



HEALTH & CLEAN AIR

newsletter

Fall-Winter 2006

California's Push to End Global Warming

The best way to predict the future is to invent it.

Alan Kay, Apple Computer, 1971^a

As the name states plainly, the *Health & Clean Air Newsletter* is devoted to examining the implications for personal and public health of scientific studies of air pollution as they enter the literature. There are times, however, when furthering that mission requires a departure from business as usual. Recent events in California demand just that.

Since the so-called “Earth Summit” in Rio de Janeiro in June, 1992¹ and the then-proposed agreement that it gave rise to in 1997, the Kyoto Protocol², the world’s governments have searched in vain³ for a solution to the increasingly obvious threats posed by global warming. Temperatures⁴ and sea levels have risen,⁵ glaciers⁶ and ice caps receded,⁷ yet most of the world’s governments — with the notable exception of the single largest polluter, the United States⁸, which has essentially rejected taking any affirmative action⁹ — have dithered over how to save the planet from global warming.

But in its own quintessential style, California has stepped forward to lead the way out of the global warming wilderness. This is the state that gave the world its first controls on car and truck pollution,¹⁰ pioneered solar,¹¹ wind¹² and geothermal¹³ electricity, and built the first state-of-the-art plant for burning coal with vastly lower emissions.¹⁴ Now California has adopted a raft of global warming initiatives that, taken together, may constitute the most significant advance in air pollution control in a generation. If other governments follow suit — and many almost always do when the subject is air pollution¹⁵ — these measures could leapfrog the Kyoto Protocol and pull the world back from the brink of potential catastrophe.

Few press accounts seemed to capture the revolutionary nature of California’s new measures. Headlines

With great sadness,
we must report that
Dr. David V. Bates, co-editor of
this Newsletter recently passed
away. For further information,
please see page 11.

^a Alan C. Kay, “The Early History of Smalltalk,”
<http://gagne.homedns.org/~tgagne/contrib/EarlyHistoryST.html>

THE NEW GLOBAL DEBATE

California's actions will inevitably be debated throughout the world for a number of reasons:

First, the legislature cast its net wide enough to capture all pollutants that cause global warming — and there are scores of them¹⁶ — not just the six covered by the Kyoto Protocol.

Second, by attacking all greenhouse pollutants, including those like soot and smog, the legislature assured that reductions would not only yield climate benefits, but reduce death and illness as well.

Third, by refusing to mandate so-called carbon “cap-and-trade,” in which polluters are given the right to pollute coupled with the right to swap their air pollution like so many shares of stock or head of livestock, the legislature opened the door to innovative and extraordinarily effective measures from Europe and Asia.

Fourth, by supplementing global warming legislation with other specific mandates — requiring deployment of solar and other renewable forms of energy, for example — the legislature provided a safety net so that if the generic legislation fails, other measures will guarantee success.

Fifth, because of all of the above, the legislature assured that emission reductions could start yielding climate and health benefits within months or even weeks, instead of the centuries that would be required if the focus were only on the greenhouse gases targeted by the Kyoto Protocol.

Finally, and perhaps most importantly, near-term reduction of global warming may help avert arrival of the “tipping point,”¹⁷ (see box on page 4) after which temperature increases could come at catastrophic speed, shifting the planet into an utterly different and unprecedented climate.

focused on the new law's requirement that emissions of the principal greenhouse gas — carbon dioxide, produced when coal, gasoline, diesel and other carbon-containing fuels are burned — be reduced to 1990 levels by 2020.¹⁸ That's important, because CO₂ will cause most future temperature increases — that light at the end of the tunnel is an on-coming locomotive called carbon dioxide that, unless it is halted, will crush humanity beneath

its wheels. As important as it is, CO₂ has a lifetime of 3,000 years, so reducing it provides long-term, not near-term, cooling benefits.¹⁹

To obtain near-term benefits requires reductions in black carbon²⁰, or soot, and tropospheric ozone, or smog, and other “contributory” pollutants (which, during heated discussions over whether they should be covered, advocates began referring to them as “The Others”). Like carbon dioxide, these also cause global warming. But unlike CO₂ and the other pollutants targeted by the Kyoto Protocol, their atmospheric lifetimes are measured in minutes, months and years, not decades, centuries and millennia.²¹

California has long controlled these substances to protect public health, but now it must do more. The result: because smog and soot are killers — about 8,000 Californians,²² 50,000 Americans²³ and millions of others²⁴ die each year because

of them — more lives will be saved. Just as important, cooling will start much sooner because the average lifetime of The Others is about 4.7 years compared to 10,805 years for the Kyoto gases — and speed counts.

There is widespread fear among scientists that the “tipping point” — that is, the point at which the earth itself will begin to cause global warming, after which no action, no matter how drastic will be able to restore the climate under which civilization evolved — may be just around the corner.²⁵ (Indeed, some scientists believe that it may have already been passed.²⁶) Curbing emissions of only the Kyoto gases would do little to slow the drift toward the tipping point, but not so with The Others. Reducing them can yield benefits in literally minutes.

Politically, by refusing to limit its attention to only the six pollutants targeted by the Kyoto Protocol — the so-



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called Kyoto “bag of six”^b — California deftly sidestepped many of the most potent arguments advanced by corporate polluters and their defenders against acting on global warming.²⁷ No longer can they argue that the technology to reduce greenhouse pollutant emissions doesn’t exist because devices ranging from catalytic converters to filters to trap soot number in the tens of millions and have been in use for decades.²⁸

Another claim spiked by California is that the United States should refuse to act until developing nations like China and India control their emissions, because these nations already have adopted state-of-the-art controls, some of which are stricter than those of the U.S., Canada and Australia.²⁹ Now, a nation refusing to reduce its emissions is not merely declining to deal with what some claim to be a distant and speculative threat. Instead, a president, prime minister, governor or legislator refusing to act is jeopardizing the lives and health of voters, their children and their parents.

Moreover, the California legislature’s actions make it possible for citizens to directly engage in the fight against global warming by taking simple, easy to implement actions: switching to high efficiency light bulbs, beefing up energy saving insulation, and buying a car that has 90 percent lower emissions of pollutants like carbon monoxide and oxides of nitrogen, both of which cause global warming, but are not covered by Kyoto, for example. Limiting reductions to just the Kyoto gases, and even then by mandating carbon cap and trade as the sole policy option, would leave citizens virtually impotent, able to buy a chunk of pollution and retire it, but not much else.

Not content to deal only with the overarching threat of global warming, California legislators also passed a number

^b The greenhouse gases listed under the Kyoto Protocol are carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF₆). <http://unfccc.int/resource/docs/convkp/kpeng.html>

CALIFORNIA’S BOLD ATTACK ON GLOBAL WARMING

AB 32, the Global Warming Solutions Act —

- complements “Pavley bill” of 2002 requiring vehicle controls;
- places the Air Resources Board in charge of implementing its requirements;
- requires California to reduce emissions of greenhouse gases to 1990 levels by 2020;
- includes black carbon, ozone, CO, CFCs/HCFC/HFCs and other non-Kyoto pollutants;
- rejects mandatory carbon cap-and-trade;
- mandates emissions limits and control measures reflecting “maximum technologically feasible and cost-effective reductions in emissions of greenhouse gases;”
- provides a savings provision in case the 2002 law requiring controls of GHG emissions from cars and trucks is overturned by courts; and,
- mandates “early actions” to reduce emissions of greenhouse pollutants.

Cleaning Up Coal: SB 1368 prohibits new long-term contracts for electricity unless the emissions are at least as low as those from natural gas combined cycle.

One Million Solar Roofs: SB 1 creates funding and infrastructure to install 3,000 megawatts of solar power on one million new and existing residential and commercial roofs over 10 years.

Speeding Up Renewable Energy: SB 107 requires 20 percent of the electricity provided by major investor-owned utilities to be from renewable sources by 2010.

Boosting Incentives for “Self-Generated” Electricity: AB 2778 extends to 2012 the load controls and cash incentives for self-generated electricity from fuel cells and wind.

Energy Efficiency Goals for Municipal Utilities: AB 2021 requires the Energy Commission to establish ten-year efficiency and demand reduction targets and update them every three years.

New Cars and Trucks: AB 1012 (*vetoed*) would have required that starting in 2020, one-half of all new cars and light trucks sold in California be “clean alternative fuel vehicles,” defined as running on a fuel containing more than 50 percent non-petroleum constituents.

Oil Conservation, Efficiency, and Alternative Fuels: SB 757 (*vetoed*) would have established an across-the-board program curbing oil demand and boosting fuel economy of cars and trucks. It would have required every state agency to “take every cost-effective and technologically feasible action to reduce the growth of petroleum demand and increase vehicle energy efficiency and the use of alternative fuels.” It required lobbying in favor of doubling CAFE standards.

Cleaning up Ports and Ships: SB 927 (*vetoed*) would have imposed a \$30 fee on each shipping container entering the ports of Los Angeles and Long Beach—\$10 each for pollution mitigation, rail improvements, and port security.

THE “TIPPING POINT”

The “tipping point” is a threshold where a slight rise in the Earth’s temperature triggers a far greater increase in global temperatures through a positive feedback. For example, tundra thawed by global warming begins to decay, releasing the greenhouse gases methane and carbon dioxide, which in turn cause more warming



A positive feedback that could trigger the “tipping point.” Ice reflects sunlight and its energy. When it melts because of global warming, however, the dark waters or soils thus exposed absorb sunlight and its energy, causing more warming, which melts yet more ice, exposing more waters and soils. According to the U.S. National Aeronautics and Space Administration, the Arctic is warming at a rate of 4.5 degrees F per decade.

of the last ice age. One of the scientists termed it an “ecological landslide that is probably irreversible and is undoubtedly connected to climatic warming.”

He added that the thaw had probably begun in the past three or four years.

Source: Ian Sample, “Warming hits ‘tipping point,’” *The (London) Guardian*, Aug. 11, 2005

that thaws more tundra.

There are many potential tipping points, and there is persuasive evidence that some of the processes are already underway. For example, in 2005 researchers found an area in Siberia of permafrost spanning a million square kilometers — the size of France and Germany combined — that has started to melt for the first time since it formed 11,000 years ago at the end

most of the world’s air pollution: namely, combustion, or in plain terms, fire.

Black carbon and ozone are the result of combustion,³⁰ and so, too, are carbon monoxide³¹ and carbon dioxide. Cancer-causing substances like benzene are the byproducts of incomplete combustion of gasoline and diesel fuels. Mercury that falls to earth, washes into lakes, rivers and eventually the sea where it concentrates at dangerous levels in tuna, swordfish and other fish is the result of burning coal. All of these, and much more, will be reduced sharply if the world’s governments adopt policies that mirror those of California, and the logical — indeed perhaps inevitable — result will be the death of fire.

For example, black carbon, or soot, is essentially a tracer of fire.³² It is composed primarily of elemental carbon,³³ and 90 percent of it comes from the consumption of fossil fuels — particularly diesel fuel, coal, jet fuel, natural gas and kerosene — as well as the burning of wood and other biomass when land is cleared or in fireplaces or stoves.³⁴ Typically more than 90 percent of black carbon is in the fraction of particulate matter that is most dangerous, namely specks of soot 2.5 microns, or a millionth of a meter, or smaller.³⁵ Much of the black carbon is emitted by “low technology” combustion, such as open burning.³⁶ Once it enters the air, black carbon causes a litany of ills: death,³⁷ illness,³⁸ visibility reduction,³⁹ and, of course, global warming.⁴⁰

Tropospheric ozone,^c or smog, is also a by product of combustion. The heat of combustion causes naturally

of other measures designed to deal with specific sources of pollution, and ways of reducing it.

- One required that electricity production create no more pollution than that associated with one of the most advanced generating technologies, the natural gas combined cycle. In effect, the legislature adapted a concept familiar in the context of food and pharmaceuticals — product safety and purity — and applied it to the world’s most widely used commodity, electricity.
- Two others measures boost the state’s “million solar roofs” plan and fuel cells, devices that when fueled with hydrogen, produce only pure water and electricity, with zero pollution.

- Yet another measure would have imposed a \$30 fee for each container at the ports of Long Beach and Los Angeles — possibly the largest aggregate source of global warming pollution west of the Mississippi — to help pay for cleansing the air. It, however, was vetoed by Governor Arnold Schwarzenegger.
- Another proposal, also vetoed, would have required that by 2020, at least 50 percent of new passenger cars and light-duty trucks be clean, alternative-fuel vehicles, such as hydrogen, so-called “plug-in” hybrids and flexible-fuel vehicles.

Little noticed by most observers, the collection of California legislation is, in effect, a frontal assault on the source of

^c Ozone plays several different roles in the Earth’s atmosphere. In the high-altitude region of the stratosphere, ozone acts to shield the planet from harmful ultraviolet radiation. In the lower portion of the atmosphere (the troposphere), ozone can damage human health, crops and ecosystems. As a greenhouse gas, it causes global warming. Indeed, scientists at the U.S. National Aeronautics and Space Administration estimate that ozone is responsible for one-third to one-half of the winter and spring warming in the Arctic. “NASA Study Links ‘Smog’ to Arctic Warming,” March 14, 2006, <http://www.giss.nasa.gov/research/news/20060314/>.

PULLING THE “BLANKET” OFF THE PLANET’S BED

A crude, but not entirely inaccurate, way of thinking of global warming is of a blanket on the bed. Too hot? Simply pull the blanket off. The same is true with the global atmosphere. Too hot? Remove the “blanket,” which is the greenhouse pollutants that cause global warming, such as carbon dioxide, smog and soot.

Trouble is, it doesn’t cool completely until the blanket — whether on the bed or over the Earth — is completely removed. If for some reason it takes two weeks to get the blanket off the bed, that’s how long it takes before the sleeper will be cooler. Again, the same with greenhouse pollution: we can start removing the blanket now, but it is not fully gone until all the pollution in the pipeline is removed from the atmosphere.

From the time when a greenhouse pollutant is emitted to the point where it is destroyed is its atmospheric lifetime. Emissions might be reduced to zero the instant you read this, but the pollutant emitted the instant earlier will continue to cause global warming until it is destroyed — the end of its atmospheric lifetime.

Of the six greenhouse pollutants addressed by the Kyoto Protocol, the international agreement designed to deal with global warming, five have lifetimes ranging from 50 to 50,000 years. Reaching a zero concentration in the air will thus require 50 to 50,000 years, so reducing emissions today provides no near-term cooling. For that, emissions of short-lived greenhouse pollutants need to be reduced. Because they are short lived, atmospheric processes are destroying them within, literally, a few seconds to a few years. Concentrations will fall quickly and, with them, warming will begin to decline.

Of course, those content to endure 50 to 50,000 years of Katrina-like hurricanes, melting icecaps and glaciers, as well as swelling ocean levels can focus on reducing only carbon dioxide and the other long-lived Kyoto pollutants. Others, however — perhaps more anxious to curb global warming during their own lifetimes — will wish to focus on smog, soot, and other short-lived greenhouse pollutants, as well as the Kyoto pollutants.

occurring oxygen and nitrogen, either in the air or the fuel, to form oxides of nitrogen. These, in turn, react with hydrocarbons,⁴¹ such as gasoline fumes, to form ozone, which not only chokes the world’s cities,⁴² but blankets the planet itself. Ozone is formed naturally through a variety of processes — lightning strikes,⁴³ for example — and transport downward from the stratosphere,⁴⁴ where it blocks ultraviolet radiation.⁴⁵ The bulk of ground level ozone, however, results from human pollution.⁴⁶ The natural background of ozone — that is, the level that it would be in the absence of human activity — is one-half to one-third of that measured in rural areas today.⁴⁷ Ozone concentrations in cities are even higher, ten or more times the natural background.⁴⁸

In addition, there are greenhouse pollutants that are not the product of fire:

the chlorofluorocarbons (CFCs), which destroy stratospheric ozone, and their substitutes, for example.⁴⁹ Molecule for molecule, some CFCs have 10,000 times the warming effect of the principal greenhouse gas, carbon dioxide.⁵⁰ Indeed, the warming effect of these chemicals is so great that in 1990, two scientists concluded that accelerating the global bans on their production, which is not until 2050 in some cases, would, in and of itself, significantly reduce global warming.⁵¹

California is attacking all of these. The principal over-arching legislative initiative was Assembly Bill 32, the Global Warming Solutions Act.⁵² It requires California to reduce emissions of greenhouse gases to 1990 levels by the year 2020, which is estimated to be about a 25 percent reduction from projections.

MAJOR ELEMENTS OF AB 32

The Air Resources Board is in charge.

Experts regard the California Air Resources Board (CARB) as perhaps the world’s most technically competent air pollution agency. Historically, however, that competence has been largely in the field of cars, trucks and other mobile sources, largely because they are, in the aggregate, the state’s biggest source of air pollution. The control of local sources such as power plants, cement kilns, refineries and the like has been the responsibility of the local Air Pollution Control Districts. AB 32, alters that traditional division of authority, requiring the ARB to —

- Develop a plan and implement regulations to return emissions to their 1990 levels by 2020.
- Identify and adopt discrete measures to reduce emissions in the near term.

- Allocate reductions to sources.
- Adopt emissions limits and control measures reflecting “maximum technologically feasible and cost-effective reductions in emissions of greenhouse gases.” Cost effectiveness is measured by the cost per unit of reduced emissions adjusted for global warming potential.
- Determine whether and to what extent “market” mechanisms will be employed.
- Develop a strategy to reduce mobile sources emissions if the current regulations, which are being challenged in court by car companies, are overturned.

“EARLY ACTIONS”

Unwilling to accept a program for the leisurely development of actions to curb global warming, the California legislature enacted a requirement for “early actions” to start reductions sooner rather than later.

By June 30, 2007, or ten months after AB 32 was enacted, the Air Resources Board must publish a list of “discrete early action” emissions reduction measures. Then,

by January 1, 2010, or another 30 months, the Board must issue regulations compelling early actions. These rules must achieve “maximum technologically achievable and cost-effective” emission reductions.

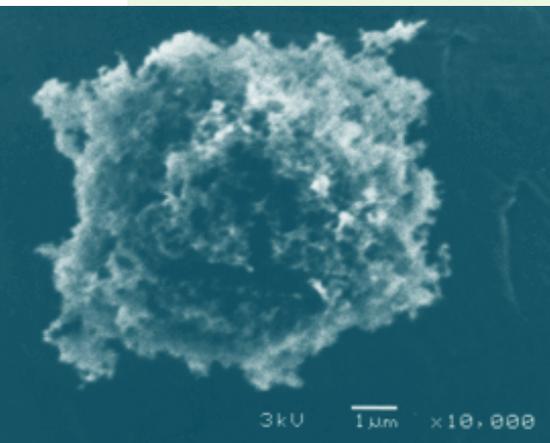
Measures that have been mentioned as possible early actions range from mandatory capture of methane, or natural gas, from all but the smallest landfills, which are ranked as the largest human source of this pollutant, to restrictions on the sale of HFC-134a, the refrigerant used in car and truck air conditioners,

to only certified repair shops. Some experts believe there are scores of such early actions that could start producing global cooling before the decade is out or sooner.

Although AB 32 requires the adoption of early actions before any so-called “market” programs, such as emissions trading, can be put in place, Governor Schwarzenegger ignored this mandate, instead issuing an executive order creating an advisory committee to study pollution-credit trading. His actions were attacked by two of the law’s principal sponsors, Assembly Speaker Fabian Nuñez (D-Los Angeles) and Senate president pro tem, Sen. Don Perata (D-Oakland).

Environmental and health groups were particularly supportive of the early action mandate because measures could not only deliver near-term cooling benefits, but also save lives and reduce illness by lowering levels of black carbon, ozone and other demonstrated causes of death and injury.

Source: Marc Lifsher, “Climate shifts on global-warming law,” Los Angeles Times, Oct. 24, 2006 and other reports.



A particle of black carbon.

- Develop the means to raise money to run the programs.
- Prosecute those who violate CARB rules.

In the judgment of some, the two most important decisions embodied in AB 32 were, by far, its refusal to mandate carbon “cap and trade,” thus leaving the door open to a variety of other policy approaches; and, its inclusion of greenhouse pollutants other than those listed under the Kyoto Protocol.

“Cap and trade” sets a standard for emissions, but it also allows companies to trade in the right to pollute up to that standard. That means companies that cut emissions can sell “emission rights” to other companies that don’t want to invest in cleaner technology. It doesn’t eliminate pollution as much as create a market in it. Despite immense pressure from businesses and outspoken support of trading by some environmental groups, the Legislature allowed carbon cap-and-trade but refused to mandate it.

The *Los Angeles Times* editorialized that cap-and-trade “worked well in the context of the Clean Air Act.” Not so. The measure of success should be whether health and environmental objectives are met. The purpose of Clean Air Act trading was to restore life to lakes and streams, especially in the Northeast, that had been acidified by pollution from coal-fired power plants. But 16 years later, lakes and soils in the Northeast are still acid damaged, and further reductions are required for full recovery.⁵³ Trading programs to reduce the lead content of gasoline also failed, as did attempts to use trading to reduce smog-forming emissions in southern California.⁵⁴

The same is now occurring in Europe, where a carbon cap-and-trade program was adopted in 2001. It is faring so badly that the Bloomberg Report condemned it, saying—

Five years later, the 25-nation EU is failing to meet the Kyoto Protocol's carbon-dioxide emission standards. Rather than help protect the environment, the trading system has led to increases in electricity prices of more than 50 percent and record profits for RWE AG and other utilities.⁵⁵

Refusing to mandate cap-and-trade opens the door to new market mechanisms for reducing pollution. Sweden's "feebates," for example, tax relatively dirty polluters or their products, then rebate all the money to relatively clean polluters. The feebate used against smog-forming oxides of nitrogen caused emissions to drop 34 percent within 12 months in Sweden.⁵⁶

Another such mechanism is Japan's requirement that polluters pay lost income, medical bills and burial costs to nearly 100,000 victims of air pollution, which has resulted in some of the world's cleanest power plants and refineries.⁵⁷

In addition to its stance on cap-and-trade, AB 32 also improves on other global warming initiatives by applying curbs not just to carbon dioxide but to "contributory" pollutants such as black carbon, or soot, and ozone, or smog.

California lawmakers went further, pushing the state away from coal and oil, and toward zero and near-zero energy and technologies.

OTHER CALIFORNIA INITIATIVES

Zero-polluting Energy

One Million Solar Roofs: SB 1.

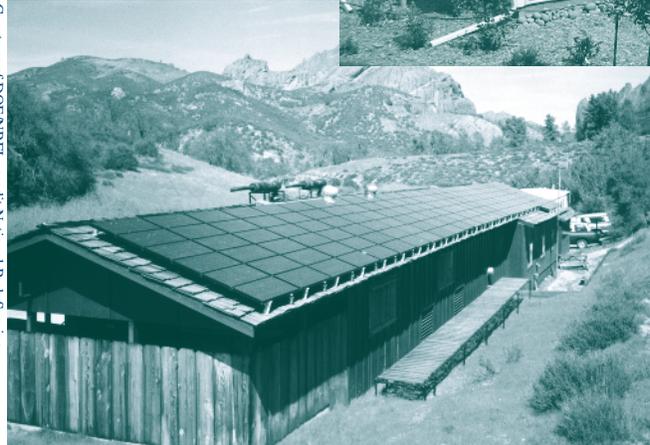
California is known as the Sunshine State for good reason: the solar resource is immense. Although there is widespread support for the concept of generating electricity from sunlight, the politics

NREL's 2005 zero energy home is super insulated, very tightly constructed and designed for passive solar gain to reduce heating loads. The PV array will be grid connected and sized to produce excess energy in the summer to balance out the excess consumption in the winter leading to net zero energy consumption.

Courtesy of DOE/NREL, credit Pete Beverly



Courtesy of DOE/NREL, credit National Park Service



Photovoltaic system at Pinnacles National Monument in California provides power for three employee residences, a ranger station, visitor center, campground, comfort station, well pump, and two wastewater effluent pumps. It eliminates a \$20,000 annual fuel bill for a diesel generator that produced 143 tons of carbon dioxide each year.

of the details can be treacherous. In 2004, legislation to establish a muscular and aggressive program to support the deployment of solar photovoltaic devices got tangled in complicated policy and political differences and died. It was resuscitated in 2005 as Senate Bill 1, the Million Solar Roofs bill, aimed at installing solar energy systems on one million new and existing residential and commercial roofs over 10 years, with subsidies for purchase of the systems provided by a surcharge on all electric utility bills.

The proposal again bogged down, leading the Public Utility Commission (PUC) to approve its own California Solar Initiative (CSI) modeled on SB 1. The PUC committed a combined \$3.2 billion in rebates for homeowners, businesses, farmers and government projects investing in rooftop solar. Its goal was to restore California to a position of global PV manufacturing leadership in solar energy by installing 3,000 megawatts of solar power, the equivalent of six large power plants.

Even though the PUC's program appropriated in the words of one com-

mentator, the "heart and soul" of SB 1, there remained a need for complementary policies that only the legislature could provide. These included the following:

- **Raising the cap on net metering:** Although utilities were required to buy electricity generated by their customer's solar systems, that requirement had been capped at 0.5 percent of a utility's total load. SB 1 lifted the cap to 2.5 percent, a substantial increase but still short of the 5 percent needed to build one million solar roofs.
- **Mandating solar panels as an option in new homes:** Starting in 2011, builders are required to offer home buyers the option of buying solar panels. For later years, SB 1 requires the California Energy Commission to determine when solar power should not merely be an option, but a standard feature of all new construction.
- **Extend the rebate program to municipal utilities:** Because the PUC does not regulate municipal utilities, some of the state's largest electricity suppliers had no rebate program.

SB 1 requires these utilities to adopt their own solar rebate program totaling \$800 million.

Speeding Up Renewable Energy:

SB 107. No state, and very few nations, have sought more aggressively than California to encourage wind, solar and other forms of renewable energy. Its landmark Renewable Portfolio Standard (RPS) had already required 20 percent of the electricity provided by major investor-owned utilities to be from renewable sources by 2017. SB 107 moved the deadline up to 2010.⁵⁸

Boosting Incentives for “Self-Generated” Electricity: AB 2778.

In the year 2000, the legislature required the California Public Utility Commission (CPUC) to start load control and “self-generation” programs with cash incentives for residential and business customers to produce their own energy. In implementing the law, the CPUC included not only extremely low-polluting technologies like fuel cells and wind turbines, but also microturbines and internal combustion engines. AB 2778 extended the SGIP program until 2012 for fuel cells and wind technologies only, removing combined heat and power technologies, effective January 1, 2008.

Cleaning up Cars and Trucks

For decades, California has pursued the complementary goals of diversifying its car and truck fuel supply and reducing vehicle emissions. Some of its attempts have been hugely successful, though occasionally in unexpected ways. For example, the state’s pursuit in the late 1980s and early 1990s of methanol created a competitive threat so great that one major oil company (ARCO, now BP) developed the first “environmental” gasoline with intrinsically lower emissions. Other attempts, such as the failed requirement that car makers sell a minimum

number of zero emitting vehicles, have enjoyed less success.

In 2002, the California legislature became one of the world’s first to confront emissions of greenhouse gases from cars and light trucks, requiring the Air Resources Board to adopt reduction requirements to achieve “the maximum feasible and cost-effective reduction of greenhouse gas emissions from motor vehicles.” The auto industry has sued to overturn the legislation, arguing that it was preempted by federal Corporate Average Fuel Economy (CAFE) standards.

In the latest legislative session, California lawmakers not only continued their pursuit of the twin goals of fuel diversity and emissions reduction, but created a safety net in the event that the state’s earlier law is overturned in federal court.

Protecting California’s Car and Truck

Regulations: AB 32. Tucked into Part 7, the “Miscellaneous Provisions” of AB 32 is language designed to keep California’s regulation of greenhouse gas emissions from cars and light trucks alive, even if the rules issued in 2005⁵⁹ are overturned. The new law requires the Board to adopt “alternative regulations to control mobile sources of greenhouse gas emissions to achieve equivalent or greater reductions.”

Increasing Alternative Fueled Vehicles.

In August, 2002, after completing a study mandated by the legislature, the California Energy Commission recommended in its report “Reducing California’s Petroleum Dependence” that the state adopt a policy to reduce gasoline and diesel fuel demand to 15 percent below 2003 demand levels by 2020 and to maintain that level after that date. The report included certain recommendations (e.g., more fuel efficient tires, improving vehicle maintenance, doubling light-duty vehicle fuel efficiency, and implementing fuel cell-powered vehicles). The report also recommended a goal of increasing use of non-petroleum fuels to 20 percent

of on-road fuel consumption by 2020 and 30 percent by 2030.

Although the motivation was principally to reduce petroleum dependence, reducing emissions of greenhouse pollutants was clearly a major consideration as well. During the 2005–06 legislative session, two bills were approved by the legislature to boost prospects of non-petroleum fuels and thereby reduce air pollution. Both were vetoed.

New Cars and Trucks: AB 1012

(vetoed). This bill would have required that starting in 2020, one-half of all new cars and light trucks sold in California be “clean alternative fuel vehicles,” defined as running on a fuel containing more than 50 percent non-petroleum constituents, with emissions as good as or better than those required of conventional cars and trucks. Specific types of vehicles that would have qualified included —

- Hybrid vehicles;
- Plug-in electric hybrid vehicles with a minimum of 20 miles all electric range or that met minimum specifications established by the state board;
- Flexible fuel vehicles (FFVs);
- Compressed natural gas (CNG) vehicles;
- Liquid propane gas (LPG) vehicles; and,
- Hydrogen fuel cell vehicles (HFCVs).

Oil Conservation, Efficiency, and Alternative Fuels: SB 757 (vetoed).

This bill was a comprehensive, across-the-board attempt at curbing oil demand and boosting fuel economy of cars and trucks. It would have required every state agency to “take every cost-effective and technologically feasible action to reduce the growth of petroleum demand and increase vehicle energy efficiency and the use of alternative fuels.”

At the state level, the Air Board was to develop requirements, incentives, and partnerships for publicly administered fleets to purchase and install alternative



This 500-kilowatt engineering and manufacturing development wind turbine, of the sort encouraged by new California laws, is installed at the Fairmont Reservoir of the Los Angeles Department of Water and Power. The turbine is grid-connected and features a downwind rotor, hinged blades that flex, and soft towers that bend slightly to reduce loads on the other components.

fuel vehicles and advanced transportation technologies. At the federal level, the California Environmental Protection Agency was instructed to “influence Congress and the U.S. Department of Transportation to double the combined fuel economy of cars and light trucks by 2020.”

Cleaning up Electricity

The legislature passed a number of measures to reduce emissions from electricity generation.

Cleaning Up Coal: Senate Bill 1368.

Although coal burned within California to generate electricity is a trivial amount, as much as 20 percent of the state’s power comes from stations in nearby states — so-called “coal by wire” — and its share is increasing. Senate Bill 1368 prohibits new long-term contracts for electricity unless the emissions associated with its generation are at least as low as those from a modern, state-of-the-art facility.

Three state agencies, the California Public Utility Commission (CPUC) the California Energy Commission (CEC) and the Air Resources Board, are required to establish standards for the maximum allowable emissions of greenhouse gases per megawatt hour of generation based on natural gas-fired “combined cycle” in which fuel is first burned in a gas turbine to generate electricity, then heat extracted from the exhaust is used to generate steam to make still more electricity.

Utilities can still buy higher polluting electricity on the short term, or “spot” market, but are barred from entering long-term contracts or constructing new plants that fail the standard.

Although the CPUC had already imposed such a policy on the state’s three investor-owned utilities,⁶⁰ legislating the requirement not only precludes backsliding, but extends the requirement to municipal utilities, which are generally not governed by the state utility commission.

The bill’s principal sponsor, Senate President Don Perata (D-East Bay), said the new law “makes power companies and utilities buy energy that meets strict emission standards, puts California light years ahead of the rest of the world — where we ought to be when it comes to smart stewardship of the environment.”

Energy Efficiency Goals for Municipal Utilities: AB 2021.

As the cost of building new power plants has risen and, with them, the price of many fuels, conservation and energy efficiency are increasingly attractive options. They reduce pollution while saving money. AB 2021 requires the California Energy Commission to establish ten-year efficiency

and demand reduction targets and update them every three years. In addition, the bill focuses on one specific device, air conditioners, requiring a study of ways to increase their efficiency and cut peak energy demand.

Cleaning up Ports and Ships

The ports of Los Angeles and Long Beach handle an astounding 40 percent of U.S. imports and exports. It’s no coincidence that the ports are also the biggest air polluters in the six-county Los Angeles Air Basin. More than 180,000 vehicles clog Interstate 710 everyday, including approximately 35,000 daily truck trips traveling to and from the ports⁶¹ — and the volume of goods moving through

the ports is expected to triple over the next 20 years.⁶² The hundreds of tons of pollutants emitted at the ports per day puts nearby communities at unacceptable levels of risk.⁶³ The ports are also anticipated to quadruple in growth over the next 15 years, making the issue extremely urgent.⁶⁴

Senate Bill 927 would have funded pollution control programs with income from a \$30 fee on each shipping container entering the ports of Los Angeles and Long Beach — \$10 each for pollution mitigation, rail improvements, and port security. However, it was vetoed by Governor Schwarzenegger.⁶⁵

by David V. Bates, CM, MD, FRCP, FRCPC, FACP, FRSC

When I sat down at my computer to prepare my set of notes from annotated articles, I was surprised to find that since I began this task systematically, I had produced written notes on over twelve thousand scientific papers dating back for more than twenty years. Over this period I have learned some things that may well be passed on and prove helpful to those that are just beginning such a task.

The annotation is a synthesis of the research in question that also places it in the context of other work. I do not think that modern guides and technology render this task more difficult or enable it to be eliminated altogether. Indeed, one could argue that the very volume of increasing information collection makes the task more, rather than less, important.

Nor is an annotation made less necessary by the Abstract that the author provides. Often Abstracts omit essential details. This is particularly true of the Abstracts provided for epidemiological studies. Perhaps this is because the editor provides so little space for these. In this case, where the Abstract has been carefully and concisely written, but its length somewhat exceeds the space the editor has set for it, the authors should argue with the editor that its length is appropriate. Or perhaps the author is overwhelmed by the task confronted, for the Abstract is too often dismissive, giving little idea of the scope of the work and the breadth of the limitations. It often tries to assure the reader (necessarily in advance) that all possible wrinkles have been considered or that the aim of statistical purity has been at the forefront of the author's mind.

In this tangle of undergrowth, general lessons and conclusions may be lost. An image that comes to mind is of the canopy of the rain forest, which shuts out so much light that nothing much of importance can survive at ground level. Too often, I have found that for the reader to get any idea not only of the work involved, but of the foundation on which the conclusions rest, I must restate the details of the study. In a study in which, let us say, 3,500 children have been involved over a three-year period with lung function tests four times a year and with the completion of a questionnaire at each attendance, the impression given by the Abstract description is so dismissive that one can imagine that the whole study might have been conducted over a long weekend.

The Annotator can often disregard the overlong discussion the authors have provided as to why his conclusions are supported by much collateral data. The paper should stand on its own feet. The discussion section is often poorly written. It is here that the reader's attention should be directed to some findings from the study which might otherwise be overlooked; a recent example that comes to mind was a study of the apparent association between the macrophage loading by small carbon particles in normal children, and other consequences^a (see Worth Noting, back page). It was easy to lose sight of the fact that the cohort of 64 normal children studied by induced sputum in this study also showed that, although in all of them their lung function was normal, their actual level of lung function (within the normal limits of FEV1) fluctuated with the level of fine particles (as PM₁₀) to which they had been exposed. This is a highly original and important observation, if it can be confirmed in more extensive studies.

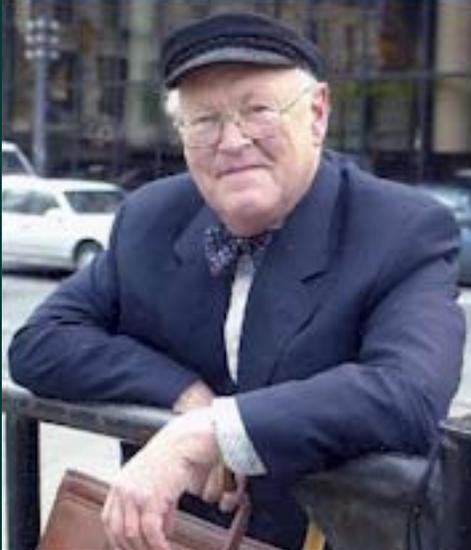
(Seventeen years ago, in the third edition of my textbook^b, we pointed out that correction for sex, age and height in the case of the normal FEV1 still left the major part of the variability in the normal FEV1 unexplained. Is it possible that the FEV1 is, after all, not a bad indicator of the state of the small airways of the lung. Thus an FEV1 in the lower part of the distribution within the normal range (of children let us say) of the FEV1 might indicate that a persistent low-level chronic respiratory bronchiolitis induced by some environmental cause, is reflected in a lower than "optimal" FVC or FEV1. I very much hope that this clue will be followed up. It could lead to an unraveling of the relationship between early environmental exposures and later lung disease.)

Sifting through tons of gravel to come across a solitary diamond is what the skilled reader does. It is especially gratifying when one might come across an observation that the authors might have overlooked — or if not overlooked, at least demoted to a relatively low status.

^a KULKARNI, N., PIERSE, N., RUSHTON, L., & GRIGG, J., Carbon in Airway Macrophages and lung function in children, *N Engl J Med* 2006; 355: 21–30

^b BATES, D.V., *Respiratory Function in Disease*. Third Edition., W.B.Saunders Co. Philadelphia. 1989. 558 pages.

DR. DAVID V. BATES
(May 20, 1922 – Nov 21, 2006)



With great sadness, we must report that Dr. David V. Bates died peacefully in his home on November 21, 2006. He was a wonderful man who, in an age when selflessness is rare, devoted himself to helping others from his earliest years to the end of his remarkable life.

Noted researcher and teacher, UBC dean of medicine from 1972 to 1977, inducted into the Order of Canada in 2003, poet, voracious reader, academic, scientist, gardener and vintner, David Bates will be sorely missed by all who had a chance to experience his humor, intellect, knowledge and love. He was a good man, a fine friend and he made a difference. Who amongst us can boast of more.

Readers, friends and colleagues are invited to post public comments about their experiences with David at <http://healthandcleanair.org/dvb/sign.php>. Private thoughts for the family can be sent to abates@softrak.

FAREWELL

What are you doing tomorrow?
There are a million answers
To that single question
But on one future day
For each of us
The answer is irrelevant.
The posting of the letter
The planting of the potatoes
The commitment to comfort another —
All of these are for others to do
(Maybe the heron knew).

Yesterday's tasks were complete
The crossword filled
The cheque to Andrew written
The place set in the dining room
The kitchen orderly and neat.

There was no burial,
Except the placing of the remembered silver
In the cellar,
The cataloguing of the unpaid bills,
The sorting of the family photographs,
And the sanctification of the garden —
All of these took but an hour
(Let us remove the dying flower).

So we tended the paraffin heaters
For the last time,
And this morning
The Aga was not filled
But allowed to die —

And I am ready to depart.

*David Bates,
5 March 1976*

Worth Noting

At a time when California has decided to regulate air pollutants for climate as well as health reasons, a recent study reinforces the health threats posed by one of the contaminants that causes global warming, black carbon, produced when wood, gasoline, diesel, coal or other carbon-rich fuels are burned.

In one, a team at the University of Leicester in the United Kingdom examined the sputum of 114 healthy children to determine whether macrophages⁶⁶, small blood cells that engulf bacteria, viruses and other foreign material, contained black carbon.⁶⁷ They were able to assess the carbon content in 64 of the

children, or 56 percent. They also administered lung tests.

As levels of air pollution rose, so did the black carbon in macrophages; and, as macrophage carbon content increased, measures of lung function dropped sharply, between 12.9 and 34 percent.⁶⁸

Reduced lung function later in life has been described as second only to the exposure to tobacco smoke as a risk factor for death,⁶⁹ and a deficit in growth during childhood will most likely translate into a deficit in baseline function carried throughout life.⁷⁰ In the view of the Newsletter's co-editor, Dr. David V. Bates, the study's findings suggest that exposure to

fine particles is "associated with chronic respiratory subclinical bronchiolitis."⁷¹

The reader is encouraged to consider the moment of these findings. First, black carbon is a ubiquitous pollutant. It simply cannot be avoided. Second, children who inhale black carbon are permanently, and almost certainly, irrevocably injured.

In an editorial accompanying this study, the writer concluded that "The best control strategy from the standpoint of human health, supported by the scientific evidence to date, is to reduce the levels of all types of air pollutants. Our children's health depends on it."⁷² We agree.