

Smaller, Closer, Dirtier



DIESEL BACKUP GENERATORS IN CALIFORNIA

EXECUTIVE SUMMARY

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ENVIRONMENTAL DEFENSE

finding the ways that work

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ENVIRONMENTAL DEFENSE

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Cover photo: Diesel backup generator. Photo by Kate M. Larsen

Our mission

Environmental Defense is dedicated to protecting the environmental rights of all people, including the right to clean air, clean water, healthy food and flourishing ecosystems. Guided by science, we work to create practical solutions that win lasting political, economic and social support because they are nonpartisan, cost-effective and fair.

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CARB estimates of the number of diesel BUGs by air basin: 2000



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Executive summary

Late one Thursday afternoon in March, a massive power outage darkened much of the University of California's Berkeley campus. Classes ended abruptly, students were herded out of darkened dormitories, and the campus server went down. But the lights did not stay off everywhere on campus. Tucked away in basements and behind buildings was a secret weapon, 40 backup generators or BUGs, 29 of them diesel-fired. During the blackout all but one were switched on to protect sensitive laboratory experiments, power dining facilities, and light hallways. Their service came at a steep cost, however. Toxic diesel exhaust from the Berkeley BUGs wafted across the busy campus and into nearby residential and commercial areas. Alarmed to see plumes of smoke from exhaust outlets, several staff and students dialed 911.

Although there wasn't a fire, there was still plenty to worry about. BUGs are large diesel engines, similar to those found in Greyhound buses, eighteen-wheel trucks, or locomotives. Because they are intended to operate only in the rare event of a power failure, they lack even rudimentary pollution controls. BUGs expose people living, working, and going to school nearby to high levels of toxic diesel emissions. Diesel BUGs emit smog-forming chemicals, fine particles and cancer-causing compounds at many times the rate of newer diesel engines with pollution controls. At their worst, BUGs pollute up to 100 times as much as conventional power plants. This report analyzes the health impacts of BUGs and provides recommendations on how these impacts can be lessened.

BUGS and California's recent electricity supply shortages

The California Air Resources Board (ARB) estimates there are more than 11,000 diesel BUGs in the state. Regulators' records indicate that BUG use increased substantially from December 2000 to May 2001, when rolling blackouts occurred.

Faced with the threat of recurring outages, the administration of Governor Gray Davis developed a plan to use California's largest diesel BUGs as blackout "busters," a function for which they were never approved. Under the plan, BUG owners would have received cash payments to operate BUGs when power supplies got tight. Legislation was even proposed to roll back restrictions on BUG use and provide taxpayer-financed cash incentives for companies to purchase BUGs. Fortunately Californians were spared the predicted nightmare scenario of frequent summer blackouts, and these plans were never implemented. But some experts predict California could face more shortages. If they're right, BUGs could once again emerge as an under-regulated, highly polluting antidote.

BUGS remain a serious health threat

Even if the shortages do not materialize, California's newly expanded crop of BUGs still poses a significant public health threat that merits greater oversight. Five influential governmental or scientific bodies have designated diesel exhaust as a probable or potential human carcinogen. Recent studies have found that diesel exhaust contributes more than 70% of the cancer risk from air toxics in the United

States.¹ The cancer risk from diesel exhaust is about ten times higher than all other toxic air pollutants combined.²

Diesel exhaust also has numerous acute and chronic noncancer effects, involving the respiratory, neurological and immunological systems.³ Diesel exhaust contains or creates nitrogen oxides (NO_x) and volatile organic compounds (VOCs), both precursors to ground-level ozone, or smog; carbon monoxide (CO); and particulate matter (PM).

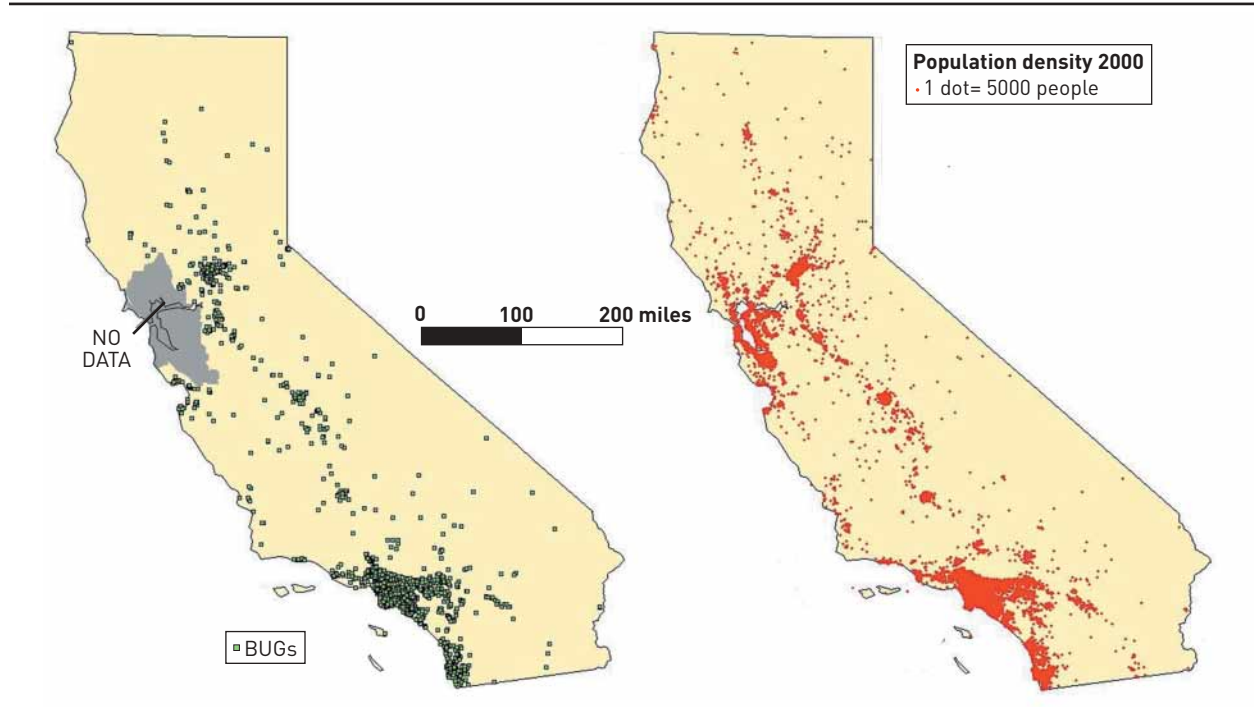
Especially worrisome is the fact that diesel BUGs emit fine particles at extremely high rates. Studies have linked fine particles to many adverse health effects, including asthma, cardiovascular and respiratory problems, strokes, and heart attacks.⁴ Researchers estimate that as many as 60,000 Americans die prematurely each year because of exposure to fine particles.⁵ Children, the elderly, and the ill (especially those who have existing respiratory problems) are particularly vulnerable.

California is swarming with BUGs

There are likely many more BUGs in California today than the 11,000 estimated by the Air Resources Board before the electricity shortages. Regulators can only make informed guesses about the number of BUGs, because until recently some air districts did not even require BUG owners to get a permit. Regulators not only had no way of knowing who had a BUG, they could not conduct inspections to detect and penalize unauthorized use.

Air quality regulators need to know where the BUGs are, especially as BUG owners everywhere face growing incentives for unauthorized use. Foremost among these incentives are demand-response programs, which compensate customers

Population density and diesel BUGs in California

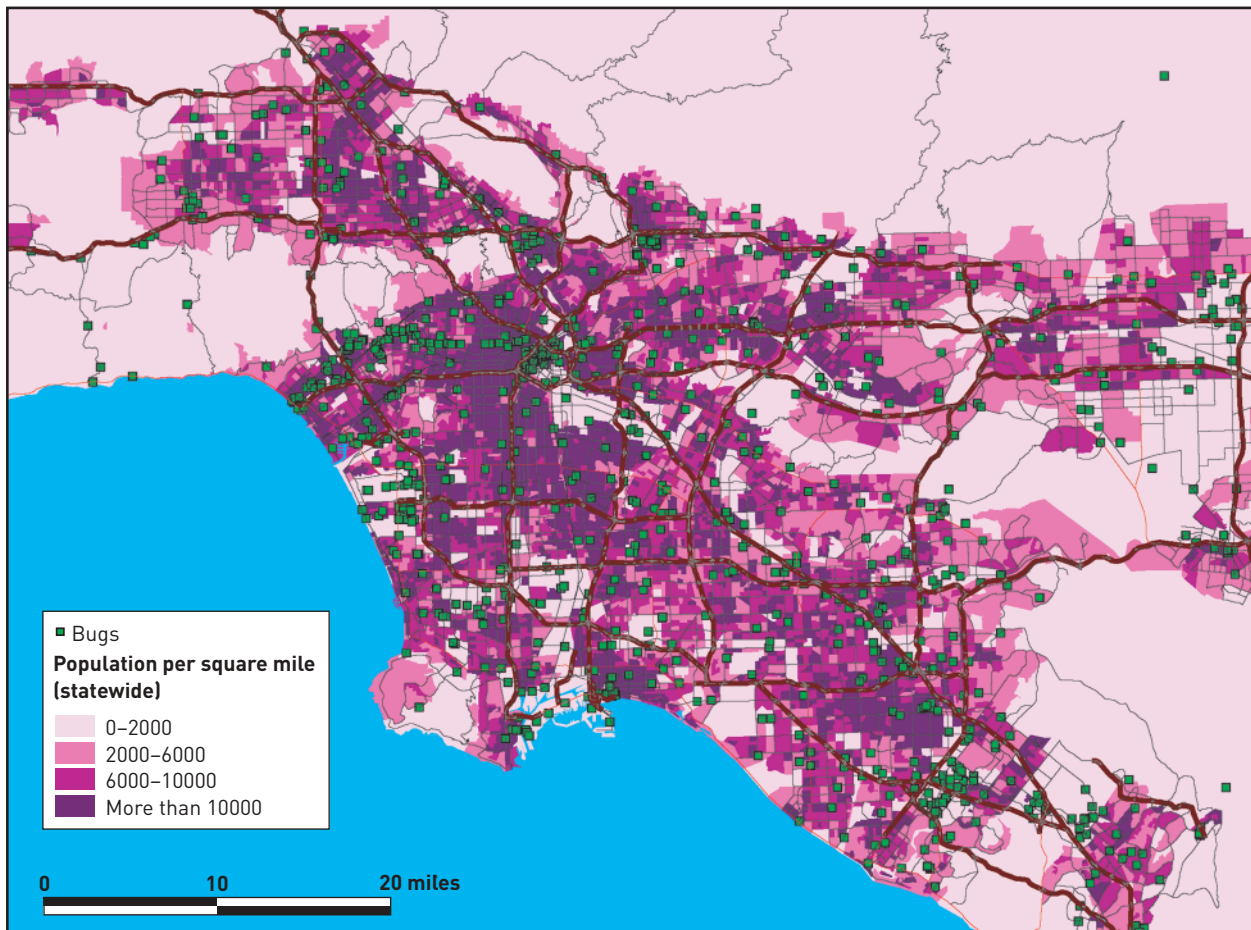


across the nation for cutting their use of grid power when electricity supplies are tight. While these programs can save consumers money and reduce the threat of power outages, they also tempt BUG owners to reap incentive payments by substituting dirty BUG power for much cleaner grid power. The complex utility rates for large commercial and industrial customers can create additional financial incentives for unauthorized BUG use.

Using data from the California Energy Commission (CEC) inventory of nearly 4,000 large BUGs, Environmental Defense found that most California BUGs are clustered near where people live, work, and go to school, as illustrated in “Population density and diesel BUGs in California,” page 6. Even within heavily urbanized regions BUGs are likely to be found where populations are most dense, as is the case in Los Angeles (see “Population density and diesel BUGs in the Los Angeles area,” below). That means the potential health damage caused by BUGs is compounded.

The CEC BUG database, compiled in 2001, is based on permitting records from 27 of the state’s 35 local air districts. The Bay Area air district and some rural districts were unable to provide the necessary data because they did not require BUG owners to obtain permits, so they are not included in the database. The inventory documents the owner, location, and specifications of each BUG

Population density and diesel BUGs in the Los Angeles area



300 kilowatts and larger. The CEC inventory is the most complete record of BUGs in California.

How close is too close: The Risk Zone

People in close proximity to BUGs are exposed to more harmful diesel emissions than those living and working further away. In this report, Environmental Defense has attempted to determine the “risk zone” for BUGs, or the area surrounding a BUG in which people are exposed to concentrations of diesel pollution that result in unacceptably high health risks. We chose as a threshold a cancer risk of one per million, consistent with regulatory benchmarks. Our analysis focused on five cities where most BUGs are located—San Francisco, Los Angeles, San Diego, Fresno, and Sacramento.

Even if BUGs are operated as little as 100 hours per year—the limit of typical permits—the surrounding risk zone ranges from 63 to 118 acres. That’s 10 to 20 average city blocks. In general, the more BUGs are used, the larger the risk zone. Since BUGs are concentrated in densely populated areas, expanding the risk zone means increasing the number of people exposed to unacceptably high levels of pollution.

San Diego diesel BUG risk zones



BUG HOT SPOTS ARE COMMON IN MAJOR CALIFORNIA CITIES

Our risk zone analysis also demonstrates that many BUGs are located close enough to each other that their risk zone circles overlap. Health risks may increase considerably when individuals are exposed to emissions from more than one BUG. “San Diego diesel BUG risk zones,” page 8, shows that in the San Diego area, BUG clusters occur both inside and outside the core downtown area. We found many similar BUG hot spots throughout California in cities such as Los Angeles, Fresno, and Sacramento.

THE BURDENS FALL DISPROPORTIONATELY ON THE POOR, ELDERLY, AND MINORITIES

By integrating demographic data with the CEC BUG inventory, we show that in each of the districts we analyzed, the population within the BUG risk zone is more likely to be low income, elderly, and of a racial minority. While absolute differences are sometimes small, they are generally statistically significant, and the pattern of disparities is consistent across districts. In some instances the proportional differences are substantial: For example in the Sacramento metropolitan air district the proportion of elderly residents within the risk zone is 26% higher than for the entire district. BUG areas also tend to have higher existing background concentrations of diesel pollution, so emissions from BUGS affect a population that is already disproportionately burdened.

BUGs affect the health of over 150,000 schoolchildren

To better analyze the impact on children, who are most vulnerable to developing asthma or other respiratory ailments from air pollution, we examined the proximity of primary and secondary schools to BUGs in the four surveyed districts. We found that over 200 schools are within the boundaries of a BUG risk zone (see “School children’s exposure to BUG emissions, operation as permitted,” below). Based on this mapping exercise and the average enrollment of a California school,⁶ we estimate that over 150,000 school children may be exposed to unacceptably high emissions from BUGs in just the four districts studied. Statewide figures would be significantly higher.

Policy recommendations

California’s recent electricity shortages highlighted the critical role BUGs play during outages, but also illuminated regulatory gaps and potential abuses. The California Air Resources Board (ARB) and many of the local air districts already have taken several important steps to remedy these problems.

School children’s exposure to BUG emissions, operation as permitted

Air district	Schools within Risk Zone	Estimated children enrolled
South Coast	140	96,600
San Diego	27	18,630
San Joaquin Valley Unified	34	23,460
Sacramento Metro	18	12,420

Following are Environmental Defense's recommendations to reduce toxic emissions from diesel BUGs.

- **Adopt uniform permitting requirements for BUGs**

All California air districts should require BUGs of 50 hp and larger to have permits so that local air regulators will know how many BUGs are in their districts, where they are located, and who owns them. This information will make it possible for the districts to enforce appropriate restrictions on BUG use.

- **Confine BUG use to emergencies**

Air districts should ensure that BUG use is confined to true emergencies—those rare occasions when natural disasters or other events cause a loss of grid power *at the site where the BUG is located*. All air districts should adopt the ARB definition of an emergency: “when electrical or natural gas service fails or emergency pumping for fire protection or flood relief is required.”⁷ Air districts also should make clear that compensated curtailments do not justify BUG operation. All load-shedding programs should explicitly forbid using BUGs to meet curtailment calls or respond to price signals. Program operators should require BUG owners to inform the local air district of their participation in real-time pricing programs, interruptible rates or other load-shedding programs.

- **Require pollution controls on BUGs**

The California Air Resources Board's staff has proposed tough new emissions standards for BUGs to take effect in 2004. These call for BUG owners to reduce emissions of diesel PM by 85% and to comply with a 0.15 g/bhp-hr diesel PM emission rate or to replace any existing BUG with one that meets the requirements for new BUGs. New or rebuilt BUGs greater than 50 bhp would be required to meet an emissions standard of at least 0.15 g/bhp-hr. Environmental Defense supports adoption of these proposed standards by the Board. In particular, the oldest engines—for which no retrofit technology is available to meet the new emissions standards—must not be grandfathered. A strict timeline needs to be established for replacing or retiring these BUGs.

- **Adopt effective enforcement measures**

Even if emissions limits are implemented, effectively enforcing restrictions on operating hours will be essential to guarantee that emissions remain below acceptable levels. Because BUGs are expected to run only a few dozen hours per year, the proposed new standards allow BUGs to emit fine particles at *15 times* the rate allowed for prime engines, which typically run for hundreds of hours. The different emissions limits make sense only if BUGs stay within their allotted annual operating hours.

In addition to the ARB's recommendation that air districts require run-time meters, BUG owners should be required to maintain records of hours of operation, purpose of operation (i.e. testing, maintenance, emergency), and the nature of emergency hours. This data should be reported once a year and made available to the public.

To ensure honest reporting, the air districts should conduct routine inspections of meters and run-time logs. Once emissions limits are implemented,

inspectors should verify that control equipment has been installed. At large facilities, regular inspections should be expanded to include BUGs. The majority of BUGs, however, are located at facilities that would not otherwise be inspected. To provide an effective deterrent, a program of random inspections should be instituted for these facilities, with severe penalties for violations.

- **Use financial incentives to reduce pollution from BUGs**

The legislature should consider providing direct financial incentives to retrofit or retire the dirtiest diesel BUGs. In fact, \$14 million allocated to lessen the impacts of increased BUG use during last year's electricity shortages was axed from the budget in the first round of cuts. It should be restored.

- **Encourage alternative backup power sources**

Cleaner options for backup power exist or are being developed. Although some on-site fuel storage considerations must be addressed, fuel cells are an especially promising alternative. Because fuel cells are a relatively new technology, operating experience must be gained to ensure they are an efficient and reliable option. Facilities planning backup power upgrades should introduce fuel cells to provide this experience.

- **Protect the public's right to know about risks from BUGs**

The ARB plans to expand the inventory to include all BUGs. In addition to data on engine characteristics and type of use, Environmental Defense recommends that the inventory include information on engine location, ownership and retrofit status. The legislature should allocate sufficient funds to ensure that the inventory will be comprehensive and that ARB can update it as new BUGs are permitted and retrofits are completed. The inventory should be available in an easy to access form on ARB's Web site so that Californians can find out if there is a BUG near where they live, work, or go to school. In addition, the air districts should collect and make available data on BUG run-times.

Conclusion: The health risks of BUGs are too high to ignore

By keeping essential functions running during an emergency, backup generators provide a critical service. But BUGs are the dirtiest form of power generation available, and their use threatens the health of millions in California and across the nation. These engines especially impact the health of the most vulnerable: children, the elderly, and low-income and minority groups. Increased reliance on BUGs sets a dangerous precedent. Standards to reduce pollution from BUGs are critically needed. In addition, BUG use should remain confined to true emergencies and cleaner alternatives should be put in place to protect the health of all citizens.

Notes

- ¹ Environmental Defense Scorecard, 2002, calculated from 1999 EPA National Scale Assessment of Air Toxics data.
- ² Ibid.
- ³ California Office of Environmental Health Hazard Assessment, Air Toxicology and Epidemiology Section, "Proposed Identification of Diesel Exhaust as a Toxic Air Contaminant," *Health Risk Assessment for Diesel Exhaust* app. III, part B, as approved by the Scientific Review Panel, April 22, 1998. Available on-line at <ftp://ftp.arb.ca.gov/carbis/regact/diesltac/partb.pdf>, accessed on January 20, 2002.
- ⁴ K. Donaldson, V. Stone, A. Clouter, L. Renwick, W. MacNee, "Ultrafine particles," *Occupational Environmental Medicine* 58 no. . (March 2001):199, 211-6. R.D. Morris, "Airborne Particulates and Hospital Admissions for Cardiovascular Disease: A Quantitative Review of the Evidence," *Environmental Health Perspectives* 109, supp. 4 (August 2001): 495-500.
- ⁵ R. Wilson and J. Spengler, eds., "Particles in Our Air: Concentrations and Health Effects," (1999): 212.
- ⁶ Available on-line at <http://www.cde.ca.gov/resrc/factbook/fingertip.htm>.
- ⁷ California Air Resources Board, "Guidance for the Permitting of Electrical Generation Technologies," Sacramento, CA, September 2001, p. 10.

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