OPPORTUNITY 08
Independent Ideas For Our Next President

Building a Secure Energy Future
A Challenge for New Presidential Leadership

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Summary

The next President will face two intertwined challenges that have long been viewed as distinct issues -- energy security and global climate change. During the current decade, volatile prices have drawn attention to rising demand for energy, the need for investment in energy development, and key vulnerabilities in the energy economy. In parallel, the international scientific community has solidified its consensus that carbon dioxide emissions and other greenhouse gases threaten the Earth's climate and therefore an astonishing array of aspects of human life.

Responding to these immense challenges will require the full weight and leadership that a new President will bring to office. The next President should:

- **Start by promoting energy efficiency –** Efficiency in energy use should stand at the very top of our national energy policy agenda, because it can yield the quickest benefits in protection against climate change and disruptions in energy supply. The President should support a goal of *an annual increase of 2.5 percent in energy efficiency*. To meet this goal, the President should promote the full range of proven, cost-effective techniques to increase energy efficiency, initiating a sustained, multi-decade effort to use less energy in our households, businesses, and communities.
- **Get serious *now* about energy security and climate protection** – The President should work with Congress to enact, as soon as possible, *initial* measures to enhance energy security and mitigate climate change. Early action would set basic consumer expectations and spur investment in long-lived

energy-consuming devices for our nation's industries, families, and government agencies. An early response would make clear to the international community that a new Administration intends to be part of the global *solution* to energy and climate problems.

- **Adopt a "Hippocratic oath"** for energy security – The President must ensure that U.S. policy recognizes climate protection as an integral aspect of energy security. The President should adopt policies that discourage the greater use of carbon-intensive technologies. Further, the President must engage the energy industry—not antagonize it—in meeting our climate and energy security challenges.
- Lead a national effort to **get smart about energy** – The new President should promote an ongoing and informed societal discussion about energy use and energy security. The relationship between personal choices and energy policy must be made clear to everyone.
- **Prepare for the long haul** – Resolving our nation's energy and climate problems will not be completed in the new President's first 100 days, by the United States acting alone, or through simple fixes. Instead, the President's agenda must encompass concerted, steady efforts to develop and refine successive rounds of new policy. The new President must accept—and must impress upon the general public—that there will be no easy answers and that we will have to reduce our energy consumption steadily, embrace new ideas, and pursue the future patiently along with international partners.

Context

Break the Cycle

For more than 30 years, the United States has struggled to enhance its energy security. Unfortunately, our efforts have been episodic rather than systematic. Our attention to energy security reaches a fever pitch when global energy prices spike or international conflict threatens to disrupt energy trade. We typically respond by vainly seeking a technological or legislative "silver bullet" that does not fundamentally alter energy consumption and supply patterns. The public's and policymakers' attention

wanes when prices subside naturally, lulling us into a false sense of security while the energy intensity of our economy remains undiminished. In a few years, the cycle repeats.

Meanwhile, over the past 15 years, the scientific community has spoken with a steadily stronger consensus that greenhouse gas emissions are placing natural systems and over time large numbers of human lives at risk. Certainly, many details of the global climate's internal workings are unclear, as are certain of the economic implications of potential policy responses to climate change. What *is* clear is that, by continuing to emit huge quantities of greenhouse gases into the atmosphere, we are engaging in a scientific experiment of unprecedented scale and potentially catastrophic consequences.

The linked energy and climate challenges that the United States faces in the still-young 21st century require a more aggressive, more thorough, more sustained response than our country has mustered so far. New threats to the functioning of international energy markets have taken shape—threats from rapidly growing competitors for traditional hydrocarbon resources, from terrorists whose willingness to wreak human suffering and economic chaos is beyond debate, and from environmental impacts that risk wholesale changes to the global climate system. The next President has an opportunity to reduce these threats by meeting the energy and climate challenges head on.

Elements of Energy Security

Traditional definitions of energy security have included availability, reliability, and affordability.[1] The United States must contend with these three factors but, now, must also manage a fourth of energy security—environmental sustainability (Table 1).

Availability

First and foremost, energy security reflects consumers' ability to secure the energy they need. Commercial energy markets take shape only when suppliers and

[1] For example, see Daniel Yergin, "Ensuring Energy Security," Foreign Affairs, March-April 2006.

consumers find mutually acceptable terms of trade. Energy availability requires physical resources, capital investment, the efficient application of technology, and both social and regulatory acceptance. U.S. energy markets are highly developed, and virtually all consumers have commercial energy available to them. By contrast, worldwide, 1.6 billion people still lack energy services in their homes.

Demand for energy is skyrocketing across the globe due to economic stability in industrialized countries and accelerated growth in China, India, and other emerging economic powers. The transportation sector is rapidly expanding in these countries and depends heavily on petroleum-based fuels. Past oil and gas development has depleted the relatively easy-to-access petroleum reserves, and in the future oil and gas development will involve deposits that are:

- scarcer, with fewer super-giant fields being discovered
- farther from demand centers
- deeper and harder to extract, involving deep-water locations, high pressure, or high sulfur content
- located in poorer countries, with risks of political instability and poor governance
- controlled by governments that rely on resource nationalism, state capitalism, or secret bilateral contracts and, inevitably,
- costlier to develop.

Reliability

Reliability involves the extent to which energy goods and services are available uninterrupted. Energy is an essential building block of economic activity, and interruptions jeopardize the continuous ability to run factories, illuminate hospitals, and heat homes. Ways to enhance energy reliability include:

- diversifying *sources* of supply
- diversifying the *supply chain* used for processing, transporting and distributing energy
- increasing *reserve* capacity of energy networks such as pipelines and power generating and transmission systems
- creating *emergency* stocks

- developing a *redundant infrastructure* and
- disseminating timely *market information*.

Affordability

Affordability encompasses more than the question of whether energy prices are low or high in absolute terms. It includes the *volatility* of prices: that is, whether prices are significantly higher than previously and whether consumers expect them to increase or decrease.

Consumers and voters tend to prefer inexpensive energy, because, at least in the short run, low energy costs allow them to spend on other things. However, low costs that fail to convey the full impact of energy use are incompatible with true energy security. The expectation of low prices encourages consumption, discourages investment in production, and makes buyers vulnerable to price shocks when their expectation proves wrong.

Sustainability

A contemporary approach to energy security must include environmental sustainability, for two reasons:

- *Climate change clearly will profoundly affect energy systems.* For example, rising sea levels will require redesign and re-construction of the transportation infrastructure that serves energy systems—from oil terminals to shoreline rail and road systems.
- *A focus on a narrow concept of energy security could prompt use of technologies and practices that would exacerbate climate change.* For example, subsidies for coal-to-liquids technology, which Congress has been considering in order to reduce petroleum use, would increase greenhouse gas emissions unless major breakthroughs occur in carbon capture and storage.

Table 1: Energy Security Elements, Components, and Potential Threats

Elements	Components	Potential Threats
Availability	• Physical endowment of producer-countries • Ability of producers, transit countries, and consumers to agree on terms of trade • Technologic solutions for production, transportation, conversion, storage, and distribution • Capital investment • Viable legal and regulatory structures • Compliance with environmental and other regulatory requirements	• Exhaustion of reserves that can be extracted cost-effectively • Limits on development opportunities (such as resource-nationalist policies and state-to-state contracts) • Problems in sitting infrastructure (The "not in my back yard" or NIMBY syndrome)
Reliability	• Robust, diversified energy value chain • Adequate reserve capacity for entire value chain • Short- and long-term protection from terrorist attacks, extreme weather, and political interruptions • Adequate information about functioning of the global energy market	• Failure of energy systems due to severe weather, earthquake, etc. • Failures due to poor maintenance or under-investment • Attacks (or threat of attacks) by military forces or terrorist organizations • Political interventions (such as embargoes, sanctions)
Affordability	• Transparent pricing for various consumers • Prices include impact of any applicable subsidies • Low price volatility • Realistic expectations for future price • Prices reflect costs over differing timescales – short-term operations, full lifecycle	• Exhaustion of reserves that can be extracted cost-effectively • Excessive demand resulting from high energy intensity and/or failure to institute sound pricing and other desirable policies • Failure to incorporate environmental dimension into concepts of energy security (resulting in need for an even more urgent response to climate change or other sustainability threats)
Sustainability	• Low emissions of	• Policy responses to

	greenhouse gas and other pollutants • Minimal contribution to local, regional, or global threats to environmental quality • Protection from impacts of a changing climate	narrow definition of energy security (e.g. support for increased use of coal before carbon capture and storage are commercialized) • Impacts of a changing climate (such as sea-level rise, storm surges, severe weather events)

New Policies, New Leadership

Shortly after taking office, Vice President Cheney famously said, "Conservation may be a sign of personal virtue, but it is not a sufficient basis for a sound, comprehensive energy policy." If nothing else, the last six years should have helped us realize that, while energy policy cannot consist *solely* of energy efficiency, energy efficiency is *exactly* the place we need to start in order to meet our country's energy security challenges.

Make Energy Efficiency a National Priority

The next President should enshrine efficiency as our very top energy priority, because it can help us reduce our energy security vulnerability in a timely fashion while improving economic and environmental performance. Further,

- energy efficiency efforts have yielded positive results in the past
- we still have great capacity for efficiency improvement and
- by being serious about energy efficiency, we can more easily engage international partners in cooperative energy security projects.

The new President's energy efficiency program should involve quantified targets for climate change mitigation. It should be comprehensive, addressing both energy supply and demand. It should be market-based. And, it should be complemented by expanded support for research and development on energy efficiency and renewable sources.

Energy efficiency has been an element of U.S. energy policy since the 1970s, which has resulted in federal and state legislation, a base-level of public awareness, numerous policy innovations, and significant reductions in the amounts of energy that otherwise would have been used. Unfortunately, energy efficiency has never been treated as the cornerstone of energy policy. For example, the Energy Policy Act of 2005, which Congress debated for four and one-half years, buries modest energy efficiency provisions under a mound of measures intended to promote cheap energy supply.

Indeed, few policy goals have united American political leaders as much as has the pursuit of low energy prices—bringing together Republicans and Democrats, the legislative and executive branches, labor leaders and industrialists. The emphasis on cheap energy has had the inevitable result: people use more of it than they would if it cost more.

Energy efficiency is a proven tool that has already saved our country both huge quantities of energy and great sums of money. According to the Bush Administration's National Energy Policy report, issued in May 2001, "Had energy use kept pace with economic growth, the nation would have consumed 171 quadrillion British thermal units (Btus) last year instead of 99 quadrillion Btus. About a third to a half of these savings resulted from shifts in the economy. The other half to two-thirds resulted from greater energy efficiency." A forthcoming study estimates that our avoided energy consumption has saved us $700 billion per year.[2]

Opportunities for further cost-effective improvements in energy efficiency are abundant. Studies suggest that it would be economically realistic to reduce natural

[2] The avoided energy consumption is the equivalent of 4.2 billion metric tons of avoided carbon dioxide emissions (as against a baseline of U.S. emissions of nearly 6 billion tons of CO_2 in 2004), or 33 million barrels of crude oil per day (an amount equal to roughly two-fifths of current world oil production). Audrey B. Chang, Arthur H. Rosenfeld, and Patrick K. McAuliffe. "Energy Efficiency in California and the United States – Reducing Energy Costs and Greenhouse Gas Emissions." In *Climate Change Science and Policy,* Stephen H. Schneider, Armin Rosencranz, and Valerio Mastandrea, eds, forthcoming, 2007.

gas consumption by nine percent or more and electricity consumption by 20 percent or more, with some estimates ranging considerably higher.[3]

The UN Foundation's forthcoming study, "Bringing Energy Efficiency to Scale," recommends that all G-8 nations accept the goal of increasing energy efficiency by 2.5 percent per year. *The next President should adopt this goal from the day of inauguration, signaling unambiguously that a new day has come in U.S. energy policy and that the President intends to attach all the prestige of the office to this priority.*

Improvements in energy efficiency result from decentralized decisions by myriad economic actors and an array of policy approaches and specific measures. Consumption patterns depend on investment choices in equipment and infrastructure that are used for a long time (such as refrigerators, motor vehicles, and air conditioners), and the next President will need to *employ all the available tools* that have been developed over the years, including:

- pricing structures that create incentives for buying high-efficiency devices[4]
- programs to inform consumers about their purchases' energy requirements (such as the EnergyStar program)
- legal and regulatory reforms and
- minimum performance standards for household and commercial appliances, building materials, and cars and light trucks.

A substantial benefit of Presidential leadership on energy efficiency will be to improve the atmosphere for international cooperation on all issues related to energy security.

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[3] Energy analysts struggle with differences among *technical* potential (reductions that could theoretically be achieved through the application of available technology, without regard to cost-effectiveness), *economic* potential (reductions that would be cost-effective), and *achievable* potential (reductions that could be applied in the marketplace given current policy, regulation, and economic factors). Another complication is secondary economic effects. For example, corporate average fuel economy (CAFE) standards made automobiles more efficient through the 1970s and 1980s, thus reducing consumers' out-of-pocket costs for driving a given distance. This cost reduction spurred unforeseen increases in the amount that the average driver traveled by car. *See* Steven Nadel, Anna Shipley, and R. Neal Elliott, "The Technical, Economic, and Achievable Potential for Energy Efficiency in the U.S. – A Meta-Analysis of Recent Studies," American Council for an Energy-Efficient Economy, 2004.

[4] For example, builders currently have little or no incentive to install highly efficient appliances and materials in new homes. But, if electric utilities bore some of this expense, they could avoid more costly investments in power plants. Timothy E. Wirth, Vinod Khosla, and John D. Podesta, "Change the Rules, Change the Future," May 22, 2007. Available at http://www.grist.org/comments/soapbox/2007/05/22/change/.

International cooperation is an essential prerequisite for effectively addressing many energy security issues, including climate change in particular.

Act Early on the Energy-Climate Connection

As prices have climbed, voters have had energy issues on their minds, and their concern has been echoed in the words of political leaders. In the 2006 State of the Union address, President Bush, the one-time Texas oilman, declared that we are "addicted to oil." A year later, he announced a target of reducing gasoline consumption by 20 percent below 2010 projections, through higher fuel efficiency, "alternative" fuels, and coal-to-liquids conversion.

From the first day of the 110th Congress in January 2007, members have focused on energy security and climate change, proposing a wide range of new legislation. Competing bills would establish a cap-and-trade system for carbon dioxide and other greenhouse gases, encourage domestic oil and gas production on the outer continental shelf, promote use of coal for the production of liquid fuels, encourage domestic ethanol production, and create a carbon tax, among other ideas.

The Administration has invested remarkably little political capital in dealing seriously with climate change.[5] The issues to be resolved are complex, and every decision has the potential to engender opposition from a powerful lobby. *The new President should signal from the outset that it is more important to have an early climate change mitigation instrument than to spend five years developing a perfect and comprehensive one.*

Congress is now considering two main approaches to reducing greenhouse gases—a *carbon tax* and a *cap-and-trade* system. A carbon tax would increase the cost of any

[5] Instead, the Bush Administration has spent time and political capital undercutting and obstructing the Kyoto Protocol. Admittedly, that agreement is an incomplete start to the business of mitigating climate change. However, instead of working to correct and amend it, the Administration sowed doubt about climate science and delayed a multi-lateral response. Consequently, when the Bush Administration announced its new climate initiative on May 31, 2007, just in time to help defuse conflict between the United States and European Union at the G-8 summit in Heilingendamm, international reaction was tepid. *See* The White House, "Fact Sheet: A New International Climate Change Framework, May 31, 2007." Available at http://www.whitehouse.gov/news/releases/2007/05/20070531-13.

good that results in the emission of carbon into the atmosphere, while a cap-and-trade system would provide a hard limit for greenhouse gas emissions nationwide, then establish a mechanism under which companies could trade emissions permits under that "cap." Either mechanism could deliver environmental and energy security benefits, simply because both would increase the cost of energy and goods that require energy in their production.

The carbon tax has been criticized by influential opponents. For example, in July 2007, House Energy and Commerce Committee Chairman John Dingell (D-Mich.) said, "I sincerely doubt that the American people will be willing to pay what [a proposed carbon tax] is really going to cost them."

A cap-and-trade system also would result in higher energy prices. In fact, that is exactly the point. At present, our energy prices completely fail to reflect the environmental and security implications of energy use. The next President should send an unmistakable signal that Americans must make different energy choices than they do today. Without doubt, *the United States needs higher energy prices*.[6]

The next President must shepherd a *first* greenhouse gas control measure through Congress and sign it into law quickly, while stressing that Americans must plan for a protracted period of rising energy prices. Either a carbon tax or a well-designed cap-and-trade measure could be this first step. Either should be *phased in*, so as not to shock the economy. But this is just the first step. Many other energy policy innovations will be needed in the years to follow, to enable us to reduce greenhouse gas emissions by the huge increments that are essential.

[6] The impact of higher energy prices on rural and low-income households requires careful analysis and carefully crafted relief mechanisms. *See* Ian W.H. Parry, "Are Tradable Emissions Permits a Good Idea?" Resources for the Future, November 2002; U.S., Congressional Budget Office, "Limiting Carbon Dioxide Emissions: Prices Versus Caps," March 15, 2005; *or* Craig Hanson and James B. Hendricks, Jr., "Taxing Carbon to Finance Tax Reform," Issue Brief, World Resources Institute, available at http://pdf.wri.org/taxing_carbon_full.

Take a "Hippocratic Oath" for Energy Policymakers

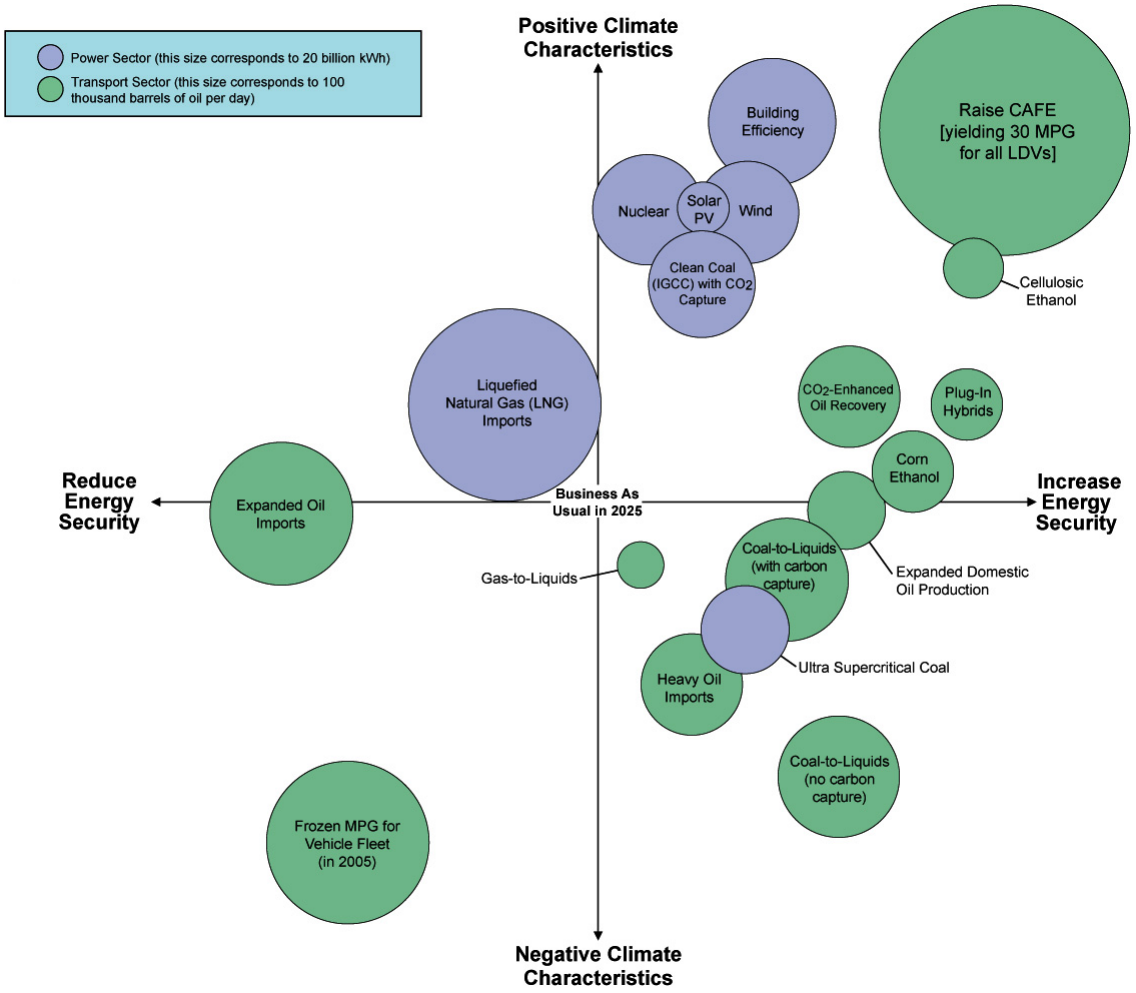
Newly trained physicians are admonished: "*Primum non nocere*" -- "Above all else, do no harm." In this spirit, the next President should ensure that our actions on energy policy do not create bigger energy security problems for future generations.

The risk takes different forms. For example, if we continue to view increased energy security as anything that leaves us less dependent on imported energy supplies, we might be tempted to resort to the wholesale use of domestic coal reserves, even before we learn to capture and store the resulting high carbon emissions. In transportation, we may aggressively tap Canadian tar sands, which yield crude oil only after energy- and water-intensive processing and broad disturbance of the natural environment. Or, we may be tempted to develop or even subsidize the capacity to transform coal into liquid fuels.

These approaches all have in common the easing of one part of our energy security problem—import dependence—at the expense of worsening climate change, another threat to true energy security. The World Resources Institute has illustrated the interaction between traditional energy security concerns and climate change characteristics for different technologies (Figure 1).[7] Ideally, energy security policies would promote technologies in the upper-right quadrant of Figure 1, because they do the least damage to both climate and energy security.

[7] World Resources Institute, available at: http://www.wri.org/climate/topic_content.cfm?cid=4368.

Figure 1: Selected U.S. Energy Options – Climate Change and Energy Security Options and Tradeoffs to 2025



Source: World Resources Institute

Another aspect of the "Hippocratic oath" for energy policy relates to private-sector engagement. Some political leaders have taken to blaming the energy industry for the bulk of our problems. This is neither accurate nor productive. The industry must be an integral part of the solution. To illustrate, progress on carbon capture and storage requires the expertise of the oil and gas companies, which have the only existing experience injecting carbon dioxide into deep underground storage. Similarly, creating more robust energy systems, emergency stocks, and redundant infrastructure requires a legal and regulatory environment that attracts private investment. Our leaders should hold the energy industry to high ethical standards and should call on it to

accept change and to engage in an honest dialogue with the public. But our leaders must avoid vilifying the industry for short-term political advantage.

Help Citizens Get Smart about Energy

No aspect of our nation's energy security challenges will be easy to resolve. Every aspect will involve tradeoffs and concerted action, sustained over decades. The underpinning of action must be an informed awareness of the issues at stake; today, many Americans are poorly informed about the energy industry and highly suspicious of it. Americans have a wildly exaggerated sense of our share of the world's global petroleum resources.[8] As many as seven in eight assume that energy companies are manipulating markets in order to gouge the consumer.[9] In one survey, eight in ten respondents voiced serious concern about energy security, while three in four opposed having a power facility built near their homes.[10] Voters in numerous states support renewable portfolio standards (requiring that a certain share of power come from renewable sources), but then obstruct wind farms and transmission lines that would deliver the green power where it is needed.[11] Similarly, many people appear to support action to reduce climate change but recoil at the thought of paying more for energy, using less of it, or paying attention to greenhouse gas emissions.

The energy industry itself has done a spotty job of engaging the general public – and sometimes even policy-makers--in a discussion of our energy future. Energy issues are often technical and intricate, and many in industry view the policy process with disdain – the province of the simple-minded. Rather than draw policy-makers into a

[8] Consumer Federation of America "Americans Alarmed about Dependence on Oil Imports and Resulting High Gas Prices and Funding of Terrorism." *News release*, May 21, 2007.

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[9] Opinion Research Corporation for Civil Society Institute, "Americans and Summer Gas Prices: Views About the Need for Action by Washington," May 2, 2007. Available at http://www.40mpg.org/getinf/050207release.cfm .

[10] See "US consumers want energy self-sufficiency, but say no to traditional energy plants in their back yards: RBC Capital Markets survey," press release, RBC Capital Markets, June 5, 2007, http://www.rbc.com/newsroom/20070605cm.html or see: Melanie Tatum, "Most Americans are Resistant to Energy Infrastructure: RBC Survey," Platts Global Alert, June 5, 2007.

[11] Shalini P. Vajjhala, "Siting Difficulty and Renewable Energy Development: A Case of Gridlock?" *Resources* 164 (Winter 2007).

long-term discussion that could foster awareness of the legitimate concerns of energy companies, some in industry try to ignore and avoid the public policy community.

Consequently, an important step for the next President is to initiate an *informed national dialogue* about energy security, energy consumption, and energy tradeoffs. For example, in using the bully pulpit to promote energy awareness, the next President could put forward a series of questions:

- Are we content to rely on an energy infrastructure that could fail if demand suddenly spikes?
- Are we prepared to support a full renaissance of the nuclear power industry—with its remaining security and waste challenges—in order to reduce carbon emissions?
- Are we satisfied to meekly accept climate changes that will inundate our coastlines, melt our glaciers, stress natural systems to the breaking point, and cause great hardship in countries least able to protect their people?

Commit the Nation for the Long Haul

While *starting* the process of improving energy security, the next President also must shape a realistic strategy for adjusting our energy policy over the long haul. Success will require focus, patience, ideas, international partners, and effective international institutions.

The focus must be broad. The multiple parallel efforts that are needed include increasing energy efficiency (the central policy plank), reinforcing and diversifying energy supply, strengthening transmission and distribution networks, and enabling off-grid and distributed energy systems to flourish.

Patience is important, because it will be a hard struggle to enact changes for which the political pain is immediate and the political payoff lies in the distant future. Further, success will be difficult to prove and may be measured only by the *absence* of price shocks, the *minimization* of sea-level rise, the *avoidance* of summer brown-outs.

New ideas are essential. We do not today have all the tools we need to address the full range of energy security problems effectively—even though we have enough of these to start our response. We will need creative new policies and brilliant new technologies. Accordingly, we must *expand support for research, development, demonstration, and dissemination* of energy technology and policies.

Energy security will be achieved only if the United States works productively with other countries around the globe. The legacy of the present Administration will complicate efforts to obtain international cooperation. Popular support for the United States is currently at an all-time low worldwide,[12] and the United States is perceived in foreign capitals as generally inflexible on energy security. Over time, these perceptions can be overcome.

Finally, to enhance energy security, the next President will need effective international institutions. Greater funding should be given to critical institutions like the International Energy Agency, which has powerfully enriched the international dialogue on energy policy since the 1970s. From energy data to technology partnerships, and from integrated assessments to emergency stock releases, no other organization has played as important a role in fostering sound energy policy and practice.

Concluding Observations

Energy security is a core challenge of our time. It necessitates drastic change in political, economic, and security structures. It affects countless daily choices. It demands flexibility and wisdom.

The next President has the opportunity to address the energy/climate challenge with a clean slate. The new President can initiate a multi-decade effort to strengthen our energy security and, in the process, contribute to our national welfare, the vitality of our economy, the slowing of climate change, and the preservation of Earth's natural

[12] Pew Global Attitudes Survey, 2006. Available at: http://pewglobal.org/reports/pdf/256.

systems. This is an opportunity that will call on all the persuasive powers of a new Administration. It is a daunting task, but one of the great opportunities in American history.

About the Author and the Project

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Jonathan Elkind is a nonresident senior fellow at Brookings and Principal at EastLink Consulting, LLC. He is an expert in energy security, Eastern Europe, and the former Soviet Union. Elkind, formerly Director for Russian, Ukrainian, and Eurasian Affairs within the National Security Council and Assistant to the Secretary of Energy, has contributed to several books on U.S and Eurasian energy security.

Opportunity 08 aims to help 2008 presidential candidates and the public focus on critical issues facing the nation, presenting policy ideas on a wide array of domestic and foreign policy questions. The project is committed to providing both independent policy solutions and background material on issues of concern to voters.

Additional Readings

Chow, Edward & Jonathan Elkind. "Hurricane Katrina and U.S. Energy Security." *Survival: The IISS Quarterly 47:* 145-160, Winter 2006.

Deutch, John, Ernest J. Moniz, et al. "The Future of Coal: Options for a Carbon-Constrained World." Massachusetts Institute of Technology, 2007. Available at http://web.mit.edu/coal/.

Hawkins, David, Daniel Lashof, & Robert Williams. "What to Do about Coal." *Scientific American 295*: 68-75, September 2006.

International Energy Agency. "Analysis of the Impact of High Oil Prices on the Global Economy." Paris, May 2004.

International Energy Agency. "World Energy Outlook: 2006." Paris, 2006.

UN Foundation. “Bringing Energy Efficiency to Scale.” Forthcoming, 2007.

Yergin, Daniel. “Ensuring Energy Security.” *Foreign Affairs 85:* 69-82, March-April, 2006.