

# Guide to selecting generators and stationary engines

**Smart choices can minimize impacts**







## Emergency generators and stationary engines

Emergency generators and stationary engines that are used to provide power for events, critical services, or even home backups are available in a wide range of options. Many of those options directly impact air quality, noise levels, health, and overall aesthetics of an environment. While one generator may not seem to have much impact, added together they can have noticeable, negative side effects. This guide will help you make informed decisions when selecting a generator, to help lessen your overall footprint and benefit your surrounding community.

### What is the concern?

Fuel combustion in generator engines releases pollutants that can directly harm people and may contribute to regional air quality problems. Because stationary engines

such as diesel generators typically have long operating lives, many older units with minimal or no emission controls remain in service. Older units are a particular concern because of their higher emissions.

### Why does it matter?

Many generators operate at businesses, hospitals, schools, and other public locations. Air pollution at these locations may adversely affect large numbers of people, especially those most susceptible – children, elderly, and those already suffering from respiratory and cardiovascular issues. Evidence shows that exposure to diesel exhaust can result in adverse respiratory effects, aggravate allergies, or exacerbate asthma symptoms. Prolonged exposure can even cause lung cancer\*.

\*Minnesota Pollution Control Agency. Emergency generators and stationary engines recommended practices. <https://www.pca.state.mn.us/sites/default/files/aq1-51.pdf>

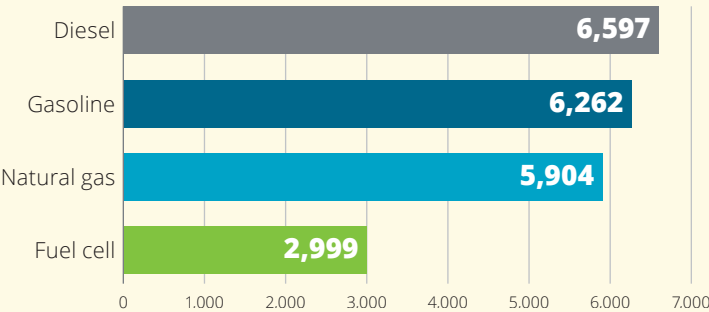


# Emissions

When generators operate, thousands of chemicals are emitted into the air. Many of these are air pollutants that can directly or indirectly affect human health, reduce visibility, cause property damage and harm the environment. For these reasons, the Minnesota Pollution Control Agency attempts to reduce the amount of pollutants released into the air.

## Daily greenhouse gas emission totals (pounds)\*\*

By generator type



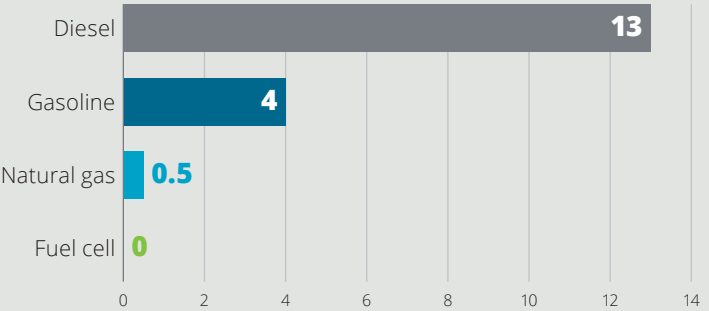
## Greenhouse gas emissions

Greenhouse gases trap heat in the atmosphere, which makes the Earth warmer. They enter the atmosphere through burning fossil fuels like in a generator powered by diesel or natural gas. Several pollutants make up greenhouse gases. Their effect on climate change depends on three main factors:

- How much of these gases are in the atmosphere;
- How long they stay in the atmosphere; and
- How strongly they influence global temperatures.

## Daily particulate matter emission totals (pounds)\*\*

By generator type

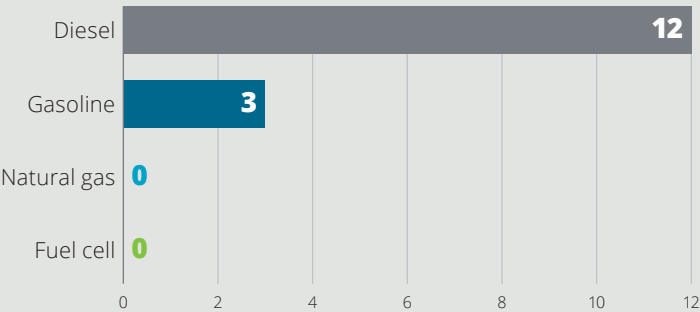


## Particulate matter emissions

Particulate matter is a complex mixture of extremely small particles and liquid droplets that get into the air. Some particles, such as dust, dirt, soot, or smoke, are large or dark enough to be seen with the naked eye. Others are so small they can only be detected using an electron microscope. Once inhaled, these particles can affect the heart and lungs and cause serious health effects. Particulate matter is also the main cause of reduced visibility (haze) in parts of the United States, including many of our treasured national parks and wilderness areas.

## Daily sulfur dioxide emission totals (pounds)\*\*

By generator type

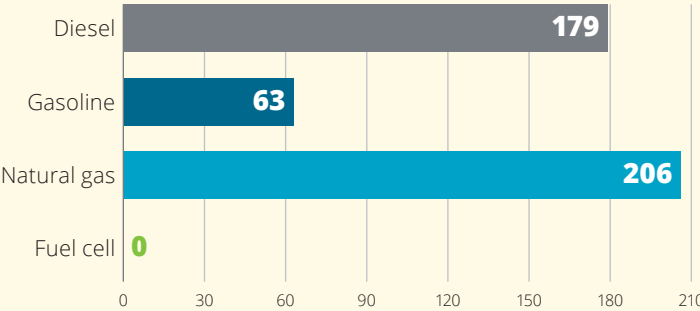


## Sulfur dioxide emissions

Sulfur dioxide emissions can affect both health and the environment. Exposure to sulfur dioxide emissions can harm the heart and lungs and make breathing difficult. Children, the elderly, and those who suffer from asthma are particularly sensitive to effects of this pollutant. Additionally, emissions of sulfur dioxide can harm trees and plants by damaging foliage and decreasing growth, and can contribute to acid rain which can harm sensitive ecosystems.

## Daily nitrogen oxide emission totals (pounds)\*\*

By generator type



## Nitrogen oxide emissions

Nitrogen oxide emissions can affect both health and the environment as well. Exposure can irritate airways and can aggravate respiratory diseases like asthma. Longer exposure may contribute to the development of asthma and potentially increase susceptibility to respiratory infections. Children, the elderly, and those who suffer from asthma are generally at greater risk for the health effects of nitrogen oxides. These emissions can also contribute to acid rain and make the air hazy and difficult to see through.

\*\*Source: Minnesota Pollution Control Agency



## Best management practices

- **Select a clean unit using natural gas or ultra-low sulfur diesel fuel.** Diesel fuel with a sulfur content limited to 15 ppm is available and required for some engines. This lowers sulfur dioxide emissions. Check with your dealer to ensure your engines and your fuel delivery systems are compatible with this fuel. You might even consider using a fuel cell instead of a unit powered by an engine.
- **Vent the emissions upward.** Orient the stack outlet to vent emissions vertically without obstruction. Make the stack high enough that the exhaust can disperse easily. A counterbalanced flapper-type rain cap is a better choice than a fixed rain cap.
- **Install generators and pumps away from fresh air intakes, windows or doors.** Emissions from testing and running generator engines can affect indoor air quality.
- **Size the generator to load.** For diesel engines, the load should be at least 30 percent of generator capacity to avoid “wet stacking.” This inefficient operation results in higher emissions and unburned fuel in the exhaust. Wet stacking may result in additional maintenance or premature engine failure. Consider specifying engine exhaust temperature monitoring on new units, a relatively inexpensive option, to confirm the engine is operating above the minimum temperature requirement.
- **Follow up with routine maintenance checks.** These can help save fuel and reduce pollution. Change the oil on schedule. Check belts and hoses; maintain air cleaners, PCV valves, and EGR systems.

## Noise

Generator noise originates from six major sources (in order of decreasing levels):

1. Engine exhaust without silencer, usually reduced by 15 dB(A) with a standard silencer
2. Engine noise from mechanical and combustion forces, depending on the size of the engine
3. Cooling fan noise from the sound of air being moved at high speed across the engine and through the radiator
4. Alternator noise from cooling air and brush
5. Induction noise from fluctuations in current in the alternator windings
6. Structural/mechanical noise from mechanical vibrations

Maximum permitted overall noise levels for generators range from 45 dB(A) to 72 dB(A) (at 7m or 21 ft), depending on location and zoning. Larger diesel and gasoline combustion generators often have noise levels that exceed 100 dB(A) (comparable to jet engines), while smaller and natural gas generators are closer to 80 dB(A) (comparable to heavy street traffic). Natural gas powered fuel cells typically operate in the 60–70 dB(A) range (comparable to normal conversation), while lithium ion battery storage with inverters like the Tesla PowerWall has noise levels below 40 dB(A) (comparable to a library).



### References:

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