

Natural gas power plants in California's disadvantaged communities

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California's power plants are disproportionately located near communities with high cumulative socioeconomic and environmental burdens. By applying the environmental justice screening tool CalEnviroScreen 3.0, we find that half of California's natural gas power plants are located in communities that rank among the 25% most disadvantaged.

Background

Power plants are often disproportionately located in low-income and minority communities [1, 2, 3], due to either initial siting in these communities or subsequent growth of such communities near power plants after they are built. Pollution from fossil fuel-fired power plants has health impacts over broad regional areas, and poor air quality from resultant particulate matter and ozone can have health impacts ranging from asthma attacks to heart attacks [4, 5, 6]. While these health impacts extend hundreds of miles from the power plant stack, studies have also found an association between living near power plants and adverse health outcomes such as increased emergency hospital visits among the elderly [7], pre-term births [8], and respiratory-related hospital visits [9]. Low-income and minority communities often experience high cumulative socioeconomic and environmental health burdens, and these communities have also been found to have more adverse health outcomes in response to environmental health stressors such as poor air quality [10, 11]. California has largely phased out the use of coal and oil in its power plants, but 49% of in-state electricity generation came from natural gas in 2016 [12]. Burning natural gas emits nitrogen oxides, which can contribute to the formation ozone and particulate matter.

In California, the state Office of Environmental Health Hazard Assessment has released the environmental justice screening tool CalEnviroScreen 3.0 to enable communities and policymakers to identify disadvantaged communities that are both exposed to multiple sources of pollution and particularly vulnerable to that pollution [13]. Using an earlier version of this tool, we analyzed populations living within six miles of California's peaker power plants – gas plants that are used only a fraction of the time when electric demand is highest but which have some of the highest rates of pollutant emissions when they are used. We found that 84% of peaker plants were located in areas considered to be in the most disadvantaged half of communities using CalEnviroScreen 2.0, and half of these peaker plants were located in the most disadvantaged 30% [14]. California has set aside funding from its Greenhouse Gas Reduction Fund to benefit disadvantaged communities, which it defines as those census tracts with CalEnviroScreen scores ranking among the highest 25% [15].

In what communities are California's natural gas plants located?

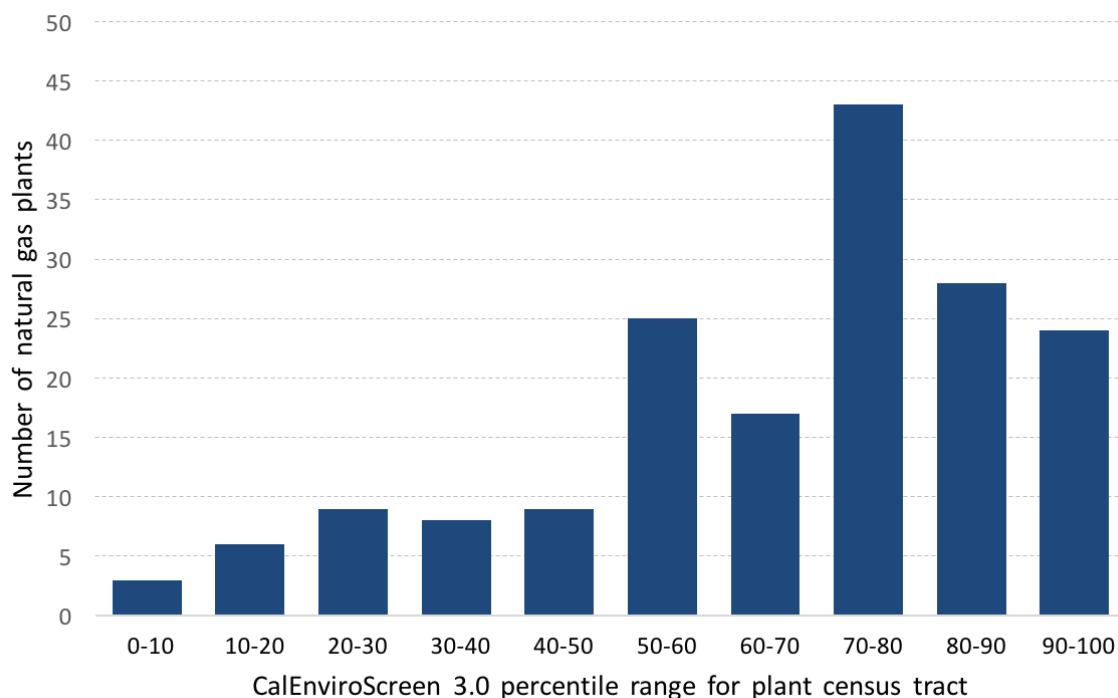


Figure 1: Distribution of power plants and CalEnviroScreen 3.0 scores for plant census tract.

According to the California Energy Commission's (CEC) list of power plants [16], the state had 213 gas-fired power plants larger than 10 megawatts at the beginning of 2017, with a total of nearly 47 gigawatts of generation capacity. We identified latitude and longitude for each plant based on a combination of data from the EPA Air Markets Program Data [17], earlier CEC datasets, the Energy Justice Network [18], and individual plant websites, and we cross-checked these locations as appropriate on Google Earth. We could not determine the location of 11 smaller plants, some of which we believe may be retired, and there is some uncertainty associated with the location of some of the additional small generators, particularly those associated with industrial facilities. We also note that this most recent CEC list omitted nine peaker plants that had been included in earlier datasets, but when we reassess our data including these peakers we do not find significant changes in our trends. For the rest, we determined the environmental justice score of the census tract where the facility is located using CalEnviroScreen 3.0. There were 29 power plants located in census tracts without scores, typically due to low population counts, leaving 173 gas-fired power plants in our primary analysis.

In **Figure 1**, we show the distribution of power plants based on the CalEnviroScreen 3.0 percentile of the census tract where each plant is located; the plants located in the 90-100 percentile census tracts are located among the 10% most disadvantaged communities in California. We find that 49% of these gas plants are located in the highest scoring 25% of census tracts, meaning that nearly half of the power plants are located in communities designated as disadvantaged by the State of California. In contrast, only 9% of power plants are located in the 25% least disadvantaged communities.

If we look at the size of the power plants in addition to the number of power plants, we find very similar distributions: once again, 49% of total gas power plant capacity is located in disadvantaged communities. We note that slightly more than half of natural gas combined-cycle plants, the large gas plants used to meet many baseload energy needs, are located in disadvantaged communities;

peaker plants follow similar trends. Cogeneration plants, which typically produce heat along with electric power, were located in disadvantaged communities in just under half of cases. Smaller industrial plants were less likely to be located in disadvantaged communities (although we were less certain of the location of these plants).

If we take a closer look at those power plants located in California's most disadvantaged communities, we find that 14% of plants are located in census tracts that rank among the most disadvantaged 10%. **Figure 2** illustrates that many of these are located in the San Joaquin Valley, Sacramento, and Los Angeles areas, and in the south of the state.

These data could be further refined by looking specifically at populations living within a specific radius of each plant, whether or not they are located in the same census tract. For example, some vulnerable communities may live very close to a power plant located on the edge of an adjacent census tract with a different CalEnviroScreen 3.0 score. However, these results are already consistent with our previous analysis of populations living within six miles of California's gas peaker plants.

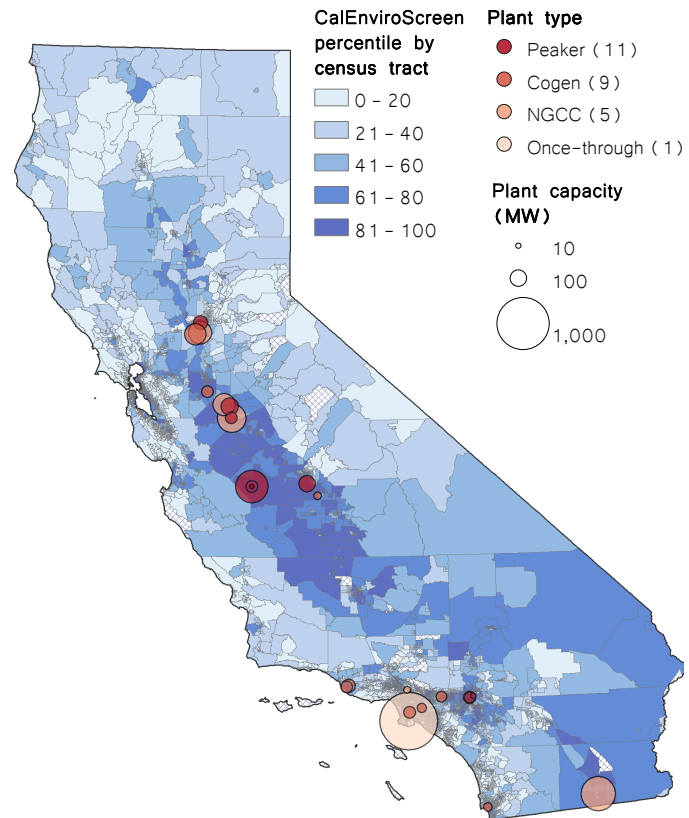


Figure 2: Gas power plants located within the communities that rank among California's most disadvantaged 10%, as classified by CalEnviroScreen 3.0.

Across California, gas power plants are significantly more likely to be found in the state's disadvantaged communities.

References

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