



Reducing Sulfur in Gasoline: The Next Step to Cleaner Vehicles?

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President Clinton's recent announcement of limits on sulfur in gasoline punctuated — but certainly did not end — controversy surrounding the latest federal move to cleanse the nation's air. At stake is public health, especially that of asthmatics, children, and other vulnerable groups; the economic future of the automobile and petroleum industries; consumer patience and disposable income; and, national

security, depending on which of the many stakeholders is talking.

Often lost in the debate is the fact that none of the groups dispute the wisdom of lowering sulfur in gasoline, and that doing so provides the biggest environmental bang for the buck. According to a panel of experts at a Congressional briefing hosted by EESI in April, the petroleum industry

is against the plan only because it wants a regional rather than national approach and a longer compliance timeline. The strongest opposition in fact may come from some with only indirect stakes in the matter: specifically, Members of Congress. (Indicative of the unusual alignments the issue has fostered, the auto industry is in a rare alliance with environmentalists.)

Background

The 1990 Clean Air Act (CAA) amendments directed the U.S. Environmental Protection Agency to develop new air-quality standards in two phases. In the latter, "Tier Two," the agency was to propose a new set of vehicle-emissions standards. Along the way, EPA hit upon the idea of requiring sulfur to be reduced from gasoline. The EPA has statutory authority to regulate gasoline content since many of its ingredients emerge

from tailpipes as pollutants. Not only is sulfur a pollutant in its own right, it retards pollution-control equipment on cars.

Lawmakers as well have introduced legislation amending CAA to reduce sulfur in gasoline. Sen. Daniel Patrick Moynihan (D-N.Y.) in January and Rep. Dale Kildee (D-Mich.) in March presented companion bills, S. 171 and H.R. 888, dropping

allowable levels from the naturally occurring 330 parts per million (ppm) to 40 ppm. Indeed, "the question is not *if* we will take steps (to reduce sulfur), but *how*," Kildee told EESI attendees.

Steps are seen by all supporters as a double-barreled approach for reducing volatile organic compounds (VOCs), most importantly as the best strategy for cutting nitrogen oxides (NOx), which are initial ingredients of smog, or ground-level ozone. Mandated in 1975, catalytic converters remain the primary technology on cars for reducing air pollution, but the sulfur in gasoline interferes with their ability to remove NOx and other "criteria pollutants" regulated by EPA under CAA. Therefore, removing sulfur will effectively remove the other pollutants.

Smog affects nearly half the U.S. population, causing lung inflammation and reduced lung function, and coughing and breathing discomfort.

BRIEFING PANELISTS

Rep. Dale Kildee

Sponsor of H.R. 888, Clean Gasoline Act of 1999

Gary Herwick

Staff engineer for the public policy center, General Motors

Andrew Wheeler

Counsel, Senate Subcommittee on Clean Air

Bill Becker

Executive Director, STAPPA/ALAPCO

Blake Early

Environmental consultant, American Lung Association

Robert King

Director of environmental fuels technology, Sunoco

Representing the National Petroleum Refiners Association

Smog also causes forest and crop damage.

NOx by itself causes lung irritation and reduces lung immunities. It also damages open bodies of water. NOx also is a precursor to particulate matter of 2.5 microns in size (PM 2.5), the newest criteria pollutant. This pollutant causes respiratory illness, lung damage, cardiopulmonary disease, and even premature death.

Regardless of its effect on other VOCs, sulfur emitted from cars causes its own problems. When combusted with oxygen, it forms sulfur oxides (SOx), which can cause respiratory illness and damage to forests, crops, open water, and even buildings. SOx also is a precursor to PM 2.5.

Such dangers already have led smog-weary California to take action. In 1996, the California Air Resources

Board (CARB) required gasoline sold in the state to have no more than 80 ppm of sulfur. In reality, most gasoline sold there has 30 to 40 ppm or even less. Partially because of this, supporters of a national sulfur standard say, 1998 was Los Angeles's cleanest air year in some 40 years. Outside the United States, Japan already uses low-sulfur fuel, Europe will do so in the next few years, and Canada plans to adopt California-like standards by 2005.

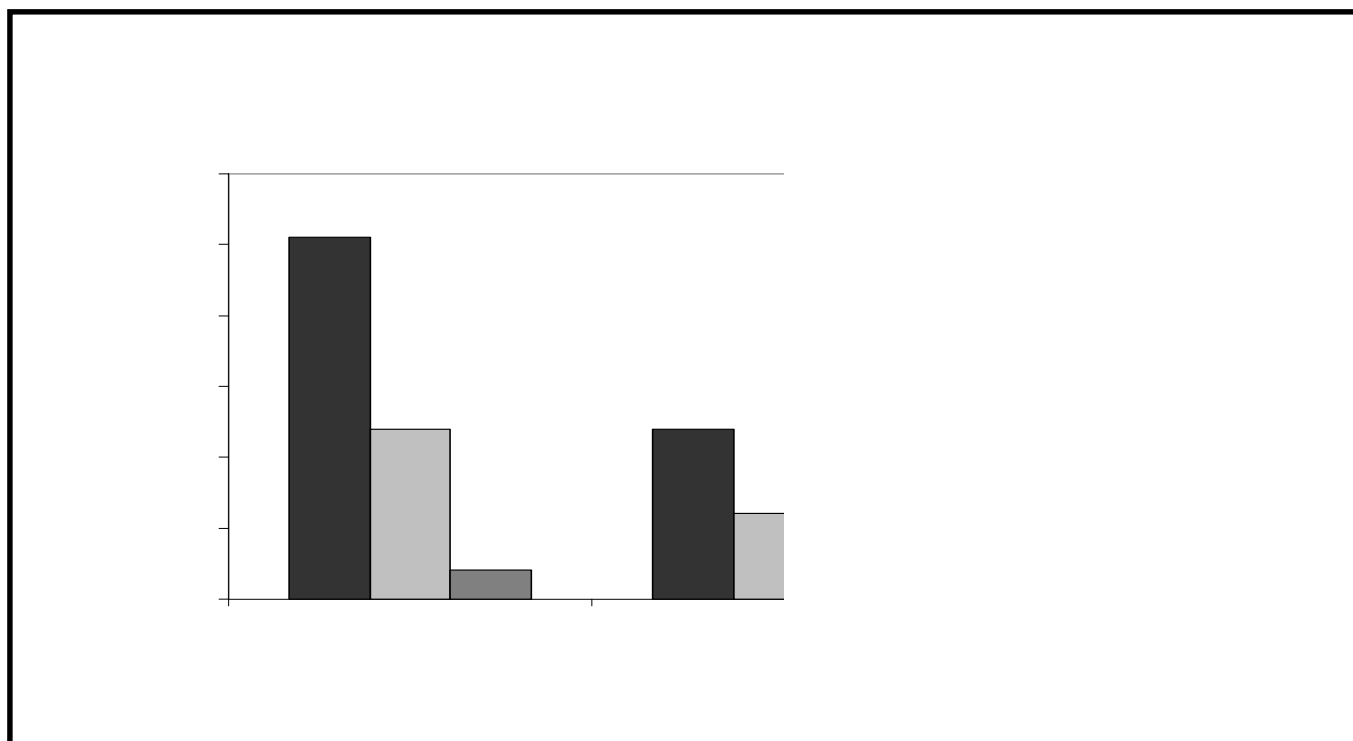
State and Local Views

Bill Becker, Executive Director of the State and Territorial Air Pollution Program Administrators and Association of Local Air Pollution Control Officials (STAPPA/ALAPCO) explained that "sulfur is a poison. It has no redeeming virtue in motor-vehicle fuel." Removing it will only become more important with time as more complex and delicate emissions-control technology that is expected to emerge will need to be as free of extraneous matter as possible.

Becker underscored the already-documented effects that cutting sulfur would have on smog and the practical effects on PM 2.5, greenhouse gases, regional haze and waterways such as the Chesapeake Bay. He emphasized that the petroleum industry's leading proposal is predicated *only* on helping areas that exceed the smog standard, and *not* on the collateral benefits. While some have said that EPA's expected proposal is hardly relevant or fair to the less-polluting West, it would help

the area in terms of PM 2.5 and regional haze.

Becker mentioned the results of a STAPPA/ALAPCO study on the anticipated effects of lowering gasoline sulfur to 40 ppm. Among other comparisons, the results for pollution would be equivalent to removing 54 million cars from the road, he said. And a recent joint study by the oil industry and car makers on the benefits of low-sulfur gasoline for imminent



low-emission vehicles (LEVs) had like results. These results are highlighted in the chart below.

Becker went on to discount arguments that instituting EPA's presumed sulfur standard is not yet feasible. California has achieved a similar level for the past two years; the European Union is heading toward 50 ppm; and Japan and New South Wales, Australia, are already below 30 ppm. Moreover, BP Amoco and other major refiners have said they can achieve the standard before the expected 2004 deadline.

Contrary to some charges, lowering the sulfur standard is "cheap and cost-effective," Becker said. The cost to the California consumer is less than 2 cents per gallon, while EPA and vendors of emissions-

control equipment have said the cost of a national program will be just a few cents. "And the fact is the public doesn't discern between price increases in gasoline of a penny or two," he said. Furthermore, the sulfur standard would be especially cost-effective relative to other pollution controls, such as vehicle inspection and maintenance, reformulated gasoline (RFG), and other methods.

Directing his comments toward Congressional staff in the audience, Becker noted that "your constituents face a zero-sum game" regarding the array of pollution-control options. With lawmakers and EPA clearly resolved to reducing air pollution, not adopting the sulfur standard means the nation "...would be forced out of necessity to make up for lost emissions-reductions opportunities on

the backs of some other sectors of the economy, including 'Mom and Pop' businesses." And if states cannot develop air standards in line with EPA directives, they could be sanctioned by the agency, such as by withholding highway funds.

A related complication may come back to haunt the oil companies that are trying to get EPA and the Office of Management and Budget (OMB) to back off the sulfur standard, Becker suggested. States would still have "no other option" but to adopt their own standards, which would result in an array of "boutique" programs. This would place a great strain on the refining industry since there conceivably could be more than 50 clean-fuel programs with which it would have to comply, he said.

A Congressional View

While Becker's arguments may have appeared overwhelming, a key congressional staffer cautioned the audience — and policymakers — not to lose sight of several easily overlooked factors. Andrew Wheeler, counsel for the Senate Environment and Public Works Committee's Clean Air, Wetlands, Private Property and Nuclear Safety Subcommittee, pointed out that even though CAA is aimed at air quality, it nevertheless requires EPA to weigh the costs of its potential regulations. And while many inside the Beltway appear united on a low sulfur standard, states are divided on the issue by regional concerns, he asserted.

As for the cost-benefit issue, EPA appears to be looking at sulfur only in terms of air quality — "which is its primary role," Wheeler acknowledged — but it has been

unable to explain the environmental benefits of cutting its level in gasoline. For more than a year, the Committee has repeatedly asked EPA for such an analysis, but the agency has been unable to provide it, he charged. That suggests the justification for the standard is following the decision, rather than the other way around, he added.

Moreover, the definition of "cost" in weighing the sulfur standard should be a broad one. Wheeler stated that both Congress and the administration through OMB need to consider the effect on energy supply and demand. It is true that the public may not discern the *costs* of gasoline, but it can and will discern if there is a *shortage* of gasoline, he pointed out. This could be the case in the Rocky Mountains, where the few refineries there are small and relatively likely to

go out of business under the added overhead of removing sulfur, he argued.

Analyses should also consider the standard's implication for national security, Wheeler said. This factor is of great interest to Clean Air Subcommittee Chairman James Inhofe (R-Okla.) since he also chairs the Readiness and Management Support Subcommittee of the Armed Services Committee. U.S. reliance on foreign oil already is great, with imports accounting for 50 percent of the crude that is refined. A low sulfur standard could drive smaller refiners out of business, and with refineries now operating at 98 percent of capacity, the result would be greater dependence on other countries for both crude and the finished product, Wheeler suggested.

There is a distinction between refiners and refineries, which is crucial

"Among other comparisons, the results [of lowering the sulfur content in gasoline] for pollution would be equivalent to removing 54 million cars from the road," Becker said.

to water contamination. Thus, the sulfur standard may increase the demand for MTBE.

to EPA's economic-impact analysis under the Small Business Regulatory Enforcement Fairness Act (SBREFA). The agency apparently is looking only at the effects on refiners, which are defined by the size of the company, rather than the effects on refineries, which are individual facilities owned by companies. The cost of the rule could move big companies to close small refineries, which could hurt local economies, Wheeler said.

Even if the sulfur standard makes sense in environmental and economic senses, it is not clear that it can be achieved, Wheeler argued. EPA has not looked at the availability of sulfur-reduction equipment. If the EPA had, it would have found that there are only two vendors and that it has been installed at only one plant in the United States. It is questionable whether two companies can supply all the necessary equipment in just five years.

Also dubious is EPA's assertion that it can and will speed the permitting process for the sulfur technology. Applications typically take one to two years to process, but the agency plans to reduce this to six months, Wheeler pointed out. With no extra money or personnel requested for the task in EPA's FY '00 budget, "I don't see any possible way" of getting all refiners their permits by 2004.

Even so, he echoed Kildee in saying that the real issue is not *whether* to reduce emissions: "I don't think anybody debates that we need to have

cleaner fuel." As for *how* to reduce emissions, one issue is whether to alter fuel content or upgrade catalytic converters. EPA's own estimates put the cost of the sulfur standard for consumers at 5 to 6 cents per gallon, and that is "for the life of the auto," he said. On the other hand, the efficiency of catalytic converters can be doubled for a one-time cost of about \$40, he said.

Another issue is *when* a significant move to new emissions-control technology is needed. Wheeler noted that the next generation of cars will not require such products until late in the next decade, suggesting there is breathing room rather than a need to rush to new air-quality standards. He cited the concern of some that EPA's sulfur standard may be a deal with car makers to get their "buy-in" to the rest of the Tier Two standards.

Wheeler suggested the urgency for the new clean-air and sulfur standards is overheated. For instance, all involved should bear in mind that they are debating the final four percent of car emissions — those emissions are now 96 percent cleaner than when pollution-control devices were first required. Also, the process for removing sulfur from gasoline at the same time removes octane, which is crucial to combustion, Wheeler pointed out. The preferred, if not only, method of boosting octane is through the use of methyl tertiary butyl ether (MTBE), which has been linked

Automaker Input

The fact that the auto industry agrees with environmentalists, public health groups, and state officials is noteworthy by itself, and should lend credibility to the sulfur standard, Greg Dana, vice president of the Association of International Automobile Manufacturers (AIAM), told the EESI audience. (Dana replaced Gary Herwick of General Motors on the panel of speakers.) The explanation for the "strong and diverse coalition" is simple. The standard "is one of the biggest emissions-reductions benefits you can do right now. There isn't anything out there I know of that can get as huge a bang for the buck as quickly as this does," Dana declared.

The standard is needed because car makers will not be able to meet tighter air-quality standards without it. The low emission vehicles (LEVs) of the next decade will be at a "99 percent control level," meaning that manufacturers will have curbed emissions as much as possible through purely automotive technology. "We can't do much more without cleaning up the fuel," Dana said.

A potential, imminent problem can already be seen in emerging "direct injection" engines. Such engines have 20 to 30 percent better fuel economy, but their air-fuel ratio creates worse NOx emissions than do today's cars. The prototype control systems are extremely sensitive to sulfur contamination.

A low sulfur standard should not be considered an extreme environmental move, Dana noted. Indeed, the United States is behind the rest of the industrialized world in

clean-fuel standards, creating a dichotomy with its car-emissions requirements, which are among the most stringent.

Like Becker, Dana also discounted opponents' claims regarding the cost of a low sulfur standard. Charges that consumers will have to shell out another nickel per gallon misconstrue the California data on which the cost estimate is based. In fact, only about one-third of that increase was attributable to sulfur removal, while the rest was due to other changes in the 1996 program, Dana asserted.

As for high overhead causing refiners to go under, Dana cited a recent MathPro Inc. study done for AIAM that found even those in the supposedly susceptible Rocky Mountain region "unlikely" to be closed. Moreover, EPA has indicated it will give smaller refiners more time than larger ones to comply with the standard.

REFINERS' TWO CENTS WORTH

Robert King, Director of Environmental Fuels Technology for Sunoco and representing the National Petrochemical and Refiners Association (NPRA), emphasized that his industry does not oppose removing sulfur from gasoline. Rather, it much prefers regional standards rather than a national one and wants a phased approach to meeting them.

NPRAs has been looking for such a plan for more than a year. It generally calls for a sulfur standard in "cleaner conventional gasoline" averaging 300 ppm (with a cap of 450 ppm) west of the Mississippi (except for California, Louisiana, Missouri and eastern Texas). It calls for "low sulfur gasoline" averaging 150 ppm east of

the Mississippi (capped at 300 ppm), with "cleaner reformulated gasoline" of 150 ppm average used mainly on the northeastern seaboard. Pockets of relatively congested counties would use cleaner fuel than their surrounding areas under the industry plan.

The crux of the plan's divergence from environmental and public-health advocates is the fact that the petroleum industry faces a "regulatory blizzard" of new pollution limits and compliance deadlines over the next 12 years that combine to make any one element difficult to meet. "It seems as if as the air gets cleaner, we keep getting more and more regulations," King noted.

An NPRAs chart provided at the conference shows RFG Phase II standards must be met by 2000; MTBE must be phased out in California and some urban air toxic standards must be met by 2003; Refinery Maximum Achievable Control Technology (MACT) II, some NOx, Tier Two, and National Ambient Air Quality Standards (NAAQS) ozone requirements must be met by 2004; other NAAQS standards must be reached by 2007; diesel and global climate change-related standards may have to be met as early as 2008; and NAAQS ozone, PM 10, and PM 2.5 standards must be met by 2011.

Moreover, a sulfur standard could crowd this field unnecessarily. King charged that Sunoco's work with sulfur in its own catalyst systems over the last 50 years has shown that its effects are reversible, that it need not be taken out altogether for them to work well.

King also complained that EPA had weighed the Tier Two and sulfur standards in isolation from the other requirements it has promulgated. Gauging them in that context might have led at least to a more logical

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sequence for compliance with the regulations.

Compounding matters is the fact that additional regulations invariably cause "unforeseen circumstances." King noted that a "backlash" against diesel fuel rules in California and against RFG programs in New York and Pennsylvania in the mid-1990s caused disruptions in fuel supplies. Policymakers should expect the unexpected in that a low sulfur standard will drive up prices and otherwise affect supplies.

King further mounted the familiar feasibility arguments, saying that "EPA is pretty much counting on unproven desulfurization technology to achieve a low-cost solution." Again, no stranger to sulfur, Sunoco has been removing it from its gasoline for some time — doing so costs 5 cents per gallon.

Some 100 refineries will have to be outfitted with sulfur-reduction equipment, and there are perhaps five firms that can provide the equipment. Only two offer equipment that may get the cost down to a more-

economical 2.5 cents per gallon. “Going from nowhere to 50 refineries per vendor I think is a large gamble for EPA to count on,” King said.

Add to that scenario the fact that much of the technology is unproven, and serious fuel-supply disruptions appear possible, if not likely. Alluding

to Wheeler’s point regarding fuel imports and national security, King questioned where relief would come from.

Finally, King also questioned assertions that the low sulfur standard poses little or no risk to small refiners

and related regional economies. Another MathPro Inc. study on Canada’s sulfur rule found that three to six of the nation’s 18 refineries could go out of business. Those facilities share characteristics found in U.S. Rocky Mountain refineries, King noted.

Breath of Fresh Air?

According to an advocate of those most harmed by dirty air, the sulfur issue cannot be divorced from unyielding transportation trends. An environmental consultant for the American Lung Association (ALA), Blake Early noted that the “fundamental problem” at the core of the sulfur debate is the fact that more cars are being driven more miles. They must keep getting cleaner “if we are to continue our love affair with the gas-powered automobile,” he said.

New air-quality data underscores how endemic the problem is and the need for a strong, national program to fight it, Early said. For instance, according to a 1998 Clean Air Network study, the second-highest

violation rate of new NAAQS standards was not found in a state with many big cities, such as Texas, New York, or California, but in North Carolina. Florida has a similarly surprising problem. Early explained that both are rapid-growth states, with suburban “sprawl” and long commutes causing high auto emissions.

Moreover, the oil industry’s own data clearly shows the sulfur issue to be a national rather than regional one. Early cited a 1996 American Petroleum Institute map of areas in “non-attainment” of clean air standards to that effect. A national sulfur program is necessary in part to keep states from trying to “shoehorn” themselves into relatively lax regions,

a scenario that could be a political and bureaucratic nightmare and almost certainly would lead to more emissions than intended.

An ALA survey last December produced “numbers that were really quite stunning” in terms of public desire for cleaner air, fuel and vehicles, Early emphasized. As did the other sulfur-standard supporters at the conference, he underscored the broad backing from often-contentious interest groups — environmentalists, health advocates, the auto industry, state air regulators, and the public. With the support of nearly everyone, national reduction of sulfur in gasoline “is the biggest no brainer I have seen in quite some time,” Early said.

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