



Photo: Rachel Ellis

## Xcel Energy's Gas Plants Threaten the Health and Safety of Denver's Communities of Color

*A Review of Denver's Overlooked Environmental Justice Offenders — the Cherokee and Arapahoe Gas Plants*

Report by: Anna McDevitt

Reviewed by: Amelia Myers, Brendan Pierpont, Ean Thomas Tafoya, Katara Burrola, Kristiana Faddoul, Matthew Gerhart, and Thomas Young

November 2021

“All people have the right to breathe clean air, drink clean water, participate freely in decisions that affect their environments, live free of dangerous levels of toxic pollution, experience equal protection provided by environmental policies, and share the benefits of a prosperous and vibrant pollution-free economy...”

- Colorado House Bill 21-1266

---

## Table of Contents

<b>Executive Summary</b>	<b>2</b>
<b>Background</b>	<b>3</b>
<b>Overview of Xcel Energy’s Gas Plants in Denver</b>	<b>4</b>
<b>Xcel’s Denver Gas Plants Pollute Neighborhoods and Harm Human Health</b>	<b>6</b>
<b>NOx pollution</b>	<b>6</b>
<b>SO2 pollution</b>	<b>7</b>
<b>CO2 pollution</b>	<b>8</b>
<b>Xcel Energy’s Gas Plants in Denver are Disproportionately Located in Low-Income Communities of Color with Higher-Than-Average Health Burdens and Rates of COVID-19</b>	<b>9</b>
<b>Demographic Indicators</b>	<b>9</b>
<b>Health Indicators</b>	<b>12</b>
<b>COVID-19 Rates</b>	<b>12</b>
<b>Xcel Energy’s Gas Plants in Denver are Located in Parts of the City That are Already Disproportionately Impacted by Many Sources of Localized Pollution and Climate Change</b>	<b>14</b>
<b>Localized Pollution and Environmental Indicators</b>	<b>14</b>
<b>Vulnerability to Climate Change</b>	<b>16</b>
<b>Recommendation</b>	<b>18</b>

---

## Executive Summary

For decades, low-income communities of color in Denver have been disproportionately burdened by pollution from multiple sources. Transportation pollution from highways cutting through neighborhoods, refineries that supply fuel for industry, and coal and gas-fueled power plants are all examples of sources of pollution that are more likely to be in Denver's predominantly low-income communities, especially those with a higher share of people of color. Concentrating pollution sources in communities of color constitutes environmental racism, defined as "intentional or unintentional racial discrimination in environmental policy-making, enforcement of regulations and laws, and targeting of communities for the disposal of toxic waste and siting of polluting industries<sup>1</sup>."

In particular, Xcel Energy's Cherokee and Arapahoe gas plants in Denver are textbook examples of environmental racism. Each year, they spew tons of dangerous air pollution into surrounding neighborhoods that have a lower median household income and higher percentage of people of color than most of Colorado, as well as higher overall health burdens compared to the Denver metro area. This is a pattern replicated across the state: A 2020 analysis by Physicians, Scientists, and Engineers for Healthy Energy (PSE) found that Colorado's gas plants are disproportionately located in communities with a higher share of people of color and low-income households than the state average<sup>2</sup>.

This analysis will provide an environmental justice review of Xcel Energy's gas plants in Denver and discuss the benefits of early retirement of Cherokee and Arapahoe. It includes a summary of the demographic and health indicators within three miles of each plant to better understand the environmental and socioeconomic vulnerabilities of the Coloradans who live near the plants. A review of demographic, health, and environmental pollution indicators reveals the following:

1. Xcel Energy's gas plants in Denver pollute nearby neighborhoods with air pollutants that are bad for human health.
2. Xcel Energy's gas plants in Denver are located in low-income communities of color with higher-than-average health burdens and rates of COVID-19.
3. Xcel Energy's gas plants in Denver are located in parts of the city that are already disproportionately affected by many combined sources of localized pollution and by climate change.

This review demonstrates the opportunity for Colorado's largest city and largest electricity provider to work together to transition off of fossil fuels to a more equitable, clean energy future that promotes healthy neighborhoods for everyone in accordance with several state laws. We recommend that in the pursuit of environmental justice, climate action, and Denver's goal of 100 percent renewable electricity by 2030, Xcel Energy should consult with local communities and the City of Denver government to come up with plans to retire the Cherokee and Arapahoe gas plants by 2030 at the latest.

---

<sup>1</sup> Oxford University Press definition of [Environmental Justice](#)

<sup>2</sup> [Equity Focused Climate Strategies for Colorado](#)

---

## Background

### Colorado State Laws

In 2019, Governor Polis signed House Bill 19-1261 into law, setting Colorado up with a goal to reduce economy-wide greenhouse gas emissions 50 percent by 2030 compared to 2005 levels. This law requires the state to reduce harmful air pollution in disproportionately affected communities and strive to ensure the health, environmental, and air quality benefits of climate pollution reductions are distributed equitably, particularly to disproportionately impacted communities. In 2021, the Governor signed into law two bills that provide additional requirements for state agencies to consider environmental justice. HB 21-1266 provides a framework for holding Colorado state government responsible for achieving “environmental justice, health equity, and climate justice for all communities by avoiding and mitigating harm.” SB 21-272 requires the Colorado Public Utilities Commission, among other things, to “consider how best to provide equity, minimize impacts, and prioritize benefits to disproportionately impacted communities and address historical inequalities.”

The state’s electricity sector—and more specifically, its largest electric utility, Xcel Energy—will need to play a pivotal role in enabling the state to meet these science-based and equity-focused goals. It can do so by rapidly transitioning off its fossil fuel power plants to ensure that Colorado reduces its emissions swiftly and that disproportionately impacted communities are prioritized in plans to reduce pollution.

### Denver’s Commitment to 100% Renewable Energy

16 cities and counties across Colorado, including Denver, have committed to transitioning to 100 percent renewable energy by 2030. These targets require Xcel Energy to plan for a rapid transition off of coal and gas plants that deliver electricity to these communities. In 2018, Denver Mayor Michael Hancock announced a goal of 100 percent renewable electricity by 2030 as part of the city’s 80x50 Climate Action Plan, which aims to reduce climate pollution from the sectors of Denver’s economy with the highest emissions.

More recently, Denver’s Office of Climate Action, Sustainability, and Resiliency released a Climate Protection Fund Five Year Plan in November 2021 that includes an updated goal of eliminating 100 percent of the city’s greenhouse gas emissions by 2040.<sup>3</sup> In the near-term, Mayor Hancock has also committed the city to reducing its greenhouse gas emissions 65 percent by 2030 from a 2019 baseline. The plan includes equity-focused metrics aimed at reducing exposure to air pollution and avoiding the harms of climate change. But, the fossil fuel power plants in Denver used by Xcel Energy to generate electricity stand in the way of the city achieving its goals—the Cherokee and Arapahoe gas plants.

---

<sup>3</sup> [Denver Office of Climate Action, Sustainability, and Resiliency Climate Protection Fund Five-Year Plan](#)

## Overview of Xcel Energy's Gas Plants in Denver

Before all else, it must be noted that Xcel Energy's gas plants in Denver reside on land that is the traditional territory of the Arapaho, Ute, and Cheyenne People. They took the sacred tribal names of the Cherokee and Arapaho without consent.

Figure 1: Location of Xcel Energy's Denver Gas Plants with 3-mile Radius

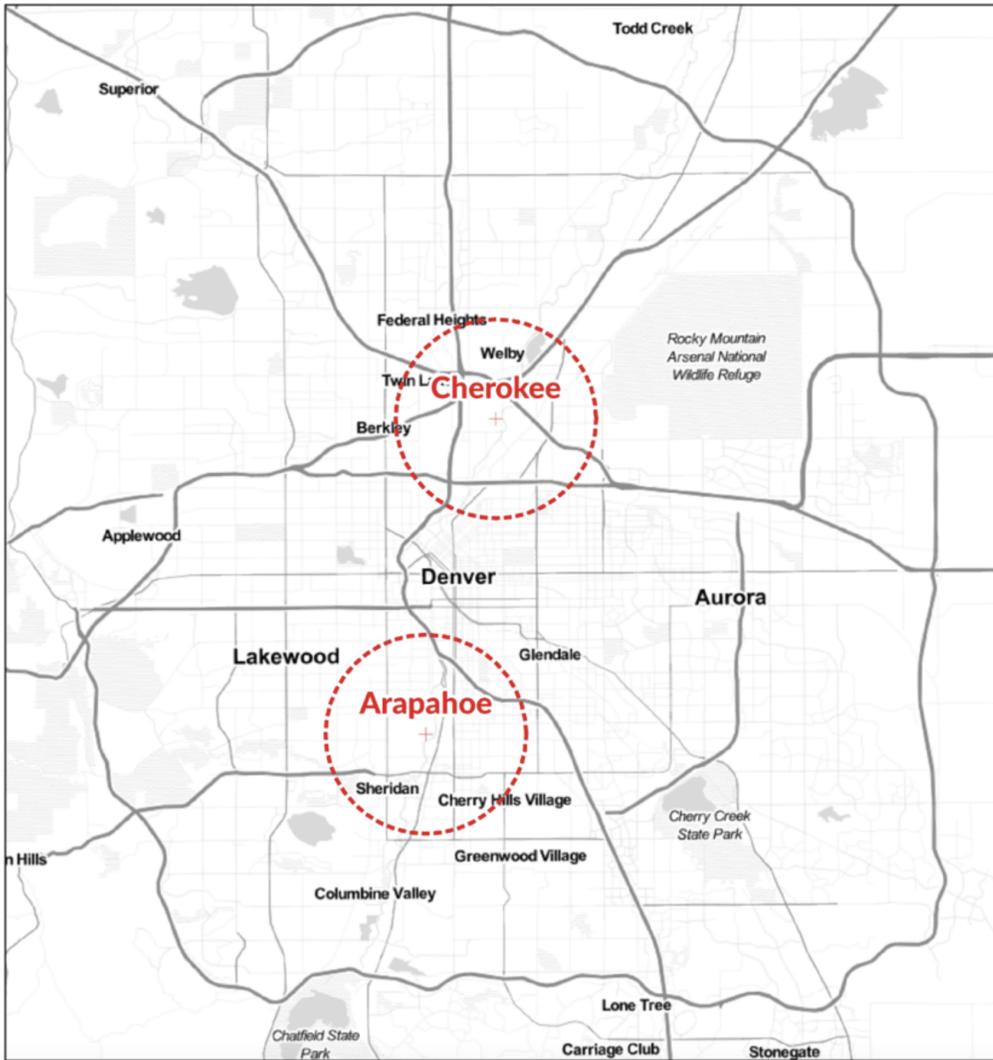


Figure 1 shows the Cherokee (north Denver) and Arapahoe (south Denver) gas plants as red crosses with circles around them showing the three-mile radius around the plant.



## Cherokee 4

Xcel Energy’s Cherokee gas plants in north Denver include four gas units (individual generators) at two gas plants—the Cherokee 4 power plant and the Cherokee Combined Cycle Plant.

The Cherokee 4 power plant is a 310-megawatt (MW) capacity gas steam turbine plant on the border of Denver and Adams County, Colorado, owned by Xcel Energy. The plant previously burned coal, but three of the four coal-burning units were retired. The last unit (unit 4), which came online in 1968, converted to burning gas as the primary fuel in 2017. That unit is still operational today. However, in 2020, the Air Quality Control Commission issued a regulation as part Colorado’s Regional Haze State Implementation Plan under the Clean Air Act requiring Cherokee Unit 4 to close no later than the end of 2028.

## Cherokee Combined Cycle (“CC”)

At 600 MW, the Cherokee CC power plant is one of the largest gas plants in the state. Located adjacent to the Cherokee 4 unit in North Denver, this combined cycle gas plant has three units (5, 6, & 7) that came online in 2015. According to Xcel Energy’s 2021 Electric Resource Plan, the estimated



retirement year for these three units is 2055. Notably, 2055 is five years after Xcel Energy says it will deliver customers with 100 percent carbon-free electricity and 25 years after the City of Denver strives to hit 100 percent renewable electricity.

## Arapahoe

The Arapahoe power plant in Sun Valley, Denver, consists of three combined cycle gas units with an operating capacity of 126 MW. The first unit came online in 2000 and the last in 2002, making the plant close to 20 years old. The gas plant is operated by Onward Energy (formerly, Southwest Generation Operating Company) and the electricity from the plant is purchased by Xcel Energy under a contract that expires in 2023. In Xcel Energy's 2021 Electric Resource Plan, currently being reviewed by the Colorado Public Utilities Commission, it is not yet known whether Xcel Energy will propose to extend its use of the Arapahoe gas plant in a new contract or let it expire in 2023.



---

## Xcel's Denver Gas Plants Pollute Neighborhoods and Harm Human Health

Nitrogen oxide (NO<sub>x</sub>), Sulfur dioxide (SO<sub>2</sub>), and Carbon dioxide (CO<sub>2</sub>) are some of the primary air pollutants emitted by gas-fired power plants like Cherokee and Arapahoe. NO<sub>x</sub> and SO<sub>2</sub> emissions harm human health directly, and CO<sub>2</sub> emissions contribute to the climate crisis, which greatly threatens human health. These pollutants are known for a variety of smog-forming, health-related, and climate polluting effects, which are reviewed briefly in this section. Notably, Cherokee 4 and Cherokee CC's emissions consistently rank within the top two to six gas plants in the state for each pollutant, meaning north Denver is burdened by the pollution from two of Colorado's most polluting gas plants in one location.<sup>4</sup>

### Nitrogen Oxide (NO<sub>x</sub>) Pollution

Breathing in high concentrations of NO<sub>x</sub> both short- and long-term is known to lead to respiratory illnesses, especially for children, the elderly, and people with asthma. Short-term, NO<sub>x</sub> can lead to respiratory inflammation such as asthma attacks or coughing. Long-term, NO<sub>x</sub> can lead to the development of respiratory diseases and infections.

Additionally, NO<sub>x</sub> is a smog-forming pollutant, meaning that it reacts with oxygen and sunlight to form particulate matter and ozone. The Northern Front Range (which includes the Denver metro area) is already classified as a "serious nonattainment zone" for ozone levels and is on track to be designated as "severe nonattainment" in 2022. The region broke records for ozone levels in summer 2021 and the three-year average for 2019 to 2021 for many

---

<sup>4</sup> 2019 emissions data is used as a proxy for current emissions because electricity demand and plant emissions were abnormally low in 2020 due to government-ordered closures of businesses at the beginning of the COVID-19 epidemic. Thus, 2019 is the most recent year for which a full year of emissions data is available and provides the best available estimate of current emissions.

of the ozone monitors closest to Denver is over 80 parts per million, violating the health-based EPA ozone cap of 70 parts per million.<sup>5</sup>

Figure 2: NOx pollution from Xcel Energy’s gas plants in Denver

	NOx emissions (2019)	State Rank for NOx Emissions
<b>Cherokee 4</b>	<b>766,050 pounds</b>	<b>2</b>
<b>Cherokee CC</b>	<b>261,563 pounds</b>	<b>6</b>
<b>Arapahoe</b>	<b>46,783 pounds</b>	<b>13</b>

Figure 2 shows 2019 NOx emissions for each Denver gas plant using emissions data reported in EPA’s Air Markets Program Data database. State rank applies to the 19 out of 32 gas plants in Colorado that have reported emissions, which account for over 98 percent of gas-based electricity generation in 2019.

In 2019, Cherokee 4 emitted more NOx pollution than all but one of the other gas-fired power plants in the state. At 766,050 pounds, the unit emitted three times the NOx of the average gas plant in Colorado that year, which released 229,209 pounds of the pollutant. Cherokee 4 is currently under scrutiny because when Xcel Energy applied for a permit to convert some of the facility to natural gas in 2012, the Colorado Department of Public Health and Environment (CDPHE) issued the permit without doing the necessary air modeling to verify that its emissions would meet National Ambient Air Quality Standards (NAAQS).<sup>6</sup>

Together, the Cherokee gas plants spewed 1,074,396 pounds of NOx into the north Denver community in 2019. This makes the Cherokee gas plants among the biggest NOx polluters in the Denver metro area, alongside the Suncor Refinery and Denver International Airport.

## Sulfur Dioxide (SO2) Pollution

Figure 3: SO2 pollution from Xcel Energy’s gas plants in Denver

	SO2 emissions (2019)	State Rank for SO2 Emissions
<b>Cherokee 4</b>	<b>6,677 pounds</b>	<b>5</b>
<b>Cherokee CC</b>	<b>12,876 pounds</b>	<b>3</b>
<b>Arapahoe</b>	<b>1,265 pounds</b>	<b>12</b>

Figure 3 shows 2019 SO2 emissions for each Denver gas plant using emissions data reported in EPA’s Air Markets Program Data database. State rank applies to the 19 out of 32 gas plants units in Colorado that have reported emissions, which account for over 98 percent of gas-based electricity generation in 2019.

<sup>5</sup> [Ozone plagues Colorado’s Front Range, state report says, but bids to change it are elusive](#)

<sup>6</sup> May 2021 PEER [letter](#) to EPA

Similar to NOx, Sulfur dioxide (SO2) is known to cause damage to the human respiratory system in children, the elderly, and those with preexisting respiratory conditions. SO2 pollution can lead to coughing, asthma attacks, and reduced lung function. Like NOx, SO2 pollution is also a contributor to haze and particulate matter.

Combined, the Cherokee gas plants emitted 19,553 pounds of SO2 into north Denver in 2019, which is more pollution than any other gas power plant site in Colorado.

## Carbon Dioxide (CO2) Pollution

Carbon dioxide (CO2) is a heat-trapping gas fueling global climate change. The higher average temperatures associated with CO2 pollution and climate change are known to increase allergens and air pollutants—most notably, ozone and wildfire smoke pollution. While gas plants typically emit less CO2 than the average coal plant, burning gas to generate electricity still produces CO2 emissions that contribute to global climate change.

Additionally, while the necessary upstream emissions data is not reported for Denver’s gas plants, the production, processing, and transportation of fracked gas releases methane, a greenhouse gas that is 84 times more potent than carbon dioxide during the time it remains in the atmosphere.<sup>7</sup> Methane has a high global warming potential over a shorter period than carbon dioxide and ultimately breaks down into carbon dioxide.<sup>8</sup>

Figure 4: Carbon Pollution from Xcel Energy’s Gas Plants in Denver

	CO <sub>2</sub> emissions (2019)	State rank for CO <sub>2</sub> emissions	Annual social cost of CO <sub>2</sub> emissions
<b>Cherokee 4</b>	<b>659,956 tons</b>	<b>5</b>	<b>\$44,877,008</b>
<b>Cherokee CC</b>	<b>1,270,789 tons</b>	<b>3</b>	<b>\$86,413,652</b>
<b>Arapahoe</b>	<b>112,774 tons</b>	<b>12</b>	<b>\$7,668,632</b>

Figure 4 shows 2019 CO2 emissions in short tons for each Denver gas plant using emissions data reported in EPA’s Air Markets Program Data database. State rank applies to the 19 out of 32 gas plants units in Colorado that have reported emissions, which account for over 98 percent of gas-based electricity generation in 2019. The annual social cost of CO2 emissions is calculated by multiplying 2019 CO2 emissions by the current minimum value of \$68/short ton required by House Bill 21-1238.

In 2019, the Cherokee and Arapahoe gas plants spewed more than two million tons of CO2 into the atmosphere, and those emissions are worsening the impacts of the climate crisis in Colorado communities.

Colorado House Bill 21-1238 requires investor-owned utilities in Colorado, like Xcel Energy, to use a social cost of carbon of \$68 per ton in utility resource planning for CO2 emissions. Using the social cost of carbon allows Xcel Energy to account for the costs of climate damages that result from each ton of their CO2 emissions. When the current social cost of carbon is applied to 2019 emissions, the more than two million tons of CO2 pollution from Xcel Energy’s Denver gas plants cost roughly \$139 million in climate damages that year.

<sup>7</sup> [Methane: A crucial opportunity in the climate fight](#)

<sup>8</sup> [How bad of a greenhouse gas in methane?](#)

# Xcel Energy's Gas Plants in Denver are Disproportionately Located in Low-Income Communities of Color with Higher-Than-Average Health Burdens and Rates of COVID-19

A 2020 analysis from Physicians, Scientists, and Engineers for Healthy Energy shows Colorado's gas plants are disproportionately located in communities of color, and Xcel Energy's gas plants in Denver are no exception. The EPA's EJScreen tool looks at the demographics of the people who live within three miles of a pollution source. Some 66,940 people live within three miles of the Cherokee plants and 150,649 people live within three miles of the Arapahoe plant. The three-mile radius is utilized by EPA's EJScreen to acknowledge the communities that are most affected by a power plant's pollution, though it should be noted that these impacts are not limited to just this three-mile radius. Emissions like NOx and SO2, and the ozone and particulate pollution they create in the atmosphere can travel farther than three miles.

Nationally, EJScreen analyses show that power plants tend to be located in communities with higher percentages of low-income people and people of color. Denver's gas plants are textbook examples of this kind of environmental racism. Census tract level data also shows that the population within three miles of Xcel Energy's gas plants in Denver is also overburdened by respiratory and cardiovascular diseases, including COVID-19, when compared to Denver metro area averages.

## Demographic Indicators

A review of the demographics within three miles of Cherokee and Arapahoe gas plants shows that Xcel Energy's Denver gas plants are located in communities where a disproportionate proportion of households are composed of people of color, low-income people, linguistically isolated people, and those with less than a high-school education. These demographic indicators are defined below and are depicted as a comparison to Colorado state averages in Figure 5.

Figure 5: Demographics of Population Within 3-mile Radius of Arapahoe and Cherokee Compared to Statewide Average

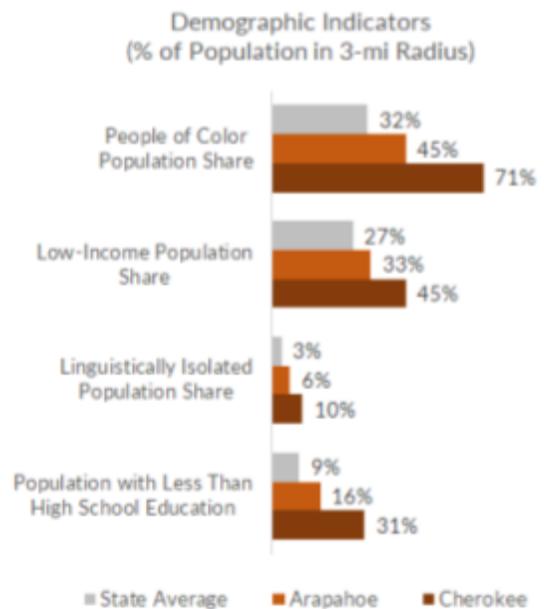


Figure 5 uses EPA EJSCREEN data to compare demographic indicators for the three-mile radius around each gas plant to the Colorado state average.

### People of Color Population Share (or “Minority Population”)

Xcel Energy’s gas plants in Denver are both located in areas where the population is predominantly Hispanic/Latino, marked by orange in Figure 6 below. Minority population is defined by EJScreen as the number or percent of individuals in a US Census block group who list their racial status as a race other than white alone and/or list their ethnicity as Hispanic or Latino. That is, all people other than non-Hispanic white-alone individuals. The word “alone” in this case indicates that the person is of a single race, since multiracial individuals are tabulated in another category—a non-Hispanic individual who is half white and half Native American would be counted as a minority by this definition.

The people of color population share within three miles of the Cherokee gas plant is 71 percent and 45 percent for the Arapahoe gas plant. This is notably higher than the state average for people of color population share, which is 32 percent.

As a percentile, the three-mile radius around the Cherokee gas plants and the Arapahoe gas plant have a higher percentage of people of color than 91 percent and 75 percent of Colorado, respectively. It’s worth noting that the orange area to the east of Denver is home to one of Xcel Energy’s gas plants as well—the Blue Spruce Energy Center (297 MW) in east Aurora, outside of the geographic scope of this analysis.

Figure 6: People of Color Population Share by Census Tract

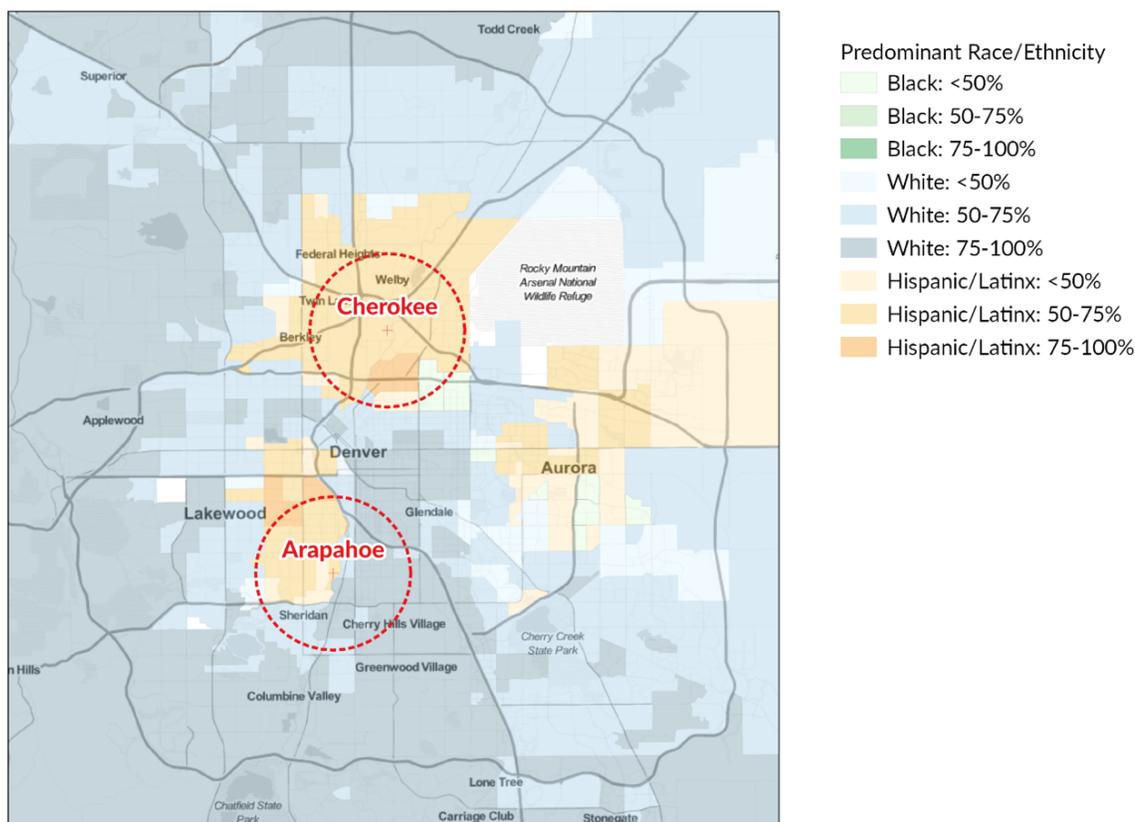


Figure 6 uses 2018 Census American Community Survey data to show the population share by race and ethnicity for Denver metro area census tracts. “White” represents non-hispanic white in the map above.

### Low-Income Population

Figure 7 below shows that the Cherokee and Arapahoe gas plants are also located in relatively low-income areas of Denver, as indicated by the lighter blue areas of the map. “Low-income” is defined as the number or percent of a block group’s population in households where the household income is less than or equal to twice the Federal poverty level.

Within three miles of the Cherokee gas plants, 45 percent of people fall into the low-income category compared to 33% percent of the people living within three miles of the Arapahoe gas plant. Statewide, 27 percent of Coloradans are considered low-income, meaning a higher percentage of low-income individuals live adjacent to both of Xcel Energy’s gas plants in Denver.

Put another way, the population within three miles from the Cherokee and Arapahoe gas plants has a lower median household income than 83 percent of the rest of Colorado. For the 3-mile radius around the Arapahoe gas plant, the median household income is lower than 68 percent of the state.

Figure 7: Median Household Income by Census Tract

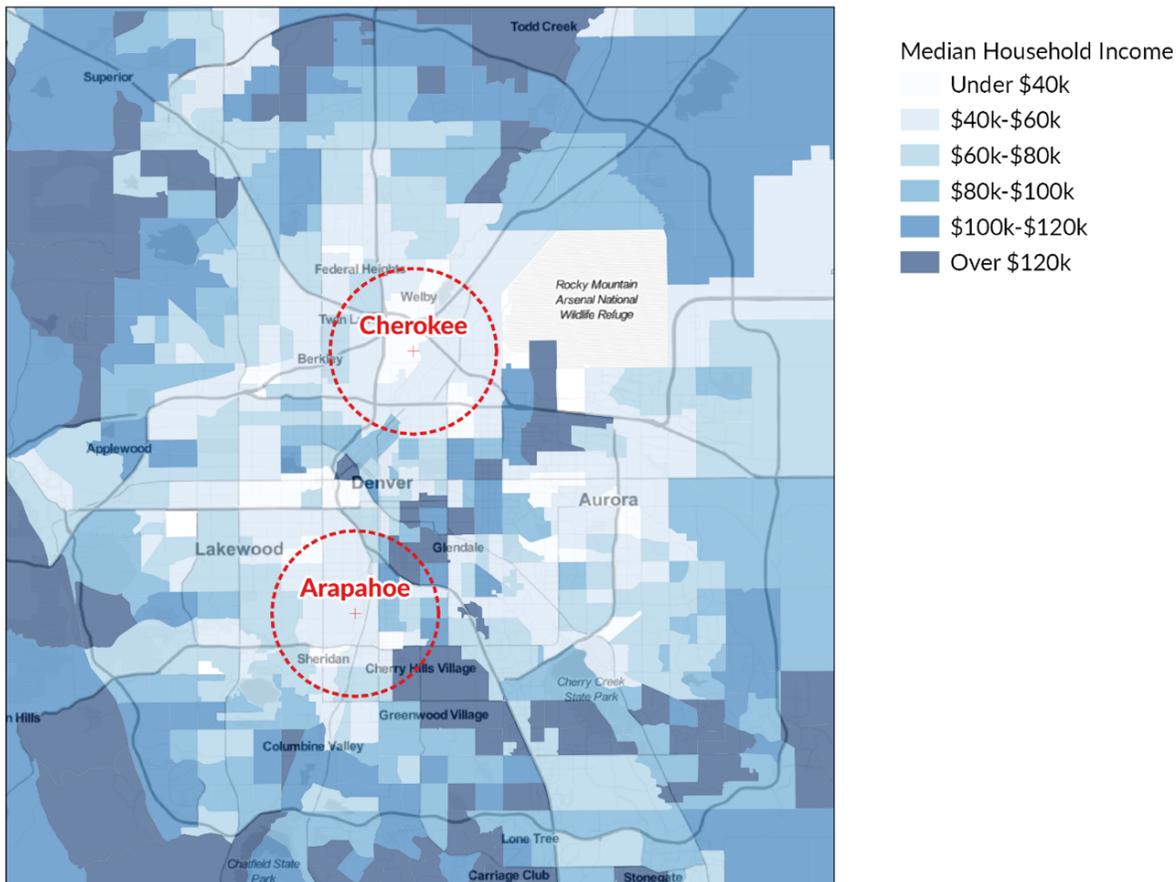


Figure 7 depicts the median household income for the Denver metro area by census tract using 2018 American Community Survey estimates.

### Linguistically Isolated Population

The Cherokee and Arapahoe gas plants are located in parts of Denver that are more linguistically isolated than the rest of the state, meaning they have disproportionately high rates of linguistically isolated households, in which all members aged 14 years and over speak a non-English language and have difficulty speaking English.

Ten percent of the population living within three miles of Cherokee gas plants is considered linguistically isolated, along with six percent of the population adjacent to the Arapahoe gas plant—compared to just 3 percent of Colorado’s population on average. The population around Cherokee and Arapahoe gas plants is more linguistically isolated than 91 percent and 83 percent of the state, respectively.

### Less Than High School Education Population

Less than high school education is defined as the number or percent of people age 25 or older in a block group whose education is short of a high school diploma.

While the state average for this metric is nine percent, 31 percent of the population within three miles of Cherokee gas plant have less than a high school education, along with 16 percent of the population within three miles of the Arapahoe gas plant. When compared to the rest of the state, the population around Cherokee and Arapahoe gas plants is at the 94th percentile and 81st percentile for less than high school education, indicating that the population around these plants has had less access to secondary education than most of Colorado.

### Health Indicators

Census tract level data shows that the communities adjacent to the Cherokee and Arapahoe gas plants have higher health burdens than the rest of the Denver metro area. Figure 8 shows higher rates of asthma, cancer, high blood pressure, and diabetes for those who share a census tract with Xcel Energy’s gas plants in Denver, with the exception of a relatively low rate of cancer near the Arapahoe gas plant.

### COVID-19 Rates

On top of the long-term respiratory and cardiovascular diseases that disproportionately burden the communities surrounding Xcel Energy’s gas plants in Denver, there is evidence that COVID-19 has also hit these communities harder than the broader Denver community. A July 2021 report by Colorado Health Institute (CHI) found that the

Figure 8: Health Indicators (% of Population in Census Tract of Plant)

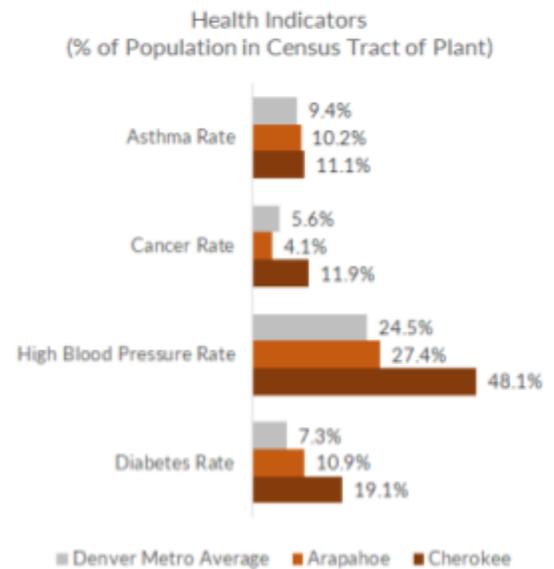


Figure 8 uses CDC Census tract level data to compare health indicators for the tract where the Cherokee and Arapahoe gas plants are located to the Denver metro average.

highest number of COVID-19 cases were found in neighborhoods with the lowest education levels, along with higher concentrations of non-English speakers and people of color.<sup>9</sup>

A number of reports about high COVID-19 rates in Globeville-Elyria-Swansea, some of the neighborhoods closest to the Cherokee gas plants, have surfaced throughout the pandemic. A CBS4 Investigates report from August 2020 found that at the time the Elyria-Swansea neighborhood had a rate of 2.9 COVID-19 hospitalizations per 1,000 people, but the Country Club neighborhood, a whiter neighborhood with higher education levels, had 0.3 hospitalizations per 1,000 people.<sup>10</sup>

A report from the Colorado Health Institute found that between April 2020 and March 2021, the neighborhood that hosts the Cherokee gas plants had COVID-19 rates that were 117 percent of the Denver average. Nearby neighborhoods had COVID-19 rates that were over 140 percent of the average. Similarly, the Denver neighborhood that hosts the Arapahoe gas plant, College View, also had higher-than-average COVID-19 rates at 179 percent of Denver's average, with adjacent neighborhoods ranging between average and 190 percent of the Denver average.

The overlap in Denver between higher COVID-19 impacts and communities disproportionately burdened by air pollution mirrors trends globally. A study published in October 2020 by the journal *Cardiovascular Research* found that exposure to air pollution could be responsible for nearly 15 percent of COVID-19 deaths globally due to the ability of PM2.5 to exacerbate respiratory symptoms.<sup>11</sup>

---

<sup>9</sup> [CHI Story Map of Neighborhood COVID-19 Rates](#)

<sup>10</sup> [Denver Hispanic Neighborhoods With Higher COVID-19 Hospitalization Rates Also Have Higher Air Pollution Levels Than White Neighborhoods](#)

<sup>11</sup> [Regional and global contributions of air pollution to risk of death from COVID-19](#)

# Xcel Energy's Gas Plants in Denver are Located in Parts of the City That are Already Disproportionately Impacted by Many Sources of Localized Pollution and Climate Change



Photo: Lauren DeFilippo / The Luupe

## Localized Pollution and Environmental Indicators

### *The Three-mile Radius Around the Cherokee Gas Plants*

The people living within the 3-mile radius around the Cherokee gas plants face environmental risks that far outstrip the state average. The area is home to three Superfund sites, the intersection of Colorado's two largest interstate highways, the Suncor oil refinery, and railroad tracks that transport hazardous materials.

The Environmental Protection Agency's EJScreen tracks 11 different environmental indicators that help to measure the presence of compounding localized pollution sources on a population. In the three-mile area surrounding the Cherokee gas plants, nine of those 11 indicators are at or above the 84th percentile statewide.

Four of those indicators are in the top fifth percentile for Colorado, meaning they are worse than at least 95 percent of the state when considering these pollution factors. Those four indicators are:

1. NATA Diesel PM: National Air Toxics Assessment (NATA) diesel particulate matter level in the air.
2. NATA Respiratory Hazard Index: Ratio of air toxics exposure to a health-based reference concentration.
3. Superfund Proximity: Number of Superfund facilities nearby and distance from those.
4. RMP Proximity: Number of Risk Management Plan (RMP) facilities nearby and distance from those.



*Cherokee CC with Suncor Oil Refinery in the distance*

This area suffers particularly from PM 2.5 pollution, with the area surrounding Cherokee having PM 2.5 pollution at the 89th percentile compared to the rest of the state. For ozone, the level is under the 50th percentile in the state, but it is at the 91st percentile compared to the whole country. This is because across Colorado, ozone levels are high. This makes the percentile look smaller when compared to the state only, but higher when put in perspective of the whole country. In total, nine of the 11 environmental indicators for the three-mile radius around the Cherokee gas plant are worse than 75 percent of the United States.

Figure 9: Pollution Indicators for the Three-mile Radius Surrounding Cherokee and Arapahoe vs. Statewide Distribution

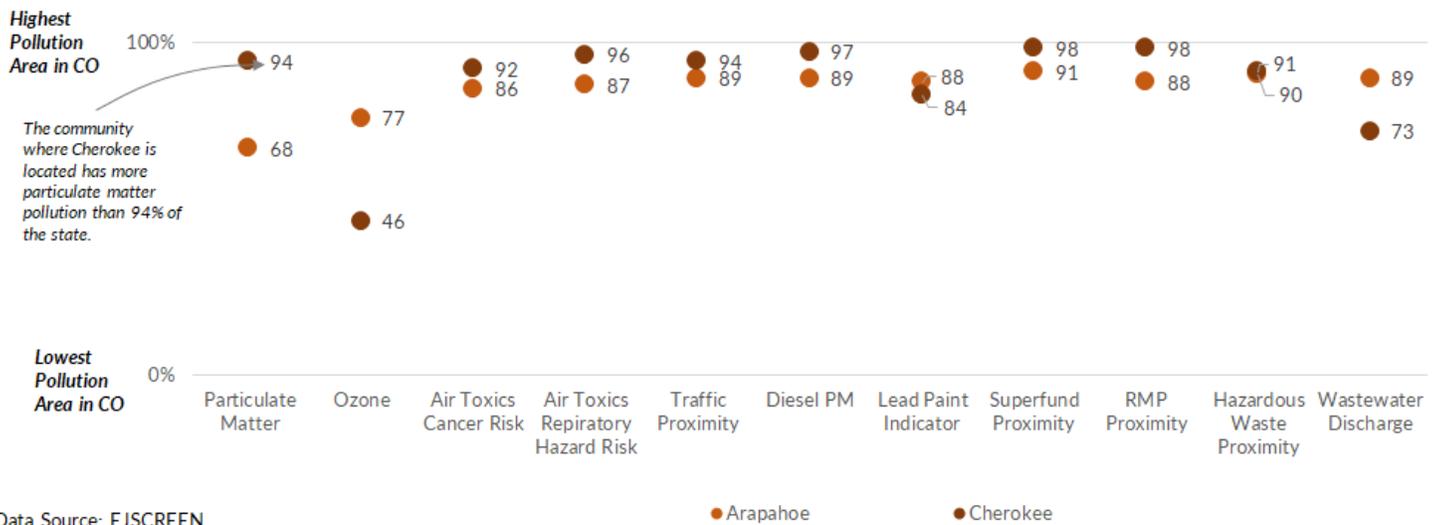


Figure 9 shows how EPA EJSCEEN pollution indicators compare to the rest of the state as a percentile.

### The Three-mile Radius Around the Arapahoe Gas Plant

Similar to the Cherokee gas plants, the population within a three-mile radius of the Arapahoe gas plant faces significant environmental risk factors, with 10 of the 11 environmental indicators above the 75th percentile for the state of Colorado. Two of these indicators are at or above the 90th percentile for Colorado, meaning they are worse than 90 percent of the state. Those two indicators are:

1. Superfund Proximity: Number of Superfund facilities nearby and distance from those.
2. Hazardous Waste Proximity: Number of hazardous waste facilities nearby and distance from those.

The Arapahoe gas plant's proximity to Interstate Highway 25 puts the area around it in the 89th percentile in Colorado and at or above the 85th percentile nationally for both diesel particulate matter in the air and traffic proximity and volume. While the ozone pollution in this area is in the 77th percentile for Colorado, nationally, it is in the 93rd percentile for ozone levels, meaning the area's ozone pollution is worse than 93 percent of the country.

### Vulnerability to Climate Change

There are numerous studies that document the disproportionately high vulnerability to the impacts of climate change that communities of color and low-income communities face when compared to wealthier, whiter

communities. A 2018 study by the American Public Health Association highlights that climate impacts that affect human health include extreme heat, drought, extreme weather, wildfires, and air quality impacts.<sup>12</sup>

In addition to poorer air quality due to smoke from larger and more frequent wildfires that compounds existing pollution, extreme heat disproportionately burdens the neighborhoods adjacent to Xcel Energy's gas plants in Denver. Both areas rank highest among Denver neighborhoods when it comes to heat vulnerability at a time when temperatures are rising in Colorado because of climate change.

Figure 10: Heat Vulnerability Scores by Census Tract

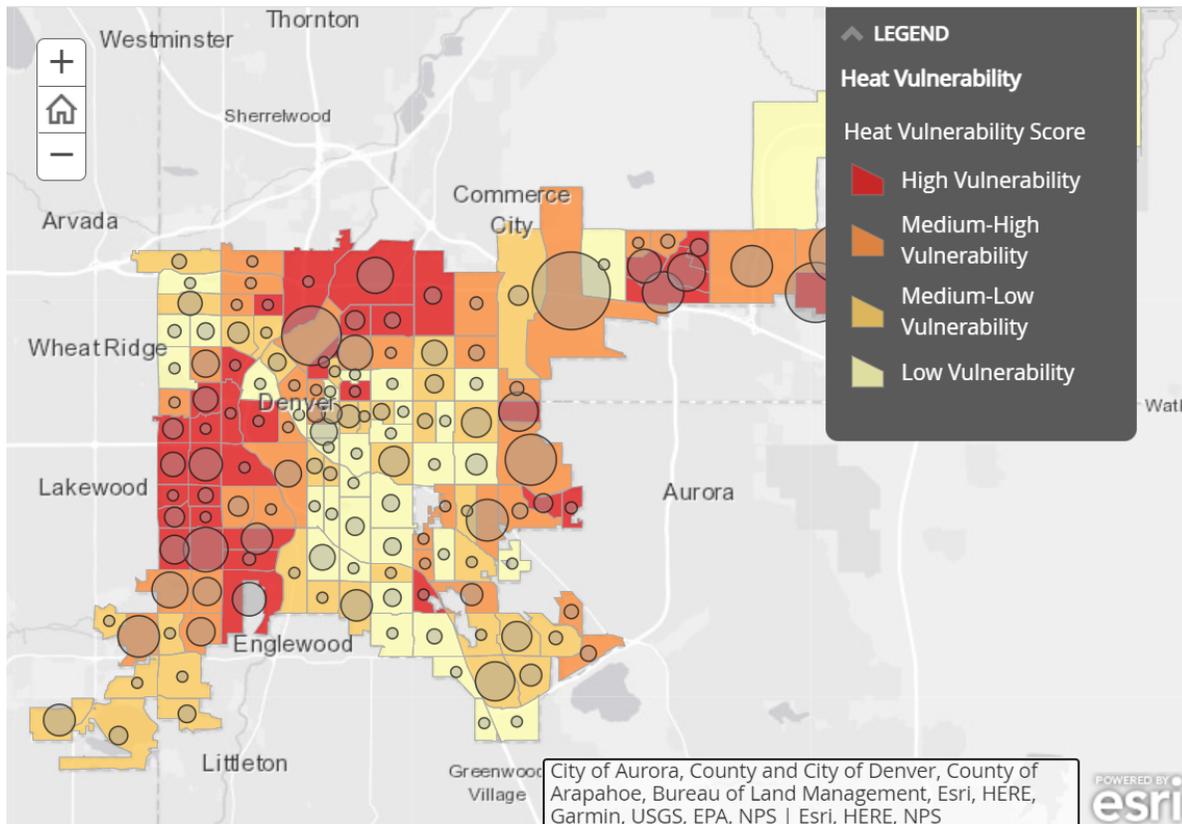


Figure 10 is a screenshot of a map from the City and County of Denver showing the overall heat vulnerability score for census tracts across Denver.<sup>13</sup> The darker reds correspond to census tracts with the highest overall vulnerability. Overlaid circles are proportional to that census tract's population.

The heat vulnerability scores depicted in Figure 10 were compiled by the City and County of Denver as a measure of how the built environment, demographics, and human health combine to increase heat vulnerability in Denver's population. Indicators such as impervious surfaces and tree canopy (which can be observed as a proxy for the Urban Heat Island Effect) as well as vehicle access, elderly population share, and health factors all inform these measures to determine a community's heat vulnerability in a changing climate. The EPA defines the Urban Heat Island Effect as the following:

<sup>12</sup> [Climate Change, Health, and Equity: A Guide For Local Health Departments](#)

<sup>13</sup> [Heat Vulnerability in Denver](#)

*Heat islands are urbanized areas that experience higher temperatures than outlying areas. Structures such as buildings, roads, and other infrastructure absorb and re-emit the sun's heat more than natural landscapes such as forests and water bodies. Urban areas, where these structures are highly concentrated and greenery is limited, become "islands" of higher temperatures relative to outlying areas. Daytime temperatures in urban areas are about 1–7°F higher than temperatures in outlying areas and nighttime temperatures are about 2–5°F higher.*

The neighborhoods adjacent to the Cherokee and Arapahoe gas plants have the highest heat vulnerability scores and appear to experience the Urban Heat Island Effect more than other parts of Denver, meaning that as temperatures rise due to human-induced climate change, these parts of Denver will experience the highest temperatures and related health risks.

---

## Recommendation

Xcel Energy's Cherokee and Arapahoe gas plants spew tons of dangerous air pollution into surrounding neighborhoods each year. They are located in low-income communities of color that have higher-than-average health burdens and rates of COVID-19, and which are already disproportionately affected by other sources of localized pollution and by climate change. Retiring all of Xcel Energy's Denver gas plants would avoid polluting the surrounding disproportionately impacted communities with approximately 1,074,396 pounds of NO<sub>x</sub>, 20,828 pounds of SO<sub>2</sub>, and 2,043,519 tons of CO<sub>2</sub> each year.<sup>14</sup>

While the Cherokee 4 gas plant is scheduled to retire by 2028, the Cherokee CC is currently projected to burn gas in north Denver until 2055—25 years beyond the date that Denver has committed to transitioning to 100 percent renewable energy, and five years past Xcel's goal of achieving a zero-carbon grid. While the contract that Xcel Energy has with Onward Energy for the electricity produced by the Arapahoe gas plant expires in 2023, the future of the Arapahoe plant after 2023 is unclear. In Xcel Energy's 2021 Electric Resource Plan, currently being reviewed by the Colorado Public Utilities



Photo: Rachel Ellis

---

<sup>14</sup> Uses 2019 historical emissions from Figure 1 as proxy for annual emissions

Commission, it is not yet known whether Xcel Energy will propose to extend its use of the Arapahoe gas plant in a new contract or let it expire in 2023.

**Recommendation:** In the pursuit of environmental justice, climate action, and achieving Denver’s goal of 100 percent renewable electricity by 2030, Xcel Energy should consult with local communities and the City of Denver government to come up with a plan to retire the Cherokee and Arapahoe plants by 2030 at the latest.

The next decade is critical to transitioning off of fossil fuels in the power sector to combat climate change and mitigate the impacts of fossil fuel pollution on the Denver metro area. Low-income communities of color bear the brunt of the air pollution from the Cherokee and Arapahoe gas plants. At a time when the Northern Front Range remains plagued with dangerous levels of ozone and Colorado must halve state climate pollution by 2030, making plans to transition off of Xcel’s Denver gas plants is one step towards protecting local residents and achieving clean air and healthy neighborhoods for the Denver metro area.

**Sierra Club National**  
2101 Webster St, Suite 1300  
Oakland, CA 94612  
(415) 977-5500

**Sierra Club Legislative**  
50 F St NW, Eighth Floor  
Washington, DC 20001  
(202) 547-1141

[sierraclub.org](http://sierraclub.org)  
[facebook.com/SierraClub](https://facebook.com/SierraClub)  
[twitter.com/SierraClub](https://twitter.com/SierraClub)

