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RFF Scholar Testifies Before House Science Committee On Role of Renewable Resources in Power Generation

In recent testimony before House Science Committee, RFF Senior Fellow Joel Darmstadter sounded a note of caution about the potential role of renewable energy sources in addressing the nation's power generation needs. "Despite widespread optimism, dating from the energy market upheavals of the 1970s, and considerable policy support over the years, the reality is sobering: nearly 30 years later, renewable energy systems have not emerged as a significant factor in the country's electricity infrastructure," he said. "Nor is this picture likely to change appreciably over the next several decades."

The exception is hydropower, currently the dominant renewable resource, accounting for roughly 10% of the nation's electricity generation, Darmstadter said, who focused his remarks on other renewable energy sources. "Hydropower is a mature, low-cost technology that raises different policy issues than those raised by other renewable energy sources. Those other sources involve emerging technologies that face barriers which are primarily economic in nature."

Darmstadter spoke before the House Committee on Science, as part of a panel hearing on the role of renewable energy and energy efficiency in addressing the nation's energy future. The hearing was conducted by committee chairman, Rep. Sherwood Boehlert (R-NY), to look at what he called the "real energy crisis," this country's "irresponsible and probably unsustainable" energy profile.

Renewable Energy's Role in the Marketplace

The failure of renewables to play a more prominent role is intimately linked to the concurrent decline in the cost of conventional generation, Darmstadter said. Several

factors have contributed to this, including the emergence of more competitive energy supply markets, productivity improvements in oil and gas exploration and coal production, the successful deregulation of the railroads (a major factor in reducing the cost of coal shipping), and technological progress in conventional generation itself (such as gas-fired, combined-cycle power plant systems). Notwithstanding the current problems facing California, the ongoing restructuring of the electricity industry also has put downward pressure on generation costs, he said.*

While all of these changes have been mostly beneficial for electricity consumers, they have hindered the development of technologies for renewable energy resources, which have had to compete in this changing environment, Darmstadter said. "In other words, supporters of renewables have had to fix their sights on what has so far been a steadily receding target. Nor is that competitive tension likely to abate in the years ahead."

Future gas prices will play a critical role in setting the bar for renewables, he said. Unlike the situation for other generation technologies, where capital costs are the dominant component in the cost of generation, fuel costs drive the cost of power from gas-fired units. The current high price of gas is an important contributor to California's costly electricity purchases.

Some Lessons To Be Learned

Still, the renewables experience cannot be termed bleak, according to Darmstadter. The relative cost of power generated by renewable sources has come down over the years. For example, there have been significant improvements in the size and

technological sophistication of wind turbines. Such cost reductions occurred without the benefits of large private investments and significant output volume and represent a genuine accomplishment that can be a springboard for future progress, he said. Moreover, the reductions are at least partial testimony to the efficacy of public support for renewable energy.

Over the years, the federal government's promotion of renewable energy—both through research and development (R&D) support and a variety of financial incentives—has hardly been negligible, Darmstadter said. Whether the extent of this policy support could be justified by the environmental virtues of renewables compared to conventional energy sources is not clear, he said. In any case, during the same period that the federal government was supporting R&D efforts and offering tax credits for wind power applications and the price per kilowatt hour for wind power was falling, the concurrent fall in the price of conventional energy meant that the competitive edge favoring the latter remained substantial.

"Although the marketplace remains the ultimate arbiter of successful outcomes, the complementary role of government in representing the broad public interest is scarcely trivial," Darmstadter said. Looking ahead, conventional and renewable energy sources both have a place in the wide-ranging energy portfolio that is in the nation's best interest." The federal government should consider a prudently targeted, economically efficient program of support for renewables, centering on R&D and, in particular, on the basic research part of that duality, he said.

* The performance of renewables over the past 30 years was more fully discussed in "Renewable Energy: Winner, Loser, or Innocent Victim?" by Dallas Burtraw, Joel Darmstadter, Karen Palmer, and James McVeigh, *Resources*, spring 1999 (www.rff.org/resources_archive/pdf_files/135_burtraw.pdf).

RFF ANNOUNCES FIRST ENDOWED CHAIRS

Resources for the Future (RFF) is honored to announce the establishment of the Thomas J. Klutznick Chair and the Linda and Ken Lay Family Chair at RFF, the first endowed senior fellowships in the institution's history. Darius Gaskins, chairman of the RFF Board of Directors, says that the endowed chairs will "significantly enhance RFF's ability to support timely and objective research by the country's foremost thinkers on environmental policy. We are truly indebted to Tom and to Ken and Linda for their generosity and commitment to securing RFF's future well into the 21st century."

The Thomas J. Klutznick Chair

"Americans are fed up with urban sprawl, disappearing farmland, and congestion. But what we do about it is still open for debate. I think there is a real need for independent analysis on how to prevent and alleviate the negative impacts of unfettered urban growth. RFF is one organization that we can count

on to bring research, reason, and common sense to this highly contentious debate."

With those words, Thomas J. Klutznick pledged to endow one of the first chairs at Resources for the Future. Klutznick, a philanthropist and civic activist, is president of Thomas J. Klutznick Company, a Chicago-based real estate investment and development firm. Since the 1970s,

Klutznick has been involved in the development of office, retail, hotel, resort, and residential properties nationwide. He has been responsible for such landmark properties as Chicago's Water Tower Place, Los Angeles's Fox Plaza, and Boston's Copley Place. In the 1980s and 1990s, Klutznick was co-managing partner of Miller-Klutznick-Davis-Gray, whose portfolio included the Pebble Beach Company and the Aspen Skiing Company. His concern for an appropriate balance between growth and environmental protection is reflected in these projects—and throughout his career.

"By establishing this chair, I am planting the seeds for research that will help policy-makers in particular, and society in general, understand the complex relationship among urban development, land-use planning, transportation, and the environment," says Klutznick. In addition to urban affairs and the environment, his interests and involvements include economic policy, education, and social policy. Klutznick is currently the chairman of the board of trustees of Oberlin College and a trustee of the Committee for Economic Development. He has also served on the boards of Chicago's Roosevelt University, where he founded the Institute for Metropolitan Affairs, the Yosemite Restoration Trust, and the National Building Museum, among others.

Klutznick's gift also symbolizes his long-time commitment to Resources for the Future. From 1985 to 1994, he was a member of the RFF Board of Directors. Under his leadership as the first development committee chairman, RFF launched its individual giving program. Today, over 200 donors from around the world contribute to RFF, providing vital financial support to the organization.

He also played an instrumental role in establishing RFF's real estate portfolio. Ted Hand, RFF Vice President—Finance and Administration, credits Klutznick with "laying the foundation for the development of the Resources and Conservation Center (RCC). Tom provided invaluable guidance as we worked our way through the process from conceptualization through construc-



tion to financing and leasing. Today the equity in RCC represents one-third of RFF's endowment. Tom has long been a good friend to Resources for the Future. This chair is just another example of his commitment and generosity."

The Linda and Ken Lay Family Chair

"In his role as chairman of Enron Corp., Ken Lay has almost singlehandedly made the world rethink what it means to be a modern energy company. With his and Linda's very generous gift, I hope RFF can force a rethinking of the role that objective analysis can play in energy and environmental policymaking," says Paul Portney, president of Resources for the Future, upon the establishment of the Linda and Ken Lay Family Chair at RFF.

Beginning in 2004, the Chair will be awarded to an outstanding senior fellow at RFF or used to recruit an exceptional scholar to RFF for a three-year term. The Lay family's gift will help underwrite research and communications activities undertaken by the chairholder to improve the way decisionmakers consider important issues on the top of the nation's policy agenda.

Ken Lay is currently serving his second term on the RFF Board of Directors, having previously been a trustee in the early 1980s. He has been with Enron since 1986, following the merger of Houston Natural Gas and InterNorth, Inc. He also served as Enron's chief executive officer from 1985 until February 2001.

Ken received both his bachelor's and master's degrees in economics from the University of Missouri and his Ph.D. in economics from the University of Houston. He has long been a proponent of using eco-

nomic principles in decisionmaking, especially in the public policy arena, where objective analysis can often be used effectively to bridge the gap between different stakeholder groups.

Among other philanthropic interests and activities, Ken currently serves on the boards of the American Enterprise Institute; the H. John Heinz III Center for Science, Economics and the Environment; and Howard University. He is a member of the Texas Business Hall of Fame, and received the 1998 Horatio Alger Award.

Linda Lay owns a real estate development company and is an active community leader, who has raised millions of dollars for nonprofits such as DePelchin Children's Center, Design Industries Foundation Fighting AIDS, The Rise School of Houston for Children with Down's Syndrome, and United Negro College Fund. She received the Crohn's and Colitis Foundation's 1999 Women of Distinction Award and was a Susan G. Komen Breast Cancer Foundation 2000 Lifetime Member Honoree. Linda is also a business and personal advocate for a large Bolivian community in Houston. The Lays have five married children and six special grandchildren.

"Resources for the Future plays a unique



role as an objective and expert voice in the otherwise quite often emotionally charged debates on energy, resources, and the environment. It is our hope this chair will further enhance Resources for the Future's stature and authority in these most critical discussions," states Ken Lay.

For more information on these chairs or other giving opportunities at Resources for the Future, please contact Lesli A. Creedon, director of development, at (202) 328-5016.



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RFF Studies Suggest Annual NO_x Reductions Would Save Billions of Dollars Compared to Current Seasonal Approach

Emissions of nitrogen oxides (NO_x) contribute to the formation of smog (technically ozone), which is associated with health hazards as well as environmental problems. The U.S. Environmental Protection Agency (EPA) has called on eastern states, where the ozone problem is most pronounced, to formulate state implementation plans (SIPs) for reducing NO_x emissions, a requirement of the 1990 Clean Air Act.

EPA's proposed policy, known as the SIP Call, would implement a five-month, summer-season emissions cap aimed at reducing NO_x and the resulting smog it creates. The reduction in NO_x emissions would also lead to reductions in particulate formation, another pollutant that is different from smog. The proposed policy would primarily affect electricity generators in 19 eastern states plus the District of Columbia. The program would emulate the successful sulfur dioxide (SO₂) program by allowing affected sources to meet the cap through emissions trading.

The electricity industry will make substantial investments over the next few years to come into compliance with the NO_x provisions of CAA. While the extent to which investments for ozone protection yield cost-effective health benefits is controversial, two recent studies by RFF researchers demonstrate conclusively that redesigning the manner in which ozone-mandated emission targets are met can result in sizeable health benefits for virtually no additional capital investment. These benefits (from reduced particulate pollution) can be achieved if the program is simply shifted from being a seasonal program to an annual program. The investment in pollution reduction equipment is altered only

slightly; the equipment simply would be operated across the whole year when it does yield particulate benefits and not just during ozone-sensitive summer months.

In specific, the RFF analyses consider three NO_x reduction scenarios: a summer seasonal cap in the eastern states covered by EPA's NO_x SIP Call, an annual cap in the same SIP Call region, and a national annual cap. All scenarios allow for emissions trading. Both analyses conclude that an annual cap-and-trade policy in the SIP Call region would do far better than a seasonal policy when comparing benefits with costs. The particulate-related health benefits of the annual policy in the SIP Call region are more than double those of a seasonal policy, yet the compliance costs of an annual policy are only slightly greater. The annual policy limited to the SIP region also appears to dominate a national annual policy.

Economic Regulation and Industry Restructuring

The two studies assume that economic regulation in the electricity industry will evolve toward greater competition over the next decade. Economic regulation is the overarching issue currently facing the electricity industry. Electricity generation and supply are regulated at the state level, and roughly half of the states have committed themselves to move away from traditional cost-of-service-based regulation with prices set by a regulator. In its place, these states will adopt competition, with prices determined by market forces. The change also is expected to have an important effect on environmental performance in the industry and on the costs of reducing NO_x emissions.

In one study, the researchers modeled the electricity industry to reflect existing

commitments to restructuring in various states around the country. They calculated particulate-related health effects stemming from NO_x emissions, and compared these to the compliance costs that would be incurred in order to achieve these emissions reductions. The annual policy was found to offer net benefits (benefits minus costs) that exceed those from the other scenarios by at least a billion dollars per year. Perhaps more important than the effect on compliance cost, from a political perspective, is the effect on electricity price. The study found the effect to be only slightly greater in the annual scenario than in the seasonal scenario in the SIP region, and at a national level electricity price is less in the annual scenario.

A second study compared current commitments to restructuring with a nationwide adoption of restructuring across the electricity industry. The study reveals three important additional findings. First, the performance of an annual policy compared to a seasonal one varies significantly with the approach to regulating the electricity industry. Nationwide restructuring is found to increase NO_x emissions substantially, due to increased utilization of coal for electricity generation. An emissions cap on NO_x would eliminate the increase while preserving the majority of the economic benefits from electricity restructuring. However, the NO_x cap would have little effect on the increase in carbon dioxide emissions that would also occur.

A second finding is that compliance costs do not equal economic costs from environmental policy. Compliance costs include out-of-pocket costs for capital investments and operation of emissions control equipment. Economic costs measure what society has to give up to achieve emissions reductions, measured as changes in consumer and producer surpluses. Con-



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sumer surplus is the difference between consumers' willingness to pay for electricity and the price consumers actually must pay. Producer surplus is the difference between revenues and production costs. The sum of consumer and producer surplus is called economic surplus.

In the limited restructuring case, much of the nation sets the price of electricity in an inefficient manner. Consequently, the change in economic surplus due to the NO_x policy was found to be less than compliance costs. However, under nationwide restructuring, electricity is priced efficiently. If some consumers decide to reduce consumption of electricity, the forgone electricity consumption has a value that is at least as great as its price. This makes the cost of emissions reductions appear more expensive, from an economic perspective.

A third finding is that, even when measured in terms of changes in economic surplus, the annual policy dominates a seasonal one. Under limited restructuring, an

annual policy would yield more than \$600 million in net benefits per year measured in this way. Under nationwide restructuring, an annual policy would yield nearly \$1 billion in net benefits per year.

Benefits Exceed Costs

The health-related benefits from reducing particulates are expected to represent the major portion of all benefits, so they provide a meaningful basis to analyze the cost-effectiveness of the policies under consideration. However, a limitation of the two studies is the omission of other expected benefits of NO_x reductions, including reduced nitrogen deposition and reduced ozone concentrations. When these are taken into account, each of the modeled scenarios appears likely to have benefits roughly equal to or in excess of compliance costs. In all cases benefits also are expected to be greater than economic costs, or the change in economic surplus. Under an annual policy, benefits are likely to be sub-

stantially greater than economic costs. In every case, the inclusion of additional benefits boosts the argument in favor of an annual policy in place of a seasonal one, because many of the omitted benefits would accrue on an annual basis.

The additional benefits of extending the proposed seasonal cap on NO_x emissions to an annual basis could be expected to outweigh the additional costs, according to the researchers. EPA and the affected states may want to consider replacing or supplementing the current initiative for the eastern United States—a seasonal program to reduce NO_x emissions—with a new initiative aimed at annual reductions.

This article is based on two recent studies, which can be found on the RFF website: "Cost-Effective Reduction of NO_x Emissions from Electricity Generation" by Dallas Burtraw, Karen Palmer, Ranjit Bharvirkar, and Anthony Paul (www.rff.org/disc_papers/PDF_files/0055.pdf); and "Restructuring and the Cost of Reducing NO_x Emissions in Electricity Generation" by Karen Palmer, Dallas Burtraw, Ranjit Bharvirkar, and Anthony Paul (www.rff.org/disc_papers/PDF_files/0110.pdf).

RFF Researchers Assessing U.S. Efforts to Meet U.N. Goals To Cut World Hunger in Half by 2015

Currently, more than 800 million people around the world are chronically hungry. Most of this "food insecure" population live in developing countries and survive on less than a \$1 a day. Experts estimate that if the status quo continues, there will be an additional 2.5 billion hungry people by 2025.

To combat hunger, the United Nations Food and Agriculture Organization (FAO) convened the World Food Summit (WFS) in 1996 to renew earlier commitments of reducing world hunger. The pledge from member countries was to reduce the number of undernourished people by half by

2015. Following the summit, the FAO and member countries committed to achieving the WFS goal by supporting economic development in developing countries and fostering "sustainable, intensified, and diversified food production" systems. Based on this mandate, each member country was charged with developing an action plan to reduce hunger both domestically and internationally.

In March 1999, the United States issued the *U.S. Action Plan on Food Security*, which details priorities, actions, and commitments for meeting the WFS goals at home

and abroad. A subsequent report was released in November 2000, documenting the progress of implementing the U.S. action plan. The Action Plan was developed by the Interagency Working Group on Food Security, which was co-chaired at the subcabinet level by the U.S. Agency for International Development, the U.S. Department of Agriculture, and the U.S. Department of State.

RFF Senior Fellow Mike Taylor and Research Assistant Jody Tick, in collaboration with Dr. G. Edward Schuh, the Orville and Jane Freeman Professor in International Development and Investment Policy at the University of Minnesota and co-chair of the Food Security Advisory Committee, are in



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the process of a six-month study to analyze the implementation of the *U.S. Action Plan on Food Security*.

The research team will evaluate the action plan's international components as they relate to food aid and agricultural development assistance, focusing on governance, policy, and budget issues within the broader historical context of U.S. inter-

national assistance to developing countries. This approach will provide a frame of reference for differentiating between existing programs and resources to promote international food security and new programs initiated as a result of the renewed U.S. commitment to the WFS goal.

Funded by RFF, the study aims to provide policymakers and stakeholders with a

common factual and analytical base for evaluating the U.S. effort to meet WFS goals. This study is part of a larger effort in the development of a food system program at RFF. This new program takes a multidisciplinary approach to food system issues with emphasis on food safety, international food security, and the nexus of agriculture and the environment.

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