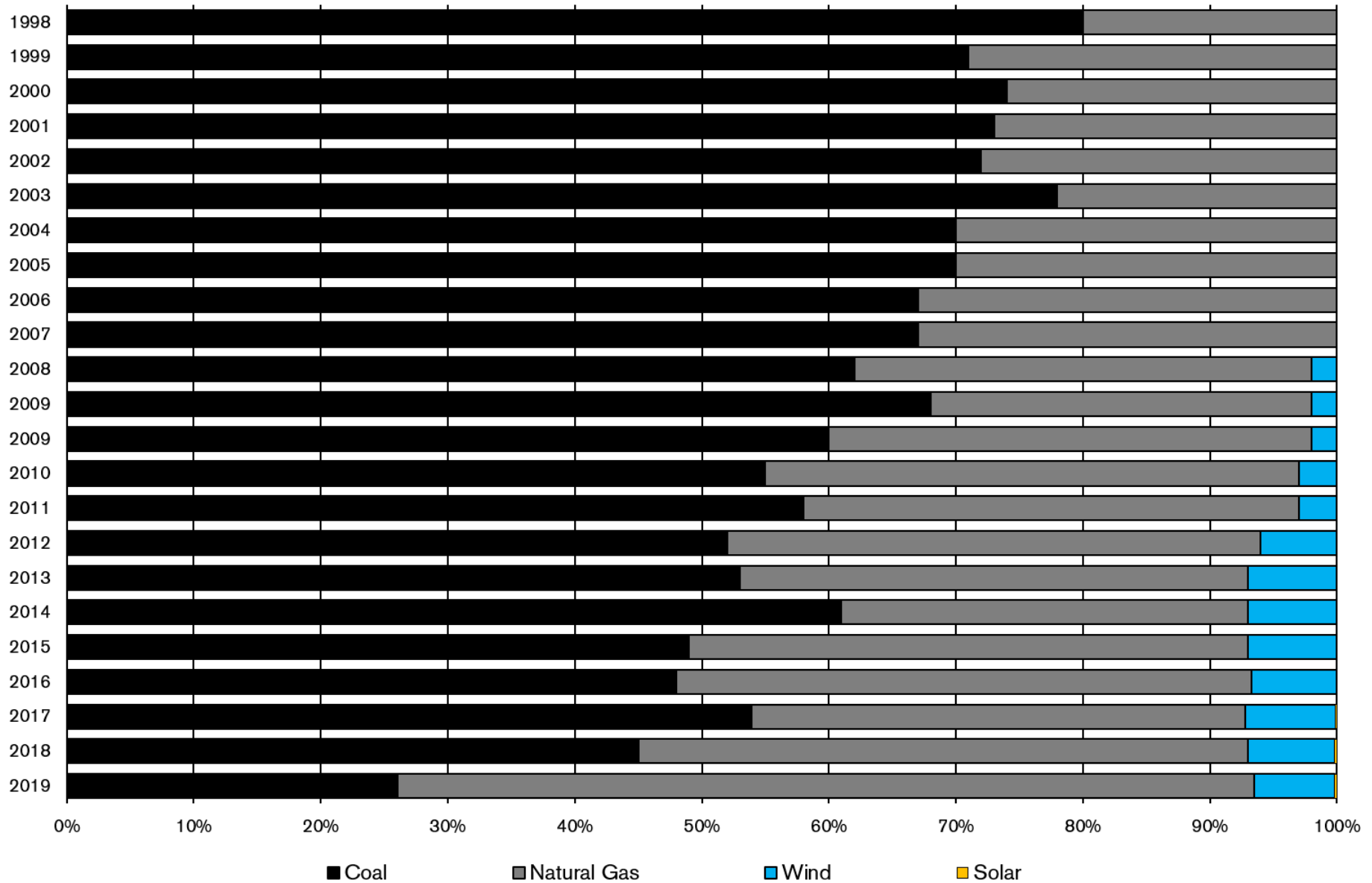
How electricity is priced by OG&E varies due to tariffs. Utility tariffs are collections of rates and charges which can vary by season, time of use, sector, facility size, amount of electricity used, and more. For example, OG&E has four different tariffs that can apply to residential ratepayers, six tariffs for public schools, and three for oil and gas producers. All tariffs are submitted to, reviewed, and approved or denied by the OCC, whose responsibility it is to regulate “in the interests of the public.”

OG&E is able to assess, adjust, and recover fuel costs based on commodity prices. Coal and natural gas are purchased as commodities, which are subject to price volatility. Renewable forms of energy are not subject to these variable fuel costs. OG&E publishes average price per kilowatt hour by generation fuel which illustrates the pass-through commodity cost on an annual basis. These costs are pass-through as they

are recoverable through fuel adjustment clauses, which allow OG&E to adjust rates based on market commodity prices whether they increase or decrease. The annual price of natural gas especially demonstrates volatility, though OG&E does have ownership in publicly-traded natural gas midstream company, Enable Midstream, that operates across four states and three major shale developments.

While coal demonstrates more stable pricing, OG&E’s supply of low-sulfur western coal is purchased from Wyoming suppliers. The volatility of commodity prices are a fundamental difference between fossil fuels and renewables: solar, wind, and geothermal tap into unlimited “fuel” with no price tag. As such, these sources of energy remove a significant cost that would otherwise be passed-through to ratepayers.

Figure EP-2: OG&E Electricity Generation Mix, 1998 - 2019



Source: OG&E

Though its use has declined over the past 30 years, coal remains a major component of OG&E's electricity generation fuel until falling sharply in 2019. The growth of renewable generation, primarily wind, can be seen slowly over the past decade and has yet to reach 10% of annual generation and solar generation was not added until the 2018 calendar year as 0.2% of overall generation.

**Franchise Fees.** Franchise fees are charged to public utilities for the use of public rights-of-way for their infrastructure. These fees, which differ from utility to utility, are the second largest contributor to the City's General Fund after sales tax.

OG&E pays an annual franchise fee of 3% of gross revenues on electricity sales within the corporate limits of Oklahoma City. The City is also provided a credit of up to 0.5% of kilowatt-hours sold to Oklahoma City ratepayers which can be applied to public assets including street lights, traffic signals, and City buildings. The terms of the current OG&E franchise agreement were approved by City Council on March 7, 2006, and approved in an election on May 9, 2006 with 3,905 voters. The franchise agreement's terms remain for a 25-year period, meaning a new franchise agreement will not be voted on until 2031.

The OG&E franchise agreement fundamentally compounds the financial contradiction of energy efficiency. The agreement ties franchise fees to gross revenue and because of this creates an incentive to maintain or increase electricity use in Oklahoma City. Similarly, sales tax levied on electricity bills is also one of the largest sources of revenue for the City. In other words, when electricity consumption in Oklahoma City is reduced, the City receives less revenue from two sources: franchise fees and sales tax.

**Electricity Generation.** How the electricity we use is generated connects directly to our local economy. The City of Oklahoma City itself is one of OG&E's largest customers but also represents more than 400,000 ratepayers within its corporate limits.

From 1998 to 2017, the fuel mix used by OG&E averaged about 64% coal, about 34% natural gas, and wind about 3%. Over this 19-year term, OG&E's reliance on imported coal decreased 32.5%, hitting a low of 48% in 2016; natural gas has expanded 95% with a high of 45.3% in 2016; and wind, not added to the generation mix until 2008, has grown 250% (**Figure EP-2**).

The volatility of commodity pricing is reflected in natural gas' 2016 peak share, as that year saw the



Photo by Trace Thomas

OG&E has two solar generation plants: a 2.5 MW, 10,000 panel plant at their Mustang facility and a 9.7 MW, 38,000 panel plant in rural Oklahoma near the town of Covington.

prices of natural gas and crude oil fall to their lowest points in a decade. Illustrative of this, too, is the 41% decrease in kilowatt hours for OG&E oilfield accounts in Oklahoma from 2015 to 2016.

OG&E holds a 25.7% limited-partnership interest and 50% management interest in Enable Midstream alongside Houston-based CenterPoint Energy. Enable owns and operates natural gas and crude oil gathering and natural gas processing assets across five states that include the Anadarko Basin, the Arkoma Basin, the Ark-La-Tax Basin, and the Williston Basin.

## Resident Savings

While critical to address how our electricity is generated, it is no less important to ensure energy consumption is as efficient and productive as possible. OG&E's customer numbers for 2018 show 849,372 accounts across their service territory. Of those, the vast majority - 725,440, or 85% - are residential. Those residential accounts use an average of 13,446 kWh annually at an average price per kWh of \$0.926.

State data for 2017 published by the U.S. Energy Information Administration (EIA) found homes

across Oklahoma have the sixth lowest average monthly price for electricity. Nonetheless, homes statewide were 13th for monthly electricity use, ranking 26th by average size of monthly electricity bills. Residences in Oklahoma are, on an average monthly basis, using more electricity and thus paying more for that electricity than residences in 24 states including California, New York, Colorado, Arkansas, and Michigan. Of those 24 states, 21 had a higher average electricity price than Oklahoma.

The Census Bureau's American Housing Survey five-year estimates for 2013 through 2017 includes housing costs for cities including Oklahoma City. Of an estimated 237,895 occupied housing units citywide, 29% are considered unaffordable. This is based on the definition of affordable housing used by the U.S. Department of Housing and Urban Development (HUD): households who pay more than 30% of income for housing, including utilities. It is also important to note the difference in housing costs between owner-occupied and renter-occupied. Based on the same 30% or more HUD threshold, 19.5% of owner-occupied housing is unaffordable while 42.8% of renter-occupied units are unaffordable.



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## LEFT: RESIDENTIAL LEED

This single-family home, built as part of Central Oklahoma Habitat for Humanity's 217-home Hope Crossing neighborhood in northeast Oklahoma City, earned silver LEED accreditation in 2009. Homes in this development were affordably priced around \$85,000 and included geothermal HVAC systems.

The most recent American Housing Survey data includes housing-related costs for a sample of 25 U.S. cities. Per that data, the largest share of Oklahoma City households - about 30% - pay between \$100 and \$149 per month for electricity, followed by 20% of households who pay \$150 or greater. Citywide, the median monthly cost of electricity per household is \$104 for an annual median cost of \$1,248.

OG&E forecasts electricity sales across their service territory will increase 6% between 2017 and 2024, an indicator of population and economic growth. Oklahoma City residential electricity use is driven heavily by cooling as evidenced by OG&E peak demand during hot summer months, especially June, July, and August. Nationally, the EIA projects future homes will use less energy, largely because appliances and consumer products will continue to become more efficient. However, those projections indicate an overall increase in energy for air conditioning and cooling.

While electricity prices are low compared to other regions of the U.S., Oklahoma tends to use more electricity than other states. The per capita electricity consumption is higher in Oklahoma than the national average and is greater than three-fourths of U.S. states. Utility bills, including electricity, are part of the overall cost of homeownership. To increase the

energy efficiency of housing is to decrease those costs. Energy efficiency must be understood and treated not as a value-added luxury feature but a necessity for affordable housing.

One way to accomplish this is through a voluntary accreditation system like that of Leadership in Energy and Environmental Design (LEED). It and systems like it rely on receiving credits for specific items, projects, and additions to a home. We estimate 27 Oklahoma City residences have opted for LEED accreditation. These include a 2,000-square-foot single-family home in historic Mesta Park and numerous homes in Central Oklahoma Habitat for Humanity's Hope Crossing neighborhood in northeast Oklahoma City. However, LEED is just one example of certification and generally, the process is not just voluntary, but includes added costs.

Another, broader way of reducing electricity consumption is through the adoption of newer building codes. Updates and enforcement of newer iterations of each code would require increased efficiency in new developments. The International Code Council's codes serve as the base standards in the U.S. and are updated triennially. Currently, Oklahoma City's adopted codes including the 2015 International Building Code, the 2015 International

Residential Code, the 2015 International Fire Code, and the 2009 International Energy Conservation Code.

The adoption of newer building codes is often met with opposition based on a perception of added cost to builders. Significant research demonstrates those initial costs are offset through savings generated by more efficient homes and businesses. For example the U.S. Department of Energy found regardless of climate zone, costs associated with the energy efficiency improvements required in the 2009 and 2012 codes have payback time periods between one and two years. Because these codes apply to new construction, the longer older codes are applied, the more building stock will assuredly be less efficient - and thus more costly than it could.

Ultimately, the inexorable rise of electricity costs will erode household disposable income and increase the price of property, be it residential or commercial. An expansion of distributed generation - where electricity generation is done nearer or at the site of use - as well as a look at our opportunities in newer codes can stave off these growing costs and contribute to maintained affordability for Oklahoma City residents.



## City Savings

The City of Oklahoma City owns approximately \$3 billion in property (**Figure EP-3**). Operating costs for all City facilities, from City Hall to the Chickasaw Bricktown Ballpark, are driven by electricity demand. The Cox Convention Center and the Chesapeake Energy Arena share a central plant to meet heating and cooling needs at both facilities. As such, these facilities combined accounted for \$2.7 million in electricity bills in FY16 alone.

In FY17, the City of Oklahoma City spent \$24.8 million on electricity representing approximately 6% of total General Fund expenditures. The combination of retrofit projects and strategic operational adjustments can enhance the efficiency of existing properties and protect against budgetary impacts of electricity price volatility. Reductions in electricity use at any City facility equate to a larger share of funds applicable to other programs or needs.

A comprehensive energy program should be established that targets strategic projects to yield returns on investment through cost reductions in existing facilities and ensures the design and construction of future City buildings to be as energy productive as possible. Electricity consumption at City facilities is driven by basic services from water treatment and pipeline booster stations, for example, to keeping the lights on at recreation centers and golf courses.

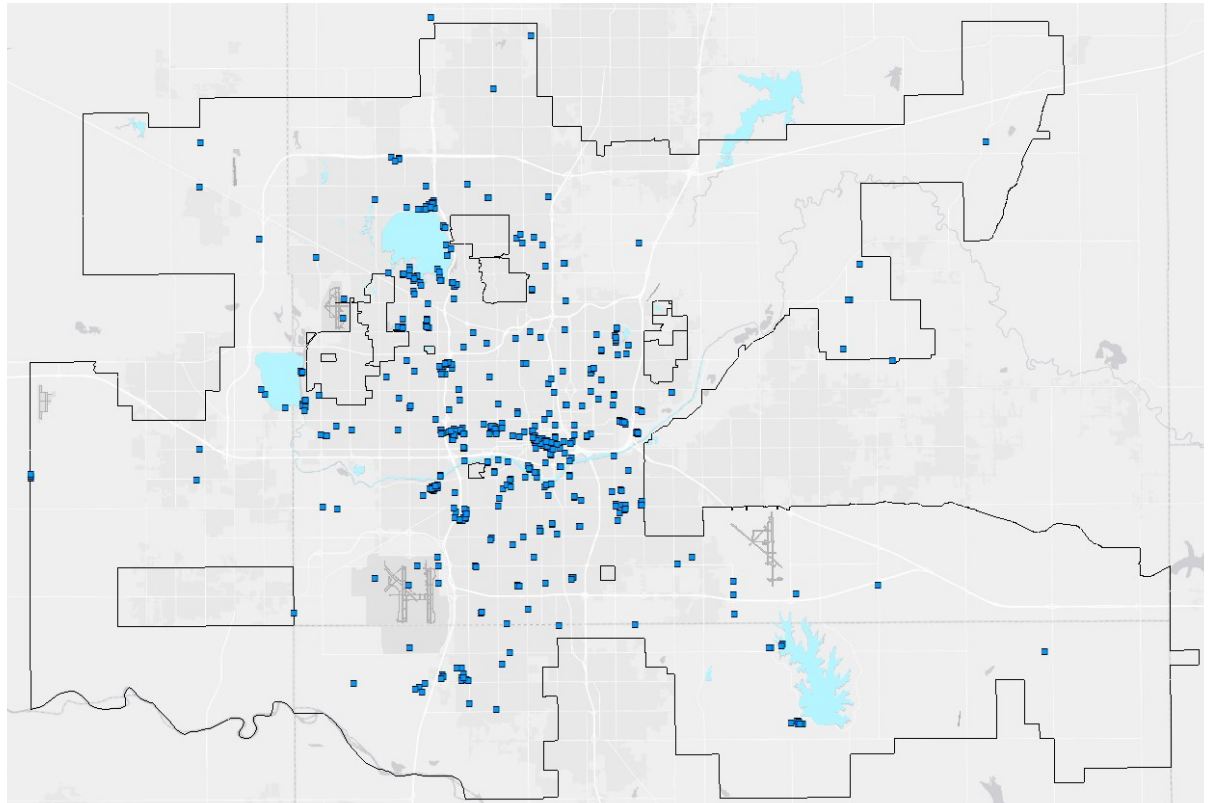
Additionally, while OG&E owns and maintains the majority of streetlights across Oklahoma City, the cumulative cost across 621 square miles - plus facilities like water pipeline booster stations outside of the city - is paid by the City.

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# \$24.8 million

was the cost of electricity paid by the City for public facilities in FY17, an increase of about \$2.7m from the year prior.

Figure EP-3: City-Owned Facilities, 2018



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From parks to parking garages, water treatment plants to road salt storage facilities, the City of Oklahoma City has over 500 separate buildings, structures, and properties for which it is responsible for electricity consumption. Unconventional examples include the Chesapeake Energy Arena (bottom left) and all of the traffic signals throughout the city (bottom right).

## Case Study: Tinker Air Force Base

The largest single-site employer in Oklahoma, Tinker Air Force Base (TAFB) has more than 26,000 military and civilian employees across approximately nine square miles with 15.2 million square feet of floor space in 760 buildings. According to the Oklahoma City Air Logistics Complex, TAFB is the largest user of energy in Oklahoma, the largest user of energy throughout the U.S. Air Force, and the largest user of energy in all of the U.S. Department of Defense.

Efficiency mandates, such as the Air Force's goal to reduce energy consumption 25% by 2025, have driven efficiency projects including steam decentralization that successfully reduced TAFB's natural gas consumption by 30% and a \$19.1 million modernization project on the central utility plant to cut energy consumption 44% annually. Through the use of energy service contracts, TAFB is able to pay for projects with future energy savings generated by the improvements to be installed, provided and guaranteed by the contracting energy service company (or ESCo).

In 2017, TAFB announced the largest energy savings performance contract in the Air Force's history as a \$243 million facility modernization project to reduce energy consumption by 23% and save \$20.5 million annually. The energy savings performance contract with Honeywell guarantees annual energy and operational savings that will eliminate the need for TAFB to provide capital investment. Upon completion, improvements are anticipated to save more than \$626 million in costs over the 21-year life of the project with energy expenses reduced by at least \$6.7 million in the first year alone.

Elements of the project include manufacturing line modernization to eliminate wasted ventilation and increase work safety, updating wastewater treatment systems with equipment controls and alarm monitoring, installing two 2,000-ton chillers to increase cooling system reliability, installing efficient LED lighting with wireless controls, and installing smart meters to better monitor, track, and manage building energy consumption.



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ABOVE: TAFB MANUFACTURING

A single wing of the Oklahoma City Air Logistics Complex is responsible for the maintenance and overhaul of more than 22,000 engines for a range of bomber, refueling cargo, and fighter aircraft.



## Emissions

The process of generating electricity is incredibly resource-intensive. OG&E relies on two fuels for the majority of electricity generation: coal and natural gas. Both of these fuel sources result in emissions whose byproducts impose a range of risks from impacts to public health to contribution to climate change.

Oklahoma's electricity-generating power plants emit an estimated equivalent of 41 million tons of CO<sub>2</sub> annually, more than double those of all Oklahoma's passenger cars and trucks. These emissions are largely the result of imported coal, which remains the primary generation fuel for Oklahoma utilities including OG&E. An increase in electricity generation fueled by natural gas and renewables would not only reduce Oklahoma City's CO<sub>2</sub> output, but benefit our local economy.

Across OG&E's service area, CO<sub>2</sub> emissions have fallen since 2010 even as electricity generation at OG&E facilities has trended upwards. Much of this is due to the decrease in coal use while natural gas and wind have increased. Nonetheless, the Muskogee and Sooner power plants continue to produce the majority of OG&E's facility emissions. The former plant was outfitted with emissions-reducing scrubbers for \$534 million, a cost that all ratepayers will see reflected in their monthly bills.



## Economic Development

Oklahoma has a high concentration of energy sector employment - 5.8% of total state employment compared to 2.4% of national employment - and significant opportunity exists to expand and diversify Oklahoma City's energy industry jobs. The renewable energy sector can offer job growth as well as greater sales and use tax contributions to further displace Wyoming-imported coal as OG&E's primary generation fuel.

Both renewable energy jobs and energy efficiency jobs are valuable as they rely on geographically-constrained resources and as such are highly resistant to outsourcing. Oklahoma needs to strengthen both sectors in order to better insulate from out-of-state job displacement whereby demand is met by a supply of labor from nearby, more developed markets like Dallas or Denver.

Projections of sector employment changes in the Oklahoma City MSA between 2014 and 2024 find the largest increases in construction (15%), education and health services (14.1%), professional and business services (13.2%), and leisure and hospitality (21.1%). The construction industry job growth can benefit through energy efficiency practices as 70% of the 12,294 energy efficiency jobs presently in Oklahoma are in construction firms dealing with high efficiency and renewable heating and cooling. Nonetheless, state energy efficiency employment currently makes up just 0.6% of the national total and lags behind nearly all neighboring states. Energy efficiency jobs are projected to grow overall by about 9% with energy efficiency jobs within the construction industry increasing by 11%.

Renewables offer varying workforce benefits to Oklahoma City. In 2018, estimates from the American Wind Energy Association found between 7,000 and 8,000 wind industry jobs in Oklahoma including those at seven manufacturing facilities. Many of those opportunities, however, are found outside of Oklahoma City given the rural siting of Oklahoma's wind facilities.

A 2011 report from the office of Oklahoma Governor Mary Fallin found Oklahoma to be "the

nation's leading geothermal" state given workforce proficiency in drilling, equipment manufacturing, and system engineering and design. Employment estimates were approximately 4,200 statewide with annual revenues more than \$550 million. Oklahoma City is home to the headquarters of ClimateMaster, a recognized geothermal industry leader, which employs more than 600 and houses manufacturing, research and development, engineering, and marketing. The U.S. Bureau of Labor Statistics projects an estimated 63% increase in solar photovoltaic installer jobs between 2018 and 2028. That rate ranks it as the fastest-growing occupation in the U.S. during those ten years with the addition of approximately 6,100 jobs nationwide.

Solar is a significant job growth opportunity for Oklahoma City. While Oklahoma as a whole has seen remarkable solar sector job growth - 112% from 2015 to 2018 per the Solar Foundation's Solar Jobs Census - the state is 48th in the nation for solar jobs per capita. The primary barrier to growth has been state laws but, with the Attorney General's June 2018 opinion, the market is primed for expansion and growth. While those solar sector jobs had a 2018 median annual wage of \$42,680, the second fastest-growing occupation, wind turbine service technician, is projected to see a 57% increase with a 2018 median annual wage of \$54,370.

With the right strategic investments, Oklahoma City can add more quality jobs within the energy sector that not only build our local economy but enable residents and businesses to better meet their energy needs through the robust resources Oklahoma has to offer.



**Property-Assessed Clean Energy (PACE).** Under a PACE arrangement, private property owners evaluate measures that achieve energy savings and obtain financing, repaid as an assessment on the building. The assessment mechanism allows access to low-cost, long-term capital to finance improvements to the property. By eliminating upfront costs, extending financing, and simplifying the transfer of repayment obligations to new owners upon sale, PACE overcomes challenges that have hindered building energy efficiency and related projects.

More than 20 states are home to commercial PACE (C-PACE) programs and cover areas that include St. Louis, Dallas, Little Rock, Houston, Denver, Omaha, Washington D.C., Atlanta, Milwaukee, and many more. Market data estimates more than \$521 million has been invested in C-PACE projects nationally. The Urban Land Institute reports commercial property owners across the country completed \$222 million in PACE financing in 2017, up from the 2016 amount of \$132 million. The largest share of C-PACE financing has gone towards office building projects followed by mixed use, retail, industrial, and healthcare.

Oklahoma is one of five states, alongside New Mexico, Wyoming, Alabama, and North Carolina, with PACE-enabling legislation but no PACE program or programs. Oklahoma has two statutes that authorize county governments to develop PACE financing to facilitate energy efficiency improvements for commercial property owners.

The Oklahoma Energy Independence Act, 19 O.S. § 460.1-460.7, authorizes counties to create "County District Energy Authorities" that can issue notes and bonds, seek out public and private lenders, and apply for grants and loans from other governmental entities to establish and fund PACE programs.

Once a county has established the Authority and PACE program, commercial property owners can receive a loan from the county for permanently-fixed renewable energy or energy efficiency improvements to their properties. These low-cost, long-term loans are then repaid through the owner's property taxes and constitute a lien on the property until paid in full.

The Energy Independence Act became law in 2009, but not a single county in Oklahoma had made use of PACE. After updates to the legislation in the 2019 legislative session, Tulsa County is working to establish a replicable program model that would streamline the effort in other counties.

From the perspective of regional competition, five states near Oklahoma - Texas, Colorado, Nebraska, Missouri, and Arkansas - all have active PACE programs, including programs specific to counties and municipalities like Frisco, Texas; Omaha, Nebraska; St. Louis, Missouri; and Pulaski County and Fayetteville in Arkansas. While Oklahoma City spans four counties, a program set-up in Oklahoma County alone could yield economic development dividends through supporting areas of intensive commercial development and redevelopment.

## Example C-PACE Projects



### 1225 North Loop West Houston, Texas

A 20-year fixed rate PACE loan of \$1.3 million funded the cost of two new chillers, HVAC controls, and LED lights in this 200,000 square foot, 11-story multi-tenant office building.



### D.C. United Audi Field Washington, D.C.

With 500,000 square feet of mixed-use retail and residential on site, D.C. United Audi Field was the first use of PACE for a stadium project. \$25 million of PACE financing was integrated into the project budget of \$300 million.

## Geothermal

Geothermal is a renewable source of energy as it relies on the Earth's constant and inexhaustible flow of heat. Geothermal can be used as both a source of electricity and directly for heating and cooling. The U.S. leads the world in installed geothermal capacity with more than 3.7 gigawatts and projections find geothermal alone could meet more than 10% of national electricity demand.

Because geothermal electricity generation requires water or steam at high temperatures (300°F to 700°F), it is best suited where hot springs or geothermal reservoirs are located within a mile or two of the Earth's surface. The hot water is pumped through a heat exchanger, which transfers the heat from the water into a building's heating system. The used water is injected back down a well into the reservoir to be reheated and used again, generating little to no waste and very few emissions of any kind.

Some may find geothermal to be a new or obscure method of electricity generation but Oklahoma is foremost in the nation for geothermal research and implementation. Oklahoma City-based ClimateMaster, for instance, is the world's largest manufacturer of water-source heat pumps used in geothermal installations, and has received Quality Jobs business incentive funds for job creation in 2016 and 2017.

Geothermal is widely used in residential developments. Beginning in 2014, Oklahoma City-based Ideal Homes added geothermal heat pumps as an option for every Ideal Home residence and constructed two neighborhoods with geothermal heat pumps as a standard feature. An entire neighborhood of 1,600 to 2,500-square foot single-family homes in Moore began construction in 2015 with McAlister Construction and ClimateMaster including geothermal heating and cooling systems in each home. No doubt a significant contributor to this expansion is the federal tax credit for geothermal

heat pumps last extended through the Bipartisan Budget Act of 2018.

While no comparable tax credit exists for public facilities, there are nonetheless a multitude of facilities with geothermal systems. Examples include the Lincoln Park Golf Course Clubhouse, the Northwest and Southwest libraries, Sooner Haven apartments, Myriad Gardens, Deer Creek Elementary School, John Glen Elementary School, and more.

Many other facilities in Oklahoma City and across the state house geothermal systems, as illustrated below, yet vast opportunity remains to expand deployment into both new and existing buildings, public and private, to reduce generation-related emissions and costs without curtailing electricity use. New or significantly expanded facilities should be subject to analysis to determine what if any cost savings could be achieved from the installation of a geothermal system to accommodate electricity use and reduce life-cycle maintenance costs.

## Geothermal Facility Examples in Oklahoma City



The Metro Career Academy, a 54,000 square foot LEED-certified facility in Northeast Oklahoma City, was designed and constructed with a high-efficiency HVAC system powered by a 223-ton geothermal heat pump system.



Western Heights Middle School in Southwest Oklahoma City added a vertical ground-loop geothermal system of 200 wells to enhance the 144,000 square foot school's HVAC system.



The six-floor, 400,000 square foot Oklahoma State Capitol is one of the largest buildings in the world heated and cooled by geothermal. Installed in 1990, a 370-well system has provided a minimum 25% energy cost savings.

## Wind

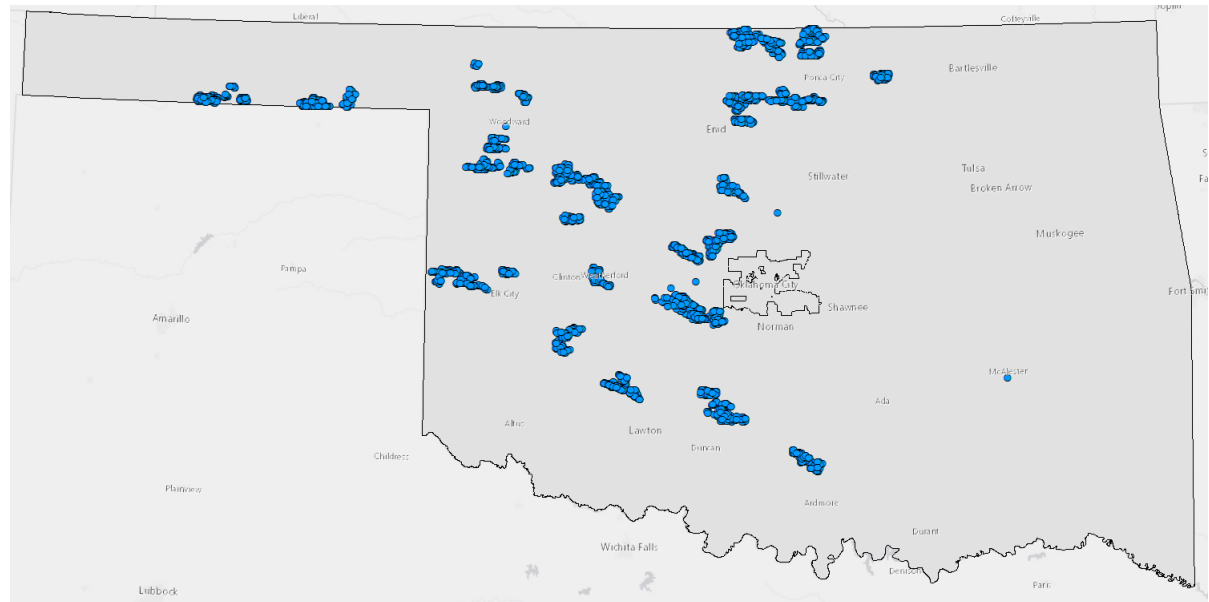
Oklahoma is third in the nation for installed wind capacity and second in wind energy generation behind only Texas and Iowa. As of late 2019, Oklahoma has 8,072 megawatts (MW) of installed wind capacity with another 1,015 MW of wind projects under construction. In 2010, Oklahoma adopted a voluntary goal to achieve 15% of electricity generation from renewable sources by 2015. That goal was not only achieved but surpassed with the 2015 renewable generation capacity reaching 25.9%.

In 2018, wind energy alone provided 31.7% of all in-state electricity production, making Oklahoma one of four states (Kansas, Iowa, and South Dakota) generating more than 30% of electricity from wind. The total capital investment into Oklahoma wind energy is estimated to be \$14.7 billion through 2018 with between 7,000 and 9,000 direct jobs.

Alongside in-state use, Oklahoma wind energy developments export clean energy to multiple states, including Alabama, Nebraska, Arkansas, and Colorado. Oklahoma is considered a national example of the private sector owning, developing, or purchasing directly from wind projects. For example, when Google constructed a data center in rural Mayes County in 2011, the company agreed to purchase all energy generated from NextEra Energy Resources' Minco II wind facility for a 20-year period. The 100.8 megawatt Minco II facility was built as a direct result of Google's financial commitment.

This is an important mechanism for economic development as more and more companies, including Amazon, Target, and Walmart, adhere to corporate commitments to renewable energy. With wind estimated to be the cheapest new power source in 14 states including Oklahoma, it is in Oklahoma City's best interest to ensure wind development continues despite occurring outside our corporate limits. Research conducted by the State Chamber of Oklahoma Research Foundation underscores how sustained statewide wind energy development can contribute to growth and economic health of Oklahoma City.

Figure EP-4: Oklahoma Wind Turbines, 2019



Source: U.S. Geological Survey

There are currently more than 4,000 wind turbines across Oklahoma.

Based on tax records through 2015, the State Chamber found wind energy installations had increased county tax bases and property tax revenues in their respective counties through the installation of equipment appraised at \$3.3 billion dollars. Counties home to wind energy projects see increases in the taxable property base which boosts revenue for county services and local school districts. This increased school district revenue benefits not only these rural districts but districts across the state.

The calculation of state aid to local school districts factors in the number of district revenue sources. If, after those sources are tallied, the district's projected per pupil revenue exceeds 150% of the projected state average per pupil revenue, the amount of state aid supplied to that district is proportionately reduced. This means more state funds are available for the support of all Oklahoma schools.

Simultaneously, wind development can directly reduce ratepayer energy prices. An annual analysis by the financial advisory and asset management firm Lazard found that in comparing electricity generation sources by unsubsidized levelized cost of energy - a metric of comparison that combines capital costs, operating and maintenance costs, performance costs, and fuel costs - the average cost of one megawatt hour (MWh) of wind-generated electricity has plummeted from \$135 in 2009 to \$45 in 2017. This is the lowest rate of any generation source, especially compared to coal (\$102 per MWh). To that end, Oklahoma's two investor-owned utilities, OG&E and AEP-PSO, estimate wind energy projects will save ratepayers close to \$2 billion.

While wind development has increasingly become a political target, its sustained development across Oklahoma has already afforded advantages to residents beyond rural counties. Recognition of and



The U.S. Bureau of Labor Statistics projects the second fastest-growing job in the U.S. between 2018 and 2028 will be that of wind turbine service technicians with a 57% growth rate. The top fastest-growing job? Solar photovoltaic installers.

support from Oklahoma City could see these advantages compounded.

Development of large-scale wind energy occurs outside of urban settings but manufacturing facilities are far more likely to be located within cities and towns. There are a few small turbines within Oklahoma City's corporate limits as code permits "private wind energy conversion systems" or PWECS. A prominent example is the OSU-OKC Engineering Technology Center, a LEED-certified facility with a geothermal HVAC system, solar panels, and wind turbine. 10-kW turbines are also located at a Department of Human Services facility near NW 23rd and I-235 and at the Governor's Mansion. The addition of PWECS is increasingly rare, but recent cost reductions could potentially signal a resurgence.

OG&E makes use of their wind-generated electricity through a specific sales program where a ratepayer can elect for a percentage of their annual use to be

attributed among OG&E's seven wind farms statewide. Notably, OG&E prices this program at a higher cost, meaning a ratepayer using OG&E's general portfolio of electricity generation - again, chiefly coal and natural gas - would by design pay less than a ratepayer who elected 100% wind-generated electricity.

As an OG&E customer, the City could elect to enter into a power purchase agreement (PPA), the contractual mechanism for purchasing of large quantities of electricity, for wind-generated power. This could come at a higher cost, however, than is presently enjoyed by the City, despite the absence of fuel costs. While a preponderance of wind development would have numerous indirect benefits to Oklahoma City, what would ultimately be most beneficial is a shift to on-site distributed electricity generation, be it through geothermal means, photovoltaic solar arrays, or distributed wind systems.



**\$918m** is the estimated amount of local school district funding projected to be paid out by wind energy projects statewide between 2003 and 2043.

## Solar

Nationally, the solar industry is more diverse than comparable industries, thus providing more equitable job opportunities should the Oklahoma City market see greater development. The Solar Foundation's 2018 Solar Jobs Census found the solar workforce is comprised of approximately 26% women, 17% Latino/Hispanic, 10% Asian or Pacific Islander, 7.6% black or African-American, 10.5% age 55 or older, and 7.8% veterans. The importance of veteran participation in the solar workforce is critical given Tinker Air Force Base as a prime opportunity for veterans with highly desirable technical skills, especially given the deployment of solar by the U.S. military and the recognition that reliance on foreign fuel constitutes a threat to national security. The 7.8% cohort of U.S. Armed Forces veterans in the national solar workforce remains greater than the 7% overall participation of veterans in the national workforce, which underscores the opportunity Oklahoma City has to connect local veterans with job opportunities. In 2014, the Department of Energy launched Solar Ready Vets, a program developed on the specific needs of high-growth solar employers and tailored to build on the technical skills that veterans have acquired through their service. At 10 military installations across the U.S., roughly 20 soon-to-be inactive military personnel were trained for four to six weeks on skills vital for solar industry management, installation, sales, and other technical and non-technical positions, all with no out of pocket costs. While the program was effectively shuttered in 2017, it nonetheless graduated 526 students and remains indicative of how solar can provide opportunities for both military and non-military residents.

1:2,142 was the ratio of solar workers to the overall Oklahoma workforce in 2018 per the Solar Job Census. The majority of Oklahoma solar jobs were found to be concentrated in Oklahoma County (187), Tulsa County (162), and far south Jefferson County (122), but Oklahoma's statewide total of 838 ranks it 40th in the country for solar jobs overall, even with year-to-year solar job growth of 13% from 2017 to 2018.

The incongruity between Oklahoma City's solar potential and relatively low solar employment is indicative of unrealized job growth opportunity and the chilling effect of state legislation like SB 1456 (2014) allowing public utilities to surcharge rate payers who install solar or wind on their homes. Given projected increases of solar deployment and employment nationally, an important initiative to ensure we capitalize on the benefits offered by solar expansion in both the private and public sectors.

To that end in 2016, the City was selected to participate in the SolSmart initiative, a national program led by the International City/County Management Association and the Solar Foundation, funded by the U.S. Department of Energy, and supported by partners including the National League of Cities, the Solar Energy Industries Association, the Electric Power Research Institute, and the National Renewable Energy Laboratory.

A six-month period working with a SolSmart-provided consultant entailed outreach to solar experts and business owners, engagement with OG&E, and, most importantly, assessing existing Oklahoma City codes and ordinances to identify barriers to solar. Solar hard costs - inverters, modules, structural and

electric components - have declined precipitously such that non-hardware costs or "soft costs" such as permitting and code requirements, zoning, financing, and interconnection policies now comprise the bulk of solar energy costs.

Though state utility policies are at the behest of the Oklahoma Corporation Commission and the Oklahoma Legislature, soft costs can be addressed at the local government level. City staff, the Solar Foundation, and the SolSmart consultant identified critical gaps that should be addressed to ensure residents, businesses, and institutions have clarity and stability should they pursue solar installations.

These and other important findings can be addressed through the City's development codes update process already underway, thereby ensuring Oklahoma City is a solar-ready community willing and able to capitalize on another significant resource within its energy portfolio.

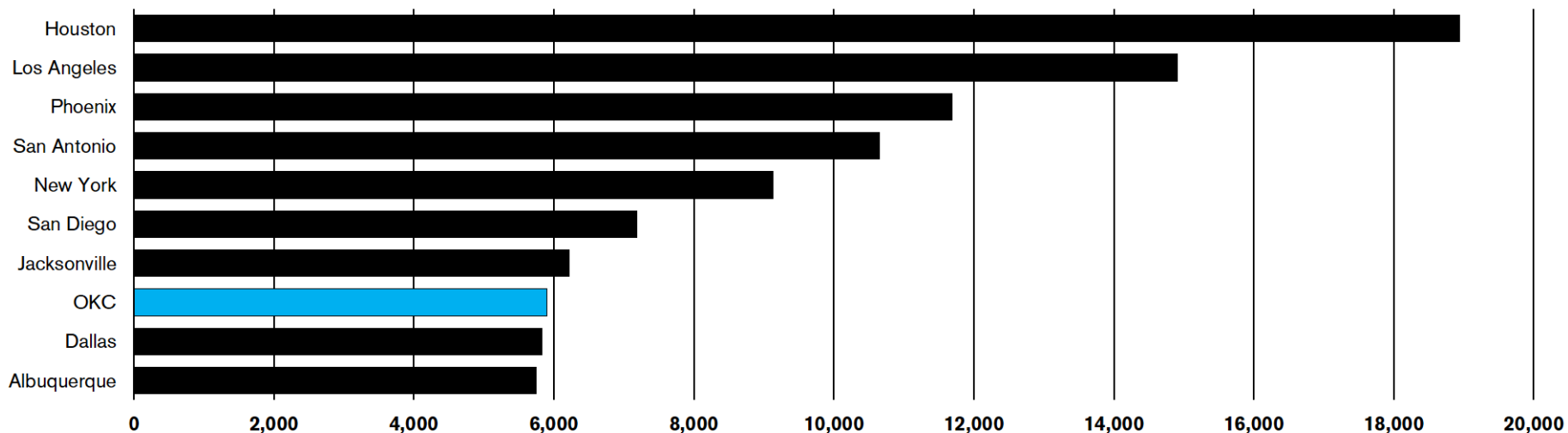
Additionally, there has been a significant recent shift in state policy related to solar over the last year. In response to an inquiry from the Oklahoma Secretary of Energy and Environment, Oklahoma Attorney General Mike Hunter issued a formal opinion in June 2018 regarding distributed generation, which is



An Oklahoma City home outfitted with a photovoltaic solar array.



**Figure EP-5: Top 10 U.S. Cities with Highest Solar Potential by Annual Gigawatt Hours**



Source: Project Sunroof

Oklahoma City has enough solar-viable rooftops to generate an estimated 7.2 million MWh of solar electricity annually. Oklahoma City residents consume 3.7 million MWh of power each year. If all of the viable rooftops went solar, it would be enough to meet more than 100% of the city’s residential power requirements. “Solar potential” can be understood as an area’s propensity for sunny days.

broadly defined as electricity generation near or at the site where the electricity will be consumed by an end-user. Distributed generation can apply to a multitude of technologies including wind and geothermal but is especially important to solar.

A critical component of distributed generation is third-party financing, which allows a solar company to install solar on a customer’s property, often with no upfront cost, and retain responsibility for system maintenance. Under a Power Purchase Agreement (PPA), the customer pays for the electricity generated by the installed solar at an agreed-upon rate. The customer leases the solar system and benefits from the electricity the system produces.

At the end of a PPA or lease term, the customer may be able to extend the term or purchase the system. The Attorney General’s opinion finds third-party distributed generation financing through both leases and Power Purchase Agreements (PPAs) are lawful within incorporated areas, i.e. within Oklahoma cities

and towns, under existing Oklahoma and federal laws and regulations. Systems must meet requirements set forth in the federal Public Utility Regulatory Policies Act (PURPA) of 1978 to qualify as a small power producer but, upon doing so, utilities are required to accept the excess power they generate. Lastly, the Attorney General found that third-parties with qualified small power producer systems would not be seen as a utility and are therefore excluded from utility regulation.

In addition to the Attorney General’s 2018 opinion, the Oklahoma Corporation Commission in 2019 asked regulated utilities to submit tariffs enabling net-metering. Net-metering is the mechanism by which users and/or owners of distributed generation can receive compensation for any excess electricity their system generates and places onto the grid. This compensation represents “avoid energy cost,” or the increment a utility - in this case, OG&E - avoids by having electricity generated elsewhere but seeing that

electricity fed into the grid, thus circumventing the cost of generation. The majority of U.S. states have net-metering policies in place with 16 providing compensation at full retail price. Without an adopted net-metering policy, Oklahoma would be one of three states alongside South Dakota and Alabama with no net-metering policy. The actions of the Oklahoma Corporation Commission will help to bring much of Oklahoma’s solar policies into the 21st century and provide a substantive opportunity to foment economic development and job growth.

Google’s Project Sunroof estimates that maxing out rooftop solar on Oklahoma City buildings would reduce city-wide greenhouse gas emissions equivalent to taking 1,000,000 cars off the road over the life of the solar installations, which is typically 20 years or more. While this is a far-fetched idea, it illustrates what we can accomplish community-wide through expanded solar installation and warrants continued, proactive development.

## Resilience

Overhead transmission lines are the most common electricity infrastructure across Oklahoma City, yet are a major liability during increasingly common extreme weather events. Ice storms, straight-line winds, flash flooding, and tornadoes frequently occur throughout the Oklahoma City metro, and cause both major and minor outages with adverse effects.

No type of electricity infrastructure is wholly invulnerable to the multitude of hazards to which Oklahoma City residents are exposed. In all cases, however, greater mitigation of the effects wrought by these hazards can limit their impact to people and property. As the variability of Oklahoma City's climate increases, diversifying and decentralizing our electricity infrastructure can ensure we are better able to adapt to shocks, natural or otherwise.

The City's Hazard Mitigation Plan identifies six electricity facilities throughout or extremely near Oklahoma City sited within 500-year floodplain, an exceptional degree of vulnerability for such vital infrastructure. Areas designated as 500-year floodplains are areas with a 0.2% chance of flooding in a given year. Such flooding in Oklahoma City would, per the U.S. Geological Survey, be based on the amount of rainfall in a given time period: 5.2 inches of rain in one hour, 12.5 inches of rain in 24 hours, 14.8 inches of rain in three days, or 15.5 inches of rain over seven days. Such floods have been experienced by Oklahoma City in June 2010 and May 2015. Projections of future inundation events underscores the physical vulnerability of our electrical infrastructure and the importance of secondary and tertiary options.

For a power system to be resilient, it must be capable of operating independently, or "islanding," from the grid during outages. Generally, outages in Oklahoma City are caused by damage to aforementioned transmission infrastructure but in a scenario where a major generation facility - OG&E's Mustang Power Plant, for example - is directly hit, overall grid reliability would be compromised.

Renewable forms of energy can offer redundancies suited to critical infrastructure including providing on



### ABOVE: OKLAHOMA CITY VETERANS AFFAIRS MEDICAL CENTER

In 2012, the Oklahoma City Veterans Affairs Medical Center (VAMC) installed a \$4.6 million, one megawatt solar photovoltaic (PV) system to provide approximately 5.5% of the VAMC's annual electricity usage. Yearly savings were estimated to be about \$110,000.

-site power during or after an event. Systems such as solar microgrids can act self-sufficiently, generating energy and powering critical loads until utility services are restored. Diesel generators are often viewed as the default solution for providing resilient power and frequently the resource used at critical infrastructure sites from hospitals to public safety facilities, but they might not always be the most reliable or cost-effective solution. Reliance on traditional fuels such as diesel reduces an energy system's resilience because a disruption or contamination in the fuel supply can cause vulnerabilities.

In addition to being resistant to sustained disruption, on-site renewable energy can also be scaled to provide electricity to a single site or several city blocks. As Oklahoma City's significant area includes many rural portions, solar in particular could be especially advantageous to residents and businesses that might see prolonged outages during and after events. These downscaled electricity grids can serve as redundancies regardless of geography or density.

With the Oklahoma Corporation Commission permitting third-party leasing as well as net-metering, the opportunities to invest in solar as a means of resilience can help such projects see a quicker return on investment. Nonetheless, a oft-voiced concern is whether or not solar modules can withstand hail. The U.S. Department of Energy and the National Renewable Energy Laboratory (NREL) collaborate on panel durability testing which includes firing ping-pong-ball-sized ice at different panel areas at approximately 70 miles per hour. After one severe hailstorm, NREL staff found only 1 of more than 3,000 panels was broken.

Oklahoma City's resilience can be strengthened through energy redundancies, resources, and flexibility so as to adapt to the challenges of today and those yet to come. Determining how to plan, finance, and implement strategies for greater energy resilience while simultaneously enhancing quality of life is not only possible but a necessity.



*Photo by Steve Gooch, the Oklahoman, 2007*

## **2007 Ice Storm**

Between Saturday, December 8, and Tuesday, December 11, 2007, freezing rain fell across most of Oklahoma with between 1.5 to 3 inches accumulating in the Oklahoma City and Tulsa metros. 25 of Oklahoma's 77 counties were federally declared disasters including Oklahoma, Canadian, Cleveland, and Pottawatomie counties. At least 30 deaths were reported, many due to the hundreds of automobile crashes from dangerously icy roads and highways, and statewide as many as 640,000 homes and businesses lost power. OG&E said it was the largest outage in their 105-year history with an estimated 300,000 losing power in their service area. Damage to private property was estimated at more than \$780 million.

Amid the widespread damage and outages, pictured above is an Oklahoma City resident casting her ballot on December 11, 2007, in the powerless St. David's Episcopal Church. The only citywide election that day was the 11 propositions making up Oklahoma City's \$835.5 million general obligation bond. While every proposition passed, voter turnout for this critical decennial election responsible for major infrastructure maintenance dollars was estimated at fewer than 5% of registered voters with many polling places lacking light and heat. This is a stark reminder that the lingering effects of a single disaster could have long-term impacts on core tenets of local governance and finance; the continuity and stability of our most basic services and functions cannot and should not be taken for granted.



## Our Plan

There is no foreseeable circumstance where the cost of electricity declines. Even less foreseeable is a circumstance where City operations, residents, businesses, and institutions see a reduced need for electricity. Right now, however, we cannot conflate low price point with low cost. Fossil fuel dependency guarantees exposure to commodity price volatility while shifting the burden of degraded environmental and public health to ratepayers. That same dependency bolsters barriers to renewable energy deployment, which compound costs by curtailing economic growth. We must work through every means possible to realize the full potential of a thriving renewable energy sector, especially our emerging solar market.

The energy efficiency of City operations should be a priority. Residents pay for electricity twice: once for their homes or businesses through monthly bills and again for the City's via taxes. Be it avoided costs in new facilities or return on investment in renovations and remodels, energy efficiency must be an inseparable and essential operating principle of City projects.

As the years grow increasingly hotter, we must be proactive with policies and programs to support affordability for residents, businesses, and institutions through efficiency, enforcement, and modern building requirements.



## Our Goals

### ATMOSPHERE AND CLIMATE

1. Reduce emissions associated with energy consumption.

### ENERGY CHOICE

2. Diversify local and state energy economies.

### RESILIENCE

3. Reduce cost of municipal operations.

## Our Initiatives

Energy Productivity Initiatives	Goals		
	1	2	3
1. Reduce energy emissions.	■		■
2. Use and promote renewable energy sources.	■	■	■
3. Increase energy code compliance.	■		■
4. Enhance and promote energy efficiency programs.	■	■	■
5. Support renewable energy job sectors.	■	■	
6. Increase energy efficiency of City facilities.	■		■
7. Monetize carbon emission offsets.			■

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"As we improve our energy efficiency, our emissions decline along with our costs."

- Devon Energy Corporation  
 Response to the Carbon Disclosure Project's  
 Climate Change 2016 Information Request



## INITIATIVE 1

### REDUCE ENERGY EMISSIONS

**Establish a greenhouse gas emissions reduction target.** Inventories are important tools to establish emissions quantities and sources. The City last published a greenhouse gas inventory in March 2010 that assessed emissions during FY09. Emissions for both City operations and the community were highest from energy consumption. An updated inventory would not only be instrumental in setting a greenhouse emissions reduction goal but to pinpoint sectors and City facilities where the greatest emissions reductions could be achieved through energy efficiency, renewable energy, and other methods to curtail costly wasted energy.

#### POLICIES

**AQ-2:** Conduct greenhouse gas emissions inventories every five years to capture both City operations and community-wide emissions.

**AQ-3:** Use emissions data to establish reduction targets.

**AQ-4:** Develop an emissions reductions strategy.

## INITIATIVE 2

### USE AND PROMOTE RENEWABLE ENERGY

**Install solar on City property.** New City facilities and those seeing significant renovation should be candidates for solar installations. These projects should be subject to a solar feasibility and cost-benefit analysis built into the required scope of architectural and engineering requests for bids.

**Incorporate solar and wind best management practices into development regulations.** Chapter 59 of the City's municipal code should be updated to explicitly allow photovoltaic solar panels as a permitted, or by right, use. This will ensure no barriers and, other than electric permit requirements, see no additional review procedures or permits are needed. Small wind systems are presently height-restricted and require a variance even in large acreages. Larger properties in conformance with planokc land use typologies could allow larger systems.

**Consider geothermal technology to heat and cool City facilities.** New City facilities and renovations to existing facilities should be candidates for geothermal installation. These projects should be subject to a

geothermal feasibility and cost-benefit analysis built into the required scope of architectural and engineering requests for bids.

#### **Provide renewable energy education opportunities for residents and businesses.**

Community workshops should be held to help residents and businesses navigate City and utility processes for solar, wind, and geothermal as well as existing programs for energy efficiency improvements. These should be conducted in collaboration with community partners including OG&E, neighborhood and homeowners' associations, and trade associations.

#### POLICIES

**EP-1:** Allow photovoltaic solar panels by right in all zoning districts.

**EP-2:** Increase renewable energy education opportunities and promote completed projects.

**EP-3:** Engage utilities to advance renewable energy use and identify partnership opportunities.

**EP-4:** Create solar-ready guidelines for builders in Oklahoma City.

**EP-5:** Develop criteria for using renewable energy in City projects and include in the City's Interdepartmental Guidelines on Coordination of Facility Projects.

**EP-6:** Perform cost-benefit analysis of including renewable energy on new or more than 50% renovated City facilities.

**EP-7:** Train appropriate staff to use cost-benefit tools to assess return on investment of renewable energy in new construction and major renovation (50% or more) projects.

**EP-8:** Require solar-ready construction for new City facilities that meet the criteria established in EP-5.

**EP-9:** Develop criteria for solar-ready construction requirements for developments seeking public financial assistance.

**EP-10:** Increase the number of Green Home Loan projects that include renewable energy.



**EP-11:** Identify opportunities and determine viability of solar energy generation on public property including, but not limited to, under-utilized land, brownfields, or Opportunity Zones.

## INITIATIVE 3

### INCREASE ENERGY CODE COMPLIANCE

**Perform field inspections to verify compliance with adopted international energy code.** City Council voted unanimously to adopt an amended form of the 2009 International Energy Conservation Code (IECC) in 2012. The City must target barriers to enforcement and integrate IECC into the plan review process to comply with both Council-approved policy and the terms of the American Recovery and Reinvestment Act. Enforcement would ensure new commercial construction is as efficient as possible to reduce overhead and limit energy cost pass-through to consumers.

The City is responsible for the cost of lighting, heating, and cooling more than one million square feet of public facilities. Data on facility energy use and costs is vital to reducing demand. New City facilities are built to adopted energy code standards and major facility renovations should also be opportunities to ensure energy code compliance.

One way to realize cost savings from outdated, inefficient public buildings is to ensure their future operations minimize costs. These renovations and improvements typically include public libraries, parks and recreation centers, maintenance facilities, and police and fire stations. Such facility renovations and improvements should require bringing facilities up to, at minimum, IECC 2009 to defray future energy costs as much as possible and remain consistent with the City's adopted codes.

### POLICIES

**EP-12:** Provide energy code training for plan review, inspection, and code enforcement staff.

**EP-13:** Implement field inspections for energy code compliance.

**EP-14:** Perform energy code field inspections for municipal construction and major renovation (50% or more) projects.

## INITIATIVE 4

### ENHANCE AND PROMOTE ENERGY EFFICIENCY PROGRAMS

**Expand the Green Home Loan program to offer more residents access to funding for energy efficient home upgrades.** In 2010, the City created a revolving loan fund (RLF) with a portion of the \$5.4 million formula grant from the Department of Energy's Energy Efficiency Conservation Block Grant program.

The Green Home Loan program is a proven success and efforts should be made to increase the RLF budget, expand the program's reach, and better integrate options for renewable energy systems into the program offerings and audits.

**Provide information on the City's website about utilities, state, and federal energy efficiency programs available to property owners and residents.** There is no cost to the City to promote existing energy efficiency opportunities. Examples include OG&E's free Home Energy Efficiency Program, Commercial and Industrial Energy Efficiency Program, or the federal tax credits for geothermal, residential wind turbines, and photovoltaic solar systems. Knowing about these opportunities - much less navigating them - can be a difficult feat but we can combine information on applicability and eligibility to help Oklahoma City residents make the most of these programs.

### POLICIES

**EP-15:** Promote utility, state, and federal energy efficiency programs available to property owners and residents.

**EP-16:** Increase funding to expand the Green Home Loan program.

**EP-17:** Explore revising public financial assistance policies to include energy efficiency standards.

**EP-18:** Connect owners of multi-family properties to energy efficiency resources.

**EP-19:** Offer technical assistance and promote energy efficiency to businesses engaged in the Commercial District Revitalization Program.

## INITIATIVE 5

### SUPPORT RENEWABLE ENERGY JOB SECTORS

**Collaborate on a Property Assessed Clean Energy (PACE) program.** Already enabled by state legislation, working to establish a county PACE program would provide another economic development tool in addition to diminishing costly, wasted energy consumption. PACE could incentivize corporate redevelopment or relocation as well as stoke local energy efficiency and renewable energy economic expansion. Reductions in energy use at commercial buildings and offices not only lessen pass-through costs but provide capital assistance to businesses and developers.



**Extend government relations efforts to the Oklahoma Corporation Commission.** Responsible for the regulation of prices and service reliability for numerous industries, the Oklahoma Corporation Commission’s oversight includes the three investor-owned utilities operating across much of Oklahoma. Rate changes and the introduction of new tariffs are set with the approval of the three elected Corporation Commissioners through administrative hearings, technical conferences, and rulemakings.

As the City contracts with lobbyists and drafts state and federal legislative agendas, a presence at the Corporation Commission is vital to ensure a voice in future rate cases. Changes in electricity regulation affect not just City operations but every resident, business, and institution within Oklahoma City.

**Propose to include renewable energy in the City’s Legislative Agenda.** Each year, the Mayor, City Council, and City Manager work together to create a Legislative Agenda to establish priorities, initiatives, and positions in anticipation of the annual session of the Oklahoma State Legislature. State policy changes could create jobs, add manufacturing opportunities, expand finance and lending offerings, attract investment, and reduce both business overhead and resident utility costs.

These prospects should be explored in greater detail and articulated to City policymakers for



“Oklahoma is an energy state. We are in the top three of oil and gas and wind, and we could be number six in solar energy, but we have some work to do.”

- Lindsey Pever  
Vice President, Oklahoma  
Solar Association

consideration. Expansion of local opportunity for renewable power already aligns well with a federal legislative priority: to monitor enforcement and definitions of compliance with the Clean Air Act and EPA standards. Renewable energy sources emit no emissions and efficiently support reduced energy and water consumption. As result, fewer point sources contribute ozone precursors to the Oklahoma City metro’s air.

**Work with local schools, colleges, and universities to establish solar training programs.** Oklahoma City has the potential to be a major solar market. Key to ensuring that potential is realized is a trained, qualified workforce that can meet local demand. Programs and curricula to certify and train workers for solar occupations are needed to see local workers better positioned to occupy local jobs. Community colleges and technology centers are ideal starting points to develop and implement these programs.

**Incorporate renewable energy into economic development programs.** Oklahoma City and Oklahoma disproportionately rely on jobs related to oil and gas. The share of Oklahoma City’s economy related to oil and gas is 6.65 times the national average and Oklahoma’s oil and gas-related sectors are about 5.8% of total state employment, well above the national share of 2.4%. The renewable energy sector is a major employer nationally as the solar workforce increased by 25% in 2016 and wind employment increased by 32%. Oklahoma City has not been able to foster expansion due to barriers in state law.

The City, the Greater Oklahoma City Chamber of Commerce, and the Alliance for Economic Development of Oklahoma City work together on programs to provide performance-based incentives for qualifying employers in the renewable energy sector whenever possible.

#### **POLICIES**

**EP-20:** Establish a Commercial Property Assessed Clean Energy (C-PACE) financing program.

**EP-21:** Participate in Corporation Commission rulemaking and tariff processes.

**EP-22:** Build regional coalition of municipalities for representation at Corporation Commission.

**EP-23:** Partner with educational institutions, including colleges and metro technology centers, to develop renewable energy certificate programs.

**EP-24:** Support renewable energy and alternate energy sector businesses in pursuit of local and state job creation incentives.

## **INITIATIVE 6**

### **INCREASE ENERGY EFFICIENCY OF CITY FACILITIES**

**Track and publish utility consumption data from City facilities.** The importance of transparency in how public funds are spent cannot be understated. As with other public financial transactions, the City’s energy consumption and costs are indicators to residents that we are continually striving to improve. We should work to publish the energy use and cost of Oklahoma City’s operations to demonstrate how design, construction, and operations influence costs and how energy efficiency itself can be a source of savings.

**Establish dedicated funding for ongoing energy efficiency improvements in municipal facilities.** The City’s Energy Management program requires funding to assess and implement efficiency measures. A dedicated operating budget is a necessity. Options should include savings generated by the City’s opt-out of OG&E Demand Program Rider, savings generated by efficiency programs, or General Fund revenue. Regardless, dedicated operational funds are the best route to reducing long-term utility costs for the City.

**Use third-party commissioning for municipal construction projects and major renovations.** Third-party commissioning should be integrated into existing project management processes to verify building performance and functionality prior to final acceptance.



For retrofits and improvements of existing City facilities, energy service companies, or ESCos, can enter into an agreement with the City, called performance-based efficiency contracts, which include contractually-guaranteed annual energy cost savings.

Performance-based efficiency contracts are a means to incentivize energy efficiency by contractually tying ESCo profitability to performance, ensuring the City would see a return on investment, and assuring cost savings are persistent and consistent.

#### **POLICIES**

**EP-25:** Perform third-party commissioning for municipal construction projects or major renovations.

**EP-26:** Pursue dedicated funding source for on-going energy efficiency improvements in municipal facilities.

**EP-27:** Track municipal facilities in Energy Star Portfolio Manager.

**EP-28:** Publish municipal facilities' energy consumption and cost data to the public.

**EP-29:** Target cost reductions in City facilities with high energy demands by using performance-based energy efficiency contracts with guaranteed return on investment.

## **INITIATIVE 7**

### **MONETIZE CARBON EMISSIONS OFFSETS**

**Define the City's opportunity to monetize carbon emission offsets.** Multiple markets exist for the purchase of carbon offsets including one promulgated in Oklahoma via the Oklahoma Carbon Sequestration Enhancement Act. These markets require quantification and verification through a third party of projects before approval to be placed on a market. The calculated benefits from projects that offer some form of ecosystem services, such as trees that capture carbon, filter polluted water, or general biodiversity conservation, can be available for sale, trade, or transfer via payment for ecosystem services (PES) programs.

Private companies in Oklahoma, including Devon Energy and Chesapeake Energy, already make use of PES markets for carbon offsets and the research journal *Nature Sustainability* estimates more than \$36 billion is exchanged each year in PES programs with the category of watershed services (\$24.7 billion in 2015) leading the way.

Broadly, local projects could include transitioning vehicles to alternative fuels, tree plantings, or installing renewable energy systems on City land or facilities. Greater scrutiny of markets' required methodologies as well as the cost associated with quantifying and submitting projects should be assessed.

#### **POLICIES**

**EP-30:** Develop process to submit carbon emissions reductions from City projects for sale on market.

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“Devon Energy has been undertaking a number of efforts to reduce its greenhouse gas (GHG) emissions throughout its operations in the United States and Canada. The company plans on greatly expanding these efforts because of the emergence of the market for generating and selling carbon offsets. Given the desire of many emission credit buyers to reduce their own carbon footprint – either for voluntary or potential compliance reasons – Devon has the opportunity to expand its GHG reduction initiatives, sell the resulting reductions as emission credits and earn additional revenues.”

- Devon Energy,

