Gas Stove Image by Steven-L-Johnson

Study Calls for Ban on Gas Appliances, Misleads Californians

By Steve Goreham

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A study published in April by the Fielding School of Public Health at the University of California Los Angeles claims residential natural gas causes dangerous indoor and outdoor air pollution, and proposes to eliminate gas from California homes. But the study, *Effects of Residential Gas Appliances on Indoor and Outdoor Air Quality and Public Health in California*, lacks accuracy and perspective, as discussed in my paper criticizing the study that was published in June. Natural gas is a low-cost, nonpolluting fuel for heating, cooking, industrial use, and generating electricity.

Indoor Pollution

In the case of indoor pollution, stoves are the only appliances that might be a concern for indoor air in California. California law requires furnaces, water heaters, and other gas appliances to vent exhaust to outside air.

The UCLA study claimed that gas appliances cause harmful indoor pollution but did not develop any new data. Instead, the study used models and hypothetical cooking scenarios to claim that “concentrations of CO and NO2 during cooking events can exceed levels set by

national and California-based ambient air quality standards." Carbon monoxide (CO) and nitrogen dioxide (NO2), if breathed in high concentrations, can be hazardous to health.

However, the UCLA study itself did not find hazardous indoor CO levels from gas stoves. The model results summarized in Table 2-2 of the study did not find that CO levels exceed either California or U.S. Environmental Protection Agency (EPA) standards. Modern gas stoves, when professionally installed and maintained, do not pose a carbon monoxide risk for today's homes.

Nitrogen is not part of natural gas fuel, but NO2 can be created by stove burner flames, which break down nitrogen in the air. The UCLA models projected that if a stove and oven were used simultaneously for two hours of cooking, indoor levels of NO2 could reach 34 parts per billion (ppb), exceeding the California Ambient Air Quality Standard (CAAQS) of 30 ppb.

But it's not clear that NO2 concentrations of 34 ppb are hazardous to health. The EPA National Ambient Air Quality Standard (NAAQS) for NO2 is 53 ppb. The EPA states that, for NO2 levels below 50 ppb, "No health impacts are expected for air quality in this range."

In addition, the studies cited by the UCLA paper did not find evidence that NO2 emissions from gas stoves are unhealthy. For example, UCLA cites Dales (2008), which states: "Whether chronic exposure to low concentrations of nitrogen dioxide from indoor sources increases the risk of respiratory illnesses is unclear." Contrary to claims by the study, residents should have confidence that modern gas stoves do not pose an indoor air pollution health risk.

Based on only questionable model projections on nitrogen dioxide, with no evidence on carbon monoxide or other indoor pollutants, and with only inconclusive support from the scientific literature, the UCLA paper urges the elimination of all California gas stoves.

Outdoor Pollution

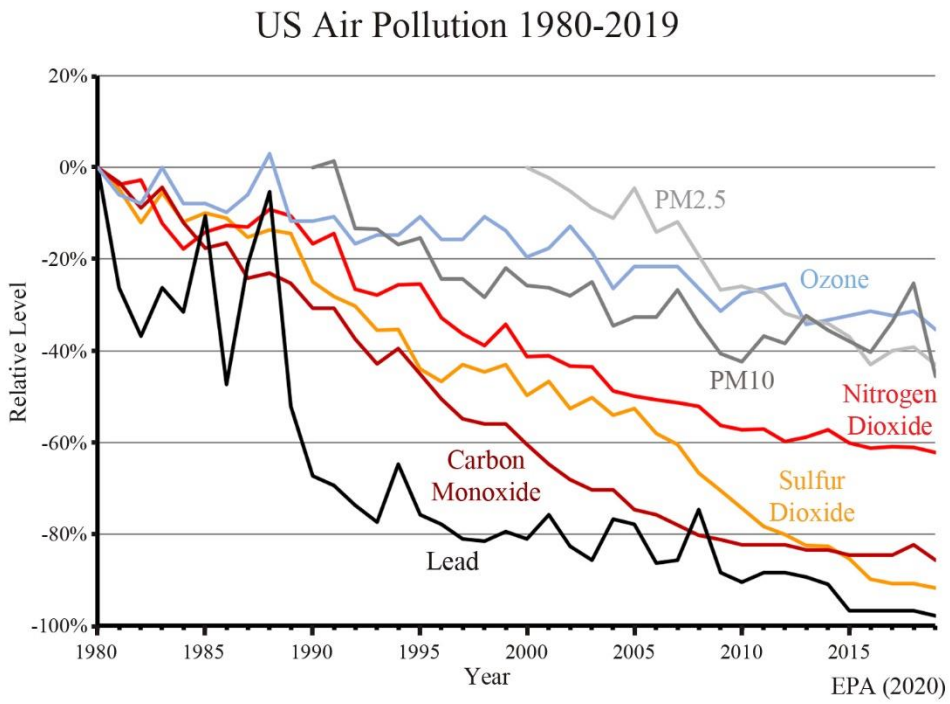
The second part of the UCLA paper claims that gas appliances generate harmful PM2.5 particle pollution. It claims that if California residential appliances were transitioned to electric, the reduction in PM2.5 emissions would result in 354 fewer deaths and reduce health costs by approximately $3.5 billion each year.

The EPA classifies PM2.5 as particles smaller than 2.5 microns in diameter, smaller than the eye can see. For several years, the EPA has warned that inhalation of small particles is associated with premature death. The agency warns that death may occur within a few hours of inhalation of PM2.5, or may be caused by long-term inhalation over decades.

In 2013, EPA Policy Advisor Amanda Brown stated that between 130,000 and 320,000 Americans died prematurely in 2005 due to particle pollution, or between 6 and 15 percent of total US deaths, an incredible claim.

The EPA claims that particle pollution triggers heart failure, respiratory failure, and other causes of mortality. If a senior citizen dies on his 70th birthday, and a coroner determines heart failure to be the cause of death, the EPA may regard this death as "premature" and caused by particle pollution.

Today, our nation's air is remarkably clean. Health incidents from serious air pollution are rare. The EPA's six criteria air pollutants, lead, nitrogen dioxide, sulfur dioxide, ozone, and particulates, are down a combined 77 percent in 2019 compared to 1980. These improvements in air quality have been achieved with U.S. residents using over 50 percent more natural gas today than in 1980. PM2.5 pollution is typically below the EPA national standard of 12 micrograms per cubic meter, down 43 percent since 2000.



Twelve micrograms per cubic meter is not very much. Dr. James Enstrom, a retired researcher from the UCLA School of Public Health, points out that a person breathing in 12 micrograms of small particles per cubic meter of air would inhale less than 5 grams, or less than one teaspoon full, of these microscopic particles over an 80-year lifespan. The EPA's assertion that this tiny dose of particles causes premature death is not credible.

How do the EPA, the California Air Resources Board (CARB), and other organizations conclude that thousands of Americans die prematurely each year from particle pollution? No coroner ever attributes a cause of death to small particles. Instead, the EPA relies on epidemiological observational studies that find statistical associations between particle pollution and death.

Epidemiological studies look for associations between exposure to an agent and appearance of disease in a population. An example is the Doll and Hill study in the 1950s that found that cigarette smoking caused lung cancer in a population of 41,000 British medical doctors. The EPA has concluded that associations found in epidemiological studies show that inhalation of small particles causes premature death.

The Harvard Six Cities study of 1993 and the American Cancer Society study of 1995 are two of the studies that form the basis of EPA small particle science. These studies found an increase in relative risk of less than 20 percent (RR=1.2). An increase in death rates of less than 20 percent is almost statistically indistinguishable from zero. In comparison, the Doll and Hill study found smokers had 10 times the rate of lung cancer of non-smokers, a relative risk of RR=10. The weak association (small relative risk) between death and particle pollution that the EPA judges to be causal could be due to other factors in measured populations, or even random chance.

Other studies have found no causal association between small particle pollution and death. For example, Cox (2017) analyzed small particles and death of persons 75 years or older in Boston and Los Angeles during periods from 2007 to 2013. The study found that ambient PM2.5 concentrations did not predict average elderly mortality rates in either Boston or Los Angeles.

The underlying data from the Harvard Six Cities study and the American Cancer Society study have never been released. As a result, other scientists are not able to replicate and verify the results of these studies.

The EPA recently issued a Supplemental Notice of Proposed Rulemaking (NPRM), titled "Strengthening Transparency in Regulatory Science." This proposed rule is a follow-on effort from a 2018 NPRM intended to base regulatory policy on scientific studies which release their underlying data for reanalysis and critique. This is certainly needed in the case of epidemiological studies claiming associations between low levels of particle pollution and death.

The UCLA paper projects that, if gas appliances were replaced by electric appliances in California buildings, then outdoor levels of PM2.5 would be reduced by 0.11 micrograms per cubic meter. But airborne particulate pollution is dominated by other sources of particles.

On January 1, 2018, California legalized the recreational use of marijuana. A person who smokes a single marijuana joint or a single tobacco cigarette inhales more particles than breathing a year's worth of particles in California air. In just two days, the 2017 Napa Valley fire produced an estimated 10,000 tons of PM2.5, the amount emitted by California's 35 million vehicles in a year.

Eliminating gas appliances from 13 million residences would reduce California outdoor airborne particle pollution by less than one percent. Such a small change in air quality could not be detected by any measurement system.

Climate Concerns and Rising Energy Costs for California Homes

It appears that the real goal of the UCLA paper is to support climate change policies with arguments about projected improvements in air quality and illusory health benefits. The paper states that natural gas is primarily methane, "a potent greenhouse gas" and that "buildings are responsible for an estimated 25 percent of GHG [greenhouse gas] emissions in California."

But California gas appliances are an insignificant part of world energy usage, only 0.33 percent of world natural gas consumption. If all California residential appliances were converted from gas to electric, the effect on global gas usage and global greenhouse gas emissions would be negligible.

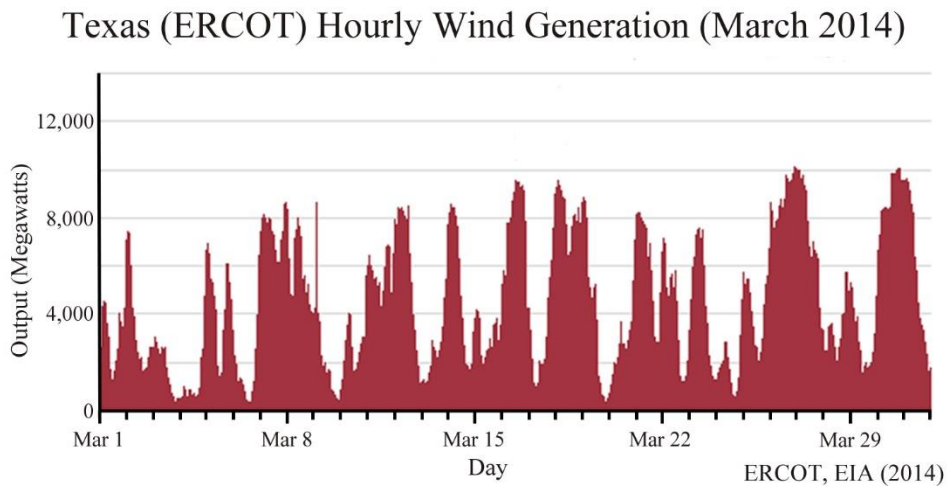
While gas and electric appliances both have advantages, usage shows that California residents overwhelmingly prefer gas. Gas stoves offer better temperature control than electric stoves. Consumer Affairs Research points out that gas dryers use 30 percent less energy than electric dryers. Gas water heaters heat water twice as fast as electric water heaters.

But the biggest advantage of gas appliances is lower cost of operation. Think Energy reports that homeowners can save $1,000 to $2,000 annually with a gas furnace compared to an electric furnace. Water heater savings can be $200 annually, and dryer and stove savings can each be $100 annually, when using gas instead of electric.

On September 10, 2018, then California Governor Jerry Brown signed Senate Bill 100, mandating that the state obtain 100 percent of its electricity from "clean energy sources" by 2045. But Californians will experience the shock of rapidly rising electricity prices as more renewable energy is added to the power system.

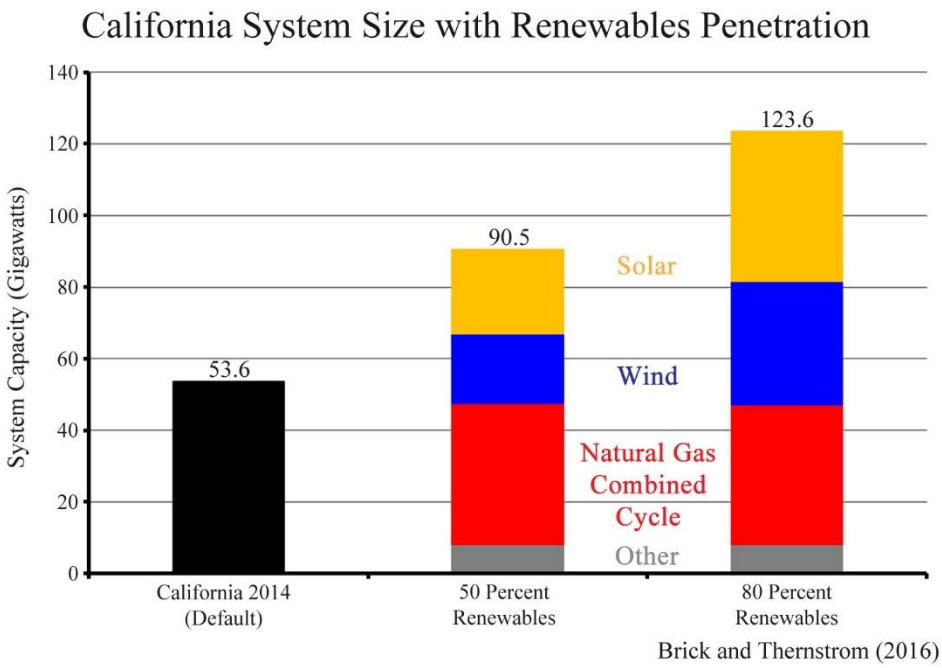
Wind and solar cannot replace traditional coal, natural gas, and nuclear power plants if continuity in the supply of electricity is to be maintained. Wind and solar are intermittent generators. Wind output varies greatly from high output to zero, depending upon weather conditions. Solar output is only available about six hours each day when the sun is overhead and disappears completely on cloudy days or after a snowfall. Hydro power can replace traditional plant output, but even this source is insufficient in years of low snow runoff or drought.

Because of intermittency, utilities can only count on about 10 percent of the nameplate capacity of a wind or solar facility as an addition to power system capacity. For example, wind output in March, 2014, for the state of Texas varied from over 8,000 megawatts to under 500 megawatts in a few hours.



To try to achieve “deep decarbonization,” California will need to keep 90 percent of traditional power plants as backup while adding increasing amounts of wind and solar. Traditional power plants will be run inefficiently at low utilization with priority given to renewables. Total system capacity must double and triple as 100 percent renewable output is approached.

A 2016 study by Brick and Thernstrom projected that California’s power capacity would need to rise from 53.6 gigawatts (GW) to 90.5 GW at 50 percent renewable output. Capacity would need rise to 123.6 GW to achieve 80 percent renewable output.

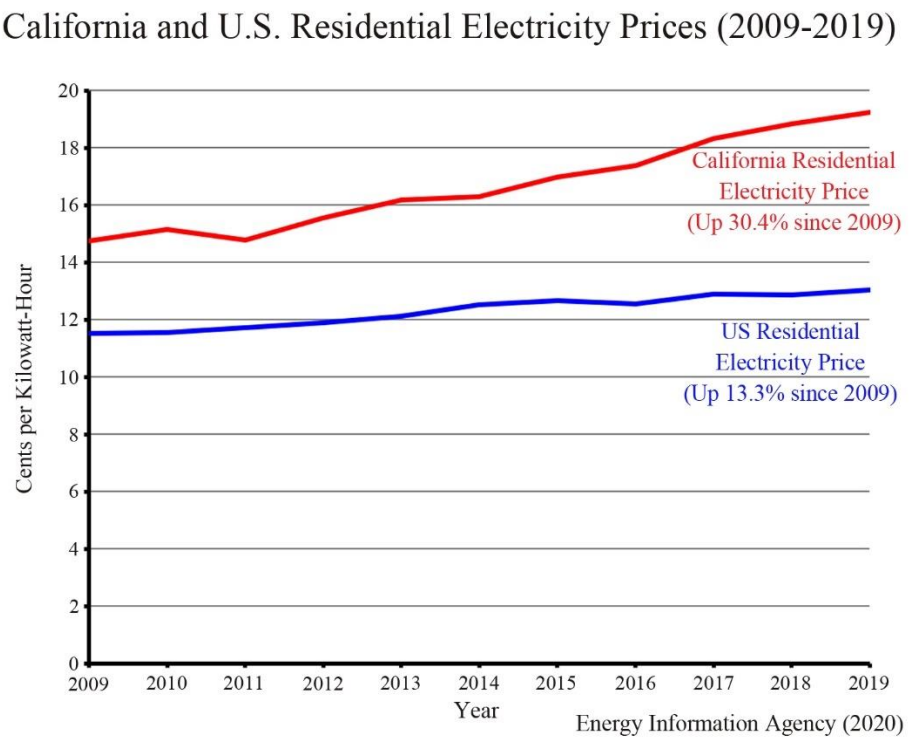


As a result of rising system capacity, Brick and Thernstrom concluded that, to achieve 50 percent renewable penetration, wholesale electricity prices would need to rise from 5.2 cents per kilowatt-hour (cents/kW-hr) to 9.6 cents/kW-hr. For 80 percent renewable penetration, prices would rise to 14 cents/kW-hr, approaching a tripling of wholesale electricity prices.

Green energy advocates recognize renewable intermittency and propose grid-scale batteries to solve the problem. They claim that large-scale commercial batteries will be able to store power during high levels of renewable output and then deliver power to the grid when wind and solar output is low.

But batteries are not a sufficient answer because of the large seasonal variation in renewable output. Wind and solar output in California in December and January is less than half of summer output. Today's commercial batteries are rated to deliver stored electricity for only two hours or ten hours. No batteries exist that can store electricity in the summer and then deliver in the winter when renewable output is very low.

In 2019, California residential electricity prices were 19 cents per kilowatt-hour, 47 percent higher than the national average. California rates increased 30.4 percent over the last decade, rising more than twice as fast as national prices. In addition, California mandates for 100 percent renewable energy will double or triple electricity prices in the next two decades.



More than 30 cities covering almost 10 percent of California population now prohibit gas appliances in new housing. The elimination of gas appliances and rising electricity prices will cause a painful loss of standard of living, particularly in low-income households.

“The UCLA study is a disservice to the hardworking people who are trying to make ends meet during these tough times,” said Jim Nathanson, Executive Director for The Empowerment Alliance. “Low cost, abundant, domestic natural gas not only helps American families stretch their household budgets when it comes to more efficient appliances but creates American jobs and bolsters national security.”

Removing gas from California homes will not measurably improve either indoor or outdoor air quality. Nor will it measurably reduce global warming. But residents will lose the flexibility, efficiency, and low-cost operation of gas appliances. In addition, homeowners will be exposed to the full measure of rising state electricity prices. California residents should reject bans on gas appliances.

Steve Goreham is a speaker on the environment, business, and public policy and author of the book *Outside the Green Box: Rethinking Sustainable Development.*