

# Xposing Xcel



## THE TOLL OF COAL ON COLORADO



A report from WildEarth Guardians

By Jeremy Nichols

March 30, 2009



## MISSION STATEMENT

WildEarth Guardians protects and restores the wildlife, wild places, and wild rivers of the American West.

Inquiries about this report and WildEarth Guardians' Work can be made directly to:

Jeremy Nichols

WildEarth Guardians

1536 Wynkoop, Suite 301

Denver, CO 80202

303-573-4898 x 537

[jnichols@wildearthguardians.org](mailto:jnichols@wildearthguardians.org)

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## EXECUTIVE SUMMARY

Xcel Energy is an investor-owned utility company and the largest electricity provider in the State of Colorado. Yet 60% of the company's distributed electricity comes from burning coal, increasingly threatening clean air, the Earth's climate, and the health and prosperity of Colorado communities.

This coal baggage casts a long and dangerous shadow across the State of Colorado. The company operates seven coal-fired power plants that are collectively responsible for spewing massive amounts of toxic chemicals, global warming pollution, and smog-forming gases into the air we breathe. According to Xcel's own data, every year the smokestacks at these power plants release in Colorado:

- 25% of all toxic air pollution, including 45% of all mercury emissions and more than 25% of all dioxins, an extremely toxic group of chemicals;
- 52% of all sulfur dioxide, a potent haze forming gas, and 12% of all nitrogen oxides, which are key smog forming chemicals; and
- More than 17% of all carbon dioxide, making the company the single largest source of global warming pollution in Colorado.

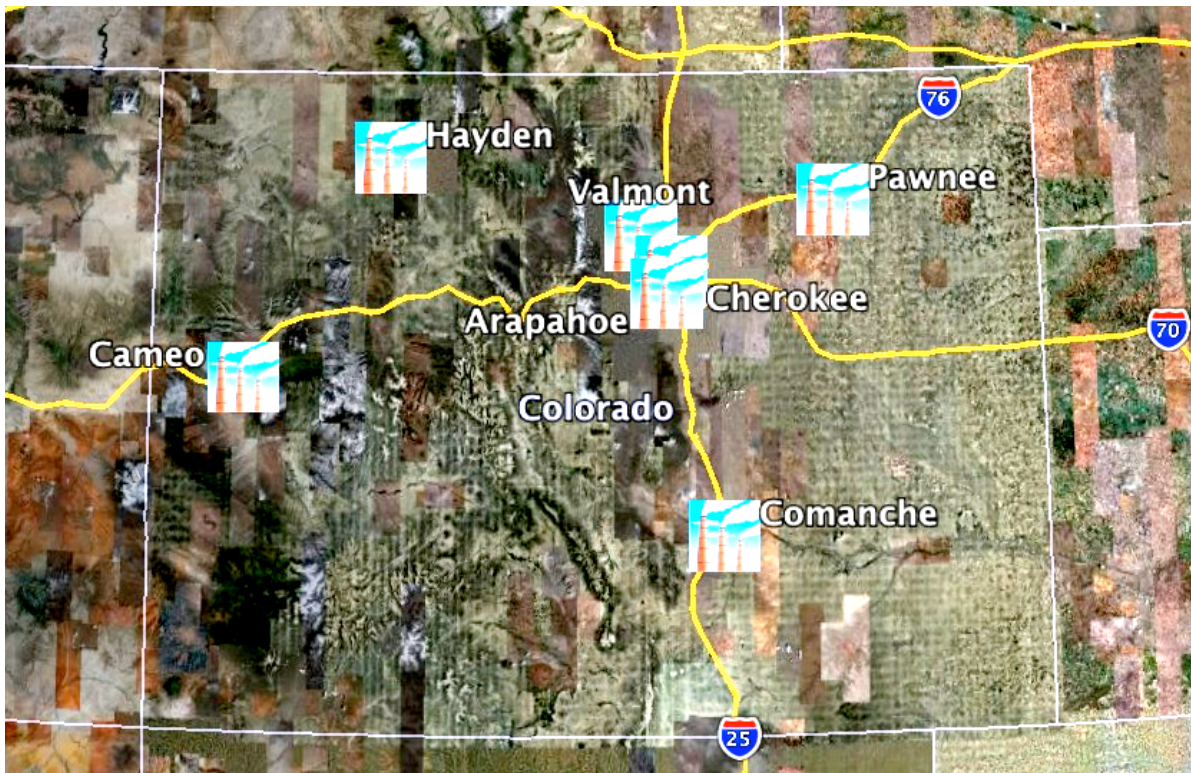
The company has made progress toward developing clean, renewable energy in Colorado, going so far as to commit to shuttering two of the company's coal-fired power plants. Unfortunately, this progress may be fleeting.

Xcel is on track to open up a new coal-fired boiler in 2010 at the company's Comanche power plant, located in Pueblo, Colorado. Once fired up, this boiler will erase any gains the company has made toward reducing harmful air pollution in Colorado. Put simply, any progress made toward clean, renewable energy promises to amount to nothing tomorrow.

It's time to expose Xcel Energy and the toll the company's coal imposes on the State of Colorado. For the sake of public health, a healthy environment, and economic prosperity, Xcel needs to get serious about powering past coal. Xcel itself has shown that clean energy solutions are at hand. It's time to move beyond rhetoric and put the promise of clean energy into action.

## INTRODUCTION

Xcel Energy operates seven coal-fired power plants in the State of Colorado: Arapahoe, Cameo, Cherokee, Comanche, Hayden, Pawnee, and Valmont.<sup>1</sup> See Figure 1. These plants burn upwards of 11,000,000 tons of coal annually and collectively have the capacity to generate 3,446 megawatts of electricity.<sup>2</sup> According to Xcel Energy, one megawatt of electricity is enough to meet the needs of approximately 1,000 homes in Colorado.<sup>3</sup> Xcel Energy is the largest electricity provider in the State of Colorado and 60% of its distributed electricity comes from coal.<sup>4</sup>



**Figure 1. Xcel's coal-fired power plants in Colorado.**

<sup>1</sup> Xcel Energy operates in Colorado as both Xcel Energy and Xcel Energy doing business as Public Service Company of Colorado.

<sup>2</sup> Data on coal consumption from Federal Energy Regulatory Commission as provided by Xcel Energy In the Matter of the Application of Public Service Company of Colorado for Approval of its 2007 Colorado Resource Plan, Public Utilities Commission Docket No. 07A-447E.

<sup>3</sup> "Xcel Energy Plans Major Wind Acquisition in Colorado; Would Become Largest Provider in U.S.," [http://www.redorbit.com/news/science/342420/xcel\\_energy\\_plans\\_major\\_wind\\_acquisition\\_in\\_colorado\\_would\\_become/index.html](http://www.redorbit.com/news/science/342420/xcel_energy_plans_major_wind_acquisition_in_colorado_would_become/index.html) (last accessed March 29, 2009).

<sup>4</sup> According to the U.S. Energy Information Administration.



**Arapahoe:** Located in South Denver. 156 megawatt plant with two coal-fired boilers: Unit 3 - 45 megawatts and Unit 4 - 111 megawatts. Began operation in 1950.<sup>5</sup>



**Cameo:** Located east of Grand Junction. 73 megawatt plant with two coal-fired boilers: Unit 1 - 24 megawatts and Unit 2 - 49 megawatts. Began operation in 1957.



**Cherokee:** Located in North Denver. 717 megawatt plant with four coal-fired boilers: Unit 1 - 107 megawatts, Unit 2 - 106 megawatts, Unit 3 - 152 megawatts, and Unit 4 - 352 megawatts. Began operation in 1957.



**Comanche:** Located in Pueblo, Colorado. 660 megawatt plant with two coal-fired boilers: Unit 1 – 325 megawatts and Unit 2 – 335 megawatts. New Unit 3 will have a generating capacity of 750 megawatts, making Comanche the largest plant in Colorado. Began operation in 1973.



**Hayden:** Located in Hayden, Colorado. 446 megawatt plant with two coal-fired boilers: Unit 1 – 184 megawatts and Unit 2 – 262 megawatts. Began operation in 1962.



**Pawnee:** Located in Brush, Colorado. 505 megawatt plant with one coal-fired boiler. Began operation in 1981.



**Valmont:** Located in Boulder, Colorado. 229 megawatt plant with one coal-fired boiler. Began operation in 1964.

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<sup>5</sup> Data and photos of coal-fired power plants from Xcel Energy website, “Power Generating Facilities – Colorado,” [http://www.xcelenergy.com/Company/About\\_Energy\\_and\\_Rates/Power%20Generation/Pages/ColoradoPlants.aspx](http://www.xcelenergy.com/Company/About_Energy_and_Rates/Power%20Generation/Pages/ColoradoPlants.aspx) (last accessed March 29, 2009).

Coal burning releases a number of harmful air contaminants, including mercury, smog forming gases, carbon dioxide, and other compounds, making Xcel's coal-fired power plants one of the greatest risks to public health and the environment in Colorado. Coal is often described as a "dirty" source of energy. Xcel's coal-fired power plants more than live up to this description.

## XCEL'S TOXIC AIR POLLUTION

All of Xcel's coal-fired power plants release a number of air contaminants that are known to be toxic. Many of these pollutants are regulated as "hazardous air pollutants" under the Clean Air Act.<sup>6</sup>

According to the U.S. Environmental Protection Agency's ("EPA's") toxic release inventory, Xcel's coal-fired power plants released 471,614 pounds of toxic air pollution in 2007.<sup>7</sup> See Figure 2. This represented nearly 25% of all the toxic air pollution released in the State of Colorado, making Xcel's coal-fired power plants the largest source of toxic air pollution in the state.



The Heron Pond Natural Area in North Denver is located less than a mile from the Cherokee coal-fired power plant.

This toxic pollution included 690 pounds of mercury, a known neurotoxin that is especially harmful to developing children.<sup>8</sup> This amount of mercury represents 45% of Colorado's mercury air pollution and roughly equals the amount in more than 300,000 household thermometers.<sup>9</sup> It is generally reported that mercury from just one household thermometer can contaminate the fish in a lake with a surface area of 20 acres.<sup>10</sup>

Additionally, this pollution included 0.002684 grams of dioxins and dioxin-like compounds, more than 25% of all dioxins released into the air in Colorado. Dioxins are an extremely toxic group of human-created chemicals that accumulate in the environment. A byproduct of combustion and other chemical processes, dioxins are best known as the main ingredient of Agent Orange, an herbicide used during the

<sup>6</sup> Section 112 Clean Air Act regulates listed hazardous air pollutants from stationary sources of air pollution. See 42 USC § 7412.

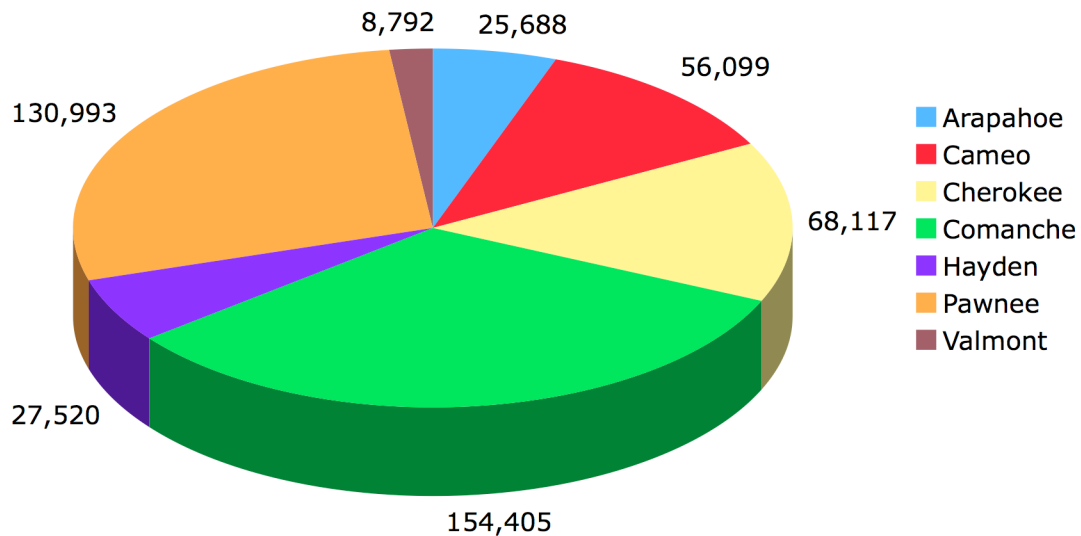
<sup>7</sup> Data from U.S. EPA's toxic release inventory, accessed at <http://www.epa.gov/tri/> (last accessed March 29, 2009).

<sup>8</sup> U.S. EPA, "Health Effects of Mercury," accessed at <http://www.epa.gov/mercury/effects.htm> (last accessed March 29, 2009).

<sup>9</sup> A typical mercury thermometer contains around 1 gram of mercury.

<sup>10</sup> See e.g., U.S. EPA, "EPA Recognizes 47 New England Hospitals for Mercury Reduction Efforts," accessed at <http://yosemite.epa.gov/opa/admpress.nsf/d0cf6618525a9efb85257359003fb69d/88c64f9ee84a23e4852574240004276d!OpenDocument> (last accessed March 29, 2009).

Vietnam War. Dioxins can be lethal and are a probable human carcinogen. According to the U.S. Environmental Protection Agency, there is no known safe level of dioxin exposure, which is why even at low levels, dioxin releases are of concern.<sup>11</sup>



**Figure 2. Total toxic air emissions from Xcel's coal-fired power plants from 2007 (in pounds).<sup>12</sup>**

Xcel's coal-fired power plants also released a number of other toxic air pollutants, including hydrochloric acid, hydrofluoric acid, sulfuric acid, barium compounds, lead compounds, manganese, chromium, vanadium, copper, and polycyclic aromatic compounds. These pollutants pose myriad adverse health effects. For example, hydrochloric and hydrofluoric acid are corrosive while lead can hinder physical and cognitive growth in children.<sup>13</sup> Breakdowns of toxic air pollutants by Xcel's coal-fired power plant are presented below in Figures 3-9.<sup>14</sup>

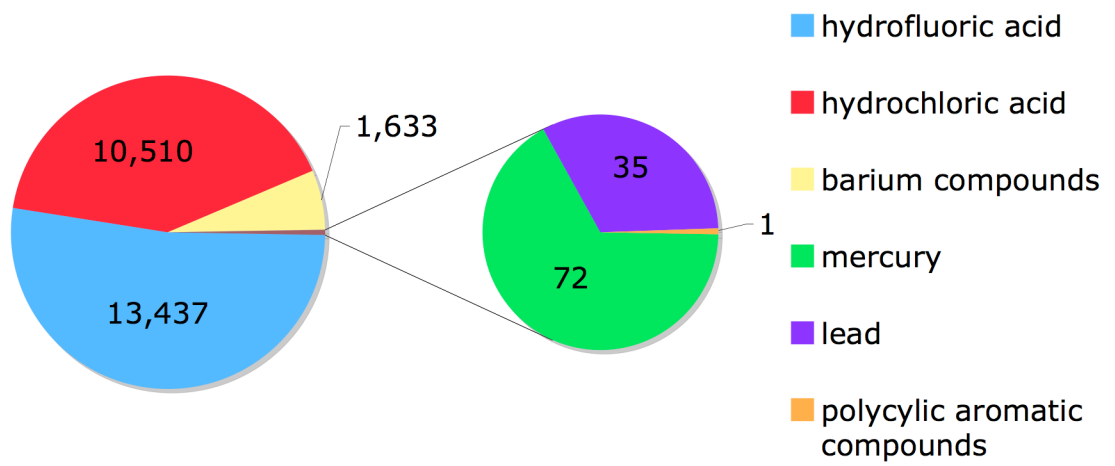
<sup>11</sup> EJNet.org, "Dioxin Homepage," accessed at <http://www.ejnet.org/dioxin> (last accessed March 29, 2009) and U.S. EPA, "Dioxins and Furans," accessed at <http://www.epa.gov/pbt/pubs/dioxins.htm> (last accessed March 29, 2009).

<sup>12</sup> Data from U.S. EPA's toxic release inventory.

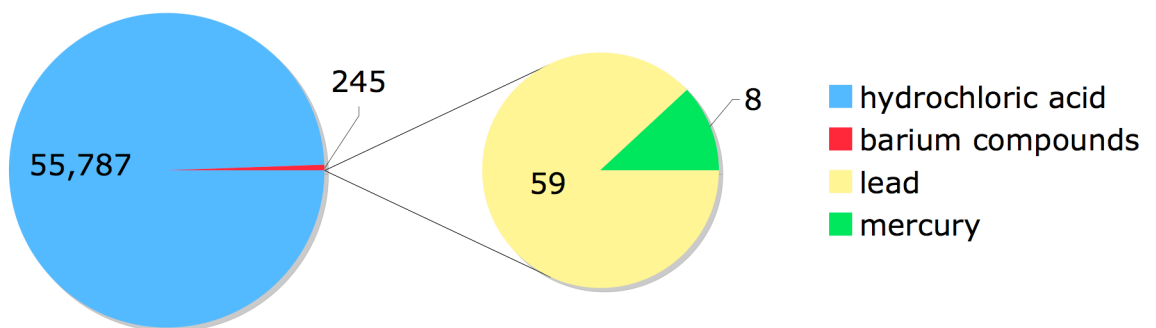
<sup>13</sup> U.S. EPA, "Health Effects of Hydrochloric Acid," accessed at <http://www.epa.gov/ttn/atw/hlthef/hydrochl.html> (last accessed March 29, 2009); U.S. EPA, "Health Effects of Hydrofluoric Acid," accessed at <http://www.epa.gov/ttn/atw/hlthef/hydrogen.html> (last accessed March 29, 2009); U.S. EPA, "Health Effects of Lead Compounds," accessed at <http://www.epa.gov/ttn/atw/hlthef/lead.html> (last accessed March 29, 2009).

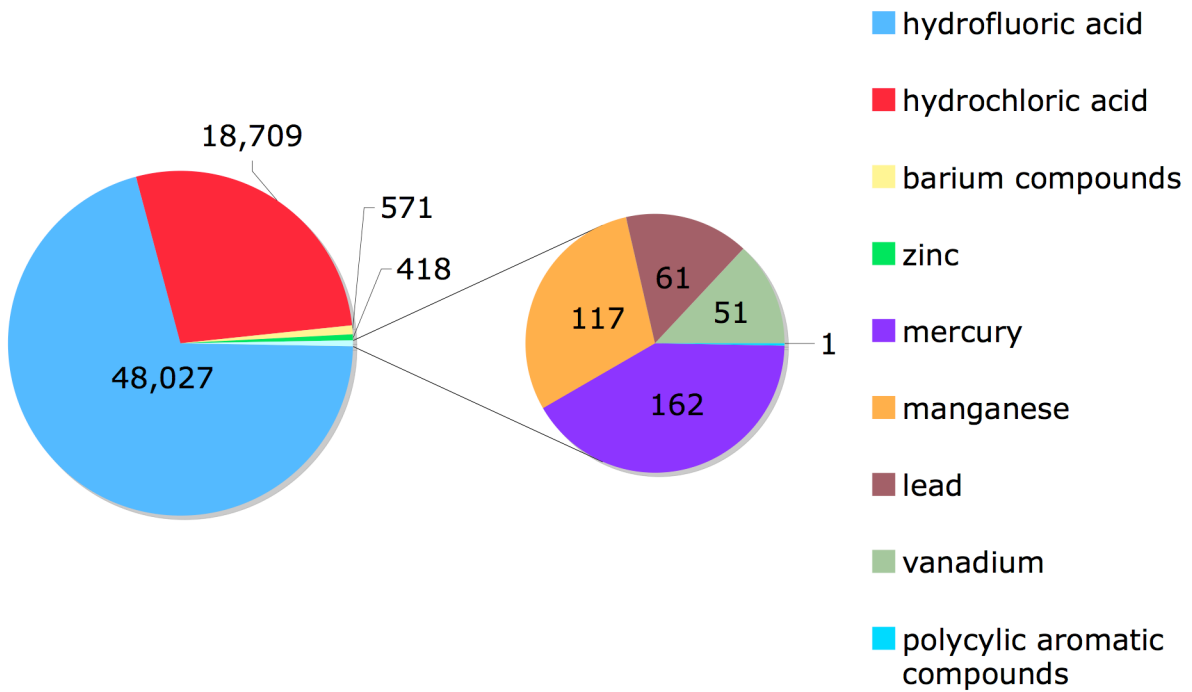
<sup>14</sup> Data in Figures 3-9 from U.S. EPA's toxic release inventory.



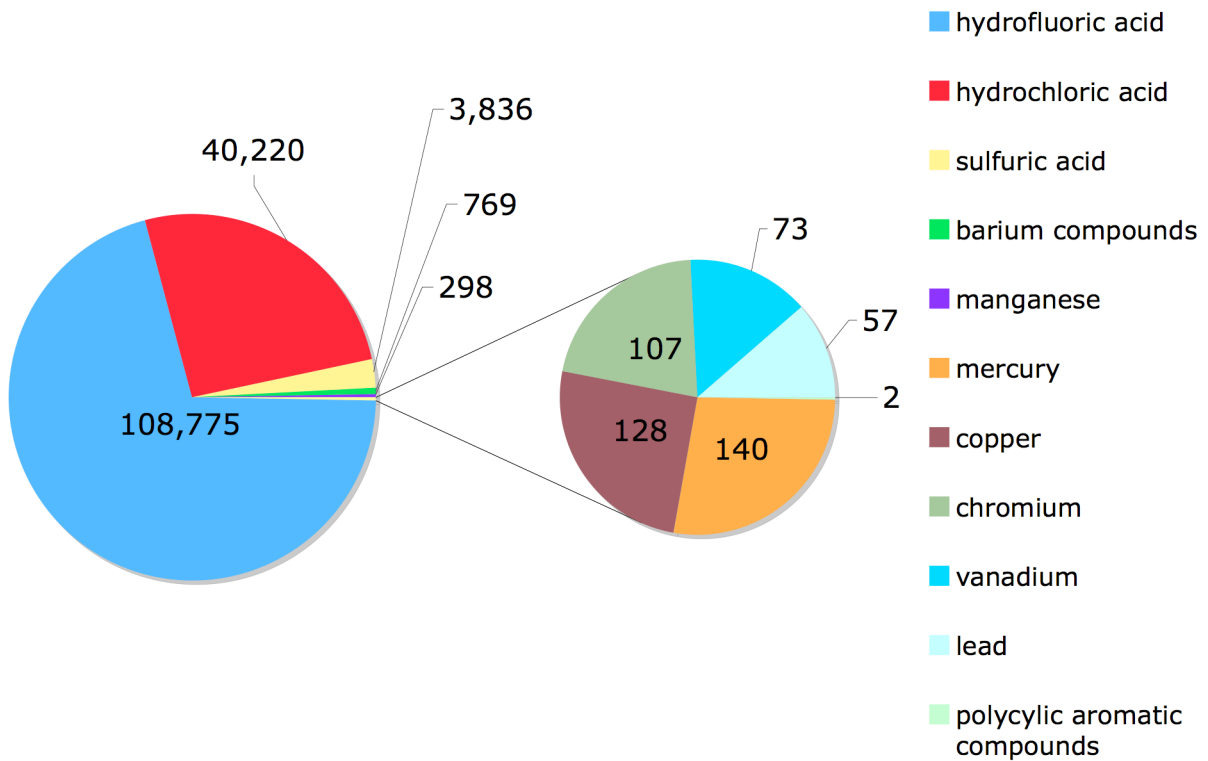


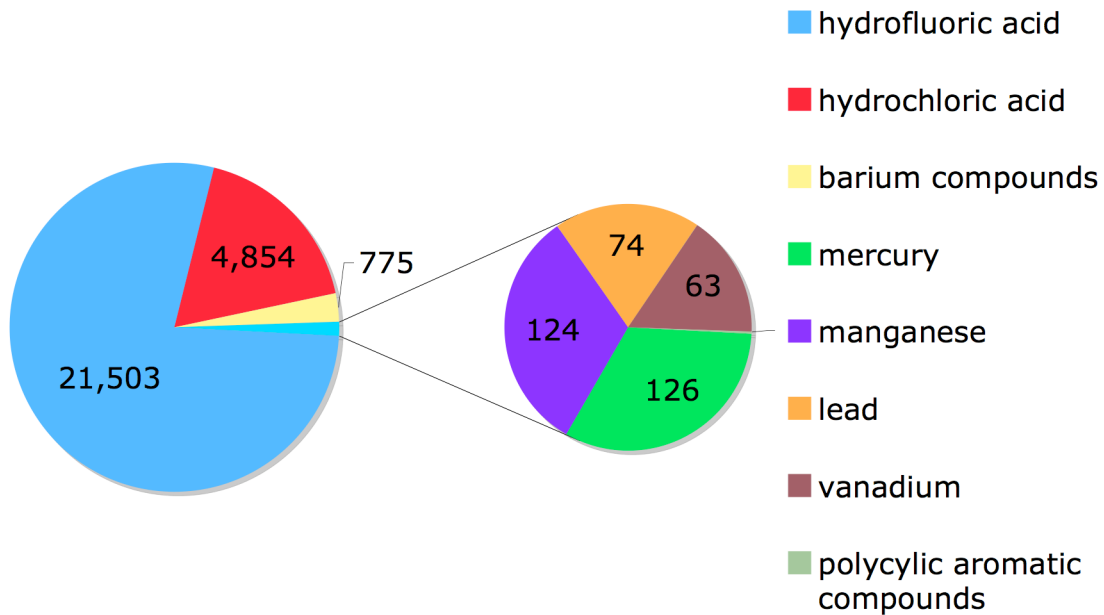
**Figures 3 and 4. Total toxic air emissions by pollutant from the Arapahoe (above) and Cameo (below) coal-fired power plants (in pounds).**



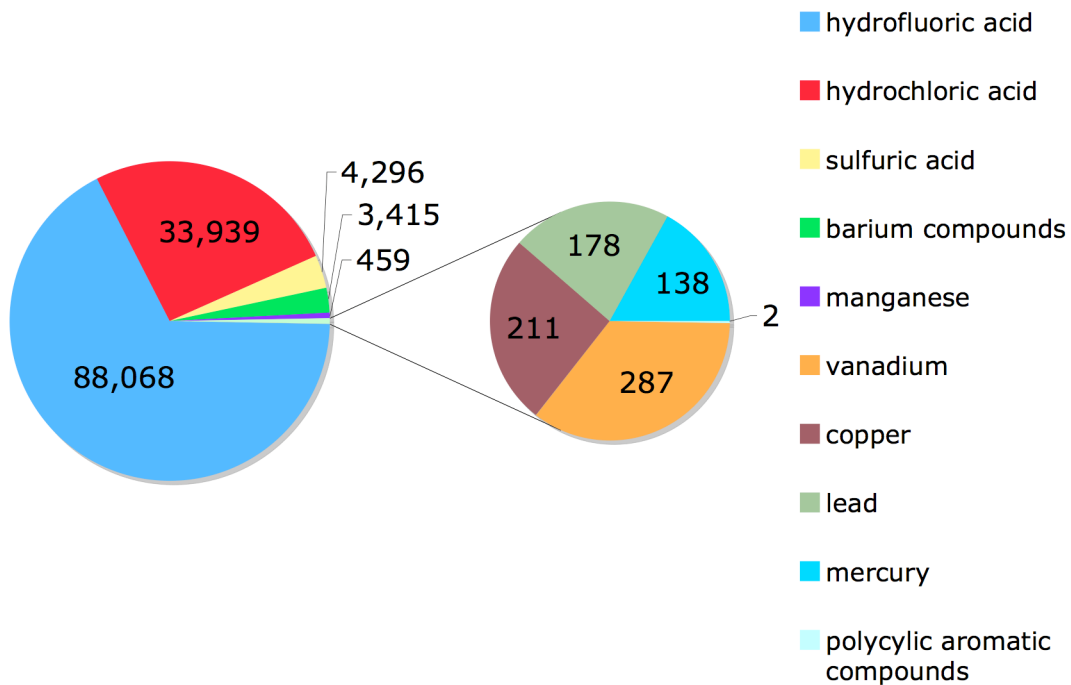


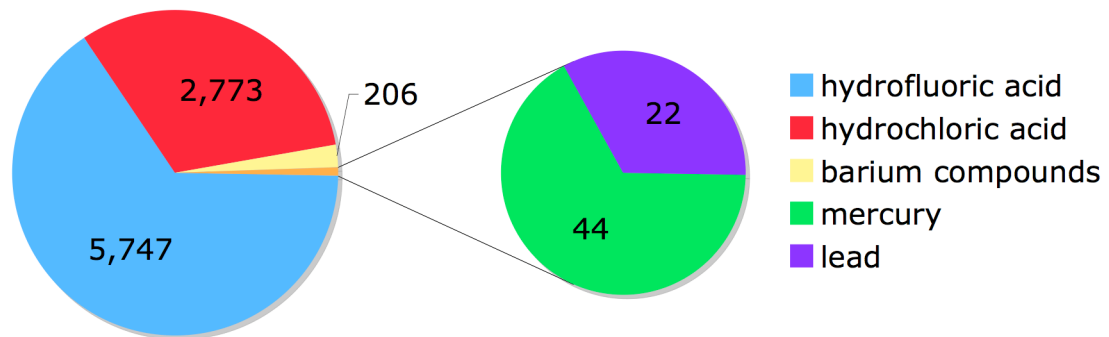
**Figures 5 and 6. Total toxic air emissions by pollutant from the Cherokee (above) and Comanche (below) coal-fired power plants (in pounds).**





**Figures 7 and 8. Total toxic air emissions by pollutant from the Hayden (above) and Pawnee (below) coal-fired power plants (in pounds).**





**Figure 9. Total toxic air emissions by pollutant from the Valmont coal-fired power plant (in pounds).**

## SMOG AND HAZE

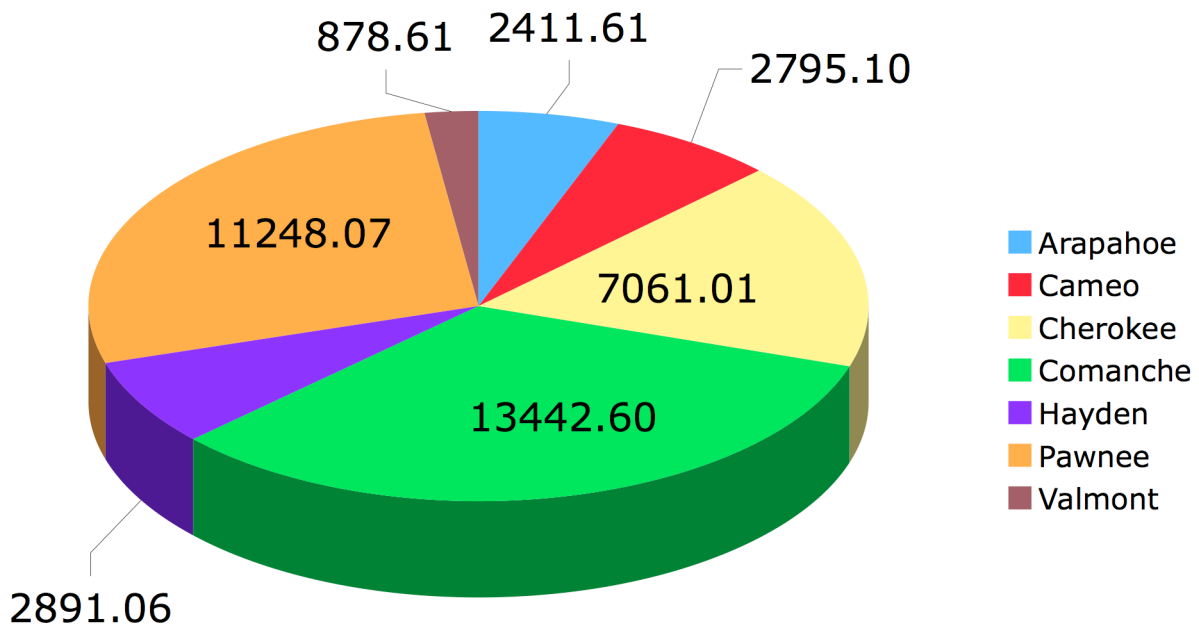
Xcel's coal-fired power plants release large amounts of two major pollutants that are linked to smog, haze, and a number of other health and environmental impacts. These pollutants are sulfur dioxide, or SO<sub>2</sub>, and nitrogen oxides, NO<sub>x</sub>, both of which are byproducts of coal burning.

According to the EPA, sulfur dioxide "causes a wide variety of health and environmental impacts because of the way it reacts with other substances in the air."<sup>15</sup> The health and environmental impacts of SO<sub>2</sub> include difficulty breathing, respiratory illness, premature death, visibility impairment, or haze, acid rain, crop damage, and erosion of buildings, including monuments and statues. In Colorado, the impact of haze is especially noticeable in the state's National Parks and wilderness areas. Visibility in

<sup>15</sup> U.S. EPA, "Health and Environmental Impacts of SO<sub>2</sub>," accessed at <http://www.epa.gov/air/urbanair/so2/hlth1.html> (last accessed March 29, 2009).

Rocky Mountain National Park for example, is on average nearly 100% worse than natural conditions.<sup>16</sup>

In Colorado, Xcel's coal-fired power plants release around 40,000 tons of SO<sub>2</sub> annually.<sup>17</sup> According to emissions inventory data maintained by the Colorado Air Pollution Control Division, this is more than 50% of all the SO<sub>2</sub> released by human-created sources, making Xcel's coal-fired power plants the largest source of SO<sub>2</sub> in Colorado. The largest source is the Comanche plant, followed by the Pawnee and Cherokee plants. See Figure 10.



**Figure 10. Sulfur dioxide emissions from Xcel's coal-fired power plants (in tons/year).**

<sup>16</sup> Colorado Air Pollution Control Division, "Colorado State Implementation Plan for Regional Haze, Technical Support Document, Mandatory Class I Federal Area: Rocky Mountain National Park," available at <http://www.cdphe.state.co.us/ap/RegionalHaze/TSDRockyMountainOct.pdf>.

<sup>17</sup> Data from U.S. EPA's Clean Air Markets database, accessed at <http://camddataandmaps.epa.gov/gdm/index.cfm> (last accessed March 29, 2009) and 2005 Colorado Air Pollution Control Division emission inventory.

Nitrogen oxides are a group of compounds that include nitrogen dioxide, nitric acid, nitrous oxide, nitrates, and nitric oxide, all of which cause a wide variety of health and environmental impacts.<sup>18</sup> NOx pollution is particularly troublesome because it can react with sunlight to form ground-level ozone, the key ingredient of smog. Ground-level ozone is a corrosive gas that can irritate the lungs, trigger asthma attacks, permanent lung damage, and even premature death.<sup>19</sup> Currently, nine counties along the Front Range of Colorado, including the area from Douglas County north to Fort Collins and Greeley, are in violation of National Ambient Air Quality Standards that limit ground-level ozone to safeguard public health. According to the Colorado Air Pollution Control Division, reducing NOx pollution will be the key to cleaning up the region's smog.<sup>20</sup>

NOx also contribute to acid rain, microscopic particulate pollution, nitrogen loading in streams and lakes, and also contributes to the formation of haze. Nitrous oxide is also a potent greenhouse gas that is 310 times more potent than carbon dioxide in its heat trapping capability.



In Colorado, Xcel's coal-fired power plants release around 36,000 tons of NOx annually.<sup>21</sup> This is roughly equal to the amount of NOx released from the tailpipes of more than 1.8 million cars.<sup>22</sup> According to emissions inventory data maintained by the Colorado Air Pollution Control Division, this is a little more than 12% of all the NOx released by human-created sources. The largest source is the Cherokee plant, followed by Comanche and Hayden. See Figure 11.

Estimates show reducing all SO<sub>2</sub> and NOx from Xcel's Arapahoe and Cameo plants would yield more than \$40 million in health benefits by 2010.

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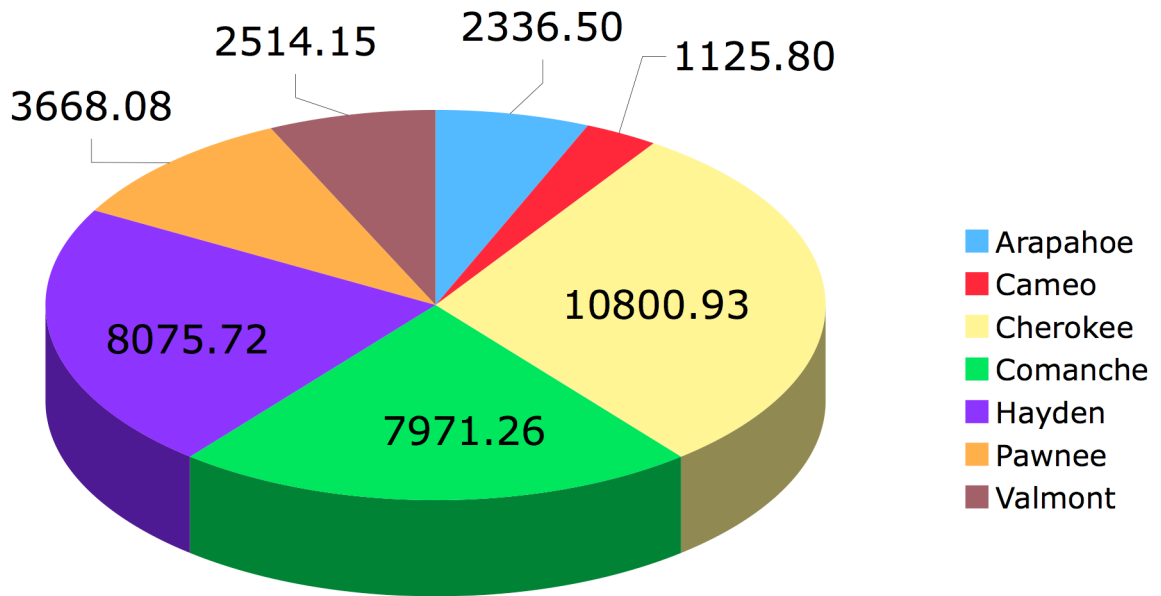
<sup>18</sup> U.S. EPA, "Health and Environmental Impacts of NOx," accessed at <http://www.epa.gov/air/urbanair/nox/hlth.html> (last accessed March 29, 2009).

<sup>19</sup> U.S. EPA, "Ozone, Health and Environment," accessed at <http://www.epa.gov/air/ozonepollution/health.html> (last accessed March 29, 2009).

<sup>20</sup> See Colorado Air Pollution Control Division, "Colorado NOx Forum," presentation given January 21, 2009. Available online at <http://www.cdphe.state.co.us/ap/down/NOXRHraqcFeb09.pdf>.

<sup>21</sup> Data from U.S. EPA's Clean Air Markets database, accessed at <http://camddataandmaps.epa.gov/gdm/index.cfm> (last accessed March 29, 2009) and 2005 Colorado Air Pollution Control Division emission inventory.

<sup>22</sup> According to the EPA, a standard car releases 38.2 pounds of NOx annually. See <http://www.epa.gov/otaq/consumer/f00013.htm>.



**Figure 11. Nitrogen oxide emissions from Xcel's coal-fired power plants (in tons/year).**

## GLOBAL WARMING POLLUTION

Xcel's coal-fired power plants are massive sources of greenhouse gases that contribute to global warming. The impacts of global warming to Colorado are now and promise to continue to be significant. In his Climate Action Plan issued in November 2007, Colorado Governor Bill Ritter, Jr., summarized:

Global warming is our generation's greatest environmental challenge. The scientific evidence that human activities are the principal cause of a warming planet is clear, and we will see the effects here in Colorado. But the seeds of change are also here in Colorado, in our scientific and business communities, and in each of us individually. This Colorado Climate Action Plan is a call to action. It sets out measures that we in our state can adopt to reduce emissions of greenhouse gases by 20 percent by 2020, and makes a shared commitment with other states and nations to even deeper emissions cuts by 2050.

Why is this important? For Colorado, global warming will mean warmer summers

and less winter snowpack. The ski season will be weeks shorter. Forest fires will be more common and more intense. Water quality could decline, and the demand for both agricultural and municipal water will increase even as water supplies dwindle.<sup>23</sup>

Governor Ritter's Climate Action Plan details the present and future impacts of climate change to this state, stating "[i]n the coming decades, scientists project that Colorado and neighboring western states will see":

- 3-4 degree temperatures increases by 2030, with more frequent and longer-lasting summer heat extremes;
- even "[l]onger and more intense wildfire seasons" with fires "projected to claim more land each year than the year before";
- "Midwinter thawing and much earlier melting of snowpack" with resultant "flooding," "ski season[s]" shortened by "three to six weeks," and "added stress on reservoirs";



Global warming threatens to strain the scenic Yampa River in Western Colorado.

- "Much lower flows in rivers in the summer months and a greater vulnerability to drought with consequent impacts to the ability of "[a]lready over-used river systems" to satisfy "existing water rights and future growth," degradation of water quality, and a potential "decline" in "[h]ydropower production";
- Slower recharge in groundwater aquifers, with an overall decline of 20% projected for the Ogallala aquifer if temperatures increase by more than 5 degrees F.
- "Movement of plant and animal species to higher elevations and latitudes" and the fragmentation of high-elevation habitat. "Many of today's high-elevation species will face localized or total extinction";
- "Insect attaches in forests" caused by warmer winter temperatures that will "reduce winterkill of beetles," warmer summer temperatures that will "allow faster insect lifecycles," and forests rendered vulnerable by "summer droughts";

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<sup>23</sup> Governor Bill Ritter, Jr., "Colorado Climate Action Plan" (November 2007).



- “Less snow cover and more winter rain on farm lands” whereby the “[p]elting rain on bare ground will increase soil erosion”; and, if that isn’t enough
- “More weeds.”<sup>24</sup>

These impacts are obviously dramatic, and will extend across state lines, as noted by the Climate Action Plan.

Further, recent reports indicate that global warming is having a disproportionate impact on the American West and Colorado, raising temperatures here faster than the rest of the world. The Rocky Mountain Climate Organization and the Natural Resources Defense Council released a report in March 2008 indicating that temperatures in the American West were rising 70% faster than the world-wide average. The report noted:

Already, decreases in snowpack, less snowfall, earlier snow melt, more winter rain events, increased peak winter flows, and reduced summer flows have been documented. Scientists have recently attributed more than half of these changes in the West between 1950 and 1999 to the effects of heat-trapping pollutants.

As global warming continues, the IPCC also predicts more intense and longer Droughts....<sup>25</sup>

Responding to these findings, Colorado Governor Bill Ritter, Jr., recently issued a groundbreaking Executive Order calling for, among other things, a 20% reduction in greenhouse gases below 2005 levels by 2020 and an 80% reduction below 2005 levels by 2050. According to Governor Ritter, “Many sectors of Colorado’s economy, including agriculture, recreation, skiing, and tourism, could experience significant changes and impacts if emissions are not reduced.”<sup>26</sup>

Xcel’s coal-fired power plants primarily release carbon dioxide, as well as lesser amounts of nitrous oxide. In total, the company’s plants release more than 22,168,144 tons of carbon dioxide annually, which represents more than 17% of the State of Colorado’s total greenhouse gases.<sup>27</sup> See Figure 12. This makes Xcel’s coal-fired power plants the largest source of global warming pollution in Colorado.

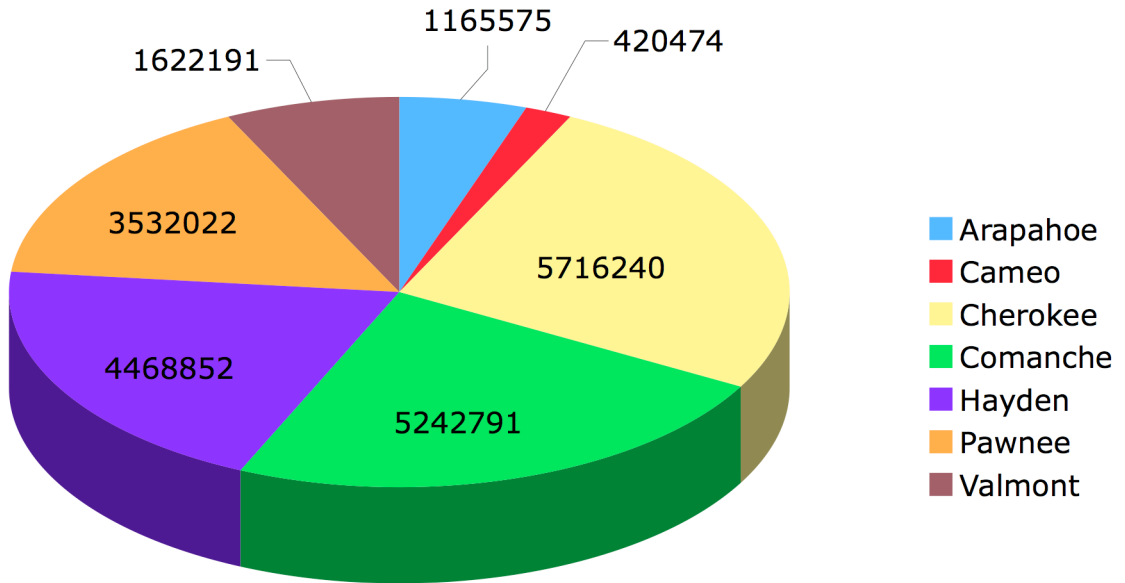
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<sup>24</sup> *Id.*

<sup>25</sup> NRDC, “Hotter and Drier: The West’s Changed Climate” at v (March 2008).

<sup>26</sup> Executive Order D 004 08, “Reducing Greenhouse Gas Emissions in Colorado” (April 22, 008).

<sup>27</sup> Carbon dioxide emissions data from the EPA’s Clean Air Markets database and Center for Climate Strategies, “Final Colorado Greenhouse Gas Inventory and Reference Case Projections 1990-2020” (October 2007).



**Figure 12. Carbon dioxide emissions from Xcel's coal-fired power plants (in tons/year).**

### COMANCHE 3 TO UNDERMINE CLEAN ENERGY

The impact of Xcel's coal-fired power plants on air quality, climate, and public health in Colorado promises to worsen in the coming year. By 2010, Xcel expects to begin operation of a third coal-fired boiler at its Comanche power plant in Pueblo. Once fired up, this new boiler will only add to the woes already facing the State of Colorado and its communities from coal burning.

The Comanche 3 boiler would have a generating capacity of 750 megawatts, which would make it one of the largest coal-fired boilers in Colorado. The boiler would increase the generating capacity of the Comanche power plant to 1,410 megawatts, making it the largest in Colorado. Although



The Comanche power plant with a projected image of the number 3 boiler to the right. Photo by Xcel Energy.

Xcel Energy has committed to using more up-to-date air pollution control technology, annual projected emissions of harmful air pollutants are still projected to increase substantially. See Table 1. For example, the Comanche 3 boiler is projected to release an additional 4,830,000 tons of carbon dioxide annually, solidifying Xcel Energy’s position as Colorado’s largest source of greenhouse gas emissions.

**Table 1. Projected Comanche 3 air pollution increases.<sup>28</sup>**

<b>Pollutant</b>	<b>Annual Projected Emissions</b>
Carbon dioxide	5,313,000 tons
Sulfur dioxide	3,250 tons
Nitrogen oxides	2,600 tons
Mercury	130 pounds

But perhaps the most significant impact of the Comanche 3 boiler will be that it will erase many gains Xcel Energy promises to make toward cutting harmful air pollution in Colorado. As part of the company’s recently approved Resource Plan, Xcel committed to shuttering the Arapahoe and Cameo power plants.<sup>29</sup> Although these power plants are two of Xcel’s smallest coal-fired power plants, this commitment represented a major step forward toward confronting the impacts of dirty energy and toward meeting the Governor Ritter’s stated goal of reducing greenhouse gas emissions within Colorado.

Unfortunately, while shutting down Cameo and Arapahoe promises to reduce overall emissions of sulfur dioxide and nitrogen oxides, overall emissions of carbon dioxide and mercury promise to increase as a result of the Comanche 3 boiler coming on line. See Table 2. In fact, carbon dioxide emissions promise to increase by nearly 4,000,000 tons annually. The hard truth of the matter is that Xcel’s reliance on coal-fired electricity will continue to undermine Colorado’s greenhouse gas reduction goals and fuel global warming.

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<sup>28</sup> Emissions data from Colorado Department of Public Health and Environment and Colorado Greenhouse Gas Inventory.

<sup>29</sup> Proctor, C, “Xcel takes unusual step to shut down coal power plants,” Denver Business Journal (August 20, 2008), accessed at <http://denver.bizjournals.com/denver/stories/2008/08/18/daily23.html> (last accessed March 30, 2009).

**Table 2. Projected air pollution increases and decreases resulting from Arapahoe and Cameo shuttering and Comanche 3 opening.**

<b>Pollutant</b>	<b>Emission Decreases from Arapahoe and Cameo</b>	<b>Emission Increases from Comanche 3</b>	<b>Net Increase/Decrease</b>
Carbon dioxide	1,586,049 tons	5,313,000 tons	3,726,951 tons
Sulfur dioxide	5,206 tons	3,250 tons	-1956 tons
Nitrogen oxides	3,462 tons	2,600 tons	-862
Mercury	80 pounds	130 pounds	50 pounds

## POWERING PAST COAL

Xcel Energy has shown that it is possible to power past coal and embrace a clean energy future. The company has proposed to shutter two coal-fired power plants and is considered to be a leading provider of renewable energy. Notably, Xcel is on track to meet Colorado’s requirement that 20% of its electricity be generated from renewable sources ahead of schedule.<sup>30</sup> However, Xcel’s reliance on coal to generate electricity continues to put Coloradoans at risk, releasing large amounts of toxic air contaminants, smog and haze forming gases, and global warming pollution. If Xcel Energy is truly committed to confronting climate change, to safeguarding public health and the environment, and to promoting clean energy solutions, the company needs to get serious about shifting away from coal once and for all.



A future without coal is bright.

<sup>30</sup> See <http://www.xcelenergy.com/Company/Newsroom/Pages/NewsRelease2009-01-08-XcelEnergyfilessettlementtoexpandColoradoWindsource.aspx>.

