

RESOURCES



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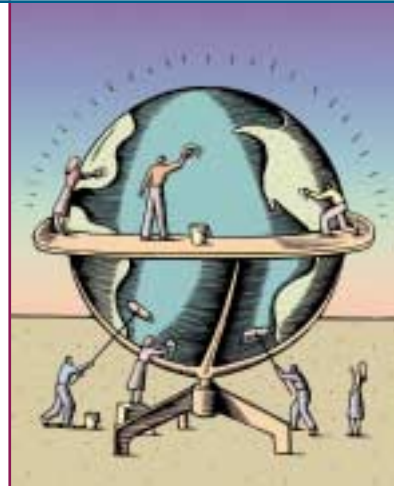
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Paul R. Portney

HOW ARE WE DOING?

Former New York Mayor Ed Koch used to walk around the city asking the people he met, “How am I doing?” On occasion he got a more graphic response than he might have preferred, but his strolls provided a direct way of learning what his constituents thought and gave them the sense that they were being heard.

While I’m far from being an elected official, it’s important for me, too, to get feedback on how we at Resources for the Future are doing. But because *Resources* goes out to readers in all 50 states and more than 50 countries, a walk-around strategy like Mayor Koch’s isn’t promising. That’s why I am hoping that you will take time on occasion to let me know what RFF is doing well and, especially, where we need to do better, and how. You can do this by writing to me at the address found on page 1 of each issue or by emailing me at portney@rff.org.

To help you assess our performance, we need to be clear about our mission and objectives. RFF’s mission is to “improve policymaking worldwide on natural resource and environmental issues through objective social science research of the highest caliber.” Our three strategic objectives, accordingly, are: ensure that we are doing the very best and most objective research possible; concentrate that research on the country’s and the world’s most important environmental and natural resource problems; and, finally, communicate the results of our work both clearly and through a variety of means so that it really does inform and elevate the key policy debates.

To be sure, measuring some of what we do is straightforward. For instance, one of my goals as president of RFF has been to grow the size of the research staff. Grow it has, from 27 full-time researchers in 1995 to 43 today. Accordingly, our annual budget has grown from about \$7 million in 1995 to more than \$13 million. Similarly, we can at least partially assess the quality of our research program by tallying articles in peer-reviewed journals, books published, and invitations to participate in scholarly conferences.

Other things are much harder to judge, however, and this is where you can be helpful. For example, you read a lot in the pages of *Resources* about climate change, the ongoing restructuring of the electricity industry, and, increasingly, the environmental and resource problems of the developing world. This reflects our view of the importance of these issues. But how about your views? Are there important problems we seem to be overlooking altogether, or to which we should be devoting more attention? If so, please tell me.

Equally important, are we clearly and effectively communicating the results of our work? This is another important goal of ours and we need to know how we’re doing, particularly through the articles you read in *Resources*. In the same spirit, I encourage you to visit our website at www.rff.org and give me your reactions. Is there useful information there, is it presented in a clear fashion, and is the site user-friendly and easily navigable? Finally, are there things about RFF or the people who work here that you would like to know? By all means, feel free to ask.

So, how are we doing? Please let me know and I’ll happily respond. Thanks, readers!



DOES THE CLEAN AIR ACT MEASURE UP?

Alan J. Krupnick

RFF Senior Fellow Alan Krupnick recently testified on the performance of the Clean Air Act before the House Subcommittee on Energy and Air Quality, part of the Committee on Energy and Commerce. The subcommittee is holding a series of hearings regarding the possibility of reauthorizing the Clean Air Act, with this hearing being the opening one, emphasizing accomplishments of the Act. The following article is based on Dr. Krupnick's formal remarks.

How much better off are we with the Clean Air Act than without it? Retrospective and prospective studies by the U.S. Environmental Protection Agency (EPA) show that on the whole, the nation has received high returns on its investment in air quality. From 1970 to 1990, estimated benefits exceeded costs by a factor of 40 or more; from the 1990 Amendments forward, benefits still exceed costs, although by much less. Though carefully executed and scrutinized, the EPA studies have some important shortcomings.

- They were conducted at an aggregate level, a very simple approach. Because EPA did not disaggregate the benefits by pollutant, sector, or subsection of the act, it is difficult to tell what is working and what isn't.
- EPA used some unrealistic assumptions—freezing control

technologies, holding constant the geographic distributions of people and economic activities, and assuming no state or local regulation or voluntary action in the absence of the Act.

- EPA's valuation of a statistical life—the critical variable in calculating benefits from averting premature mortality—may be too large by a factor of three, or perhaps even six.
- EPA did not address most ecosystem impacts or consider potential carcinogenic and certain other health effects.
- Costs did not include tax interaction effects—the economy-wide result of imposing additional abatement costs in the context of existing (distortionary) taxes.

Let's consider selected elements of the act.

SO₂ ALLOWANCE TRADING

The sulfur dioxide (SO₂) allowance trading program for electric utilities is a success: the expected benefits from reduced risk of premature mortality and other health benefits measure several times the expected costs. The environmental impacts from hotspots or rearrangement of emissions have not justified skeptics'

fears, and in fact, with trading, pollutant concentrations decrease and health benefits increase in the East and Northeast. The cost savings run \$700 million to \$800 million per year, primarily through innovation. The trading program provided the incentive and flexibility to accelerate and realize technological change.

Given those results, EPA now considers market-based instruments on equal footing with command-and-control methods when it contemplates new regulations—the nitrogen oxide (NO_x) trading program, for example. Nevertheless, there is room for improvement in both programs. The cap on total emissions could be tied to allowance prices, and as prices fall below some level the cap could fall to capture low-cost benefits. Conversely, if allowance prices rise to unanticipated or unjustified levels, the cap could rise to avoid higher than expected costs.

MOTOR VEHICLE EMISSIONS REDUCTIONS.

The measures to reduce emissions of hydrocarbons, carbon dioxide (CO₂), and NO_x from mobile sources are another success. Reformulated gasoline is relatively effective because it can be applied to the entire fleet; its cost-effectiveness in reducing emissions of



volatile organic compounds (VOCs) has been estimated at \$1,900 to \$3,900 per ton. By contrast, the tailpipe standards affect only new vehicles and, by making new cars more expensive, may have contributed to the lengthening lifetime of high-emitting used cars. Some of the additives used in reformulated gasoline have been troublesome, however. MTBE is now known to create groundwater pollution, and ethanol's high cost is disguised by a subsidy.

Another problematic issue is vehicle inspection and maintenance programs, required in some nonattainment areas. Such programs have generally achieved far less emissions reductions than projected, and estimates of cost-effectiveness range from \$4,400 to \$9,000 per ton of NO_x plus VOCs.

Accordingly, vehicle maintenance—the last potentially low-cost area for on-road emissions reductions—should be a top priority. One approach is to rethink the allocation of responsibility and put the onus on manufacturers through extended warranties, emissions repair liability, or expanded vehicle leasing.

More problematic still are programs that promote alternative-fueled vehicles. Projected costs per ton of reductions range from \$6,000 to nearly \$100,000 per ton of VOCs plus NO_x. Although costs are likely to fall with technological change and mass production, there may be cheaper approaches to explore first.

POINT-SOURCE EMISSIONS REDUCTIONS

Regulation under the New Source Review (NSR) program has spurred new abatement technology, but at a cost. Tighter standards on new sources create a bias against plant turnover, leaving possibly dirtier industrial capital in place. NSR has also led to considerable litigation. And with national and regional cap-and-trade programs in effect, NSR is simply redundant.

SIP PROCESS

The state implementation plan process has not worked well. When it was designed, long-range pollution transport was assumed to be minor.

Now we understand that ozone and its precursors, as well as fine particulates, can travel great distances. Holding nonattainment areas solely responsible for air quality becomes problematic when nearby states are contributing significantly to their pollution.

NAAQS

The centerpiece of clean air legislation has been the National Ambient Air Quality Standards. Despite the recent Supreme Court ruling against the use of cost-benefit analysis, the criteria for setting standards in the absence of a concentration threshold remain undefined, if not indefinable under current law. Tighter standards are not necessarily better. As EPA's Clean Air Scientific Advisory Committee (CASAC) itself suggested, it might be more efficient to have a new ozone standard no tighter than the current one. Recent epidemiological evidence suggests that a fine particulate standard even tighter than the new one could be justified, particularly if we understood more about the particle sizes and types that are most dangerous.



AMERICAN SECURITY TODAY: CHALLENGES FOR A NEW ERA

The terrorist attacks of September 11th revived debate about how best to deal with the complex and multifaceted challenges to U.S. national and economic security. This winter, RFF brought together senior policymakers and leading experts from the business, advocacy, and academic communities for two on-the-record symposia focusing on distinct and nontraditional threats to national security.

DEVELOPMENT POLICY IN THE NEW ERA: U.S. POLICYMAKING ON GLOBAL POVERTY AND HUNGER

The importance of global poverty and hunger to U.S. national security interests has become ever more apparent in the months following September 11. And the role of U.S. development policy has increasingly come into question. At RFF's food security symposium, held in late January, two clear themes emerged from the discussions: there is a need for order, structure, accountability, and leadership in food security policies, and those same policies need to be presented in such a way as to ensure political support. The symposium was divided into two panels: "Perspectives on How Development Policy is Made and Executed" and "Connecting National Interest, Domestic Politics, and the War on Hunger."

In the first session, Dan Glickman, the secretary of agriculture in the

Clinton administration, addressed the political realities that determined the Clinton food security policy, a subject Glickman's colleague from the Clinton administration, former Clinton Chief of Staff John Podesta also touched upon. "The dominant drive [of food policy] was probably assuaging the concerns of key political allies," said Glickman.

For the future, Glickman advocated fixing imbalances in food prices and the food market, emphasizing the need to integrate more order and structure into the policy development process. Podesta was in agreement with Glickman, later adding, "We need political accountability and political leadership."

Symposium organizer and RFF Senior Fellow Mike Taylor emphatically echoed this sentiment. Referring to his recent report on the U.S. response to the World Food Summit goal of cutting hunger in half by the year 2012, Taylor cautioned the audience that the agencies that monitor food security in the United States lack the authority to effect change.

Alan Larson, the current undersecretary for economics, business, and agricultural affairs at the U.S. State Department, looked forward in his presentation, suggesting that future policy could link food security with terrorism, thereby maintaining public interest in otherwise-obscure

food security issues. Larson also recommended applying technology to food security issues, an approach G. Edward Schuh, co-chair of the Food Security Advisory Committee, endorsed. Schuh also discussed impediments to food security, pointing out the need to "articulate what's in our best interests" to ensure support and success of programs.

Speakers in the second session also were very concerned with identifying what makes a food security program successful. Bill Nichols, State Department reporter and diplomatic correspondent for *USA Today*, spoke on the role of the media in promoting policies. He cautioned the audience that "doing good is not thought to be newsworthy."

Former Chief of Staff to the National Security Council Mara Rudman called for a sustainable constituency for food security programs. She suggested presenting food security issues in a global development context.

Congressman James McGovern (D-MA) seized upon Larson's suggestion to link food security and terrorism. McGovern said that giving food "is a way to give hope," adding that terrorists recruit "those without hope." He also agreed with Rudman that a broad constituency is needed, and suggested bipartisan efforts as a tool to reach that end.

David Beckman, president of Bread for the World, seconded the



need for bipartisanship, and cited the widespread support for President Bush and Secretary of State Colin Powell as a promising sign. Beckman also claimed that U.S. public opinion on food issues is more progressive than U.S. policy.

Robert Thompson, the World Bank's director of rural development, brought an international point of view to the discussion. He said the world's short-term food problems are poverty and food safety. However, the long-term issue, he said, was agricultural development. "If you don't have purchasing power," he told the audience, "you are susceptible to hunger."

Michael Hanlon, a senior fellow at Brookings Institution, worried that aid to help a country grow, without the right policies, won't work.

This symposium is part of a new RFF initiative to improve policymaking that affects poverty and hunger in developing countries (for more information, visit www.rff.org/AmericanSecurityToday/GlobalPoverty&HungerResources.htm).

U.S. ENERGY SECURITY: TRADITIONAL AND EMERGING CHALLENGES

There are no easy answers to solving our national energy security needs, according to the economists and energy experts who took part in an energy security workshop held in January at RFF. Price volatility and

power generation reliability are the predominant security issues, they said, but emerging concerns, from the threat of terrorism to the lack of electricity transmission capacity, also have to be considered.

The events of September 11, the war in Afghanistan, and the continuing political turmoil in the Middle East have heightened public concern about an already complex problem. But reducing U.S. dependence on foreign oil, the cornerstone of the president's energy policy, will not be easy, the experts agreed. Demand for oil is inflexible and short-term solutions for increasing domestic production are few. President Bush's call to allow oil drilling in the Arctic National Wildlife Reserve (ANWR) was met with skepticism. "Opening ANWR will do absolutely nothing for energy security and price volatility," said Robert Weiner, associate professor of business at George Washington University.

Simply put, the world is not running out of oil, said Paul Leiby, manager of fuel supply modeling and research at Oak Ridge National Laboratory. Energy security is not a matter of how much we import, nor whom we import from, but rather in how we respond to price shocks, he said. "So long as the system doesn't break down entirely, oil will move."

LIMITED OPTIONS

Price volatility has been and will continue to be a reality that must be acknowledged, the experts agreed. While the social costs are troubling in the short run — price hikes have frequently spurred the economy into recession over the past 20 years — shifting prices are also the mechanism by which the market straightens itself out, said Barry McNutt, senior policy analyst in the Office of Domestic Policy and International Affairs at the U.S. Department of Energy (DOE).

The federal government's primary policy mechanism for buffering oil price shocks, the Strategic Petroleum Reserve, has been stalled in ongoing debates about how to use it, several experts said. The current administration has repeated the mistake of its predecessors in forswearing use of the SPR just for dampening prices, when that is the key reason for having the reserve, said Michael Toman, an RFF senior fellow. "The SPR should be the first line of defense against oil policy gyrations — now at best, it's the last line of defense," he said. "If we can't figure out what to do with it, we should just empty it."

The long-term answer to oil security will be found by expanding the number of market-compatible fuel suppliers, such as Russia, and funding basic



research into new technologies, said Toman. “If we want to do more in the short run, it’s just a question of how much we are willing to pay.”

POWER GENERATION SECURITY

The security of our domestic power generation system is contingent on both reliability and security, said Howard Gruenspecht, an RFF resident scholar. Under traditional reliability criteria, electricity systems are designed to operate without disruption under high-demand conditions, even when the largest generator or transmission line serving a region is not available for use, he said. Now we must prepare for attacks seeking to disrupt power generation systems as well as attacks that use power-generating systems as

a weapon to achieve a larger goal, said Gruenspecht.

Lou Leffler, project manager at the North American Electricity Reliability Council said, “There’s an emerging consensus about what it will take to protect our critical infrastructure, including physical security over the long term, process controls, timely information sharing, common interpretation of threat levels, and secure and reliable communications.”

A second, emerging reliability concern has to do with transmission capacity, which has rapidly declined over the past two decades, according to Eric Hirst, a consultant on the technology and economics of electricity reliability. “It’s a critical, complicated issue involving markets and technologies,”

he said. Many types of entities own and operate transmission and generation systems, and reliability responsibilities are shared across several levels and institutions.

“Clearly, reliability standards are needed,” Hirst said, “but the question is whether they should be set at the national or regional level.” Transmission issues in the Midwest, where lines must cover long distances, are far different than those on the East Coast, he said. One solution would be the development of large, regional transmission systems that would be free of the bias in the current approach, where a system operator that also has generating capacity can limit outside access to transmission equipment in the name of reliability.

TOP USDA OFFICIAL, ON LEAVE AT RFF, WILL HELP LEAD FOOD SAFETY PROGRAM

Margaret Glavin is RFF’s newest visiting scholar. She is on a two-year leave of absence from the U.S. Department of Agriculture’s (USDA) Food Safety and Inspection Service, where she most recently served as acting administrator.

As the USDA’s top-ranking career food safety official, Ms. Glavin’s accomplishments include managing implementation of major food safety reforms in U.S. meat and

poultry plants, developing new initiatives to combat *Listeria* in foods, and initiating highly regarded management improvements within USDA’s food safety agency. In 1999, she was the recipient of the U.S. Presidential Rank Award for Distinguished Executive, the highest civil service award.

Glavin will be a leader here at RFF in the continued development and management of the food safety

program. Specifically, she will play a critical role in linking the program’s work on resource allocation models with the interests and concerns of the policy and stakeholder communities. RFF’s food safety program focuses on improving regulatory decisionmaking and the allocation of government food safety resources to reduce the risk of foodborne disease.



IN APPRECIATION

A TIME FOR REFLECTION

Joel Darmstadter

Celebrating our 50th anniversary this year was bound to evoke a sense of pride in accomplishments but also some feelings of nostalgia and poignancy. A year ago, we noted the passing of Allen Kneese, one of RFF's intellectual pioneers. Here, we remember several other major figures of an even earlier era. A seminal RFF work, *Energy in the American Economy* (1960), bears the names of three RFF researchers— each a notable scholar— who have died within just a few months of each other: Hans Landsberg in October 2001, Bruce C. Netschert on February 20, and Sam H. Schurr on March 4. (Two other contributing authors were Vera Eliasberg and Joseph Lerner.)

The American economy in RFF's first decade was confronted by major concerns, such as the Cold War, the end of the Korean War, and persistent anxiety about resource availability. Schurr, Netschert, and Landsberg recognized the necessity of integrating empirical data and interpretive analysis in order to gain a comprehensive perspective on the linkages between the demand for and supply of energy and other resources on the one hand, and economic growth, on the other. Fundamental research into the economics

Joel Darmstadter is a senior fellow at RFF.

of natural resource commodities got much of its foundation from books by these men and their colleagues, with companion studies that include *Trends in Natural Resource Commodities* (1962), *Resources in America's Future* (1963), and, in part building on the contributions and insights of these works, *Scarcity and Growth* (1963).

The uniqueness of the historical reconnaissance provided in *Energy in the American Economy* was recognized by the U.S. government, when the book's database, along with statistical data on minerals, became a core historical time series in the Census Bureau's *Historical Statistics of the United States*, first published in 1949.

To be sure, in the decades since publication of *Energy in the American Economy*, development of such major quantitative efforts has increasingly become the responsibility of government agencies and other entities with large-scale computing facilities. At the same time, one would be badly mistaken to view the work by Schurr and his co-authors as primarily numerical. A mere glance at that book would reveal insights that analysts concerned with long-term energy trends might well ponder today.

Let me mention just one example of an energy issue treated in uncommon depth in *Energy in the American Economy*.

In a 45-page chapter, the book dissects the energy consequences, over the course of a century, of both structural changes in the U.S. economy and productivity-enhancing technological progress, particularly the role of increased electrification. The resulting relationship between energy and gross domestic product is nothing like the "coupled" phenomenon that some analysts, whose historical perspective seems to be limited to a few decades, confidently characterize as the long-term picture of the country's energy experience.

SAM H. SCHURR

Sam H. Schurr, one of RFF's leading scholars and a pioneer in energy and mineral economics, died peacefully in his sleep on March 4 from



Sam H. Schurr

cardiac arrest. He was 83.

"Though it's been a long time since Sam Schurr served on the research staff at RFF, his impact is felt every day," said RFF President Paul Portney. "Not only was he a leading light in the fields of energy and mineral economics, but he also helped establish the tradition here of even-handed and empirically grounded analysis."



IN APPRECIATION

The author and co-author of many major works on energy economics, Schurr gained widespread recognition for his pioneering insight into the pivotal importance of fuels and power as part of technological progress and economic growth.

Schurr was born in 1918 in Youngstown, Ohio. After earning degrees at Rutgers and Columbia Universities, he spent the war years working as a research economist in various government settings. In the early 1950s, he worked for the U.S. Department of Interior's Bureau of Mines, where he was chief economist, and the RAND Corporation. His career at RFF as the director of the energy and mineral resources program started in 1954. In 1973, he joined the Electric Power Research Institute as the director of the energy systems, environment, and conservation division. He subsequently returned to RFF as a senior fellow in 1976 before once more joining EPRI. He retired in 1989.

Throughout his professional career, Schurr served on a number of distinguished advisory panels for the National Academy of Sciences and the Federal Power Commission, among others. He was honored by the American Institute of Mining, Metallurgical, and Petroleum Engineers with its Mineral Economics Award in 1968, and by the International Association of Energy Economists for his contributions to the literature of energy economics in 1981.

His wife of 50 years, Beatrice Gray Schurr, died in 1992. He is survived by his second wife, Sally N. Schurr.

BRUCE C. NETSCHERT

Bruce C. Netschert, a distinguished energy economist and early member of the RFF research staff, died of cancer February 15. He was 82.

Among Netschert's specialties was energy pricing and forecasting. He regularly testified before Congress

on energy markets and also served as an expert witness in federal and state courts.

He was born in Newark, N.J. and received a bachelor's degree and a doctorate in economics from Cornell University. During World War II, he served in the Army, specializing in communications and cryptography. From 1951 to 1955, he worked for the President's Material Policy Commission, whose chairman, William Paley, was the catalyst for RFF's establishment. From 1955 to 1961, he served as a senior research associate at RFF where, in addition to *Energy in the American Economy* mentioned in the accompanying commentary, he authored *The Future Supply of Oil and Gas*. Netschert joined National Economic Research Associates in 1961, where he rose to the rank of vice president before retiring in 1989.

He is survived by his wife, Katherine Bock Netschert, and several family members.



REACHING OUT

RFF's researchers continue to bring their work to the world at large. The following is just a sampling of RFF outreach efforts over the past few months.

Ruth Greenspan Bell made presentations at the Foreign Service Institute to foreign service officers preparing to go to Poland, the U.S. Environmental Protection Agency on environmental public participation and the Aarhus Convention in Central Europe, and the Woodrow Wilson Center at a conference on "EU Enlargement and Environmental Quality in Central and Eastern Europe and Beyond."

Jim Boyd was interviewed on NPR's "Morning Edition" for a report on water shortages caused by the continuing northeastern drought. He also was quoted in a Greenwire story on the need for statutory changes to encourage regulatory innovation and flexibility by discouraging lawsuits.

Howard Gruenspecht was interviewed on the PBS "Newshour with Jim Lehrer" as part of a report on the Senate energy bill. He was also interviewed on ABC News'

"World News Tonight with Peter Jennings" and NPR's "All Things Considered" regarding U.S. reliance on foreign oil.

Alan Krupnick briefed a group of economists at the Department of Transportation on new approaches to estimating the value of a statistical life.

Ramanan Laxminarayan spoke on antibiotic resistance at the Woodrow Wilson School of Public and International Affairs at Princeton, and on tobacco at Johns Hopkins School of Public Health. He also participated in a panel discussion on future research directions for drug resistance at the Institute of Medicine, part of the National Institute of Health.

Work by **Richard Morgenstern** and several colleagues on reducing carbon emissions and limiting costs was called "a novel approach to tackling climate change [that] could satisfy economists and environmentalists alike" in *The Economist*. The article concludes, "The RFF approach seems best. It forces politicians to say what price society should be willing to pay to address global warming—and offers a pragmatic way to make that cost explicit."

Paul R. Portney debated John Felmy, the American Petroleum Institute's chief economist, over the role of fuel efficiency standards for cars and light-duty trucks. The event, which was held at Catholic University, was covered on C-SPAN.

The Bush administration's plan to shift the Superfund burden from industry to taxpayers generated many news stories that cited **Kate Probst's** report, *Superfund's Future: What Will It Cost?* which was published last year by RFF Press. News outlets included the *New York Times*, Associated Press (over three dozen placements), *Chemical Week*, the *Chattanooga Free Press*, and *Seattle Times*. She was also interviewed on NPR's "Living on Earth."

David Simpson and **Heidi Albers** have been asked to participate in the "Millennium Assessment," a very broad United Nations-sponsored review of the state of ecological resources and options for improved management.

PENNY-WISE AND POUND-FUELISH?

New Car Mileage Standards in the United States

Paul R. Portney

The debate over domestic energy policy has one side shouting “produce more” while the other side shouts “use less.” Not surprisingly, the Corporate Average Fuel Economy (CAFE) standards were fought over during hearings on the Senate energy bill. The chairman of the NRC’s CAFE Committee offers his perspective on where to go from here.

Our seemingly endless debate about energy policy in the United States has been especially sharp since May 2001 when the Bush administration announced its new national energy policy. If anything, that debate has been much sharper still since the terrorist attacks of September 11, 2001, reminded us of the perils of using as much oil as we do in the United States.

Most of us remember the tiresome beer commercial in which seemingly normal people debated whether a particular brand was better because it “tasted great” or was “less filling.” At the risk of only some exaggeration, we have our own

version of this debate over domestic energy policy, with half the protagonists shouting “produce more” while their opponents shout “use less.” The former look especially fondly at the Arctic National Wildlife Refuge (ANWR) as a possible source of additional oil, while the latter focus on improved fuel economy standards for new cars as the way to slake America’s unquenchable thirst for petroleum. Both sides suffered at least temporary losses when the Senate—in the space of a few short days—recently rejected efforts to open ANWR for oil exploration and to tighten the Corporate Average Fuel Economy (or CAFE) standards for all new light-duty vehicles produced in the United States.

Paul R. Portney is a senior fellow and the president of RFF.

Last year, I had the pleasure of chairing a committee assembled by the National Research Council (the study arm of the National Academy of Sciences) to examine the past and possible future effects of the CAFE standards (hereafter referred to as the CAFE Committee). The committee's final report, *Effectiveness and Impact of Corporate Average Fuel Economy (CAFE) Standards*, was published last summer. Accordingly, I watched the debate over fuel economy standards quite closely. Here I report on the findings of that study and offer some suggestions on the way readers might think about the CAFE program. Let's begin with a bit of history regarding the fuel economy standards and what we know (and don't know) about their early effects.

LOOKING BACK

Because of several disruptions in world oil markets during the 1970s, the price of oil went from less than \$20/barrel in 1970 to more than \$80/barrel in 1981 (converted to year 2000 dollars). Even before the end of that decade, Congress passed legislation requiring all new passenger cars and light-duty trucks (in other words, pickup trucks, minivans, and the now-ubiquitous sport utility vehicles, or SUVs) to meet federal mileage standards. Cars were required by Congress directly to meet a fleet average of 27.5 miles per gallon (mpg) by 1985, and the National Highway Traffic Safety Administration mandated that light-duty truck fleets were to average no less than 20.7 mpg. Since new cars were averaging only about 16 mpg in 1977, the year before the CAFE requirements begin to ramp up, and new trucks about 13 mpg, these required increases were quite significant.

What effects did the new standards have? Perhaps surprisingly, this is a harder question to answer than one might think. The principal confounding factor is that the price of gasoline had been going up since well before the CAFE standards were established. This created

a strong demand on the part of new car buyers for more fuel-efficient cars, as well as an incentive for automakers to produce them. The CAFE Committee found that these two forces working together—higher gasoline prices and federally mandated fuel economy standards—resulted in a greater than 50% improvement in new car and light-duty truck fuel economy between 1978 and 1985. As a result, the country enjoyed significant reductions in oil consumption and also emissions of carbon dioxide, a greenhouse gas.

In fact, the CAFE Committee estimated that by the year 2000, improved fuel economy was reducing oil consumption by 2.8 million barrels per day (or about 14% of the current total) and reducing annual emissions of carbon in the United States by about 100 million metric tons (or 6% of current annual emissions). The committee could not determine how much of these improvements were due to the price effect (which subsided rather dramatically beginning in 1981 when oil prices began their fall back to about \$20/barrel in year 2000 prices) and how much was due to the effects of the CAFE standards. Since 1981, it is highly likely that fuel economy remained where it did solely because of the federal standards.

There is another, less happy consequence to the rapid improvement in fuel economy between 1978 and 1985, however. Because automakers were being forced both by consumer demand for more fuel-efficient cars (for a time, at least) and by government regulations, they had little choice as to the way they could improve fuel economy so rapidly. The result was an almost decade-long cohort of new cars and light-duty trucks that were smaller and lighter than their predecessors. According to all but two dissenting members of the CAFE Committee, the rapid downsizing and “downweighting” of new vehicles that began in 1978 was responsible by 1993 for about 2,000 more fatalities annually than would have been observed had vehicles remained as

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large as they were prior to 1978. As we shall soon see, this does not necessarily mean that further enhanced fuel economy must come at the cost of highway safety, but the rapid improvements of the late 1970s and early 1980s most likely did.

LOOKING AHEAD

Given the improvements of the past, why the continuing concern about future fuel economy? Despite the fact that both passenger car and light-duty truck fleets continue to meet their respective standards, the average fuel economy of the combined new car fleet has declined about 8% since 1986. “How can this be?” you might reasonably ask. Actually, the answer is quite simple, as Figure 1 illustrates. In 1975, when the law establishing the CAFE program was passed, light-duty trucks (once again, this category comprises pickups, minivans, and SUVs) accounted for about 2 million of the 10 million total vehicles sold that year in the United States. By 2001, however, light-duty truck sales accounted for 51% of the 17 million-plus new vehicles sold. Since these light-duty trucks are only required to average

20.7 mpg, as opposed to 27.5 mpg for passenger cars, their growing share of all new-vehicle sales is gradually pulling down the combined new vehicle fuel economy average. Along with robust growth in the number of miles that all cars are being driven, this shift in the new-car mix is a major reason why oil use and imports are growing steadily.

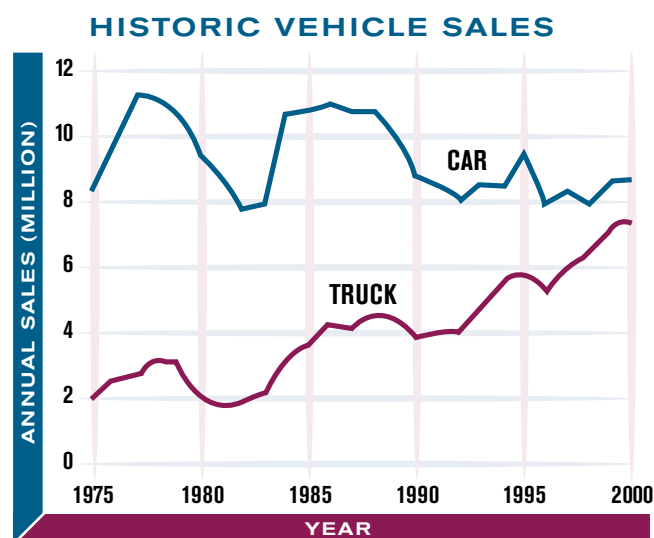
What can and should be done about this? The former is much easier to answer than the latter. Regarding possible future fuel economy improvements, the CAFE Committee thoroughly investigated the technological potential for short-, medium- and long-term gains. According to the committee report, “Technologies exist that, if applied to passenger cars and light-duty trucks, would significantly reduce fuel consumption within 15 years.”

I cannot even begin here to identify all the technologies the committee considered, but they include mostly things that are already in limited use for some parts of the new vehicle fleet rather than technologies for which dramatic breakthroughs are required. Examples are such things as variable valve timing, intake valve throttling, variable-compression ratio engines, continuously variable transmissions, friction reductions, 42-volt electrical systems, and reduced aerodynamic drag and rolling resistance.

So what if the technological potential exists for fuel economy improvements? It is almost always possible to do better technologically than we are currently doing—whether from an automotive, computing, medical, or agricultural standpoint. The really important questions are how much will these improvements cost and what benefits will we derive from them?

The committee provided at least some information along these lines. Beginning with technologies that could improve fuel economy rather inexpensively, and moving successively to those that could do so but at greater expense, the committee first sketched out what economists

FIGURE 1



Notes:

1. Source: Friedman et al. (2001) (see For More Information for details).
2. Trucks include vehicles under 8,500 pound gross vehicle weight (GVW) that are not classified as passenger cars.

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would recognize as a marginal cost curve for fuel economy improvement. This was done on the assumption that the automakers would have at least 10 and as many as 15 years to make these changes—an extraordinarily important assumption, as we shall later see. By combining these cost estimates with estimates of the discounted value of the fuel that would be saved, the committee summarized part of its work in a table like that in Table 1.

As the table indicates, through the application of the technologies the committee identified, it would be possible in 10 to 15 years to improve the fuel economy of a mid-sized passenger car (for example, a Buick Regal, C-class Mercedes, or Honda Accord) from the current mpg average of 27.1 to 32.6 (a gain of 20%). This would add an estimated \$791 to the purchase price of the car but would be more than offset by the \$1,140 in discounted (at 12%) fuel economy savings over the assumed 14-year life of the car. Additional fuel-saving technologies could be applied, but according to the committee these technologies would add more to the purchase price of the car than they would save

in discounted fuel costs. The larger the car, the greater the savings: the fuel economy of a mid-size SUV (such as a Ford Explorer or a Toyota Highlander) could be improved from its current 21 mpg to 28 mpg (33%). This would add \$1,254 to its purchase price but would result in more than \$2,000 in discounted fuel savings over its lifetime.

One question immediately arises: would these estimated improvements in fuel economy adversely affect safety? No, according to the committee. In fact, the committee found that neither passenger safety nor vehicle performance (acceleration and towing capacity, for example) would suffer when measured against today's standards so long as the technologies the committee identified were introduced throughout the fleets. The committee even figured into its calculations a slight increase in the weight of vehicles because of safety requirements likely to be imposed over the next 15 years. (It is possible, even likely, however, that performance would suffer in comparison to what it might be in 10 to 15 years were automakers not required to improve fuel economy.)

TABLE 1

Vehicle Class	Base mpg	Enhanced mpg (% Improvement)	Purchase Price Increase (\$)	Lifetime Fuel Savings (\$)
CARS				
Subcompact	31.3	35.1 (12)	502	694
Compact	30.1	34.3 (14)	561	788
Midsized	27.1	32.6 (20)	791	1,140
Large	24.8	31.4 (27)	985	1,494
LIGHT TRUCKS				
Small SUVs	24.1	30.0 (25)	959	1,460
Mid SUVs	21.0	28.0 (33)	1,254	2,057
Large SUVs	17.2	24.5 (42)	1,629	2,910
Mini Vans	23.0	29.7 (29)	1,079	1,703
Small Pickups	23.2	29.9 (29)	1,067	1,688
Large Pickups	18.5	25.5 (38)	1,450	2,531

Source: Adapted from NRC CAFE report (see For More Information for details).

THINKING MORE DEEPLY

Does all this mean that it's a good idea to impose more stringent fuel economy standards on automakers? Possibly, but not necessarily. First, one could argue, most people already know full well they could get better fuel economy by purchasing a different car. After all, no one buys a large SUV thinking it will stretch his or her gasoline dollar. Rather, at gasoline prices that typically range between \$1.25 and \$1.75 per gallon, there simply isn't very great demand among the American public for "fuel-sippers." Although I take strong issue with several of the arguments put forward by automakers during the recent Senate debate on CAFE, they are dead right on at least one count. CAFE standards require them to produce more fuel-efficient cars than large segments of the public appear to want—at least at current gasoline prices.

Second, if the government does require better new-car fuel economy, or if automakers provide it voluntarily, then the cost of driving a given distance falls (you'll use less gas per mile driven). This means the number of miles traveled will increase—about 1 to 2% for each 10% reduction in the cost of driving, according to research. This "rebound" effect—and its possible contribution to air pollution, increased congestion, and accident risks—has to be factored into CAFE policymaking.

Third, if people are much more sensitive to the upfront cost of buying a new car than to the fuel savings they will enjoy over its life, tighter CAFE standards could slow down the retirement of older vehicles on the road. ("We can't afford a new car, so we'd better keep ol' Bessie for a while.") We have observed this effect (called "new source bias") in decisions regarding the construction of new coal-fired power plants, certainly (see the article by Gruenspecht and Stavins in this issue), and it could keep gas-guzzlers on the road longer than we expect.

Fourth and finally, suppose CAFE standards are made more stringent. Although the CAFE Committee argued that this need not adversely affect safety or performance so long as automakers adopt the technologies identified by the committee, there certainly would be no requirement that they do so. If they chose to meet tighter standards by, once again, making cars smaller and lighter, drivers and passengers could be put at greater accident risk. Of course, consumer insistence on vehicle safety could force automakers down the technological route to enhanced fuel economy.

Given these possible shortcomings, CAFE standards must be weighed against the benefits of improving fuel economy. It is clearly worth something to reduce emissions of carbon dioxide and there are benefits as well to lessening our dependence on oil and, hence, our vulnerability to oil price shocks.

Suppose that a ton of carbon reduced is valued at \$50, the figure used by the CAFE Committee (admittedly at the high end of the current range of estimated benefits of carbon abatement). Suppose further that the external benefits of each barrel of reduced oil consumption are valued at \$5 (again, at the high end of estimated values). Together, these are equivalent to a \$0.25 premium on the price of a gallon of gasoline. For this premium to be larger, either additional benefits of fuel economy improvements have to be identified or larger values justified for carbon reduction and/or oil consumption reductions.

A BOTTOM LINE

By far, the hardest question for any policy analyst to answer is this one: What would you do if the decision were yours to make? First, recognize that CAFE standards are distinctly inferior to higher gasoline taxes (and thus prices) as a way of dealing with both climate change and oil market externalities, a key finding in

the CAFE Committee report. Higher gasoline prices would motivate new car buyers to demand better fuel economy; accordingly, automakers would be more willing to produce such vehicles since the demand would be there. Much more importantly, higher gasoline prices would also create an incentive for those driving the 200 million plus vehicles already on the road in the United States to drive less, carpool (or take public transport) more, and keep their cars in better tune. By working only on the new-car margin, CAFE is an incredibly slow way to deal with climate change and oil consumption. Thus, in my world of worlds, I would gradually increase gasoline taxes (along with taxes on all other carbon-based fuels), while rebating the tax revenues to the public by reducing other taxes so as not to exert drag on the economy.

But what if our elected officials continue to lack the wisdom or, more likely, the will to increase the taxes on gasoline and other carbon-based fuels? Is the CAFE program an acceptable, second-best alternative? Yes, I reluctantly conclude, but only if it is modified in ways the committee recommended.

I would support gradual increases in the required fuel economy targets automakers face, beginning in model year 2007 and extending through 2017. By that time, the passenger car fleet ought to be averaging 35 mpg and the light-duty truck fleet, 28 mpg. However, manufacturers whose fleets fall short of these targets must be able to purchase fuel economy “credits” from companies whose cars or light-duty trucks exceed the goals.

There is no reason why an automaker wishing to specialize in heavy-duty pickups or large SUVs should have to produce smaller vehicles to offset its fleet impact so long as it can pay another manufacturer to make “gasoline misers.” Moreover, if fuel economy improvements are harder to come by technologically than the CAFE Committee believed (so that safety might be compromised),

the government should offer to sell extra fuel economy credits to automakers at some predetermined price—a “safety valve,” if you will, to ensure that the fuel economy program does not become more expensive than it should.

There are no easy calls regarding fuel economy. Now you have mine.

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THE ARSENIC RULE:

A Case for Decentralized Standard Setting?

Wallace E. Oates

The controversy over EPA's rule regarding arsenic in drinking water centered largely on the agency's own cost-benefit study, which produced less than black-and-white results. A close examination of the arsenic "problem" points out the dilemma in setting a national standard when there are striking variations in costs across water districts.

In the waning days of the Clinton administration, the U.S. Environmental Protection Agency (EPA) issued a new standard for the permissible level of arsenic in U.S. drinking water. The new arsenic rule reduced allowable arsenic concentrations by 80% from 50 parts per billion (ppb) to 10 ppb. A short time later, the new Bush administration put the revised standard on hold, citing the need for further scientific evaluation. But following a contentious period of debate, EPA Administrator Christine Whitman announced in October 2001 that the new arsenic standard would indeed be 10 ppb, as set in January.

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The controversy has centered largely on the original EPA benefit-cost study. The study supporting the new measure presents, in fact, a close call. The estimated benefits are somewhat less than the costs for the benchmark case, but the government has argued that there are sufficient “intangible” benefits to make the measure worthwhile. Some subsequent studies, in contrast, find the EPA analysis far too optimistic and argue that the new measure comes nowhere near passing the benefit-cost test.

A close examination of the nature of the arsenic problem suggests, in my view, a quite different perspective on the whole matter. I will argue that rather than setting any uniform national standards, there

is a persuasive, if provocative, case for decentralized standard setting. My proposal is that each water district in the United States be empowered to choose its own arsenic standard.

The basis for this proposal is twofold. First, the arsenic standard is a very close, real-world approximation of what economists call a “local public good.” The issue here is long-term exposure to a contaminant with certain carcinogenic risks. But the population at risk is restricted to regular users of the local water system—that is, the residents of the particular water district. Drinking water quality is a service shared by a well-defined local group of people (at least for most contaminants).

Second, there are striking variations in the cost of treatment across U.S. water districts. Treatment of drinking water is an activity that exhibits enormous economies of scale. Table 1 reports the cost per household of achieving the target of 10 ppb for water districts of different sizes. This target can be attained very inexpensively in large water districts—at less than \$1 per annum per household in the largest class of districts. But, as the table shows, implementing this standard is a very dear proposition for residents of small districts; its cost per year can exceed \$300 per household!

The move from 50 ppb to 10 ppb brings an estimated tiny reduction in risk. EPA estimates that the tighter standard may save approximately 20 to 30 statistical lives per year nationwide. But this is subject to a large dose of scientific uncertainty—some claim that a reasonable confidence interval will actually encompass zero lives saved.

The point here is that it may well be worth an extra \$1 per year per household for such a small risk reduction as this. But it seems highly unlikely that this can justify an expenditure of more than \$300. Indeed, such a sum could effect far greater reductions in risk if used for other public (or private) health measures, such as increased frequency of mammograms, colon screening, or a host of other measures. In short, the arsenic rule is

a case where a uniform national standard seems highly inappropriate; one size simply doesn’t fit all in this case.

LARGE VERSUS SMALL WATER DISTRICTS

It is interesting that the pattern of existing arsenic concentrations, in fact, reflects the cost differentials in Table 1. Most large water districts already meet the standard of 10 ppb. Of the 54,000 community water systems in the United States, about 95% are already in compliance with the proposed new standard. Of the systems that will have to introduce more stringent treatment procedures, 97% are small systems that serve fewer than 10,000 people each. The new measure would thus impact primarily small districts, precisely those for whom the new standard is most expensive and likely not worthwhile.

EPA is well aware of the costliness of this measure for small water districts. In fact, there is provision under the Safe Drinking Water Act for “exemptions” from the standard due to “compelling” factors that

TABLE 1

AVERAGE ANNUAL COST PER HOUSEHOLD FOR AN ARSENIC STANDARD OF 10 PPB BY SYSTEM SIZE

System Size	Cost Per HH
<100	\$327
101-500	163
501-1,000	71
1,001-3,300	58
3,301-10,000	38
10,001-50,000	32
50,001-100,000	25
100,001-1million	21
>1 million	0.86
All categories	32

THE ARSENIC RULE

may include the inability of a particular district to meet the cost of complying with the standard. However, the term exemption is a little misleading here; it is not an exemption from meeting the standard but rather the granting of an extension of the period over which the district must come into compliance.

Whitman has indicated the agency's commitment to working with small districts to assist them in various ways (including grants and loans) to meet the new standard. But this really avoids facing up to what I see as the real issue here: the standard simply is inappropriate for small water districts. The nature of the problem suggests that the standard should be tailored to the circumstances of individual districts. And these circumstances might well reflect not just differences in costs, but also differences in preferences across various communities. The best way to accommodate such variation is to allow districts to determine their own standards.

Let me offer a vision of how decentralized standard setting might work. EPA would play a critical role in providing basic information and guidance both for the risks associated with different arsenic standards and for the costs of treatment. The agency would, in a sense, provide a menu of choices to individual water districts. The districts themselves would then, either through their own elected officials or through a referendum if they wish, select their own standards for the arsenic concentration. In this way, both the large differences in treatment costs and any differences in preferences across localities would manifest themselves in local choices. The outcome would be a range of standards across districts, tailored to the particular conditions of each.

BEST LEFT TO EXPERTS?

This is admittedly a tricky and contentious issue. Some believe that the setting of public-health standards should be left to the experts. This issue is not quite the same thing, they would argue, as a decision on whether

or not to repave a local road. And yet, we give plenty of responsibility to decentralized levels of government. And I am not persuaded that the outcomes are generally inferior to uniform national standards set at the central level. The experts, in my proposal, still have a crucial role to play: providing basic information and guidance. The key point here is that a uniform standard for a local public good is not the economically right answer: it involves a waste of valuable resources. We can do better, sometimes much better, with programs that are responsive to local settings and conditions.

The arsenic rule, of course, is not the only candidate for decentralized standard setting. In fact various other pollutants of drinking water present similar opportunities for individualized standards that are responsive to local conditions. And this may well apply to certain other dimensions of highly localized environmental quality. But the arsenic rule presents an intriguing case that could be used as an experiment or initial foray into this kind of localized environmental decisionmaking.

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NEW SOURCE REVIEW UNDER THE CLEAN AIR ACT:

Ripe For Reform

Howard K. Gruenspecht and Robert N. Stavins

As currently applied, the New Source Review program wastes resources and can retard environmental progress. It should be replaced with more effective and efficient environmental policies.

The Bush administration, like the Clinton administration before it, is considering significant changes in the rules and guidance implementing a Clean Air Act requirement that new or upgraded facilities be cleaner than old ones. These changes would clarify the circumstances under which upgrade or maintenance projects at existing plants trigger this provision. Environmentalists (and some in Congress), who fear that the new guidance will also make it easier to modernize existing plants without installing new pollution control

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equipment, have cried foul, saying that the Clean Air Act's New Source Review (NSR) program is the cornerstone of meaningful environmental regulation of power plants and other major emissions sources.

In our view, critics of NSR reform are wrong on their own terms. As currently applied, NSR wastes resources and can retard environmental progress. To assure sustainable environmental progress, NSR should be replaced with more effective and efficient environmental policies. Here we discuss the inefficiencies inherent in NSR and briefly outline several more promising policy approaches that address the problems caused by the distinction between new and old plants.

WHAT IS NSR?

The NSR program applies to any new source whose potential emissions at full utilization are high enough to qualify it as a major source¹. The program also applies to any modification at an existing major source that results in an emissions increase. In addition to securing a permit prior to commencing construction or modification, sources subject to NSR must achieve emissions rates that reflect the performance of the best-available emissions control technology. NSR sources located in areas that do not meet national ambient air quality standards are also required to secure offsets for their emissions.

The NSR requirement under the Clean Air Act dates back to the 1970s. The lawyers and engineers who wrote the act thought they could secure greater environmental progress by imposing tougher emissions standards on new power plants (and certain other emissions sources) than on old ones. The theory was that emissions would fall as old plants were retired and replaced by retrofitting control equipment. But experience over the past 25 years has shown that this approach is both excessively costly and environmentally counter-productive. The reason for this is that companies are motivated to keep old (and dirty) plants operating and to hold back on investments in new (and cleaner) power generation technologies.

NSR AND NEW PLANTS

NSR can create perverse environmental incentives, especially when major technology advances make new plants much cleaner than old ones. A recent analysis by Byron Swift illustrates how NSR requirements can impede the adoption of clean and efficient energy

¹ The cut-off value used to determine whether a source is major generally varies between 10 and 100 tons of emissions per year, depending on the source category and the severity of any air quality problem where the source is located.

technologies, such as combined heat and power (CHP) systems. In a modern CHP system, fuel is burned in a turbine to generate electricity, and the waste heat from combustion, which in conventional stand-alone generation systems is vented to the atmosphere, is used in commercial or industrial processes at the site. A new CHP installation using a gas-fired turbine with low-nitrogen oxide burners and no end-of-pipe emissions controls substantially reduces nitrogen oxide emissions from levels that would result from the continued operation of an existing onsite boiler to provide process heat and an offsite power plant to provide power. CHP also allows for a substantial reduction in the total primary energy input required to meet heat and power needs, yielding economic benefits and lower carbon dioxide emissions.

Unfortunately, NSR rules pose a substantial deterrent to the spread of CHP technology. Potential users of CHP, typically existing industrial or commercial facilities with old onsite boilers, are subject to an uncertain and time-consuming NSR permitting process. In addition, NSR rules require the application of end-of-pipe control technology to an already clean turbine with very low emissions. This requirement can significantly increase the cost of a CHP project and removes only a small amount of pollution, resulting in a very high cost per ton of removal — upwards of \$25,000 by Swift's estimate, or 25 to 75 times the cost of emissions reductions available from existing sources.

In addition to delaying capital stock turnover, NSR can also promote environmentally perverse decisions regarding the use of new capacity. For example, new coal-fired power plants built following passage of the 1977 Clean Air Act Amendments are required to build and operate scrubbers to remove sulfur dioxide emissions. However, the costs of running scrubbers were high enough that new coal-fired plants were more expensive to operate than many existing ones, which were not regulated under a new source standard.

Under these conditions, utilities reduced output from their new, scrubbed units while operating older plants at full capacity during off-peak seasons and time periods.

By reversing the usual preference for maximizing use of the most modern capacity, differentiated regulation sharply reduced the environmental benefits resulting from the mandated investment in expensive scrubbing equipment. This part of the story, at least, has a happy ending: the sulfur dioxide emissions trading program implemented under the Clean Air Act Amendments of 1990, which is discussed below, overcame the inefficiencies in sulfur dioxide regulation associated with NSR-type programs.

NSR AND EXISTING PLANTS

NSR applies to existing plants only if they make a major modification that results in a net increase in emissions. This approach has several serious problems. First, although old plants typically emit the lion's share of total pollution in any sector, NSR does not provide a continuous and effective incentive for emissions reductions at these plants. As a result, many of the most cost-effective emissions reduction opportunities are simply not exploited. Second, because the lengthy and costly NSR process is triggered by a "modification," the NSR program actually provides a disincentive for improvements and efficiency upgrades at old plants. Since adjusting the existing equipment to perform better can be a major source of pollution reductions as well as cost savings, the chilling effect of NSR can be both economically and environmentally harmful. Third, NSR creates a highly uncertain environment with high transaction costs for business.

The finding of a major modification inevitably raises tricky issues in situations where changes are made to an existing plant. The combination of delay cost, control technology costs, and the cost of emissions

offsets create a powerful incentive for existing sources to avoid triggering NSR.

The decision to apply for an NSR permit rests with the plant owner. Routine maintenance, repair, and replacement activities are recognized as falling outside the scope of the NSR program, but the line separating these activities from a physical change that would be covered by the NSR process is subject to uncertain and changing interpretation. Several high-profile enforcement actions against major electric utilities were initiated in 1999, alleging that the utilities had evaded NSR requirements by improperly classifying major upgrade and life-extension projects as activities that do not count as major modifications under EPA's regulations.

Existing plants can also avoid triggering NSR requirements by demonstrating that a modification, even if otherwise major, does not increase emissions. For steam-electric generating units, actual emissions before the change are compared with projected emissions after the change to determine whether a modification increases emissions. Modifications that allow a plant to produce more electricity per unit of fuel burned can lead to an increase in its projected future emissions, because better efficiency will often result in higher projected utilization. Such projects can trigger NSR, even if they reduce emissions in the region, considering induced changes in the utilization of other facilities. Facilities other than steam-electric generating plants, which under current rules must compare their potential emissions at maximum operating rates after the actual change to actual emissions before it, face an even higher hurdle in demonstrating that a modification causes no increase in emissions.

The current interpretation of NSR discourages companies from maintaining their existing facilities. Plant owners contemplating maintenance activities

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must weigh the possible loss of considerable regulatory advantage if the work crosses a murky line between upkeep and improvement. Protracted, costly, and time-consuming legal wrangling is inevitable over whether maintenance activities have crossed a threshold sufficient to justify forcing an old plant to meet new plant standards. In the electricity sector, the deferral of maintenance compromises generation plant reliability, and thereby increases the risk of outages.

WHAT CAN BE DONE?

Although environmental regulation is often necessary to achieve emissions reductions, research has shown that the NSR process unnecessarily drives up costs (not just for the electricity companies, but also for their customers and shareholders) and can result in worse environmental quality than would have occurred if firms did not face this disincentive to invest in new, cleaner technologies. NSR is reminiscent of the misguided 1970s effort to regulate differentially the price of old and new oil, which likewise created perverse incentives and spawned innumerable lawsuits. Congress and the administration responded by replacing that unworkable policy. It is time to take similar action with NSR. Both short- and long-run changes are needed.

The ultimate solution is a level playing field that motivates both old and new plants to cut emissions in order to achieve clearly defined environmental objectives. The best approach is to cap total pollution emissions and use an allowance trading system to assure that any emissions increases at one plant are balanced by offsetting reductions at another. The sulfur dioxide program in the 1990 Clean Air Act, which has successfully achieved targeted emissions reductions with a minimum of litigation, can serve as a model.

No matter how emissions are initially allocated across plants, the owners of existing plants and those

who wish to build new ones will then face the correct incentives with respect to retirement decisions, investment decisions, and decisions regarding the use of alternative fuels and technologies to reduce pollution. Requirements for localities to meet ambient air quality standards would remain in effect, preventing a concentration of emissions allowed under the cap in any geographic region that would conflict with needs to protect public health with an adequate margin of safety.

Of course, emitters and environmentalists may have different views regarding stringency—which pollutants should be capped and at what levels. As we seek to craft policies to replace NSR, it will be important to weigh carefully the arguments presented by both sides regarding the environmental advantages and costs of alternative targets. To date, the evidence suggests that it is both feasible and desirable to set caps that would substantially reduce emissions of nitrogen oxides, sulfur dioxide, and mercury from their current levels.

As Congress puts caps for the relevant pollutants in place, NSR should be phased out. In the meantime, and for sectors and pollutants where cap-and-trade systems are not established, explicit NSR thresholds—such as spending more than 3 to 5% of a plant's value on maintenance procedures—should be set to reduce disincentives for maintenance that result from uncertainty. Other issues also need to be addressed as part of this process, including the choice of time period for measuring actual emissions prior to a physical change that could trigger NSR, the scope of opportunities to use an emissions bubble combining several point sources in applying NSR, and ways to apply more uniform rules for comparing before and after emissions in all sectors.

Where to set investment thresholds and how to resolve these other issues are matters of dispute between industry and environmentalists, as both sides seek

leverage for upcoming debates in Congress. Neither side comes to the table with completely clean hands. But this short-run maneuvering should not detract attention from the importance of clearing up the current ambiguities in the NSR program.

Finally, some of the problems with NSR can be ameliorated by improved design in other parts of the regulatory program in order to explicitly recognize the importance of capital stock turnover to both environmental and economic progress. One idea along these lines is to allow the owner of a major emissions source affected by a new environmental standard the option of a somewhat longer period to bring the facility into compliance in exchange for a firm and enforceable commitment to retire the facility following the extension. The short-run environmental cost of such a policy arises from the possibility of a modest delay in reductions of the targeted pollutant.

However, retirement of an old facility, once it occurs, will often result in larger reductions in the targeted pollutant, as well as significant reductions in other emissions. For example, a new gas-fired power plant that would most likely replace an existing coal plant under today's market conditions would have substantially lower emissions of sulfur dioxide, nitrogen oxides, mercury, particulates, and carbon dioxide than the coal plant, even when the latter is retrofitted with advanced emissions controls. Thus, it is quite possible that the retirement option, if taken, can produce positive results—both from an environmental and an economic perspective—by helping to accelerate the replacement of dirty old plants with clean new ones.

It is not only possible, but also eminently reasonable to be both a strong advocate for environmental protection and a strong advocate for the elimination of NSR and its replacement with more cost-effective policies. And that is where the evidence leads us.

For More Information:

Edison Electric Institute. 2001. Straight Talk About Electric Utilities and New Source Review. (<http://www.eei.org/issues/enviro/nsr/straight.pdf>, accessed April 19, 2002). Lays out the concerns of major coal-burning utilities in a position paper.

Spitzer, Elliot. 2002. Press Statement by the New York Attorney General on the President's Air Policies. (http://www.oag.state.ny.us/press/2002/feb/feb14b_02.html, accessed April 19, 2002). Addresses environmental concerns.

Swift, Byron. 2000. Grandfathering, New Source Review, and NO_x—Making Sense of a Flawed System. *Bureau of National Affairs Environment Reporter*, vol. 31, no.29, 1538–1546.

U.S. Energy Information Administration. 2002. Analysis of Strategies for Reducing Multiple Emissions from Power Plants: Sulfur Dioxide, Nitrogen Oxides, and Carbon Dioxide, SR/OIAF/2000-05, December. (<http://www.eia.doe.gov/oiaf/servicerpt/powerplants/footnotes.html>, accessed April 19, 2002). Provides an assessment of the potential impact on electricity markets of current NSR enforcement actions against coal-fired power plants.

U.S. Environmental Protection Agency (EPA), 2001 NSR 90-Day Review Background Paper, June 2001. (www.epa.gov/air/nsr-review/nsr-review.pdf, accessed April 19, 2002). Provides background on the NSR program and its implementation, and summarizes publicly available data related to the impact of the program on investment in electric generation and petroleum refining facilities and related environmental controls. EPA's technical NSR website can be found at <http://www.epa.gov/ttn/> (accessed April 19, 2002).



RFF WELCOMES TWO NEW BOARD MEMBERS

KATHRYN S. FULLER



Kathryn S. Fuller is the most recent addition to RFF's board of directors. Fuller is the president and chief executive officer of the World Wildlife Fund (WWF)-US, a position she has held since February 1989. She served previously as executive vice president, general counsel, and director of WWF's public policy and wildlife trade monitoring programs.

Before joining WWF in 1983, Fuller practiced law with the U.S. Department of Justice, first in the Office of Legal Counsel, then in the Land and Natural Resources Division, where she headed the Wildlife and Marine Resources Section.

Fuller received a bachelor of arts degree from Brown University and a juris doctorate from the University of Texas. She pursued graduate studies in marine, estuarine, and environmental science at the University of Maryland. Her field work includes wildebeest behavioral studies in Tanzania and coral reef studies in the Caribbean.

She has received several honorary doctorates and awards, including a place on the U.N. Environment Programme's Global 500. Fuller serves on several nonprofit boards for organizations

that include Brown University and the Ford Foundation. She is a member of the Council on Foreign Relations.

Fuller's work at WWF has emphasized innovative conservation methods such as debt-for-nature swaps and environmental trust funds, and she has advocated for the inclusion of women in grassroots conservation programs and for the design of projects that provide both environmental and economic benefits. During her 13 years as president and chief executive officer, WWF-US has doubled its membership, tripled its revenue, and expanded its presence around the globe.

JOAN Z. (JODIE) BERNSTEIN



Jodie Bernstein is another addition to the RFF Board. Bernstein most recently completed six years as director of consumer protection at the Federal Trade Commission (FTC). During her tenure, the agency targeted fraudulent operators of commercial web sites; initiated a leading coordination program in the government's effort to attack identity theft and reported to Congress on issues of Internet privacy.

Prior to her work with FTC, Bernstein served for several years at

the Environmental Protection Agency (EPA)—first as general counsel and then as assistant administrator for enforcement of EPA's regulatory and permit programs. Following her service as the general counsel of the Department of Health and Human Services, she joined the Washington law firm Wald, Harkrader and Ross's environmental practice representing Pfizer and Merck in several Clean Water Act matters and Westinghouse Electric in a major Superfund case in Indiana. She also represented Waste Management Inc. in connection with several RCRA and Superfund matters at the federal and regional levels.

For the next five years, she was the general counsel of Chemical Waste Management, the country's largest hazardous waste company. She subsequently served as a senior vice president of Waste Management Inc., the parent company, where she developed and supervised the company's environmental compliance and ethics programs.

Bernstein has been recognized as a spokesperson on consumer, environmental, and health and safety issues. As such, she received several awards, including the Good Housekeeping Award, the National Consumer League Trumpeter Award and an Excellence in Government Service Award from the National Association of Women Executives in State Government.



RFF'S ACADEMIC AWARDS, 2002-2003

GILBERT WHITE FELLOWS

Thomas Lyon and Timothy Considine won RFF's 2002-2003 Gilbert White Postdoctoral Fellowships. Awarded annually since 1980 in honor of the retired chairman of the RFF Board, the fellowships support postdoctoral research in the social or policy sciences in areas related to natural resources, energy, or the environment.

Lyon, associate professor and Bank One faculty fellow in the Department of Business Economics and Public Policy at Indiana University, will write a book, *Corporate Environmentalism and Public Policy* (to be published by Cambridge University Press) and study the effect of regulation on investments in the electric power industry, particularly mechanisms for inducing investment in transmission.

Considine, director of the Center for Economic and Environmental Risk Assessment and a professor in the Department of Energy, Environmental, and Mineral Economics at Pennsylvania State University, will complete a book on the industrial ecology of steel (initially funded by the National Science Foundation) and work on two additional topics: the economic value of hurricane forecast information and an empirical paper on spot and forward pricing of sulfur dioxide pollution permits.

JOSEPH FISHER DISSERTATION AWARDS

In honor of the late RFF president, the Joseph L. Fisher Dissertation Awards were given to support the following students in their final year of study:

Zuhre Aksoy, Department of Political Science, University of Massachusetts, for her study of how farmers adapt to changing pest, pathogen, and environmental conditions under different national and international institutional regimes; **Diji Chandrasekharan Behr**, Department of Natural Resources, Cornell University, for her dissertation on the role of commercialization initiatives in promoting cultivation of nonwood forest products in order to advance forest conservation; **Sueng-Rae Kim**, University of Texas-Austin, whose thesis focuses on the development and application of theoretical/empirical general equilibrium modeling to evaluate policy interactions affecting economic growth in a world with other existing policy distortions; and **Fumie Yokata** of Harvard University, whose research develops a value-of-information model to understand and measure the usefulness of various toxicological testing requirements of the U.S. Environmental Protection Agency under the pilot phase of the Voluntary Children's Chemical Evaluation Program.

WALTER O. SPOFFORD MEMORIAL INTERNSHIP

The Walter O. Spofford Memorial Internship is for graduate students with an interest in Chinese environmental issues. **Chunxiang Li**, from the Department of Public Policy and Administration, University of Massachusetts at Amherst, will work with RFF researchers on issues related to China and the World Trade Organization.

RFF FELLOWSHIPS IN ENVIRONMENTAL REGULATORY IMPLEMENTATION

RFF awarded its new fellowship for the pursuit of scholarly research documenting the implementation and outcomes of environmental regulations to three winners. **Leonard Shabman**, professor, Department of Agricultural and Applied Economics at Virginia Tech University, will research the origins, implementation, and consequences of wetlands provisions in the Clean Water Act. **James T. Hamilton**, associate director of the Sanford Institute of Public Policy and Oscar L. Tang Family Associate Professor of Public Policy, Economics, and Political Science at Duke University, plans to study the origins and impact of the Toxics Release Inventory Program. **Roger A. Sedjo**, senior fellow, RFF, will focus on implementation and outcomes under the Plant Protection Act as related to the commercialization of transgenic trees for the production of timber and industrial wood.



RFF PRESS UPDATE

Through RFF Press, RFF supports the publication of original, high-quality books about a broad range of important issues in environmental and natural resource policy. During the winter and spring, we released four new books.

One of RFF's most notable books of the past decade was *A Shock to the System*. Published in 1996, the book offered a history of electricity policy, with a rigorous analysis of various proposals for restructuring the industry and increasing the role of competition. Not surprisingly, the most anticipated of RFF's recent publications is a follow-up work: *Alternating Currents: Electricity Markets and Public Policy*, by Timothy J. Brennan (RFF), Karen L. Palmer (RFF), and Salvador Martinez (University of Florida). *Alternating Currents* examines the difficulties involved in introducing market competition and builds on experiments, experiences, and lessons in California, Pennsylvania, Chile, and the United Kingdom. The authors consider what makes electricity a unique resource, and present the potential conflict between competition and reliability as the most pressing of long-term concerns about the transformation of the electric power industry.

The environmental challenges of developing countries are becoming a frequent focus of RFF books. *Which Way Forward? People, Forests, and Policymaking in Indonesia*, which includes perspectives

from 26 social and natural scientists who have had extensive experience in Indonesia, is one such book. Indonesia has some of the world's most spectacular and biodiverse forests. But the economic and political turmoil of the past several years have had dramatic consequences for both the health of the nation's forests and the well-being of its human inhabitants. The contributors tell a complex story about the interactions of politics, economics, ethnic conflict, fire, and weather. Edited by Carol J. Pierce Colfer and Ida Aja Pradnja Resosudarmo, the book is RFF's second collaboration with the Center for International Forestry Research, headquartered in Bogor, Indonesia.

In *Pollution Control in East Asia*, Michael Rock, an economist at Hood College, brings his academic experience and his work for Winrock International and the World Bank to a study of the economic and political factors associated with efforts to reduce industrial pollution in China (including Taiwan), Indonesia, Malaysia, Singapore, and Thailand. In evaluating the results of pollution control policies, Rock looks at the relevant historical and political context for each economy, the pressures placed on its political system from domestic and international sources, and the influence of ongoing trends in East Asia for democratization and economic liberalization.

The publication of books about

developing countries brings an obligation to disseminate their content where it can be most directly applied. *Which Way Forward?* and *Pollution Control in East Asia* mark RFF's first copublications with the Singapore-based Institute of Southeast Asian Studies, which will distribute the books throughout East and South Asia. In addition, an Indonesian-language edition of *Which Way Forward?* will be published in the summer of 2002 by Yayasan Obor, a Jakarta institute that promotes cultural growth, democratic values, and human rights through scholarly publishing.

RFF's fourth new book looks at the participants and process involved in making environmental decisions. Increased public participation in the policymaking process sounds virtuous, but does it have a practical, positive consequence for environmental management? Focusing on the United States, *Democracy in Practice: Public Participation in Environmental Decisions* considers 239 cases from 30 years of public involvement in the policymaking process. Thomas Beierle (RFF) and Jerry Cayford (RFF) provide a concrete assessment of the achievements of public participation, demonstrating the value it has in education and in reducing the conflict and mistrust that often plagues environmental issues.





EMERGING PUBLIC HEALTH AND ENVIRONMENTAL CONCERNS CALL FOR NEW WAYS OF THINKING

Two public health and environmental problems once thought to be intractable—antibiotic resistance and fine particulate matter in the air—are emerging as serious public health and environmental concerns. Solutions will not be easy to find without rigorous, formal analysis and the cooperation of stakeholders from scientific disciplines, government, and industry, according to the economists and policy experts who spoke at two panel sessions during RFF's Spring Council meeting held in April.

John Graham, administrator of the Office of Management and Budget's Office of Information and Regulatory Affairs, said, "We face an enormous challenge in gauging the severity of an emerging health threat." Sometimes there may be widespread public concern but little historical basis for determining the magnitude of the threat—examples include antibiotic resistance, bioterrorism, and mad cow disease, he said. In order to perform good risk assessment of these emerging threats, "we need much better information about the most susceptible groups in society."

A LOOMING THREAT

A challenging dimension to solving the problem of antibiotic resistance centers on the question of incentives. In the field of resource economics, antibiotic resistance would be considered

a fundamental common property problem, said Ramanan Laxminarayan, an RFF fellow. Even though the available pool of antibiotics is dwindling, consumers, cattle and chicken producers (which use the drugs for promoting growth), and drug manufacturers have no formal incentive to change their own current behavior, he said.

There are many reasons why antibiotic resistance is increasing, Laxminarayan said. Antibiotics are overused and often inappropriately used. A small number of drugs are widely marketed, with few alternatives under development, and bacteria quickly evolve and become resistant to them. The result is a looming public health threat from increasing strains of drug-resistant pneumonia and tuberculosis.

According to Mark Goldberger, acting director of the Food and Drug Administration's Office of Drug Evaluation, there are existing tools to help foster the development of new drugs in the form of formal and informal FDA guidance, early assessments of a drug's efficacy (done for certain AIDS drugs), and exclusivity for "orphan" drugs developed for small patient populations.

"But there's more that we can do," Goldberger said. "We can reduce the size of drug trials, address the tradeoffs between a drug's effectiveness and the enormous resources required to perform a trial, and evaluate trial data on qualitative and not just quantitative aspects."

In funding new drug research, antibiotics compete unfairly against drugs used to treat chronic diseases,



Raymond Kopp, RFF; Daniel Greenbaum, Health Effects Institute; Alan Krupnick, RFF; and Jeffrey Holmstead, U.S. Environmental Protection Agency



where there's an ongoing revenue stream, said Bert Spilker, senior vice president for scientific and regulatory affairs at PhRMA, an industry trade association. To tip the balance, he said, manufacturers need incentives, including accelerated FDA approval, patent extensions to allow companies more time to develop new drugs, and more fundamental research into the problem of resistance.

LEARNING LESSONS

The government tends to treat all fine particulates in the air as equally toxic, regardless of their precise diameter or chemical composition “because it’s analytically simple even though it’s not biologically plausible,”

said Graham. The growing body of scientific evidence about particulate matter (PM) “could play an important role in helping us set good priorities and do effective cost-benefit analyses,” he said.

Since the PM_{2.5} standard was established in 1997 by the U.S. Environmental Protection Agency, a substantive body of field data has been developed that compares morbidity and mortality rates against air pollution levels. (PM_{2.5} refers to particle size.) The lessons to be learned from those data point toward curbing sulfur dioxide (SO₂) emissions as the most effective means for cutting particulate matter levels, but there are still many other unanswered questions, the experts said.

The president’s proposed “Clear Skies Initiative”—which will cut power plant emissions of nitrogen oxides (NO_x), SO₂, and mercury, using a market-based approach—should yield substantive cuts, they agreed.

Dan Greenbaum, president of the Health Effects Institute, said poorer people (as defined by educational level, a marker for income) tend to suffer greater health impacts because they often work outdoors and get more exposure. But confounding issues, such as diet and access to health care and air conditioning, do have to be considered, he said.

When everything else is controlled for, there’s roughly a 4 to 7% increase



John Graham, Office of Management and Budget (Right): Amy Schaffer, American Forest and Paper Association



All photos: Michael Carpenter



in mortality for a 10% increase in micrograms per cubic meter in ambient concentration of fine particles, Greenbaum said. But in the long run, there are questions that still need to be answered, like is there a dose response? when do effects occur? and are all particles equal? “We’re still learning, about mechanism and effect,” he said. “It’s unlikely that we’ll find one magic bullet—there are too many factors to account for.”

Alan Krupnick, an RFF senior fellow, explained that “an enormously complicated interaction” occurs when SO_2 and NO_x emissions enter the atmosphere, generating sulfates (from SO_2), nitrates (from NO_x), plus other compounds such as ozone (which derives from the interaction of NO_x and hydrocarbons).

The challenge is to sort out where the most efficient and cost-effective $\text{PM}_{2.5}$ reductions can be found, Krupnick said. The emerging evidence shows that cutting SO_2 is about 10 times more effective per ton than cutting NO_x . Reducing NO_x in certain cases “could actually increase sulfates, which are pretty potent to human health,” he said.



Victoria J. Tschinkel, a member of the RFF Board of Directors



Gwen Ifill, moderator of “Washington Week in Review” and guest speaker at the RFF Council Dinner

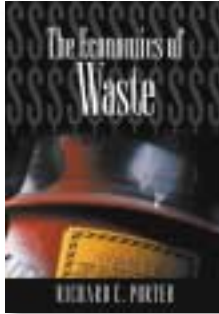


Ichiro Sakai and David Raney, both from American Honda Motor Co.



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