



chapter four

air quality

CHAPTER 4: AIR QUALITY

Our Situation	86
Carbon Dioxide	88
Ozone	91
Alternative Fuels	98
Our Plan	108
Our Goals	108
Our Initiatives	109
Internal Indicators	158
External Indicators	164







Our Situation

The connection between land use and transportation is highly evident across Oklahoma City's 621 square miles. Our sprawl has a commensurate transportation system of approximately 4,930 miles of streets, roads, and highways, and Oklahoma City residents are estimated to drive about 36.7 miles daily. That ranks us fifth in the nation for daily vehicle miles traveled (VMT) per capita. In *Air Quality*, we focus on two byproducts of our automobile-oriented infrastructure: carbon dioxide (CO₂) and ground-level ozone.

In the past decade, Oklahoma City has made historic strides towards a more diverse transportation system: introduction of a downtown bike share; creation of a Regional Transit Authority; expansion of EMBARK night service and the addition of Sunday bus service; adoption of the city's first bicycle-pedestrian master plan, **bikewalkokc**; voter approval of the Better Streets, Safer City temporary sales tax; and a forthcoming bus rapid transit route along Classen and Northwest Expressway.

These advances are critical yet cars continue to dominate how we get around. Per five-year Census estimates, 82% of Oklahoma City commutes are single-occupant cars or trucks. By comparison, commutes made by walking, biking, or public transit represent a combined 2%. It is imperative the City

continue to implement policies and design and build infrastructure to diversify Oklahoma City's modes of transportation, as greater use of so-called alternate modes of transportation is a key tactic to reduce emissions. Significant growth is projected for the region: between 2010 and 2040, the Oklahoma City metro is expected to increase 40% in population and 54% in vehicle miles traveled (VMT).

Our best approach to emissions reduction is two-fold: continue to enhance transit services and prioritize safe infrastructure for bicycle and pedestrian commutes; and accommodate remaining VMT through alternative fuels that generate few to no emissions. Those emissions - namely CO₂, and ground-level ozone precursors nitrous oxides (NO_x) and volatile organic compounds (VOCs) - pose serious risks to the health, well-being, and economies of Oklahoma City.

Our primary sources of CO₂ emissions are personal vehicles, second only to electricity generation. The Supreme Court found in a 2007 case that the U.S. Environmental Protection Agency has the authority to regulate greenhouse gases including CO₂. While the likelihood of a federal mechanism to tax or assess a fee on CO₂ emissions appears high within the next ten to twenty years, it is CO₂ that is also a primary contributor to climate change. The concentration of

CO₂ in the Earth's atmosphere is currently at the highest level in approximately three million years at 416 parts per million and the annual rate of CO₂ emissions is not only increasing in quantity but accelerating in growth. Between 1959 and 2018, the annual rate of global CO₂ emissions increased 204%, but nine of the ten years with the highest average CO₂ emissions have all occurred since 2000. Steps to reduce our CO₂ emissions now could not only help us avoid the brunt of a future regulatory update to the National Ambient Air Quality Standards (NAAQS) but help us reduce our contribution to climate change.

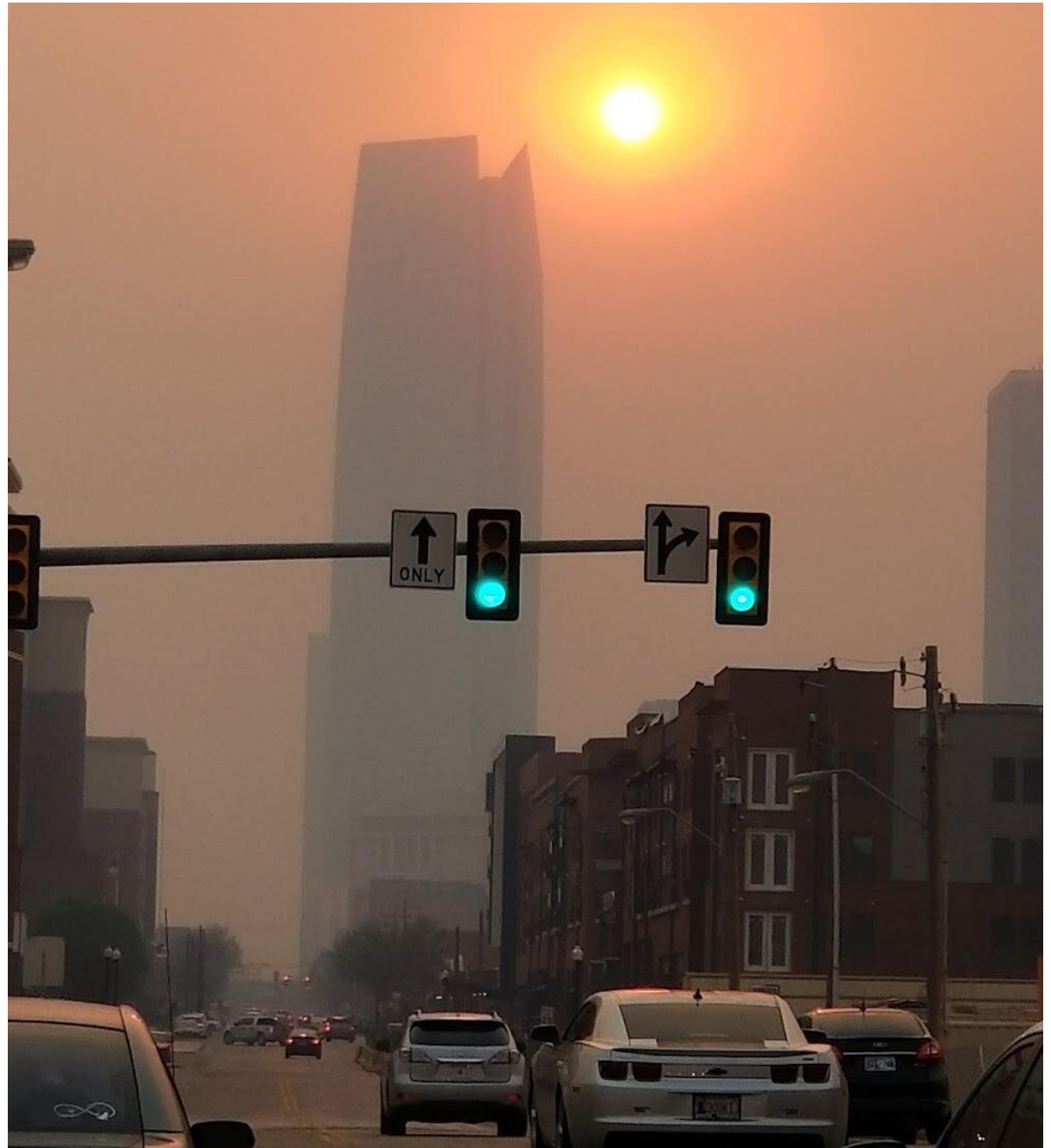
In 2002, the City was a signatory alongside the Association of Central Oklahoma Governments, the Oklahoma Department of Transportation, the Greater Oklahoma City Chamber of Commerce, the Oklahoma Department of Environmental Quality, and U.S. EPA Region 6 on the Early Action Compact (EAC). Submitted to U.S. EPA, the EAC was a memorandum of agreement among parties to develop and implement a plan to reduce emissions so as to avoid violation of federal air quality standards. City Council's federal legislative agenda currently includes monitoring, enforcement, and compliance of federal air quality standards, but the region is at immediate risk of violating those federal standards. Were the Oklahoma City metro to violate the ozone

standard, the subsequent requirements would reach into the daily lives of every resident, business, and institution across the region. Summer gas prices would increase as gas stations carry mandated reformulated gasoline to reduce vehicle emissions. Vehicle registration could see the addition of a Vehicle Inspection and Maintenance Program requirement that mandates emissions inspection and compliance to register or renew. Economic development would be hampered by more stringent requirements for facility construction and expansion.

One illustration of the relationship between CO₂ and ozone - and how that relationship has already affected us - occurred in April of 2018. Areas of Western Oklahoma were rated as in a condition of “exceptional drought,” the highest category of drought per the National Oceanic and Atmospheric Administration’s U.S. Drought Monitor; the addition of high winds and low humidity bore widespread wildfires with more acreage burnt statewide in April than all other months of the year combined. A single fire burning near the small town of Rhea consumed about the same square mileage as Oklahoma City which prompted mobilization of the Oklahoma National Guard. Those high winds ushered clouds of smoke and particulates hundreds of miles to Oklahoma City, degrading air quality and visibility.

Because of the accumulation of CO₂, conditions for more frequent and intense wildfires will increase as springs and summers grow drier and hotter. As these more frequent and intense fires burn, they emit pollutants - chiefly CO₂ but also ozone precursors - that accumulate in our atmosphere. This feedback loop - CO₂ accumulation causing more fires, and in turn causing more CO₂ accumulation - crystallizes how the content and quality of our air can impact us and our environment. And as for an effect on our economy, these fires warranted a FEMA major disaster declaration for five counties during a ten-day span and included more than \$5.2 million in federal recovery funds.

The means and technology exist to help us improve the quality of our air and reduce wasteful and harmful emissions. Better we undertake these steps voluntarily than face a future of federal intervention that constrains our ability to perform and compete.



Smoke from a 120-acre wildfire 25 miles away blanketed downtown Oklahoma City the afternoon and evening of Friday, April 13, 2018.

Carbon Dioxide

When fossil fuels such as coal, petroleum, and natural gas are burnt, carbon dioxide (CO₂) emissions are a byproduct. While CO₂ is a common, naturally occurring gas, the amount of CO₂ within our atmosphere has increased drastically during modernity. As a greenhouse gas, CO₂ traps energy from the sun within our atmosphere and manifests as severe climatic instability worldwide. Some excess CO₂ can be absorbed by world oceans, but this reduces seawater pH which has widespread ecological impacts as reductions in pH mean increased acidity. While Oklahoma City is certainly no seaside municipality, the sheer scale of these changes would directly and indirectly affect us in multitudes. How we reduce our present contributions to atmospheric CO₂ as well as how we mitigate the impacts of present CO₂ levels are critical to long-term planning at every level.

Nationally, the CO₂ emissions of transportation surpass those of electricity generation. The latest Energy Information Administration (EIA) data for Oklahoma indicates the largest source of our CO₂ emissions is indeed transportation, mirroring national numbers. The most recent National Emissions Inventory (NEI) published by the EPA estimates Oklahoma's 2014 CO₂ transportation emissions as 31.2 million metric tons. 63% of those emissions – approximately 19.8 million metric tons – come from passenger cars and trucks. A forthcoming update to the NEI that reflects data gathered in 2017 should be available by the end of 2019 and provide a more current picture of Oklahoma City's CO₂ emissions.

The expanding use of wind and natural gas as electricity generation fuels continues to reduce the reliance on coal for electricity, in turn driving down CO₂ emissions in that sector from the 2008 peak of 51 million metric tons to 39.6 million metric tons in 2015. No such widespread fuel switch has occurred in the transportation sector, however, and when burned, a single gallon of gasoline produces approximately 20 pounds of CO₂. Our large land area is thus a contributing factor to our transportation and a major source of our CO₂ emissions.



Photo by Doug Hoke, the Oklahoman, 2011

Buildings near NW Expressway and N. May Avenue partially obscured by haze.

The EIA estimates CO₂ transportation emissions in Oklahoma have increased 52% from 1980 to 2016. The Oklahoma City region's estimated average CO₂ household contribution is 9.31 tons. Comparatively, this is a greater per household tonnage than the metros of Portland (8.20 tons), Denver (8.22 tons), Phoenix (8.27 tons), Pittsburgh (8.34 tons), Detroit (8.35 tons), Albuquerque (8.53 tons), Dallas-Fort Worth, (8.88 tons), Houston (8.96 tons), Omaha (8.98 tons), El Paso (9 tons), Madison (9 tons), Austin (9.03 tons), Jacksonville (9.03 tons), Kansas City (9.09 tons), Knoxville (9.23 tons), Des Moines (9.24 tons), Atlanta (9.28 tons), and many others.

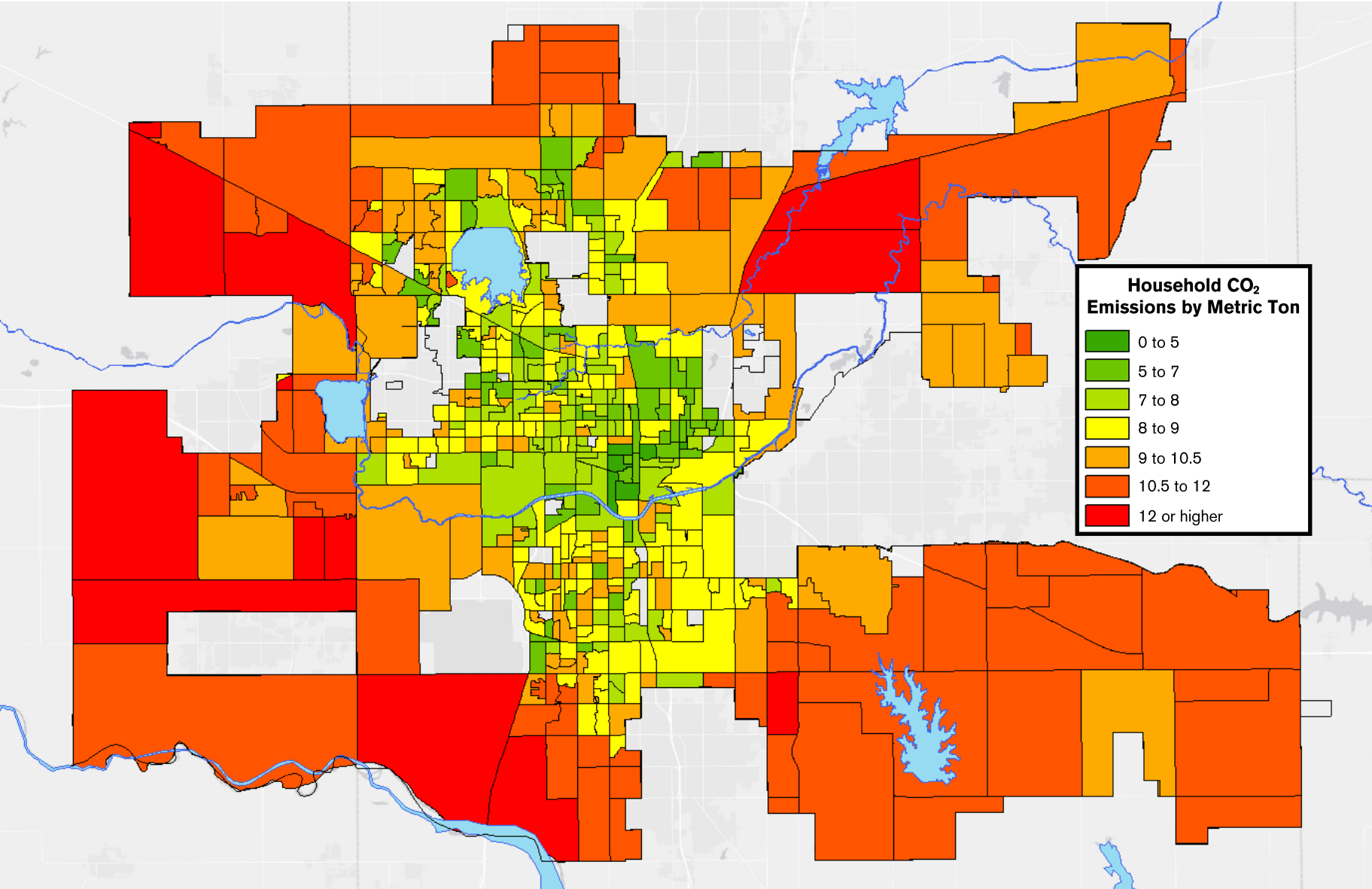
Climate Change. CO₂ is currently at the highest atmospheric concentration ever in human history at approximately 416 parts per million. It is this atmospheric concentration that drives warmer conditions, glacial and ice melt, and ocean acidification. Often, the term “climate change” is seen as interchangeable with “weather.” This is

deeply inaccurate. A major difference between weather and climate is measure of time. Weather is what conditions of the atmosphere are over a short period, generally in a fixed location, whereas climate is how the atmosphere “behaves” over relatively long periods of time, often a minimum of 30 years.

Weather can change from minute-to-minute, hour-to-hour, day-to-day, and season-to-season. Climate, however, is the average of weather over time and space; its scope can span years, decades, or centuries. Anecdotes of a cold winter or mild summer are indicative of weather whereas climate is informed by long-term data about successive winters or summers.

Climate change is a global problem that has local consequences. Climate change projections downscaled to Oklahoma City compare the 30-year averages of 1981-2010 to those of 2021-2050 and 2051-2080. Those projections indicate a five degree Fahrenheit increase in Oklahoma City's annual

Figure AQ-1, Oklahoma City Annual CO₂ Emissions from Auto Use Per Household



Source: Center for Neighborhood Technology

Within Oklahoma City, the average annual amount of CO₂ emissions from transportation per household is estimated to be 8.78 metric tons. Block groups nearer to city center demonstrate a smaller per household emissions rate, anecdotally demonstrating the efficiency of dense development in emissions reduction and the role land use can play in diminishing emissions.

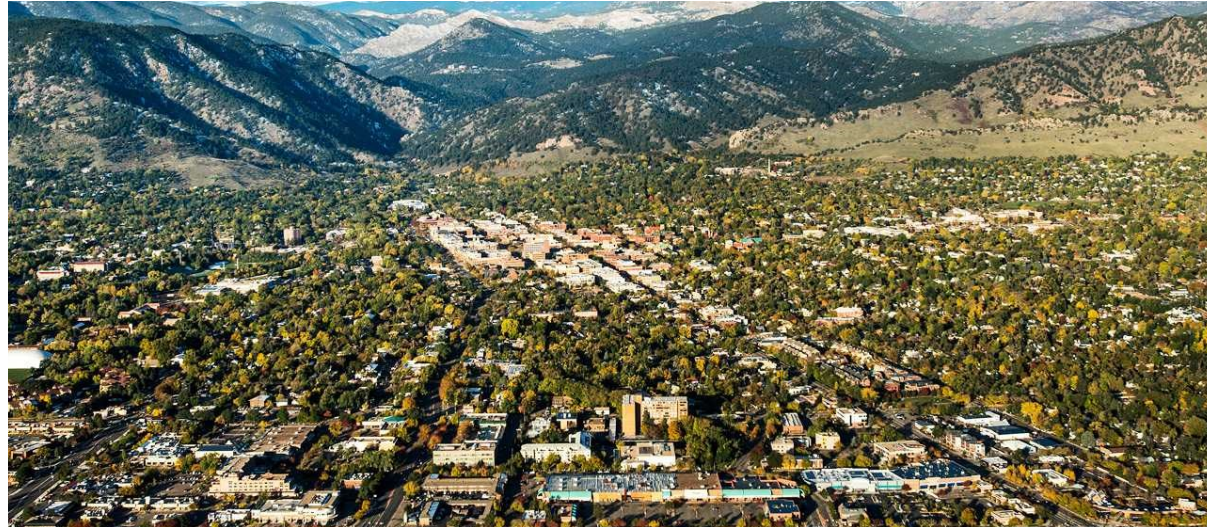
average temperature; significantly hotter, drier summers; warmer, wetter springs, falls, and winters; and fewer freeze-thaw cycles. The impacts of such changes would be sweeping and costly to residents, businesses, and the City itself, including heightened electricity demand, decreased agricultural yields, increased heat-related mortality, increased damage to all forms of infrastructure, increased smog, and even increased insurance deductibles for City-owned assets.

In Oklahoma City, the prospect of single-handedly halting the repercussions of climate change is impossible. Policies and initiatives on a much larger scale are needed to address the root causes of our changing climate. What we can and must do, however, is craft mitigation strategies to fortify our community and critical infrastructure from present day impacts and those yet to come.

Regulation and Taxation. A 2007 decision by the U.S. Supreme Court found the EPA has the authority under the Clean Air Act (CAA) to regulate greenhouse gases including CO₂. This allowed the EPA to include greenhouse gases in the two most recent iterations of the Corporate Average Fuel Economy (CAFE) standards for light-duty vehicles. These new standards, however, are part of a proposed rollback which could see CAFE standards frozen for vehicles produced between 2021 and 2026.

Despite uncertainty, future regulation, like the inclusion of CO₂ into the NAAQS or the creation of a national carbon tax, is worth consideration. A multitude of carbon tax proposals have emerged in recent years, from the cap-and-trade approach championed by former U.S. Secretary of State James Baker to the fee-and-dividend bill introduced in Congress in 2018. These efforts have been unsuccessful to date but a handful of U.S. cities and counties have structured their own carbon tax, including Boulder, Colorado (see inset) and Maryland's Montgomery County.

Many companies, including OG&E and ONG, use an internal price per metric ton of CO₂ equivalent as a tool in economic modeling and project forecasting. These valuations serve to demonstrate the monetization of carbon is neither improbable nor



Case Study: Boulder, Colorado Carbon Action Plan

The only functioning carbon tax in the U.S. is in Boulder, a city of just over 100,000 residents situated at the base of the Rocky Mountain foothills. In 2007, Boulder residents voted to levy a tax on residential, commercial, and industrial sector electricity customers to fund a Climate Action Plan (CAP). The City of Boulder works with the area's for-profit, investor-owned utility, Xcel Energy, to collect and remit CAP tax funds.

The CAP tax is the nation's first voter-approved tax dedicated to addressing climate change. The tax rate differs based on sector: \$0.0022 per kWh for residential customers, \$0.0004 per kWh for commercial customers, and \$0.0002 per kWh for industrial customers. On average, these rates add \$21 to residential customers, \$94 dollars to commercial customers, and \$9,600 to industrial customers. The CAP tax generates approximately \$1.8 million each year.

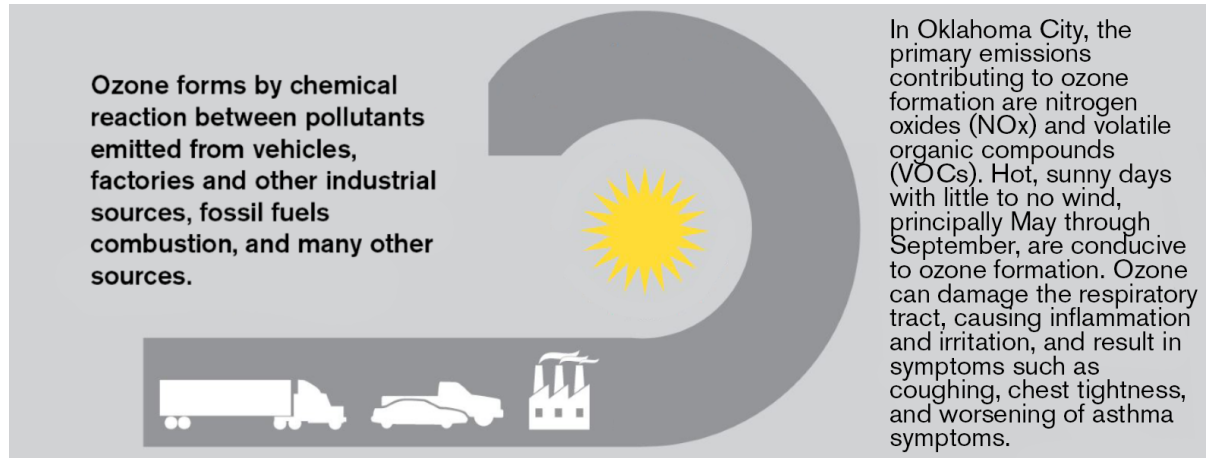
Funds generated by the CAP tax go exclusively towards programs intended to reduce greenhouse gas emissions. These programs have included a city-wide greenhouse gas inventory, significant energy efficiency programs specific to the commercial and residential sectors, renewable energy, water conservation, urban forestry, and alternate fuels and modes of transportation. The City of Boulder estimates CAP-funded programs helped to avoid more than 50,000 metric tons of emissions between 2007 and 2015, maintaining emissions rates as Boulder saw growth in population, jobs and economic activity.

In 2015, Boulder voters approved a continuation of the CAP tax through March 31, 2023.

distant. Hypothetically, carbon regulation or taxation would factor in real costs not presently captured in the market price; by making consumption costlier, consumption would be reduced. This would likely translate to higher prices for fossil fuel-generated electricity and heat as well as motor vehicle fuels.

What the future holds with regard to a national carbon tax is not clear. However, what is clear is that there is an associated price with carbon, albeit one that differs from organization to organization. For example, the City's Water Utilities Trust purchases CO₂ via contract at a cost of \$100 per ton; this is a higher rate than used by many other companies including OG&E (\$15 to \$20 per ton), Devon Energy (\$16 to \$24 per ton), ConocoPhillips (\$9 to \$43 per ton), and General Motors (\$5 to \$20 per ton). Markets that trade in carbon via offsets have emerged in recent years and cities have begun capturing, packaging, and monetizing local CO₂ reductions. For example: the cities of Austin and Pittsburgh along with King County, Washington, and Clackamas County, Oregon, are all in varying stages of CO₂ credit projects for tree plantings and reforestation. Other forms of projects are eligible, however, including energy efficiency, renewable energy, and transportation/fleet efficiency. While no single authoritative body regulates carbon standards, there are required protocols and formulations to quantify and verify project offset amounts and payments. These protocols, and the IRS credit valuation of \$35-50 per megaton can vary, especially based on the type of offset project.

The Oklahoma Carbon Sequestration Enhancement Act (§27A-3-4-101) authorized the Oklahoma Conservation Commission to establish and administer a carbon sequestration certification program. With this in mind, the City should explore opportunities to quantify, verify, and monetize carbon offsets as part of existing projects and programs. This can be especially effective by including prospective partners such as the Oklahoma City Community Foundation or local companies already engaged in carbon offsets like Chesapeake Energy and Devon Energy, who have generated a combined 547,428 credits via two projects through the American Carbon Registry.



Source: California Air Resources Board

Ozone

Within the stratosphere – the second major layer of the atmosphere between approximately 6 and 31 miles above Earth's surface – a shield of ozone absorbs 97% to 99% of incoming solar ultraviolet radiation. That shield, the ozone layer, is how most are familiar with the gaseous chemical ozone, particularly through efforts to reduce its depletion. However, ozone can form in the layer of the atmosphere closest to the planet's surface, the troposphere, where this ground-level ozone can go by a different but familiar name: smog.

As with any chemical reaction, the formation of ground-level ozone cannot occur without the proper ingredients and conditions. Those ingredients, or precursors, include nitrogen oxides (NO_x) and volatile organic compounds (VOCs), typically byproducts produced from the burning of fossil fuels by industrial facilities and internal combustion engines. The required conditions, common in Oklahoma City throughout the spring and summer, are hot, sunny days with little to no wind. Stagnant air allows concentrations of NO_x and VOCs to chemically react in sunlight and create ground-level ozone. In Oklahoma County, the greatest annual share of NO_x comes from non-diesel passenger vehicles and diesel-powered heavy-duty vehicles – 7,024 tons and 6,527 tons respectively. Whereas oil

and gas production is the largest NO_x source statewide, it is only the sixth greatest source in Oklahoma County, where it also comprises just 1% of those statewide oil and gas NO_x emissions. As for VOC emissions across the four metro counties, non-diesel passenger vehicles are within the top four emissions sources in each county: fourth in Canadian, second in Cleveland and Oklahoma, and third in Pottawatomie. Even with both statewide and county emissions reductions, passenger vehicles continue to be a primary source of ground-level ozone precursors.

As ground-level ozone is a pollutant with adverse effects on human health, it is subject to regulation by the EPA. Regulatory authority of air pollutants was vested in the EPA by the Clean Air Act (CAA), first passed by Congress in 1963 and subsequently strengthened in 1965, 1967, 1970, 1977, and 1990 by Congressional amendments. The 1970 amendments established the National Ambient Air Quality Standards (NAAQS), a series of regulatory limits on six types of air pollution – including ozone – periodically reviewed and revised by the EPA. If an area exceeds the pollution limit, the EPA could designate it as a nonattainment area. This formal designation entails considerable regulatory changes at the federal, state, and local levels.

The U.S. overall has shown improved air quality

.....

RIGHT: OUHSC CAMPUS

In a nonattainment scenario, the University of Oklahoma Health Sciences Center (OUHSC) campus' 450,000-square foot, 144-bed patient tower would see construction complications and costly delays due to its potential to emit.

.....

since 1990 based on the pollutants regulated by the EPA. While this is true too of the Oklahoma City metro, ozone has seen the smallest reduction of those pollutants at just 14%, compared to the national average reduction of 21%. Future revisions to the NAAQS that lower the allowable pollutant threshold further expose Oklahoma City and the metro to greater risk of a federal nonattainment designation, especially as average annual temperatures continue to increase. The consequences of such a federal designation would be significant, far-reaching, and long-lasting.

A study conducted for CAPCOG, the Central Texas metropolitan planning agency (MPO), found a nonattainment designation could cost the Austin metro between \$24 and \$41 billion total from 2018 to 2046. In 2011, the City of Wichita estimated a vehicle inspection and maintenance program required with a nonattainment designation would cost more than \$13.7 million annually. The MPO for the San Antonio metro area estimated costs could range from \$3.2 billion to \$36.2 billion based on the severity of the designation and ensuing time frame. Locally, ACOG, with support from nine organizations including the City of Oklahoma City, used federal transportation funding to release a Cost of Nonattainment Analysis Scoping Report for the Central Oklahoma area in February 2020 to better understand the regulatory risks of a nonattainment designation. However significant the economic losses, however, the purpose of nonattainment designation is to safeguard the health of the public.

For the sake of our residents' well-being, our regional prosperity, and our city's economic growth, proactive efforts to reduce ground-level ozone and its



precursors is, while no small feat, an absolute necessity for the City and the region.

Economic Expansion. Businesses seeking to construct, modify, or expand a major plant or facility could face costly restrictions under a nonattainment designation, thereby reducing Oklahoma City's competitiveness and the efficacy of economic development programs. The increased costs, delays, and uncertainties would not only discourage investment in Oklahoma City but also could erode the economy of the entire Oklahoma City metro.

Air quality permits, issued after review and analyses by the Oklahoma Department of Environmental Quality (ODEQ) as set forth in the 1990 amendments to the CAA, are documents issued to a specific site with legally enforceable requirements regarding on-site emissions-generating equipment, air pollution control equipment, monitoring requirements, and any specific rules that apply to that facility.

Nonattainment compounds the permitting process through Nonattainment New Source Review (NNSR), requiring technical assessments to quantify a facility's emissions potential, prescribe technology to reduce or control pollutants with consideration of cost, and/or require a company to either reduce their proposed facility's emissions or identify, negotiate,

and purchase emissions offsets. In addition to direct costs, NNSR assessments can protract the permitting process to last beyond a year, adding uncertainty and delay. In some conditions, inability to demonstrate emissions reductions at a facility may effectively prohibit construction, expansion, or modification.

Examples of facilities likely to be subject to NNSR include publicly-owned treatment plants, petroleum refineries, landfills, cement plants, paper mills, hot mix asphalt facilities, natural gas transmission and storage facilities, and many others as NNSR is based upon potential to emit rather than strictly defined categories of facility types.

CAPCOG's nonattainment analysis included specific financial estimates due to loss of economic activity. The loss of expansion at an Austin semiconductor manufacturing facility was projected to cost between \$21 billion and \$33 billion in gross regional product (GRP) between 2018 and 2046. Another projected loss, the prospective construction of a new cement plant, was estimated to cost between \$1.8 billion and \$3.7 billion in GRP. Costs of reducing NOx emissions to existing Austin metro facilities would total approximately \$463 million between 2022 and 2046.

The Alamo Area Council of Governments also conducted a nonattainment study and estimated the



.....

LEFT: OKC BOULEVARD

.....

In a nonattainment scenario, the Boulevard would require detailed analyses and emissions modeling in order to gain funding and approval from the Federal Highway Administration.

.....

cost of each NNSR to illustrate the possible severity of the San Antonio MSA's nonattainment designation. Each NNSR permit could entail a cost of \$100,000 to \$250,000 each, totaling between \$24.2 million and \$67.3 million. Project delays due to the permitting process were estimated to total between \$1.4 billion and \$1.6 billion in lost GRP. A nonattainment designation's chilling effect on expansion or relocation within regional manufacturing was estimated to range from \$699 million and about 5,000 jobs to \$27 billion and more than 140,000 jobs.

The fewer the barriers to Oklahoma City's growth and prosperity the better. The functions of entities like the Alliance for Economic Development of Oklahoma City, the Oklahoma Department of Commerce, the Greater Oklahoma City Chamber, the Oklahoma State Chamber of Commerce, and the City itself are predicated on working directly with new and existing businesses for job growth. Competition between other urban centers, including those within the region, is already significant.

A nonattainment designation would greatly impede economic development efforts and seriously impair Oklahoma City's ability to attract new businesses and foster growth and expansion for companies already at home in this market.

Streets and Roads. Federal dollars play a crucial role in Oklahoma City's transportation infrastructure. Between FFY13 and FFY17, approximately \$45 million in federal funds were awarded to Oklahoma City for transportation projects including road widenings, street resurfacings, and traffic signal upgrades. Typically, federal dollars fund 80% of the total project cost with Oklahoma City providing the remaining 20%. A requirement of nonattainment called transportation conformity would severely limit the City's flexibility in using federal funds for transportation infrastructure. These effects would extend to the Oklahoma Department of Transportation (ODOT) and other metro area cities, towns, and counties as well.

Transportation conformity requires any federally-supported transportation project, whether supported through federal funds or through federal approval, to demonstrate it would not negatively impact the area's air quality or exceed the area's motor vehicle emissions budget. The term is rooted in the requirement that projects conform to an approved plan to reduce emissions, called a State Implementation Plan, in both the planning and coordination stage at the regional level (e.g. through the Association of Central Oklahoma Governments) and at the local, project level. Such a demonstration of conformity is produced through emissions

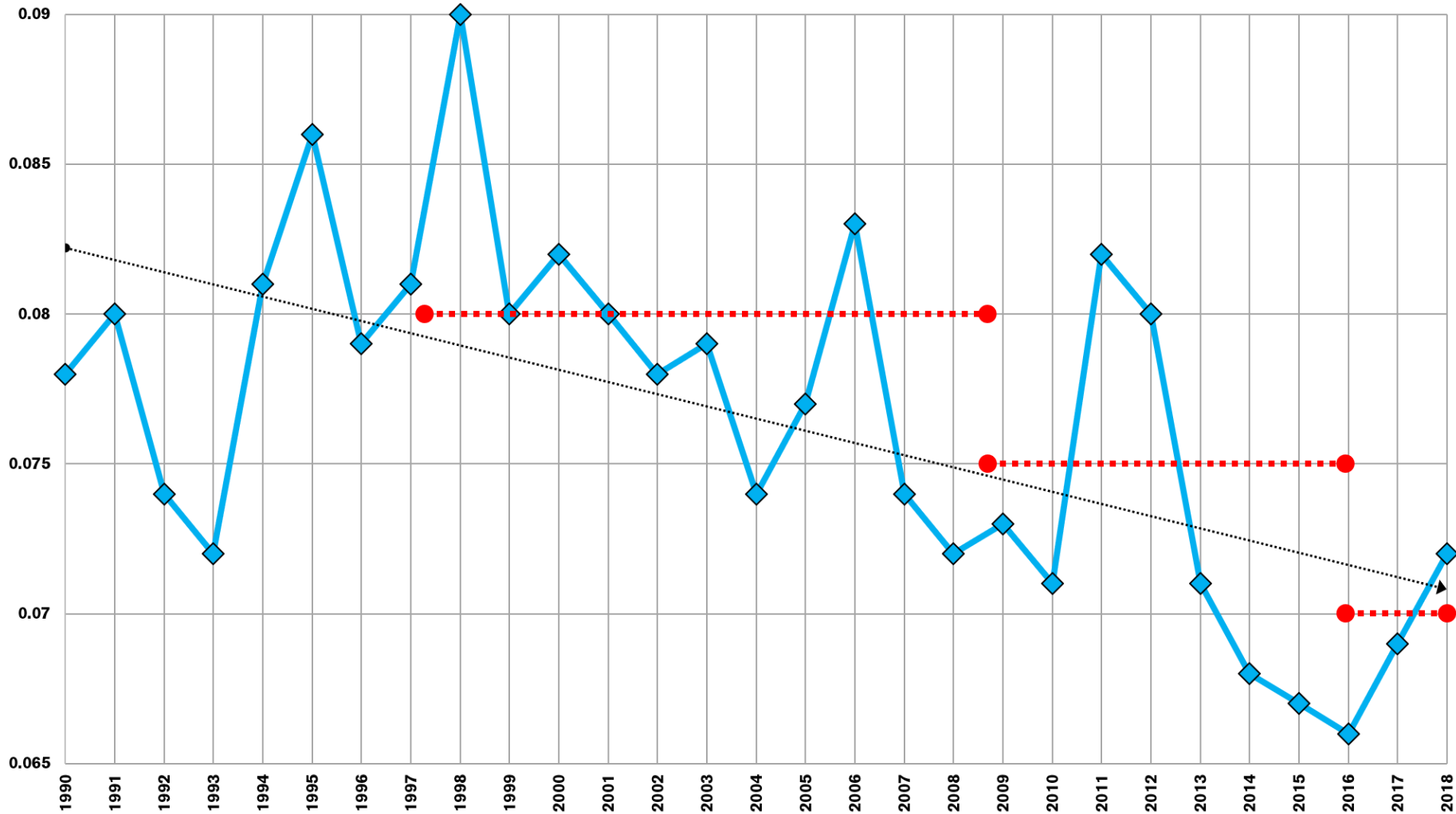
analyses, including inventorying and modeling, the findings of which are subject to review and approval by regional interagency bodies, the EPA, the U.S. Department of Transportation, and the Federal Highway Administration as well as public notice, public comment, and public hearing procedures. In many areas of the U.S., the local process of conformity determination has been the target of lawsuits from advocacy groups, which only compounds project delays.

The full repercussions are difficult to project but both the aforementioned CAPCOG study and the Alamo Area Council of Governments study sought to quantify their regional transportation conformity impacts and can help to demonstrate the scale of this facet of nonattainment. The CAPCOG study estimated the costs generated by transportation conformity to be in the range of \$72 million to \$216 million including lost federal funds, project delays, and required project analyses. The Alamo Area Council of Governments study estimated road construction delays would cost between \$571 million and \$855 million in lost GRP.

Oklahoma City's transportation infrastructure has required our most consistent public investment. While transportation conformity would not entirely eliminate Oklahoma City's capacity to conduct and fund local street and road projects, it would unreservedly constrain how we could both access federal transportation dollars and the types of projects eligible for those dollars.

Historically, with designation comes additional federal transportation dollars to assist with emissions reductions, specifically Congestion Mitigation and Air Quality (CMAQ) funds. The current federal transportation bill, the Fixing America's Surface

Figure AQ-2: Oklahoma City MSA Annual 4th Highest Ozone Values in Parts Per Million, 1990 - 2018



OKC MSA Design Value

The design value is a number based on the annual fourth-highest daily maximum 8-hour concentration of ozone taken from ODEQ's monitoring system averaged over three years. The design value is the regional number assessed by the EPA for the purpose of designation.

EPA 8-Hour Ozone Standard

In 1979, an ozone standard of 0.12 ppm on a 1-hour basis was established. That changed in 1997 when the standard was not only lowered to 0.08 ppm but shifted to an 8-hour standard. That 8-hour standard was lowered in 2008 to 0.075 ppm and again in 2015 to 0.07 ppm.

The chart above shows a general improvement in air quality from 1990 to 2018 in the Oklahoma City metropolitan statistical area, but the standard established by the EPA has also decreased the allowable pollution levels, most recently in late 2015.

Several factors contribute to improving air quality, but more stringent fuel efficiency standards for automobiles made a significant contribution to the pollution reduction during this timeframe. Growth in vehicle miles traveled combined with hotter, drier summers could increase conditions for ozone formation, however.

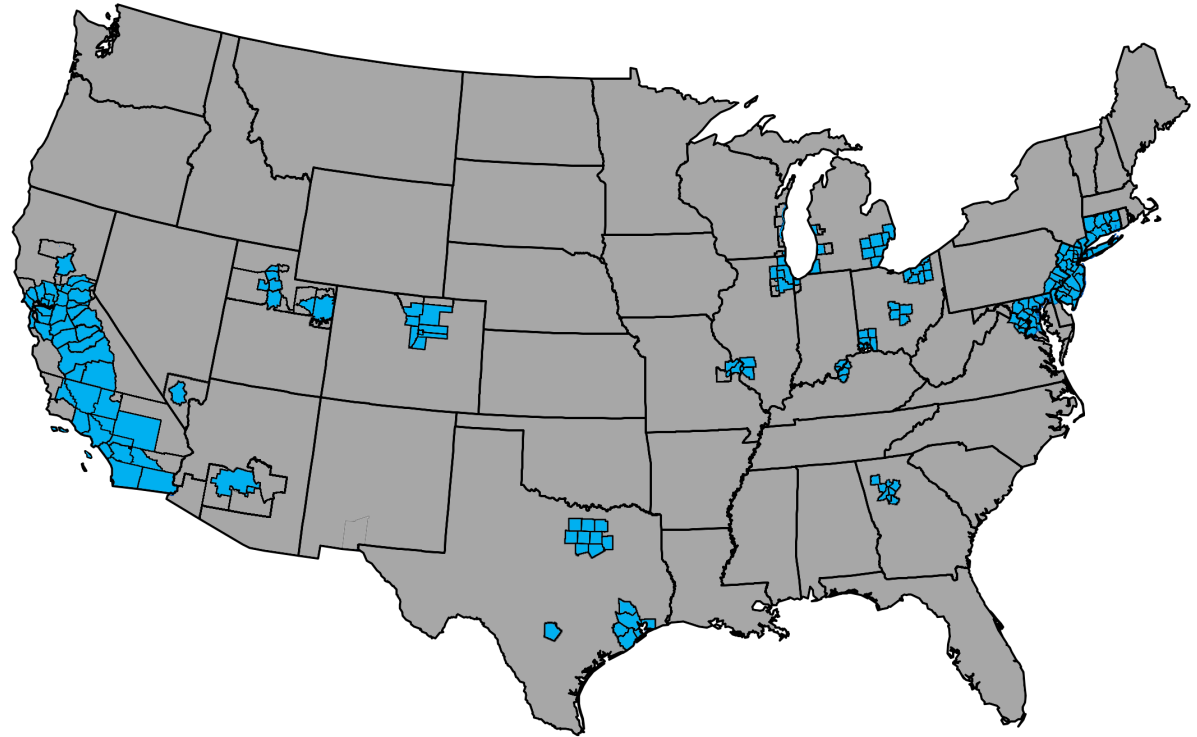
Transportation (or FAST) Act, authorized about \$2 billion annually from 2016 to 2020 in CMAQ funds. These are, however, subject to the constraints of transportation conformity.

There are project types exempt from transportation conformity per Title 40 of the Code of Federal Regulations (§ 93.126). It is perhaps most important to underscore that bicycle and pedestrian projects are wholly exempt from conformity alongside many transit project types. Functionally, this could translate to more dollars available for bicycle, pedestrian, and transit projects which could circumnavigate the costly and time-consuming delays faced by many other types of street and road projects. Broadly, safety projects such as resurfacing, the addition of medians, lighting improvements, and traffic control/signalization are exempt, and exempt transit options include shelters, fleet replacement, fleet vehicle rehabilitation, operating assistance, and more. While there is a degree of flexibility when it comes to project type exemptions during development of a State Implementation Plan, it is highly unlikely any project that widens or adds lane capacity to a road or highway would be allowed given the induced demand and subsequent contribution to congestion they cause.

Nonattainment would affect our ability to finance, construct, and maintain projects on one of our most vital public assets, rendering some projects ineligible while multiplying costs and timelines, and ultimately rendering it more difficult to provide the quality of infrastructure residents expect. For a region such as ours that has an overwhelming reliance on our transportation infrastructure, conformity would provide additional funds while significantly constraining our ability to take a business-as-usual approach to our transportation infrastructure.

While ozone and its precursors are less present in Oklahoma City's air, the lowering of the NAAQS continues to apply pressure to our ability to escape a nonattainment designation. Proactive steps now to further diversify regional mode share and replace emissions-generating VMT with alternative fuels that reduce or eliminate tailpipe emissions could not only generate dividends but prove vital to avoiding the high cost of nonattainment.

Figure AQ-3: Areas Designated Nonattainment of 2015 8-Hour Ozone Standard



Source: U.S. EPA

Above are the 51 areas consisting of 197 counties currently designated with some degree of nonattainment under the 2015 8-hour standard as of late 2019.

“The City works with ACOG and state agencies to monitor the metropolitan area’s [Clean Air Act] compliance. The Central Oklahoma region has remained in compliance, though we had a challenging summer in 2018, and came within one failed pollution reading to be out of compliance.”

- Oklahoma City 2019 Federal Legislative Guide

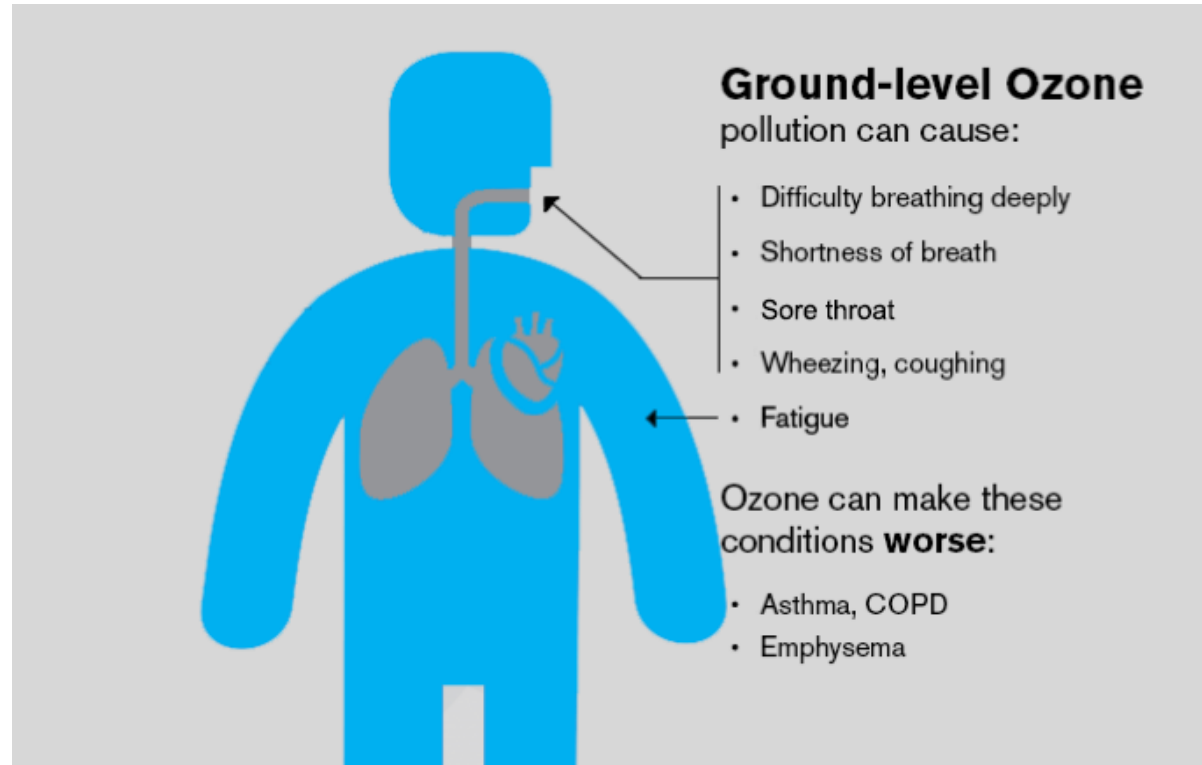
Public Health. The regulation of ground-level ozone was federally established because it presents a direct threat to public health. Inhalation of ground-level ozone can induce respiratory symptoms including coughing, irritation of the throat, shortness of breath, and pain, burning, or discomfort when taking deep breaths. Higher daily concentrations of ozone are associated with increased asthma attacks, hospital admissions, and daily mortality.

The Centers for Disease Control and Prevention's Behavioral Risk Factor Surveillance System (BRFSS) indicates Oklahoma's adult asthma rate as 10%, well above the U.S. median of 9.3% and the 16th highest adult asthma rate among all U.S. states. Oklahoma's 10% rate is a marked increase from the state's 2000 rate of 6.3%. Most Oklahomans with asthma experience persistent severity, meaning 68.3% of adults in Oklahoma diagnosed with asthma are on long-term medication or have uncontrolled or poorly controlled asthma without medication.

The most recent asthma mortality data ties Oklahoma and Indiana at fifth in the nation with 12,900 asthma-related deaths per million residents. The prevalence of asthma and other chronic respiratory conditions has other implications for health and wellness. For example, 40.8% of Oklahomans with asthma report their health as "fair" or "poor" whereas Oklahomans without asthma report their health as "fair" or "poor" at a significantly lower rate of 19.5%. The share of obese Oklahomans without asthma is 30.2%, more than ten points below the share of obese Oklahomans with asthma: 41.3%.

Locally, the EPA tool EJSCREEN places Oklahoma City in the 91st percentile nationally for ground-level ozone, meaning the average person in an Oklahoma City Census block group has a chance of exposure greater than or equal to 91% of the U.S. Oklahoma County has the highest adult asthma rate of all 77 counties at 11.4%.

The Oklahoma City-County Health Department reports chronic lower respiratory diseases (CLRD) were the third leading cause of death for residents of all ages in Oklahoma County, and disproportionately for residents age 55 or over, between 2011 and 2015.



When all 56 ZIP codes within Oklahoma County are ranked by CLRD mortality rates per 100,000 residents between 2013 and 2015, the top nine are all either wholly or partially within Oklahoma City. Those nine ZIP codes have an average mortality rate of 131.8 whereas the full list of 56 ZIP codes averages 67.9.

Our built environment can directly influence exposure to traffic-related pollutants like NOx based on land uses near highways as well as busy streets and roads. Research indicates populations living close to roads are more likely to experience adverse health outcomes including breathing problems, heart disease, cancer, and premature death.

Populations with increased vulnerability to these impacts include children, the elderly, and people with certain pre-existing medical conditions including CLRD. The Oklahoma City **planokc** Health Impact Assessment includes an analysis of major Oklahoma

City highways with sensitive land uses nearby. The analysis estimates greater than 50,000 Oklahoma City residents live within 500 feet of a major highway; additionally, within that same 500 foot buffer, there are eight schools, seven of which include elementary students.

Ultimately, supporting an expansion of transportation modes through service and infrastructure is the primary way to reduce ozone-forming emissions. We can design and construct our built environment, through the siting of sensitive land uses and the placement of vegetative buffers and tree canopies, as a tool to mitigate the impacts of existing emissions on residents.

Case Study: San Antonio, Texas

After the EPA's revision of the NAAQS in October 2015 lowered the 8-hour threshold for ground-level ozone from 0.075 to 0.070 ppm, the San Antonio metropolitan statistical area's MPO, the Alamo Area Council of Governments, published a study projecting the potential economic costs of a regional nonattainment designation. The study focused on potential loss of gross regional product, as well as the impact on employment, incomes, and output within major industries under both a marginal and a moderate nonattainment designation.

Researchers estimated costs could range from \$3.2 billion to \$27.5 billion under marginal nonattainment and could increase from \$7.1 billion to \$36.2 billion if the San Antonio region is given a moderate nonattainment classification. The region's transportation infrastructure would suffer a loss of between \$23.7 million and \$74.6 million in federal funds while transportation conformity would impose costs between \$48 million and \$141 million. These costs include project delays and required analyses of air quality impacts by each prospective project.

These analyses would critically limit the types of transportation projects that could receive federal funding and could even affect locally-funded projects should federal approval be required. Expansion of rail systems and aviation services would also see delays, costing as much as a combined \$2 billion.

The private sector, particularly manufacturing, construction, large businesses, and the Department of Defense's Joint Base San Antonio would be significantly affected by nonattainment. Designation would trigger new requirements for permits and infrastructure development and additional regulations on business emissions are now required in an effort to get the region back in compliance with air quality standards.

Companies planning expansion or seeking to relocate could incur losses ranging from \$699 million to \$24 billion. Permits needed to adhere to new regulations could cost between \$24 million and \$60 million. Researchers found nonattainment could discourage two major companies from expanding in the region, costing as much as a combined \$37.5 billion in lost gross regional product.

On Wednesday, July 18, 2018, the EPA announced of the eight counties in the San Antonio metropolitan area, all were designated as in attainment with the new 2015 ozone standard - with the exception of Bexar County. Home to approximately 1.7 million, Bexar County is the fourth-most populated county in Texas and the location of the city of San Antonio. Bexar County has until 2021 to meet the 0.070 ppm threshold for ground-level ozone.



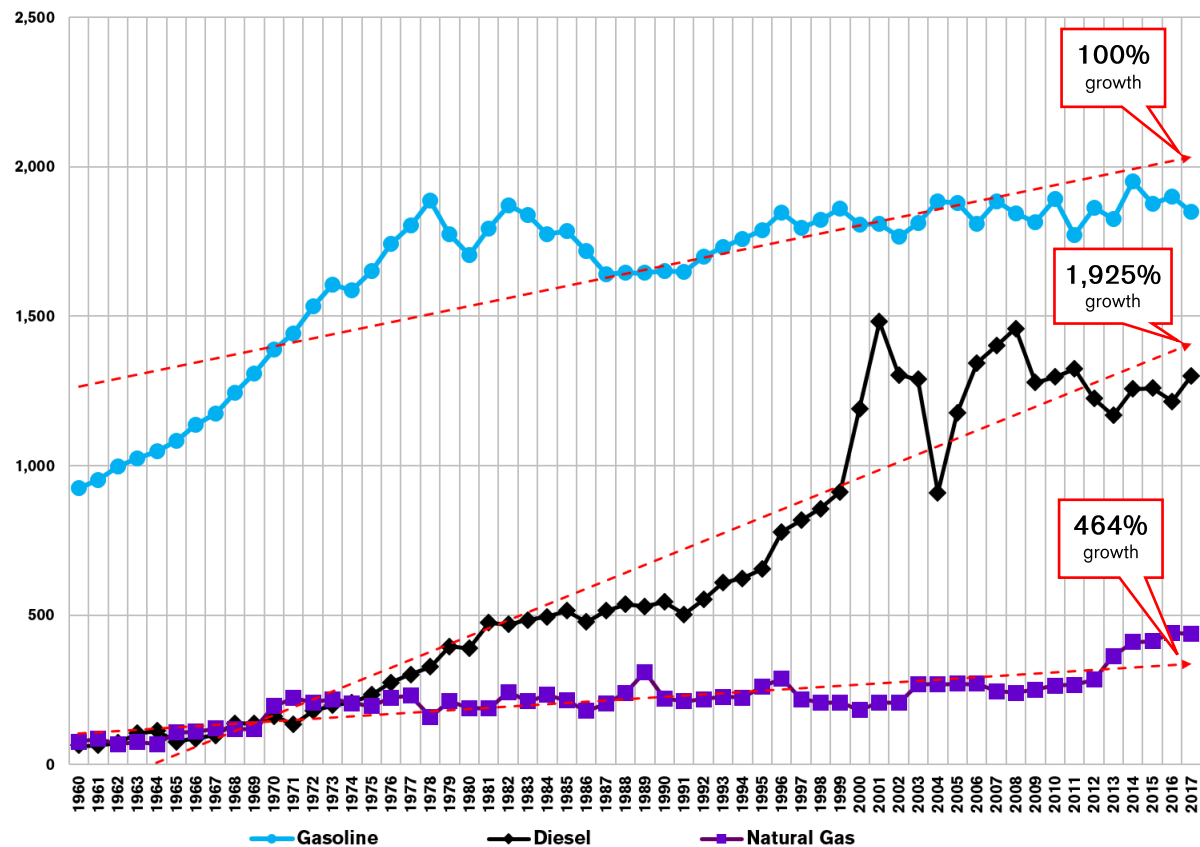
Between 2015 and 2017, the period of record for the EPA's decision, San Antonio's average ozone levels were calculated at 0.074 ppm. The new standard as of October 2015 is 0.070 ppm.

Alternative Fuels

The term alternative fuels refers to a broad range of fuels derived from sources other than petroleum. Per the Energy Policy Act of 1992, these are defined as “pure methanol, ethanol, and other alcohols; blends of 85% or more of alcohol with gasoline; natural gas and liquid fuels domestically produced from natural gas; propane; coal-derived liquid fuels; hydrogen; electricity; pure biodiesel (B100); fuels, other than alcohol, derived from biological materials; and P-Series fuels.” The U.S. Department of Energy can designate other fuels as alternative if the fuel is substantially non-petroleum and yields significant energy security and environmental benefits. As many alternative fuels are produced domestically, they contribute to energy security insofar as reducing reliance on foreign oil imports, a pillar of national energy policy since the embargos of the 1973 oil crisis. Alternative fuels also consistently emit fewer pollutants than petroleum-based fuels, an important tool to stave off future contributions to climate change as well as the possibility of a nonattainment designation.

Critically, alternative fuel adoption is fundamentally market-driven. Variables such as public and private sector commitments, sufficient fueling infrastructure, sufficient vehicle market demand and availability, and pricing competitive with petroleum-based fuels are key to advancing fuel switching on an effective scale. For Oklahoma City, alternative fuels offer a way to accommodate high vehicle miles traveled during gradual reduction through multimodal strategies while simultaneously diminishing emissions and reinvesting money into domestic, if not local, fuel processors and manufacturers. The City must determine how best to navigate its role in advancing the deployment of alternative fuels beyond its existing commitment to the municipal fleet. Without strategic action, not only could the benefits of alternative fuels decline but prove disruptive to our infrastructure and economy. Long-term consumption of diesel and natural gas as transportation fuels has grown markedly even though the quantities consumed remain well below those of gasoline.

Figure AQ-4: Oklahoma Transportation Fuel Consumption in Millions of Gallons or Gallon Equivalent, 1960 - 2017



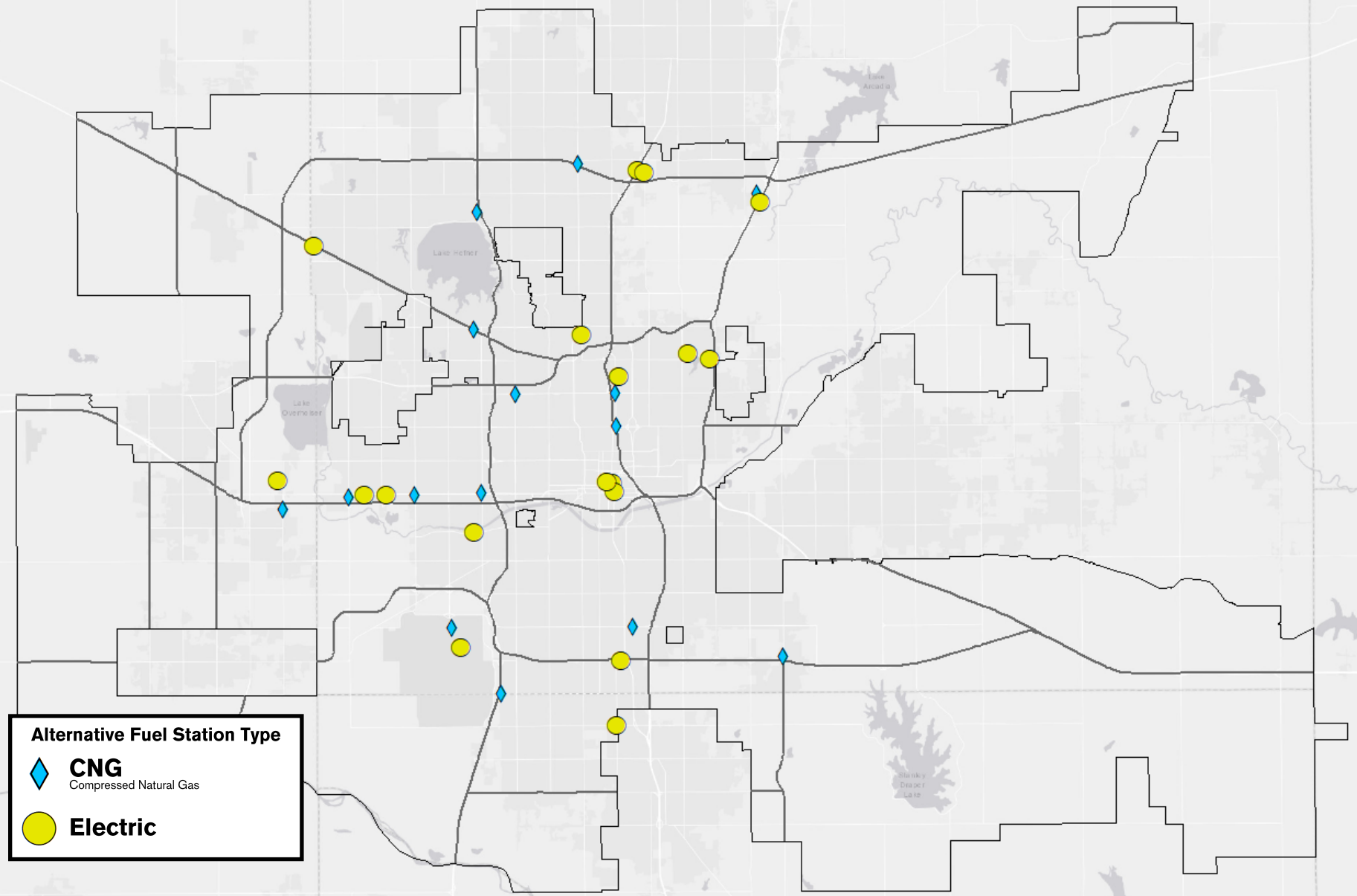
Source: U.S. Department of Energy

The significant growth of diesel consumption statewide indicates the growing demands of shipping and freight on our transportation infrastructure.

Consider, however, that as the existing apportionment formulas for the dedicated diesel and natural gas fuel taxes do not include remittances to Oklahoma cities and towns, those marked increases illustrate lost revenue to local governments - including Oklahoma City. The existing diesel fuel apportionment formula, for example, produced an annual remittance of \$2.1 million to Oklahoma County during FY18; about \$107,000, or 5%, of that

amount was deposited in the County Bridge and Road Improvement Fund, which can be used to jointly fund construction and maintenance of roads with the state and/or cities. Oklahoma County is responsible for approximately 549 miles of roads, the ninth fewest miles of roads among all 77 counties. The portion of Oklahoma City within Oklahoma County alone is comprised of approximately 3,622 miles of road, more than six times that of Oklahoma County.

Figure AQ-5: Publicly-Available CNG and Electric Vehicle Fuel Stations in Oklahoma City, 2020



Source: U.S. Department of Energy

As of early 2020, Oklahoma City has 15 CNG stations and 18 stations equipped with 44 electric vehicle charging ports. Compare to nearby cities such as Dallas (9 CNG, 199 EV stations with 326 ports); Tulsa (11 CNG, 29 EV stations with 78 ports), Wichita (1 CNG, 8 EV stations with 52 ports), and Little Rock (1 CNG, 25 EV stations with 91 ports).

Fuel Taxes. Petroleum-based fuels have long dominated as the primary fuel of the transportation sector, so much so that from the national level all the way down to municipalities, taxes on fuel purchases have generated revenue for governments. Oklahoma levies a tax of 20¢ per gallon on both gasoline and diesel fuel, the collections of which are apportioned by the state to a variety of entities including state, county, and local governments based on separate apportionment formulas codified in law. These 20¢ per gallon taxes are in lieu of sales tax, meaning the amounts afforded governments represents the total financial contribution of fuel purchases to every level of government in Oklahoma.

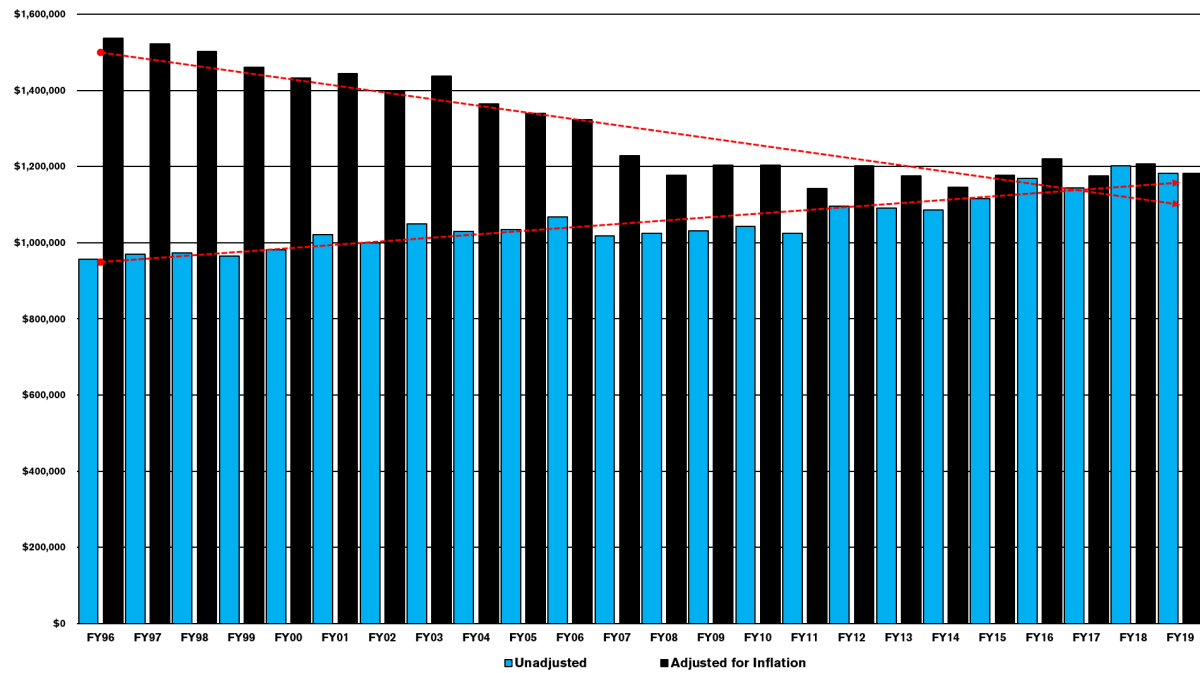
The amounts remitted to county and local governments are strictly required, per the Oklahoma Constitution, to be spent on the construction, repair, and maintenance of streets and roads. The Oklahoma fuel taxes are in addition to a federally-levied tax of 18.4¢ on gas and 24.4¢ on diesel, respectively, the revenue of which the U.S. Department of Transportation’s Highway Trust Fund uses to finance transportation projects.

The gas tax apportionment formula’s 1.875% remittance to cities and towns is distributed monthly based on gas sales within an entity’s corporate limits. Given Oklahoma City’s size and share of state population (approximately 16%), we receive the largest monthly apportionment of all Oklahoma cities and towns. However, in the 21 years between FY96 and FY19, the average annual remittance amount has been approximately \$1 million.

That apportionment alone is far from able to fully fund municipal transportation expenditures, so those funds are placed in the City’s General Fund and bundled with general purpose tax dollars to form the budget of the Public Works Department’s Streets program, which is responsible for road repair and reconstruction. Based on Streets program budget actuals from FY13 to FY18, gas tax funds comprise an average of about 8.9%.

As for Oklahoma’s diesel tax of 20¢ per gallon, it is now tied with Texas as the fifth lowest in the U.S. However, no portion of diesel tax collections are remitted to cities and towns, even as annual freight

Figure AQ-6: Gas Excise Tax Remittances to Oklahoma City, FY96 - FY19



Source: Oklahoma Tax Commission, U.S. Bureau of Labor Statistics

tonnage on Oklahoma City metro roads and highways is projected to increase 35% between 2010 and 2040. Oklahoma City is at the intersection of two interstate highways of the U.S. – I-40 and I-35 – making it a major crossroads for freight in North America.

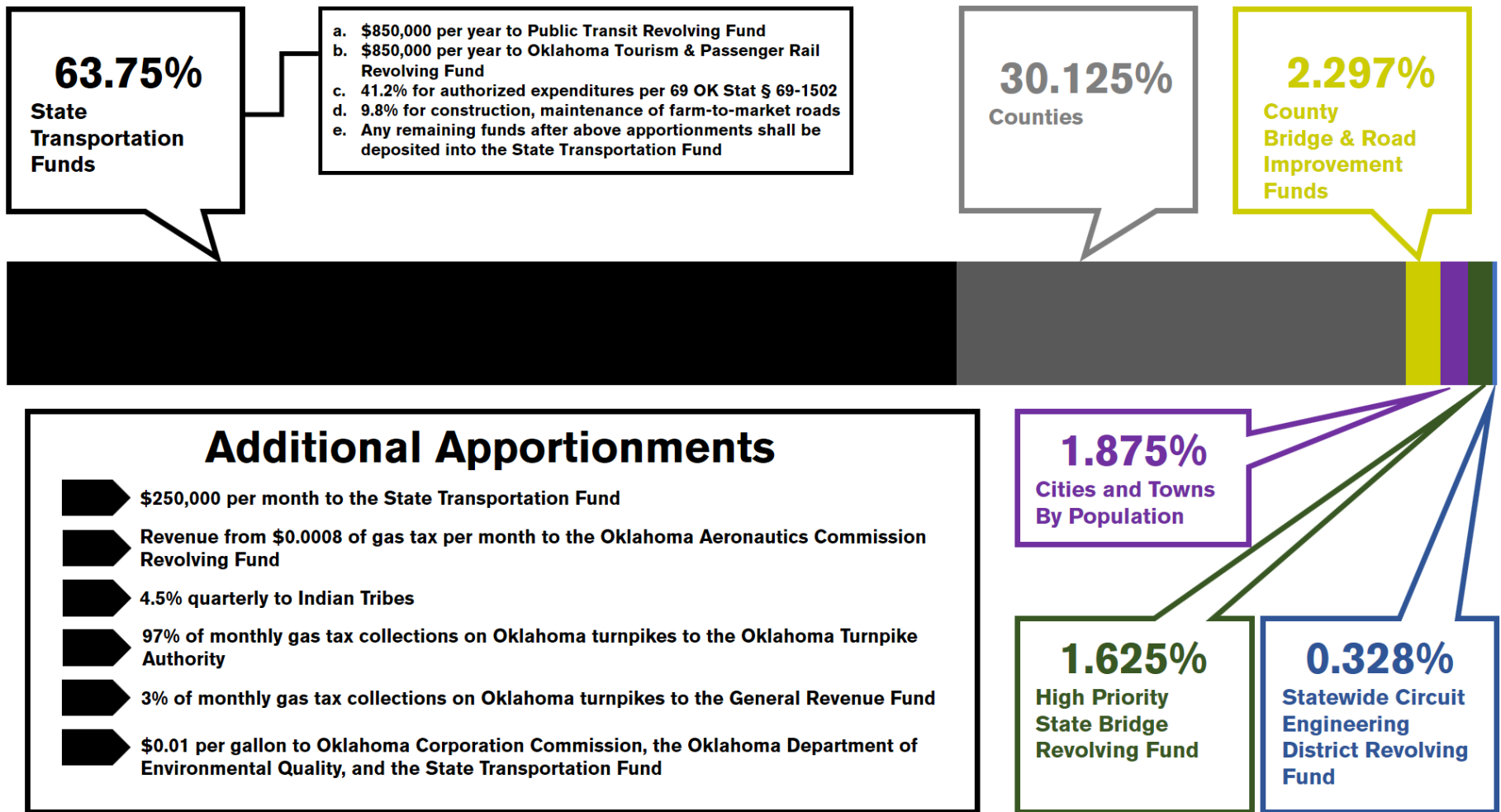
The U.S. Department of Transportation valued 2013 statewide freight flow via all modes at \$327.1 billion, and the highest value commodities shipped from Oklahoma, to Oklahoma, and all within Oklahoma are energy-related: coal, crude petroleum, and fuel oils. More than half of all statewide freight flow – approximately 65% – is by diesel truck. As a result, the Oklahoma City metro is one of 49 U.S. metros with highway freight truck volumes greater than 8,500 per day. The continuing growth of e-commerce is a leading contributor to freight growth and, while the Supreme Court’s 2018 decision in *South Dakota v. Wayfair Inc.* closed the tax-free loophole for online sales, it is state law that ensures the growth of

diesel-fueled freight traffic will afford no return to Oklahoma City by way of diesel fuel tax.

Oklahoma City residents consistently express dissatisfaction with the conditions of local streets and roads via the annual Oklahoma City Citizen Survey. Since 2005, satisfaction with the condition of Oklahoma City streets among residents has averaged just 18.3%, reaching its lowest point in 2016 at 9%. In all annual Citizen Surveys conducted, the City service residents identified as most important was the condition and maintenance of streets and roads. Thus, fuel tax collections are an essential component of meeting what residents have consistently articulated as their most pressing concern.

Part of the challenge is that gasoline consumption in Oklahoma has remained relatively flat for decades, which clearly has repercussions on gas tax revenue. While there have been year-to-year increases and decreases, in the 33 years between 1982 and 2016,

Figure AQ-7: Oklahoma Statutory Apportionments of Gasoline Excise Tax



The Oklahoma FY17 revenue and apportionment data from the Oklahoma Tax Commission can help illustrate the practical application of the above formula. Overall, the gas excise tax took in \$308,079,273.04 between July 2016 and June 2017. The largest share of that amount, about \$137 million, went to the State Transportation Fund. Cumulatively, counties received about \$94 million between direct remittances as well as payments to the county bridge and road improvement funds and circuit engineering district revolving funds. Tribes received about \$13.7 million and the state's General Revenue Fund saw about \$1.4 million. The Turnpike Authority kept about \$46 million while about \$6.4 million went to the specific funds that include Tourism and Passenger Rail, the Oklahoma Aeronautics Commission, High Priority State Bridges, and Public Transit. Approximately \$5.4 million was split between 584 cities and towns.

changes have shifted between the 2014 height of about 1.9 billion gallons to a low of 1.6 billion gallons in 1987, all within a range of about 310 million gallons. In 1987, Oklahoma gasoline sales totaled 5.7 million gallons per day and by 2014 those sales decreased slightly to 5.6 million gallons per day. Oklahoma was one of only 10 states to see a reduction in gasoline sales during that period, even if less than approximately 2%. This exposes the two serious flaws of Oklahoma's fuel taxes which, incidentally, are mirrored in the national fuel taxes: vulnerability to inflation and commodity price volatility as well as unresponsiveness to ever-increasing fuel efficiency.

Oklahoma's fuel taxes are fixed at a cents per gallon rate. Those fixed amounts mean diminished returns over time due to inflation. The Bureau of Labor Statistics' Consumer Price Index (CPI) Inflation Calculator estimates \$1 in 1987, when the state gas tax was last increased prior to 2018, has the same buying power as \$2.27 today. More specifically, what was 16¢ in 1987 was the equivalent of 36¢ today. In contrast to Oklahoma's fixed rate fuel taxes, 21 states have some form of variable-rate gas tax to capture sufficient transportation revenue. For instance, Florida, Maryland, North Carolina, and Rhode Island adjust their gas tax based on the CPI. Georgia adjusts their tax based on vehicle fuel efficiency standards; and Hawaii, Illinois, and Indiana all apply their general states sales tax to gasoline. While fuel tax rates are the purview of the Oklahoma Legislature, it is unavoidable that the current approach guarantees only inadequate transportation funding in perpetuity at the local, state, and national levels.

Corporate Average Fuel Economy (CAFE) standards, mandated by Congress after the 1973 oil crisis, are one of the principal catalysts – if not the principal catalyst – for the increases in miles per gallon of cars and light duty trucks. The CAFE standards are fleet-wide averages that must be achieved by each automaker for its car and truck fleet, each year, since 1978. When these standards are raised, automakers respond by creating a more fuel-efficient fleet, which is intended to improve national energy security and save consumers money while also reducing emissions.



ABOVE: MUNICIPAL FLEET CNG

A City employee refills a CNG-powered fleet vehicle at the \$1.28 million fast-fill CNG fueling station at the City's Central Maintenance Facility site. The station was added through federal funds from the Energy Efficiency & Conservation Block Grant through the U.S. Department of Energy.

Since the standards went into effect for passenger cars in 1978, the requirements have ratcheted up from 18 miles per gallon to about 40 miles per gallon in 2017, a 122% increase in efficiency that translates to fewer gallons of gas required to travel further in U.S. cars. Light duty trucks, whose CAFE standards were introduced in 1982, have jumped from 17.5 miles per gallon that model year to about 29 miles per gallon in 2017, an increase of about 65%.

These standards are in direct contrast to the nature of fuel taxes, however: whereas federal, state, county, and local taxes rely on fuel purchases, CAFE standards effectively mandate reductions in fuel purchases. While the CAFE standards do diminish said tax revenue, they can also be interpreted as incentivising research, development, and adoption of alternative fuels.

There are two well-developed alternative fuels already present in Oklahoma City that afford economic and environmental benefits: CNG and electricity. Both fuels have already had an impact on Oklahoma City and, due in no small part to private sector support, shall undoubtedly continue to do so.

CNG. Oklahoma's most prominent alternative fuel is CNG, hardly surprising as Oklahoma is the third largest natural gas producer in the U.S. CNG fuel consumption in Oklahoma continues to trend upward as consumption reached an all-time high in 2016, the most recent year data is available, with 440 million gallons of gas equivalents (GGEs) consumed – a growth of 469% from 1960 to 2016. The Department of Energy's Alternative Fuel Data Center identifies 103 public CNG stations statewide with 16 of those within Oklahoma City's corporate

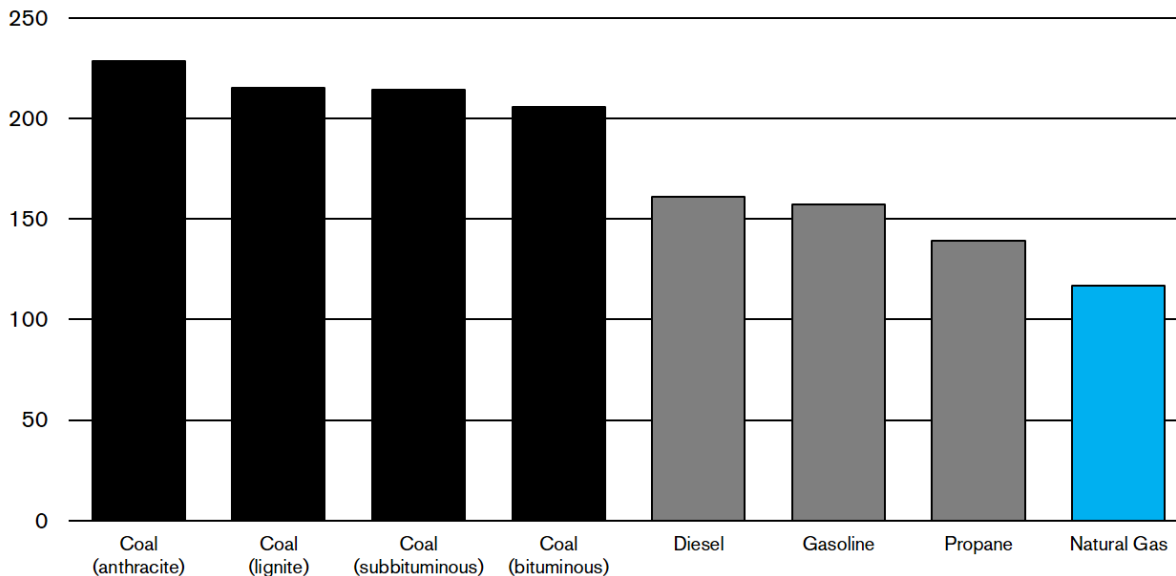
limits. Oklahoma leads the nation in CNG fueling stations per capita thanks in part to a statewide corridor with public CNG stations every 100 miles.

At a state level, Oklahoma has supported CNG fuel adoption via a suite of incentives and tax credits. For instance, the Alternative Fuel Vehicle (AFV) Tax Credit. This served as a one-time tax credit of 45% towards the incremental cost of either converting a vehicle to run on an alternative fuel or the purchase of a new alternative fuel vehicle. Eligible alternative fuels, however, were limited to CNG, liquefied natural gas (LNG), and liquefied petroleum gas (LPG). Another tax credit also allows for up to 75% of the cost and installation of commercial alternative fuel infrastructure for natural gas, propane, and electricity, with a 50% credit for residential CNG refueling system. A reduced fuel tax on CNG of 0.05¢ per gas gallon equivalent (GGE) is also tied to the expiration of the AFV tax credit, after which the excise tax will increase to be equal to the tax rate imposed on diesel fuel. The AFV credit was scheduled to sunset at the end of calendar year 2019, but was extended in 2019 through December 31, 2027.

While this subsidized fuel excise tax rate has not yielded a remittance to Oklahoma City, Argonne National Laboratory's GREET model estimates the life cycle petroleum use and emissions of light-duty vehicles running on CNG emit approximately 6%-11% fewer pollutants than gasoline, meaning Oklahoma City has benefited from fewer tailpipe emissions even while it reduces fuel excise tax revenue. The City has supported CNG through the addition of CNG vehicles to its fleet, including 80 light-duty CNG vehicles, heavy-duty CNG refuse haulers, five CNG sedans, and an ever-growing fleet of CNG-powered transit buses. A federally-funded \$1.28 million fast-fill CNG pumping station was installed at the City's Central Maintenance Facility. The most recent fiscal year City fuel usage reports indicate that, by annual average price per gallon (or equivalent), CNG was the cheapest fuel by both bulk purchase (\$1.11 per GGE) and at the pump (\$1.08). In contrast, conventional unleaded gasoline was the most expensive at \$1.63 per gallon in bulk and \$1.71 per gallon at the pump. A downside of CNG,

Figure AQ-8: Pounds of CO₂ Produced By Fuel Type

Per Million British Thermal Units of Energy



Source: U.S. Energy Information Administration

The amount of CO₂ produced when a fuel is burned is a function of the carbon content of the fuel. The heat content, or the amount of energy produced when a fuel is burned, is mainly determined by the carbon (C) and hydrogen (H) content of the fuel. Natural gas is primarily methane, which has a higher energy content relative to other fuels, and thus has a relatively lower CO₂-to-energy content.

however, is that while it emits far fewer emissions than conventional petroleum fuels, the extraction process itself generates emissions of a highly potent greenhouse gas. Natural gas itself is largely methane and leakage from wells, storage tanks, pipelines, and processing plants account for a significant portion (32%) of U.S. methane emissions and about 4% of total U.S. greenhouse gas emissions per the EIA. While methane is a short-lived pollutant, lingering in the atmosphere for approximately twenty years in contrast to the centuries or millennia for which CO₂ can persist, the Intergovernmental Panel on Climate Change estimates methane's potency as a heat-trapping gas is 86 times greater than that of CO₂. Furthermore, when methane does decay after a few decades, it simply becomes CO₂.

Natural gas is an important part of the economies of both Oklahoma City and Oklahoma and, while a significant improvement over petroleum fuels, it nonetheless poses environmental risks for which there are better long-term options.

Electric Vehicles. An emissions-free form of transportation, electric vehicle (EV) motors are becoming increasingly common in the 21st century despite development dating back to the early 19th century. Adoption of EVs in Oklahoma appears more gradual than elsewhere in the country. Across the state there are 234 public stations with 622 electric vehicle charging outlets. Oklahoma City is home to 28 of those locations with 15 fast-charging stations, surpassed only by Tulsa (37 total with 12

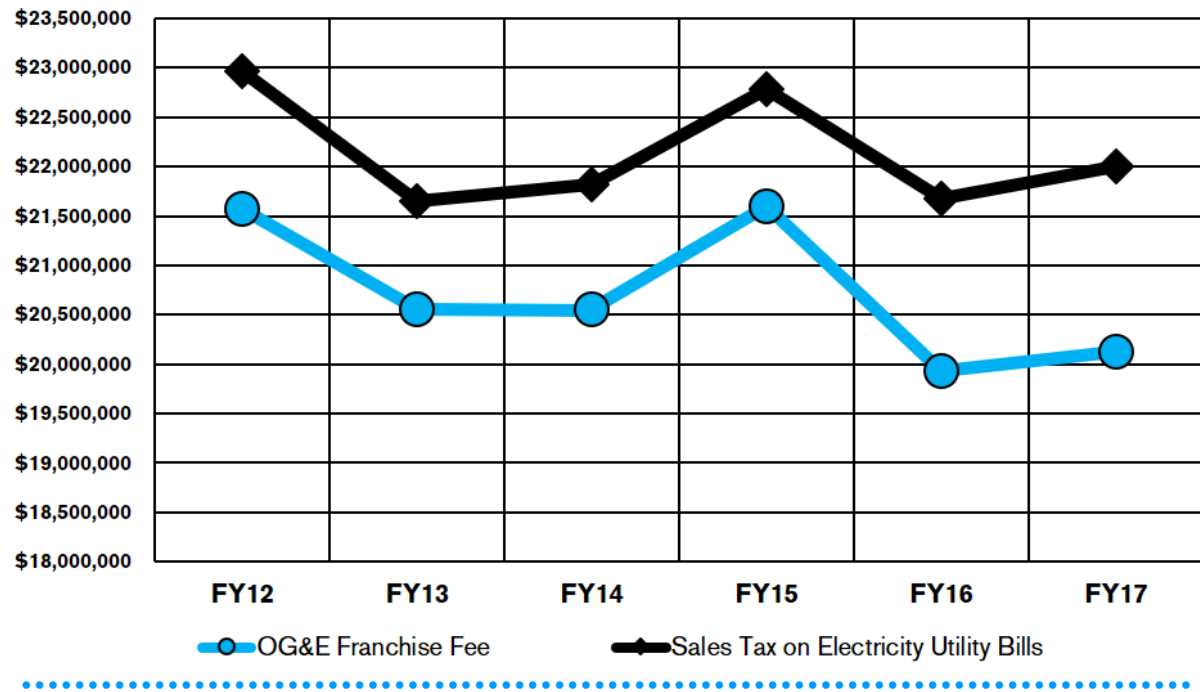
fast-charging) for the largest share of stations. Current locations include the Zoo, Skirvin Hilton Hotel, Whole Foods, Leadership Square parking garage, and OKC Outlets shopping center. Nationally, there are more than 30,000 public EV charging stations with more than 90,000 charging outlets, which means Oklahoma's share is less than 1% of both U.S. charging stations and charging outlets. Oklahoma is well below the U.S. average of about 461 charging stations per state, putting an unquestionable damper on EV adoption.

The state's two Clean Cities Coalitions (ACOG's Central Oklahoma coalition and INCOG's Tulsa Area coalition) formed the Oklahoma Electric Vehicle Coalition, a working group with more than 30 private sector, non-profit, and government representatives, including both City of Oklahoma City and OG&E seeking to increase EV use and facilitate the deployment of EVSE (electric vehicle equipment).

OG&E has made an effort to bolster EV adoption in Oklahoma in the recognition that the transportation sector is a new market segment for the investor-owned utility. In 2017, OG&E struck a promotional agreement with two regional car dealerships, Fenton Nissan and Bob Howard Nissan, to provide a \$10,000 rebate on the purchase price of a 2017 Nissan Leaf EV. This rebate, in conjunction with the existing federal tax credit for the purchase of an electric vehicle, equated to a potential \$17,500 reduction of a Leaf's sticker price, which ranged from \$30,000 to \$38,000.

The scenario OG&E finds itself in is not unlike that of the City. Clearly, OG&E would benefit from greater adoption of EVs but OG&E itself cannot single-handedly install the needed infrastructure in both residential and commercial sectors. Yet the charging infrastructure is arguably the critical component to greater momentum behind EV adoption. The Department of Energy's Electric Vehicle Infrastructure Projection Tool (EVI-Pro) Lite estimates at the end of 2016, the Oklahoma City metro had 985,500 light duty vehicles with 520 of those being EVs. If that number were to double to 1,040, the region would need an additional 49

Figure AQ-9: Comparison of Electricity Consumption Revenue, FY12 - FY17



Electrification could generate more revenue for the City twice-over: once through sales tax levied on increased electricity bills - a higher tax rate than that of the gasoline excise tax - and again as part of the contractual 3% return on gross receipts provided by OG&E as part of the franchise agreement.

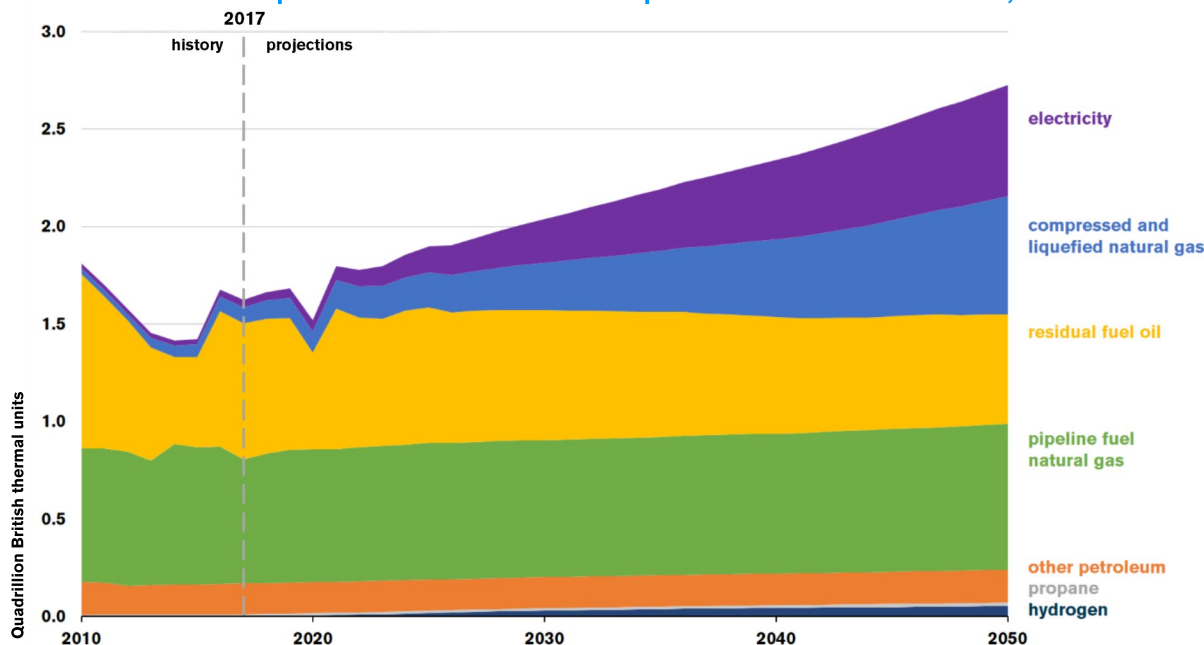
charging outlets capable of Level 2 chargers of 240-volt output or more. This assumes, however, every EV driver has residential charging and a mix of plug-in hybrids and all-electric vehicles with differing ranges. This underscores the chicken and the egg conundrum of EVs: consumers are unlikely to invest in an EV without plentiful, visible EVSE, yet investment in EVSE is unlikely until more consumers invest in EVs. OG&E, like the City, must determine how to best navigate the market-driven factors to reach the opportunities in wider EV adoption.

One of the major opportunities is distinctly economic. Electricity utility bills are subject to Oklahoma City's local sales tax, a substantially higher taxation rate when compared to the sliver of gas tax revenue remitted to the City. Increases in electricity

consumption within Oklahoma City boosts OG&E's annual revenue, of which 3% is returned to Oklahoma City per the 25-year franchise agreement. Practically, the expansion of electricity as a transportation fuel would be financially beneficial to Oklahoma City, both in terms of revenue and the achieved emissions reductions.

Electricity costs are also substantially lower than that of gasoline. The Department of Energy estimates a statewide average of \$2.69 per gallon of gas in Oklahoma. By comparison, they use residential energy prices to determine the cost of an "eGallon," or the electrical charge of an EV equivalent to a gallon of gasoline in a conventional vehicle. An Oklahoma eGallon is 94¢, meaning a resident could save \$1.75 per gallon of gas. While this can differ

AQ-10: U.S. Transportation Sector Consumption of Alternative Fuels, 2010 - 2050



Source: U.S. Energy Information Administration

Electricity and natural gas are projected to see the greatest growth through midcentury. Electricity use as fuel is projected to increase sharply after 2020 due to a projected rise in new light-duty vehicles sales that are electric and/or plug-in hybrid-electric. Natural gas consumption increases over the entire projection period due to growing use in heavy-duty vehicles and freight rail. Nationally, both passenger travel and total freight movement are projected to increase including 18% growth in light-duty vehicle VMT and truck freight VMT by 27%.

based on vehicle type and the specific tariff a residence or business might be on - think about a SmartHours participant charging their vehicle during peak hours versus charging overnight - it nonetheless demonstrates the significant cost savings to consumers electric vehicles can provide.

The average Oklahoma City household, per the Center for Neighborhood Technology, sees an average annual expenditure of 26% of household income on housing and 25% on transportation. While Oklahoma City's housing costs are far below the national average, our transportation costs are higher due in part to the significant average

household VMT (21,327 per year). Changes to household expenditure on fuel could help reduce those household transportation costs given the price difference of gasoline and electricity. While in-home vehicle charging would increase housing costs, consumers would still lower overall costs. The City has already taken steps to light the path for wider EV adoption. The municipal fleet includes several partially-electric and fully-electric vehicles for employee use, ensuring short trips are made without an emissions impact. With the addition of those vehicles comes EVSE at the Civic Center and within the Arts District Garage, though neither are open to

the public. The City has recently added two EVSE and EV-dedicated parking spots to the remodeled Santa Fe Intermodal Hub as well as the Oklahoma City Zoo. While these are policies internal to the City and City assets, an ordinance adopted in 2017 has created a mechanism for property owners to better accommodate EVs and EVSE.

Adopted in August 2017, City Council approved ordinance 25,709, which, in § 32-625, establishes a process whereby property owners can apply to the City's Traffic and Transportation Commission to designate and dedicate parking spaces for electric vehicles. This ordinance not only creates the ability to dedicate parking spaces upon approval of the Commission but allows for enforcement via parking citations for non-electric vehicles or non-charging electric vehicles found to be occupying spaces reserved for electric vehicles. The ordinance requires these reserved spaces are connected to EV charging infrastructure and are clearly marked by signage. This important tool provides not only the opportunity for property owners to reserve parking stalls but also to strategically offer a soft incentive to residents by placing those at premium locations nearer to a business' entrance.

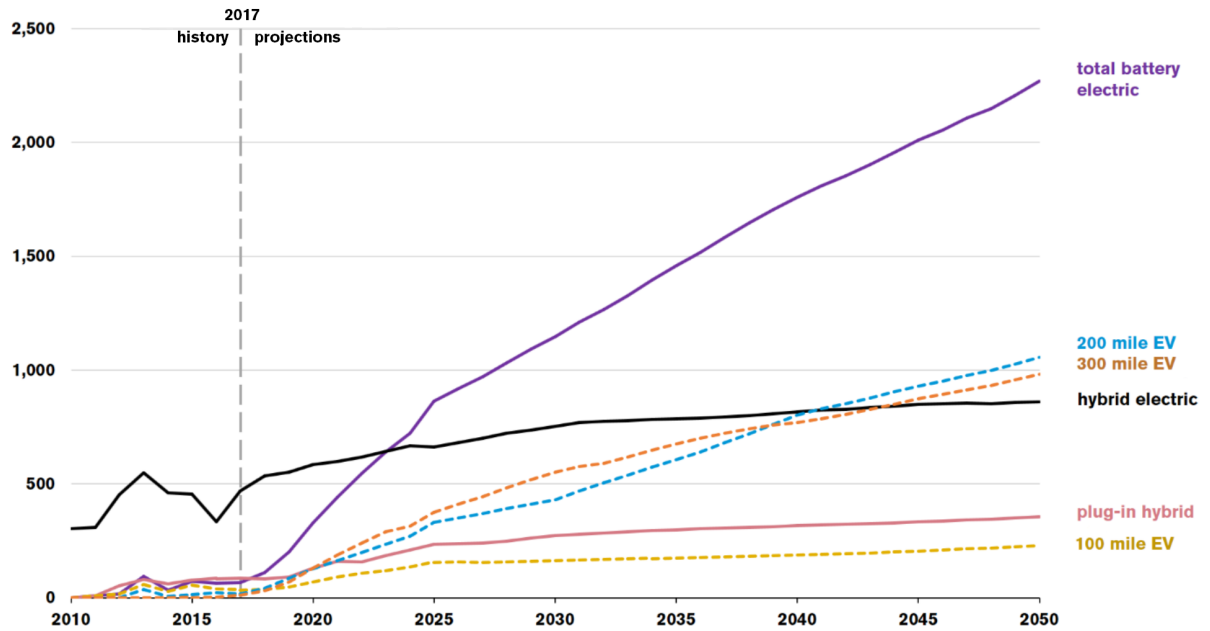
The convergence of transportation and energy provided by EVs is one Oklahoma City is well positioned to take advantage of. Not only are we a high VMT community with auto-centric infrastructure but our renewable energy resources are plentiful enough to serve as reliable means of generating electricity for a vehicular system. Whether through distributed generation such as combined EVSE of charging outlets and PV solar panels or a substantial increase of the amount of grid power generated by wind, the reality of drastically reducing transportation emissions is a present day feasibility. While realistically it will require gradual changes, policies, and market-driven adoptions, the environmental and economic benefits are more than sufficient to warrant further action - especially after consideration of the cost of doing nothing.

The projected market growth of total battery electric vehicles represents an opportunity for Oklahoma City. Local and regional VMT not reduced by

expanded bicycle, pedestrian, and transit infrastructure, safety, and service can be accommodated through technology that simultaneously reduces emissions and provides more revenue to the City. Additional EIA projections show combined sales of new electric, plug-in hybrid electric, and hybrid vehicles will grow from 4% in 2017 to 19% in 2050. The combined share of sales attributable to gasoline and flex-fuel vehicles is projected to decline from 95% in 2017 to 78% in 2050 due to the growth in the sales of electric vehicles. Passenger cars are projected to gain market share relative to light-duty trucks because of higher fuel efficiency in periods when motor gasoline prices are projected to increase and because crossover vehicles, often classified as passenger cars, increase in availability and popularity. New vehicles of all fuel types show significant improvements in fuel economy because of compliance with increasing fuel economy standards. New vehicle fuel economy is projected to rise by 45% from 2017 to 2050.

The EIA estimates Oklahoma's statewide electricity generation mix is 41.22% natural gas, 31.88% wind, and 22.69% coal with the remainder made up of small percentages of hydroelectric, biomass, solar, oil, and miscellaneous fossil fuels. The percentage of wind-generated electricity in Oklahoma places us third in the nation, meaning more than a quarter of statewide power is generated without CO₂ emissions. As a result, electric vehicles in Oklahoma see reduced emissions not just from nonexistent tailpipe pollutants but also reduced pollutants from the generation of electricity that powers them. Thus, growth in all electric vehicles as well as renewable forms of electricity generation would generate significant reductions in emissions. Unfortunately, this may not be true of Oklahoma City EVs as OG&E's generation mix differs notably from the statewide generation mix, relying more on coal and natural gas with only about 10% of electricity generated renewably, principally wind. This is where that convergence of transportation and energy becomes important: part of the emissions reduction of EVs is determined by how the electricity used to power it is generated. All-electric vehicles (EVs), plug-in hybrid electric vehicles (PHEVs), and hybrid

Figure AQ-11: Projected U.S. Sales of New Battery Powered Vehicles Per Thousand Vehicles, 2010 - 2050



Source: U.S. Energy Information Administration

There is little question as to whether or not electric vehicles will continue to penetrate the personal vehicle market; rather, the question is how the necessary charging infrastructure will keep pace.

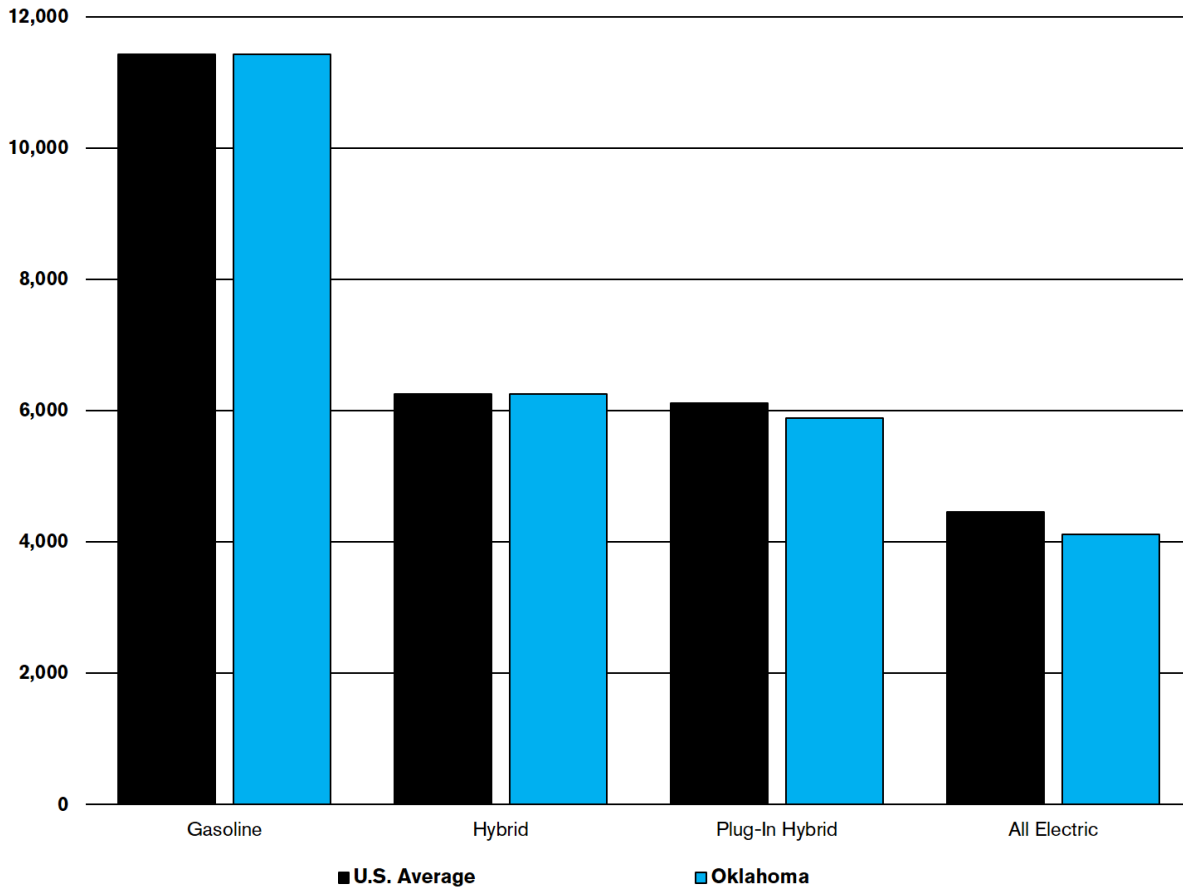
electric vehicles (HEVs) typically produce fewer tailpipe emissions than conventional vehicles. When measuring well-to-wheel emissions, electricity source is important: for PHEVs and EVs, part or all of the power provided comes from off-board sources of electricity. There are emissions associated with the majority of electricity production nationwide and this is reflected in OG&E's generation mix. EVs and PHEVs running only on electricity have zero tailpipe emissions, but emissions may be produced by the source of electrical power such as a coal-fired power plant. In areas that use relatively low-polluting energy sources for electricity generation, PHEVs and EVs typically have a well-to-wheel emissions advantage over similar conventional vehicles running on gas or diesel. Regions that depend heavily on conventional fossil fuels for electricity generation, may not see a

well-to-wheel emissions benefit.

Ideally, a greater share of OG&E's electricity generation would come from renewable sources, thereby eliminating source emissions - CO₂ and nitrogen oxides and volatile organic compounds in particular - but also contributing by powering personal vehicles with little to no tailpipe emissions themselves.

Ultimately, the challenge with alternative fuels in general, but especially EVs, is determining what role local government can play in its expansion. Certainly, there is a revenue-based incentive for the City to see more EVs on the road as a result of both the OG&E franchise agreement remittance and the sales tax levied on utility bills. Yet the cost of infrastructure expansion is significant and it isn't clear precisely

Figure AQ-12: CO2 Emissions Comparison by Vehicle Type



Source: U.S. Energy Information Administration

Gasoline vehicles emit almost four tons more CO₂ than all electric vehicles.

upon whom that cost will fall. It was not until January 2019 that the Oklahoma Corporation Commission allowed for the exemption of electric vehicle supply equipment/charging infrastructure from electricity resale laws. This is significant as it allows for customers to be charged and pay for electricity consumption “at the pump” rather than aggregating the electricity consumption costs into the property owner’s account. But this harkens back to the chicken and the egg conundrum: will gas stations,

parking garages, and business pay for the installation of EV charging stations without a notable presence of EVs driven by regional consumers? While the focus on adding public charging stations will be needed, some strategic focus will shift to increasing workplace charging and other strategies that increase demand for EVs.

The long-term effects of an underequipped EV-ready region, one without widespread, publicly-available

"Oklahoma has a long history of alternative fuels leadership ... The state also looks toward a future with more electric vehicles on our roads as the availability of these vehicles increases and costs come down. Increased use of alternative fuels in transportation advances the nation’s energy security and assists in regional efforts to remain in attainment of National Ambient Air Quality Standards."

- J. Michael Patterson
Former Executive Director
Oklahoma Department of
Transportation

charging infrastructure, could include decreased tourism and associated spending as EV drivers instead plan their trips from charging point to charging point.



Our Plan

Without strong efforts to reduce our emissions - both of CO₂ and ground-level ozone and its precursors - not only will the quality of our air degrade but so will the health of the public and the health of our economy.

Rather than suffer the burden of a federal nonattainment designation or a prospective emissions tax, Oklahoma City can work to proactively and responsibly curb emissions through more expanded bicycle and pedestrian infrastructure as well as expanded transit service. Determining a role in the expansion of alternative fuels is also necessary as helping that market develop in Oklahoma City can help replace existing, high-emissions VMT with low-to-no emissions commutes. We also cannot ignore the fiscal limitations we face in sustaining our transportation infrastructure and the increasingly outdated approach through which we receive street and road funding.

Safe, healthy air is a fundamental signifier of quality of life. As part of a transportation system that works for all users, eliminating emissions and pollutants must be part of the equation and at this crucial point in time we have the option of doing it ourselves or doing so under federal requirements.

Our Goals

EMISSIONS

1. Safeguard Oklahoma City's attainment designation.
2. Secure funding for transportation infrastructure.

Our Initiatives

Air Quality Initiatives	Goals	
	1	2
1. Reduce transportation emissions.	■	
2. Increase funding for transportation infrastructure.	■	■

"Good air quality in central Oklahoma is also an economic development issue. Companies that look to locate here consider our air quality as an important factor that contributes to their financial success and the health of their employees."

- Roy Williams
President and CEO
Greater Oklahoma City Chamber



INITIATIVE 1

REDUCE TRANSPORTATION EMISSIONS

Establish a greenhouse gas emissions reduction target. To measure Oklahoma City’s progress reducing transportation sector greenhouse gas (GHG) emissions, we must first establish an emissions benchmark by identifying major sources of GHG emissions both for City operations and community-wide. Once established, the inventory should be updated every five years to demonstrate changes in GHG emissions.

Reduce idling in City vehicles. Extended periods of idling in City vehicles not only contributes unnecessary emissions but wastes public resources. A comprehensive analysis should be performed to quantify idling time/fuel losses and a plan developed to recommend strategies to reduce idling.

Improve accessibility and expand the number of shelters at bus stops. To encourage use of the bus system and to protect riders from the extremes of Oklahoma weather, every bus stop should include a shelter from the wind and rain and connect to a network of sidewalks. Negative perceptions of public transit accessibility is a primary deterrent to new riders and creates daily challenges for existing riders.

Increase use of alternative fuel vehicles in City fleet including buses when operationally appropriate. EMBARK operates 49 total buses in the public transit system, 19 of which use CNG for fuel and the remaining 30 use diesel. Diesel engines are a primary source of vehicle emitted particulate matter and nitrogen oxides and provide a major opportunity to reduce emissions associated with public transit service. With more than 2.8 million service miles driven each year, the reduction of more than 31 annual tons of NOx and PM2.5 emissions would equate to about \$650,000 in annual health benefits according to the EPA.

Support electric vehicles. Electric vehicle use reduces emissions and supplements City revenue for road maintenance through sales tax and franchise fee collections. Providing and promoting a public



network of reliable fuel sources for EV users will remove perceived barriers to EV ownership and minimize emissions associated with metro-area commutes.

Support bicycle commuting. Residents have voiced support for more choices in how to get to work. The City should create a safe environment for bicycle commuters and provide secure bicycle parking solutions to encourage choosing active transportation. Decreasing the number of single occupancy vehicles in Oklahoma City metro commutes will not only reduce congestion and associated emissions, but will also mitigate wear and tear on highways and City streets.

Analyze potential long-term impacts of automated vehicles. Driverless vehicles are a major component in long-term transportation planning, as many sectors such as freight and ride sharing are already conducting on-road tests to refine the technology. Oklahoma City, located at an intersection of major freight corridors, is positioned to take advantage of this opportunity, but must adapt policy positions and infrastructure that will embrace the benefits and minimize disruptions.

POLICIES

AQ-1: Partner with regional and state agencies to estimate economic impact of nonattainment.

AQ-2: Conduct greenhouse gas emissions inventories at minimum 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.

AQ-5: Increase the number of publicly-available electric vehicle charging ports and promote locations online.

AQ-6: Conduct analysis of City fleet use and establish target for percentage of fleet comprised of electric vehicles.

AQ-7: Develop strategy and implement process to reduce idling in municipal vehicles.

AQ-8: Promote local, state, and federal alternative fuel incentives and vehicle emissions standards.

AQ-9: Require “EV-ready” construction to ensure new public buildings are suitable for electric vehicle supply equipment.

INITIATIVE 2

SECURE FUNDING FOR TRANSPORTATION INFRASTRUCTURE

Support development of statewide fuel tax alternatives. Fuel efficiency standards established in the 1970s coupled with the introduction of a growing number of alternative fuel vehicles on Oklahoma roads will continue the downward trajectory of local tax remittances from gasoline and diesel consumption. Municipal agencies responsible for street maintenance need assured funding for the future.

Partner with local, regional, and state agencies to study effects of nonattainment. The three-year regional air quality values are edging near the EPA's threshold for a non-attainment designation. This designation would initiate new processes, like New Source Review and Transportation Conformity, that would affect the City's economy. It is vital to understand the reach of these impacts before a non-attainment designation is affirmed.

POLICY

AQ-10: Advocate to amend the state apportionment formula for motor fuels to increase gasoline and diesel tax remittance to cities and towns.

.....
RIGHT: An electric vehicle is connected to a charging port at the recently renovated Santa Fe Transit Hub along E.K. Gaylord Blvd.

