The Health, Safety, Climate, and Economic Risks of Fossil Gas Extraction and Use

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SIERRA CLUB
NORTH STAR CHAPTER

MN350

EXECUTIVE SUMMARY

A growing body of evidence suggests the extraction and use of fossil gas (called "natural gas" by the fossil fuel industry) poses significant health and safety risks to communities. Shifting toward clean sources of energy can save money and prevent these risks, particularly for the vulnerable subgroups most adversely impacted by fossil gas pollution.

FOSSIL GAS PRODUCTION AND USE

- Fossil gas is a flammable fossil fuel that occurs naturally underground.
- It is extracted primarily by fracking in the United States.
- Fossil gas is not extracted in Minnesota, but our state contributes to production by mining and exporting silica sand used in fracking fluid. We import fracked gas by interstate pipelines to power industrial processes, residential and commercial buildings, and electricity generation plants.
- Utilities propose building several new gas-powered electricity plants in the state within the next 5-10 years.

3.6 million
metric tons of CO_2 emitted by Minnesota's gas-powered electricity generation plants in 2018

35,075
Miles of fossil gas pipelines in Minnesota

26
Fossil-gas powered electricity generatioon plants in Minnesota

SAFETY RISKS

Gas extraction, transport, and combustion to power industry, buildings, and electricity plants can:

- Contaminate and deplete water reserves
- Trigger earthquakes
- Lead to life-threatening carbon monoxide leaks and pipeline explosions
- Release large quantities of methane, a powerful greenhouse gas 86 times more damaging to the environment than carbon dioxide.
- Expose consumers and gas industry workers to hazardous pollutants with serious health risks, including lung inflammation, asthma attacks, heart attacks and strokes, preterm delivery and low birth weight, cancer, and early death.

Since 2005 fossil gas pipelines in Minnesota have led to: **77** incident reports, **9** injuries, **3** deaths, and **$59 million** in damages

14
Chemicals used in fossil gas extraction that are carcinogenic

43% adults & 35% children
Minnesotans with asthma report gas cooking as an asthma trigger

ECONOMIC RISKS

- Decreased costs of clean energy power sources like wind and solar mean new investments in fossil gas could increase costs for Minnesotans for many years to come, as the retirement age of gas plants can extend beyond 50 years.
- Investing in clean energy power sources rather than new gas-powered generation plants will create jobs and save Minnesotans money.

$600 Million
Could be saved by building clean energy power sources instead of the two gas plants proposed by Minnesota utilities

30%
Projected increase in gas per unit delivered fuel cost in the Midwest as a result of declining costs of renewable energy sources

8-10
Years until operating new gas plants proposed in Minnesota is more expensive than building and operating new wind and solar power

ENVIRONMENTAL INJUSTICES

The economic and safety risks of gas production and use are more likely to harm Black and Indigenous People of Color (BIPOC), residents living in poverty, gas industry workers, and physiologically vulnerable subgroups like children, the elderly, and individuals with chronic disease.

Black American mortality rates from power plant pollution are 25% higher than the population average and 12% higher than the rates for Whites.

Oil and gas disposal wells are more than twice as common in areas with ≥80% BIPOC than in majority White areas.

OVERVIEW

FOSSIL GAS is a flammable gas that occurs naturally underground and is made up of methane and other hydrocarbons. It is extracted primarily using hydraulic fracturing (fracking) techniques in the United States. The fossil fuel industry refers to it as "natural gas" to enhance its appeal to consumers, but in this report, we refer to it either as fossil gas or fracked gas. Minnesota does not have any fossil gas reserves or extraction wells, but we contribute to fracked gas production by mining and exporting silica sand used in fracking fluid, and interstate pipelines bring fracked gas to our state for use in powering industrial processes, residential and commercial buildings, and electricity generation.

Local utilities are planning to build several new gas-powered electricity generation plants within or adjacent to our state boundaries in the near future. Gas power plants produce less carbon dioxide than coal plants when burning fuel to produce electricity, but large quantities of methane are released into the atmosphere when the gas is extracted, processed, and transported to the power plant. Methane warms the atmosphere more than carbon dioxide over a 20 year time frame and exposes Minnesotans to significant health and safety risks. Additionally, because recent trends suggest that clean energy generation plants are cheaper to build than gas-powered plants, the proposed investment in new gas-powered electricity plants could lead to costly utility rate increases for Minnesotans down the road.

Decisions about whether to construct new gas-powered generation plants in our state should take into account how fossil gas extraction and use can impact the health, safety, and economic security of Minnesotans. To inform these decisions, this report summarizes available information on the health, safety, environmental, and economic impacts of fossil gas extraction and use, drawing on both national and Minnesota-specific data sources, and highlighting the effect of these risks on our most vulnerable communities.

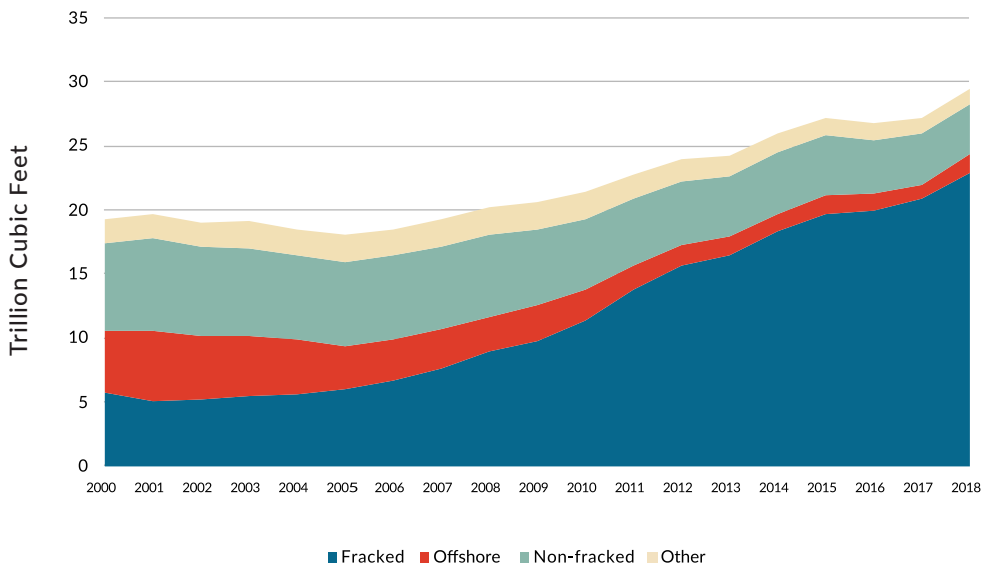
HOW FOSSIL GAS IS PRODUCED AND USED

Fossil gas is produced using either conventional or unconventional processes. Conventional processes extract gas from permeable rocks relatively near the earth's surface. Unconventional processes use hydraulic fracturing techniques to pump water, silica sand and chemicals into shale rock miles beneath the earth's surface in order to fracture the rock and release the gas contained within it. The percentage of fossil gas extracted by hydraulic fracturing processes in the United States has increased over time as conventional sources of fossil gas have been depleted. More than 300,000 fracked gas wells have been built in the United States since 2002, and roughly 20,000 are added annually.[1] Fracked gas now accounts for more than 77% of the fossil gas produced nationally.

77%
U.S. gas produced by fracking

300,000
Fracked wells in U.S.

UNITES STATES GAS EXTRACTION BY TYPE 2000 - 2018



Source: US Energy Information Association, Annual Energy Outlook References, January 2019.

The fossil gas extracted by fracking and other processes in the United States is used to power electricity generation plants, residential and commercial buildings, and industrial processes. Nationally, the largest share (36%) of fossil gas consumed in 2019 was used to power electricity generation plants, followed by residential and commercial buildings (27.5%), and industrial processes (27%).[2] As of 2018 there were 1,854 gas-powered electricity generation plants in the Unites States,[3] and 88 additional plants were planned to be built by 2025.[91]

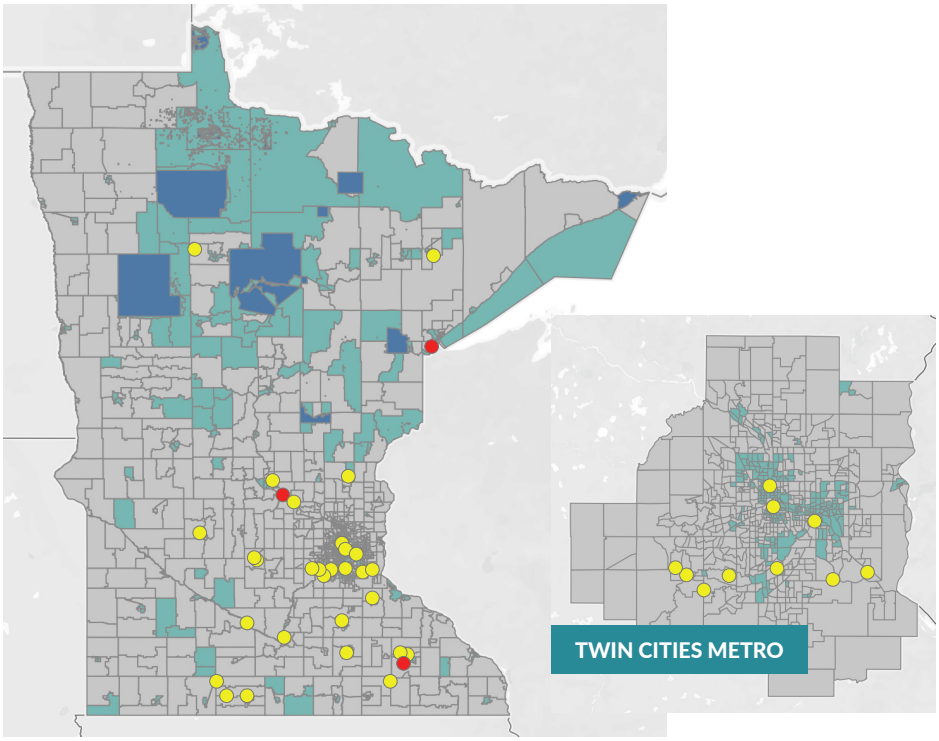
1,854
Fossil gas-powered electricity generation plants in U.S.

Because Minnesota does not currently have any fossil gas wells, we import all the fossil gas we use. The majority of fossil gas consumed in Minnesota (53%) is used to power residential and commercial buildings, followed by industrial processes (34%) and electric power generation (13%).[4] Only 18% of electricity generation in Minnesota is currently powered by gas,[5] but this percentage may increase, as one of our largest utility companies (Xcel Energy), is proposing in its 15-year Integrated Resource Plan to build a new gas-powered electricity generation plant in Becker, Minnesota, to replace retiring coal-powered generation plants in that location. Additional gas power plants have been proposed by Minnesota Power & Dairyland Power in Superior, Wisconsin and by Rochester Public Utilities in Rochester.

18%
Electricity generated by fossil gas in Minnesota

26
Fossil-gas powered electricity generation plants in Minnesota[97]

EXISTING AND PLANNED FOSSIL GAS-POWERED ELECTRICITY PLANTS IN MINNESOTA



Planned power plants

Existing power plants

Tribal land

Environmental justice areas
Defined as any tribal community, or a census tract where # of people of color is greater than 50%, or more than 40% of the households have a household income of less than 185% of the federal poverty level.

Source: Power plants and environmental justice, Minnesota Pollution Control Agenncy

Although Minnesota does not have any fossil gas wells, our state contributes to the production of fracked gas by mining and exporting the silica sand used in fracked gas operations. Silica sand is a fine sand composed of pure quartz, or silicon dioxide (SiO_2) grains.[6] Although silica sand is used in the manufacturing of glass, abrasives, and other applications, its primary use in the United States is in fracked oil and gas development. It is the ingredient in fracking fluid that holds shale rock fractures open while the fracked gas escapes. Fracked gas wells require approximately 10,000 tons of silica sand per well.[6]

10,000
Tons of silica sand required for each fracked gas well

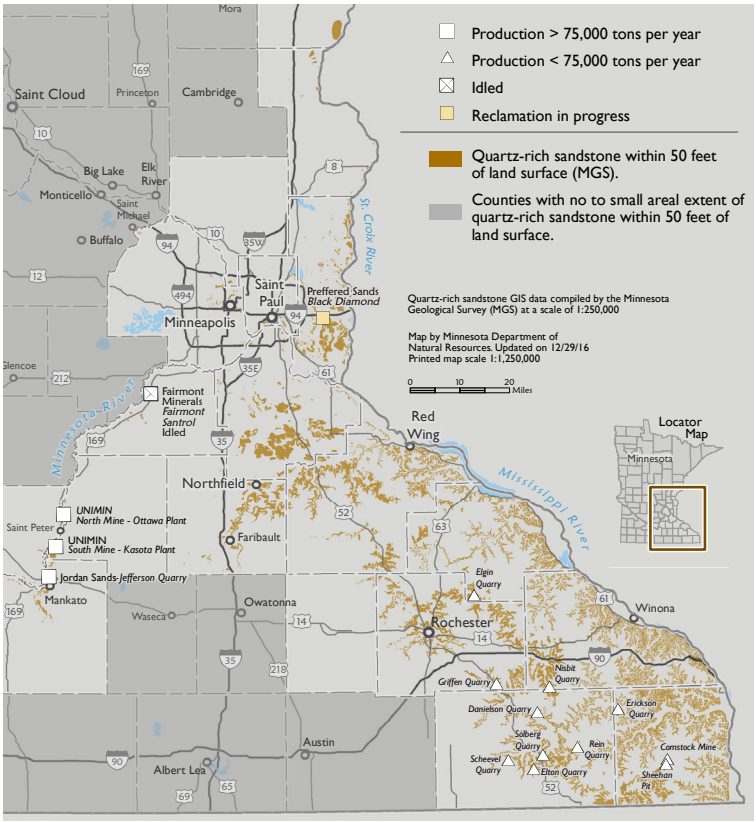
FOSSIL GAS IS NOT SAFE

Fossil gas production, transport, and use can pose health and safety risks to gas industry workers and community members by polluting air and water sources, accelerating climate change, and causing pipeline explosions and earthquakes.

WATER DEPLETION

Fossil gas production processes pose a number of risks to water resources. The first risk is depletion of water reserves. Fossil gas extracted using hydraulic fracturing processes requires vast quantities of water (up to 13 million gallons per well).[7] These large withdrawals can decrease flow to local streams,[8] disrupt aquatic ecology,[8] and threaten the ability of fracking regions already battling water shortages[9] to adequately weather the increasingly longer and more frequent periods of drought resulting from climate change.[7,10,11] Minnesota's abundant water resources are threatened by the water demands of our multiple silica sand mines that export sand for use by out-of-state fracked gas wells. Silica sand mines consume up to 2 million gallons of water a day.

SILICA SAND MINES IN MINNESOTA



2 million
Daily gallons of water required per silica sand mine

13 million
gallons of water required per fracked well per year

14
Active silica sand mines in Minnesota

Source: Minnesota Department of Natural Resources, Division of Lands & Minerals - Jess Richards, Director (December 2016)

Additionally, the recent proposal from a Dakota County company to ship our water to western states suffering shortages caused by drought and fracking[12] suggests our water resources could be depleted by regional demand if this type of exchange is legally permitted.

WATER CONTAMINATION

The second risk to water resources imposed by fossil gas production is drinking water contamination. The fluid used and wastewater produced by fracking processes contain a variety of hazardous and potentially toxic substances including lead and other heavy metals, methane, polycyclic aromatic hydrocarbons (PAH), radioactive materials, and volatile organic compounds (VOC).[13–15] A recent study documented that 14 of the chemicals commonly contained in fracking fluid are definitely carcinogenic, meaning they can cause cancer in humans.[16] Many others are known reproductive or developmental toxicants,[16] or endocrine disruptors,[17] meaning they can cause birth defects, and other developmental disorders. Additionally, methane and other flammable hydrocarbons contained in fracking wastewater can cause fires and explosions when leaked into shallow drinking water wells.[13]

Drinking water resources can be contaminated with these hazardous and toxic substances when fracking fluid and/or wastewater leaks from cracked gas well casings, accidentally spills or is intentionally discharged into rivers and streams, or migrates to underground drinking wells. Contamination of drinking water sources near fracked wells with chemicals used and produced by fracking processes have been documented in several states.[18–20] Water contamination is one potential mechanism that could explain the growing body of evidence documenting that living near gas extraction sites is associated with adverse pregnancy outcomes.[21,22]

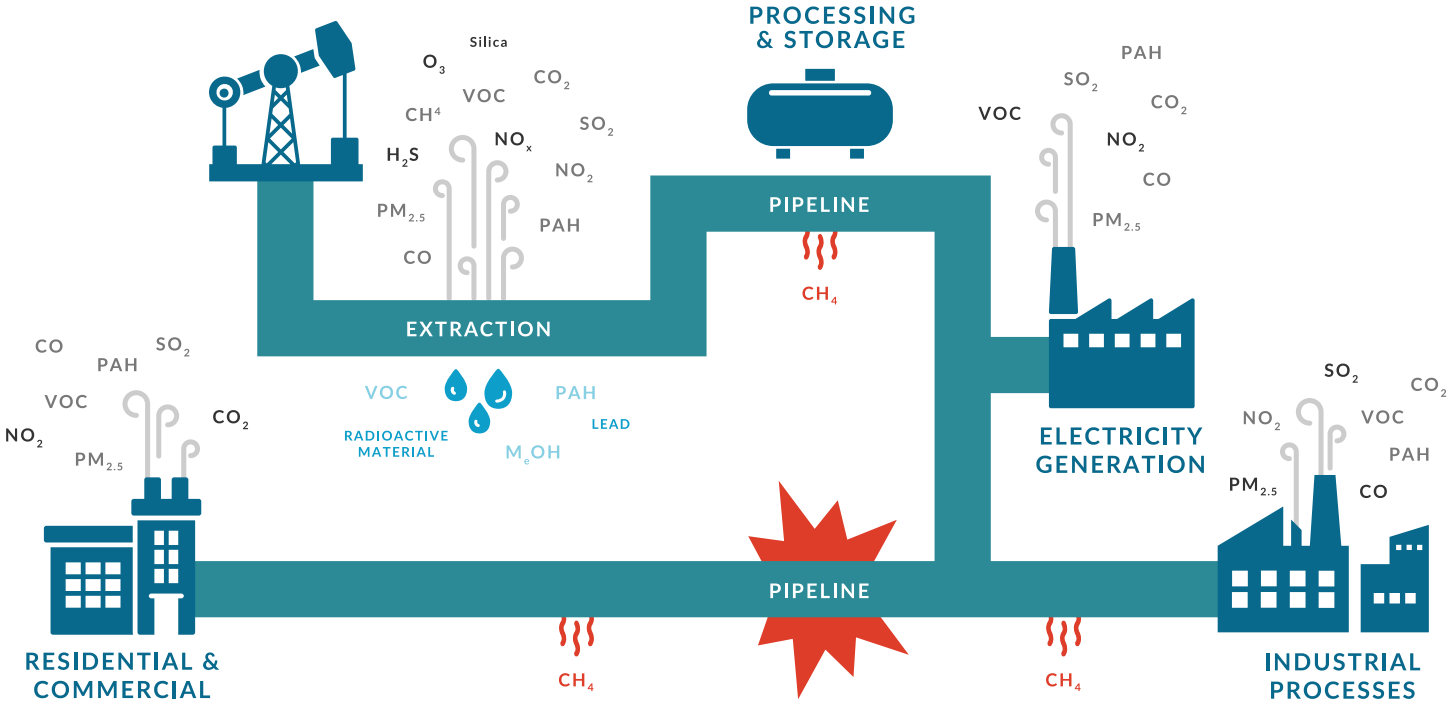
Minnesota residents could be exposed to polluted water leaked from our many silica sand mines that supply out of state oil and gas development sites. Wastewater from silica sand mines can contain a variety of hazardous pollutants, including acrylamide, which can cause blood and nervous system disorders and may cause cancer,[23] and diallyldimethylammonium chloride (DADMAC), which is a potential carcinogen when combined with other chemicals. Both substances are considered sufficient threats to drinking water to be monitored by the Minnesota Department of Health.[24]

14
Chemicals in fracking fluid that are carcinogenic

Fossil fuel disposal wells are more than twice as common in areas with ≥80% BIPOC than in majority White areas.[43]

FOSSIL GAS CYCLE

Methane (CH_4) leaks and explosions throughout process



AIR POLLUTANTS

- **Carbon monoxide (CO)** - Inhalation causes flu-like symptoms at low concentrations. At high concentrations can cause heart attacks and death.
- **Carbon dioxide (CO_2)** - A greenhouse gas that causes climate change and health effects associated with air pollution, high pollen counts, temperature extremes, fires, and floods.
- **Hydrogen sulfide (H_2S)** - Can irritate eyes and cause damage to respiratory, neurological, cardiovascular, metabolic, and reproductive systems.
- **Methane (CH_4)** - A greenhouse gas that heats the planet 86 times faster than carbon dioxide.
- **Nitrogen oxides (NO_x)** - Reacts with sunlight and other chemicals to form smog. Can decrease lung function, cause asthma attacks and birth defects, worsen chronic disease symptoms, and lead to reproductive and neurological problems.
- **Nitrogen dioxide (NO_2)** - Inhalation decreases lung function, particularly in children and individuals with chronic respiratory diseases. Causes asthma attacks. Worsens heart disease symptoms.
- **Ozone (O_3)** - Main ingredient in smog. Can cause respiratory problems including decreased lung function, asthma attacks, chronic obstructive pulmonary disease, increased susceptibility to respiratory infections, and premature death.
- **Particulate matter ($PM_{2.5}$)** - Inhalation decreases lung function, worsens asthma, and can cause heart attacks and strokes.
- **Polycyclic aromatic hydrocarbons (PAH)** - Inhalation can cause bronchitis and lung cancer, can worsen heart disease and asthma symptoms, and may affect fetal development.
- **Silica** - Sand dust that can inflame and scar the lungs and lead to tuberculosis, lung cancer, chronic bronchitis, autoimmune disorders and kidney disease.
- **Sulfur dioxide (SO_2)** - Inhalation worsens asthma and heart disease symptoms and increases chance of respiratory infections.
- **Volatile organic compounds (VOC)** - Inhalation can cause flu-like symptoms, decrease lung function, and damage the nervous system. Some VOCs cause cancer.

WATER CONTAMINANTS

- **Lead** - Ingestion can cause anaemia, hypertension, reduced kidney function, reproductive organ damage, and irreversible mental retardation and behavioral disorders in children.
- **Methanol (MeOH)** - Ingestion can cause headaches, dizziness, insomnia, nausea, gastric disturbances, blurred vision, and blindness.
- **Polycyclic aromatic hydrocarbons (PAH)** - Ingestion can adversely affect the skin, immune system, fertility, and birth outcomes.
- **Radioactive material** - Ingestion can cause digestive problems, muscle weakness, breathing difficulties, and heart problems.
- **Volatile organic compounds (VOC)** - Ingestion can cause flu-like symptoms and damage the nervous system. Some VOCs cause cancer.

AIR POLLUTION

Fossil gas extraction, transport, and combustion can release harmful pollutants into the air we breathe, both outdoors near gas extraction sites and electricity generation plants, and indoors in buildings where we use gas to power heating and cooking appliances.[25]

FROM GAS EXTRACTION SITES AND ELECTRICITY GENERATION PLANTS

Air pollutants emitted by gas extraction sites, silica sand mines, and gas-powered electricity generation plants include: hydrogen sulfide (H_2S), methane (CH_4), nitrogen oxides (NOx), ozone (O_3), particulates ($PM_{2.5}$), silica, sulfur dioxide (SO_2), volatile organic compounds (VOC), and a variety of other hazardous air pollutants with documented health risks.[25–27] Many of these pollutants (NO_2, O_3, $PM_{2.5}$, SO_2) are regulated by Environmental Protection Agency air quality standards because exposure to them is linked to respiratory disease, heart disease, and elevated mortality.[28–31]

Black American mortality rates attributable to power plant PM2.5 pollution are 25% higher than the population average and 12% higher than the rates for Whites.[98]

Fossil gas extraction sites are more likely to be permitted and constructed in neighborhoods with a high proportion of BIPOC and residents living in poverty.

Low income residents and BIPOC are more likely to die from long term exposure to some of these pollutants, such as $PM_{2.5}$.[30,32] Additionally, one recent study found that individuals exposed for long periods of time to even low levels of $PM_{2.5}$ are much more likely to die of COVID-19.[33] Some VOCs are known carcinogens,[16] and silica, a fine sand used in fracking and mined in Minnesota, can cause lung inflammation and permanent scarring (silicosis) when inhaled.[34] Silicosis reduces lung function[34] and can increase the risk of developing lung cancer, tuberculosis, chronic obstructive pulmonary disease, and kidney and autoimmune disease,[35] particularly among gas industry workers chronically exposed to this hazardous substance at fracked gas extraction sites and silica sand mines.[36]

17.6 million

People living within one mile of oil and gas extraction sites in the U.S.

Gas extraction sites and silica sand mines can raise levels of these pollutants at or near extraction sites to thresholds that exceed air quality standards, threatening the health of gas industry workers and nearby residents.[37] Recent studies have documented that individuals exposed to air pollution from gas extraction sites are more likely to experience asthma symptoms,[38] high blood pressure and other indicators of cardiovascular disease,[39] adverse birth outcomes,[21,22] and cancer.[40] Since 17.6 million people live within 1 mile of[41] and more than 600,000 work at oil and gas extraction sites in the United States,[42] these adverse health effects could impact a large fraction of the population. Unfortunately these risks are more likely to threaten BIPOC and residents living in poverty, as fracked gas extraction sites are more likely to be permitted and constructed in their communities.[43,44]

FROM USE IN BUILDINGS

This section summarizes information first detailed in a Fresh Energy policy brief on the health and safety risks of using fossil gas to power buildings.[45] Fossil gas is the most common fuel source used for space and water heating in both residential and commercial buildings in Minnesota[46] and is also used to power clothes dryers and cooking appliances. Combusting fossil gas to power these appliances and heating devices can generate a variety of air pollutants, including nitrogen dioxide (NO_2), sulfur dioxide (SO_2), polycyclic aromatic hydrocarbons (PAH), carbon monoxide (CO), carbon dioxide (CO_2),

volatile organic compounds (VOC), and particulate matter ($PM_{2.5}$). Indoor concentrations of some of these pollutants can reach levels 2 to 5 times higher than typical outdoor levels.[47] Since the average American spends 90% of their time indoors,[47] many of us could be routinely exposed to hazardous levels of the pollutants produced by gas appliances and heating devices. One recent study estimated that 62% of residents using fossil gas stoves are regularly exposed to nitrogen dioxide levels that exceed indoor air quality standards.[48] Although a variety of sources (including outdoor air pollution, building materials, and cigarette smoking) can increase indoor accumulations of these pollutants, gas heating and cooking devices are the primary sources of indoor accumulations of both nitrogen dioxide and carbon monoxide.[49]

Numerous studies have shown that nitrogen dioxide from gas heating and cooking can increase airway responses to irritants and allergens;[28,50,51] exacerbate symptoms associated with chronic obstructive pulmonary disease,[28,52] asthma,[28,51,53,54] and heart disease;[55,56] and may adversely affect the mental development of children.[56,57] Children and the elderly are more vulnerable to these health effects, in part because they spend a greater fraction of their time indoors.[28] Rural residents, people living in poverty, and BIPOC are more vulnerable because they are more likely to use unvented gas cooking and heating appliances and to use gas stoves as a supplemental heat source.[58,59] Individuals with chronic respiratory and heart disease are more vulnerable because fossil gas combustion pollutants can worsen symptoms associated with heart disease, asthma, and other respiratory diseases.[60] In Minnesota, gas cooking was reported as an asthma trigger by 35% of children and 43% of adults participating in the 2015 Minnesota asthma callback survey, making it the third and the fourth most commonly reported trigger for children and adults with asthma in the state, respectively. Replacing gas stoves with electric or induction ranges[54] or improving ventilation[61,62] can reduce nitrogen dioxide levels, but surveys suggest only one-third of households with gas appliances routinely use their exhaust fans while cooking, and only 35% have exhaust fans that vent to the outside.[63,64] Given limited access to and low compliance with proper ventilation, the best option for reducing the adverse health effects associated with gas cooking and heating may be to replace gas appliances with electric.

In addition to the above risks associated with indoor nitrogen dioxide accumulations, carbon monoxide poisoning from improperly installed, ventilated, operated, or maintained gas appliances and heating devices can lead to health complications ranging from temporary flu-like symptoms to cardiac morbidity and death. Every year, roughly 21,000 people visit an emergency room, 2,300 are hospitalized, and 438 die of unintentional, non-fire related carbon monoxide poisoning in the United States.[65] In Minnesota between the years 2012-2017, carbon monoxide poisoning led to 1,725 emergency room visits, 175 hospitalizations, and 74 deaths.[66] Carbon monoxide poisoning in Minnesota is more common in men and the elderly, and occurs more frequently in the winter months, when fuel burning heaters are heavily used.[66]

62%
Residents regularly exposed to dangerous levels of pollutants from gas stoves

Black and Puerto Rican children are ≥ twice as likely to suffer from Asthma than White children.

American Indians / Alaska Natives and Black Americans are 38 and 23% more likely to be diagnosed with asthma in their lifetime than White Americans.

Black adults are >2 times more likely to die from asthma complications than White adults.[99]

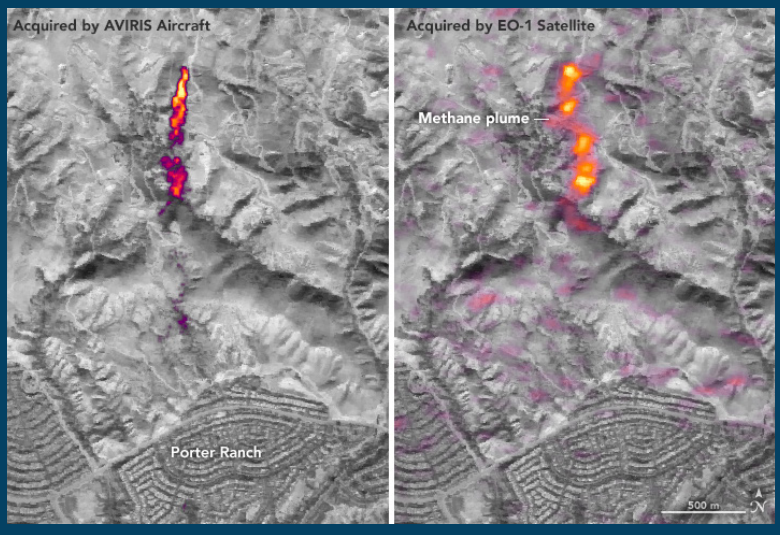
Every year in Minnesota CO poisoning from fossil fuels causes **287** Emergency room visits, **29** hospitalizations, and **12** deaths

CLIMATE IMPACT

Gas extraction and use impacts climate by emitting methane, a powerful greenhouse gas that heats the planet at a rate 86 times faster over 20 years than carbon dioxide.[67] One third of methane emissions come from the fossil fuel sector,[68] making it the second-largest human-made methane source after the agriculture industry.[69] Methane can leak along the whole lifecycle, from gas extraction sites, transmission and distribution pipelines, storage tanks, and electricity generation plants, to buildings using gas to power industrial processes, appliances, and heating devices. Nationally, methane emissions from oil and gas extraction, processing, transmission, and distribution total over 6.7 billion CO_2-equivalent tons each year, which equates to 16% of all human made CO_2 emissions.[69]

In Minnesota, methane and other greenhouse gases can leak from our buildings, 35,075 miles of fossil gas pipeline,[70] 2 billion cubic feet of fossil gas storage capacity,[71] and 26 gas-powered electricity generation plants.[72] Every year, Minnesota's fossil gas-powered electricity generation plants emit at least 3.6 million metric tons of carbon dioxide into the atmosphere.[72] The two gas-powered electricity plants Minnesota utilities plan to build would significantly increase this total. Current Minnesota statutes mandate reducing greenhouse gas emissions by 80% by 2050, and many legislators have been advocating for more aggressive targets (100% carbon-free electricity by 2050) in order to forestall the worst impacts of climate change in our state. Building new fossil fuel infrastructure will make it difficult to meet either target.

Climate changes caused by methane, carbon and other greenhouse gas emissions can lead to increases in flooding, drought, extreme heat, fires, allergens,[73] poor air quality, and food, water and vector-borne diseases that threaten public health.[74–76] The elderly, BIPOC, and low-income residents are more likely to be adversely affected by these impacts because they are more likely to suffer from chronic diseases that can worsen their effects, to live in areas hardest hit by flooding, extreme weather events and air pollution, and to lack resources to prevent, mitigate, or recover from climate-related threats to health and safety.[77,78] Pregnant women and children are particularly vulnerable due to their greater physiologic vulnerability to extreme heat and infections.[78]



Satellite image of methane leaking from a large underground storage facility near Porter Ranch, California (June 24, 2016)

Non-Hispanic Black Americans are 2.5 times more likely than White Americans and 2 times more likely than Hispanic Americans to die of extreme heat-related illness.[100]

EXPLOSION RISKS

Gas extraction, transport, and use depends on pipeline infrastructure that poses safety risks, including injury, death, and hardship resulting from leaks and explosions. Every year in the United States, there are about 240 fossil gas pipeline accidents, roughly half involving gas transmission pipelines (those that primarily transport gas from gathering systems to refining, processing, or storage facilities), and half involving distribution pipelines (those that deliver fuel to consumers).[79] Since 2005 in the United States, fossil gas pipeline accidents resulted in 860 injuries, 195 fatalities, and more than $4.2 billion in property damages.[79]

In Minnesota, we experience an average of five reported pipeline incidents a year.[79] Since 2005, there have been 77 fossil gas pipeline incidents (29 involving transmission and 48 involving distribution lines) in Minnesota; a total which is slightly higher than the national average of 71 per state over this same time period.[79]

The pipeline accidents occurring in Minnesota since 2005 have led to two fatalities, at least 9 injuries, and more than $59 million in property damages.[79] Last year Minnesota experienced three pipeline explosions: one in Pequot Lakes that hospitalized a restaurant owner with severe burns,[80] one in Paynesville that leveled a home,[81] and one in St. Paul that destroyed a house and badly burned an elderly resident.[82]

St. Paul fire investigators determined the fatal explosion that destroyed a home on the city's Payne Avenue on Nov. 23 was likely caused by a natural gas leak. The home's owner, John Lundahl, 80, died from injuries sustained in the blast. (Courtesy of the St. Paul Fire Department)

Since 2005 fossil gas pipelines in Minnesota have led to: **77** incident reports, **9** injuries, **3** deaths, and **$59 million** in damages

EARTHQUAKES

Hydraulic fracturing and underground injection of wastewater produced by gas extraction processes can trigger mild to moderate (<6.0) earthquakes.[83,84] Most induced earthquakes are caused by underground injection of wastewater, but 1-2% are caused by fracking processes.[84] Wastewater injection has been conclusively linked to earthquakes in at least two fracking regions,[85,86] and is a suspected contributor to a 5.8 magnitude earthquake experienced in central Oklahoma in 2011.[83] Wastewater injection induced earthquakes have become so common in Oklahoma that the State Supreme Court recently ruled that residents can sue the oil and gas industry for injuries and property damage suffered as a result of earthquakes.[87] Although induced earthquakes do not directly endanger Minnesota residents because our state does not have any gas extraction sites, we import and consume fracked gas from regions that do experience induced earthquake risks.

ECONOMIC RISKS OF INVESTING IN NEW FOSSIL GAS INFRASTRUCTURE

Nationally, utilities are planning to invest more than $120 billion in new fossil gas-powered electricity generation plants and pipelines over the next 10-15 years.[88] In Minnesota, utilities have also proposed sizable new investments in fossil gas infrastructure. CenterPoint Energy proposed an investment of $200 million in their 2019 rate case filing with the Public Utilities Commission to replace and upgrade fossil gas pipelines, which, if approved, would raise residential gas bills by 8.7%.[89] Minnesota Power has proposed to build a 625 megawatt Nemadji Trail gas-powered electricity generation plant in Superior, Wisconsin (shared with Wisconsin's Dairyland Power), Xcel is proposing to build a 800 megawatt gas-powered electricity plant and pipeline to replace retiring coal plants in Becker, Minnesota, and Rochester Public Utilities is considering building a gas plant in Rochester, Minnesota. However, recent trends call into question the economic rationale for continued, significant investment in gas infrastructure. In the United States, clean energy power sources like wind and solar are already cheaper than new gas-powered electricity generation plants to build[90] and are expected to be cheaper than 90% of existing gas plants to operate by 2035.[88,91] These trends apply in Minnesota as well. Both the Nemadji Trial and Becker plants proposed by Minnesota utilities are already more expensive to build than clean energy power sources with similar capacity and reliability characteristics, and will be more expensive than clean energy power to operate within 8-10 years.[92]

90%

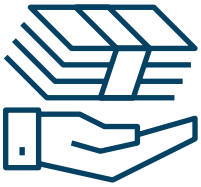
Existing gas plants that will be more expensive than clean energy power sources to operate by 2035

These trends mean that any new resources directed toward gas power plants and pipeline expansions now could emerge as wasted investments that will translate to increased consumer costs for Minnesotans for many years to come, as the retirement age of gas plants can extend beyond 50 years.[93] One recent study found that declines in fossil gas demand could lead to per unit delivered fuel cost increases of up to 30% in the Midwest, and as high as 140% in the Southeast.[88] Electricity prices are much more stable than gas prices, having remained virtually unchanged for the past 50 years,[94] and recent studies suggest that shifting building power to electricity could lead to consumer savings in the long run. For instance, one California study estimated that most residents' energy bills would decrease with electrification of space and water heating.[95]

8-10 years

until new gas plants proposed in Minnesota are more expensive than wind and solar power to operate

BUILDING CLEAN ENERGY POWER SOURCES INSTEAD OF THE PROPOSED GAS PLANTS IS EXPECTED TO SAVE MINNESOTA AND WISCONSIN CONSUMERS APPROXIMATELY $600 MILLION.



30%

Projected increase in fossil gas per unit delivered fuel cost in the Midwest due to declining renewable energy costs

COST COMPARISON OF PROPOSED GAS PLANTS AND CLEAN ENERGY POWER SOURCES

Proposed gas plant	Gas plant service year	Proposed capacity	Gas plant cost / MWh	Clean energy cost / MWh	Clean energy savings	Gas plant stranded year*
Nemadji Trail	2024	625 MW	$52	$38	$231 million	2032
Becker	2027	800 MW	$55	$46	$360 million	2037

**Year in which the cost of operating a new clean energy power source becomes cheaper than the costs of operating a gas plant. Source: Sierra Club North Star Blog, November 12, 2019*

PM2.5 pollution exposure versus production among Americans:

Latinx - exposed to 63% more pollution than they produce

Black - exposed to 56% more pollution than they produce

Whites - exposed to 17% less pollution than they produce.[98]

Black, American Indian, and Hawaiian/Pacific Islander households are ≥2 times more likely than White households to report energy insecurity (including forgoing food or medicine to pay energy costs).

Black Non-Hispanic Children are 2.5 times more likely and Hispanic children 1.5 times more likely than White children to live in households experiencing economic energy insecurity.[101]

ENVIRONMENTAL JUSTICE CONCERNS

According to the United States Environmental Protection Agency, no group of people should bear a disproportionate share of the negative consequences resulting from industrial operations.[96] Unfortunately, this principle has not been successfully applied in the fossil gas industry.

The risks of fossil gas production and use disproportionately harm people of color and residents living in poverty. Specifically, BIPOC and residents living in poverty are more vulnerable to the outdoor air pollution, water contamination, and earthquake damage caused by fossil gas production and transport because fracked gas extraction sites[43,44] are more likely to be permitted and constructed in their communities. They are more likely to be harmed by the indoor air pollution caused by gas combustion for heating and cooking in buildings because they are less likely to own properly vented gas cooking and heating appliances and are more likely to use gas stoves as a supplemental heat source.[58,59] They are more likely to live in areas hardest hit by the flooding, extreme weather events, and air pollution caused by climate change, and less likely to possess resources to prevent, mitigate, or recover from these threats to health and safety.[77,78]

All of these risks are compounded by the fact that BIPOC and residents living in poverty are more likely to suffer from the chronic diseases that can worsen the adverse health effects of air pollution and water contamination, and are more likely to die from long term exposure to air pollution.[30,32] What's more, the projected fuel cost increases caused by continued investment in fossil fuel infrastructure will represent a greater financial burden for low income families.

CONCLUSIONS

A growing body of evidence suggests that fossil gas production and use poses health and safety risks by polluting air and water sources, accelerating climate change, and triggering pipeline explosions and earthquakes. These risks are more likely to harm people of color and residents living in poverty, and also disproportionately threaten gas industry workers, and physiologically vulnerable subgroups like children, the elderly, and individuals with chronic disease. These health, safety, and economic risks of continued reliance on gas to generate electricity and power buildings in Minnesota are avoidable and can be prevented by shifting sooner rather than later toward clean sources of energy like wind and solar. In addition to saving lives, improving health, and protecting consumer pocketbooks, shifting toward clean sources of energy will reduce harmful air pollutants responsible for climate change.

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SIERRA CLUB
NORTH STAR CHAPTER

ABOUT SIERRA CLUB

The Sierra Club is America's largest and most influential grassroots environmental organization, with more than 3.5 million members and supporters. In addition to protecting every person's right to get outdoors and access the healing power of nature, the Sierra Club works to promote clean energy, safeguard the health of our communities, protect wildlife, and preserve our remaining wild places through grassroots activism, public education, lobbying, and legal action.

MN350

ABOUT MN350

MN350 is a statewide group with 20,000 supporters, MN350 unites Minnesotans as part of a global movement to end the pollution damaging our climate, speed the transition to clean energy, and create a just and healthy future for all. MN350 is an affiliate 350.org. MN350 Action is its political and advocacy arm.