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Introduction: The Oil Price Premium, Roots and Causes

Since 2004, a growing scarcity of energy commodities worldwide has heightened concerns about key geopolitical risks and threats. Concerns about these threats and other factors have led to an almost 250 percent strengthening in oil prices between April 2004 (\$36/barrel) and May 2008 (\$125/bbl).

Those threats included:

- \*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 barrels per day (b/d) to 17 million b/d of Mideast 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 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.

These threats are all real, and they justified a rise in the price of oil above the \$36 level seen in May 2004. Still, it is hard to quantify how much of a risk premium is built into the current price of oil, how much is based on perceptions of long term fundamentals such as supply and demand, and how much of the oil price today reflects a speculative mania linked to negative trends in other financial markets and instruments.

Ironically, in the case of the terror premium, many of these oil supply and security risk factors have actually eased in recent months (public threats from Israeli politicians of early June notwithstanding), leaving the question about the extent to which other factors are contributing to the recent skyrocketing of oil prices ahead of the U.S. summer driving season. According to a new Baker Institute study called "*The Global Energy Market: Comprehensive Strategies to Meet Geopolitical and Financial Risks –The G-8, Energy, Security and Global Climate Issues*" taken individually, many of the risks driving the oil price premium may be less catastrophic than they seem at first glance and have, in some cases, actually eased over the last year.

The Baker Institute study concludes that:

- 1) While Al-Qaeda cells have been more focused on attacking oil facilities in the Middle East following directives starting in 2004, their operational reach is reduced and to date, attacks on facilities have not been successful. These cells have been weakened in Saudi Arabia and Iraq.
- 2) Iran's recent election shows that sanctions policy, especially the tightening of Iran's access to international credit, has been effective in influencing Iranian internal politics against the radical populists led by President Ahmadinejad. 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 would only strengthen the hands of the radicals at the very moment that they are losing domestic support and likely the Presidency.
- 3) According to Baker Institute simulations, a cutoff of Russian natural gas to Europe would cause a large spike in prices temporarily but European markets would likely show resilience relatively quickly in attaining alternative supplies.

Russia could wind up being the long term loser to such a proposition, with its long term market share negatively affected for over a decade.

- 4) New, tighter U.S. and Chinese corporate automobile efficiency standards will have a significant impact in lowering oil demand over the next decade from previously projected levels, easing the possible gap between potential supply and demand in the future. Even stronger efficiency standards of 50 mpg, currently backed by U.S. democratic candidates, could shave over 7 million b/d of oil demand in the United States by 2030, if implemented by 2015.

It has become a standard mantra in the oil market that higher oil prices are being driven primarily by the ongoing rise in oil demand and that this rise in demand is defying the normal impact of rising prices given the strength of developing economies like China and India. However, in reality, demand has responded strongly to high prices and is currently falling significantly. April U.S. oil demand is running 3.5 percent below a year ago (first quarter was down 4.3 percent) while EU-15 demand has seen a 1.1 percent drop against the spring of 2007. Oil demand in Pacific industrialized nations (Japan, South Korea, Taiwan, Australia and New Zealand) is also down over 4 percent. Overall, while Chinese demand remains healthy with stockpiling to prevent shortages ahead of the Olympics, global oil demand is still faltering, growing only by 0.4 percent so far this year or a small gain of 350,000 b/d (compared to the 2.5 million b/d gain predicted). The argument that Asian consumers are shielded against oil price impacts by generous government subsidies is losing water, given that India, Malaysia, Indonesia, Bangladesh and Sri Lanka have all been raising government-set domestic fuel prices. In China, demand for unregulated products –naphtha and fuel oil- fell 2 percent in the first quarter of 2008, a sign of what will come if China eases its other fuel subsidies after the Olympics.

### Today's Speculative Bubble

So if demand is weakening substantially across the globe, why has the price of oil been climbing?

The risks which used to be referred to as the “terror premium” or the “war premium” have been replaced by a dangerous interplay of complex financial forces that are propelling continued rise in oil prices—perhaps one that could be classically defined as a speculative mania—and the Fed is devoid of tools that can offer a solution.

Following the classical pattern famously described by economists Hyman Minsky and Charles Kindleberger, the original rise in oil prices was driven by legitimate demand-and-supply conditions. Triggering this initial price rally into a mania, wherein speculators buy oil because prices are rising and prices are rising because speculators are buying, Minsky and Kindleberger argue that it takes an excessive supply of credit. This piece of the puzzle has been provided in spades by the seemingly-perpetual expansionary policies of the U.S. Federal Reserve, which has been desperately seeking to avoid recession following the serial implosions of previous credit-driven speculative bubbles. The Fed's policies of lowering interest rates gave rise to the dynamics of a self-fulfilling prophesy where the dollar could be counted on to fall, giving oil producers who are paid in dollars

for their commodity the impetus to cut supply to raise prices to defend the purchasing power of their dollar-denominated oil revenues. At the same time, investors seeking a refuge from inflation, the weakening dollar and/or a possible collapse in the value of other financial investment vehicles related to real estate and other markets have rushed to invest in commodities, especially oil and commodity futures funds and oil trusts, to garner more favorable returns, thereby boosting prices further. The link to financial and dollar trends was highlighted during the week of June 2 when pronouncements that the U.S. Federal Reserve would not likely continue to lower interest rates caused liquidations in oil futures, temporarily easing prices.

While paper profits from the rising price of oil help hedge funds and pensioners whose money is invested in the commodities markets, the impact on average Americans has been devastating. Lower income Americans are now spending over 13 percent of household income on gasoline, up from 8 percent in 2001. Speculative profits earned during the dot.com boom are one thing, but speculative profits that damage the overall U.S. economy and hurt working class Americans' mobility and economic survival is another. Creative avenues need to be considered to both allow commodity futures markets to function and offer a dynamic place for hedging and price clearing, while at the same time, preventing dangerous and risky bubbles.

Several policy tools exist that could be utilized to cool the speculative bubble in oil futures markets. One option that has been discussed in policy circles is to raise the financial commitment that must be paid up front to buy oil futures (the so-called margin). Another option is to better investigate the role the U.S. Strategic Petroleum Reserve and the IEA strategic stock system can play in discouraging market manipulation and rampant speculation.

In recent years, consuming countries have not been effective in tapping the leverage of strategic stocks in negotiating with the Organization of the Petroleum Exporting Countries (OPEC) about its responses to supply disruptions or tightening markets. The George W. 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 consumer-country strategic stocks. The current Bush administration, 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 or she will be more flexible in the interpretation of when to order the use of strategic oil stocks.

### Long Term Supply Issues

Putting the current speculative bubble aside, there are long term fundamental signals that point to continued high prices and the possibility that the amounts of oil needed by the United States may simply fail to materialize in the coming years.

Over the past few years, 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 on 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.

In the past year, as prices have been rising, OPEC has announced few new capacity expansion projects. Saudi Arabia has stated that it will sit tight with its previously planned expansion that will raise the Kingdom's production capacity by 1 to 2 million b/d by 2010. Last week, Libya announced plans to raise its output to 3 million b/d by 2012, up from 1.85 million b/d currently. Kuwait has signed a deal with ExxonMobil to develop 900,000 b/d of heavy oil capacity at its northern Lower Fars field, but the plan faces some domestic political opposition, and Abu Dhabi is also pursuing some smaller capacity expansions with ExxonMobil. Energy Intelligence Group (EIG) has projected OPEC could add up to 3.5 million b/d by 2010, but most of this represents gains from Saudi Arabia and Angola that were announced several years ago, before prices began the latest run-up. Cartel members have announced no major changes in spending so far this year in response to prices, with Saudi Arabia in fact indicating it is going to cancel plans to add another 2.5 million b/d of capacity beyond 2010. Furthermore, many of the countries projected by EIG to have planned gains in the next two years may falter (such as Nigeria, Iraq and Iran) in the face of internal turmoil, technical problems, and worsening output declines in older fields.

The oil and gas supply response in the United States is expected to be better, with a tremendous boom in drilling by smaller investors and independents for natural gas in the shales of Texas, Arkansas, New York and Pennsylvania. Moreover, the Baker Institute study projects that lifting access restrictions would lead to an overall increase in Lower 48 natural gas production of about 1.5 trillion cubic feet (tcf) in 2015 (or a 7.5 percent increase), increasing to 3.1 tcf greater production (or a 10.1 percent increase) in every year from 2015 through 2030. More specifically, Offshore Continental Shelf production would total 5.0 tcf in 2015 and 6.1 tcf in 2025 as compared to only 3.5 tcf in 2015 and 3.9 tcf in 2025 if the restrictions remain in place. Easing conditions for drilling in the Rocky Mountains could add another 0.10 tcf by 2015 and 0.93 tcf by 2025.

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 b/d by 2030; the investment required to provide this petroleum could run to four trillion dollars or more. Fifteen

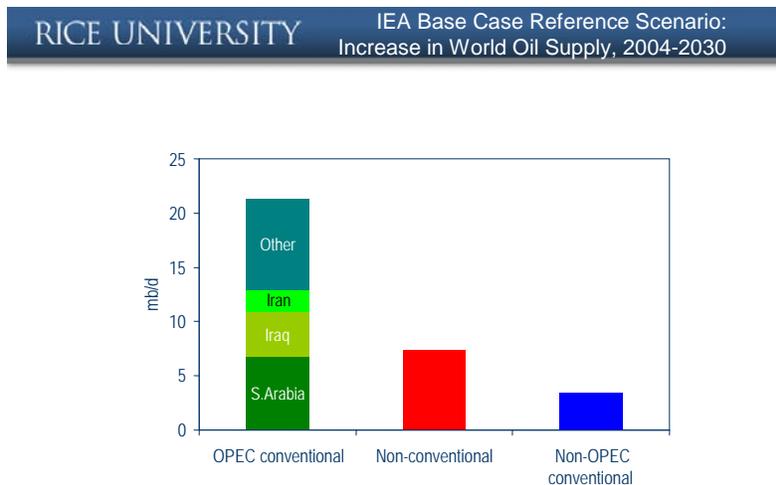
percent of that added demand is projected to come from the United States alone and another 24 percent from China.

Since oil supply from member states within the Organization for Economic Cooperation 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 some day, Saudi Arabia.

Global oil demand is expected to rise at a rate of roughly 1.6 percent per annum over the next two decades from about 76.4 million b/d in 2001 to 90.4 million b/d in 2010 and 106.7 million b/d by 2020. Almost 75 percent of this increase in demand will come from the transport sector where renewable energy and nuclear energy are not expected to play a significant role without a major technological breakthrough toward electric cars.

Under a "business as usual" scenario, much of this increased demand for oil, roughly 60 percent, will have to be supplied by rising production from OPEC over the next 25 years. The reality of conventional oil and natural gas geology is that approximately 62 percent of remaining proven resources lie in only five countries. In the case of oil, the five largest resource holders are all Middle Eastern countries. In projecting future supply potential, more than half of that volume is projected to come from just three countries shown in Figure 1: Iraq, Iran, and Saudi Arabia. These forecasts might prove unrealistic given the political and economic conditions in those countries. Conventional oil production from non-OPEC countries is expected to play a markedly smaller role by providing just 10 to 15 percent of increased supply.

Figure 1: Future New Supplies of Oil



*Under a business as usual scenario, world will increasingly rely on Persian Gulf and unconventional oil, including about 3.5 to 4 million b/d of Canadian tar sands production, 1.5 to 2 mb/d of upgraded heavy oil, 2.4 mb/d of gas to liquids and 1.7 mb/d of coal to liquids, oil shale, etc*

This means that nonconventional resources will play an increasingly important marginal supply role by supplying 25 to 30 percent. Canadian tar sands production would represent the largest possible diversity away from Middle East supply at over 3.5 to 4 million b/d. Upgraded heavy oil could yield another 1.5 to 2 million b/d, while an additional 1.7 million b/d of production is expected from coal-to-liquids and oil shale production. Gas-to-liquids output is expected to reach 2.0 to 2.5 million b/d. Without the development of these unconventional resources, the world will be even more dependent on Middle East supply. However, the pursuit of these unconventional resources is not without a downside. They all tend to have a higher carbon footprint, pitting energy security goals against climate priorities.

The need to diversify the heavy dependence on Saudi, Iraqi and Iranian oil in the United States is driven home by the tensions and conflicts that now plague the Persian Gulf. Many Persian Gulf nations currently face both internal instability and future succession problems. A severe oil supply shock could potentially materialize from any number of possible events emanating from the Middle East.

Over the past two decades, the U.S. oil policy has been to rely on allies in the Persian Gulf, such as Saudi Arabia, the United Arab Emirates, Kuwait, Qatar and Oman, as well as major exporters like Venezuela and Nigeria to provide the oil we need. In 1990, when Iraq invaded Kuwait, cutting off 5.0 million b/d of oil supply, Saudi Arabia, the United Arab Emirates, Nigeria, and Venezuela increased production to make up the difference, limiting the effect on world oil supply and price.

But the internal stability of many of these large oil producing countries looks a lot shakier now than it did in the 1980s and 1990s. In fact, the list of oil exporting countries where production has been stagnant or falling in recent years, despite ample reserves, due to civil unrest, terrorism, inefficiency, government mismanagement, or corruption is long and diverse. Projections that OPEC will increase capacity by an additional 10 to 20 million b/d in the next 20 years to meet the rising demand discussed above run counter to historical experience. OPEC's capacity has fallen, not increased, over the past 25 years, from 38.76 million b/d in 1979 to roughly 31 million b/d today.

Many factors have contributed to OPEC's inability to expand its sustainable oil production capacity. In the late 1980s, OPEC had planned to increase its oil field production capacity to 32.95 million b/d by the mid-1990s. Instead, OPEC production capacity stagnated at 29 million b/d for most of the decade, only creeping higher in recent years. Even so, large capacity expansion programs in Saudi Arabia, Iran, Libya, and Iraq have all failed to achieve production targets due to international sanctions. Venezuela's planned expansions were thwarted by a change of government, related civil unrest and a redirecting of funds away from the oil sector to social welfare programs, and the country's oil potential has been slipping in recent years. Regional and ethnic conflict and civil unrest also plagued Nigeria's efforts to expand production while domestic politics has blocked oil field investment in Kuwait.

## Implications of the Rising Role of National Oil Companies

As the world becomes more dependent on NOCs for future oil supplies, major oil consuming countries are questioning the ability of these firms to bring online new oil 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 diversion of corporate NOC capital to social welfare. Moreover, in several major energy-producing and resource-holding countries, important violent and non-violent 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 hyper-mobilized social movements have created new political risks, which have in turn had negative consequences for international investment and have also curtailed energy supplies in the region.

In the 1980s, the investor-owned international oil companies (IOCs) moved to reinvest their high profits to find more oil, and this investment helped produce rising oil output in countries outside of OPEC. But the investment response from the IOCs has been slow to materialize over the past several years.

### Are the IOCs Investing Enough?

The exploration spending of the five largest IOCs was flat to lower between 1998 and 2006. Thus, given the rise in costs of material, personnel, and equipment such as drilling rigs, the five largest IOCs have in effect cut exploration spending levels in real terms over the past ten years. This trend appears, however, to be easing, with exploration spending by the five largest IOCs rising by 50 percent in 2006, from 2005, and up 10 percent in 2007, from 2006. Instead of favoring exploration, the five largest IOCs have used fifty-five to fifty-six percent of their increased operating cash flow on share repurchases and dividends in both 2006 and 2007. The IOCs have increased spending on developed resources over the past few years (development spending increased 10 percent between 2006 and 2007), presumably to monetize these assets quickly while oil prices are high. As a result of these spending decisions, aggregate oil production from the IOCs fell from the early 1990s to 2005, before starting to recover recently. The large amount of capital that has been used over the past few years and is still being used for share repurchases and dividends does not bode well for growth in long term oil supplies which requires a long lead time of increased exploration spending to identify new resources.

By contrast, thankfully for the U.S. domestic picture, spending of the next 20 largest American independent oil firms has not followed a similar pattern. Instead, they have steadily been increasing exploration spending since 1998 and their exploration spending levels are now equal to that of the five largest IOCs. This differing pattern comes despite the fact that the five largest IOCs have access to operating cash flow that is three times the size of the next 20 largely traded American oil firms. Oil production of the next 20 American independent firms has grown over the last decade, linked to their successful exploration activities.

Research and development spending of the five largest IOCs has risen significantly in the past year from \$2.6 billion in 2006 to \$3.3 billion in 2007. This spending is still small compared to companies in other industries such as GE (\$4 billion a year), Microsoft (\$6 to \$7 billion), and General Motors (\$6 to \$7 billion). Generally speaking, the IOCs have increased their spending in alternative energy over the past two years, with some companies such as Shell, BP and Chevron taking a leading role, but their expenditures are still relatively small when compared with the companies' overall operating cash flow.

### The U.S. Energy Tab and Future Dependence

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 have become depleted. The United States is now more dependent on foreign oil than ever before. It imported 12.3 million b/d in 2006 or about 60 percent of its total consumption of roughly 20.7 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).

More than three decades after the 1973 oil crisis, U.S. supply of oil is no more secure today than it was thirty years ago. Moreover, its dependence on oil for mobility has never been stronger. All told, there are over 242 million road vehicles in the United States, or one vehicle for every person. Each vehicle is driven over 12,000 miles annually, and virtually all vehicles are powered by petroleum-based fuels, either gasoline or diesel. 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. By comparison, China, even with its growing economy, has about 13 million vehicles and consumes only about 5 percent of all the road fuel produced in the world, despite having a population that is more than four times the size of the United States.

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, but also it 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 as much as 40 percent of the overall U.S. trade deficit in 2006, compared to only 25 percent in 2002. This rising financial burden is stoking inflation and creating ongoing challenges for the U.S. economy.

To meet this long term supply challenge, there are many policies that can be put in place. The United States needs to consider a more comprehensive approach—one that enhances environmentally sensitive domestic drilling while at the same time channels sufficient funding and incentives to alternative energy, energy efficiency and conservation.

Unfortunately, the reality is that no single solution will lead to a *decrease* in U.S. gasoline consumption or achieve U.S. energy independence. The problem of U.S. oil import dependence is a complicated one to solve. It is going to take a portfolio of policies aimed at improving efficiency, encouraging alternative fuels, promoting public transportation, etc., to curb gasoline use in the United States. It may also require changes in lifestyle and perhaps, depending on circumstances in the future, personal sacrifices. That is the reality of our situation and the barometer through which proposed energy policies should be judged. The bottom line is that in order for us to decrease oil consumption, many of the proposed policies would have to be implemented all at the same time. Any single policy, implemented without the others, is unlikely to do anything more than eliminate only a small part of our projected future increase in oil import requirements.

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 equal. By contrast, 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.

There is also some evidence that declining energy intensity has moderated the negative effects of rising energy prices by reducing the 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.

The Energy Independence and Security Act of 2007, passed on December 18, 2007 and signed by President George W. Bush, raises automobile fuel efficiency standards (CAFE) to 35 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. However, it will likely only 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 one 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.

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 five percent or 10 percent of each refining company's average customer demand. The U.S. federal government and states bordering hurricane-prone regions

should also 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.

Alternative energy supplies provide ready substitutes if the price of oil rises too extremely and can shield the economy from the negative impact from disruption of any one fuel source. 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. Examples include micro-turbines for distributed power markets, improved vehicle technologies, including plug-in hybrid automobile technology, household solar technologies, among others. Electricity in the United States is generated without recourse to oil-based fuels, providing a unique opportunity for creative avenues for alternative energy policy that would promote the use of electricity in the transportation sector.