

# Heritage Special Report

SR-88  
MARCH 17, 2011



Published by The Heritage Foundation



## **Coordinated Terrorist Attacks on Global Energy Infrastructure**

*Modeling the Risks*



Douglas and Sarah Allison Center for Foreign Policy Studies  
& Center for Data Analysis



The Heritage Foundation is a research and educational institution—a think tank—whose mission is to formulate and promote conservative public policies based on the principles of free enterprise, limited government, individual freedom, traditional American values, and a strong national defense.

Our vision is to build an America where freedom, opportunity, prosperity, and civil society flourish. As conservatives, we believe the values and ideas that motivated our Founding Fathers are worth conserving. As policy entrepreneurs, we believe the most effective solutions are consistent with those ideas and values.

## Leadership *for* America **Ten Transformational Initiatives**

This paper is part of the **American Leadership, Energy & Environment, and Protect America Initiatives**, three of 10 Transformational Initiatives making up The Heritage Foundation's Leadership for America campaign. For more products and information related to these Initiatives or to learn more about the Leadership for American campaign, please visit [heritage.org](http://heritage.org).



**American Leadership**



**Education**



**Energy & Environment**



**Enterprise & Free Markets**



**Entitlements**



**Family & Religion**



**First Principles**



**Health Care**



**Protect America**



**Rule of Law**

# **Coordinated Terrorist Attacks on Global Energy Infrastructure**

*Modeling the Risks*

By Ariel Cohen, Ph.D., and David W. Kreutzer, Ph.D., with  
William W. Beach, James Jay Carafano, Ph.D., and John L. Ligon

## Abstract

The 2010 Heritage Energy Game demonstrated that there are significant vulnerabilities in the domestic and international energy network. Coordinated attacks by terrorists and other violent nonstate actors could cause a massive drop in oil production and price spikes that would seriously harm the U.S. and the global economies. The reality may be even harsher: wide, prolonged instability in the Middle East may threaten Saudi Arabian and other Persian Gulf oil production, including spare capacity. Careful implementation of select policies could limit the economic damage, but implementation of misguided policies could easily make such a crisis even worse. The United States and its allies would need to exercise decisive and effective leadership to deal with the crisis, but this requires the U.S. to develop an assertive international energy policy, preferably before such a crisis.

## About the Authors

**Ariel Cohen, Ph.D.**, is Senior Research Fellow in Russian and Eurasian Studies and International Energy Policy in the Douglas and Sarah Allison Center for Foreign Policy Studies, a division of the Kathryn and Shelby Cullom Davis Institute for International Studies, at The Heritage Foundation.

**David W. Kreutzer, Ph.D.**, is Research Fellow in Energy Economics and Climate Change in the Center for Data Analysis at The Heritage Foundation.

**William W. Beach** is Director of the Center for Data Analysis at The Heritage Foundation.

**James Jay Carafano, Ph.D.**, is Deputy Director of the Kathryn and Shelby Cullom Davis Institute for International Studies and Director of the Douglas and Sarah Allison Center for Foreign Policy Studies, a division of the Davis Institute, at The Heritage Foundation.

**John L. Ligon** is Policy Analyst in the Center for Data Analysis at The Heritage Foundation.

The authors are grateful to Owen Graham, Nicolas Loris, and Michaela Bendikova for their assistance in producing this report.

© 2011 by The Heritage Foundation  
214 Massachusetts Avenue, NE  
Washington, DC 20002-4999  
(202) 546-4400 • heritage.org

This paper, in its entirety, can be found at:  
<http://report.heritage.org/sr0088>

Nothing written here is to be construed as necessarily reflecting the views of The Heritage Foundation or as an attempt to aid or hinder the passage of any bill before Congress.

# Coordinated Terrorist Attacks on Global Energy Infrastructure: Modeling the Risks

*By Ariel Cohen, Ph.D., and David W. Kreutzer, Ph.D., with William W. Beach, James Jay Carafano, Ph.D., and John L. Ligon*

In June 2010, The Heritage Foundation conducted a simulation exercise to assess the strategic and economic impact of a major energy supply disruption caused by coordinated terrorist attacks on key nodes in the global energy infrastructure. The exercise built on two prior games conducted in 2006 and 2008<sup>1</sup> and included two iterations.

The purpose of the exercise was to examine the international and domestic responses to the crisis, examine the principal actors' interactions, and simulate the effects on world oil supply, demand, and prices. Analysts at The Heritage Foundation's Kathryn and Shelby Cullom Davis Institute for International Studies developed the simulation exercise to assess the long-term and short-term policy implications of the oil disruptions. Analysts in Heritage's Center for Data Analysis measured the effects of these disruptions on the U.S. economy and the international oil price. Under the business-as-usual (baseline) scenario:

- Petroleum prices jump from \$75 per barrel to \$250 per barrel and eventually fall back to \$125 per barrel after two years;
- Gasoline prices jump to \$8 per gallon and remain above \$4 per gallon throughout the first year;
- Gross domestic product (GDP) losses exceed \$300 billion per year for both years of the crisis;
- Employment drops by more than 1.3 million the first year and drops an additional 1.1 million in the second year for a total two-year drop of 2.4 million.

Experts from policymaking circles and academia played individual countries. They identified policy steps that should be taken on the domestic and international levels to mitigate the impact of the terrorist attacks on the price of oil and the global economy and to restore the supply and security of the transportation chain. This includes military, diplomatic, economic, and regulatory measures. Their expertise, insight, and input proved to be invaluable sources of information. Heritage Foundation analysts analyzed these policy recommendations using the same economic model that was used to make the initial baseline estimates and found that the policy recommendations:

- Moderate the petroleum price increase by \$20 per barrel after three months, but petroleum prices are only \$3 per barrel below the baseline by the 24th month;
- Moderate the gasoline price increase by as much as \$0.60 per gallon, but gasoline prices are only \$0.10 per gallon below the baseline by the 24th month;
- Reduce GDP losses by \$130 billion in 2011 and by \$50 billion in 2012;
- Reduce employment losses by 630,000 jobs in 2011 and by 650,000 jobs in 2012.

---

<sup>1</sup> James Jay Carafano, William W. Beach, Ariel Cohen, Lisa A. Curtis, Tracy L. Foertsch, Alison Acosta Fraser, Ben Lieberman, and James Phillips, "If Iran Provokes an Energy Crisis: Modeling the Problem in a War Game," Heritage Foundation *Center for Data Analysis Report No. CDA07-03*, July 25, 2007, at <http://www.heritage.org/Research/EnergyandEnvironment/cda07-03.cfm>, and William W. Beach, James Jay Carafano, Ariel Cohen, David W. Kreutzer, Karen A. Campbell, and Hopper Smith, "The Global Response to a Terror-Generated Energy Crisis," Heritage Foundation *Center for Data Analysis Report No. CDA08-11*, November 10, 2008, at <http://www.heritage.org/research/reports/2008/11/the-global-response-to-a-terror-generated-energy-crisis>.

The purpose of the exercise was to model data on how the United States and other countries would respond to an oil crisis resulting from simultaneous, high-impact terrorist attacks on high-value oil infrastructure targets in the U.S., Saudi Arabia, and the Strait of Malacca. However, lessons learned in this exercise are applicable to the current upheavals in the Arab Middle East, especially concerning oil production and spare capacity disruption. Suffice to say that a one million barrels per day production decline in Libya has already triggered speculative oil spikes to \$120 for a barrel of Brent. Continuous social unrest, particularly in the Persian Gulf, including Kuwait, Oman, Bahrain and especially Saudi Arabia, may drive oil prices even higher. If energy prices climb significantly higher, economic repercussions for growth rates in the developed, and especially developing, world are likely to be negative.

In broader terms, the goal of the exercise was to capture the economic impact of a sudden disruption of the petroleum supply. The economic analysis should provide insight into policy decisions that should be made during the energy crisis. In addition, the exercise was intended to test the validity of the economic model used to simulate market responses to policy decisions during an energy crisis.

### **Why Energy Crisis Simulation Is Important**

The demand for oil is growing, driven mostly by China, India, and other developing countries. Producers and consumers are transforming global energy markets through their sheer size and rates of growth. The Persian Gulf, a major energy source and transportation hub, is gaining in importance, making freedom of navigation through the Strait of Hormuz a vital American and global interest. Similarly, the Strait of Malacca, the shortest sea route between Persian Gulf suppliers and East Asian markets, is another critical choke point. An attack on critical energy infrastructure or tankers in any of these regions would be of paramount significance.

Therefore, any evaluation of the potential response to an energy crisis needs to explore the actions of major consumer nations, energy producers, geostrategic powers, and sub-state and transnational nonstate actors that will shape the military and diplomatic agendas and energy policies during and after a crisis.

History shows that the United States has been less than fortunate in formulating policies to respond to energy crises. The oil shocks following the Arab oil embargo in 1973–1974 and the revolution in Iran in 1979 occurred during a period of high inflation and low economic growth. The ill-advised price controls led to fuel shortages and long lines at gas stations, and they compounded the energy-related damage to the overall economy. The escalation in petroleum prices also began a massive wealth transfer from the West to the Middle East. The situation was further exacerbated by newly enacted economic and environmental regulations and new implementing agencies that interfered with domestic energy supplies and limited the private sector's ability to respond to events. The lessons learned from these harmful policy choices should serve as a cautionary tale as America faces similar energy challenges. Bad decisions can make bad situations much worse.

In the face of historical experience, it is critically important to develop tools that will help to evaluate decisions and weigh potential policy options and their consequences before a crisis occurs. With the global markets more competitive and integrated than ever before, any disruption will affect both the U.S. economy and worldwide economy. Thus, in the event of a global energy crisis, it would be valuable to have the tools to evaluate policy decisions and their consequences.

### **Scenario Description**

The crisis scenario was designed to be plausible, to make the results of the game as realistic as possible, and to prevent players from “fighting the scenario.” The intent of the attacks was to cause an immediate shock to the global petroleum transportation and processing system, with secondary effects that would reduce petroleum output

from producing nations to consuming nations. It was hypothesized that such an oil shock would likely cause an economic downturn of historic proportions, the scope of which would be captured in the scenario.

In the scenario, terrorists affiliated with al-Qaeda attack refineries in Houston along the Houston Shipping Channel and a refinery in Louisiana. Houston is a critically important hub for oil refining and cargo transportation. Terrorists simultaneously attack a large oil processing and loading facility in Saudi Arabia, the world's largest supplier of oil; attack oil tankers transiting the Strait of Malacca; and mine the strait with EM-52 mines (polymer-coated to reduce the likelihood of detection). The attacks cause a disruption of nearly 1.9 million barrels per day (b/d).<sup>2</sup> An additional attack successfully targets the oil storage hub in Cushing, Oklahoma.

Cushing is the largest crude pipeline facility in North America, one of the world's major oil terminals, and the largest crude transportation hub in the world. More than 70 percent of the petroleum that is shipped in the U.S. flows through Cushing. The Cushing complex is the delivery point for NYMEX West Texas Intermediate crude oil futures contracts. As of August 2009, the Cushing facility held around 47.5 million barrels of oil.

In the Middle Eastern theater, terrorists simultaneously attack the Ras Tanura and Abu Qaiq oil-processing and shipping facilities in Saudi Arabia. Just prior to the attacks, terrorists take hostages in a middle school to distract Saudi security forces. As a result of the destruction of the Ras Tanura and Abu Qaiq facilities, traffic through the Strait of Hormuz is reduced. The terrorists also attack the offices of the Saudi Aramco Company, destroy its Internet facilities, and kill some of its executives.

In the Pacific theater, the terrorist organization Jamaat al-Islamiya attacks oil tankers in the Strait of Malacca and Strait of Sunda. The initial attacks stop all oil traffic through the straits, and insurance agencies stop extending coverage to hydrocarbon cargos. Oil tankers are forced to detour more than 1,000 kilometers to reach the refineries and terminals of Southeast Asian consumers. Transportation delays and costs increase around the globe as producing and consuming nations increase security measures. These events cause a major disruption and a shortage of the refined product in U.S. markets.

As a result of the disruptions:

- Six million b/d of oil production goes offline.
- Fifteen million b/d can no longer be shipped via the most direct routes.
- Saudi Aramco insists on being the only contractor for repairs at the damaged oil shipping facilities.
- The U.S., U.K., Japan, India, China, and Australia deploy naval and special forces assets to the Strait of Malacca to hunt down al-Qaeda and Jamaat al-Islamiya seaborne and land-based teams and to conduct demining operations. This requires three months.
- The U.S. seeks to compensate for gasoline shortages by increasing production in other refineries and increasing imports.

As a result, the world faces a massive oil supply disruption and a moderate refining product shortage, the market is short 6 million barrels of oil, insurance rates skyrocket, and nearly 350,000 b/d of gasoline refining capacity is offline in the United States.

Even in the absence of policy intervention, markets respond to disruptions. After petroleum prices rise, private inventories are drawn down and brought to market, and consumers and consuming industries economize on their use. Further, international agreements govern the use of strategic reserves. Access to these reserves is built into the baseline. (For a description of the responses built into the baseline scenario, see the Appendix.)

---

<sup>2</sup> The losses break down as follows: 270,600 b/d at Houston Refining LP, Houston, Texas; 83,000 b/d at Valero Refining Co–Texas LP, Houston; 572,000 b/d at ExxonMobil, Houston; 455,790 b/d at BP Products, Texas City, Texas; and 503,000 b/d at ExxonMobil, Baton Rouge, Louisiana.

### The Players

The analysis focused on only some of the primary international actors that are particularly relevant to energy supply and demand. The United States, the European Union (EU), China, India, Russia, Saudi Arabia, Iran, Japan, and al-Qaeda are represented in the game. For research purposes, the United States, which was played by multiple actors (e.g., Congress, National Security Council, the President), was considered a unitary actor. Only decisions approved by the President were used for the final analysis. This provided a finer texture to U.S. decisions, but created more work for the U.S. team and somewhat slowed the process. This same dynamic was applied to the EU, which was played by the same individuals on the level of the institution, the national states, and NATO. The latter functioned in close cooperation and coordination with the United States.

Some important actors, such as Venezuela and Turkey, were not included in the game due to resource limitations. Furthermore, no additional attacks by al-Qaeda were included in the scenario beyond the first day. This made the overall assessment of al-Qaeda's strategy somewhat more complicated because the success rate of any subsequent attacks would be a good indicator of whether the players' strategies were effective over the long term.

The game was conducted in two separate rounds. The first round, conducted on June 5, 2010, enabled the players and organizers to familiarize themselves with the scenario and rules and to improve the performance of the second round of the game, held on June 29, 2010. However, the scenario remained the same, which allowed Heritage analysts to evaluate both rounds as one.

### Al-Qaeda

Al-Qaeda is a global Islamic terrorist organization conducting operations against military and civilian targets, including energy infrastructure. Al-Qaeda's security goals are:

1. Attacks on U.S. political, military, and economic targets;
2. Attacks on U.S. allies, particularly Saudi Arabia (including toppling the monarchy), Pakistan, Iraq, Jordan, and Israel; and
3. Reestablishment of the Caliphate.

### China

China's energy policy goals are:

1. Secure supplies of energy;
2. Safe and reliable energy transit, especially maritime shipping lines, but also a growing number of transnational pipelines; and
3. Reducing dependence on American goodwill for energy supply.

Another external goal is Chinese geopolitical preeminence in East Asia. All of these are means to achieve the overarching goal of preserving Communist Party rule at home.

### European Union

The EU is a status quo power and has a low tolerance for risk. It is not aggressive and seeks to avoid confrontation. Its security goals are:

1. Avoiding being drawn into a military conflict;
2. Maintaining reasonable and stable energy prices; and
3. Ensuring or maintaining reliability of supply.



### **India**

India's security goals, starting with the most immediate, are:

1. Avoiding being drawn into a military conflict;
2. Maintaining reasonable and stable energy prices; and
3. Ensuring or maintaining reliability of energy transit.

### **Iran**

Iran's leadership has messianic characteristics, which gives it a very high tolerance for risk. Iran is opposed to the status quo and is prepared to undertake aggression to accomplish its objectives. Iran's security goals are:

1. Assumption of a leadership position in the Islamic world;
2. Establishment of Iranian hegemony in the Persian Gulf;
3. Greater control of the energy market;
4. Removal of U.S. influence in the Middle East and broader Muslim regions; and
5. The destruction of Israel.

### **Japan**

Japan is a status quo power and has a low tolerance for risk. It is not aggressive and seeks to avoid confrontation. Japan's security goals, starting with the most immediate, are:

1. Avoiding being drawn into a military conflict, particularly as a means for avoiding attacks by either North Korea or China;
2. A continued U.S. presence in the Asia–Pacific region;
3. Nuclear disarmament of North Korea;
4. Blocking regional hegemony by China;
5. Maintaining reasonable and stable energy prices; and
6. Ensuring or maintaining reliability of energy supply.

### **Russia**

Russia is the largest hydrocarbon producer and exporter in the world. Russia's security goals are:

1. Direct involvement in energy and security policies in the Persian Gulf region with a general preference for keeping energy prices high, even at the price of increased political instability;
2. Increasing the market share of its oil and gas exports;
3. Expansion of arms sales to the Middle East and around the world; and
4. Diminishing the U.S. role in the Gulf region and globally.

### **Saudi Arabia**

The Kingdom of Saudi Arabia is a conservative Sunni Muslim power. Saudi Arabia plays the central role in Islam as the “keeper of the two mosques” (Mecca and Medina). It has large energy resources and currency reserves, but

is otherwise relatively weak and vulnerable. Traditionally, it has had a close security and economic relationship with the United States because both players have a vital interest in securing the energy resources possessed by the Kingdom. Saudi Arabia's security goals are:

1. Securing the energy resources it possesses;
2. Regional stability; and
3. Defending its leadership of the Muslim world in opposition to Iran.

### United States

As a leading world power, the United States prefers the status quo and has a low tolerance for risk. The United States has a vital interest in securing access to energy resources and energy transport within the Persian Gulf and around the world. It is unlikely to resort to the use of force unless provoked. On the other hand, it will likely come to the defense of its allies. The U.S. security goals are:

1. Deterring or defending against any attack on its homeland;
2. Deterring attacks against its allies;
3. Securing access to energy resources and preventing a war that disrupts oil flows;
4. Maintaining reasonable and stable energy prices;
5. Ensuring or maintaining reliability of supply;
6. Limiting the political advantages that would otherwise accrue to other states, particularly adversaries, either as consumers or as producers; and
7. Continuing its strong presence in the East Asia and Persian Gulf regions.

### The Crisis

Policy options to counter the economic impact of the cuts in petroleum throughput are limited, while options to compound the damage are many. The only way to reduce actual—as opposed to apparent—petroleum costs is to increase supply or reduce demand.

In most cases, reducing demand requires limiting economic activity and the accompanying jobs and income. Some opportunities exist for substituting other sources of energy for petroleum. This swap almost always occurs in electric power production. The potential for swapping gas, nuclear, wind, and other energy sources for petroleum is limited in the U.S. because less than 2 percent of petroleum in the U.S. is used in power production, and it generates less than 1 percent of the country's electricity.

Increasing supply means putting more petroleum on the market. In places where oil production is limited by regulation, short-term production increases are possible if there is sufficient capacity to refine and distribute the additional crude. Opening new areas to petroleum production can eventually add to supply, but bringing new production on line typically takes longer than the two-year time horizon of this simulation.

The following policies helped moderate the economic impact:

- Additional withdrawals from the Strategic Petroleum Reserve;
- Reopening nuclear facilities in Eastern Europe; and
- Increased liquefied natural gas (LNG) sales to Japan from Russia.

Table 1 shows the impacts of these policies.

## Adjustments to Scenario Crude Oil Supply per Decisions

	MONTHS							
	1	2	3	4	5	6	7-12	13-24
<i>Policy effects in millions of barrels per day</i>								
U.S. strategic petroleum reserves increased withdrawals	0.4	0.75	0.75	0.75	0.5	0.5	0.25	0
Japanese gas/oil swap in electricity generation	0	0.1	0.15	0.2	0.296	0.296	0.296	0.296
Eastern Europe nuclear/oil swap in electricity generation	0	0	0	0	0	0	0	0.004
Total additions	0.4	0.85	0.9	0.95	0.796	0.796	0.546	0.3
<i>Demand elasticity for petroleum</i>	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.15
<i>Policy effects on prices</i>								
Baseline petroleum price	\$250.00	\$250.00	\$250.00	\$200.00	\$200.00	\$200.00	\$150.00	\$125.00
Petroleum price with policies	\$240.00	\$231.00	\$230.00	\$182.94	\$185.67	\$185.71	\$142.64	\$122.11
Difference	-\$10.00	-\$19.00	-\$20.00	-\$17.06	-\$14.33	-\$14.29	-\$7.36	-\$2.89
Baseline gasoline price	\$8.00	\$8.00	\$8.00	\$6.00	\$6.00	\$6.00	\$4.50	\$3.75
Gasoline price with policies	\$7.70	\$7.40	\$7.35	\$5.50	\$5.60	\$5.60	\$4.30	\$3.65
Difference	-\$0.30	-\$0.60	-\$0.65	-\$0.50	-\$0.40	-\$0.40	-\$0.20	-\$0.10

Sources: Heritage Foundation calculations.

Table I • SR 88  heritage.org

Policies that had no effect on oil price included:

- **Selective embargoes.** Unless accompanied by a corresponding reduction in petroleum production, selective embargoes may force changes in trading patterns, but will not measurably affect marginal cost of crude in any of the targeted countries.
- **Low price guarantees.** In logic similar to selective embargoes, low price guarantees require an accompanying increase in petroleum production to change the marginal cost. If there is an accompanying increase, the cost of petroleum drops worldwide. In essence, a low price guarantee without a change in oil production is simply a wealth transfer from the oil-producing country to the target beneficiary.
- **Long-term projects,** such as expanding the Strategic Petroleum Reserve or comprehensive energy legislation can help in the longer run. However, they take too long to have an impact within the time frame of this exercise.
- **Odd-even day sales.** Limiting the days on which sets of consumers can purchase gasoline adds extraordinary inconvenience, but has minuscule effect on overall prices because most people would simply plan their purchases more carefully.

## Responses to Terrorist Attacks

The following section provides an analysis of short-term (within six months) and long-term (between six months and two years) policies of each of the actors. Countries were given a set of objectives at the beginning of the game as shown above. Policy responses were supposed to be tailored toward achieving these objectives.

### Short-Term Responses

The players developed a variety of short-term responses to the energy crisis.

**Al-Qaeda.** In the short term, al-Qaeda comprehensively and globally approached tasks at hand. The terrorist organization coupled its successful attacks with an assertive global outreach effort through a sophisticated media

campaign. This enabled the organization to survive the period of tightened security measures. It also increased emphasis on intelligence collection and anti-Israeli/anti-U.S. communication strategies. However, al-Qaeda primarily focused on targeting Mecca and Medina. The organization deployed a wide range of strategies to overthrow the “apostate” Saudi regime. Al-Qaeda also reached out to Turkey for support. This should come as no surprise given the recent policy shifts in Ankara and the increasing Islamist orientation of the Turkish government. Al-Qaeda’s media strategy was essential and complementary to the successful execution of terrorist operations and to the organization’s survival.

**China.** China’s international and energy policy actions were assertive and backed by ample resources. Beijing not only secured 1 million b/d from the Kingdom of Saudi Arabia in a secret deal, but also gained access to advanced technologies from the International Energy Agency (IEA) in exchange for providing \$100 billion in 2010 to help with energy infrastructure reconstruction after the attacks. This was a substantial contribution for an agency with a budget of roughly \$33.2 million. Significantly, China used its massive foreign exchange reserves to purchase minority stakes in energy-producing companies worldwide, further expanding its influence and securing its position in the energy markets. Moreover, China invested significant resources to obtain cutting-edge technologies (e.g., information, telecommunications, infrastructure, and bioengineering) by acquiring U.S. companies hit by the crisis.

However, Beijing did not adequately address the friction between maintaining good relations with the United States and pressuring Taiwan to rejoin the mainland. These objectives are at odds with each other. The issue of Taiwan has to be seen in the context of U.S.–Taiwan relations. The United States maintains strong unofficial relations with Taiwan, including sales of military equipment.

An interesting dynamic occurred when the Chinese sought to expand Beijing’s presence and influence within Russian borders. In response, Russia reacted by encouraging increases in the Russian population in the Far East.

**European Union.** The EU did not take any significant diplomatic steps on the international level. This is likely because the EU’s Common Foreign and Security Policy is not developed to the point that the EU can act as efficiently and vigorously as an individual nation-state. Competing national interests inevitably undermine any common action. In the face of high energy prices, EU member states might decide to take a protectionist approach toward their domestic energy markets, effectively stopping any efforts to liberalize them.

The EU decided to call for a 10 percent reduction in short-term oil demand. The mechanism that allows member states to share crude and refined products according to country needs within the framework of IEA would be activated after a certain period of time because IEA member states are required to have oil and gas supplies.

**India.** India undertook domestic measures to decrease gas and energy consumption and to increase energy efficiency. Internationally, India focused on cooperation with Russia. It also expanded cooperation with Iran. India concluded a defense supply agreement with Iran. Transfers of advanced military technologies to Iran were particularly troublesome to participants because they would likely have destabilizing effects in the Middle East; complicate the U.S. stabilization efforts in Iraq and Afghanistan, especially given Iranian state sponsorship of terrorism; and present a serious proliferation threat. Both the United States and India have invested significant energy and resources into creating a strategic partnership in recent years, and increasing Indian cooperation with Iran would put this partnership in serious jeopardy.

**Iran.** The Islamic Republic of Iran demonstrated tactical flexibility and strategic commitment to hegemony and its nuclear agenda. Iran committed to behaving like a responsible actor in helping to defuse the oil crisis, mitigate its consequences, and maintain the steady supply of oil to its trading partners. Tehran’s policy was very assertive and backed by a vital resource, its oil. This allowed Iran to secretly secure important bilateral cooperation and relationships with key players, contrary to U.S. interests. Iran’s main objective was to crack the sanctions regime and have sanctions ultimately lifted.

The government of Iran remained committed to building its nuclear program. Tehran presented its moderate front to the world. It skillfully emphasized the threat posed by al-Qaeda and used it as a foil to deceive other countries and buy time to achieve its goals, especially to develop its nuclear weapons program. Iran made temporary and deceptive concessions to the EU and Japan on energy deals.

**Japan.** Japan adopted stringent measures to limit domestic energy consumption. It also sought to enhance cooperation to secure energy supplies because Japan is dependent almost exclusively on hydrocarbon energy imports to fill its energy needs. As a result of this dependency, it was one of the countries hardest hit by the crisis. The economic pressure resulting from the rise in the energy prices led to a decision to conclude oil import agreements with Russia and Iran. Such an agreement with Iran would significantly affect the U.S.–Japan relationship, especially considering that the United States provides security guarantees to Japan. Lastly, Japan increased LNG cooperation with other international actors (e.g., Indonesia, Australia, Malaysia, and Brunei), which were not programmed into the game.

**Russia.** Russia engaged in active diplomacy both in its “near abroad” and globally. Russia was able to use its national power to influence the EU decision-making process because Germany, France, Italy, Greece, and Spain often discuss policy decisions, especially in the energy sphere, in close collaboration with Moscow. The EU depends heavily on Russia for its energy needs. More than 30 percent of oil and 40 percent of natural gas consumed by member states is imported from Russia.

Moscow successfully took advantage of the crisis to expand cooperation with China and East Asia. The conflict in the Persian Gulf served Russia’s interests because it benefits from higher energy prices. The Kremlin’s policy toward the Middle East, especially toward Iran, was aimed to ensure that the conflict continues, draining U.S. resources and weakening the United States internationally. Revenues were used to sponsor strategic partnerships (e.g., with Brazil, Mexico, or Indonesia) and massive investments in technology acquisition and military modernization.

**Saudi Arabia.** Saudi Arabia did not develop any immediate initiative on either the domestic or international level that could contribute to preventing further attacks. The rapid reconstruction of damaged facilities was slowed by Riyadh’s protectionist approach.

Little was done to effectively secure Saudi energy resources. This gave al-Qaeda a better chance and more possibilities to expand its operations. Information operations to combat the influence of al-Qaeda and the Iranian media strategy were limited and insufficient.

**United States.** Quite understandably, most decisions taken immediately following the crisis focused on the domestic front. The U.S. strategy was to project confidence in its market-based response. Special emphasis was given to the agencies capable of influencing energy prices, such as the Department of Energy and the Department of the Treasury, and on actions, such as releasing the National Petroleum Reserve and lowering interest rates. The international response was limited to issuing a call for the governments of energy-consuming countries to ask their populations to reduce petroleum use.

Disappointment with U.S. inaction on the international level led to the perception that the United States was unable to secure its interests and protect allies, which resulted in allies seeking assurances elsewhere (e.g., Saudi Arabia reached out to China and Japan reached out to Iran). This would present the United States with significant problems in the long term because the U.S. simply cannot achieve its energy objectives on its own. Real-world policymakers need to develop comprehensive policy responses to address this challenge.

## Long-Term Responses

The players also implemented a variety of long-term responses to the crisis.

**Al-Qaeda.** Because of the success of al-Qaeda’s strategy in the short term, the terrorist organization could definitely pose a threat to the Saudi regime, which was not proactive in combating the threat.

However, al-Qaeda seemed to lack an efficient follow-on strategy. A crackdown by security forces would leave the organization dispersed, decentralized, and vulnerable, if it survived the initial pressure. Global operations would be more difficult to conduct. Al-Qaeda limited its activities to calls for jihad in the United States, Saudi Arabia, and worldwide. The organization did reach out to the Quds Force, a more hard-line element of the Islamic Revolutionary Guard Corps in Iran. However, Iran did not follow up on the offer. Evaluating al-Qaeda’s long-term

strategy is difficult because no further strikes were “programmed” into the game. The number of subsequent attacks would have been a good indicator of the success or failure of the steps taken to counter the terrorist threat.

**China.** Beijing managed to formulate a strategic plan vis-à-vis the United States to take advantage of the crisis. Significantly, this included a major naval expansion. Beijing also invested heavily into expanding its oil refining capabilities. This would eventually challenge the U.S. position as the main global refiner of hydrocarbons. It would also have the side effect of generating more income.

China also pushed opening insurance markets. Such a move not only provides a significant source of intelligence, but would help to influence investment directions in the future. In addition, China fostered an alliance with Iran. The more responsible Iran appeared, the more trading occurred between the two countries. China skillfully used its economic leverage and other levers of power to move Taiwan closer toward unification. Beijing’s information messaging toward Taiwan emphasized the inability of the United States to protect a vital interest (oil) and, by implication, a vital ally.

It was surprising that China did not take the opportunity to increase its influence in the Persian Gulf by further expanding its “string of pearls” strategy and its stated objectives to secure reliable transit and reduce dependence on American goodwill for its energy supply. The “string of pearls” is a naval strategy based on the nexus of Chinese geopolitical influence or military presence from the coast of mainland China through the littorals of the South China Sea to the Strait of Malacca across the Indian Ocean to the littorals of the Arabian Sea and the Persian Gulf. Any real-world conflict that would jeopardize China’s oil supply from the Gulf would likely result in significant expansion of its string of pearls and the People’s Liberation Army Navy.

**The European Union.** The EU proposed internal measures, such as accelerating implementation of EU-approved projects for interconnectors in electricity and natural gas projects and implementation of EU unbundling guidelines for ownership of supply and transmission networks. The EU also proposed external measures, such as allocation of EU Structural Adjustment Funds to build oil and gas storage capacity in the EU and reaching out to Central Asian producers to supply oil to the Odessa–Brody pipeline. These measures were designed to reduce the impact of the attacks on the member states. However, its enforcement capacity was very limited, and member states decided for themselves which measures to incorporate.

The EU stated that it will steer away from increased reliance on Russian supplies, but it simultaneously sought to increase commercial engagement to increase production and imports of crude oil and product derivatives from Russia. These two initiatives are in conflict because increased energy commerce would make the EU more, not less, dependent on Russia’s supply.

**India.** India chose a strategy tailored to avoid military conflict, maintain stable energy prices, and secure energy supplies. The purpose of its policy was to become the center of international attention and benefit as much as possible from the situation. The country sought to expand its influence in Iran and eventually function as a moderating force. India would likely compete with China over influence in Iran because both were interested in Iran’s resources.

India has significant counterterrorist capabilities and wants to contribute to global counterterrorist efforts. The U.S. and others should have exploited this willingness more actively. Given that India has the largest Muslim minority in the world (more than 138 million), it is surprising that it did not address the problem of al-Qaeda influence in its territory. Nor did India address China’s assertive regional and international policy, even though China is India’s main peer competitor. It would be very difficult for New Delhi to counter China’s strategic successes.

**Iran.** Iran used its appearance of moderation to achieve its objective of lifting the sanctions in the short term. Significant oil reserves gave a major boost to Iranians and their ability to achieve their objectives and reach out to other players.

However, in the long term, Iran chose to encourage terrorist attacks worldwide to keep the prices of oil high. The country also continued to covertly develop weapons of mass destruction. Iran achieved important diplomatic victories and deceived the EU, the United States, and others into lifting the energy sanctions. Iran was able to secure cooperation with India, China, and Japan, a key U.S. ally.

Regrettably, the United States was not able to see beyond Iran's deception and rewarded what it mistakenly perceived as good behavior. However, Iran did not have a strategy to strengthen its leadership in the Islamic world vis-à-vis Saudi Arabia.

**Japan.** Japan chose to prioritize its economy over its long-term strategic and security interests. It concluded a partnership with Iran. Surprisingly, the U.S. welcomed the agreement. In reality, the U.S. would likely exercise considerable diplomatic pressure to prevent such an ad hoc agreement. Both the United States and Japan invested an inordinate amount of energy and resources in sustaining and nurturing the U.S.–Japan relationship. Japan also decided to restart self-defense exercises, which was a welcome contribution to providing for its own security in the face of North Korean and Chinese threats.

**Russia.** Russia took advantage of the U.S. “reset” policy to distract the U.S. while it undertook actions that conflicted with American national interests. Moscow's primary focus was on expanding its influence throughout its “sphere of privileged interests” in the Central Asia and Caucasus region rather than in the Middle East. Russia successfully took advantage of the crisis to expand cooperation with China and East Asia writ large. It also exploited the opportunity to exert greater influence and foster cooperation in Central Asia and with the Republic of Korea, the EU, and India. However, Russia's regional focus came at the expense of achieving its objectives in the Middle East. Russia also used its energy windfall to invest heavily in its military and purchase advanced technologies overseas.

**Saudi Arabia.** Saudi Arabia decided to conduct reprisals against al-Qaeda while seeking to maintain its religious credibility at the same time. On the domestic side, the Kingdom decided to take measures that would promote stability and gain support among a predominantly conservative public. This included placing blame for the attacks on al-Qaeda and depicting the attacks as aimed against ordinary loyal Saudis. While al-Qaeda was unlikely to succeed in overthrowing the Saudi regime, the attacks challenged the regime's survival, especially with the uncertain transition beyond King Abdullah I. Saudi Arabia added extra capacity in oil production, eventually contributing to a more rapid stabilization of the global energy market.

**United States.** Quite understandably, most decisions by the U.S. team focused on the domestic level. The U.S. government decided to liberalize energy market mechanisms and release its Strategic Petroleum Reserves. However, on the international level, the United States limited itself to issuing declarations and public statements, which disappointed U.S. allies and friends, who had expected concrete steps reaffirming the U.S. commitment to their security and stability. The lack of U.S. concrete actions led even traditional U.S. allies and friends to seek assurances from other countries. For example, Japan reached out to Iran and Russia. By focusing the bulk of the attention on the domestic level, the United States gave the impression that the international situation was of secondary importance. This also sent the signal that allies and friends would face no consequences if they acted contrary to U.S. interests (e.g., cooperation between Iran and India, between Saudi Arabia and China, and between Russia and the EU.)

## Global Effects of the Crises

The 2010 Heritage Energy Game demonstrated that a transnational, well-organized terrorist organization, such as al-Qaeda, and other violent nonstate actors, such as Jamaa al-Islamiya, are capable of causing a massive decline in oil production by attacking production, shipping, storage facilities, and routes. This demonstrated that there are significant security and diplomatic vulnerabilities throughout the domestic and global oil-producing system. Existing security measures were clearly insufficient to prevent the attacks. It was also evident that the players' responses were belated and slow to materialize and that communication was insufficient and problematic among countries.

Some of the actions taken were predictable. China used its foreign exchange to secure energy supplies for its burgeoning economy. After al-Qaeda's attacks and the resulting diplomatic fallout, U.S. allies showed limited or no interest in supporting the United States. Russia attempted to increase its share of the European and Asian energy markets. Some of the countries (e.g., China, Russia, and Iran) created considerable problems and ultimately prevented the United States from achieving its objectives. The United States failed to seize the opportunity to

propose multilateral and bilateral initiatives, including access to Saudi intelligence. Because of the lack of a U.S. response, Saudi Arabia reached out to China and even al-Qaeda to increase cooperation with China and secure the regime against al-Qaeda.

The game showed the lack of communication and policy coordination between the U.S. government and U.S. private energy companies. A major cause of this communication problem was that individuals in private companies could not obtain access to the classified information that they needed to make informed decisions in directing recovery efforts. For the sake of efficiency, it became evident that the government needs to “pre-clear” selected individuals before a crisis occurs rather than develop security clearance mechanisms ad hoc after the crisis begins.

### Energy Crisis Outcome Trends

In exploring how crisis decision making occurs in a multiplayer environment, the following practices and trends emerged over the course of the game:

- 1. Economic interests apparently heavily influenced the long-term political and security considerations and policy decisions.**
- 2. Iran was the winner of the game.** This was due to a combination of diplomacy, which combined aggression with deception, and ample energy resources that Tehran used as leverage when dealing with other countries. Several non-U.S. players advocated engagement with Iran to fill the supply void. Significantly, the question of Israel did not arise much during the course of the game. This is probably because Israel does not have any significant oil resources, and Iran appeared more interested in global hegemony, rather than regional hegemony, seeing the crisis as a foil. Sanctions against Israel, suggested by Iran, were supported only by India on the condition that they would be initiated by others.
- 3. The United States did not appear to have efficient strategies at hand to achieve its objectives despite the options available to it and its diplomatic, military, and economic power.** The United States lost important allies on the international level and failed to prevent Iran from achieving its objectives. However, the United States had a handicap in the game. “The United States” consisted of multiple actors playing different parts within the U.S. government interagency process. While this consumed additional time in the decision-making process, it simulated the real world experience of the interagency process. Yet important signals from foreign players were often missed or misinterpreted.
- 4. The United States needed to develop a coherent, assertive, and proactive international strategy, but did so only partially.** U.S. communications with other international actors were lacking. The U.S. team made little effort to use the international momentum due to the crisis to move forward with important international initiatives (e.g., Proliferation Security Initiative and Global Initiative to Combat Nuclear Terrorism). On the other hand, the United States players were able to run a well-structured “Administration” team, accurately simulating the interagency process with its advantages and disadvantages.
- 5. Saudi Arabia did not develop or implement strategies to protect its leading status in the Islamic world vis-à-vis Iran.** Effective counterterrorism and media strategies were lacking. This may be a reflection of organizational paralysis and/or the age of the monarch. Saudi Arabia failed to harden its position toward militant Salafism/Wahhabism. Passing a law stringently regulating and controlling the operation of Islamic charities would have helped to make their funding and expenditures more transparent.
- 6. Russia demonstrated its mastery of combining energy geopolitics with an anti-American agenda and by expanding its role in Asia.** Russia effectively used the “reset” policy to distract U.S. attention from its actions against the U.S. national interests in the post-Soviet space, especially in the Caucasus. Russia also used the crisis to increase its influence in Europe and Asia. Moscow leveraged the crisis to strengthen its influence around the world.



7. China did not address the friction between maintaining good relations with the United States and exercising its influence over Taiwan.
8. China strengthened its presence in areas that are seen as traditionally Russian spheres of influence.
9. The competing national interests of EU member states prevented the EU from developing a unified and ultimately more efficient international response.
10. **The U.S. mostly avoided policies that could have worsened the crisis.** The policy actions worldwide cut petroleum prices by up to \$20 per barrel and gasoline prices by \$0.60 per gallon. Compared to the business-as-usual scenario, the national income losses were \$130 billion lower in 2011 and \$50 billion lower in 2012. In comparison to the business-as-usual case, the employment losses were 630,000 jobs lower in 2011 and 650,000 jobs lower in 2012.

### Crisis Response

At the end of the game, the participants recommended a number of domestic and foreign policies that the U.S. should implement.

#### Domestic U.S. Economic Policies

The participants recommended that the U.S.:

- **Buy \$300 billion to \$500 billion in new Treasury bonds.** This would lower interest rates and stimulate the economy, but it would also reduce the value of the dollar, which increases the dollar cost of petroleum. The effects are assumed to roughly offset.
- **Tax oil companies' windfall profits.** This would negatively affect oil production and increase oil prices, but not in the period covered in this exercise. Further, to the extent the tax failed to recognize the difference between profits from extraction and profits from refining and transportation, the tax could drive down the level of domestic refining even in the short term.
- **Increase the rate of withdrawals from the Strategic Petroleum Reserve beyond the level in the baseline.** This would lower world petroleum prices modestly and increase government revenue.
- **Implement a variety of initiatives to increase access to resources.** Little additional petroleum would be produced within the 24-month horizon.

#### Foreign and Defense

The participants recommended that the United States should:

- **Set up an early warning system for terrorist attacks on U.S. and allied energy infrastructure and commerce and shipping lanes;** increase their protection; and develop a plan for rapid security response, followed by an economic response based in the private sector.
- **Increase U.S. intelligence collection and allied intelligence services cooperation** to protect energy and shipping infrastructure worldwide, including with energy-consuming and energy-producing countries.
- **Rely on market forces in the long term and coordinate security and rebuilding activities** to restore confidence of markets and consumers faster than a response that relies exclusively on government intervention.

- **Expand security cooperation between energy companies and government security and intelligence agencies.** The existing framework should be expanded to include early warnings and security-related issues (e.g., giving the contractors security clearances before the actual attacks would make effective cooperation easier under difficult post-attack conditions).

### Lessons Learned

The 2010 Heritage Energy Game demonstrated that there are significant vulnerabilities in the domestic and international energy network. Terrorists and other violent nonstate actors could cause a massive drop in oil production and price spikes; so can protracted turmoil in principal OPEC and non-OPEC oil producers. The exercise also demonstrated that major producer and consumer nations and the oil and non-energy companies need to cooperate and communicate better to prevent violent disruptions and post-disruption economic downturns. Reliance on markets and security cooperation can do much to restore the confidence of governments, corporations, and consumers. The United States and its allies would need to exercise decisive and effective leadership to deal with the crisis.

Under the business-as-usual baseline scenario (see the Appendix), petroleum prices rose from \$75 to \$250 per barrel, gasoline prices rose to \$8.00 per gallon, GDP fell by \$325 billion per year, and employment fell by 2.4 million jobs. All impacts diminished by the end of the 24-month window.

Under policies suggested by Heritage Foundation players, the petroleum price increased \$20 less per barrel, gasoline prices increased by \$0.65 less per gallon, GDP fell by \$130 billion less per year, and employment dropped by 650,000 fewer jobs.

The Heritage game demonstrated the vulnerabilities of the global system's capacity to produce and deliver sufficient oil supplies in a timely manner after a concerted transnational terrorist threat. This exercise also suggests that the lack of assertive international energy policy of the United States would further weaken the U.S. international position during a crisis. The government and oil companies need to address the U.S. institutional inability to develop proactive, multilayered responses to deal with situations such as those presented in the scenario.

# APPENDIX

## Consumer and Government Reactions to the Crisis

If a catastrophic event of the magnitude described in the game occurred, the reaction of the consuming nations would include:

**Reaction #1: Within hours of the event, the International Energy Program (IEP) would be triggered. (The IEP is automatically triggered when 7 percent of a country's supplies are not available.)**

- The IEP requires the sharing of available supplies across participating countries (generally OECD countries).
- The IEP requires the implementation of demand-side measures to reduce consumption across participating countries.
- Governments would announce that the Strategic Petroleum Reserves would be available.

**Reaction #2: Within hours of the event, consumers in the U.S. and other industrialized nations would begin hoarding refined petroleum products.**

- Consumers hoard oil by filling their tanks (e.g., gasoline tanks in cars and heating oil tanks for homes). Hoarding quickly depletes commercial inventories of refined product. For example, motorists fill their tanks and attempt to keep them filled. Under normal circumstances, tanks are half full.
- Chemical companies and other large consumers of oil and oil-related products also purchase extra inventory.
- This is a singular event. Inventory can only be moved once to the consumer level.
- The anticipated impact would be that the current high level of refined petroleum product stocks (e.g., gasoline, jet fuel, diesel, and home heating oil) would at least partially be used to alleviate the shortage in the first and second months of the crisis.
- With demand for oil products already low in the current recessionary environment and with oil product inventories brimming worldwide, there is considerable room for refined product inventories to play a critical role in the crisis.
- Additionally, the U.S. and Europe have excess refining capacity. Just as happened during 2005 when the hurricanes hit the Gulf Coast, other U.S. and European refining capacity replaces the lost capacity.
- The principal effects of the loss of the U.S. refining capacity would be panic in the market and a scramble in the industry.
- However, there is tremendous redundancy in the production and distribution of refined petroleum products, and the global industry would quickly adjust. This adjustment took only about a month in 2005.

*Current OECD commercial inventories of crude oil are approximately 2,750 million barrels.*

- This is about a 60-day supply for the OECD, which is quite large by historical standards.
- However, if the commercial inventories must be shared with non-OECD countries, it is only about a 30-day supply.

- For many years, the OECD supply has been approximately a 50-day supply, which is a comfortable working level for the refining industry.
- Thus, current crude inventories could provide about 1–2 million barrels per day (mmbd) in the weeks following the attack, but they would then have no additional opportunity for further drawdown.

### *Oil on the water would continue to move to market.*

- The oil from the Mideast that was moving through the Strait of Malacca would be delayed. After several ships are attacked by gunboats or damaged by mines, the remaining ships would be stopped to wait for military escort.
- Ships en route to the strait would be redirected. However, this would lengthen their voyage time by eight to 15 days.
- In the months required to regain control of the strait, the additional shipping time would effectively reduce the amount of oil available to consuming markets by about 5 mmbd for one month. Continued delays would keep 1 mmbd in transit for the next two months.

### *The strategic petroleum reserves would be used.*

- Deployment of the strategic reserves would take one to two weeks, slightly less in Europe because its strategic reserves are managed by commercial stock managers.
- The U.S. reserve could deliver 4 mmbd for three months and at a reduced rate thereafter. The other OECD reserves could deliver at similar rates.
- However, the reserves will not be deployed at those rates. The events that led to the reduction require military intervention to rectify. As a result, the deployment rates would be reduced to maintain sufficient oil for increased military use for an extended period of time. (In the game, the oil market fully recovers in 24 months, but military strategists would not know that and would require a more conservative deployment rate.) Once the reserves are depleted, there is nothing left to draw if there is a second attack. As a result, nearly half of the OECD Strategic Reserves will be held to respond to further attacks. As a result, the U.S. reserves would only be deployed at 1–1.5 mmbd, and other OECD reserves would be deployed at similar rates.

### *Strategic reserves may be deployed to non-OECD countries.*

- Non-OECD countries are beginning to create strategic reserves, but these efforts are limited and inconsequential.
- Yet non-OECD oil demand has become large, significantly affecting global market balances.
- As motor fuel demand in these countries has risen over the past 10 years, the economic and political sensitivity to oil prices has risen exponentially.
- The OECD countries will respond by assisting the major non-OECD countries in coping with the loss of crude and petroleum products.

### *Demand rationing in OECD countries.*

- The shortfall of crude oil supplies would be more than 15 percent in month one and 9.5–10.5 percent in months two through six.
- While China, South Korea, and Japan would be hardest hit until shipping is rerouted, the U.S. would also need to cope with a significant loss of supply.
- The OECD countries have plans for demand rationing, such as odd/even purchases of motor fuels and maximum monthly purchases of home heating oil.

## **Modeling the Risks**

---

- These plans would be implemented within several days of the events.
- Demand rationing may reduce requirements by 1 mmbd in the OECD.

### *Demand rationing in non-OECD countries.*

- The non-OECD countries are not as functionally prepared for demand rationing as the OECD, but their governments exert greater control over demand.
- Non-OECD countries would immediately short consumers and create stocks.
- Subsidies would be frozen.
- There is a high probability that many of these countries would experience fuel riots.
- Demand rationing may reduce requirements by 1 mmbd in the non-OECD countries.



214 Massachusetts Avenue, NE • Washington, DC 20002 • (202) 546-4400 • [heritage.org](http://heritage.org)