Natural gas peaker plants

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Peak demand power plants, known as peakers, are part of the U.S. energy infrastructure. They generally operate at times during the day when cooling and heating needs are the highest among households. Peakers are used to supplement other types of power plants, such as baseload and intermediate plants that supply a more consistent amount of electricity to meet demand throughout the day.

Note: A plant’s capacity factor is the percent of energy produced of the total energy that could have been produced at continuous full power operation during a certain time frame.

There were 999 peakers in the U.S. in 2021, according to GAO"s analysis of the most recent Environmental Protection Agency (EPA) data. Most of these peakers were fueled by natural gas. In 2021, peakers accounted for 3.1 percent of annual net electricity generation and 19 percent of total designed full-load sustained output for all power plants.

Peakers, and other plants, emit multiple pollutants associated with various negative health effects for the people exposed, according to EPA data and GAO"s review of selected studies. For instance, short-term exposure to sulfur dioxide, which peakers emit, can lead to harmful respiratory effects, such as decreased lung function, cough, chest tightness, and throat irritation.

Using a statistical analysis, GAO found that historically disadvantaged communities (i.e., census tracts with higher percentages of historically disadvantaged racial or ethnic populations) are associated with being closer to peakers. For example, based on GAO"s model, a community that is 71 percent historically disadvantaged is expected to be 9 percent closer to the nearest peaker than a community that is 40 percent historically disadvantaged. In addition, the model showed the estimated distance to the nearest peaker varies according to population density. Urban communities have smaller estimated distances to the nearest peaker compared with similar rural or suburban communities.

When operating, peakers emit pollutants like those from other power plants that use fossil fuels, such as nitrogen oxides and sulfur dioxide. According to EPA data, peakers operate less frequently overall than non-peakers, but when they do operate, they emit more pollution. For example, peakers" total annual sulfur dioxide emissions were 96.8 percent lower than non-peakers, but the median peaker emitted 1.6 times more sulfur dioxide per unit of electricity generated than the median non-peaker. This increase may occur because peakers may not have effective, if any, emissions control technology.

Available alternatives, such as battery storage systems, could replace fossil-fueled peakers and decrease associated emissions. However, replacing peakers with alternatives has potential challenges including cost, reliability, and location, according to studies and stakeholders GAO interviewed.

Environmental advocacy groups, and some congressional leaders have expressed concerns that peakers may be less efficient than non-peakers, meaning peakers may expend more energy that is not converted into electricity than other types of plants. Further, due to the nature of their operations, peakers may also negatively affect the air quality in communities around the plants, which may be historically disadvantaged or disproportionately low-income.

GAO was asked to examine pollution from peakers across the nation. This report provides information on the number and location of peakers in the U.S., their proximity to historically disadvantaged or disproportionately low-income communities, to what extent they emit pollutants and how these pollutants affect the health of people exposed, and alternatives for replacing them. To perform this work, GAO analyzed data from EPA, the U.S. Department of Energy, and other sources, reviewed relevant literature, and interviewed federal officials and stakeholders from 19 state, industry, and nongovernmental organizations representing a diversity of perspectives about peakers.

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Clean Energy Group"s Peaker Plant Mapping Tool allows users to access basic operating and emissions information for the U.S. fleet of fossil-fuel peaker power plants, along with demographic information about populations living near each power plant. Peaker plant demographic information can be viewed in three ways: Low Income Percentile, People of Color Percentile, and Demographic Index Percentile (average of Low Income and People of Color). The data indicates significant racial and economic disparities in the communities that are most burdened by peaker plant emissions.

All information included in the tool is based on data made available by the U.S. Environmental Protection Agency through the agency"s Power Plants and Neighboring Communities Mapping Tool (2021 operating and emission data).