Energy and Environmental Policy after September 2001

C. Boyden Gray

One consequence of the events of September 11 is agreement on the need for the United States to reduce its dependence on imported crude oil. This agreement arises from the vulnerability of major oil producing regions of the world, such as the Middle East, to terrorist attacks or government upheaval. Conventional wisdom has it that this reduced dependence on imported oil necessarily involves a trade-off with environmental protection. It is the thesis of this article that this conventional wisdom has it backward and that in fact: (1) the steps one would take to diversify are almost identical to the steps one would take to achieve "the last mile" of air quality improvement and (2) that the thinking at the United States Environmental Protection Agency (EPA) has been sending the country in the wrong direction.

The key to understanding the almost complete overlap between energy security and air quality is recognition of three simple propositions:

- First, the United States has an energy policy, and it's called the Clean Air Act (CAA), the single most complex, intrusive and expensive regulatory statute in the world. One is reminded of the anecdote about Energy Secretary John Harrington at a staff meeting in the second Reagan term where he asks about the purpose of a meeting on his schedule that afternoon. "Oh," says a staffer, "they are coming in to lobby you to lobby Lee Thomas [the EPA Administrator]." In exasperation, Harrington throws up his hands and says, "How come everyone comes in to lobby me to lobby Lee Thomas; how come no one ever comes in to lobby me to lobby *me*?" "Because," says the staffer, "Lee Thomas has all the power."
- Second, like all regulatory statutes, the CAA protects incumbents, discourages innovation, and increases costs unnecessarily in relation to benefits, diverting resources away from steps that would actually accelerate air quality improvement and increase energy output at the same time.
- Third, the principal incumbent given preferential treatment by the CAA is crude oil (most of it imported, of course), the gasoline from which is so toxic that it probably would not be allowed on the market today under the CAA and the Toxic Substances Control Act (TSCA). But the way regulatory systems work, the very thing you want to reduce turns out to be "grandfathered" as a practical matter.

This article examines what changes are needed in the implementation of the CAA to reverse the wrong direction in which EPA has had us headed (the word "implementation" is used intentionally to suggest that statutory changes are not needed).

The principal difficulty with EPA's current approach is that it has abandoned reliance on the use of performance standards and market incentives, which promote innovation instead of incumbent protection, and has reverted to old-fashioned command-and-control enforcement, as typified by its New Source Review (NSR) enforcement program now under review at White House insistence. This program, launched the day after rehearing was denied in *American Trucking,* 195 F. 3d 4 (D.C. Cir. 1999), in order to try to achieve the nitrogen oxide (NO_x) and sulfur dioxide (SO_2) reductions delayed by that decision, will completely turn the CAA upside down by substituting enforcement litigation for incentives, divesting the states of discretion to fashion pollution control programs to match the conditions of their own airsheds, and centralizing all regulatory power in Washington, D.C. The NSR program, for example, will, unless revised, require all sources to install scrubber technology regardless of what reductions individual states need to meet health standards and regardless of what innovative allowance-trading programs like Title IV of the 1990 CAAA would otherwise have permitted. Scrubbers assure the continued use of high sulfur coal. By ignoring Title IV, EPA will thus be substituting reductions that cost $30,000/ton for those that today cost less than $300 for $S0_2$, and up to $50,000/ton for NO_x tons that today are capped at $2,000 by EPA's own previously implemented NO_x State Implementation Plan (SIP) Call.

EPA may well have reformed the NSR program by the time this article is published, but its mindset and attitude may not change if the past, including this review process, is any guide. EPA has stated that it would use the so-called 3-P (three-pollutant) proposal to complete

Mr. Gray is a partner at the Washington, D.C., office of Wilmer, Cutler and Pickering and formerly Counsel to the Presidential Task Force on Regulatory Relief in the Reagan Administration, and White House Counsel in the first Bush Administration. He may be reached at bgray@wilmer.com.

conversion of its command-and-control approaches for NO_x, SO_2 and mercury to the use of market incentives. But the 3-P proposal instead presents such draconian reductions for a single industry that no markets for pollution credits will be possible as a practical matter. Having asserted that it needs legislative authority to implement the use of market incentives (which emphatically it does not), EPA will likely continue its bureaucracy-heavy command-and-control enforcement if the legislation is delayed or does not pass.

The reality is that the Supreme Court's decision in *American Trucking*, 531 U.S. 457 (2001), has liberated EPA to implement a PM2.5 (particulate matter less than 2.5 microns in size) standard, the delay of which by a lower court initially triggered NSR and then 3-P. There is thus no longer any ground for continuing to pursue either NSR *or* 3-P. EPA should simply implement PM2.5 the way it does any other standard—that is, through state SIPs and the use of full-market trading between all mobile and stationary sources to guarantee a level playing field. Congress has never before been called upon to authorize a program it already delegated to EPA to implement.

Although future efforts to diversify from crude oil directly implicate only mobile sources (since utilities burn virtually no oil today), stationary sources cannot be ignored. To the contrary, stationary source regulation can potentially be just as important as mobile source regulation in diversification efforts.

For example, one of the most promising developments is the hybrid electric car that starts and runs in traffic on electricity but shifts to liquid fuels on the highway where the battery is recharged. Overregulating utilities can put electricity prices too high to allow pure electric cars to compete against this new technology. Similarly, overregulation of utilities can reduce the value of coal reserves and unnecessarily increase the cost of natural gas, which could inhibit the use of natural gas vehicles and slow any possible transition to clean fuel-cell technology.

Finally, all market-incentive, credit-trading approaches for stationary sources should be integrated into mobile source trading. There is no reason car and truck companies should not be able to offset the initially high costs of introducing hybrid, electric, alternative and fuel-cell vehicles by selling the accompanying reductions into the stationary source sector, where NO_x reductions have risen as high as $100,000 a ton (in California). And market trading is essential to sort out the trade-offs among and between coal, natural gas, crude oil, and other alternative fuels.

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Notwithstanding the importance of stationary sources, the starting point for assessing CAA changes to reduce the importance of crude is the mobile source sector. Here, there are two possibilities: cleaning up the fuel and cleaning up the car itself. The two are naturally interrelated, but it is surprising how little coordination there has been historically between the automotive and fuel industries. One of the problems is the natural tendency of each industry to try to shift as much "blame" or responsibility for reductions to the other. The result has been an allocation of burden based far more on political influence than economics or the public health. Use of market incentives that better integrates the two sectors is crucial to getting the allocation done in the most environmentally and economically productive manner. With that background, it is instructive to look at some of the fuel possibilities.

Possible Fuels

Natural Gas. Natural gas is a very clean automotive fuel that can be used in today's internal combustion engine with very little change—except for the storage problem. Natural gas or propane tanks provide limited range; unless consumer-demanded luggage or cargo space gets used up by fuel-tank capacity. However, they can be efficiently utilized by fleet operators, who comprise a very significant proportion of the vehicle miles traveled (VMT) in most urban areas and especially in New York City. The expense of the tanks and of centrally refueling these vehicles can be offset by permitting fleet operators to sell their reductions to other sources of volatile organic compounds (VOCs) and NO_x and carbon monoxide (CO). Paint and coatings suppliers, for example, have a difficult time reformulating products without VOC-producing solvents. Allowing them to buy VOC credits from the mobile source sector might be very helpful to both sides.

Methanol. Methanol is a very clean-burning fuel that is required at Formula 1 races in part because it has very high octane and in part because, unlike gasoline, it rarely explodes on impact. However, the factors that explain its safety (very high heat of vaporization) also pose cold start problems that are unacceptable for consumers in cold climates. Additionally, methanol is corrosive and requires the use of materials that are different from those required by gasoline. Nevertheless, it can be effectively used by fleets, and would be used if the added handling costs could be paid for by the kind of emissions trading EPA has not so far allowed. Equally important, methanol, which is made simply and cleanly from natural gas, is itself a feedstock for ethers such as methyl tertiary butyl ether (MTBE), which has been a key to the success of cleaner burning gasolines such as reformulated gasoline (RFG). Methanol's simple conversion to MTBE need not be performed in a refinery, thereby avoiding the permitting problems normally associated with refineries (which are today almost impossible to site). Reformulated gasolines have dramatically reduced the ozone problem in urban areas. Finally, methanol is the leading choice to be the feedstock for fuel-cell vehicles, the introduction of which requires EPA to permit mobile-stationary source trading.

MTBE. This gasoline blending component has seen its use skyrocket as a result of the 1990 CAA Amendments (CAAA) requirement for the use of 2 percent oxygen in RFG to reduce aromatics and otherwise clean up gasoline. California experienced a 40 percent drop in ozone exceedances the year RFG was introduced. MTBE was initially seen as a near silver bullet, until it was discovered to have groundwater contamination problems stemming from leaking underground storage tanks. This problem appears to have receded as EPA's regulations have been implemented to control tank leakage. It was never clear that the MTBE problem was at all widespread in any event, and it does not rank today as one of the top ten water issues facing California according to California's Department of Health Services. Although the early difficulties thus appear to have been solved, EPA has not given MTBE a clear green light.

Ethanol. Ethanol can also be used to meet the 2 percent oxygen requirement, but its utility is limited by its high cost relative to MTBE and the fact that at a blending level of 10 percent, it increases the volatility of gasoline (sometimes called Reid Vapor Pressure, or RVP), thus also increasing its emissions of VOCs, which are an ozone precursor. The cost is offset by a 6 cent-a-gallon tax subsidy that works out to 60 cents a gallon of gasoline blended with 10 percent ethanol. The subsidy, which costs the taxpayers about $500 million a year, is understandably unpopular with refineries whose product is displaced, although the subsidy is a mere fraction of the billions that oil companies have received over the years in depreciation and intangible drilling cost write-offs. The volatility problem would disappear if EPA would allow blending at 20 percent. Indeed, Brazil's gasoline is blended with ethanol at 22 percent, and at that level ethanol provides very significant air quality benefits. (No Brazilian city suffers from air pollution nearly as bad as other cities in Latin America, or even the United States, and most Brazilian cars have no pollution control equipment.)

Allowing blending at 20 percent, rather than 10 percent, would significantly improve the environmental benefits of ethanol, as well as double the renewable, nonpetroleum component of gasoline. Ultimately, if 20 percent of *all* U.S. gasoline were non-crude-based, the United States would be well on its way to diversification away from crude oil. But, without an enlarged subsidy, 20 percent blending is at the moment both too expensive to be competitive and well beyond the present capacity of U.S. ethanol producers. Potential foreign imports of ethanol from willing producers like Brazil are stymied by a 60 cent-a-gallon tariff designed to offset the 60 cents a gallon tax subsidy blenders receive that lawmakers do not want going to foreign producers.

Ethyl Tertiary Butyl Ether (ETBE). The best way to use blends and additives to reduce crude oil use while enhancing air quality is through ETBE—the ethanol-based version of MTBE. Though not totally free of potential groundwater contamination problems, it poses far fewer risks than its MTBE cousin does. Moreover, under EPA rules it can be blended at 17 percent and this could be increased administratively to 22 percent. At that level, both the energy security and air quality benefits would be very significant. Environmentally, ETBE is a virtual silver bullet because, unlike ethanol at 10 percent, ETBE has *negative* RVP blending pressure—meaning that it *reduces* gasoline volatility and thus reduces VOC emissions. Additionally, it reduces the use of aromatics, by as much as 50 percent. This would reduce by half the cancer risk associated with gasoline, and further reduce ozone and PM2.5 because the aromatic compounds in gasoline are the most reactive precursor to both ozone and PM2.5. The PM2.5 reduction will be especially significant after the PM2.5 standard is implemented.

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ETBE is thus a "four-bagger" environmentally: in addition to its crude oil displacement, it reduces volatility, cancer-causing aromatics, ozone reactivity, and PM2.5. But EPA is not very supportive. It has not signaled its willingness to give ETBE a clean bill of health with respect to the water contamination issues and has so far refused to acknowledge or credit the ability of ETBE to reduce cancer risks and PM2.5. EPA continues to insist that PM2.5 is principally a problem of sulfates from power plants, when the monitoring data clearly point the finger at aromatics and other components of vehicle exhaust, like diesel particles.

This question of PM2.5's recipe is a crucial one, with ramifications far beyond the fortunes of ETBE. As is discussed more fully below, EPA cannot set up a trading regime for PM2.5 if it cannot identify what is to be traded. Worse still, if EPA continues to insist that power plants are the sole cause of PM2.5 (when mobile sources are in fact the biggest problem), EPA will have fired a multibillion-dollar bullet at the wrong target and made other problems, like ozone, worse. This is a problem EPA itself acknowledges in its own PM2.5 standard-setting proceeding. OMB has recently asked EPA to rethink its views as to the recipe of PM2.5.

For example, one of the reasons the CAA places primary responsibility for implementing the health standards on the states is because the precise mix of air quality problems—and thus the precise fix—varies, sometimes dramatically, from airshed to airshed, from East to West, and North to South. For example, while sulfur is a significant contribution to PM2.5 in the East, though greatly overshadowed by mobile sources, it plays virtually no role in PM2.5 formation in the West, where NO_x is more important. Thus, a nationwide set of rules for PM2.5 does not make sense, and can in fact be counterproductive. In the East, where NO_x reductions aren't required for PM2.5 control, EPA's current isolation of power plants as the sole culprit will not only waste millions of dollars on unnecessary NO_x control but will in the process actually make ozone worse. As a consequence, the CAA (Section 184(f)) permits urban areas to petition for an exemption from New Source Review (NSR) in order to avoid counterproductive reduction of NO_x. Several areas, including Chicago and Detroit, have such exemptions that EPA is flouting in its NSR enforcement program and in its pursuit in Congress of the utility-only three-pollutant bill.

In many ways, the pollutants that alternative fuels would eliminate are the last and most difficult obstacles to finishing the "air quality war" where all the "low-hanging fruit" has already been harvested. These alternative fuels are also the route out of the crude oil trap. But if EPA will not recognize the benefits of these fuels and remove the obstacles to their use, the United States will never complete the goals of the CAA—and neither will the rest of the world, which usually follows U.S. environmental leadership.

Mobile Sources—Cleaner Car and Truck Technologies

This article has examined fuels before looking at the different vehicle technologies for two reasons. First, changing fuels—assuming the changes can be accommodated by the existing car fleet—can reduce dependency far more quickly than developing new car and truck technology.

Second, in order to assess what long-term technologies are available, it is essential to understand what fuels are available for those new technologies to use. Although it might seem obvious, most people ignore the fact that it takes twelve to fifteen years to turn over the car fleet (longer perhaps for heavy-duty vehicles, which have a longer life). However, introducing a new fuel can penetrate 100 percent of the fleet immediately. For example, when the 1990 CAAA's RFG was introduced in California in 1995, the number of ozone exceedances dropped by more than 40 percent the *first* summer. Removing the obstacles to use of alternative fuels at maximum value could double the blend percentage of ethers or renewables from 10 percent to 20 percent, doubling overnight the reduction of foreign crude imports. However, it will take years for hybrid electric cars or other vehicles like those discussed below to achieve enough market penetration to achieve the same reductions. Nevertheless, fleet turnover involving cleaner technologies is essential over the long term in order to achieve more than a 20 percent or 25 percent reduction in crude oil reliance.

Hybrid Cars. Hybrid cars typically rely upon battery-powered electrical power for starting and driving in urban settings, and then gasoline power once the car is warmed up and generating better mileage (as well as electricity) on the open road. There are, however, some prototypes, such as one developed at EPA's mobile source labs in Ann Arbor, Michigan, which avoid use of batteries altogether by use of hydraulic technology. The benefits of this approach are reductions of pollutants associated with the initial start-up of the engine (when the engine is at its dirtiest), minimizing urban stop-and-go driving on gasoline, which is also very pollution-heavy, and maximizing the better mileage as well as the electricity-generation capacity of highway use. Most hybrid cars generate their own electricity and thus do not rely on utility recharging. But, because they do depend on conventional fuels, they are not pollution-free.

Pure Electric Cars. The electricity for electric cars is itself generated from diversified sources, none of which involve imported crude oil. The main sources are coal (which accounts today for more than 50 percent of electricity generation), natural gas (about 25 percent); nuclear (about 15 percent); and water, wind and geothermal the rest. It is important to understand the importance of coal in this context. Coal is not pollution-free to burn, although current technology dramatically reduces the pollution associated with coal. But the pollution it does produce is largely offset if the electricity is used to displace crude oil. Direct comparisons cannot be made today because there is very little use of electric cars, but the surest way to discourage a shift to them is to push up the price of electricity so far as to make them uncompetitive. One way to sort out which car—hybrid or pure electric—produces the least net pollution is to expand pollution trading.

Alternative-Fueled Vehicles. Use of cleaner fuels as the principal propulsion source, so-called neat fuels to distinguish them from blends, is an obvious possibility because use of neat fuels such as natural gas, methanol or ethanol typically does not involve major change in car or truck technology, and the changes that are required can in many cases be retrofitted onto existing fleets like taxi cabs, delivery vehicles, heavy-duty trucks and bus fleets. Change is always expensive, however, and incentives to finance the change are clearly necessary. The most logical place to target the incentives is fleet operations. And the most obvious incentives are dramatically expanded pollution-trading opportunities and tax incentives.

For example, every taxicab in Tokyo is powered by natural gas, which accounts for most of the explanation why Tokyo, as congested with cars as any major city in the world, has less pollution than any major city, except Sao Paulo, which, as discussed earlier, relies on ethanol for its pollution control. There is no reason why fleets in urban ozone nonattainment areas should not similarly run on clean fuels.

Fuel Cells. Sometimes considered the holy grail of clean technologies, fuel cells are highly prized because they produce no pollution at all at the tailpipe—only water vapor. The most efficient and safe way to store the hydrogen used in fuel cells is by way of methanol, which itself is so much cleaner to produce than gasoline and methanol plant permitting is a breeze compared to that of oil refineries. Methanol is in turn produced primarily from natural gas, though wood is a more expensive source. Natural gas is, of course, available in huge Mideast and Russian deposits that mirror the massive crude oil reserves there, but gas is also found all over the world in large amounts where there is no associated crude oil. Notwithstanding the gas reserves in the Middle East and Russia, there is enough gas available in this hemisphere to permit a very dramatic diversification away from the Middle East and Russia.

Changing fuels can reduce dependency more quickly than developing new car and truck technology.

There is a great deal of natural gas likely yet to be discovered in the United States, while there remains very little such expectation for crude oil, other than from the Arctic National Wildlife Refuge (ANWR). Indeed, natural gas consumption in the United States today equals our entire imports of crude in barrel equivalents. Thus, greater reliance on natural gas, whether burned directly in vehicles or indirectly via electricity generation or fuel-cell use, would not require the creation of a new trend, only the acceleration of an existing one. Similarly, examining fuel cells is not a new preoccupation, but has been intensifying ever since fuel cells were developed for the space program. Indeed, a framework for all of the approaches that need accelerating is in place; the only question is how to accelerate what is needed.

How to Get There

The most important catalyst for facilitating the drive to a cleaner and more secure energy future is a dramatic expansion of the use of market incentives like those employed in the highly successful acid rain program. There the use of pollution allowance trading has delivered the anticipated SO_2 reductions more than 150 percent ahead of schedule at no more than one-fifth the cost. This is a result of utilities overcontrolling by as much as 50 percent to take advantage of the trading opportunities. Since EPA never expects more than an 80 percent yield from command-and-control programs, use of market incentives can double the pollution benefit at a fraction of the cost.

Equally important, use of market incentives can help determine the most economically and environmentally efficient way to sort out among the clean fuels and clean technologies just which ones are the best. For example, as suggested above, the only way to determine whether hybrid electric cars are cleaner and cheaper than fuel cell cars or pure electric cars, given the pollution associated with electricity generation and natural gas drilling, is to allow the market to sort out which technique is the best, most efficient, and profitably traded. Given the stakes involved—coal versus natural gas versus renewable fuels—it is political suicide to ask the political system to make the tough decisions. Thus, Senator George Mitchell, when he was Senate Majority Leader in the 1980s, found it impossible to advance an acid rain control bill in Congress until President George Bush's market incentive approach broke the political logjam in 1990 because it was impossible to predict in advance just who the winners and losers were going to be.

Two additional points are essential here. First, the most important step is for EPA to unlock mobile-stationary source trading. It is not conceptually easy, for reasons too detailed to explain here, to establish the framework for such trading, but the conceptual difficulty is not what is blocking EPA. The reluctance is primarily political, not technical. In fact, EPA has granted the California request for permission to commence mobile-stationary source trading in southern California. There is no reason EPA should not allow this nationwide.

California's program is a good example of the benefits of mobile-stationary source trading. Faced with \$100,000/ton NO_x prices in the utility pollution trading market in California in the summers of 2000 and 2001, California relieved peaking units of any obligation to comply with existing NO_x requirements. In its place, California allowed the utilities to pay a \$15,000/ton fee to the state. In effect, this approach constituted a waiver of the NO_x rules. For the future, however, the California program may prevent the need for waivers of air quality. It may allow vehicle manufacturers to sell NO_x reductions to utilities by accelerating existing plans to deploy fuel-cell vehicles on the road in the near future or by finding other creative ways to achieve mobile NO_x reductions. For example, displacing the refining of aromatics by high-octane exhaust or MTBE blends reduces NO_x emissions at the refinery itself, creating a potential set of trades that would be much more attractive if there is a robust mobile-stationary trading market.

The second point is that use of trading keeps politicians and bureaucrats more even-handed than they might otherwise be. As noted above, EPA never identified the constituent components of PM2.5 in its initial standards-setting so as to permit the establishment of a trading regime for PM2.5 the way Congress did for acid rain. Instead, EPA decided to allow polluters to pay into an EPA- or state-monitored fund whenever PM2.5 control costs exceeded \$10,000/ton. But what good is this quasi-trading opportunity when you still don't know what you are supposed to control in order to reduce PM2.5?

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Today, EPA's answer is that sulfates are the "predominant" source of fine particles in every part of the country. As a result, cars, trucks, and buses, which contribute more than half of all other pollutants, have, according to EPA, no role or responsibility for PM2.5 reduction. This is nonsense science.

Monitors in various parts of the country clearly point to mobile, carbonaceous sources as the predominant factor in the formation of PM2.5. Sulfur is also important, but only in the East, and even then it is roughly half of the mobile source contribution to PM2.5 formation. History suggests that EPA is twisting science to fit its political agenda, utilities being easier politically to target than cars or gasoline station dealers. But the use of market incentives would allow EPA to duck entirely the political blame for allocating the clean up burden, just as the allowance trading system allowed EPA and Congress to achieve acid rain reductions at little political price. Market incentives, in short, reinforce both science *and* political expediency. Finally, market incentives erase the hidden barriers to innovation—whether they be technical or regulatory—and attract private capital. The acid rain program was able to exploit and reinforce railroad deregulation to bring low-sulfur coal to the Midwest from the far West at cheaper rates than any one thought imaginable before the 1990 CAAA were passed. We do not know whether wind or solar power systems are truly competitive, but a market-incentive system that allowed them to capture their environmental benefits in the marketplace would legitimize them in ways that no soft rhetoric could possibly hope to do. Indeed, increasing industrial generation of electricity on a decentralized basis that does not rely on central power generation but rather on dispersed fuel cells would obviously contribute both to energy security and improved air quality. But unless EPA allows these industrial sources to opt-in to the acid rain program as Congress envisioned, they will not be able to realize their full potential.

There are, of course, many additional market approaches that should be pursued. More intensified natural gas deregulation, especially with respect to transportation, would, in the view of Paul McAvoy, the Yale Dean who is probably the country's leading natural gas expert, reduce natural gas prices by 20 percent without curtailing supply. This alone would provide a huge boost to the use of alternative-fueled vehicles, including fuel cells. Use of tax incentives would also be encouraged if there were market benchmarks for measuring how much tax incentives really cost. For example, the ethanol tax credit is "scored" in the neighborhood of \$500 million, but the environmental benefits potentially reduce that figure by a considerable amount.

The acid rain and lead phase-down experiments with market incentives expose just the tip of the iceberg of benefits yet to be realized by using the power of the marketplace in aid of energy security and air quality. We have plucked all the "low hanging fruit" of command-and-control. Switching aggressively to market-based approaches could add immeasurably to the public good, including the obvious benefit of encouraging energy suppliers to contribute rather than branding them as quasi-criminals, as much of the current approach unavoidably does. Reforming the current NSR enforcement approach is only the beginning of what EPA must do, and it does not need legislation, with all of its delays and tradeoffs, to do it.