Preface

When it comes to U.S. energy policy, a survey of consumers would no doubt reveal a broad consensus that it is badly off course. Not many would agree, however, on what the problems are and how they can be solved. By contrast, the same survey conducted among economists, of whatever political persuasion, would probably show much greater agreement on both the key issues and the policy solutions. The reason is that economics provides a common framework for the analysis of many social problems. Unfortunately, economists spend too much of their time talking to one another, and not to the general public, about what economic principles can teach us. This book is an attempt to remedy that by offering an economist's prescription for energy policy in a more accessible form. For a person trained to write in the language of economics, this task has been a challenge. You can judge for yourself how successful I have been.

To the extent that I have succeeded, I owe thanks to a number of friends and colleagues who have offered numerous suggestions. At the top of my list is my wife, Pat, a political scientist by training, who of-

fered encouragement and occasional harsh but constructive criticism. Ken Vincent (of the Scowcroft Institute) offered invaluable day-to-day assistance, and Rebecca Willis, Leslie McDonald, David Nyquist, and Heather Thomson provided careful editorial assistance. Special thanks are in order to professors Marian Radetzki of Luleå University of Technology and John Tilton of the Colorado School of Mines for their insightful suggestions.

The first draft of this book benefited considerably from the comments of a number of able reviewers from diverse backgrounds. The list of reviewers included an eclectic group consisting of representatives from academia (Robert Mendelsohn of Yale University and David Victor of Stanford University), government (Howard Gruenspecht, with the Department of Energy, and Jim Woolsey, former director of the Central Intelligence Agency), think tanks (William Pizer of Resources for the Future, Michael Toman of the Rand Corporation, and Henry Olsen of the American Enterprise Institute), industry (Ed Porter and Art Wiese of the American Petroleum Institute and Anthony Corridore of Lafarge), and the media (Bill Tucker of the *New York Post*). I also wish to thank the editor of my energy textbook, Boyd Griffin, for some excellent suggestions. Karen Schoen provided outstanding editorial assistance. Finally, the editorial staff at Yale University Press has been a pleasure to work with.

Introduction: An Overview from 30,000 Feet

A WORLDWIDE NEED FOR A SMART ENERGY POLICY

A key premise of this book is that energy policy, especially in the United States, is fatally flawed both in the *process* by which problems are identified and in the *solutions* that are chosen. The process is guided largely by whatever interest groups are most vocal. The solutions often feature either command-and-control mandates or a grab bag of governmental goodies in the form of subsidies, tax credits, and grants. The result is a mishmash of legislation that is inconsistent, ineffective, and ill conceived. What is needed—in the United States and throughout the world—are policies that encourage the kind of behavior, by both consumers and businesses, that will achieve clearly defined, worthy goals.

Much debate could be generated about what the goals should be, but, for the sake of the arguments presented in this book, the energy goal for the United States and other countries—indeed for the whole world economy—should be energy that is *cheap, clean,* and *secure.* These goals are intertwined and related; for example, we know that

energy produced from high-sulfur coal may seem cheap to a power producer, but it fails the cleanliness test, creating a number of environmental costs to the public that are not reflected in the price of the dirty coal.

The goal of cheap energy is based on the fact that energy is the lifeblood of a growing, healthy economy. The cost of a unit of energy is an important factor in the productivity of businesses and in the standard of living of the world's consumers. The lower the cost of a unit of clean energy, the greater the potential for the heat, light, and power needed by people and businesses. The greater the percentage of a household budget required for energy, the less that can be spent on food, medicine, housing, and discretionary items that enhance the quality of life. Cheap energy that is also clean and secure would be a great thing for the world economy.

With the pressing problems of climate change and dirty air and water, we know that clean energy is essential to the continued health and prosperity of all nations. Given the choice between dirty energy and clean energy at a moderately higher price, clean energy wins hands down. The more affluent a society becomes, the greater the premium it is willing to pay for clean energy. General awareness and appreciation for clean energy has a long history. Today, even schoolchildren understand that there are serious environmental costs associated with dirty sources of energy, particularly those resulting in greenhouse-gas emissions. New combined-cycle natural-gas-fired power plants emit one-third the carbon dioxide (CO_2) as state-of-the-art coal-fired power plants. Nevertheless, throughout the world, the prevailing market price for a unit of natural gas, the much cleaner fossil fuel, exceeds that of the dirtier alternatives such as coal; this could be viewed as an example of the market's failure to include the true cost of dirty energy in its price to the likely users (for example, electrical power plants). But under the threats of climate change and environmental degradation, clean energy must be part of the goal, and a sound policy will include a mechanism to price any given source of energy at a level that reflects its true cost to society.

Lastly, energy should be secure because it is a critical condition for a high living standard and has few substitutes in the short run. Just as with clean energy, the more affluent a society is, the greater importance it will attach to secure energy. When people talk about energy security, usually what they really mean is oil security, because of the political instability of the Middle East and its key role in the world oil market. However, security concerns apply to other areas of the world too, as evidenced by events in Venezuela and Nigeria and the reliance of much of Europe on natural-gas supplies from Russia. Oil security has two

important ramifications. The first is the economic havoc that a major disruption of Middle East oil supplies would have on the world economy. But even in the absence of a disruption, oil revenues in the hands of certain Middle East countries may go to finance terrorist organizations.

There are inherent conflicts in the quest to realize cheap, clean, and secure energy. Ideally, the cheapest energy sources would also be the cleanest and most secure; unfortunately, that is not the case. Coal, for example, may seem to be the cheapest and the most secure given current market prices, but it is certainly not clean, and when proven technologies for sequestering its carbon emissions are used, it is no longer cheap. In the mix of world energy sources as of 2005, fossil fuels—the primary source of CO_2 emissions—dominated, accounting for 87 percent of the total.[1] Other sources included hydropower (6 percent), nuclear power (6 percent), and other forms of renewable energy, such as firewood, biomass, and solar power (which together account for only 1 percent). Among fossil fuels, petroleum accounts for the lion's share, with 38 percent of consumption, and coal and natural gas account for 26 percent and 23 percent, respectively.

When we look at all the possibilities for cheap, clean, and secure energy, the challenges become clear. Hydropower, arguably one of the cheapest, cleanest, and most secure sources of energy where it exists, offers very little potential for expansion; most opportunities have already been developed. Nuclear energy is certainly not cheap and presents a number of questions about cleanliness and security. Renewable fuels from biomass are not yet cheap, especially without subsidies, and are not always clean (for example, there are water issues with ethanol), and although the use of biofuels can be expected to grow, it is unlikely that renewable fuels from current technologies will replace fossil fuels as the dominant source of energy in the foreseeable future. Solar and wind energy have shown impressive growth where conditions are favorable but are not yet cheap compared with fossil sources, and, even under optimistic growth assumptions, they will replace only a small part of the energy currently produced from fossil sources.

Faced with this conundrum, policymakers have responded with a mishmash of legislation—some actions designed to promote cheap energy, others to promote clean energy, and other legislation aimed at secure energy. The problem is that specific legislation to promote one goal often conflicts with other goals or has unintended consequences elsewhere in the economy. In many parts of the world, energy is heavily subsidized to make it cheap. The problem of course is that it only makes energy *appear* to be cheap; tax revenues must be used to pay

the subsidies. An unintended consequence is that the subsidies encourage overconsumption, which leads to greater carbon emissions and greater dependence on insecure energy forms.

Another example of the unintended-consequence problem is the U.S. policy to promote corn-based ethanol in place of gasoline. Congress conducted a beauty pageant for alternative fuels and bought into the idea that domestically produced corn-based ethanol should displace conventional gasoline, thereby displacing foreign oil imports and at the same time reducing greenhouse-gas emissions (the theory is that the CO_2 absorbed when the corn is growing should offset the CO_2 emitted when the ethanol is consumed). Unfortunately, what sounded good in theory has turned out to be a fiasco. Research shows that total CO_2 emissions from ethanol are in fact almost twice as great as those from conventional gasoline. Furthermore, replacing just 3.1 percent of U.S. effective gasoline consumption[2] with ethanol in 2007 required 23.7 percent of the corn crop and 7 percent of the total cropland acreage.[3] Finally, there is yet another unintended consequence—with corn prices tripling since 2005, all grain and livestock prices have risen sharply, bringing food and energy into direct conflict. Sadly, the United States is now locked into command-and-control legislation that mandates a fourfold increase in biofuels production by 2022. Clearly, there must be a better way than the current mishmash of command-and-control legislation and congressional beauty pageants for alternative fuels.

AN ECONOMIST'S PRESCRIPTION: TAXES AND A PRICE-BASED ENERGY POLICY

In this book I argue that the best energy policy for balancing the often-competing goals of cheap, clean, and secure energy would use the price system to fundamentally alter consumer behavior, business behavior, and the incentives to develop alternative-energy technologies. Currently, the price system fails to incorporate the true social cost of fossil fuels—the costs associated with climate change and oil security. Because these fossil fuels are artificially cheap, alternative clean and secure energy technologies are forced to compete on a very uneven playing field. By taxing fossil fuels to reflect their true environmental and security costs, we can level the playing field for these new technologies. Given a level playing field, new technologies will flourish, and energy conservation will restrain the overall growth of energy consumption. There will be no need for special subsidies, tax credits, and so forth for alternative technologies deemed winners of the congressional beauty pageant for alternative fuels. Instead, the

marketplace will identify the winners and winnow out failed technologies. There is currently no way for policymakers to identify the ultimate winners and losers. We have no idea what technologies will dominate in thirty or fifty years. Instead of policymakers attempting to socially engineer the outcome, as in the case of corn-based ethanol, it is far better to create the market conditions under which unknown and unknowable technologies will flourish.

Using the price system to modify human behavior is not a novel idea. "Sin taxes" on alcohol and cigarettes, for example, have been shown to substantially reduce consumption of both. Particularly in the Scandinavian countries, high taxes on alcohol have proved to be an effective means of curtailing consumption, after experiments with a variety of command-and-control policies, such as prohibition, generated much public discontent. But in the case of fossil fuels, taxes would not only discourage the consumption of fossil fuels, but they would also provide a level playing field on which new energy technologies could compete and flourish. Specifically,

> *Congress should enact a security tax per barrel of oil and a carbon tax per ton of emissions, thus raising the prices of all carbon-containing fossil fuels to reflect their true social cost.*

Such a strategy has several advantages over the policy of awarding subsidies and protective tariffs to industries represented by strong, entrenched lobbies such as the Renewable Fuels Association (corn-based ethanol producers) and subjecting consumers to various command-and-controls:

- *All* new technologies would enjoy a more level playing field.
- The market, not the government, would determine which of the new technologies are the winners.
- This approach is more transparent. It is extremely difficult to assess the costs (in terms of lost tax revenues) and the effectiveness of the current patchwork of subsidies and tax credits. In contrast, imposing carbon and security taxes would force us to ask how much we are willing to pay for cleaner air and added oil security.
- A focus on getting the prices right for fossil fuels would limit the opportunity for Congress to pass legislation designed to enrich particular private-interest groups.

Oil Security Tax

Oil security is a worldwide problem, with a built-in incentive for countries to underinvest in security since any one country cannot capture all the benefits.

Oil security can be achieved either by reducing world oil consumption or by increasing the amount of secure oil in the mix. Investment in the storage of emergency oil supplies, such as the United States' Strategic Petroleum Reserve, is an example of a means to accomplish the latter. But the question remains whether the price of a barrel of oil in world markets reflects its true social cost if we must buy an insurance policy in the form of adding a barrel of oil to the Strategic Petroleum Reserve. Isn't the true social cost of the oil in this case its purchase price *plus* the cost of the insurance policy? In principle, then, an oil security tax should be set equal to the cost of the insurance policy, thereby incorporating into the price the full social cost of the oil.

A security tax on all oil consumed *domestically* would raise the price to the consumer, thereby reducing consumption. Although increased prices due to an oil security tax would *not* increase the flow of oil from conventional production, they would promote conservation and accelerate the development of substitutes for conventional oil, such as oil sands and renewable fuels from promising new technologies.

Most importantly, we can use our willingness to impose such a tax as a bargaining chip to encourage other industrialized nations to follow our lead and to encourage developing countries to stop misguided oil-subsidy policies aimed at making oil artificially cheap. These subsidy policies thwart the desired conservation effects of higher oil prices and weaken oil security by increasing the reliance on Middle East oil.

Carbon Tax

For a number of reasons, economists generally favor a carbon tax that escalates over time in a predictable manner in place of the cap-and-trade system used in the European Union.[4] First, a carbon tax establishes an observable price that society is willing to pay for CO_2 abatement and creates a more level playing field for new technologies. Second, a carbon tax avoids the potential problem of uncertain and highly fluctuating prices of emissions rights. Investors in new plants know with certainty the current carbon tax and the rate at which it will escalate in the future and thus can formulate sensible investment plans. Third, a carbon tax offers flexibility, so emissions reductions can occur optimally over time. As new technologies are gradually developed and the existing stock of energy-consuming capital is replaced, carbon emitters have the option to pay the tax if, indeed, it becomes too costly to abate the CO_2. Under the proposal advanced here, the carbon tax would increase at 4 percent per annum plus the overall inflation rate. Consequently, in constant dollars, the tax would double

in eighteen years and quadruple in thirty-six years. With prospects for steadily rising carbon taxes and future technological advances, new investments in power plants and other long-lived energy-using capital equipment like cars, trucks, and airplanes will begin today. But the primary impact will occur in the future with the complete turnover of the energy-consuming equipment. This flexibility is especially important as we make the transition to lower carbon emissions.

There are two additional properties that distinguish a carbon tax. One is that a carbon tax would be much more transparent than tradable emissions allowances and potentially less subject to manipulation. There would be no offsets, for example, for farmers and foresters earning "allowance credits" that could be sold; nor would there be the clean development mechanisms that have resulted in abuses abroad. It is hoped that, as with the gasoline tax in the United States, there would be no special exemptions. The tax would be assessed on the carbon content of the fuel, which is readily measurable. Credits for carbon-sequestration technologies would be allowed only on the basis of measured quantities of CO_2 sequestered.

Another unique advantage of a carbon tax is that its revenues can be used to reduce other taxes.[5] It has long been recognized that income and payroll taxes generate a loss in general welfare by creating a disincentive to work, but they have been needed to fund government expenditures. Environmental-tax revenues could be used to reduce income and payroll taxes, correcting two economic distortions at once and giving society a double dividend.[6] Even for those who view every federal tax dollar as an invitation for increased government expenditures, it would be a simple matter to couple carbon and oil security taxes with offsetting income- or payroll-tax reductions, producing a revenue-neutral effect.[7]

SETTING THE TAX RATE

Assuming the political process could actually deliver a policy to impose taxes for oil security and CO_2 emissions, what should the tax rates be? Economic theory offers a straightforward policy prescription for setting optimal tax rates: set the rate where the marginal cost of controlling the externality equals the marginal benefit received from its abatement. In effect, to set the carbon-tax rate, create a supply and demand curve for CO_2 abatement; the price at which the two curves intersect reflects society's willingness to pay for carbon abatement and thus the optimal tax. The carbon and oil security taxes will raise the

prices of fossil fuels to reflect the true social costs of such fuels. The higher prices will make alternative fuels more economically attractive and induce more energy conservation.

This book examines in detail how the suggested taxes for oil security and carbon emissions would affect the prices of the primary fossil fuels—coal, oil, and natural gas—today and in the future. Available research supports rather modest security and carbon taxes—a $5-per-barrel oil security tax and an initial carbon tax of $5 per ton of CO_2. With 2007 energy prices as a base, these taxes would increase oil prices by 11 percent, natural-gas prices by only 5 percent, and coal prices by 49 percent. For consumers, gasoline prices would rise by 7 percent, heating-oil prices by 6 percent, residential natural-gas prices by 2 percent, and electricity generated by coal-fired plants by 14 percent. Recent emissions prices in the European Union suggest that the price increases under a cap-and-trade system might be as much as five or six times as great.

The case for moderate initial taxes that rise substantially over time is compelling. The existing stock of power plants, autos, housing, and buildings was configured on the basis of past energy prices, and in the short run, there is little one can do other than drive less and adjust the thermostat. Large energy price increases, such as could occur under a cap-and-trade system, basically punish consumers for their past decisions and achieve only small reductions in CO_2 emissions. In effect, cheap energy would be sacrificed for only minimal gains toward clean energy.

CHANGING ENERGY USE AND NEW INVESTMENT

A carbon tax that quintuples by 2050 could dramatically change our future energy infrastructure. Knowing that the carbon tax will increase dramatically over the next forty-plus years, consumers and producers would begin altering their investment decisions today. The decision to buy a more or less fuel-efficient car, air conditioner, refrigerator, or other appliance would surely be affected by the anticipation of the carbon-tax rate rising, as proposed here, by 48 percent in ten years and 119 percent in twenty years. Likewise, planners of a new power plant would take into account that the price of coal—which would increase initially by 49 percent with the imposition of the carbon tax—would more than double in twenty years. Surely, such expectations would completely change the types of future energy investments.

THE REVENUE POTENTIAL OF THE PROPOSED ENERGY TAXES

Another important advantage of a carbon tax and an oil security tax is that such taxes would generate significant federal tax revenues. It is estimated that in the first year the carbon tax would produce $37 billion and the oil security tax would produce $36 billion, a combined total of $73 billion. Over time, this figure would likely rise substantially, if only because the carbon tax would be adjusted upward annually by the rate of inflation, plus 4 percent. Assuming recent emission rates and the implementation in 2009 of a $5 carbon tax that escalates at 4 percent plus inflation of 3 percent, carbon-tax revenues in the year 2050 would be about $590 billion. With the oil security tax rising with inflation, it could contribute an additional $120 billion by 2050. Clearly, the two taxes could be huge generators of future tax revenues at the same time that they steer the economy toward lower emissions and less dependence on insecure oil. Not only would such tax revenues be a boon for the U.S. Treasury, but revenue-starved developing countries would clearly find such taxes attractive revenue generators as well. Perhaps even India and China would find such a revenue source superior to their other sources of revenue.

OVERCOMING OBJECTIONS TO TAXES

Despite the clear merits of the proposed energy taxes, many Americans are likely to oppose them on philosophical as well as macroeconomic grounds. To overcome objections to energy taxes, I propose that they be revenue neutral. Under any energy-tax legislation adopted, the tax revenues should be earmarked for offsetting reductions in income and payroll taxes and increases in the earned income tax credit. The net effect on consumers' pocketbooks would thus be offset by income-tax reductions. Again, this approach has an important advantage over cap-and-trade proposals because it allows for greater benefits to the public—through relief from income and other taxes—at the expense of carbon-emitting industries. It is no accident that large carbon emitters favor a cap-and-trade system—they see it as a means of obtaining valuable emissions permits for free and acquiring for themselves competitive advantages vis-à-vis new entrants that lack the benefit of free emissions permits.

As to objections about the macroeconomic effects of revenue-neutral energy taxes, the effects would likely be inconsequential for two reasons. First, although consumers as a group would pay more for energy, the income- and pay-

roll-tax reductions would offset these increased energy costs. To be sure, more prodigious energy consumers might not be fully compensated, whereas low energy users could receive a windfall. But these distributional issues should not be dispositive, because of the magnitude of the taxes. Furthermore, because of the relatively moderate level of the initial tax rates, these taxes would not be likely to cause any substantial short-run macroeconomic disruption.

REASONS TO READ ON

The preceding discussion is a synopsis of the book from 30,000 feet. Only the skyscrapers were identified. But there is much more that one must understand to grasp the complexity of balancing cheap, clean, and secure energy. Missing are the details of why we choose to focus on climate change, since fossil fuels contain other serious pollutants. Missing is the explanation of why until recently oil was no longer cheap and a discussion of the factors that will determine long-term oil prices. Missing is the discussion of why markets have historically done a reasonable job of providing cheap energy and why government policies should be circumscribed to certain areas. Missing is the discussion of the alarming rise of petro-nationalism[8] and the mistaken belief that countries like China can buy oil security by locking up oil reserves around the world. Missing is the discussion of why, even though past temperature changes have been relatively small, there is good reason to take climate change seriously. Missing are the discussions of how to bring the world's major carbon emitters together to cooperate and why the Kyoto Protocol has met with only limited success. Missing is the discussion of the critical importance of government funding of basic research in the energy area as well as the importance of limiting the role of government in conducting congressional beauty pageants for new energy sources. Missing is a discussion of the politics of energy policy and why ideas like limiting government's ability to dole out subsidies, tax credits, and benefits to special interests will meet great resistance. Missing too is a discussion of why the usual Washington approach is a prescription for failure. We can do much better! Read on!