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THE GLOBAL ENERGY MARKET: COMPREHENSIVE STRATEGIES TO MEET GEOPOLITICAL AND FINANCIAL RISKS—THE G8, ENERGY SECURITY, AND GLOBAL CLIMATE ISSUES

The world economy has been undergoing a radical transformation over the past half century, from one based on significant government intervention in the form of regulation and planning, to one based more on market forces. The oil market is one example of this trend, as it has moved away from bilateral contracts or government relationships between specific buyers and oil producers to a global market system based on competitive bidding and price discovery through the commercial dealings of a wide number of players. The United States, as a world power and energy consumer, favors an open, transparent, and competitive global market for oil in which no seller or group of sellers can dominate the market and thereby threaten access by the United States, its allies, and the global community to the supplies of oil needed to conduct normal everyday consumer, business, and military operations.

The broad-based support for a liberal international trading system among industrialized nations arises not only on the basis of philosophy and ideology but also from experience. Many countries can point to higher growth rates that have resulted from being integrated into the global economy, through better access to markets and foreign investment. And many countries benefit from a global economy in which there are more players in each market and prices are set more competitively.

In recent years, uncertainties have arisen in the global energy market that could threaten its smooth operation. Historically, resource exporters have complained that the liberalized global trading system is biased against them in that, while the products they export are priced at highly competitive rates, the goods they import are

typically sold in markets that are oligopolistic and inflated. The result is unfavorable terms of trade for them. Complaints have been the loudest from countries that are dependent on exports of one or two primary commodities, since commodity price volatility often translates into economic instability. As a result, primary goods exporters such as the major oil producers have sought ways in which they might cooperate to gain some market power in the export markets. (See working paper, "Militarization of Energy.")

The oil price collapse of 1998 drove home the need for collective action among major oil exporting countries, including the countries that are members of the oil cartel, the Organization of Petroleum Exporting Countries (OPEC). The collapse, stimulated by the Asian financial crisis and market share competition between Saudi Arabia and Venezuela, ushered in a plunge in oil exporting country earnings, in some cases by almost 50 percent. Intensive diplomacy began, with Venezuela and Mexico actively working to pave the way for a major agreement among oil producers to trim output and propel oil prices to higher levels. Over the past few years, to avoid previous mistakes of overproduction, OPEC has been slow to respond to rising oil prices by bringing on investments to create additional supplies, even as prices reached \$125 per barrel. OPEC's total sustainable production capacity did not expand between 1998 and 2005, despite a rising call of demand for OPEC crude oil supply. Capacity gains made through added investments in Iran, Saudi Arabia, Kuwait, Algeria, Qatar, and Libya have barely managed to offset the losses in Iraq, Venezuela, and Indonesia. (See working paper, "Militarization of Energy.")

Today, national oil companies (NOCs) hold

nearly 80 percent of global reserves of oil; they also dominate the world's oil production. The challenge of meeting growing demand for oil will be daunting in the years ahead. Many emerging economies, such as China and India, have made substantial per capita income improvements in the past decade and are at the launching point where private automobile ownership and related fuel demand is likely to jump as much as twentyfold.

In fact, unless consuming countries institute more effective energy policies, oil consumption is expected to rise by more than 30 million barrels per day (b/d) by 2030; the investment required to provide this petroleum could run to four trillion dollars or more. Fifteen percent of that added demand is projected to come from the United States alone and another 24 percent from China.

Since oil supply from member states within the Organization for Economic Co-operation and Development (OECD) is potentially limited, NOCs will be responsible for a lion's share of this increased output and investment. The picture is similar when it comes to natural gas. NOCs or state-owned natural gas companies already play a substantial part in international markets, and their role could become even more critical as more natural gas is needed from Russia, Iran, Iraq, and perhaps someday, Saudi Arabia.

As the world becomes more dependent on NOCs for oil supplies, major oil-consuming countries are questioning the ability of these firms to bring new oil on line in a timely manner in the volumes that will be needed. The list of NOCs with falling or stagnant oil production in recent years is long. Production has been affected by civil unrest, government interference, corruption, and inefficiency, and the large diversion of corporate NOC capital to social welfare. Moreover, in several major resource-holding countries, violent and nonviolent social movements are raising the costs of investment, disrupting exploration and production, and generally interfering with the flow of primary commodities. This is especially true in Latin America, where hypermobilized social movements have created new political risks that, in turn, have had negative consequences for international investment and also have curtailed energy supplies in the region. (See working paper, "Energy Security: Bolivia.")

A good example of this phenomenon is

Bolivia, where social welfare did not prosper during the natural gas boom. Poverty rates rose 2.34 percent from 1999 to 2002, and income inequality expanded. Economic reform policies promoted by the World Bank and two major government initiatives—a program to end the growing of coca plants and one to build a controversial natural gas export project through Chile—smacked of international influence but at the expense of and without the consensus of Bolivia's dispossessed poor. These unpopular programs provided fuel for social mobilization against the government. Riots ensued in 2003, prompting the cancellation of natural gas export plans and ushering in a referendum that led to major changes in energy policy, including a new nationalization law and subsequent renationalization of energy properties.

The new Bolivian energy policy has had a predictable effect on oil field development activity. The number of wells drilled in Bolivia in 2006 and 2007 averaged only ten, a decline from the sixty-four to sixty-five that were drilled annually between 1998 and 2000. These numbers also compare unfavorably with those for Argentina (1,594), Brazil (230), Colombia (241), and Peru (85) in 2006. The number of drilling rigs also demonstrates the decline in Bolivia's energy sector. In November 2007, only three drilling rigs operated in Bolivia, in contrast to nine in Peru, thirty-six in Brazil, seventy-three in Venezuela, eighty-four in Mexico, and eighty-five in Argentina. These statistics indicate that investors are not interested in expanding Bolivian output, but rather are seeking to minimize losses from sunk investments by producing minimal amounts from their existing fields. (See working paper, "Energy Security: Bolivia.") Bolivia's case is an example of how social mobilization in the face of an internal struggle for resource rents can impede resource development.

As instruments of state power, many NOCs are used—with widely varying success—as tools of economic development, employment generation, and social welfare. This, in turn, can inhibit their ability to develop new resource supplies. Abroad, NOCs have been used as instruments of foreign policy. Some governments see their NOCs as a means to enhance their international prominence, increase their influence, and foster strategic alliances. Not least, NOCs are an important mechanism through which members of OPEC can

coordinate their activities to keep oil prices high and, perhaps someday, widen their influence to global natural gas markets.

RISE IN OIL PRICES: THREAT TO ECONOMIC STABILITY?

Sharp changes in energy prices are having dramatic effects on the stability of the global economy. Threats to the global energy market could have dangerous corresponding impacts on the world financial system. To prevent a breakdown in the smooth functioning of markets will require thoughtful and sound policies on both economic issues and energy issues inside the major world economies.

Emerging-market investors were rudely awakened when multiple emerging-market economies' fortunes became linked unexpectedly in the late 1990s. Diversification effects for those investors vanished, bringing the reality of the problem of global financial contagion to the fore. More recently, contagion effects have become progressively more pronounced in terms of extreme co-movements (both positive and negative) of commodity prices and financial markets across the globe. In light of continuing and imminent pressures on the dollar under the weight of unprecedented U.S. debt, central bankers and investors around the globe have grown increasingly nervous about ongoing financial crises, such as the U.S. subprime mortgage debacle, and their long-term effects. Some Asian monetary authorities have equivocated regarding their intentions to diversify their foreign reserves away from dollar-denominated assets, but given the relative youth of the Euro, it is not yet a credible contender as a global financial anchor. Thus, for the time being, the status quo of dollarization continues.

Large swings in financial markets are now being driven by significant fluctuations in energy prices. Fluctuation has indirect economic effects on growth and corporate profitability, as well as direct financial effects on the flow of petrodollars, the demand for dollar-denominated bonds, and other related impacts. The credit bubbles driven by recycled petrodollars and Asian trade surplus dollars likewise have depressed interest rates and allowed a credit bubble to start in

the United States, most notably in the esoteric area of subprime mortgages and asset-backed securitization. This credit bubble spread around the world, increasing the chances of contagion of financial market problems. Hot petrodollar and Asian money also has fueled speculative bubbles in gold, commodities, and other markets, driving price inflation worldwide, which has also been aggravated by frequent reductions in U.S. interest rates by the U.S. Federal Reserve Bank.

The current high oil price continues to put pressure on the dollar through mounting trade deficits and U.S. debt. The dollar is thus caught in a vicious cycle: High oil prices feed the U.S. trade deficit, leading to increased U.S. indebtedness and a weaker dollar, which further drives oil prices higher. A tempting solution would be to increase interest rates in the United States to support the dollar financially, while at the same time work to improve the U.S. balance of trade. However, given the bubbles in U.S. financial markets, an increase in interest rates could have devastating effects on financial markets and the economy more generally. A sudden collapse in financial markets, or a sudden collapse of the dollar, would be very damaging to the global economy, given the still dominant role of U.S. expenditure and the U.S. financial services industry.

Petrodollar flows play a major role in the current credit bubble dilemma. Some may argue that the importance of recycled petrodollars is lower today than it was during the 1970s. They point to China as a main source of global financial flows. Indeed, the importance of Chinese outflows is critical. However, the current role of recycled Middle East petrodollars should equally not be discounted. While the flow of Chinese transnational capital has been ongoing, the acceleration in asset bubbles and worsening financial crises have been in large part driven by the rise in oil prices and related petrodollar boom that began to take shape after 2003. Outflows from Saudi Arabia and Kuwait alone have rivaled those of China in recent years. Moreover, China's economy has substantially higher absorptive capacity than the oil producing countries of the Persian Gulf, whose real estate and stock market bubbles have tested the limits of domestic recycling of petrodollars. Therefore, in the future, the nature and effects of petrodollar flows may take on a more important role in

international markets and any potential crisis that might develop over time. (See working paper, “Energy, Financial Contagion, and the Dollar.”)

The ideal solution for creditors would be for the United States to reduce the growth of its debt levels by reducing its twin fiscal and trade deficits, but the political will to accomplish this seems to be lacking in the United States. The market remains vulnerable to a trigger event that could start a flood of conversion away from dollar-denominated investments. However, many oil-producing countries in the Persian Gulf have security and other geo-economic reasons to remain invested in dollar-denominated instruments. These investors have played a particularly constructive role in shoring up financial markets. A disorganized sell off of dollars would not only spell catastrophe for the American economy but also for the entire global financial system, as the subprime mortgage crisis and subsequent bailout of U.S. investment bank Bear Stearns clearly signaled. (See working paper, “Energy, Financial Contagion, and the Dollar.”)

To date, central bankers in the United States and Europe have helped maintain the status quo by keeping interest rates low, hoping to avoid a deep recession. However, inflationary pressures are mounting, and the current atmosphere of accommodating monetary and fiscal policy is starting to wane. The eventual increase in the cost of funds, if combined with high energy prices, likely will reduce economic growth and with it oil demand. This may be one reason Saudi Arabia is looking more carefully at its oil-production policies. Saudi Arabia must weigh the negative impact of high oil prices against concerns about possible future declines in world oil demand.

To avoid a global meltdown, countries with dollar-denominated assets need to cooperate to find a transition path that weans the United States from foreign credit and foreign oil while, at the same time, moves emerging economies away from excessive export-oriented dependence on U.S. consumption. This will require international coordination. Needed policies include new initiatives to reduce savings rates in Asian economies in order to increase their absorptive capacities and to promote a systematic reduction in the U.S. current account deficit through increased saving. It also will require expanded effort to

find additional options to increase the capacities of Middle East energy-exporting countries to absorb petrodollar inflows through investment in appropriate forms of human and physical capital. Gulf countries face daunting challenges to absorb the impending demographic “youth bulge” and diversify away from heavy dependence on oil and gas exports.

Finally, there are many reasons to believe that a smooth transition to a multiple-currency regime, within which the dollar continues to play an important role, would be preferable to current uncertainty. The United States should take the lead in ensuring a constructive dialogue among stakeholders about that process. (See working paper, “Energy, Financial Contagion, and the Dollar.”)

This Baker Institute study, *The Global Energy Market: Comprehensive Strategies to Meet Geopolitical and Financial Risks*, is aimed to elucidate the ongoing threats to energy markets and to recommend policies that will be needed to safeguard transparent and open global energy markets, as well as trading and investment. By analyzing these threats in depth, the study develops a series of policy frameworks that can be used to fortify the current market system and ensure that it can respond flexibly to the current array of threats that might be encountered in the coming years. The industrialized countries also will need to consider policies to ensure the stable operation of global energy markets within the context of adopting sustainable and forward looking policies regarding global climate change.

During the 2006 summit of the Group of Eight (G8) hosted by Russia in St. Petersburg, the G8 stated its commitment to open and transparent energy markets. “Ensuring sufficient, reliable, and environmentally responsible supplies of energy at prices reflecting market fundamentals is a challenge for our countries and for mankind as a whole,” according to the G8. “Parochial national efforts to ensure energy security have so far proved unsuccessful.” However, building a multinational framework to address these issues has proved highly challenging, with resource nationalism, differing attitudes toward limiting greenhouse gas (GHG) emissions, and economic protectionism thwarting cooperation.

EVOLVING DEFINITIONS OF ENERGY SECURITY: CHANGING THREATS

The term “energy security” has evolved over time as the energy supply challenges and threats facing the United States have changed. In the post-World War II era of the 1950s, energy security was used to justify protection for U.S. domestic oil production to ensure that adequate supplies would be available in times of war. Energy security, in great measure at that time, was conceived in reference to military preparedness. By the 1970s, in the aftermath of the 1973 Arab Oil Embargo, the concept of energy security shifted to focus more on protecting the United States against any group of oil producers that might use the “oil weapon” to blackmail the United States to adjust its foreign policy in a manner that would be inconsistent with a freely-pursued U.S. national interest. In the 1970s, energy security became synonymous with independence from foreign oil.

In the 1980s and 1990s, the focus on energy security became more economic in nature, directed at protecting the U.S. economy and other major importing countries against the negative effects of supply interruptions and oil price shocks on the economic performance of the U.S. and global economy. By the 1990s, oil shock fears began to wane as a growing consensus emerged that, chances were, economies would be resilient and adjust to oil shocks with some damage but not necessarily catastrophic consequences. The threat to energy security appeared realigned to encompass only a short-term loss of oil supply, such as occurred when Iraq invaded Kuwait, and energy security concerns focused on the loss of economic welfare that could result from a sudden but short-lived disruption in energy supply.

In the aftermath of the September 11, 2001, terrorist attacks in the United States, discussion of energy security turned back to the costs of dependence on oil regimes whose interests might be inimical to the United States or its allies. This dependence raised two issues for American elites. First, concerns were raised that oil dependence could result in future constraints on the freedom of the United States to maneuver in international relations. After September 11, terrorist financing, human rights, political reform in the Middle East, and the status of women, among others, were

raised as policy areas where oil dependence was limiting U.S. freedom of movement to press for its national interests. In addition, neoconservative analysts and prominent politicians raised concerns about the transfer of large oil payments to unstable or unfriendly oil regimes, which could potentially use the money to fund terrorist activities against Western or U.S. citizens or infrastructure.

More recently, in light of Russia’s sudden, brief cutoff of natural gas supplies to the Ukraine in January 2006 and threats of oil supply cutoffs by Iran during the geopolitical standoff over its nuclear program, energy security is taking on a greater policy salience, as national security analysts think through the consequences of important oil producers using access to their vast energy supplies as a lever to gain political ends. This concern over the relative power of nations is fostering a new concept of energy security—one where oil consuming countries wish to minimize the chances that a key oil supplier could use the threat of a cutoff to supplies to gain geopolitical advantage or even, in the case of Russia, to impose political conditions inside an oil importing country. (See working paper, “ Militarization of Energy.”)

In this new setting, where oil suppliers might be more inclined to use oil as a lever for political ends, energy security could be redefined as reducing the vulnerability of the economy to the reduction or cutoff of oil supplies from any given supplier or group of suppliers or to sudden large increases in prices of specific energy commodities such as oil and natural gas. To do so, the consuming country must increase its elasticity of demand for that commodity. This can be achieved several ways. First, consuming countries can adopt policies that broaden the flexibility of energy-using industries or transport vehicles to shift among alternative fuels. Consuming countries also can adopt policies that lower the oil intensity of their economies. Finally, countries can enhance the diversity of alternative oil suppliers and the shares of alternative fuels and energy sources in their mix of primary energy use. (See working paper, “ Militarization of Energy.”)

That rising U.S. oil imports have strengthened the hand of oil producers is fairly clear. Soaring U.S. gasoline demand was a significant factor strengthening OPEC’s monopoly power in international oil markets in the 1990s. U.S. net oil imports rose from 6.79 million b/d in 1991 to 10.2

million b/d in 2000, while global oil trade (that is, oil that was exported across borders from one country to another) rose from 32.34 million b/d to 42.67 million b/d. In other words, the U.S. share of the increase in global oil trade over the period was a substantial 33 percent. In OPEC terms, the U.S. import market was even more significant, representing more than 50 percent of OPEC's output gains between 1991 and 2000.

Strong U.S. import demand not only enhances OPEC's monopoly power, it also has had a deleterious long-term impact on the U.S. economy. The U.S. oil import bill totaled \$327 billion in 2007 and is expected to top \$400 billion in 2008. The latter represents an increase of 300 percent from 2002. The U.S. oil import bill accounted for 35 percent to 40 percent of the overall U.S. trade deficit in 2006 and 2007, compared to only 25 percent in 2002. This rising financial burden is stoking inflation and creating ongoing challenges for the U.S. economy. (See working paper, "Energy, Financial Contagion, and the Dollar.")

ASSESSING CURRENT ENERGY SUPPLY RISKS AND GEOPOLITICAL THREATS

In recent years, a growing scarcity of energy commodities worldwide has heightened concerns about key geopolitical risks and threats and their possible impacts on the smooth operation of the global energy and financial markets. These risks include, among others:

- A politically motivated cutoff of oil or natural gas supplies by a major exporter (such as Russia to a European country or Venezuela to the United States) or group of exporters;
- A confrontation with Iran over its nuclear aspirations that results in sanctions against Iranian oil exports, an American or Israeli attack on Iranian nuclear facilities, or an Iranian and/or terrorist threat to oil shipping through the strategic Strait of Hormuz, through which 16 million b/d to 17 million b/d of Middle East oil passes each day;
- Terrorist attacks on major oil production facilities or export infrastructure;

- The possible spread of conflict or instability from Iraq into other oil producing countries or the escalation of a proxy war involving Saudi Arabia, Syria, Turkey, and Iran over the outcomes in Iraq;
- A failure on the part of major energy exporters to make the investments needed to meet rising global energy demand either for geoeconomic reasons or through the negative consequences of corruption, bureaucratic inefficiency, or weak government institutions;
- A cutoff of oil or natural gas exports or a delay in resource investment and development due to resource nationalism, domestic unrest, or crises in succession of political leadership;
- A work stoppage or strike by oil workers, possibly motivated by political trends involving power-sharing or human rights issues related to internal instability in a major oil-producing country;
- Destruction of oil production or fuel manufacturing infrastructure following a severe storm or natural disaster.

However, many of these risks that are driving today's oil price premium may be less catastrophic than they seem at first glance.

Many of these oil supply and security risk factors actually eased over spring 2008, leaving questions about the extent to which other factors are contributing to higher prices.

The experience of the 1970s suggests that countries will not necessarily resort to more aggressive military responses to energy shortages. Compared with the last episode of rapidly rising prices in the 1970s and early 1980s, there are now relatively few legal barriers to the movement of energy resources and fewer regulations that prevent prices and economic actors from adjusting to changes in relative energy prices. Flexible, well-functioning markets will encourage both economic adjustment and innovation in both the supply and demand for energy.

On the other hand, the 1970s were the time

of a bipolar world in which many countries were constrained in their behavior by one of the superpowers. Fear of Soviet expansion in the Middle East and the threat of Communism created an incentive for Middle East oil producers in the Gulf to seek U.S. security guarantees. Today, the world is more fragmented, and the superpowers hold less sway over other countries.

To analyze the kind of “resource war” that might threaten the global system, it is important first to define the kinds of conflicts that are being used as examples of resource wars and then to conceive which of these, if any, could threaten the global system and, finally, explore alternative avenues for solving the same problems without recourse to war. Much of the literature on resource wars jumps from various examples of conflict regions in which oil happens to exist, ignoring differences in the driving forces of those conflicts and oil’s role in them.

The competition for resources in the Caspian Basin is a much-discussed example of the hot spot that could lead to conflict over resources. In this case, resource war theory would argue that large, powerful consuming countries like the United States and China would become increasingly concerned about access to oil supplies, vie for resources in the same geographical area and, through this competition, wind up in military conflict with each other. This is the ultimate resource war that could emerge from supply scarcity. But, so far, while such diplomatic, commercial, and even military jockeying in the Caspian and other regions has taken place between the United States, China, and India, these events have yet to produce big-power confrontation. For instance, China has not challenged the buildup of U.S. troops in the Caspian region, which arguably has more to do with the war on terror and failed states than any purposeful policy to control oil supply in the region. China’s response to the increased U.S. military presence has been diplomatic, through its sponsorship of the Shanghai Cooperation Council meetings, and economic, through Chinese investment in domestic energy infrastructure in the region. China has not responded to the U.S. military presence by building up its own forces on the ground in or around the Caspian.

In the aftermath of its increased involvement in

Sudan’s oil industry, China has built a quasi-military presence in Sudan, and the Chinese assistance to the Sudanese government has made it difficult to resolve the violent conflict in Darfur. But again, the United States has not responded to the issues militarily. Instead, the United States has sought a solution through diplomacy, attempting to get the United Nations involved in providing peacekeeping troops to Darfur and pressing China, through quiet diplomacy, to cooperate.

Thus, while it is impossible to rule out the possibility that if supplies of oil tighten over time, competition for oil among large, powerful consuming countries might intensify and lead to conflict, in the immediate term, there is no geopolitical behavior on the horizon that signals a start to this pattern of international conflict. Moreover, for larger industrializing countries that are net energy importers (e.g., India, China), an aggressive resource strategy would be less likely because of their integration into the world trading system. The potential of trade sanctions serves as an effective deterrent, as these countries need access to Western markets for their manufactured goods.

Another predicted category of resource war is an act of war by a large consuming country against a smaller, weaker oil-rich country to take over its oil. The U.S. invasion of Iraq is frequently referred to as an example of this kind of resource war. In fact, the U.S. invasion of Iraq had a larger and more complex set of motivations. The United States has neither in practice nor intention taken control of Iraq’s oil. If anything, the Bush administration bent over backwards to say that the Iraqi government was in charge of all administration related to the oil, and the constitution drafted by Iraqi politicians and backed by the United States specifically states that the oil is the property of the Iraqi people for the benefit of the whole country. Iraqi oil is not being shipped back to the United States. Rather, it is sold on the open market by Iraq’s tattered state-owned oil industry.

There also is no hint of China or India sending their military to take over oil supplies. In fact, in recent years, the only invasions of oil-rich countries by other countries have involved countries that had their own oil, again driven issues more complex than simply grabbing resource supplies per se (Iraq–Iran, Iraq–Kuwait, Russia–Chechnya, Russia–Dagestan). (See working paper, “ Militarization of Energy.”)

Alternatively, an oil exporter may want to gain control of another oil exporter to secure the resource rents from producing that oil, to achieve more market power in the oil market by reducing the number of independent suppliers or to pursue political/strategic ambitions. Iraq's invasion of Kuwait in 1991 in part reflected these motives. But as the response to the invasion of Kuwait suggests, such actions, at least by smaller countries, would be unlikely to succeed and expand into a global crisis of confidence, so long as the United States remains the overwhelmingly dominant military power and is willing to use its power to enforce the global system.

Beyond these kinds of state-to-state wars, there is a rich literature emerging regarding ways that the internal interstate competition among subnational groups/militias inside oil-producing countries has led to violence and civil war, with internal attacks motivated by parties wishing to gain control of resource rents. The examples of such conflict involve many oil states, such as Columbia, Nigeria, Indonesia, Iraq, and Angola. But these conflicts also have other underlying causes related to ethnic unrest, religious divisions, failed institutions of government, social inequality, and criminality and lawlessness. It is hard to say that internal resource wars inside failed or failing states are indeed driven by scarcity of oil. These conflicts also do not by necessity involve oil-consuming nations except, perhaps, in a positive way by driving the urge to utilize diplomatic or peacekeeping initiatives by the international community in the hope that supplies will not be cut off.

The last kind of resource war that is being bandied about among commentators is the risk that an oil-rich country might try to blackmail a powerful industrialized country or a group of powerful industrialized countries by withholding oil supply, causing a conflict that escalates into a war. Such an event would indeed be a challenge for the international system and one that is attracting increased attention from security analysts in many countries around the world.

It could be argued that tightening markets could raise the benefits and possible chances of success for an energy exporting country, alone or in combination with others, that might try to leverage its control of energy supplies to wrest

political concessions by threatening to cut off needed energy supplies. However, it is instructive to note that when OPEC cut off oil supplies in 1973, consuming countries did not respond with military force. To be sure, the OPEC embargo occurred during the Cold War and when the United States was bogged down in Vietnam—factors that constrained a more forceful response. Times have changed, and the reaction of consuming countries to an embargo today might be very different, but consumer countries have other means via energy policy and strategic stocks to deal with supply cutoffs. (See working paper, "Militarization of Energy.")

The threat of an oil or energy weapon has emerged into international discourse in recent years, though no prolonged cutoff has ensued as of yet. Two oil producers, Venezuela and Iran, have specifically made public statements threatening to cut off oil supplies as a matter of state policy as a defensive and retaliatory response to political or commercial conflicts.

Iran's strategic location, as well as its important role in the supply of oil and potential as a major natural gas supplier, gives it leverage to assert itself in global energy markets. Moreover, Iran's role in the Persian Gulf region has great bearing on the stability of the Middle East and, by extension, energy security. Iran's active support for such subnational groups as Hizbollah is a major factor in regional politics, as highlighted by Israel's conflict with Hizbollah in Lebanon in summer 2006. That lingering conflict, could, if not properly managed by effective diplomacy, expand to embroil a wider range of countries and remains a destabilizing factor in the region. Iran's role in Iraq also gives Tehran a pivotal input into regional stability. An expanded proxy war in Iraq—fanned by the actions of its neighbors—could create a political and humanitarian crisis of even greater proportions and would be detrimental to the region as a whole. An expansion in violence in Iraq and beyond also would greatly damage the stability of the oil market. (See working paper, "Iran, Energy, and Geopolitics.")

Beyond its role as a regional power broker, Iran has geographical leverage on the Strait of Hormuz, the main passageway for 16 million to 17 million b/d of oil, roughly two-thirds of total world oil trade by tanker and 20 percent of total world

daily oil demand. The United States alone receives about 18 percent of its imported oil through the strait. The significance of the Strait of Hormuz has become enhanced in recent years because virtually all of the world's excess spare production capacity that can be brought on line quickly to defend against the adverse effects of a sudden oil supply crisis or disruption is located in Saudi Arabia, Kuwait, and the United Arab Emirates and thereby could be cut off if the Strait were closed. Maintaining the free flow of oil through the Strait of Hormuz is of vital strategic importance to the Gulf Cooperation Council (GCC) countries and to the world economy.

Yet, analysts believe it would be difficult for Iran to produce a sustained disruption in oil shipments in the strait using swarming tactics or sea mines. The backdrop of conventional Iranian military actions inside the Persian Gulf has raised concerns about whether a nuclear Iran would use the leverage of nuclear capability to demand political or other gains by threatening traffic through the Strait of Hormuz via conventional or nonconventional means. Strategies exist that could give the United States and its GCC allies time to pursue negotiated solutions to potential conflicts or to properly prepare for a military response. Among those alternatives are to use existing pipeline and oil-export infrastructure to create a bypass to the Strait of Hormuz. (See working paper, "Iran, Energy, and Geopolitics.")

In addition, the GCC, United States, China, and other major powers could work together to create a multinational convention to ensure freedom of sea guarantees in the Persian Gulf that would be followed by all users of the Strait of Hormuz. Such a convention might include a ban on sea mines in the waterway, a prevention of incidents management agreement (focused on freedom of navigation and avoidance of provocation) that more specifically defines maritime rules and regulations in the region, or the creation of a multilateral organization to deal with the Strait of Hormuz. Such an initiative would have the advantage of convincing Iran that unilateral action would be counterproductive, while, at the same time, demonstrating that the United States and Gulf countries recognize Iran's strategic interests. The process of negotiating a convention also would create a coalition of

countries that could respond in case Iran did pose a threat to freedom of navigation at the strait. (See working paper, "Iran, Energy, and Geopolitics.")

Moreover, internal political trends inside Iran may open the way for more constructive dialogue with the West about Tehran's nuclear aspirations. Ongoing efforts of pragmatic conservatives, whose ranks gained political clout in the latest elections, to reassert influence over the domestic economic and political agenda may create opportunities for Tehran and the West to devise an escape route from the current impasse over nuclear power. Certainly, these pragmatic conservatives will never give up on avowed Iranian rights to set Iran's own strategic agenda. Still, the conservatives' concrete interests in promoting greater foreign investment and attaining a larger measure of autonomy for the private sector, put together with their current political rapprochement with domestic reformist groups, could translate into a more flexible position on the nuclear issue.

For this reason, Washington and Tel Aviv have more leeway to give diplomatic and other means a chance to run their course. Washington should avoid being drawn into a direct military confrontation with Iran—a development that only would strengthen the hands of the radical populists at the very moment that they are losing domestic support. (See working paper, "Iran, Energy, and Geopolitics.")

There is no question that Iran has been suffering from debilitating energy shortages and that the development of domestic nuclear power plants is one option being touted to the population as a solution to these shortages. The construction of the planned nuclear power plants in Iran would indeed free up 200 million cubic feet a day (mmcf/d)—or 2.07 billion cubic meters a year (bcm/yr)—of natural gas that could be directed to other uses outside the electricity sector or exported to reap higher revenues. However, phasing out natural gas subsidies would be a more sensible policy approach to Iran's apparent natural gas shortages than building nuclear capacity and could free up as much as 2 billion cubic feet a day (bcf/d)—or 20.8 bcm/yr—of natural gas for export. By ending natural gas subsidies and pricing fuel for power generation at appropriate international levels, the Iranian government would be able to properly weigh the opportunity cost for the full range of

uses for all of its natural gas production, and not just the very small volume that might be freed up from the construction of one or two nuclear power facilities. (See working paper, “Iran, Energy, and Geopolitics.”)

The other major threat to Middle East oil beyond the Iranian situation was an apparent shift in thinking within al-Qaeda after 2004 about the importance of attacks on oil facilities and infrastructure. After the fall of the Taliban at the end of 2001, al-Qaeda leader Osama Bin Laden’s speeches increasingly focused on targeting the oil industry with destruction. Initially, this discourse focused mainly on the economic disparities between what the oil was worth and what the Muslim world—mainly Saudi Arabia—actually was being paid for its oil, which Bin Laden asserted should be priced at more than \$100 per barrel. By 2004, the attitude towards oil shifted, and al-Qaeda writings refocused on how supplying oil to the enemies of Islam justified the destruction of oil facilities by any means necessary. Attacks on oil in Muslim lands were not only legitimized but encouraged. Believers were urged not only to damage facilities to generate energy market instability but actually to destroy oil production and export systems.

As its Saudi strategy has evolved, Al-Qaeda in Saudi Arabia, as a result of its failure to mobilize a popular uprising against the al-Saud family during the period between 2003 and 2005, gradually turned to more and more extreme tactics. Rather than worrying about preserving the oil for future Muslim generations, the organization is now willing to destroy the economic basis of the kingdom rather than allow anyone collaborating with the United States to benefit from the oil. Al-Qaeda’s focus on attacking the Saudi oil industry has grown since 2004, representing a clear change in policy for the organization. Al-Qaeda unsuccessfully tried to attack the major crude oil processing facilities at Abqaiq, Saudi Arabia, in February 2006. Still, the essentially local and autonomous aspect of terror cells, in the aftermath of the U.S. military campaign in Afghanistan, which disrupted some of al-Qaeda’s global coordination capability, has reduced the chances of a successful strike against major oil facilities, which requires expert coordination, planning, and material support. (See working paper, “Oil and Terrorism.”)

It has been the specter of Russia wielding an energy weapon that has gained the most attention in energy security circles and that has prompted a re-evaluation of energy strategies in Europe. Russia has not actually threatened such a scenario. Rather, its policies toward neighboring states that previously received subsidized energy supplies have opened debate about Russia’s foreign policy goals and whether it might use an energy-supply lever to achieve political ends and enhance its regional or global power.

Some West European countries, such as Germany, are particularly dependent on Russian resources, with Russia supplying more than one-third of Germany’s crude oil and natural gas. Europe as a whole relies on Russia for about one-quarter of its oil and natural gas. Since the economies of Eastern Europe, the Baltic countries, and Former Soviet Union (FSU) states such as Ukraine and Belarus were closely integrated with the Russian economy in the Communist era, these countries are even more dependent on Russian energy supplies. This latter point, in particular, has drawn geopolitical fault lines in recent years. In an effort to forcibly renegotiate prices to reflect the market value of natural gas in Europe, Russian gas giant Gazprom temporarily reduced its flow of natural gas to Ukraine on January 1, 2006—an action that greatly affected consumers in both Ukraine and Western Europe because the cutoff coincided with a period when winter fuel demand was at or near its peak. While the motivation for such an action may have been to raise prices to reflect the true value of the natural gas, the move was widely interpreted as an attempt by Moscow to discourage the anti-Russia, pro-NATO (North Atlantic Treaty Organization) stance of a newly-elected government of Ukrainian President Viktor Yushchenko. Following the Ukraine affair, speculation about the risk of Russia using energy as a lever in foreign policy began to affect energy policy in the European Union, as countries within that community started increasingly to seek alternative sources of supply. Russia’s seemingly successful strategy in maintaining the dependence of Central Asian suppliers on Russian pipeline infrastructure to get their supplies to market has only added to Western anxieties.

Aside from worries that Russia may use its position as an energy supplier for political

purposes, there also is mounting concern about Russia's ability to meet, much less expand, its current export commitments. Despite Russia's huge potential as an energy supplier, Russian natural gas production has been relatively flat since the early 1990s in the wake of the slow pace of organizational reform and delays in new investments. In fact, production fell by about 10 percent through the mid-1990s before recovering and slightly expanding in recent years. Recent experience regarding Russian production has raised concerns among European policymakers that future Russian production may not allow Gazprom, Russia's state-run natural gas monopoly, to meet its contractual commitments beyond 2010. Russia's natural gas industry faces important tradeoffs. Billions of dollars in new investment are required to reach the country's full production and export potential, but inefficient pricing, internal political struggles, and complex relations with bordering transit states have contributed to delays in field development. (See working paper, "Russian Natural Gas Exports.")

Utilizing the Rice World Gas Trade Model (RWGTM), a dynamic spatial general equilibrium model of the world market for natural gas developed by Baker Institute scholars, Baker Institute researchers undertook scenario analysis to study the impact of a sustained Russian natural gas supply cutoff to Europe. The general implication of this analysis is that Russia's ability to adversely affect West European gas markets may be less than at first appears to be the case.

The scenario case study, which simulates a six-month supply curtailment to Europe, highlights the dramatic impact that such a disruption can have on the European market. In a supply curtailment scenario, European natural gas prices spike to \$15 per thousand cubic feet (mcf), which is about triple the price forecast under an economically-oriented, business-as-usual reference case. This scenario brings to light, however, the substantial risk to Russia in exercising such a strategy. Specifically, Europe responds to the short-term disruption by both reducing demand and increasing imports from elsewhere. This ultimately results in Russian exports to Europe remaining lower than normal through 2020, so that Russia effectively sacrifices future market for a decade for potential short-term economic and political

gain. In addition, prices remain at high levels only briefly and completely return to equilibrium patterns within two years or so. (See working paper, "Russian Natural Gas Exports.") The study shows that the ability to trade liquefied natural gas (LNG) can help diffuse the effects of a Russian cutoff throughout the world and thus lessen its impacts on Russia's immediate neighbors. Specifically, imports of LNG into the United States, India, and other regions are curtailed in 2010 to allow more imports into Europe.

The analysis highlights the common interest that the countries of Western Europe, Northeast Asia, and North America have in promoting the development of an efficient worldwide market for natural gas and the importance of trade policy and diplomacy that would block coordinated action by Russia and Middle East natural gas suppliers, including those in the Persian Gulf and North Africa.

CLIMATE ISSUES ADD TO UNCERTAINTY

Another market risk that is creating new uncertainty is the possibility of stronger controls on GHG emissions in the industrialized and key developing world economies. Concern over climate change policy is driving some of the reluctance to invest, despite tightening markets and rising energy prices. In the United States, for example, construction of roughly 26,400 megawatts (MW) of coal-fired capacity was cancelled in 2007, and it has become increasingly difficult to attain financing for new coal builds.

The 2008 presidential candidates from both U.S. political parties have proposed major legislative agendas to tackle the climate challenge on a scale never seen before. Both of the candidates have stated that they plan to recommit the United States to a constructive climate policy both at home and abroad. And, it is highly likely that, given the candidates' records and statements, as well as public opinion, the next president will favor a hybrid strategy of regulation at home and negotiation abroad: a strategy that builds a domestic system to regulate carbon dioxide emissions gradually, while pushing at the international level for a new, comprehensive climate treaty. (See working paper, "U.S. Foreign Policy and Climate Change.")

The candidates' positions reflect a changing landscape on the climate issue in the United States. By the middle of 2007, the U.S. Congress had introduced more than 125 bills, resolutions, or amendments addressing climate change, up from 106 pieces of similar legislation proposed in the previous Congress during its entire two-year term. The America's Climate Security Act proposed by Senators Joe Lieberman (D-CT) and John Warner (R-VA), may be the most viable climate change bill to be introduced since the 2006 Congressional elections. Observers believe that some kind of similar cap-and-trade legislation will be passed in the United States within the next two to three years.

The Lieberman-Warner bill proposed the creation of an auction-based cap-and-trade system to reduce GHG emissions by 19 percent below 2005 levels by 2020 and by nearly 70 percent below 2005 levels by 2050, with auctioned credits rising from 23 percent in 2012 to 73 percent in 2031. Under the cap-and-trade program, emissions allowances would be set at progressively lower levels each year between 2012 and 2050, and companies would be permitted to trade in emissions allowances under a market-based system. (See working paper, "U.S. Foreign Policy and Climate Change.")

It is frequently said that energy security and climate security are two sides of the same coin. But while policy measures to reduce the threat of global warming by reducing the consumption of fossil fuels through alternative energy, enhanced energy efficiency, and conservation would indeed enhance both climate and energy security, there already have been proposals for climate-based restrictions on fossil fuel use that actually could reduce energy security and possibly national security, especially in the short run in the United States. The International Energy Agency (IEA) projects that unconventional oil could represent as much as 9 million b/d of the incremental 30 million b/d of new oil supply that will be needed to meet the rise in oil demand by 2030. Canadian tar sands could provide between 4 million b/d to 5 million b/d while upgraded heavy oil could represent an additional 2 million b/d. Coal to liquids and oil shale could provide an additional 1 million b/d to 2 million b/d. If this supply were to be curbed to meet carbon reduction goals, as has

been proposed by various groups and legislation, dependence on Middle East oil supply would be substantially higher in the coming decades. Moreover, policies affecting the use of coal are yet another area where the goals of energy security and climate policy conflict, especially for the United States. (See working paper, "Climate Policy and Energy Security.")

In the United States, coal is used to generate around about 50 percent of total U.S. electricity supply, with natural gas and nuclear power each providing about 20 percent. Hydroelectricity supplies another 7 percent, oil products just under 2 percent and other sources, including renewables, provide slightly more than 2 percent. To investigate the implications of reducing the use of coal to generate electricity in the United States, Baker Institute researchers performed scenario analysis using the RWGTM. To understand the possible energy security implications of limiting the use of coal for generating electricity in the United States, the researchers conducted scenario analysis in which the projected net increase in coal-fired generating capacity in the U.S. Energy Information Administration (EIA) business-as-usual forecast was instead supplied by additional natural gas combine cycle power generation plants. The analysis shows the share of LNG imports in U.S. natural gas supply will rise significantly, raising dependence on Venezuelan and Middle East LNG imports and adding new challenges for U.S. energy security. (See working paper, "Climate Policy and Energy Security.")

POLICY IMPLICATIONS

The United States' Energy Situation

The United States, as the world's largest energy consumer, is facing daunting energy challenges. Demand for oil has been rising steadily, but growth in supplies has not kept pace. The United States is the third-largest oil producer in the world, but its production has been declining since 1970, as older fields become depleted. The United States is now dependent on foreign oil more than ever. It imported 12.3 million b/d in 2007, or about 59 percent of its total consumption of roughly 20.9 million b/d. That is up from 35 percent in 1973. The share of imported oil is projected to rise to close to 70 percent by 2020, with the United States

becoming increasingly dependent on Persian Gulf supply. U.S. oil imports from the Persian Gulf are expected to rise from 2.5 million b/d, about 22 percent of its total oil imports, in 2003 to 4.2 million b/d by 2020, at which time the Persian Gulf will supply 62 percent of total U.S. oil imports, according to forecasts by the U.S. Department of Energy (DOE).

Rising U.S. oil imports have significantly strengthened OPEC's monopoly power in international oil markets. The rise in U.S. net oil imports represented 33 percent of the increase in global oil trade from 1991 to 2000. In OPEC terms, the U.S. import market was even more significant, representing more than 50 percent of OPEC's output gains between 1991 and 2000.

Strong U.S. import demand not only enhances OPEC's monopoly power, it also has a deleterious long-term impact on the U.S. economy. The U.S. oil import bill totaled \$327 billion in 2007 and is expected to top \$400 billion this year. This represents an increase of 300 percent from 2002. The U.S. oil import bill accounted for as much as 35 percent to 40 percent of the overall U.S. trade deficit in 2006 and 2007, compared to only 25 percent in 2002. This rising financial burden is stoking inflation and creating ongoing challenges for the U.S. economy.

Future U.S. oil consumption is centered squarely in the transportation sector, which represents more than two-thirds of total petroleum use and will constitute more than 70 percent of the increase in demand. From 1995 to 2006, U.S. gasoline demand grew an average of 1.7 percent per year, reflecting factors such as growing per-capita income, low gasoline prices, a commensurate increase in less-fuel-efficient sport utility vehicles and other larger cars, and increasing urban sprawl. (See working paper, "U.S. Energy Policy and Transportation.")

The United States has no comprehensive strategy to deal with major supply risk challenges, and perhaps of graver concern, some of the options available to lessen this risk could come at an expensive cost in terms of climate change mitigation.

The United States has yet to forge a thoughtful response to climate change. In 2005, the United States emitted a total of 712 million metric tons of carbon, 412 million metric tons of which came

from road petroleum use. The country emits more energy-related carbon dioxide per capita than any other industrial nation. In the 1990s, the U.S. transportation sector represented the fastest growing emissions of carbon dioxide of any major sector of the U.S. economy. The U.S. DOE predicts that the transport sector will generate almost half of the 40 percent rise in U.S. carbon emissions projected for 2025.

Consuming Country Power

Given the large scale of U.S. purchases, incremental U.S. acquisitions of oil affect the overall international market price of oil. A reduction in dependence on imported fuel supplies would enhance energy security. An increase in the elasticity of demand for oil imports into the United States also could reduce oil prices. The elasticity of demand for imports can be raised by increasing either the domestic demand or supply elasticities, through an increase in the substitutability between energy sources.

Encouraging the diversification of energy supplies is one very important way governments have limited the negative macroeconomic effects of events that cause the price of any single energy commodity to rise. A portfolio of different types of energy fuels with a more stable composite price is likely to lead to greater macroeconomic stability, all else being equal. If oil prices increase unexpectedly without similar increases in other energy commodity prices, the negative macroeconomic impacts would be larger as the share of oil in total primary energy increases. (See working paper, "Climate Policy and Energy Security.")

There is some evidence that declining energy intensity has moderated the negative effects of rising energy prices by reducing increases in the cost of goods and services resulting from energy price increases. Reductions in energy intensity have, in turn, resulted from a shift to less energy-intensive activities and improvements in energy efficiency in many industries. These types of adjustments represent another way to improve energy security. (See working paper, "Climate Policy and Energy Security.")

The Energy Independence and Security Act of 2007, passed on December 18, 2007, and signed by President George W. Bush, raises corporate average fuel economy standards to 35 miles per gallon

(mpg) by 2020, with first improvements required in passenger fleets by 2011. The new 35-mpg standard for new passenger cars by 2020 that is mandated under the 2007 energy bill is a step in the right direction. Most likely, however, it only will be able to ameliorate the projected *increase* in U.S. oil imports over the next 10 years, and it is not likely to reduce the nation's imports from current levels. By 2020, the new standards would put U.S. gasoline demand at 11.6 million b/d, 2.3 million b/d below previously-projected levels but 0.3 million b/d above 2006 demand levels, assuming the average rate of new vehicle purchases experienced in recent years.

U.S. lawmakers should give serious consideration to strengthening automobile fuel-efficiency standards even further and also providing greater incentives to American automakers to develop better automobile technologies more rapidly. If, for example, a major breakthrough in car technology and innovation were to occur such that new vehicle fuel efficiency accelerated after 2015 to an average of 50 mpg by 2020, the implications would be substantial, cutting U.S. gasoline demand by 6.6 million b/d by 2030 compared to projected levels, or almost 2 million b/d below 2005 levels.

As demand has risen, the United States has ceased to be self-sufficient in its refined products manufacturing capability, and imports of gasoline have risen to peaks as high as 1 million b/d. Historically, gasoline inventories have been increased on a seasonal basis with the approach of the summer driving season and been depleted as the summer drew to a close. This is to be expected as inventories are used to meet seasonal increases in demand and are replenished during periods when demand is low. But year-on-year demand has grown steadily, while inventories have not. Absent significant increases in refinery capacity or improvements in product management, the latter of which would facilitate "just-in-time" production, this situation has resulted in increasingly large swings in summer gasoline prices. U.S. gasoline manufacturing capability has not kept pace with demand growth, and gasoline imports have been required to make up the difference, rising on an average annual basis by about 500,000 b/d, with peak imports even higher. (See working paper, "U.S. Energy Policy and Transportation.")

On-hand stocks of gasoline are needed to protect consumers from sudden outages and extreme events. One possible policy fix would be to regulate the minimum level of mandatory refined product inventories. Such a system exists in Europe and has allowed Europe the flexibility to provide gasoline to the United States during the production shortfalls that occurred following Hurricanes Katrina and Rita, preventing worse dislocations. A U.S. government program reserving the right to use regulated private industry gasoline stocks for strategic national emergency releases would ensure that needed supplies of gasoline would always be available in times of unexpected, major supply outages. The industry could be required to hold extra mandated refined product stocks of 5 to 10 percent of each refining company's average customer demand. The U.S. federal government and states bordering hurricane-prone regions also should consider strategic stockpiles of motor fuel to be used to supplement supplies during evacuations from severe storms to prevent fuel outages along key evacuation routes as was experienced during Hurricanes Katrina and Rita. (See working paper, "U.S. Energy Policy and Transportation.")

Consuming countries have implemented two key approaches to dealing with OPEC given the increasing trend towards oil price deregulation inside the OECD. One approach is that governments now hold strategic stocks of oil and have created a coordinated system to release oil in times of market cutoffs or supply disruptions through the IEA.

In recent years, there has been discussion about increasing the number of member countries inside the IEA-coordinated stockpiling system, and South Korea has joined the organization. Other countries, such as China and India, are creating national strategic oil stockpiles, but these stockpiles remain small to date, and the policy framework for using them is still under development and remains untested. The IEA has invited both China and India to participate as observers in meetings for several years and is pursuing options for finding mechanisms for major non-IEA oil consuming countries to participate in joint stockpiling emergency programs but, so far, to no successful outcome. The United States should make a more intensified effort to get China and India some type of formal cooperation with the IEA.

The larger the government-held stocks and the more consuming governments that participate in such a stock-holding program, the more effective it is likely to be in serving as a deterrent to OPEC's monopoly power in international markets. Moreover, it is in the U.S. national interest that important emerging oil importing countries such as China and India do not become potentially vulnerable to political pressures of oil producers and thereby favor policies that are adverse to the U.S. interest or the interests of all oil consuming countries.

The mere existence of the IEA stockpiling system also has served as a restraining force in the deliberations of OPEC. On several occasions in the 1990s, OPEC opted to make its own incremental supplies available. This policy reflects not only goodwill but self-interest since any OPEC failure to put extra oil on the market following a sudden, unexpected supply shortfall might invite a release in IEA stocks, leaving consumer governments to profit from any extra oil sales, rather than OPEC.

In the case of an accidental or unexpected oil supply disruption, consuming countries' willingness to release strategic stocks reduces the chances that oil producing countries will fail to replace supplies. The willingness to use strategic stocks means producers have more incentive to put extra oil onto the market and grab temporary rents for themselves (instead of ceding them to consuming governments selling oil stockpiles) since some amount of replacement oil will be made available in either case.

In recent years, consuming countries have not been effective in tapping the leverage of strategic stocks in negotiating with OPEC about its responses to supply disruptions or tightening markets. The Bush administration, by making clear its intention to use strategic stocks only under a narrow range of circumstances in an emergency related to war, has weakened the leverage that could have been gained from a more flexible management of IEA strategic stocks. The administration of George W. Bush, by signaling to oil markets and OPEC that it would not use the Strategic Petroleum Reserve to calm markets or ease prices under any circumstances except major wartime supply shortfalls, has given free rein to speculators and OPEC to manipulate oil prices upwards, without fear of repercussions and

revenue losses from a surprise release of U.S. or IEA strategic stocks. Thus, the next U.S. president should make it known that he will be more flexible in the interpretation of when to order the use of strategic oil stocks.

Another approach in the OECD to help rein in high oil prices and seek to mitigate OPEC's penchant for holding back on supplies has been the imposition of consumer taxes on oil. This strategy has been implemented notably in Europe and Japan, where oil demand has been relatively flat for several decades.

The net effect of such taxes is to discourage a wasteful use of energy by consumers even while collecting some of the rents that otherwise would accrue to oil producers. Furthermore, large oil consumption taxes can force OPEC to accept lower prices as happened throughout most of the late 1980s and 1990s.

When OPEC's monopoly power strengthens due to short-term market tightening, the incentive to exploit that power is tempered by the fact that increases in monopoly rents will not accrue entirely to producers but must be shared with consuming countries that have high energy taxes. The United States should reconsider its own position on energy taxes and look to harmonize its policies more fully with other consuming countries that have higher taxes on fuel. (See working paper, "Climate Policy and Energy Security.")

Some large consuming countries are still subsidizing fuel prices to consumers, and this practice also is something that could be addressed in a consumer-country dialogue. Fuel subsidies in large consuming countries such as China drive high levels of demand growth and make consumers in those countries less responsive to price increases. Fuel subsidies also are a key factor influencing future export volume trends for many of the largest oil exporting countries. Fueled by large consumer subsidies, the Middle East has become the second largest region of growth in oil demand after Asia, with consumption rising by more than 5 percent per year since 2003—similar to growth rates seen in recent years in China. Middle East demand for oil now represents more than 7 percent of total world oil demand. Increases are being driven by economic expansion, high population growth, and extremely large subsidies to electricity and gasoline and diesel fuel prices.

The issue of cheap and available fuel is a political hot potato inside OPEC countries. Many OPEC countries view their oil industry as a vehicle to achieve wider socioeconomic objectives, including income redistribution and industrial development via fuel subsidies. Among the noncommercial objectives imposed on NOCs inside OPEC by political interests, subsidizing domestic fuel has been among the most debilitating policies to OPEC countries' long-term economic futures. On a macroeconomic level, low petroleum product prices can stimulate growth in energy-intensive sectors and limit incentives for energy efficiency, which, in high population societies, only exacerbates the budgetary problems faced by the NOC and the government. This problem creates a treadmill effect where the subsidies serve as a drain on the budget of the government and the NOC, leaving fewer and fewer funds to reinvest in expanding oil production over time as internal oil demand grows.

Fuel subsidies often are justified on the grounds that they are helping address income inequality and providing assistance to the poor. However, they are inadequately-targeted transfers, with most of the benefit accruing to the largest consumers of oil products, who typically are not the poorest members in the society. An effective system of taxation of oil rents could raise more revenue in a manner that promotes economic efficiency. If subsidies were eased, that revenue then could be targeted at income transfers explicitly aiding the poor or at investments in education, health, and physical infrastructure that would assist the development of a modern economy with a broad participation by a larger fraction of the workforce.

It is in the U.S. interest to work bilaterally and in tandem with international institutions such as the International Monetary Fund to help oil states to liberalize domestic energy markets and begin to foster energy efficiency by easing subsidy programs. These states should instead replace subsidies with more sound fiscal policies and less distortionary social welfare programs to aid the poor in their countries.

Toward a U.S. Diplomatic Strategy with Other Important Consumer Countries

The focal point for a high-level U.S. dialogue

with other consuming countries should begin with China. The U.S.–China bilateral agenda is a crowded one, but certainly relations with the Middle East and energy policy need to be given greater priority on the list of topics for high-level meetings. So far, U.S.–China energy cooperation is handled at a technical level. Political escalation of dialogue would have definite benefits.

One idea is to have such a dialogue led by the U.S. vice president, much in the way that U.S. Vice President Al Gore and Russian Prime Minister Viktor Chernomyrdin discussed U.S.–Russian energy cooperation in 1990s, paving the way for U.S.–Russian joint investment in major energy projects. Another possibility is to appoint a senior U.S. diplomat with energy experience to serve in a new post as an energy diplomacy liaison to Beijing to jumpstart more proactive and ongoing policy coordination and new energy initiatives between the two countries. The end game should be the development of a harmonized energy policy that could enhance the leverage both countries would have in dealing with muscle-flexing oil-producing nations. Reaching energy strategy collaboration with China also would pave the way for broader coordination on global warming policy, removing a key barrier to U.S. political agreement to a post-Kyoto international accord. A U.S. deal with China on energy policy and climate policy could serve as a model for similar synchronization with the European Union, Japan, India, Brazil, and South Korea.

Chinese policymakers and the Chinese public are increasingly becoming worried about climate change. At the first meeting of China's national working group for climate change and energy conservation and emission reduction in July 2007, Chinese Premier Wen Jiabao emphasized that his administration recognized the urgency of "energy-saving and pollution reduction," and he called for higher prioritization of environment and climate change programs. China already has been experiencing the impact of climate change, including extreme climate events, drought, and sea level rise. One poll, the Global Environment Review, found that 87.6 percent of Chinese surveyed were concerned about climate change and 45.6 percent expressed a deep concern. In addition, 90.8 percent of interviewees cared about the impact of climate change on children and 96.6

percent interviewees deemed that the Chinese government should take more measures to tackle global warming and climate change. (See working paper, “Chinese Policies on Climate Change.”)

Total Chinese GHG emissions in 2004 were about 6.1 billion tons equivalent, of which 5.05 billion tons were of CO₂. The annual growth rate from 1994 to 2004 averaged around 4 percent. Widespread use of coal in China’s economy (67 percent of primary energy consumption) is the major contributor to its GHG profile. China’s initial attempts at energy savings laws resulted in an annual average rate of energy intensity decrease by 5.32 percent from 1980 to 2000. Recognizing the energy challenge, China also passed a national fuel efficiency standards for automobiles in 2004. The new standard was implemented in two stages: The first stage began in July 2005, and the second in January 2008. Although U.S. standards for fuel economy are stricter for small cars, Chinese standards are more aggressive in curbing heavy vehicles, including SUVs, and there are plans to tighten all standards in the future. (See working paper, “Chinese Policies on Climate Change.”) Thus, China is taking effective policy steps on its own, creating a favorable environment for dialogue with the United States.

Diplomacy to Promote Diversification of Oil Supply

From an energy security point of view, consuming countries benefit when global oil production comes from as diverse a base as possible. Such diversity reduces reliance on any one particular geographic country or region, thereby lessening the potential for a large-scale disruption from any one area. Diversity can begin at home with U.S. lawmakers voting to open currently key restricted areas for exploration and development of domestic oil and gas production.

Active policies that attempt to use bilateral influence, aid, conflict resolution assistance, and other diplomatic leverage to remove some of the barriers to investment and technology transfer to oil producers in Indonesia, Russia, Asia, and Africa could dramatically reduce the pressure on oil markets in the years to come.

The United States and other large consuming countries, if banded together, can do a great deal more to enhance the institutional mechanisms that favor markets over political intervention

by producers. Much international economic architecture already exists to try to influence this process, including the World Trade Organization (WTO) trade and investment rules, free trade agreements, the Energy Charter, and other multinational agreements. In some cases, energy has been exempted from these agreements, responding to the push-back of resource nationalism, but such exceptions should be more strongly resisted. Access to consuming country markets and preferential trade status should be linked in some measure to oil-producing states’ energy sectors delivering more liberalized policies toward investment in their oil resources.

The United States needs to show leadership by looking seriously at ways to bring the rules of global oil trade and investment in harmony with the rules governing trade in manufacturing and services. This would mean building on open trade and investment agreements and discriminating more actively against those countries that do not permit foreign investment in their energy resources and that limit their exports to manipulate prices. This is a tough policy to implement, but it would be more feasible if all consumer countries participated in the efforts.

As a first step, the United States should promote best practices for NOCs through existing and emerging bilateral multilateral trade mechanisms such as the WTO, the Energy Charter, NAFTA, and other similar international architecture. The case of Norway’s Statoil is instructive to this point. For Norway to join the European Economic Area (EEA), in which Norway would receive access to the common market, it was forced to follow common competition directives.

Alternative Energy and Energy Efficiency Technology Strategies

Consumer governments are increasingly discussing enhancing development of backstop technologies or promoting alternative energy sources that can serve to reduce the need for fossil fuel. Backstop technologies create an incentive for oil producers to avoid oil price shocks and supply disruptions for fear that the new technologies would be released and utilized, permanently eliminating sales markets. Alternative energy supplies provide ready substitutes if the price of oil rises too extremely, and they can shield the economy from the negative

impact from disruption of any one fuel source. Widespread adoption of alternative energy could also ease the cycle of petrodollar boom-and-bust oil revenue windfalls and related international asset bubbles.

As discussed above, the deployment of improved car technology could have a dramatic effect on future oil demand trends as well as play a major role in lowering CO₂ emissions by advancing fuel efficiency.

The expansion of nuclear power in the 1970s is an excellent example of how alternative energy can reduce vulnerability to oil producer monopoly power and oil price shocks. There is a clear energy security value for nuclear power. Nuclear power can provide more stable fuel costs as oil prices vary because uranium prices are only very weakly correlated with oil prices. By stabilizing price fluctuations, a greater proportion of nuclear fuel in the primary energy mix can then protect overall national economic performance during times of disruption. Thus, the United States should give serious consideration to policies that would enhance the deployment of expanded nuclear power in the United States. (See working paper, "Trends in Nuclear Power in the World.")

It has been shown that the lower a country's energy consumption to gross domestic product (GDP) ratio or the shorter the period that oil prices will remain higher, the lower the cost of the tradeoff between inflation and GDP loss. New technologies exist on the horizon that could allow more gains in energy efficiency. Such technologies include microturbines for distributed power markets, improved car technologies, and household solar technologies, among others. OECD governments should encourage the deployment of these technologies into the marketplace through tax incentives or other vehicles in an effort to reduce their individual exposure to OPEC's monopoly power. A coordinated strategy of research and development and deployment among large consuming nations would be even more effective than singular national strategies. Such a strategy could be an important element of a U.S.–China high-level energy dialogue.

Moving the U.S. Economy to Be Less Carbon-Intensive

The United States is currently moving from acting as an obstacle to global climate policy to becoming a leader in energy technology innovation and a stronger advocate of global GHG emissions controls. U.S. policymakers are increasingly embracing renewed ties with Europe, and a greener focus is quickly influencing American state and federal regulations and investment trends as well as culture and media. (See working paper, "U.S. Foreign Policy and Climate Change.")

Across the United States, individual states and localities have enacted their own climate change policies, often in support of binding emissions targets, renewable energy programs, and collective action, such as carbon-credit trading schemes. For instance, as of February 2007, twenty-three states had enacted highly-varied renewable-energy portfolio standards (RPS) while another fourteen were considering legislation to implement a renewable energy standard.

However, moving the U.S. economy to be less dependent on carbon-intensive fossil fuels such as oil and coal can only be achieved in cooperation with other countries. By virtue of the nature of the global accumulation of GHG emissions in the world atmosphere, solving the problem of global warming represents one of the most difficult collective action problems in modern international relations. Forging an effective U.S. climate policy will require the cooperation of major GHG emitters to prevent the so-called leakage problem where carbon-intensive industries leave the more highly-regulated countries and set up operations in a country with less stringent carbon restrictions. This will involve cooperation not just with China and India, major economic forces of the future, but also countries in the Persian Gulf, which have been setting up new joint ventures with Western firms in energy-intensive, high carbon-emitting industries such as aluminum and petrochemical manufacturing. (See working paper, "Climate Policy and Energy Security.")

Emissions from the burning of gasoline and other liquid fuels constitute more than one-third of all global emissions stemming from fossil fuel combustion. Thus, addressing the fuel efficiency issue or reducing automobile use would be an effective means to lower GHG emissions. Harmonization of automobile efficiency

standards among the car companies of major manufacturing countries and cooperation of research and development in this area could be highly productive in moving the needle to better outcomes on global GHG emission trends.

However, more than half of the projected increase in global GHG emissions will come from the operation of new power generation facilities, mainly using coal and many of which will be located in China and India, according to projections from the IEA. Thus, the ability to generate electricity more cleanly in these two countries will be a critical aspect of a successful international climate accord.

The next U.S. president should work actively with Congress to build a consensus on domestic measures roughly consistent with international efforts. In time, this would permit the United States more easily to join, if not lead, an international regime. The U.S. approach should both promote technological innovation to create cleaner energy sources and mechanisms to regulate carbon, in addition to creating domestic consent for international leadership on the issue. Significant U.S. steps to speed up technological innovation and carbon regulation, as well as provide adaptation assistance to developing countries, will likely be welcomed by most countries.

A flexible yet integrated approach may hold considerable appeal among the U.S. electorate, compared to the top-down approach of the Kyoto Protocol or unilateral action divorced from international engagement. However, a U.S. strategy that focuses on designing a new climate treaty may irritate European allies, which would like to see the United States join existing efforts, embodied by the Kyoto Protocol. The European Union will be keen to see a U.S. cap-and-trade regime in place that eventually could be linked in some form with the European Trading System. Developing countries also are more likely to accept binding emissions limitations if the United States is taking a lead in the same direction. Last but not least, international engagement by the United States on adaptation should be an essential component of a new U.S. global climate change policy. As part of a future climate deal, developing countries will want credible adaptation assistance. (See working paper, “U.S. Foreign Policy and Climate Change.”)

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