

Chapter 12

Policies to Accelerate the GET

We can't solve problems by using the same kind of thinking we used when we created them.

—ALBERT EINSTEIN

... the only thing we have to fear is fear itself ...

—FRANKLIN DELANO ROOSEVELT

The United States is an exceptional *can-do* country, limited only by the enthusiasm of its people. Time and again when Americans come together, we rise up to accomplish great goals. As I write this chapter in the spring of 2009, we are in two wars and what many experts describe as the greatest financial crisis since the Great Depression. Banking institutions and prestigious financial companies have failed, been force-fed to former competitors, or been taken over by the federal government.

President Obama has worked with the new Congress to pass the \$787 billion American Recovery and Reinvestment Act, in addition to the \$700 billion bailout to banks that will hopefully ease the credit freeze. In the meantime, our costly financial commitments to the Iraq and Afghanistan wars continue, but no matter how successful the conclusion of our wars and the stabilization of our financial system,

the majority of these taxpayer dollars are aimed at financial stabilization and national security and are not designed to reenergize America's economic future. What we need now are equally historic policies that Americans can rally around to create a new future for our country. We must mobilize all Americans, particularly our dedicated and capable labor force, to rebuild our industrial base so that we can be successfully competitive in an energy-efficient, sustainable twenty-first-century globalized economy.

Although all the attention is on our massive home mortgage problems and the financial industry and the unraveling of their supposedly magic debt instruments, we have what I believe to be an energy travesty going on. Once again, very few in Washington are paying any attention to America's abundant, clean natural gas. Because we have never had an overarching policy to use our clean natural gas for either power generation or transportation, our natural gas supplies have far outstripped demand. The price has crashed to below replacement cost, tens of billions of dollars of capital expenditures for future natural gas development have been canceled (expenditures that generate a two to three multiplier in local economies), income to state and local governments from natural gas production has declined by billions, and revenues to U.S. farmers and landowners have plummeted by tens of billions. Eight hundred drilling rigs have been idled,¹ with at least 200 to 300 more on the way to losing work,² along with tens of thousands of lost jobs in U.S. natural gas industry. Oklahoma City's two largest independent natural gas companies, Chesapeake and Devon Energy, wrote down the carrying value of their natural gas and oil properties by over \$13 billion in 2008.³ America's natural gas industry is in a disastrous bust that is unnecessarily exacerbating our ongoing economic contraction. Once again, this bust may well deliver a long-term, crippling body blow to our domestic natural gas industry.

While our natural gas industry was crashing because we have so much more than we can use, the United States paid out \$475 billion to foreign oil producers in 2008. In the first two months of 2009, it paid another approximately \$30 billion,⁴ and there will be trillions more in the decades to come that will work to cripple our economic recovery because we don't have policies to use our clean, affordable natural gas to fuel our cars, trucks, and buses. To me, it seems like an economic,

national security, and climate travesty when our country is awash in our own natural gas, which is cleaner, runs automobile engines longer, and emits about 30 percent less CO₂ and 90 percent less other pollution than gasoline.

Natural gas is the only clean alternative to gasoline and diesel that is sufficiently scalable to reduce oil imports by 5 to 6 million barrels per day by 2015. All we need to do is come together behind a large-scale plan such as the one proposed in this chapter. As President Obama has said, the nation must free itself “from the dangerous dependence on foreign oil.”⁵

Now, before we go further, let me say that I am completely in favor of wind and solar power and electric vehicles, but until we build a new smart interstate electric grid and quit generating half of our power with coal, we won’t be able to accomplish our goal of getting off oil while improving our environment and lowering CO₂ emissions, and it will take decades to do that. So, in the meantime, let’s take some big American steps forward and get the job done with natural gas as the bridge fuel to our more idealistic future.

Even more imperative than our economic crisis is the effective implementation of energy, industrial, and tax policies to accelerate the GET to rebuild the U.S. industrial base so we can be successfully competitive in an energy-efficient, sustainable twenty-first-century globalized economy. The acceleration of the GET not only will be our silver path toward a sustainable economic recovery and renewed financial health, but it will unleash the forces that will create the next great, unprecedented economic expansion. Our motto for the coming decades should become “jet the GET.”

This chapter will outline recommendations that flow from my life’s work in the energy field and a lifetime that has experienced great political swings, from Franklin Delano Roosevelt’s first inaugural admonition that “. . . the only thing we have to fear is fear itself . . .,” and his New Deal, of embracing bold change organized to resolve equally dire financial problems, to Ronald Reagan’s first inaugural getting-government-out-of-the-way stage, “In this present crisis, government is not the solution to our problem; government is the problem,”⁶ and the follow-on financial deregulation that today has brought us full circle.

My two overarching policy recommendations call for, on the one hand, more government in the form of a new twenty-first-century energy and industrial initiative similar in scale to, if not more sweeping than, Roosevelt's New Deal or the industrial tooling-up to win World War II. On the other hand, it also calls for somewhat less government in the form of sweeping tax reforms and a green, consumption-based tax system.

Today, as to our intolerable energy-related economic, national security and climate risks, government is no longer the problem, because today the problems are global and of such scale that they require an enlightened bipartisan government to work with the people and the marketplace. Since the 1970s, as a result of decades of cheap, externally subsidized, rapidly increasing coal and oil consumption, we have now arrived to face climate, economic, and national security risks of such magnitude that government must again lead our way forward.

I put forward the proposition that for the United States to lead the world in climate and energy and create the conditions for renewed economic growth and the rebuilding of our industrial base and infrastructure with energy efficient technologies, President Obama must adopt these two clear and bold strategies. But to be successful, he must have full command of the bully pulpit to articulate, motivate, and educate Americans on the great need for and equally large benefits of these goals so that we all come together to enthusiastically embrace them behind his bold leadership, just as we did when Roosevelt rallied us to lead the way out of the Great Depression, and Kennedy did to put an American on the moon in a decade.

President Obama and Congress must restore the faith in a can-do government. I believe that the confidence of the American people in their government will be fundamental for the resolution of these great issues. That confidence can only be regained by putting aside partisan bickering and moving forward with a new, bipartisan spirit of "America first." We are in an era where continued congressional bickering and grandstanding have become irresponsible. The United States needs bipartisan solutions.

The United States is at an historical turning point with an unprecedented opportunity to ride the wave of energy gases to our next era of extraordinary growth. It is time for the United States to leave

behind its nineteenth- and twentieth-century energy technologies and the policies that helped shape them and retool itself for the twenty-first century. Economies cannot sustain themselves for the long-term on services alone, so it is now time for new tax, energy, and industrial policies that will restore our energy independence and place the United States in a global leadership position for the creation of sustainable energy technologies and climate stabilization.

By embracing, rather than fearing, change and accelerating the natural evolution of the GET, humanity can achieve sustainable life and growth on Earth in this century. The United States must lead the way. By doing so, it will become the center of the next great economic expansion.

What follows is a group of policies to get us off to a great start. Following those are my overarching macro policies to jet the GET for the long term.

How to Immediately and Significantly Reduce CO₂ Emissions

There are two policy actions that I believe would be simpler, more effective, and less costly to lower CO₂ emissions faster and in larger initial quantities than either a complex cap and trade system or CO₂ emission capture and sequestration (CCS). These actions should proceed independently of all other energy policy.

Policy action number one. America's 2.2-million-mile natural gas pipeline grid⁷ is connected to 450,000 megawatts of natural gas-fired electric generating capacity. That compares with 336,000 megawatts of coal-fired capacity.⁸ The reason coal generates 50 percent of America's power and natural gas only 22 percent is because coal plants run at 74 percent capacity and natural gas combined cycle at 42 percent capacity,⁹ and natural gas simple cycle at only 11 percent, even though most natural gas-generating facilities can be run reliably at 90 percent capacity or above. Because natural gas power emits 50 percent less CO₂¹⁰ we should immediately implement a policy that requires combined cycle natural gas power be run at the highest capacity possible and be dispatched first.

This one action could replace about a third of all the coal-fired electricity in the United States without building a new plant and, at

the same time, lower annual U.S. CO₂ emissions by an astonishing several hundred million tons per year and put us well on our way to the Intergovernmental Panel on Climate Change's (IPCC) goal for the United States. Unfortunately, we cannot completely eliminate all coal power plants because in many localities on a particular electric grid there are not a sufficient number of natural gas power plants, and on many electric grids, all the coal and natural gas power capacity will be required in order to meet peak power demand. Another problem is that utilities own or unduly control the electric grid and dispatch the coal plants first because they produce more regulated profits for the utility shareholders and also because some coal-generated electricity is about 2¢ per kilowatt cheaper.¹¹ Of course, it is not really cheaper because there are large health and pollution costs related to coal's use that are not charged to the consumer of electricity but are paid instead by society in general.

If Congress passed legislation that mandated clean, low-carbon natural gas power first where possible, I estimate that enough natural gas generation capacity would be located in a sufficient number of critical locations so that about one-third of the coal plants could be closed down and over 300 million tons of annual CO₂ emissions would be eliminated. To generate one-third of the U.S. coal power with existing natural gas plants would require about 4 Tcf of new natural gas consumption annually. America's natural gas producers could meet that new demand rapidly, beginning with our current excess supplies. LNG, Canadian imports, and eventually Alaskan supplies could also fill in when and if needed. To begin with, policy makers might want to start with our dirtiest, most inefficient coal plants that use about one-third of the annual coal consumption and produce the highest levels of CO₂ per megawatt.

I urge readers to write their congressional representatives and tell them that the United States must use its clean natural gas to generate electricity before we use coal-generated electricity. To do so may cost the electric consumer a little more than from coal plants but a lot less than if laws or regulations mandate the cleaning up of coal power, so-called "clean coal," or require new equipment to lower CO₂ emissions and toxic wastes. Of course, if either a carbon tax or cap and trade are passed, carbon light natural gas will be less costly than coal.

Policy action number two. In order to meet our need for additional electric power we should mandate that no new power plant can be built that emits more CO₂ or general pollution than that of a natural gas plant. After all, during the last two years, some 90 coal plants have been taken off the drawing board¹² and several new natural gas plants announced (with some 17,000 megawatts of natural gas powered generation capacity added in 2006 and 2007¹³), the most recent being a 300 megawatt plant by Idaho Power.¹⁴ So, let's simply accelerate that trend by mandating that all new power plants be as clean and green as natural gas.

Although detailed cost studies need to be performed, I am confident that these two actions would cost the economy and consumers much less than "clean coal" technology and sequestration, and would cut CO₂ emissions immensely faster than any other policy action, including cap and trade.

I know this will cause an uproar from the coal industry but we must keep in mind that the entire coal mining industry employs only about 80,000 miners¹⁵ and that the entire industry is economically less than 10 percent the size of Wal-Mart.¹⁶ So, my point is that the coal industry should no longer have such massively disproportionate power over American politics, our environment, and energy use.

The long-term adverse macroeconomic and environmental effects of the coal industry's political control over the politics of energy have been immense. A large part of the U.S. population has suffered multiple coal-related personal health issues and their ever-increasing costs and the American taxpayers have paid an enormous burden for coal's tax subsidies, at least \$10 billion over the last decade.¹⁷ These subsidies are not necessary to go forward meeting all our new electric power demand not met by wind and solar with carbon light natural gas. Indeed, we should help retrain the miners who may lose jobs; however, many miners can easily be trained for new work in the energy industry, as there will be plenty of new jobs. A small portion of the stimulus funds already allocated to the coal industry could be used to retrain miners for safer and healthier jobs. The important point is that we should not adversely impact our energy and environmental goals because of the continuing disproportionately powerful political influence of such a relatively tiny sector of the U.S. economy.

Decouple the Electric Grid

Since its beginning, America's electric grid system has been owned and controlled by local and regional electric utilities and regulated by a patchwork of state and regional regulatory authorities. Because most electric power producers are utilities, their returns on capital investment are regulated by the individual state power commissions in such a way that the utility companies' growth depends upon the amount of capital they are able to invest. As a result, high-cost coal and nuclear power plants provide more growth for the utility companies than less capital intensive natural gas, wind, and solar generated power. Over past decades, large, costly coal and nuclear plants have been the growth strategy of most utility companies. As these plants must be paid for by consumers of electricity over 30 years or more, they tend to limit the number of less capital intensive and often more efficient power facilities. Also, because electric utility power companies often own and/or have undue control over the electric distribution grid system, there is little incentive to allow smaller distributed power systems or more efficient natural gas, wind, and solar power facilities owned by third parties into the electric grid. Thus, under our present system, competition and innovation has generally been discouraged. So in order for the United States to be successful in the development of a twenty-first-century energy infrastructure with a modern smart grid and renewable and distributed power, the ownership and control of the electric grid must be decoupled from and independent of all the electric power producers. Any qualified power producer, no matter how small, must be able to compete to produce the cleanest and cheapest electricity for America's consumers.

Policies for Energy Efficiency

As I have described in Chapter 9, "The *Real* Inconvenient Truth," because of America's failure to internalize the full costs of coal and oil over the past 30 years, our energy infrastructure and energy habits have been developed without regard for efficiency. Sadly, U.S. energy infrastructure and consumption habits are prolifically wasteful. As a result, enormous, profitable energy efficiency gains with attractive rates of return are possible throughout the entire energy sector.

My friend Amory Lovins, co-founder and chief scientist of the Rocky Mountain Institute (www.rmi.org), has been advocating various

policies and technologies to make the United States more efficient for RMI's entire 27-year history. I will not repeat the body of work here, but only highlight one important publication, *Winning the Oil End Game*. One conclusion of this publication is that "fully applying today's best efficiency technologies in a doubled-GDP 2025 economy would save half the projected U.S. oil use at half its forecast cost per barrel."¹⁸ If the enormous external costs of oil are included, Lovins and his team forecast that "it will cost less to displace all of the oil that the United States now uses than it will cost to buy that oil."¹⁹ RMI may be optimistic, but there is no question that there are very large efficiencies to be profitably achieved.

Suffice it to say that in the sectors of oil consumption (particularly transportation) and electric power consumption (industrial, commercial, and residential), there are enormous gains to be made by investment in efficiency. Some experts estimate that efficiencies could be profitably doubled over the long-term. I believe extensive policies focused on making the United States one of the most energy-efficient economies for the twenty-first century are essential to our economic success. McKinsey & Company (www.mckinsey.com) has completed an exceptionally important body of work showing how the United States can profit from energy efficiency solutions. Its July 2008 report says, "One hundred and seventy billion dollars a year invested in efforts to boost energy efficiency from now until 2020 could halve the projected growth in global energy demand."²⁰ An earlier study concluded that, using high efficiency options, "projected electricity consumption in residential buildings in the United States in 2020 could be reduced by more than a third."²¹

Nuclear Fission Is Not a Long-Term Solution

A brief word about nuclear power: Because nuclear works, it is an excellent hedge, but as described in Chapter 11, "What Won't Work; What Will Work," it is not a long-term solution. Undoubtedly, because it is a good hedge, wise policy makers will include subsidies for the near-term, such as government-guaranteed loans. It will also be necessary to streamline the permit process. Although nuclear power properly fits in the diminishing age of solids and will not be a long-term energy solution, I must join with the pragmatists who say that during the next

two or three decades, as we progress further into the Age of Energy Gases, nuclear is a justifiable hedge.

End Subsidies for Coal, Oil, and Biofuels

The next great step forward will be to accelerate the GET by developing policies to transform the fuel mix away from coal and oil and toward energy gases. First, we must eliminate current policies that are working against the GET. Therefore, I recommend the elimination of direct subsidies to the coal and oil industries.

Because of the misperception that the United States has no choice but to rely on coal, there are many special incentives for advanced coal technology, coal gasification, and other coal-related projects, created and funded by the federal government. If you haven't read Chapter 7, "Natural Gas Abundance," I refer you to the section titled "America's Attainable Natural Gas Supplies May Equal or Exceed Minable Coal Supplies" that calls into question the misperception that the United States has no choice but to rely on coal. Sufficient natural gas is available to displace coal in the future.

According to the National Research Council, "more than \$538 million was spent by federal government agencies for coal-related research and technology development in 2005."²² According to Taxpayers for Common Sense,²³ since 1984 the federal government has invested about \$2.5 billion in clean coal technology,²⁴ and the Energy Policy Act of 2005 included more than \$9 billion in subsidies for the coal industry.²⁵ These should all be eliminated, with the exception of government loans, grants, and other payments for development of CO₂ capture and sequestration (CCS). Subsidies for CCS should continue, but be focused only on sequestration technology itself. I will address specific sequestration policies later in the chapter.

No government money should be spent on converting coal to oil, gasoline or diesel, as all that does is spend taxpayers' money to artificially attempt to sustain liquids even further, producing even more CO₂ emissions than with oil use.

Coal-to-natgas is neither commercially viable nor needed, given North America's vast supplies of natural gas. So, today, to create noncommercial natural gas from coal is an utter waste. Let's not make the same \$25 billion²⁶ mistake again that we did in 1980 by creating the Synfuels Corporation to advance coal gasification and oil shale projects.

Government should prohibit all new coal-fired electric generation that is not built with full CCS facilities in operation upon startup. Legislation could take the form of the 1978 Fuel Use Act, which then prohibited the use of natgas in new power generation. But, this time, the prohibited fuel should be coal, for all the reasons given in this book.

Biofuels also work against the GET. Biofuels are merely a misguided attempt to sustain liquids beyond their normal decline, largely because automobiles, trucks, and buses have fuel tanks that hold a liquid instead of a gas. I address that issue in the transportation section. As explained in Chapter 11, biofuels are part of the era of liquids and are not a long-term solution for civilization. One way or another, scaled-up biofuels production will most always compete with either food or rainforests. We have too much to accomplish to misdirect time, brains, and capital toward liquids that are on the way out. All mandates and subsidies for biofuels should be eliminated.

Use Carbon Capture and Sequestration (CCS)

We should continue CCS programs because sequestration will be necessary to meet our long-term CO₂ reduction goals. However, it is doubtful we will use CCS for coal. The first test facility should start with natural gas rather than coal because natgas is the superior fuel that produces half the CO₂ of coal and few to none of the other toxic pollutants. Because there is half or less the CO₂ to deal with in the first place, when natural gas rather than coal is used to generate the equivalent amount of electricity, the volumes of liquid CO₂ to be piped to locations for sequestration will also be halved, as will the overall costs to create the infrastructure. In fact, it is my recommendation that the widely heralded CCS FutureGen project for coal should be resurrected as NatgasGen. Electricity produced by natural gas with CO₂ sequestration will be completely green. NatgasGen would be just about as environmentally benign as wind and solar.

Begin Opening Restricted Drilling Areas

Important quantities of abundant supplies of natural gas are locked up by government policies that prohibit drilling. These bans should be lifted so that environmentally controlled natural gas drilling can take place in all our offshore basins and in large areas in the Rocky

Mountains, which are now off limits. Because of its physical properties, natural gas is far less of a risk to the environment and our oceans and coastal areas than oil. When natural gas is produced, there is virtually *no* risk of an oil spill. In the lower 48 states, about 85 percent of the Outer Continental Shelf and 67 percent of onshore federal lands are off limits or facing significant restrictions to development.²⁷ However, in the near term, the natural gas supplies outside of these areas are already exceeding demand and will be more than adequate to meet much greater demand, leaving sufficient time to work out the environmental considerations for drilling in these environmentally more sensitive areas (see Chapter 7).

A Cap and Trade System

Cap and trade, the government-mandated system for establishing declining limits on carbon emissions and simultaneously creating a market for their trade, is a step in the right direction. However, it is not an overall long-term global solution. Cap and trade is flawed from the start, as there will always be enormous vested-interest pressure that will create international competition between governments and incentives for the overallocation of carbon emissions by individual nations. Any international cap and trade system negotiation will be no less rancorous than the arguments over farm subsidies. The system will be gamed by wealthy and poor nations alike at the cost of society in general. National governments will have to set CO₂ emission limits and their rates of decline for individual industries. So the vested interests will be lobbying for their very lives and nations will be competing with other nations for the benefit of their most-favored industries and to protect jobs at home. Therefore, although cap and trade is a worthy objective to create a real market, whether it becomes a global effort or just American policy, it will be fraught with loopholes and unfair practices. I am afraid it will be much harder to make work and agree upon than the general standards for global trade under the WTO.

Also importantly, cap and trade does not work directly to solve the large economic and national security problems related to excessive oil imports because it is doubtful that if the cap and trade limits are placed on the transportation sector that the fluctuating CO₂ prices would be sufficient to reduce gasoline demand meaningfully. Therefore, cap and

trade will not be a sufficiently effective force to reduce oil imports to a level that can begin to restore U.S. national and economic security. On the other hand, a green tax on oil, particularly imported oil, will do just that. However, cap and trade would be compatible and effective along with a green tax.

Overarching Macro Policy Objectives

The United States is in the midst of great crises at home, as well as what most likely will become civilization's largest crises emanating from our energy, geostrategic, and climate risks, so we must be bold and embrace change as never before. We must set our eyes firmly on the goal and never waver, because the magnitude of these crises is also the foundation for opportunities of equal magnitude, but only if acted on with equal boldness. President Obama must remember that our path to failure will be the path limited by the fear of bold action.

What follows are my recommendations for massive changes in how the United States consumes energy, and the macro policies necessary to jet the GET.

As I see the future, there are two fundamental seismic policy shifts necessary for America's future economic, environmental, and national security success. One is a green consumption-based tax system initially focused on coal and oil. The second is an energy and industrial policy organized to replace at least half our vehicle fleet with natural gas fueled CNG vehicles by the year 2015. By implementing these tax, energy, and industrial policies, the United States can unleash economic expansion, regain energy independence, and be far down the road toward climate stabilization by 2015. I will tackle the subject of a green consumption-based energy tax first, followed by an energy and industrial policy organized to convert half America's vehicle fleet to natural gas by 2015, and by doing so, regain our energy independence.

A Green Consumption-Based Tax System

We need a policy that will eliminate the indirect, hidden external subsidies to coal and oil that were the subject of Chapter 9. No matter what we do, we cannot overturn the economic truth that *we will always*

use more of what costs less, less efficiently, and less of what costs more, more efficiently.

The fundamental questions to ask as we face the looming three intolerables—intolerable economic, climate, and national security risks emanating from our current energy consumption rates and fuel mix—are these: What energy sources must we use less of to win our sustainable future? What must we use less of to regain economic and national security? What must we use *more* of to prevent energy-related economic and climate disasters and to become the world's energy technology leader? And how can we best accomplish these goals in turbulent and troubled economic times?

The GET gives us straightforward answers. We need to phase out the use of coal and oil that are causing the majority of our climate, economic, and national security problems, and use more gases: natural gas, wind, solar, and hydrogen. And most importantly, particularly in the midst of the U.S. financial crisis, we must drive the GET forward so that gaseous fuels replace solids and liquids, to accelerate us into the next great wave of economic growth. Let me repeat, the forthcoming wave of energy gases will unleash even greater economic growth than what we experienced in coal's Industrial Revolution and oil's post-World War II economic expansion to globalization.

In order to take full advantage of the next great economic pulse that will be fueled by the Age of Energy Gases, the United States must do all that is possible to encourage individual innovation, labor, productivity, and the growth and use of capital. In order to use less coal and oil, it seems clear that we should create a consumption-based green tax system that focuses initially on coal and oil. At the same time, in order to create incentives for labor, creativity, innovation, and invention to flourish and capital to grow and be deployed, we should eliminate all taxes on the income from our labor and the use and growth of our capital.

It is past time for a complete reform of our incomprehensibly complex, special-interests-dominated tax system. The cost for businesses, individuals, and nonprofits to comply with our tax laws and file returns has been estimated to be up to \$265 billion each year.²⁸ U.S. taxpayers should be freed from this ludicrously wasteful burden of money and time through tax simplification. To dig ourselves out of this

deep economic contraction, we need all of our labor and capital to be focused on productive efforts and investments in new opportunities. So, we must eliminate the tax laws as they currently stand and remove the tax burden from income and capital, to be replaced by a new green consumption-based tax system that will be the most macroeconomically efficient way to pay for government and at the same time drive us toward our energy and climate goals. It is a tax policy to jet the GET.

New taxes to replace these revenues could include a low flat tax or a consumption tax or both. I favor consumption taxes for three reasons. First, the mechanism for collecting sales and excise taxes is already in place. Second, sales taxes apply to everyone, foreigners and Americans, so everyone pays their fair share. The U.S. cash economy is huge—over \$100 billion per year²⁹—and not much of that is taxed. To balance our budget again, we need that tax revenue. Third, it is imperative for the United States to use less coal and oil, so a green consumption-based tax must be added on coal and oil that will reflect their real external costs. With the implementation of the green tax system, the government should conduct official studies on a continuing basis to determine as closely as possible the real external costs of the continuing use of coal and oil, as well as the other energy sources.

I know I will be rightfully challenged on the issue that a consumption tax is regressive. However, a consumption tax would broaden the tax base to include all Americans, the cash economy, and all foreigners purchasing goods in the United States. So, hopefully, such a broad tax base would lower the total burden on individual taxpayers. Additionally, our Social Security system or unemployment system would need to be expanded to include the idea of a “negative income tax” for the truly needy.

Some Approximate Tax Numbers

Individual federal income taxes produce approximately \$1.2 trillion³⁰ in revenue each year. A green consumption-based tax system initially focused on coal and oil could be phased in to replace this revenue. Imported oil’s external costs have been variously estimated to be from \$5 to \$10 per gallon.³¹ At current consumption rates, a tax of \$1 per gallon on gasoline, diesel, and jet fuel would produce revenues of about

\$200 billion. If the tax was increased by \$1 per gallon each year for five years, the revenue would be in the range of about \$900 billion after adjusting for an approximately 13 percent reduction in oil products consumption after a full five years.³²

External costs for the health effects of coal-produced electricity have been estimated to be in a wide range of from \$33 to \$83 per ton of coal consumed.³³ By starting a tax at \$30 per ton of coal consumed, revenue would equal about \$34 billion per year. If this tax were escalated to \$100 per ton over a five-year period, yearly revenue would likely increase to about \$113 billion. These rough calculations indicate federal revenue from coal and oil taxes to be about \$234 billion per year initially, escalating to approximately \$1 trillion in five years.³⁴ Thereafter, revenue would probably begin to fall as coal and oil are replaced by energy gases. As revenues from oil and coal taxes decline, sales or other consumption taxes could be increased as necessary.

I cite these numbers simply to show that the replacement of all income taxes could be achieved with a consumption-based green tax system. I will not attempt to define how a new green tax system will work, as I know there are plenty of great minds in Washington that can figure out the details. My goal is to lay out the philosophy of a green tax system and stimulate debate.

Finally, and most importantly, to set aside the regressive problem, any new plan would need to accommodate the poor, who need to drive but cannot afford the escalating gasoline cost or the conversion of their cars to CNG, as well as those who cannot afford the increased cost of electricity produced from coal alternatives. I believe that a system that offers assistance directly to the poor would be far superior and more economically efficient than one that creates macroeconomic distortions of the entire energy market and the building of energy inefficient infrastructure by keeping energy prices low *because* of the poor. By not charging the real full-cycle costs of coal and oil to consumers, we have polluted the country, diminished our health, and lost our national security. Just like the financial system, we have overleveraged our energy use and most of the debt has yet to come due. So, let's devise a system to care for the poor at the same time we phase in green taxes on coal and oil that represent—as closely as possible—their real external costs.

By making these bold changes in how we tax to pay for government, people will begin immediately to change their habits and to use less and less coal and oil as they turn to cleaner, less costly domestic fuels of all varieties. A real market for coal and oil that reflects their full-cycle costs will be, by far, the best and fastest way to diminish their use and accelerate the use of clean alternatives. At the same time, Americans will be able to keep the money they earn and grow their capital without tax. When the external costs of coal are charged to the consumer, wind and solar will certainly be less expensive and demand for them will continue to grow at exponential rates, so their current subsidies can be eliminated.

Need for Bold Changes and Fairness

Unfortunately for the United States, with today's political climate, troubled economic times, *and* unprecedented financial stress and credit problems, and the fact that so much brain power and economic strength is being drained by financial bailouts, Iraq, and Afghanistan, it is difficult to imagine that the necessary revolution in how the tax system works will occur without first experiencing further catastrophic disasters brought by one or all three of the three intolerables. However, a complete overhaul of how the government taxes to pay its costs is long overdue and vital for success in the twenty-first century.

Today, the United States must compete as never before. *Newsweek's* Fareed Zakaria aptly described this new world era as the "rise of the rest" in his book *The Post-American World*.³⁵ Without such dramatic energy and tax changes, the United States will continue to be faced with the difficult, competitive problem of a burdensome system that taxes the income from our labor and the growth of our capital worldwide, as well as a burdensome, inefficient, unsustainable nineteenth- and twentieth-century energy system. Conversely, most wealthy foreign participants in the "rise of the rest" will be able to grow their wealth largely offshore and untaxed, increasing the ever-widening gap between the world's poor and middle class, and the super-wealthy. Over decades, this trend will make the United States less competitive in the global economy, while more and more social costs and energy externalities fall upon the American wage earner. Also, without green energy taxes,

this untaxed foreign wealth will profit by participating in America's growth and by purchasing U.S. goods cheaply at less than their full cost. This is because foreign wealth will not be paying its fair share of the real external costs of energy used to create our growth or produce our goods. Without a green consumption-based tax, the external energy costs will continue to fall only upon the shoulders of Americans and inhibit our economic growth. The only way Americans can share the real costs of the use of coal and oil with all foreign participants in our economy is to create a green tax system that internalizes these costs. Otherwise, no matter who profits, these costs will continue to be borne only by Americans.

I argue that for the next 100 years, during civilization's evolution to sustainable energy systems, taxes on income and capital be abolished, and a green consumption-based tax system be phased in, focused on the two energy uses we wish to first reduce and eventually eliminate—coal and oil. Because external subsidies are the primary cause of the three intolerables, *taxes, energy, and climate are inexorably connected to one another*, as well as to future economic growth.

A green tax on coal and oil at rates estimated by government to equal the real cost of their use is fair. Why should an SUV commuter from the suburbs be subsidized by those who cannot afford SUVs and live close enough to work to walk? Obviously, such unintended, but real, consequences are unfair. Society as a whole is carrying the burden of the external costs of coal and oil. Our current policies have created the three intolerables by encouraging the inefficient use of coal and oil products. Second, to continue to tax labor and capital is to tax what we desperately need to grow and flourish, particularly as we face the necessary creative destruction of our outdated energy industries and the costs of rebuilding our entire energy infrastructure. We must not rebuild our energy infrastructure to use the same old energy sources that have brought us to the three intolerables.

Our current system of taxation was created for different times. It may have been effective for an agrarian and old industrial economy, but it is no longer socially fair or efficient. Our tax system is as outdated as our energy technologies. To compete effectively with the rise of the rest in the twenty-first century, it is my premise that the United States

must make radical changes in how we tax to pay for government, as well as radical changes in the fuels we use to run our economy.

Why a Green Tax Works Better than a Carbon or CO₂ Tax

My argument is based on the fact that in order to have a real, fair, and effective market to allocate coal, oil, natural gas, wind, solar, and hydrogen needed for future growth, we must level the economic and environmental playing field with a green consumption tax. Neither a carbon tax nor a CO₂ emissions tax will level the playing field because there are large external costs related to the full-cycle consumption of the use of coal and oil that do not apply to natural gas and are not measured by the varying quantities of carbon contained in coal, oil, and natural gas or their CO₂ emissions.

First, let's compare coal to natural gas. As a solid, coal emits particles into the air that natural gas does not. Coal also emits large quantities of sulphuric acid, which creates acid rain, and coal's emissions of mercury are the world's largest.³⁶ Forty-nine states have issued fish consumption advisories due to high mercury concentrations in freshwater bodies throughout the United States.³⁷ The American Lung Association has estimated coal's emissions cause 24,000 premature deaths annually, in addition to 550,000 asthma attacks each year and 38,000 heart attacks.³⁸ Also, as a new report implies, the full-cycle consumption cost of coal's externalities will continue to grow as coal quality declines, requiring increased coal tonnages to produce the same amount of electricity.³⁹ None of these costs relate to natural gas because natural gas produces nearly none of the pollutants that create these real and large health and environmental costs to society.

A fair consumption tax for imported oil must be set higher than for the use of coal. This is because imported oil has significantly higher external costs per unit of energy, even though it contains less carbon than coal. These higher external costs are associated with the large cost of our military protecting the free flow of oil, the cost of oil-related wars, our 2008 export rate of \$475 billion to pay for oil imports⁴⁰ that equaled about 70 percent of our trade deficit,⁴¹ and the loss of those funds to the U.S. economy. Of course, the greatest immeasurable and

tragic cost of oil is the cost of U.S. lives, oil's related cost of our diminished national security, and the fact that oil revenues finance our terrorist enemies.

A CO₂ or carbon tax does not level the environmental playing field between gasoline and natural gas because gasoline is the principal cause of the smog in all of our major cities. The extremely fine particulates emitted from gasoline are particularly deadly and linked to adverse pulmonary health effects.⁴² The use of natural gas in vehicles would eliminate all particulates and most of gasoline's other pollution. Although very difficult to measure, analysts have estimated the external costs of gasoline refined from Mideast oil to be in a range of \$5.00 to \$10.00 per gallon.⁴³ Again, natural gas has virtually none of these external costs.

If the external costs of *foreign oil imports* averaged only \$1 to \$3 per gallon since 1980, then the real cost of that oil would have been not only the price consumers paid, but an additional \$4 trillion to \$12 trillion, none of which was paid by the gasoline consumer.⁴⁴ In the case of coal, if the external costs of all coal consumed in the United States since 1980 averaged from \$10 to \$30 per ton, then the real cost of that coal would have been an additional \$260 to \$790 billion over and above what coal-fired electric power consumers paid.⁴⁵ Even though coal has considerably more carbon than oil, its external costs are less than imported oil. Neither a carbon tax nor a CO₂ tax level the economic or environmental playing field between coal, oil, and natural gas.

In addition to the serious question of whether such a thing as clean coal is pragmatically achievable, there is one additional fact about coal versus natural gas for America's energy future. In the book *Coal: Research and Development to Support National Energy Policy*, The National Research Council of the National Academies stated that "almost certainly, coals mined in the future will be lower quality because current mining practices result in higher-quality coal being mined first, leaving behind lower-quality material, with higher ash yield, higher sulfur, and/or higher concentrations of potentially harmful elements."⁴⁶ In fact, in terms of energy content, one analyst indicates U.S. coal production peaked in 1998⁴⁷ and the increased volumes of coal necessary to meet the same energy demand was made up by increased volumes of Wyoming's lower quality subbituminous coal. For the future, this means

that the increasingly larger volumes needed simply to meet today's electric needs will yield increasing levels of ash, sulphur and mercury as well as more CO₂ emissions per megawatt of electricity produced. All of these pollutants must be dealt with or the external costs of coal's use to society will continue to rise for the foreseeable future. However, none of these external costs apply to the use of increasing quantities of natural gas. In the case of natural gas, more efficient turbine designs now underway should actually lower CO₂ emissions per megawatt in the future.

Now let's look at natural gas. Natural gas contains little to nearly none of coal's and oil's non-CO₂ emissions, so the non-CO₂ external costs for the use of natural gas are minimal. One study estimated the external cost of natural gas to be about 40 cents per megawatt-hour or a tiny fraction of coal's external costs of \$13 to \$33 per megawatt-hour.⁴⁸ Because the use of natural gas to displace coal and oil will eliminate coal's and oil's large external costs, the use of natural gas actually has *external economic benefits* far in excess of its external costs. Natural gas's displacement of foreign oil imports has many external climate, economic, and security benefits. In addition, significant increases in the use of natural gas will also create large economic benefits because its increased use stimulates the domestic economy and creates more jobs at home.

To sum up, in order to level the economic and environmental playing field in the United States for the use of these three primary fuels, we would have to charge the consumer of imported oil a use tax that is actually in excess of a tax on coal, because even though oil has less carbon than coal, the use of imported oil has larger external costs. And because natural gas has very little non-CO₂ external costs, a system that only deals with carbon content is neither fair nor balanced. Neither a carbon tax nor a cap and trade system will economically or environmentally balance the carbon-based fuel playing field. So a green consumption tax is necessary to treat each fuel separately. Otherwise, the market will always tend to allocate more demand to the fuel with the highest external subsidies. Either a carbon tax or a cap and trade system by itself will be an energy policy designed to *favor* coal and oil over natural gas, wind, solar, and hydrogen, and will extend the use of coal and oil for decades into the future.

Our policy actions must respect that natural gas is the only domestic primary fuel that can be scaled up to reduce U.S. CO₂ emissions

and foreign oil imports within the coming decade. Only policies that address the external noncarbon social costs will achieve a fair and balanced energy future. At the end of the day, it is important to remember that we can't overturn the fundamental economic law that if we want to use less of something, we should increase its price, and if we want to use more of something, we should decrease its price.

The Systemic Relationship of Tax, Energy, and Climate

Because tax, energy, and climate policies are inextricably connected within society, we must be as bold in changes to our tax policies as we are in policies to solve economic, energy, and climate problems. Our economic goal must be to accelerate the forthcoming pulse of growth that will emanate from a major energy transition so that the cost of the transition is more than offset by both the economic growth and the savings that are achieved by eliminating the external costs of the old energy systems.

I call upon President Obama to scrap our inefficient, special-interest-riddled tax system and make a grand bargain with the American people to rid them of taxes on their income and the growth of their capital and replace the revenue with a green consumption-based tax system initially focused principally upon the use of coal and oil. A green consumption-based tax system will accelerate the phasing out of coal and oil and the phasing in of alternative energy sources, while releasing the product of our capital and labor from the chains of taxation. If enacted, these inexorably interconnected tax-energy-climate policies will not only accelerate the GET to diminish the three intolerables, but they will also stimulate and accelerate civilization's next and largest-ever economic expansion that will be driven by our transition to the Age of Energy Gases.

A Call for a Twenty-First-Century Energy and Industrial Recovery Plan

The American people are counting on President Obama and Congress to create a new America. We need a vision of a new future that all

Americans can come together and rally behind. Sure, we need to do all we can to prevent another Great Depression and jump-start the U.S. economy, but we need more than that and we need action now. To ensure action, the Obama administration needs overwhelming support from the American people. Here is a proposal most Americans may enthusiastically endorse:

A \$1 trillion Energy and Industrial Recovery Plan to convert and retrofit one-half of the U.S. vehicle fleet to compressed natural gas (CNG) by 2015 at little net cost to the U.S. economy. Saved payments to foreign oil producers will offset the plan's cost by 2017.⁴⁹ And we will profit from the trillions more saved over the long term. Americans paid about \$4 trillion for SUVs, light trucks, and gas-guzzlers they love. In these difficult times, we shouldn't expect them to buy new, more efficient cars to replace perfectly good ones.

America's vastly abundant, clean, affordable natural gas is the only scalable alternative to gasoline and diesel that can make a big energy and environmental difference in the near-term because much of the infrastructure is already in place. America's 2.2-million-mile natural gas pipeline grid connects most metropolitan gasoline stations and industrial facilities where CNG fueling tanks can rapidly be installed. Most importantly, 63 million American homes are connected to the grid where 130 million automobiles reside and can fill up at home. Automobile dealers can maintain jobs by beginning a massive CNG retrofitting program, along with the installation of fueling appliances at those homes.

Any automobile industry bailout should require automakers to produce CNG vehicles they manufacture in Europe here in the United States as a first step toward clean, efficient vehicles. Ford, GM, and Chrysler could also retrofit their millions of unsold SUVs, light trucks, and gas-guzzlers. The Big Three should continue to develop hydrogen fuel cell vehicles and electric plug-ins. But until most electricity is produced by sources other than coal, now generating 50 percent of America's electricity, plug-in vehicles are premature because they will actually increase CO₂ emissions. The Chevy Volt only goes 40 miles before it needs gasoline, whereas a CNG retrofitted SUV will drive about 200 miles or more. The ideal transition vehicle would be Toyota's recently announced CNG/electric hybrid.

Let's look at what this plan will accomplish:

- Pay for itself many times over in reduced foreign oil payments.
- Save millions of jobs in the automobile industry.
- Reduce oil imports by between 5 and 6 million barrels per day.
- Significantly enhance energy security.
- Save trillions of dollars in payments to foreign oil producers that can instead be invested in the United States.
- Stimulate our domestic economy by increasing natural gas demand that will trigger hundreds of billions of dollars in new private-sector capital expenditures that will generate a two to three times economic multiplier.
- Add about 250,000 new jobs in the natural gas sector.
- Increase payments to U.S. farmers and landowners by tens of billions of dollars annually.
- Help the United States dodge the economically deadly peak oil bullet.
- Reduce CO₂ emissions by over 200 million tons annually.
- Eliminate much of the pollution in major metropolitan areas and reduce related health costs.
- Restore the U.S. global leadership in energy and climate and help regain soft power.

The Obama administration's plan to save the financial system and rebuild America's deteriorating infrastructure is imperative, but a \$1 trillion Energy and Industrial Recovery Plan to convert and retrofit half of U.S. vehicles to CNG has a larger multiplier because it will go much further toward stimulating the economy and saving and adding U.S. jobs. And the owners of SUVs, light trucks, and gas-guzzlers will get full value from their \$4 trillion investment. This plan would be a major leap toward President Obama's energy and environmental goals and would set the United States on the course for an unprecedented economic expansion.

What follows are my recommendations for the transportation sector.

Low-Hanging Fruit in the Transportation Sector

Government mandates on automobile fuel standards have worked well and should continue to be an important part of policies to accelerate

the GET. Today, China already has higher gasoline efficiency standards in place than the U.S. targets for 2015.⁵⁰ The United States should lead the world in automobile efficiency and set the global standard. Therefore, U.S. mileage mandates for gasoline and diesel should be increased substantially and immediately.

America's new energy and industrial recovery plan should be organized to convert and retrofit half of all cars, trucks, and buses to compressed natural gas, CNG, principally by retrofit but also by increased production of CNG vehicles, by 2015. No other fuel can be scaled up faster to reduce our oil addiction and simultaneously diminish CO₂ emissions, smog, and other pollution in all urban areas.

Policy makers should recognize that there is no reason SUV and light-truck owners should not get full use from vehicles that have significantly depreciated in value because of high gasoline costs. The answer is to retrofit these vehicles to less-expensive, clean CNG. Americans have invested about \$4 trillion in SUVs, light trucks, and gas-guzzlers,⁵¹ and it is a tragedy for them to go on guzzling gasoline or for their owners to trade in or sell at a huge loss if gasoline becomes unaffordable, as is likely in the future. This would be a tragic loss for so many who are also struggling with home mortgage payments, losses in home values, or lost jobs.

I recommend a plan for tax credits and government guaranteed loans so that owners can retrofit their vehicles to run on 130 octane, clean CNG that usually costs less than gasoline and is produced at home and not subject to the real possibility of pocketbook-busting price increases. The plan should also cover filling appliances so if you decide to spend another \$2,000 to \$4,000,⁵² you can fill up at home as long as you are connected to the natgas grid. Think of the time and money you will save by not going to the gasoline station. The only downside is that you would have the inconvenience of only driving about 200 to 300 miles⁵³ before you throw the switch on your dashboard to go back to gasoline if your conversion remained dual-fueled. Unfortunately, unlike the rest of the world, where retrofits to CNG vehicles are growing like wildfire, the high costs and time required to meet EPA and California Air Resources Board rules, regulations, and certifications are effectively prohibiting fast conversion. Today, our regulatory system is a major incentive to keep importing oil.

Effective energy and industrial policy for converting half our automobile fleet must create clear and uncomplicated national standards and regulations so that certification can be quick and low-cost and easily completed by your local mechanic or auto dealership. Tax credits and government loans or guarantees for retrofitting to either dual-fuel or dedicated CNG vehicles should be clearly established and run through 2015. I recommend that the initial tax credit and/or loan guarantee be from \$3,000 for smaller cars and up to \$10,000 for larger cars, light trucks, SUVs, and vans. I recommend that whatever plan the government adopts be sufficient to cover the cost of conversion.

America's 2.2-million-mile natural gas pipeline grid is already connected to 63 million homes that house about 130 million vehicles, approximately half our auto fleet, and most gasoline filling stations in metro areas, and many industrial facilities and factories are also connected to the pipeline grid. Because this large part of the infrastructure is already in place, much of the chicken-and-egg infrastructure barrier to scaling up a clean alternative fuel is eliminated with CNG. We should focus on home refueling because it is vital to the creation of a large market for both the retrofitting of up to 130 million automobiles and CNG production models. As CNG catches on, this program will help motivate the auto industry to tool up for CNG vehicles. I recommend the existing federal tax credit of \$1,000 for a natural gas home fueling station be increased to \$3,000 and be combined with a government loan guarantee through 2015. Additionally, there should be mandates that CNG fueling must be installed at all gasoline fueling stations on or near the natural gas pipeline grid, and ample government assistance should be provided to owners of gasoline filling stations to cover the cost of installation.

In early spring 2009, U.S. Congressmen Dan Boren and John Sullivan of Oklahoma and John Larson of Connecticut introduced legislation to extend natural gas vehicle and infrastructure tax credits, give incentives for vehicle manufacturers to build natural gas vehicles, and require the federal fleet to choose natural gas vehicles for 50 percent of its vehicle purchases.⁵⁴ As a first step, I recommend the immediate adoption of this and similar initiatives. Tax credits, government loans, or guarantees should also be available for large industries and manufacturing facilities that are on the natural gas grid to install filling facilities

so workers can fill their CNG vehicles while at work. Fleets of vans, trucks, or buses could also be converted and filled at these locations.

CNG Production Models

The next step should be substantial government assistance for the U.S. automakers to tool up CNG vehicle production. Currently, Honda has the only production CNG vehicle—the Civic GX—now sold in the United States, while GM and Ford have several models that are upfitted to run on compressed natural gas. However, nearly all European automakers manufacture CNG vehicles, including BMW, Ford, GM/Opel, Mercedes, Peugeot, Porsche, Volvo, and Volkswagen.⁵⁵ These models could quickly come to the United States as the market demands. Today, there are only about 150,000 CNG vehicles in the United States,⁵⁶ compared to about 8 million around the world.⁵⁷ The number is growing rapidly outside the United States. About two years ago, there were only about 5 million CNG vehicles in the world and all the growth has come from other countries such as Pakistan, India, Bangladesh, China, Iran, and South American countries. It is time the United States becomes the world's leader in CNG vehicles (see Exhibit 12.1).

In fall 2008, President Bush signed into law a spending bill that included a \$25 billion loan package for troubled automakers to produce more fuel-efficient cars and trucks. To meet CAFE standards is an important goal, but tooling up could be phased in over the longer term. In the near term, converting several of their existing models to CNG



Exhibit 12.1 Honda Civic GX Natural Gas Vehicle: About \$25,000

Source: Courtesy of American Honda Motor Co. Inc.

or producing in the United States some of their current CNG models now sold in Europe would cost only a fraction of that amount for U.S. automakers. So the production of CNG models should become mandatory for the automakers that receive government assistance.

Today, there are a range of tax credits in place for purchasing a new, dedicated CNG automobile that are set to expire September 30, 2009.⁵⁸ What is needed immediately are much higher tax credits and some form of government rebate as well as loans or guarantees for CNG automobile buyers.

With these kinds of proactive policies in place to convert half of our automobile fleet to CNG and to achieve a 40 percent increase in fuel efficiency through CAFE standards by 2016, the United States can cut its oil imports from about 13 million barrels per day to about 5 million barrels per day and, by doing so, achieve a large measure of energy security.

To fuel half the U.S. fleet, including half the nation's trucks, with natural gas would require about 11 Tcf a year of new natural gas supplies.⁵⁹ I will address why I am confident we can easily meet this new demand later in this chapter.

The Approximate Costs

For half our fleet to be CNG vehicles by 2015, by far the largest percentage will be retrofitted vehicles and the balance will be new CNG production models. So let's guess that 75 percent of the 130 million automobiles at homes on the natural gas pipeline grid will be retrofitted, or about 100 million vehicles, and the other 30 million would be newly purchased CNG production models. If a tax credit was \$3,000 for most retrofits and \$15,000 for new CNG vehicles, then the lost revenue over the period from enactment to 2015 would be about \$300 billion for retrofitting and about \$450 billion for new CNG vehicles.

To install a natural gas fueling appliance in 63 million American homes, at about \$4,000 each (and prices would be lower when mass produced), would cost about \$250 billion. To install natural gas fueling facilities at the approximately 120,000 metropolitan gasoline filling stations estimated to be on or near the natural gas pipeline grid would

cost about \$70 billion more.⁶⁰ Because, like home filling, CNG filling stations are fundamental to the conversion of half of our fleet, we should mandate that those stations on or close to the natural gas pipeline grid be CNG capable by 2012. To assist their owners, we should also put in place a tax credit and government loan program to help facilitate their installation.

America's Heavy Trucks and Buses

I have concentrated so far on personal cars, light trucks, and SUVs because those are the vehicles needed by Americans for their jobs and lives. However, another sector of low-hanging fruit in transportation is the heavy trucks that move U.S. goods. Each of these heavy-hauling trucks use about 15,000 to 20,000 gallons of diesel each year.⁶¹ Many truckers turn over their fleet every 7 to 10 years,⁶² so by 2020 most of the fleet would be renewed and could be natural gas capable. Because the incremental cost of CNG or LNG capability can add as much as \$40,000 to \$60,000 to the cost of heavy trucks, they should be added to the government assistance program.

A company called Clean Energy Fuels is the only public company in the business of both converting vehicles to CNG and owning CNG fueling stations. Although relatively small, it is an excellent test case to show how well CNG works and how much the United States benefits. In late 2008, Clean Energy had about 175 CNG fueling stations with plans to add about 150 more, mostly in the Los Angeles region (see Chapter 10). The company has recently been working with the ports of Long Beach and Los Angeles to convert the heavy-haulers that pick up mostly Asian imports and deliver them to places like Wal-Mart distribution centers around the country. Within the next five years, thousands of trucks working in and out of these two ports will operate on natural gas, reducing diesel demand by about 160 million gallons per year and saving their owners about \$155 million annually.⁶³ My point in recounting this is that we know it can be done successfully here in the United States because it *is* being done. Let's learn from Pakistan, India, Bangladesh, China, Iran, our South American neighbors, and Clean Energy Fuels and ramp up this program as part of our new energy and industrial policy. If the federal government put in place the Energy

and Industrial Recovery Plan recommended herein, the combination of tax credits and government guaranteed loans could equal up to about \$1 trillion over the period 2010 to 2015. But \$700 billion would be saved during the same period on purchases of foreign oil and would pay trillions in dividends in the future.

Energy Independence and Climate Progress by 2015

With the successful implementation of this Energy and Industrial Recovery Plan, we will be well on the way to overcoming our climate and energy problems by 2015. Without including sizable CO₂ reductions resulting from across-the-board gains in energy efficiency, the transportation accomplishments alone will have lowered CO₂ emissions by about 225 million metric tons per year.⁶⁴ Our conversion to CNG vehicles, including heavy trucks, will have reduced foreign oil imports by 5 to 6 million barrels per day, and increased CAFE standards will save us another 2.3 million barrels per day,⁶⁵ for a total reduction in oil consumption of about 8 million barrels per day. That is equal to 40 percent of our daily use of 20 million barrels a day. Most importantly, our foreign imports will decline from about 13 million barrels per day to about 5 million barrels per day. *So by 2015, our nation will have regained most of its energy independence.* If peak oil occurs during this period as so many experts predict, and the world is facing oil shortages rationed either physically or by price, or both, another significant benefit is that *America will have dodged that deadly bullet.*

Under this plan, we would have substantially reduced U.S. payments to foreign producers from 2008's near \$500 billion per year. Total savings between now and 2015⁶⁶ just from our conversion to CNG would be \$700 billion, with trillions more in the decades to come. We could create a million or more jobs in the transportation and energy sectors, and we would have enriched millions of U.S. landowners by drilling for and producing their underground natural gas wealth. Most importantly, throughout this energy and industrial economic expansion, Americans would be adding to their new wealth without taxes on their income or the growth of their capital. We would be living in a reenergized,

competitive America, leading the world in energy technologies, and will have regained energy independence.

How Natural Gas, Wind, and Solar Will Meet This New Demand

If either a green consumption-based tax is placed on coal or a sufficiently stringent cap and trade system is implemented, then coal will be phased out of power generation and most new electric demand will be met with natural gas, wind, and solar facilities, paid for by the private sector without the need for subsidies. If we were to mandate that no coal-fired electric plants be built without working CCS at start-up, as I recommend, then, because of the current state of CCS technology, it is doubtful that many plants could be built until after 2020. Therefore, most new electric demand in the near term will need to be met principally with natural gas, wind, solar, and nuclear. However, because of financing and siting delays, it is unlikely that nuclear power will contribute much. So at least 90 percent of new electric demand⁶⁷ will need to be met with natural gas, wind, and solar. Assuming an 85 percent to 15 percent natural gas to wind and solar sharing, the additional natural gas required to meet new demand in the power sector would be about 2 Tcf by 2015.

When the new natural gas demand from the transportation and power sectors are added together, natural gas supplies would need to increase by about 13 Tcf—from 23 Tcf in 2008 to 36 Tcf in 2015. I am confident producers could increase domestic natural gas production to the levels necessary to meet this demand. If there are shortfalls, the balance could be made up with Canadian imports, LNG shipments from around the world (the world also has an excess supply of LNG), and our large Alaskan supplies even without drilling in ANWR.

My confidence is derived from my belief in natural gas abundance set out in Chapters 6 and 7, bolstered by the new Navigant Consulting study of U.S. natural gas resources,⁶⁸ as well as, and most importantly, the actual results from U.S. shale production over the past decade. The key for the growth of shale natural gas supplies is demand and price. If natural gas prices were demand driven over the period with prices in

the range of \$6 to \$9 per Mcf (the equivalent of \$36 to \$54 per barrel of oil), then it is credible to predict that the recent accelerating rate of shale production growth would continue and provide about 10 to 14 Tcf of supply by 2020.⁶⁹ That being true, shale production alone could scale up to meet demand necessary for half the vehicle fleet. U.S. non-shale natural gas from the very large and still undeveloped conventional reservoirs (off both coasts, particularly the East Coast, in the Rocky Mountains and Alaska), tight sands, coal bed methane, and vast potential supplies from our deep, largely undeveloped onshore geological basins, would offset much of the natural decline rates, as well as add additional reserves. In fact, with demand-driven prices all of this other nonshale natural gas should be able to grow its production another several Tcf in the near term.

In summary, to supply the transportation and power sectors, natural gas supplies in the United States would need to increase by about 13 Tcf by 2015. In 2008, the United States produced 20.5 Tcf⁷⁰ and imported 3.6 Tcf from Canada⁷¹ and less than a half of a Tcf by LNG. The United States's domestic natural gas production could grow from 20.5 Tcf in 2008 to about 30 Tcf by 2015, or about 5 percent per year. This growth would come from additional shale production and additional production from nonshale after making up for the decline rates. So domestic production, excluding Alaska, could meet near 30 Tcf of the 36 Tcf per year needed for domestic consumption. The balance would be made up by Canadian imports, LNG, and from Alaska's vast supplies.

U.S. natural gas producers can meet this challenge. Natural gas is the only fuel that can be scaled up to do the job. No other alternative fuel could accomplish so much for our climate goals and energy security for less cost to our U.S. economy with so many collateral economic benefits. When the economic benefits of a million or more new jobs, reductions of payments of trillions of dollars to foreign oil producers, reductions in U.S. health costs, and all the other climate, economic, and national security benefits are added in, it is my belief that the United States will actually be making money while achieving new economic growth and a higher quality of life. In the big picture, our enormous savings on foreign oil imports will pay several times over the about \$1 trillion cost of converting and retrofitting half of the U.S. automobile

fleet to CNG and putting in place fuel appliances and filling stations to serve this new industry.

Over the longer term, natural gas is the bridge fuel to the hydrogen economy. As we use up America's natural gas over the next 60 to 70 years, wind, solar, and hydrogen will continue to displace natural gas and electric and hydrogen fuel cell vehicles will replace CNG. These policies will lead us naturally into the hydrogen economy. The key components of the hydrogen economy are hydrogen itself, wind, and solar, and because natural gas is compatible with wind and solar, the natural gas bridge actually works to accelerate wind and solar. Because some natural gas infrastructure works with hydrogen, natural gas is also a bridge to hydrogen itself. For instance, hydrogen can be phased into natural gas pipelines and natural gas-generating facilities to lower CO₂ emissions. In the transportation sector, Honda makes a home hydrogen appliance that supplies hydrogen made from natural gas for fuel cell vehicles. Others will soon come on the market if this becomes America's direction.

Conclusion

I cannot recommend the form of these tax, energy, and economic policies, as I think that is for our policy makers to shape, but rather, here I state the case that we can afford them and even suggest that it is probable that we cannot afford *not* to embrace them. My hope is to start the debate the United States needs in order to sort out the right path through the complexities of energy use.

President Obama must rally Americans behind this new vision for our future. I believe that in the midst of all our current troubles and chaos, Americans are hungry for and in need of a new vision. It is my great hope these ideas may be the starting point. All Americans will win big from our next Industrial Revolution and economic expansion fueled by clean energy gases. It is time for the United States to re-create itself to lead the world to a twenty-first-century energy and Industrial Revolution for the benefit of all. At no other time in history has it been so essential to jet the GET.