Industry Advisory Council

Transition Study Group

Role of Technology in Addressing Energy and Environmental Issues

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Executive Summary: Role of Technology In Addressing Energy and Environmental Issues

”All of us know the problems rooted in our addiction to foreign oil - it constrains our economy, shifts wealth to hostile regimes, and leaves us dependent on unstable regions," President Barack Obama said at a Chicago press conference in December announcing his choices to lead his administration’s energy and environmental policies. "These urgent dangers are eclipsed only by the long-term threat of climate change, which - unless we act - will lead to drought and famine abroad, devastating weather patterns and terrible storms on our shores, and the disappearance of our coastline at home," Obama said.

President Obama comes to the White House signaling his seriousness about combating climate change and curbing emissions of greenhouse gases. He has said he wants to spend heavily to boost energy efficiency, promote renewable and sustainable energy, create a more efficient national energy system, and reverse our nation’s declining environmental quality.

There is certainly an urgent need for the Obama administration to address these long-standing issues, and to develop and implement a National Strategy for Energy and the Environment. Our nation’s economic future, its role in the world, its foreign policy and the vitality of American industry depend on the administration and the Congress seizing the moment at hand, reaching agreement on important issues, and charting a future course that will keep America strong. With the recent reduction in oil prices, it would be unwise to lose sight of the broader global energy issues. In fact, now is exactly the right time to accelerate the efforts needed to address the looming worldwide energy and climate crisis. There are no quick-fix solutions, but we believe that there are a set of practical and effective actions that can be taken in the near term.

The new administration must consider and make use of alternative power sources, find a means to decentralize energy production and move toward local, sustainable sources to reduce the carbon footprint both in the production and transmission of energy. Policies must be adopted to help alter consumer and business attitudes, creating a culture that makes efficient use of energy a priority. Using today’s information technology, small and medium-size companies can measure their carbon footprints. We need to encourage green information technology solutions including server consolidation, virtualization, new storage solutions, and alternative energy sources to power data centers. The federal government must serve as a model with pilot initiatives and long term approaches that demonstrate economic and environmental benefits.

In this paper, we offer our assessment of our current energy and environment posture, identify areas where actions can be taken by the new administration, and discuss areas where information technology can help the nation better manage energy resources and improve the environment. We hope the time is at hand for a new direction on energy and environmental policy.

Role of Technology In Addressing Energy and Environmental Issues

WHAT'S AT STAKE?

Energy and environmental concerns are among the most critical issues facing the new administration. The items on the agenda include the need for energy independence, reducing the cost of energy, producing energy-friendly technologies, and providing a safe and clean environment.

U.S. dependence on foreign energy sources has resulted in an unacceptable impact on American foreign policy. The national security strategy is heavily influenced by our need to protect foreign sources of energy. Respected critics of our policy decisions have argued that the U.S. has been forced to abandon the ideals of our founding fathers to ensure foreign sources of energy are maintained. The economic impact of importing energy is a major contributor to the nation's economic weaknesses including an unfavorable balance of trade and the ability of energy rich countries to increase ownership of U.S. debt.

The growing global competition for energy and the prospect of future price increases requires immediate action. The increased demand for energy has placed stress on global resources. Fossil fuel will become an increasingly scarce commodity, with developing nations rapidly increasing their demand for energy. There will be significant economic and security consequences as nations compete for these scarce resources. While the price of oil has dropped dramatically in the past few months, this is at most a temporary situation which will be reversed as soon as the global economy begins to grow. Americans are seeing an increasing percentage of their incomes being allocated to meeting their energy needs. Businesses are also being hard hit by energy costs.

Intermingled with this are environmental issues. Global climate change and global warming are having a devastating impact. We are experiencing lowered water tables and increased water shortages as well as a negative effect on growing seasons and food production. The long-term impact of ozone depletion and global climate change is a major issue for future generations. Degradation of the quality of air, ground water, and soil are increasing the risk of health issues and are accruing massive costs for future cleanup efforts. The unknown impact of climate change could drastically impact the nation's agriculture sector.

Although there has not been a cohesive energy policy or integrated strategy for energy and the environment, the U.S. has for some time focused on air and water pollution. There have been continuing declines in air pollution in the U.S. since the Environmental Protection Agency was created, showing that government action can make a difference. But the progress on air quality issues as documented in the EPA's most recent report has not been as significant as in an earlier period. Compared with other global neighbors, the carbon footprint of the U.S. reflects significant shortfall in being good stewards of our natural resources. The result of this lack of a

comprehensive strategy that addresses energy and environmental issues is a lack of focused attention and a fragmented set of initiatives.

The Obama administration must lead by example and initiate a comprehensive set of programs, ones that include federal government financial investments in new energy technologies and that make strategic use of policy and regulatory authority to promote research and innovation, and assist the private sector in bringing new products to the market. We believe significant progress in improving our nation's energy and environmental posture can be made on many fronts, and aided by applying information technology solutions to facilitate or accelerate our options.

SUPPLY SIDE ISSUES: MOVING TO SUSTAINABLE ENERGY SOURCES

Supply-side options can be deployed strategically over time to address and balance multiple issue areas such as energy independence, national security, the viability of technology, the environmental and carbon footprint, social responsibility, and incentives for implementation. The proper sequencing of the options will increase the dependability and resiliency of the critical energy infrastructure.

Sustainable energy sources fall into two basic categories: those that generate energy from biological or chemical reaction such as methane generation from plants or ethanol production from corn, and those that generate energy from natural phenomena like wind, tidal, solar, geothermal and hydro power. Some of these technologies are viable but in their infancy in terms of major production, and some are limited in their deployment based on environmental factors. The commercialization of these approaches will take varying amounts of time. Until these alternatives can mature and become economically viable they will only be used to support peak needs rather than supporting our base load electricity supply.

Nuclear Power. Historically, the acceptability of nuclear power has been limited by issues such as public perceptions of risk, the resolution of the waste issue, and uncertainty in construction and operating costs. Countries such as France, which has almost 80 percent of electricity produced from nuclear power, have limited their carbon footprint and minimized their dependence on external sources of oil and gas. There has been more than a 30-year hiatus in the commissioning of any new nuclear power reactors in the U.S. There are currently 17 new nuclear reactors approved, eight reactors under licensing review, and another six reactors planned for review by the Nuclear Regulatory Commission in the next two years. The planned reactors are of a more stable and safe design than in the past, and may receive better public acceptance. Issues such as waste are also in a more mature state of resolution.

Since nuclear energy is a better known energy production technology, it can be deployed near-term while more sustainable energy sources are developed. The use of nuclear power can work with other sustainable energy sources to supply additional energy during peak periods. The near-term use of nuclear power also will reduce our dependence on external energy sources and our carbon footprint.

Move Energy Production Closer to the Users. Energy production has historically trended toward larger energy production facilities. Although the energy infrastructure is interconnected through multiple linked grids, energy distribution is not efficient and experiences significant losses when electricity is moved over long distances. Decentralizing energy production and moving toward local, sustainable sources can reduce the carbon footprint both in the production and transmission of energy.

The use of information technology such as near-real time sensors integrated with effective digital control systems will result in effective production and distribution in close proximity. This will assist smaller, more dispersed power production facilities and minimize distribution losses. There may be a potential to use existing government facilities such as closed military bases as energy parks to allow energy production to take place closer to where it will be used. Military bases can easily be protected, the infusion of jobs and funding would supply an economic benefit to the local community, and bases are decentralized all over the country.

DEMAND SIDE ISSUES: REDUCING CONSUMPTION AND WASTE

While increasing available energy options and moving toward more environmentally-friendly sources of energy can have a significant impact on alleviating some of our nation's energy crisis, the options for reducing demand and implementing environmentally sensitive programs can provide more immediate benefit with very little cost. Increased national awareness of the need to reduce energy consumption through measurement of the carbon footprint, emphasis on conservation and protecting the environment, and having industries adopt green practices can all have enormous positive impact.

One approach to increasing awareness and altering the business culture is for companies to measure their carbon footprint. Reducing even small amounts of carbon made by many companies including those not regulated will amount to significant reductions in emissions. There are software programs that can assist small and medium-size companies to measure their carbon footprints.

With these tools, individuals also can also track energy consumption at home. If you know that turning your thermostat down one degree is equivalent to "X" metric tons of CO2 saved, which is the equivalent of taking Y number of cars off the road or saving Z number of trees, you are going to be more motivated and excited to maintain your efforts.

Transparency can be a motivator for changing behavior. Just as the implementation of the federal Toxics Release Inventory served to drive behavioral changes in the use of toxic substances, a similar effort should be made to encourage tracking of greenhouse gas emissions. The Clinton Climate Change Initiative was designed to help the world's largest cities

track, report on and share information about their efforts to reduce greenhouse gas emissions, and serves as a good model.

Advances in collaboration and secure remote access technologies provide an opportunity to expand initiatives to reduce commuting and long distance travel with resultant reductions in energy consumption and pollution. The government can lead by example in this area with appropriate policies and associated investments in technology and training.

Computer system and electronic devices are responsible for about three percent of greenhouse gas emissions. Hardware and software companies can be encouraged to produce products that reduce energy usage and thus greenhouse gas emissions.

By integrating sustainable practices into the workplace and holding companies accountable, we will create a significant opportunity to make a difference. As an example, use of nanotechnology and better manufacturing practices can help to reduce our use of some materials and improve the way we use other materials. The new administration could accelerate the use of already existing technologies. It should use investment incentives, centers of excellence, tax measures, procurement guidelines, and set standards to encourage and streamline technology to promote adoption of cost-effective energy efficient products and systems. The government also can increase federal R&D and provide incentives for private research targeted at technology development and deployment because carbon monetization isn't enough by itself to encourage the necessary R&D investment.

Integrating sustainability into managerial training and education programs, including MBA programs, could provide long term facilitator to change in accordance with the principle that change starts at the top. Sustainability must be included as key concepts for all business executives. Without CEOs embracing the importance of environmental stewardship as a corporate value, sustainability will never be achieved. Some managers will come on board voluntarily and some may need more incentives or requirements imposed. To motivate positive change and leverage market forces, companies should make a public pronouncement of their carbon footprint and sustainability status. Together, these steps will provide an understanding of the importance of sustainability to a company and will catalyze focus on issues of profit, stewardship of the planet, and social awareness. Such a focus will help motivate reluctant CEO's who are at the beginning of the learning curve.

A ROADMAP FOR REFORM

We present below five recommendations to address both supply and demand side issues.

Develop and Implement a National Energy Strategy

This strategy would provide a "call to action" to improve energy efficiency, develop new sources, reduce consumption and waste, and protect the environment. Information technology can be effectively used to assist in implementing the call to action. Modern IT tools including Web 2.0

technologies such as blogs, bulletins, sharing, emails and portals should be used to get the message out to companies and citizens. It may be appropriate for the Department of Energy to take lead in orchestrating this public awareness and in pursuing energy and environmental initiatives. Information technology can assist in sharing information regarding initiatives and best practices across the federal government.

Demonstrate Leadership through Federal Agency Action

Executive Order 13423, Strengthening Federal Environmental, Energy, and Transportation Management, issued on January 24, 2007 (72 FR 3919), directs federal agencies to improve energy efficiency and reduce greenhouse gas emissions to focus on renewable energy use, reduce water consumption, acquire bio-based, environmentally preferable, energy-efficient, water-efficient, and recycled-content products. It also calls for reductions in the quantity of toxic and hazardous chemicals and materials acquired, ensuring that new construction and major renovation of agency buildings comply with the Guiding Principles for Federal Leadership in High Performance and Sustainable Buildings for chemicals and materials acquired. It seeks reduction of fleet's total consumption of petroleum products by two percent annually by FY 2015. This means using plug-in hybrid (PIH) vehicles when reasonably comparable to non-PIH vehicles, acquiring and enabling Energy Star features on agency computers and monitors, and using environmentally sound practices for disposition of agency electronic equipment. We propose that all federal agencies provide transparency with regard to their progress through a public Web site that would track energy and environmental metrics by agency and facility. In addition, government facilities could be evaluated for possible shared use by industry to accelerate energy and environmental research and development or as energy producing sites. The construction of North America's largest solar photovoltaic system at Nellis AFB serves as a model for the enormous benefits of public-private partnerships.

Use Transparency to Focus CEOs on Sustainability and Achieve Green Business Culture

In implementing an expectation companies can leverage information technology to change work and commuting patterns, construct "smart" buildings, tailor company approaches to work based on population dispersion (e.g., shared regional work centers), and measure progress. The administration should establish the expectation that private sector organizations as well as government and academic counterparts will embrace the Sustainability Statement model used today by some organizations. Sustainability must become a key responsibility for all business executives. Without CEOs embracing the importance of environmental stewardship as a corporate value, sustainability will never be achieved. Use of information technology to measure sustainability and disseminate information will provide transparency and public review of corporate actions needed to bring the right pressure to bear in an effective manner.

Move to Green Information Technology

The U.S. data center industry is in the midst of a major growth period stimulated by increasing electronic transactions in financial services, the expansion of the Internet, expansion in communication and entertainment, and the growth in global commerce and services. Within the

government sector, key trends contributing to data center growth include the use of the Internet to publish government information; government regulations requiring digital records retention; and digital provision of government services such as e-filing of taxes and U.S. Postal Service on-line tracking.(source: Report to Congress on Server and Data Center Energy Efficiency Public Law 109-431). As a result of this growth, CIO Magazine cites that data centers now account for between 1.5 and 3% of U.S. power consumption. Yet, there are many examples of green information technology successes. Google, for example, has an initiative to harness alternative sources of power including wave power for their data centers. Microsoft's hydroelectric powered data center has an almost zero carbon footprint.

There are a number of options to reduce power consumption and environmental impacts through implementation of a variety of green manufacturing and operating principles. Through such initiatives as computer server consolidation, virtualization, advanced storage solutions, and employment of more energy efficient chip and system component technologies, energy consumption from IT uses could be significantly reduced. Deployment of alternative sources of energy for large data centers such as use of fuel cells, wind, geothermal, and solar power are also options.

Accelerate Use of Nuclear Power and Sustainable Energy Sources

By leveraging modern technology, it is possible to speed licensing processes for nuclear power plants. It is also possible to model ecosystem and economic impacts of expanded use of corn for ethanol on food prices, increase citizen participation in the deliberative process, and speed the development and construction of new energy plant systems.

While the challenges facing the new administration in the areas of energy and the environment are truly massive, there are opportunities for making rapid and major progress across a number of issue areas. The fundamental need is for strong leadership at senior levels of government. The development of a National Strategy for Energy and the Environment might be an appropriate first step. Using the federal government as a model, the administration can quickly pilot initiatives and demonstrate economic and environmental benefits. In addition, through outreach to corporate leaders and citizens, proactive support for a national strategy can be achieved. The use of modern information technologies can assist in the analysis, coordination and communication of the administration's initiatives.

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