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Energy Policy In the Obama Administration: A Year in Review

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June 4, 2010

Change and innovation are unfolding at a rapid pace in the energy sector, propelled by an influx of new entrepreneurial players entering the marketplace with capital, novel investment and business models, and differing regulatory experiences than the traditional oil and gas industry practices. This new "Clean Tech" sector is being helped along by President Barack Obama's administration. The Obama energy policy advocates a broader mix of future fuel sources and new greenhouse gas-reducing technologies that will help mitigate climate change over the next 30 years.

This white paper assesses the administration's first year of energy initiatives. It was inspired in part by a conversation of American thought leaders assembled recently at a dinner hosted by Shell Oil Company in New York City and attended by Amy Myers Jaffe, Wallace S. Wilson Fellow for Energy Studies at the James A. Baker III Institute for Public Policy.

Background

The Obama administration allocated $80 billion of the $787 billion American Recovery and Reinvestment Act to promote energy innovation, greater energy efficiency and the expansion of biofuels in the United States. The U.S. Department of Energy was in charge of the distribution of approximately $32 billion of these funds, including: $16.7 billion for energy efficiency, renewables and transportation; $4.5 billion for improvements to the electricity grid, including smart grid pilot programs; and $3.4 billion for work on carbon capture and sequestration. The administration says the energy-related stimulus investment will produce $150 billion in clean energy projects.

President Obama has stressed that his administration believed that climate change and energy issues needed to be tackled in tandem. Speaking at a meeting with governors on energy policy at the White House on February 3, 2010, President Obama stated that "my administration is following a non-ideological approach" to reducing America's dependence on foreign oil while pursuing a clean energy agenda that produces jobs domestically.

In stressing a "strategy of more production, more efficiency and more incentives for clean energy," the president stated the need to develop clean coal technology and announced the formation of a Carbon Capture and Storage Task Force, charged with determining how to utilize affordable clean coal technology on a wide scale within 10 years. The president noted that his administration wanted 10 commercial demonstration plants in operation by 2016. President Obama also reiterated his support for biofuels as a means to decrease dependence on foreign oil.

Also in February, the administration offered billions of dollars in loan guarantees for nuclear power in an effort to make more progress on a bipartisan energy agenda. President Obama mentioned nuclear power specifically in his 2010 State of the Union address. U.S. Secretary of Energy Steven Chu told a recent Senate energy committee session that the federal government must extend more than the $18.5 billion in loan guarantees passed by Congress in the 2005 Energy bill to give confidence to financial investors that new plants can be built on time and on budget.

In addition to the stimulus spending, the administration has tapped the Environmental Protection Agency (EPA) to influence policies that might be difficult to advance through the U.S. Congress. In one of its first actions after President Obama assumed office, the EPA granted the state of California a waiver to regulate CO2 emissions from passenger vehicles that will result in more fuel efficient vehicles being adopted in that state. In conjunction with the National Highway Traffic Safety Administration, the administration is proposing nationwide standards equivalent to a fuel economy standard of 35.5 miles per gallon (mpg) for passenger cars by 2016.

The EPA has also issued an endangerment finding that carbon emissions "threaten public health and welfare of current and future generations" and therefore carbon emissions can be subject to the U.S. Clean Air Act. The EPA's endangerment determination opens the door for broad administrative regulations that would be aimed at limiting mobile and stationary sources of greenhouse gas emissions. This is a signal to the U.S. Congress that the president intends to use all means to press for climate regulation.

The state of Texas and a coalition of interest groups have asked a U.S. federal court of appeals to review this finding, questioning the science that the EPA is using as its basis and claiming the policies will be damaging to the economy.

The administration has also turned to the EPA to support a robust program on biofuels. Earlier this year, the EPA ruled favorably that ethanol's use in fuel is more environmentally favorable than traditional gasoline (even though peer-reviewed scientific academic research is leaning in the opposite direction). The agency has also promised to evaluate whether it would be sound policy to increase the targets for ethanol content in fuel from 10 percent to 15 percent.

President Obama's vision for a long-term transition to a more diverse, cleaner energy future is praiseworthy. In particular, the administration can be credited with broadly outlining a strategy to achieve diversification of alternative fuels and energy efficient technologies in the 30- to 50-year horizon.

But the administration has been less successful in forging viable policies that address the country's immediate energy challenges. Instead of focusing predominantly on the 50-year landscape, the administration needs more substantial effort to shape the country's energy situation in the next three to five years. The administration's decision in the first few months of 2010 to subordinate energy and climate legislation to deal with health policy issues has, in effect, jeopardized the chances of a substantial energy and climate policy being passed in the immediate term.

The Obama administration has been slow to tackle the more pressing issues affecting the current energy supply to the United States.

In a shift in policy from the previous administration, the White House is not seeking funds to expand the nation's 727-million-barrel-capacity Strategic Petroleum Reserve (SPR) to the one billion barrel level advocated by the President George W. Bush's administration. President Bush was criticized for continuing to fill the strategic petroleum reserve even though oil prices were rising from $65 a barrel to over $100 a barrel. According to U.S. Energy Secretary Chu, the

existing reserve levels can adequately meet international standards. Although the International Energy Agency (IEA) recommends its member nations hold 90 days worth of oil in reserve, at current full capacity, the SPR would cover roughly 80 days worth of imports.

A planned release of government-controlled strategic stockpiling systems, especially when used in combination with production increases from important global oil producers who maintain spare oil production capacity (such as Saudi Arabia, the United Arab Emirates and Kuwait), can serve an important role in limiting the power of speculators in the global oil market during times of crisis or significant oil supply-demand imbalances. Such planned releases of extra oil can ensure that shortages do not create major economic damage and major interruptions to personal mobility. However, use of these tools has been spotty at best.

The experience of 1990-1991 demonstrated the clear benefit of coordinated use of strategic stocks and producer spare capacity in contrast to the kind of unfettered, dislocating responses experienced in 2007-2008. In the mid-1990s, the Clinton administration also used sales from the SPR (through the SPR exchange mechanism) to cap oil prices at $40 a barrel, sending a signal to oil markets and the Organization of the Petroleum Exporting Countries (OPEC) that the U.S. government would act to calm oil markets and discourage speculative activity during a sudden disruption or severe imbalance of markets. The strategy proved successful, discouraging future markets players from holding long positions above the $39-a-barrel level for fear that U.S. government intervention in the market could cause them losses.

In 2007-2008, however, governments around the world, including the United States under the Bush administration, engaged in building strategic stockpiles, as oil prices rose from $65 per barrel to $125. This policy signaled to oil markets participants and OPEC that governments would not use strategic petroleum stocks to ease prices under any circumstances except major wartime supply shortfalls. This allowed speculators to confidently expand their exposure in oil market futures exchanges without fear of repercussions and revenue losses from a surprise release of U.S. or IEA strategic oil stocks.

The proportion of speculative players holding long positions in the market was also increasing over that 2007 to 2008, taking advantage of the Commodity Futures Modernization Act (CFMA) of 2000 which effectively cleared the way for more lax regulation of new oil risk management products, including index funds and price swaps. Non-commercial traders (that is, participants who are not in the physical business of oil and trade for financial profits) increased their market presence more than **15-fold** over the course of the late 2000s. Open interest is the number of open contracts held active at any given time. The share of open contracts held by non-commercial players averaged approximately 20 percent of total open interest through the early part of the 2000s. However, this dramatically increased to more than 55 percent of total open interest at its maximum in 2008, which coincided with the peak in crude oil price. (For more details, see the Baker Institute study "Who is in the Oil Futures Market and How has It Changed?" at http://www.bakerinstitute.org/publications/EF-pub-MedlockJaffeOilFuturesMarket-082609.pdf)

The Obama administration is proposing new regulations for the U.S. Commodity Futures Trading Commission (CFTC) to re-impose effective position limits for financial players in organized oil futures markets in an effort to improve energy market operation. These policies are a step in the right direction. A reevaluation of the role for government physical intervention in oil markets in extreme circumstances is also warranted, to be undertaken both by the U.S. government, the IEA and by other major oil consuming and producing countries.

The Obama Administration and Alternative Energy

Looking for other ways to reduce spending on traditional sources of energy, President Obama is calling for nearly $40 billion worth of tax breaks for oil, natural gas and coal companies to be repealed over the next decade in his proposed 2011 budget. The president had tried in his 2010 budget to cut $31.5 billion in oil and gas industry incentives, including a rescinding of the industry's ability to receive a generous domestic manufacturing tax break, but Congress rejected the move. The administration also wants to eliminate all funding for research into natural gas technologies, an item that had accounted for $18 million of federal spending in the current fiscal

year. This proposed move disregards the critical role natural gas is likely to play in the U.S. energy future in the near to intermediate term.

The proposed 2011 budget acknowledges renewable energy, with wind power, in particular, seeing an increase in allocations. But the allocations are probably too small to make substantial differences. The budget provisions for wind power rose 53 percent from the low base of $80 million this year to $123 million for next year. The Obama administration also sought to increase funding for solar power by 22 percent, from $247 million to $302 million.

While the administration frequently speaks about the benefits of renewable energy, overall spending is still quite small when compared to the challenge of increasing renewable energy's share of the U.S. energy mix and against the ambitious targets for renewable energy in other countries. China has announced a goal to generate 15 percent of its total energy needs from renewable energy, including hydropower, by 2030. China is also considering giving preferential interest rates on loans to fund renewable energy projects. The European Union has set a goal for renewable energy to reach 20 percent by 2020.

However, the scale of renewable energy today and even in the next five to 10 years is still extremely limited when put into the context of total world use of fossil fuels. The world used the equivalent of 113,900 terawatt hours of fossil energy to fuel economic activity, human mobility and global telecommunications, among other modern day activities in 2007. Replacing those terawatt hours with non-fossil energy would be the equivalent of constructing an extra 6,020 nuclear plants across the globe or 14 times the number of nuclear power plants in the world today. In renewable energy terms, it is 133 times the amount of solar, wind and geothermal energy currently in use on the planet.

Globally, as we convert a proportion of our current fossil energy production to other sources, we similarly have to trade in the more than one billion liquid fuel vehicles on the road in the world at present and replace them with cars and trucks and buses that run on electric energy or some new fuel created from renewable or other non-fossil sources. This is a daunting task given that very few, if any, large-scale assembly plants for such vehicles exist right now.

The reality is that we will, by virtue of existing infrastructure and the large scale and long timeline involved in replacing these current energy facilities, be dependent on fossil fuels for several decades. As a result, our country needs to forge an energy roadmap that takes into account not just the 50-year view of where we want to go, but also how to manage the security of our fossil fuels supplies in the two-year and 10-year period as well as how to plan a transition to a new energy vision.

The latest accident in the U.S. Gulf of Mexico underscores the tremendous challenges facing the United States in identifying secure sources of oil within our borders and abroad. Offshore oil production was projected to represent more than two thirds of total world production from known but yet-to-be-developed oil fields to come on line between 2007 and 2020, according to an in-depth study by the IEA. Prior to the Deepwater Horizon disaster, the United States was forecast to see a surge in U.S. offshore production. New developed fields between 2007 and 2015 would have added about 5 billion barrels in new oil reserves in the U.S. Gulf of Mexico.

President Obama, in an effort to garner more support for an energy and climate bill, announced on March 31 of this year that that he would favor limited expansions of offshore drilling in areas that don't pose great risks to important environmentally sensitive regions. The president proposed ending a moratorium on the U.S. East coast from northern Delaware south to Florida and allowing exploration in certain areas already leased in the Chukchi Sea and Beaufort Sea in the Arctic Ocean around Alaska. After exploration, these sites would have been potentially listed for sale in 2012 or later.

Since the Deepwater Horizon disaster, President Obama has continued to say that domestic oil production in the U.S. Gulf of Mexico remains important to U.S. energy security. On April 30, nearly one week after the deleterious impact of the spill was becoming clearer, he said, "I continue to believe that domestic oil production is an important part of our overall strategy for energy security." The president has imposed a six month moratorium on deepwater drilling until the U.S. government has time to review the Horizon disaster and determine what technologies and regulations are needed to prevent future catastrophes.

The implication of the Deepwater Horizon disaster, although not yet clear, is likely to be negative for President Obama's ability to forge a broad coalition on energy legislation. American public support for offshore drilling is expected to drop in the wake of the huge environmental impact of the spill, limiting the administration's tools to attract those in the political center and right to support new energy legislation. Many key U.S. senators were in favor of drilling, and therefore drilling would have been a key element in increasing the number of possible votes for new legislation. In one sense, the Horizon catastrophe may increase support for zero-carbon energy and electrified vehicles that that will use much less or no oil. Yet it also limits the potential coalition supporting a compromise bill by reducing the option to attract votes of coastal states who had wanted to open their offshore to drilling. Now, in fact, those states may shift positions completely and support a wider moratorium on offshore drilling. The need to reevaluate the safety and regulations of offshore drilling will likely dramatically alter the debate on energy policy in the United States in ways that are too complex to predict at this early stage in the Horizon oil spill crisis.

At present, there is no fully articulated path for how we get from today's fossil fuel-dominated energy mix to the 50-year energy future that has a more diverse range of fuels and new carbon-reducing technologies. The Obama administration needs to rebalance its focus to emphasize more comprehensive approaches for addressing intermediate term challenges to U.S. strategic energy policy, rather than policies that can only meet challenges in the long term, 30-to-50 year horizon. A poll conducted by Consumer Federation of America in March 2010 found that 65 percent of Americans believe that the United States needs to increase fuel economy standards for automobiles to an average of 50 mpg by 2025. Such a move would eliminate the need for more than half of our current imports of oil.

Current U.S. energy policy puts too much emphasis on biofuels which has very limited capability to diversify the U.S. energy mix while at the same time, our immediate policies fail to recognize the increasingly important role of natural gas which is expected to serve as a bridge fuel in the coming decades until renewable resources can play a larger role.

The United States has ample, domestic natural gas resources, largely due to the rapid growth in the shale developments. Assessments of technically recoverable shale gas now reach 600 to 1,000 trillion cubic feet. That's enough to supply current U.S. natural gas consumption levels for the next 45 years. Including conventional and other unconventional gas resources, the U.S. natural gas endowment is large enough to meet current U.S. natural gas consumption levels for the next 100 years or more. Natural gas use results in a 50 percent savings in CO2 emissions over coal.

By contrast to the opportunities in natural gas, the United States is spending billions of dollars, or roughly $82 a barrel, to replace only 2 percent of total U.S. gasoline supply with corn-based ethanol, a fuel that scientists believe has little greenhouse gas advantages to traditional gasoline (see the Baker Institute study "Fundamentals of a Sustainable U.S. Biofuels Policy" at http://www.bakerinstitute.org/news/the-fundamentals-of-a-sustainable-u.s.-biofuels-policy). To date, 2009 mandates for advanced biofuels, such as those made from cellulosic materials or other non-food crops, have not been achievable. Similarly, mandates in the coming years may also be difficult to meet.

The 2009 economic stimulus package included: $480 million for integrated pilot and demonstration scale biorefineries that would produce advanced biofuels, bioproducts, and heat and power in an integrated system; $176.5 million to increase the budget for existing federal assistance for commercial-scale biorefinery projects; $110 million for fundamental research for demonstration projects; and $20 million for research related to promoting E-85 fuel and studying how higher ethanol blends (E-15 or E-20) affect conventional automobile engines. This spending is unlikely to raise the amount of ethanol that can truly replace a large percentage of current U.S. gasoline use.

The U.S. Natural Gas Potential: The Sudden Surplus

The administration's focus on the long view is causing it to simply unrealistically skip over the interim period of transition from heavy reliance on oil and coal. There is an incredible

opportunity now to tap the tremendous domestic natural gas resources that have been commercialized in the last few years, and the government needs to get behind developing them.

The outlook for the U.S. domestic markets has shifted dramatically over the past ten years. Belief that economical U.S. natural gas resources were being depleted led to predictions that the United States could become increasingly dependent on Liquefied Natural Gas (LNG) imports from Africa, the Middle East and Russia in the coming decades. Many investments were made to expand LNG receiving infrastructure in the United States. At the turn of the twenty-first century, more than 47 new receiving terminals were in the permitting phase. Since 2000, two terminals have been recommissioned and expanded while nine other new terminals have been constructed. Import capacity rose from 17.4 billion cubic feet per day (BCFD) up from 2BCFD in 2000. Europe experienced a similar story: its 7 BCFD capacity is also under expansion and will hit 17 BCFD by 2012.

The massive investment in LNG import capability reflected ongoing supply shortages seen in the U.S. market in the late 1990s and early 2000s. What was not well understood was that high domestic natural gas prices during that time would stimulate drilling in a new, more expensive resource play called shale gas. Shale gas is resource that can be developed through non-porous rock formations with the use of water and chemicals injection. Once an extremely expensive proposition, shale resource exploitation has become widespread because drilling technology advances have allowed a significant drop in the breakeven costs for profitably exploiting shale resources. Costs vary from region to region, with some areas in the Haynesville shale seeing break-even costs as low as $3 per million Btu, instead of the $5 per mBtu that was more customary in the Barnett Shale in the 1990s.

The share of natural gas use worldwide has grown from 19 percent of total world primary energy to 24 percent during the last 25 years. In the United States, natural gas is an important fuel, representing approximately a quarter of total primary energy use in 2009. Natural gas has been a favored fuel because it is considered more secure than oil, environmentally cleaner than coal, and competitively priced compared to oil, nuclear power and renewable energy. Much of the recent growth in natural gas demand derives from the power generation sector. The widespread

adoption of combined-cycle technology in power generation has particularly favored the use of natural gas due to increased efficiency in electricity production.

Natural gas holds an important place in the U.S. electricity market as the second- largest source of fuel after coal and the fastest growing fuel for power generation. About 19 percent of all electricity generated in the United States derives from the burning of natural gas, up from only about 10 percent in 1986 when wellhead natural gas prices were fully decontrolled. Around 52 percent of all new power stations built since 1995 have been gas-fired, but those plants have been larger than the average new plant (many of which were small wind generators) and thus, natural gas accounts for 90 percent of all new megawatts of capacity installed in the United States since 1995. In addition, many industrial users switched from oil to natural gas in the 1980s, and it now represents 41 percent of all fuel consumed in that sector. Natural gas is also a popular fuel for residential use for heating and cooking. More than 50 percent of Americans now heat their homes with natural gas, compared to 40 percent who use heating oil or electricity. Natural gas' share in the overall U.S. residential market stands at around 43 percent today.

The richness of the gas shale play owes its roots to small, independent energy companies who pioneered the risk of early entry to the technically risky and initially costly play in the 1990s. Those companies were helped by the Intangible Drilling Cost (IDC) expensing rules, which allows operators to either expense or capitalize those costs categorized as such. Generally, IDCs are development costs that are necessary for drilling and initiating production including but not limited to wages, supplies, contractor services and other similar expenses for which there is no salvage value. IDC costs represent more than 70 percent of start up costs for well development. If IDCs are expensed, they are deducted against the tax liability in the year that they are incurred instead of in a future year when production revenue commences. Without the IDC expensing, the lag between development costs and production revenues could hinder a small firm's available cash for continued investment. In this way, the deduction of IDCs increases the amount of capital available for drilling and production. Moreover, research and investment firm John S. Herold reported that the 50 largest independent producers reinvest 150 percent of their cash flow derived from U.S. operations back into projects based in the United States.

Without the IDC, smaller, risk-taking firms would be greatly constrained in engaging in the kinds of investment programs that brought the shale play to fruition. Smaller independent firms have played a critical role in identifying new resource plays over the decades. Furthermore, a Baker Institute analysis shows that smaller firms were quicker to respond with higher exploration and development spending budget increases as oil prices went up than larger, more conservative firms (See the Baker Institute study "The International Oil Companies" at http://www.rice.edu/energy/publications/docs/NOCs/Papers/NOC_IOCs_Jaffe-Soligo.pdf). It is important to U.S.energy security to have a thriving and active sector of small, independent energy companies. Without this sector, the shale play may have taken many more years to develop, thereby yielding more market leverage to a small number of foreign natural gas suppliers.

The availability of this alternative low-cost shale gas will combat the long-term potential monopoly power of a gasOPEC or a single producer such as Russia to blackmail large natural gas consumers in Europe or elsewhere. Prior to the discovery of shale gas, huge declines were expected in domestic production in United States, Canada and the North Sea. That meant an increasing reliance on foreign supplies—at a time when natural gas was becoming more important as a source of energy. Two countries in particular had a particular stranglehold over supply: Russia and Iran. Before the shale discoveries, these nations were expected to account for more than half of the world's known gas resources.

Russia made no secret about its desire to leverage its position and create a cartel of gas producers—a kind of latter-day OPEC. That seemed to set the stage for a repeat of the oil issues that have worried the world over the past 40 years—geopolitical instability, the policing of sea lanes and hand-wringing about security of supply.

Not only will the shale discoveries prevent a natural gas cartel from coming together for years to come, but petro-states such as Iran, Venezuela and Russia will also lose much of the muscle they currently have in world affairs, as their customers gradually cut them loose and turn to cheap shale gas produced closer to home.

The impact of shale gas is already apparent in North America. Import terminals for LNG sit virtually empty, and the prospects that the United States will become even more dependent on

foreign imports are receding. Also, soaring U.S. shale-gas production has meant that cargoes of LNG from Qatar and elsewhere are going to European buyers, easing their dependence on Russia. So, Russia increasingly has to accept far lower prices from formerly captive customers, even slashing prices to the Ukraine by 30 percent, as an example.

When it comes to environmental risks, critics argue that drilling for shale gas runs a risk to ground water even though shale is generally found thousands of feet below the water table. If a well casing fails, drilling fluids can seep into aquifers, but this has not generally been a problem. The drilling process itself is very rarely the culprit in ground water pollution; rather it is spills when companies are disposing of waste water. Water pollution *can* occur if the drilling fluids are disposed of improperly. In the case of a casing failure onshore, the extent to environmental damage is far smaller, and the speed to which it can be remedied in onshore drilling for shale gas is dramatically faster—and more effective—than in offshore deepwater. So, regulations and enforcement must be tightened to ensure safety, especially where disposal of drilling fluids is concerned. Moreover, penalties for companies that do not follow best practices should be onerous to weed out negligent players.

More rules will raise costs—but, given the abundance of supply, producers can likely absorb the hit. With drilling and development costs falling, the industry can easily afford to absorb the higher price tag of tighter regulation on the disposal of toxic process water as well as agree to a ban on certain downhole chemicals, such as diesel fuel, that increase the environmental risks associated with hydraulic fracturing for shale gas. Innovation will also likely solve the environmental issues associated with shale gas over time as companies like Schlumberger are already developing “green” non-toxic fracking fluids and better water disposal procedures.

With large new sources of shale gas in the United States, the electricity generation sector will likely see a greater shift to natural gas. While this brings obvious environmental benefits through displacement of coal, it can also enhance U.S. energy security to the extent that the transportation sector moves to plug-in/hybrid vehicles. Virtually no oil is used today in generating electricity in the United States. Moreover, the New Source Performance Standards adopted by the EPA in 2009 will likely result in the closing of older coal plants as they find the cost of compliance too burdensome to remain open. This will likely mean that natural gas will be called upon to meet a

greater proportion of electricity demand. Thus, it is important for government policy to recognize the importance of natural gas as a high-volume, transition fuel in the short-to-medium term outlook for the U.S. energy mix, even as the United States promotes greater use of renewable energy.

The Power of Efficiency

Historically, the United States has overly focused its energy policy on increasing energy supply and has not sufficiently tapped the potential to use policy to curb demand growth. Today, the U.S. supply of oil is no more secure than it was after the 1973 oil crisis. Moreover, dependence on oil for mobility has never been stronger. All told, there are over 240 million road vehicles in the United States, or almost one vehicle for every person. Each vehicle is driven on average more than 12,000 miles annually, and virtually all vehicles are powered by either gasoline or diesel fuel. As a result, despite the fact that the United States accounts for only 5 percent of the world's population, it consumes over 33 percent of all the oil used for road transportation in the world. The state of uncertainty surrounding deepwater drilling in the U.S. Gulf of Mexico makes this problem all the more pressing.

In 2007, the U.S. Congress passed new corporate average fuel efficiency standards. According to a Baker Institute study, the new 35 mpg fuel efficiency standard will shave 2.3 million barrels a day from U.S. oil demand by 2020. Pushing to a more ambitious target of 50 mpg could save as much as 7 million barrels a day of oil over a decade.

Many governments in Europe and Asia have been able to reduce the negative effects of price variability by increasing energy efficiency and reducing dependence on oil through the use of hefty consumer taxes on oil and oil products. Higher taxes have limited growth in national gasoline demand in these countries by promoting efficiency and conservation. At the same time, these countries have been able fund various social programs with the tax revenues while their gasoline demand has remained relatively flat for more than two decades. In the United States, where gasoline tax-funded social programs are currently small by comparison, the increased tax revenues from a larger gasoline tax could be beneficial in providing a rebate to lower-income households to offset any regressive effects of the tax, as well as repairing our aging bridges and

roads, developing public transportation options and funding research into alternative energy technologies.

A gradual phase in of a higher gasoline tax would give consumers time to make adjustments to mitigate the rising gasoline costs by arranging for alternatives such as carpooling, increased use of public transportation where applicable, purchase of a more fuel-efficient car and so forth. The revenues associated with a larger gasoline tax might also stimulate more confidence in the U.S. dollar through a healthier fiscal budget, which, in turn, would contribute to an improvement in the overall U.S. economic performance.

Data indicate that as retail prices increase, American's driving habits tend to change. Using existing estimates from the economic literature, a tax on the order of 50 cents per gallon, pushing today's average pump prices up from $2.50 to $3 per gallon, could be effective in reducing gasoline demand over time. This would also result in *additional* annual federal receipts of about $75 billion at 2007 gasoline consumption levels of about 142 billion gallons per year.

Transportation refinance would also allow the United States to make a more substantial contribution to public transportation. Our transportation system is critical to our national interconnectedness and prosperity. Congestion in the largest 85 major urban areas contributes to the waste of over 3 billion gallons a year (the equivalent of more than a third of the supply currently being added by domestic ethanol production), costing America roughly $80 billion dollars. Federal outlays funded by current fuel taxes only cover 20 percent of national public spending on transportation. States and localities are still the primary funders of transportation infrastructure and, as such, more and more states are increasing fuel taxes to consumers in their states.

Increased ridership in public transportation can make a significant difference in U.S. oil consumption. To hold U.S. gasoline use at 2005 levels by 2020 through conservation through increased use of public transportation, Baker Institute calculations show that the average American adult would have to drive about 23 miles less per vehicle per week, assuming on-road

efficiency improves as assumed above under the new CAFE standards. For many, that could be one day a week commuting to work by carpool or by public transportation.

Smart Grid Technology

As discussed above, the American Recovery and Reinvestment Act committed $4.5 billion for improvements to the electricity grid, including smart grid pilot programs. The U.S. electricity grid is aged and badly in need of updating, modernization and expansion. Most of the U.S. infrastructure and equipment related to transmission and distribution were largely developed in the 1970s. The U.S. grid is currently overburdened by America's rising peak electricity demand, leaving it more susceptible to blackouts; the annual number of outages affecting 50,000 or more customers has risen over the past decade. Rolling blackouts and power outages have cost the U.S. economy an estimated $100 billion of financial loss each year since the 1990s.

Even when problems fall short of closing all or part of the network down, system instability can also cause voltage and frequency fluctuations, which can be particularly problematic for sensitive electronic equipment including, for example, that used in hospitals. At present, our antiquated power grid experiences frequent fluctuations from sudden changes in levels of demand (weather-related and other stimuli), changes in the location of demand, changes in the type of equipment drawing power, sudden outages in wires or transformers, and intermittent wind supplies.

As technology improves for transmission wires, control systems and electricity storage, individuals would become more empowered to manage their own energy supplies and system operators would be better able to manage sudden load changes and the integration of intermittent renewable energy supplies. A smarter grid could assist this effort to maintain system stability while minimizing the need to the construct expensive additional capacity. To begin with, smart grid technology will offer better information about sudden outages and changes and allow for better monitoring, in turn, promoting faster response time and reduced chances of brownouts or a failure of an entire regional system.

Perhaps more importantly, a smarter grid would allow more cost-reflective prices, which in turn would give consumers an incentive to shift demand away from peak periods, and reduce demand in emergencies. Smart systems would also allow the development of equipment that automatically sheds demand in a manner that will be hardly noticeable by the user. For example, thermostat settings could respond to prices or refrigerators could shut down temporarily, effectively "storing electricity" in their insulated cooled cabinet for a period of time. Distributors could then offer demand reductions as ancillary services to help maintain network stability.

However, current regulatory structures reduce utilities' incentives to promote conservation and efficiency. The current regulatory system, which guarantees a fixed rate of return on construction of new facilities, provides an explicit incentive for power generators to increase their capital investments. This capital-subsidizing effect of the current regulatory framework is commonly referred to as the Averch-Johnson effect and has been verified in a range of economic studies.

Several policy options exist to alter the dynamics of the electricity system in the United States. Regulators can consider restricting rate-of-return regulation to the true natural monopoly elements of the system (the transmission and distribution wires) while leaving other investments to earn a competitive rate of return. This would give suppliers an incentive to meet demand in a least-cost manner, whether through building new capacity or encouraging different consumption patterns. This ideal solution is only feasible, however, where there are sufficient competing generators in the wholesale electricity market. If markets cannot be made adequately competitive by encouraging divestitures, break-ups, asset swaps across regions, or through other means, some regulation of prices may remain necessary. If so, the regulatory framework needs to reward firms for reducing costs and not just expanding capacity. Excess investments should not automatically yield a normal rate of return.

The Role of Private and Public Capital

As policymakers move forward in considering new improvements to the U.S. energy system, a balance will need to be created between the use of private and public funds. The private sector has a large role to play in bringing innovation and improvements to the energy sector, as it has

with the advent of shale gas and falling cost curves for renewable energy such as wind and solar, but government will need to be cognizant of the best means to give industry the incentive to invest. A wide range of proposals are currently on the table in the U.S. Congress, including additional subsidies for one fuel over another, regulatory standards or mandates that dictate a certain percentage of cleaner fuel that must be used in the U.S. energy mix, and a cap-and-trade system for carbon emissions that would price greenhouse gas emissions, providing a market incentive for emitters to limit the level of both stationary and mobile emissions from ongoing economic activity in a wide variety of economic sectors.

Each of these options must be widely studied and debated to avoid unintended consequences arising from the highly politicized process of passing national legislation in the United States. The costs to consumers, as well as the national security and environmental benefits, must be weighed in tandem to avoid expensive and ineffective programs such as the current ethanol program which is costing consumers $1.95 a gallon on top of the retail gasoline price with little or no real energy security value being achieved.

A serious U.S. energy initiative must take into account not just the promotion of technologies that will become available 50 years hence. It must also include concrete, viable programs that can offer benefits to the American public in the two-year, five-year and ten-year horizon, as well as manage a smooth transition to new and innovative fuels and technologies in the longer term.

The inspiration for this white paper came from a dinner held in New York City in January 2010. The dinner was hosted by Shell Oil Company and attended by leading energy analysts, policymakers, academics, energy scientists, environmentalists, and media. The dinner discussion, facilitated by the Baker Institute, focused on the question of what the priority should be for U.S. energy policy. The Baker Institute thanks these participants for their time and insights.

Among the dinner group were the following individuals:

Giles Alston, Ph.D., Oxford Analytica;
Roger Anderson, Ph.D., Doherty Senior Scholar, Columbia University, Center for Computational Learning Systems and Lamont-Doherty Earth Observatory;
John Bailey, Managing Partner, 1859 Partners LLC;
Satyajit Bose, Ph.D., Lecturer-in-Discipline, Columbia University School of International and Public Affairs;
Joe Dukert, Ph.D., Energy Consultant;
Russ Ford, Executive Vice President Onshore Gas, Shell Upstream Americas;
James Harmon, Chairman, World Resources Institute;
Walter Hook, Ph.D., Executive Director, Institute for Transportation & Development Policy;
Gar Miller, President, Aegis Energy Advisors Corp.;
Venki Raman, Ph.D., President, Protium Energy Technologies;
Michael Rogers, Principal, Practical Futurist;
Patricia Singer, Brand/Special Publics Engagement Manager, Shell Corporate Communications;
Tom Wallin, President, Energy Intelligence;
Meghan L. O'Sullivan, Ph.D., Jeane Kirkpatrick Professor of International Affairs, Harvard Kennedy School, and Member of the Board, Belfer Center for Science and International Affairs;
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The Baker Institute thanks Shell Oil Company for its generous support of the dinner event.