How Powerful is the Iranian "Oil Weapon"?

Nizan Feldman

On March 27, 2007, a rumor that an American warship had been hit by an Iranian launched missile spread through stock exchanges around the world. Before the details of the "attack" were clarified, the price of oil jumped more than five dollars a barrel, an increase of over 8 percent in just a few minutes. A few hours later, American authorities denied the report, and the price of oil returned to its previous level.[1]

Yet March 27 was not an unusual trading day. Since new details on Iran's nuclear program emerged in the summer of 2002, both rumors and reliable information have consistently signaled increased tension between Iran and the international community, which in turn have unsettled oil trading. Thus, the March 27 phenomenon is also suggestive of how the oil market might react to an intensification of economic sanctions against Iran or to an attack on Iran's nuclear installations.

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Understanding the implications of these measures for the world economy requires more than just a reading of oil traders' gut reactions. It can be assumed that the price of oil would spike in the moments following a resolution to impose an oil embargo against Iran or after markets receive indication that Iran's nuclear installations will soon be attacked. Nonetheless, the functioning of the world economy would not be significantly affected by an immediate increase in the price of oil, but rather by long term trends that would likely to continue to impact on the world's energy economy.

The sensitivity of the world's energy economy and Iran's centrality to it will perforce dictate different policies among different states with regard to the Iranian nuclear program. This essay examines how diplomatic and military attempts to contain the Iranian nuclear program are likely to influence the energy economy in the long term, and the potential damage that the world economy and the different state economies might suffer. The essay therefore surveys the current state of the energy economy and describes the changes it is likely to undergo in three scenarios: removal of Iranian oil from the world oil supply due to an oil embargo against Iran or a self-imposed Iranian oil embargo in response to the imposition of sanctions; the Iranian closure of the Straits of Hormuz; and Iranian terrorist attacks or military strikes against oil pumping facilities in the Gulf states in response to a military strike against Iran's nuclear installations. Each of these scenarios could boost the price of oil by dozens of percentage points and signifi-

cantly hamper world economic activity. At the same time, certain measures may serve to moderate the oil price increases and the resulting damage to the world's oil supply.

The World Energy Economy: A Piping Hot Oil Market

After many years of a relatively stable world energy economy, the international economy has been forced over the last four years to deal with consistent sharp increases in the price of oil. In early 2003, the price of a barrel of oil stood at approximately $30 per barrel. By July 2006, oil was being traded at an all time high of $78 per barrel.[2]

This trend of rising oil prices reflects the current state of supply and demand in the world market. Increased demand, supply shocks, and only marginal improvement in world oil production capability have narrowed the gap between oil supply and demand. The principal parties responsible for the increased demand are China, India, and other "emerging markets" with economies boasting impressive growth rates for the past decade. Growth of the American economy and recovery in certain sectors of the European economy have also contributed to the rise in demand. This new demand, however, has not been met by a similar increase in the world's oil production capacity. Most investments in the oil sector during the 1990s focused on maintaining and improving existing production capacity, not on increasing it. Under these conditions, increased pumping rates decrease world excess capacity. In other words, oil producers' ability to offset the impact of supply shocks by pumping oil more quickly is extremely limited.

Oil is a main factor in the production and consumption of many economies, and a rise in oil prices generally leads to a rise in prices and altered consumption patterns. Oil price increases stemming from supply disruption are also correlated with the adoption of restrained monetary policies.[3] Oil price fluctuation influences industrial production costs, and the accumulated impact of these processes could result in an international recession. A number of studies have found that price increases caused by supply shocks sharply decrease world economic growth, in contrast to price increases stemming from increased demand. Most studies place the flexibility of world GDP with regard to oil prices at between -0.02 and -0.06.[4] In other words, a 1 percent increase in the price of oil can slow the rate of world economic growth by 0.06 percent.

Many states have developed a system of oil reserves that are meant to serve as a restraining factor in the event of supply shock. Since 1975, the United States has been developing the Strategic Petroleum Reserve (SPR), an emergency reservoir holding more than 690.3 million barrels of oil.[5] The other members of the International Energy Agency (IEA) hold some 700 million barrels of oil designated for emergency purposes. These reserves can be channeled quickly into the international market in order to increase the supply of available oil and moderate price increases. More importantly, they can prevent an oil shock from instantly paralyzing a state's economic activity. Government reserves, in conjunction with the reserves held by private bodies in most OECD (Organization for Economic Co-operation and Development) states, can satisfy local demand for more than two months.[6] Thus, for example, even if Iran were to succeed in completely disrupting the flow of oil from the Persian Gulf, these states would not need to change production patterns immediately.

The danger of Iran's use of the "oil weapon" lies not only in disruption of its own energy supply, but in its ability to disrupt the energy supply of other Gulf states.

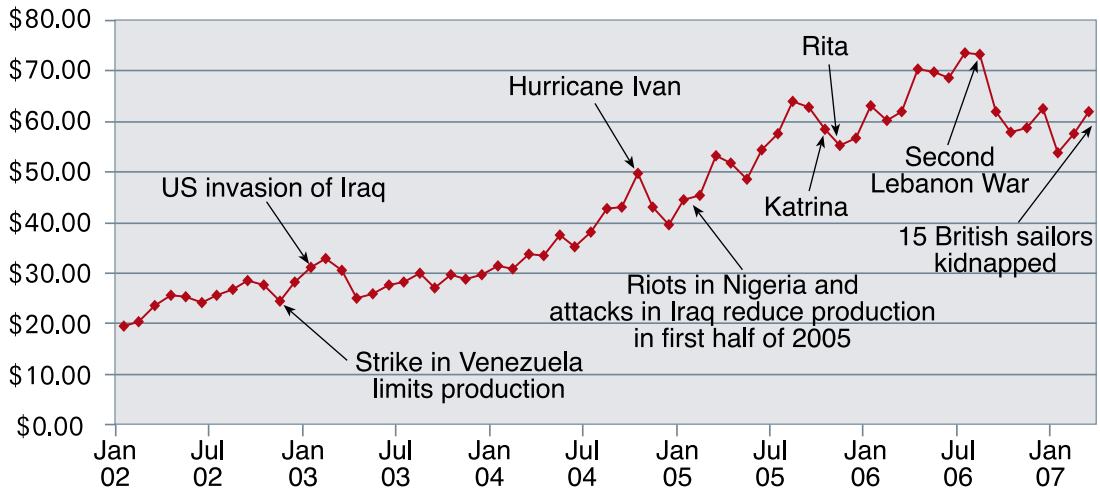

Figure 1. Influence of Exogenous Events on Oil Prices

A number of geopolitical events over the past four years have created long term and short term oil supply shocks, including the war in Iraq, [7] the disruption of oil production in Nigeria and Venezuela, and irregular weather conditions. In 2006, the world's oil demand averaged 84.5 million barrels per day, while world oil production stood at 85.3 million barrels per day.[8] When there is such a negligible gap between supply and demand and such small excess capacity, every event that heightens concerns regarding future oil supply disruption results in a sharp increase in the price of oil (figure 1). Actually, current oil prices include a risk premium that reflects the fear of the supply shock that is likely to coincide with attempts to impede Iran's nuclear program.[9] Suggestions of the likelihood of such events have caused the price of oil to skyrocket. For example, one of the reasons that oil prices reached a high point on July 14, 2006 was concern that the confrontation between Israel and Hizbollah would evolve quickly into a broader military confrontation involving Iran.

Iran's Role in the World Energy Economy

The sensitivity of oil prices to Iran-related developments is no coincidence. Iran is the world's fourth largest oil producer with an output of 4 million barrels per day, 2.4 million of which are intended for export.[10] Although this quantity constitutes only 3 percent of world consumption, the narrow 2.4 million barrel gap between daily supply and demand means that removing Iranian exported oil from the world market could result in an immediate excess in demand. Furthermore, 11.5 percent of the world's proven oil reserves are located within Iran's borders.[11]

Many doubt that Iran will be able to continue exporting oil at the current rate in the future. A study published by the National Academy of Sciences estimates that the coming years will witness a significant decline in Iran's production capabilities so that by 2015 it will no longer be able to export oil at all. This assessment is based on two factors: an absence of investment in the preparation of new oil fields will limit available oil sup-

plies; and increased local demand is likely to decrease the quantity of oil earmarked for export.[12] Iran's refining capabilities are extremely limited, and therefore it imports approximately 40 percent of the fuel it consumes. Little investment in the refinery industry and the continuation of government fuel subsidies are expected to place a burden on Iran's energy industry. At the same time, other forecasts dispute these predictions of a future decline in Iranian oil production capabilities. In fact, many researchers estimate that Iran's dominant position in the world energy economy is likely to increase, as it may exploit the potential of the massive natural gas reserves located within its borders. This would transform Iran into one of the world's leading gas producers.[13]

However, there is no certainty that Iran's oil production capabilities would be the most important variable influencing the world economy in the event of a confrontation between Iran and the West. The damage Iran can do to world oil production far surpasses the 2.4 million barrels of oil it exports each day, and any quantity of oil or gas it may export in the future. In other words, the danger of Iran's use of the "oil weapon" lies not only in disruption of its own energy supply, but in its ability to disrupt the energy supply of other Gulf states.

1 Scenario 1. The Removal of Iranian Oil from the Market

The removal of Iranian-produced oil from the global supply could result from an externally imposed oil embargo or from an self-imposed Iranian embargo in response to attempts to damage its economy and impede its nuclear program. The dominant role of the oil sector in the Iranian economy makes the use of sanctions against the Iranian energy economy an effective measure.[14] It also provides instructive insight into the economic price Iran will be forced to pay if it decides to initiate a reduction in oil exports. These factors, however, are also responsible for the sensitive interdependence between Iran and the world economy.

Increased oil prices have been the main factor underlying Iran's economic growth in recent years. In 2006, the state's income from oil exports, which accounts for approximately 80 percent of its total export income, reached $51 billion. During the same year, Iranian income from oil exports was the source of more than 50 percent of Iran's total government budget. Nonetheless, Iran's economy remains vulnerable and suffers from a series of chronic macroeconomic problems, such as a high budget deficit, double-digit inflation, and a high rate of unemployment. Every action impacting on Iran's ability to export oil is likely to aggravate the situation. The loss of foreign currency will impair its ability to import goods and raw materials, reduce consumption and production, increase the government deficit, and require significant fiscal reduction. The decline in state income will damage many government projects, and is also likely to harm the state's welfare system. The blow to Iran's economy is likely to be even more serious in the event of a self-imposed Iranian embargo on its own oil exports in response to a boycott on exports to Iran. In this situation, Iran would sustain damage both from its loss of export-based income and its reduced ability to import refined oil and other products.

The blow to Iran's economy is likely to be even more serious in the event of an Iranian self-imposed embargo on its oil exports in response to a boycott on exports to Iran.

An embargo on Iranian oil exports and Iran's possible response to an import boycott will also hurt the world economy. Ira-

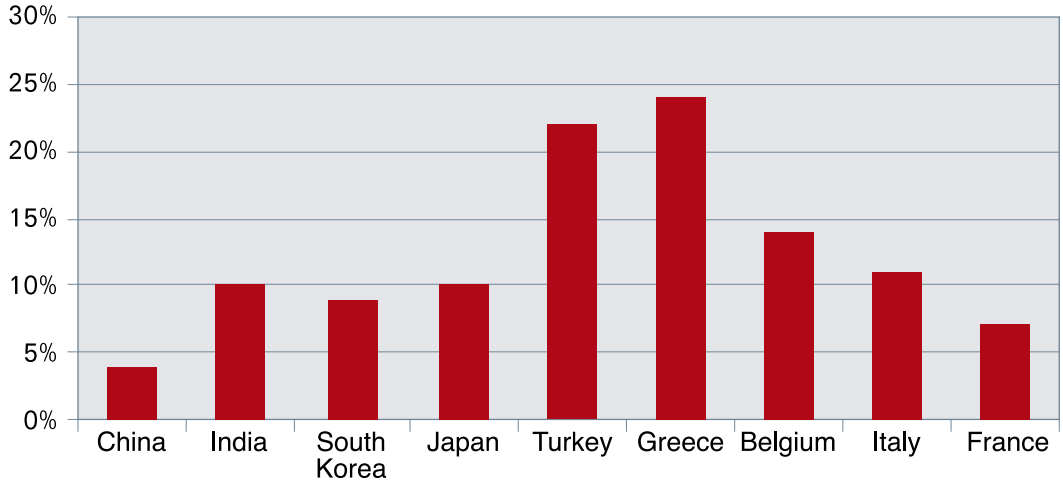

Figure 2. Relative Share of Iranian Imported Oil of Total Oil Imports

Source: Energy Information Agency

nian oil accounts for a significant portion of many states' overall oil consumption (figure 2). Halting the import of Iranian oil will require these states to find alternative sources, and even if they do, changing oil suppliers involves high transaction costs. It is therefore no surprise that some of these states are trying to moderate their tone on Iran. Furthermore, there is also no certainty that states without substantial commercial ties with Iran will cooperate with actions aimed at damaging Iranian oil exports, which will ultimately result in higher oil prices.

A rule of thumb of the Energy Information Agency (EIA) is that when the price of oil exceeds $50 per barrel (as of June 2007, a barrel of oil was traded at approximately $65), reducing the oil supply by 1 million barrels per day will result in a price increase of more than $7 per barrel.[15] According to this model, a boycott of Iranian oil exports could cause oil prices to jump more than 27 percent. Such a steep increase would in turn result in a 1.62 percent reduction in world economic growth.[16]

This and other models based on past oil shocks may not necessarily be suitable for assessing how sanctions against Iran would affect oil prices. Iran can reduce its oil supply by much more than the amount it exports, and concern that it will take actions to do so will increase during the period when sanctions are imposed. In such a situation, therefore, the risk premium built into the price is likely to rise steeply. However, all models, including those that ascribe decisive importance to the psychological factor, agree that finding alternative oil sources can stem price increases. Although most oil producers are currently working at maximum production capacity, increased pumping by Saudi Arabia and other states could expand the world oil supply by a quantity similar to that exported by Iran. In April 2007, the excess capacity of OPEC states stood at between 2.4 and 2.9 million barrels per day.[17] These figures refer to the capacity that can reach markets within thirty days and quantities sufficient for at least ninety days.

The use of US and IEA oil reserves is

another measure that can moderate price increases. Cooperation between the United States and members of the IEA, in conjunction with the channeling of oil reserves into the market as quickly as possible, will help states address a total halt of Iranian oil exports for eighteen months.[18] This does not mean that the loss of Iranian oil will not damage the world economy. The future need to replenish utilized reserves and fear of retaliatory Iranian actions will also cause an increase in the price of oil. However, the ability to compensate for the loss of Iranian oil for a period of time will moderate the price increase to a certain degree.

2 Scenario 2: Blocking the Straits of Hormuz

Iran has repeatedly hinted that it would not hesitate to disrupt the passage of oil tankers through the Straits of Hormuz in response to actions aimed at reducing the purchase of Iranian oil or in response to an attack on Iranian nuclear installations. In recent years, Iran has improved its operative capability to strike ships by purchasing various types of missiles from China and Russia. Iran may also disrupt the movement of tankers through the straits by placing mines in strategic areas.[19]

Closure of the Straits of Hormuz could cause the largest oil shock in history, and it is therefore difficult to imagine that the United States would tolerate this scenario. The US has declared repeatedly that it would act with all necessary force to open the straits in the event they are blocked.[20] The US navy undergoes training exercises aimed at preparing forces to carry out this task, and official American sources express confidence in their ability to open the straits within a number of weeks.[21] Closure of the straits would prevent Iran from exporting oil, and there is therefore no certainty that Iran would be able to close the straits for more than a few weeks. However, a supply shock could be created even without total closure of the straits. For instance, it is safe to assume that a fatal blow to a number of oil tankers would create a crisis atmosphere and disrupt tanker traffic.

More than 17 million barrels of oil per day enter the international market from the Persian Gulf via the Straits of Hormuz, providing approximately 20 percent of world oil consumption. The options at the disposal of different states cannot compensate for such a large quantity. Using the reserves of the United States and the IEA as rapidly as possible could only make up for the loss of 12.5 million barrels. For this reason, disruption of the movement of oil tankers in the Straits of Hormuz would compel states to find alternative routes.

One main bypass route is the Saudi Arabian Petroline, a pipeline that can transport 5 million barrels of oil per day from Saudi Arabia to the Yanbu port on the Red Sea. Currently the pipeline is working at less than half of its maximum capacity, and increasing the flow of oil in the system could supply an additional 3 million barrels of oil per day.[22] Another alternative route is the Iraqi pipeline in Saudi Arabia, a system of pipes stretching from Iraq through Saudi Arabia to the Red Sea port of Mu`ajiz. This pipeline can transport 1.65 million barrels of oil per day. Although it has been out of use since the 1991 Gulf War, there are no technical difficulties that prevent its reactivation. Though likewise out of use, Iraq too has another pipeline, which passes through Turkey and can carry the equivalent of 1.2 million barrels per day to a Mediterranean port.

This pipeline is also currently out of use.[23] In addition, several authorities claim the existence of devices that can expand the capacity of these oil pipelines.[24] Another solution involves integrating the pipelines of Oman and the United Arab Emirates with the Saudi Arabian Petroline. This would facilitate the flow of oil from these states in times of crisis, without the need to pass through the Straits of Hormuz. However, these contingency plans demands adequate preparation time and cannot be implemented immediately in a moment of crisis.[25]

As of today, alternative routes can compensate for a loss of 5.5 million barrels of oil per day. This amount, in conjunction with the 12.5 million barrels that can be channeled into the market from reserve sources, could conceivably compensate for the quantity passing through the Straits of Hormuz. The effectiveness of these devices, however, will decrease as the crisis continues, because after a month of drawing oil from the reserves as quickly as possible, the flow rate is likely to decrease. In addition, using this alternative method is a costly endeavor.

Therefore, pinpoint disruption of oil tanker movement that continues for a number of weeks is likely to impact on the world economy. The loss of a few percentage points of world supply for a few weeks could create a shortage that would be felt most clearly in states that import a large portion of the oil they consume from the Gulf. Although use of government and private reserves in these states can limit the impact of such a shortage, using oil reserves is expensive and indicates a future demand for oil, which is another factor that will drive the price up. Furthermore, concern regarding additional disruption of oil transport through the straits may ensure a high price of oil for a long period of time.

3 Scenario 3. An Attack on the Oil Facilities of the Gulf States

If Iran manages to cause significant damage to oil installations in the Gulf states, the world energy economy is likely to face a real long term oil shortage. Damage to these facilities could be brought about indirectly, with an attempt to conceal responsibility for the attack, or by means of an explicit Iranian military attack.

Iran's influence on Shiite groups in the Gulf will most likely enable Iran to encourage terrorist attacks. Whether such attacks would cause long term damage to the world oil supply depends in part on the time it takes to repair the damage they cause. This is one reason that Iraqi oil installations are an attractive target for attacks: the combination of domestic destabilization and terrorist attacks against the faltering Iraqi oil industry for an extended period of time has the potential to reduce Iraqi oil exports by some 1.5 million barrels per day.

Iran is likely to inflict even greater damage if it succeeds in striking Saudi Arabia's oil facilities. A terrorist attack at Abqaiq – the oil facility responsible for more than half of Saudi Arabia's production – could remove more than 6 million barrels per day from the international market. The rate at which the resulting damage is repaired will influence long term supply. Any oil producing state in the Gulf might be a target in precisely the same way.

Iran might also carry out a military attack directly on oil facilities in the Gulf states in response to an American attack. Some of the Gulf states' central oil facilities are located adjacent to the coast, making them easy targets for missiles launched from Iranian war-

ships. Iran can also land ground forces in these states to damage ports and oil facilities located close to the coast, as well as launch medium and long range missiles at oil facilities located deeper inland.[26] Still, there is no certainty that Iran will choose to retaliate to an American attack with such extreme actions, as this may very well result in a painful American response. Many believe that if Iran chooses to respond to an American attack, its response will be limited.[27] Nonetheless, all it takes is one successful attack on an important oil facility to remove a few million barrels of oil per day from the market for months. Furthermore, the American response to such an attack is likely to damage Iran's oil facilities, which will deprive the energy market of a significant portion of Iranian exports.

In this case as well, the use of oil reserves can be effective. For instance, if Saudi Arabia manages to repair damages caused by an attack on Abqaiq within a few months, the use of reserves could completely compensate for the loss. In the same way, increasing the pumping rate in Saudi Arabia and using reserve supplies could compensate for the loss of oil as a result of attacks on the oil facilities of each of the other Gulf states. It should be noted, however, that these steps will only partially moderate oil price increases: once a serious terrorist attack is carried out, fear of terrorist attacks will cease to be a hypothetical scenario. This real concern will translate into a high risk premium built into the price of oil for a long time to come.[28]

Conclusion

Every concrete diplomatic or military effort to contain Iran's nuclear program will have an effect on the world energy market. Even a crisis that does not involve a reduction in the oil supply will cause a price increase, as concern regarding a future reduction in oil supply will certainly impact on trading. Psychological factors are likely to have a major impact on trading for an extended period of time, and will intensify if Iran does in fact attempt to disrupt the world's oil supply. But neither the price of oil nor world economic activity is shaped by psychological factors alone. Rather, in the long term they are determined in accordance with market conditions of supply and demand. The three scenarios presented above show that it is possible to substantially offset the damage that Iran could cause to the world oil supply.

American military superiority reduces Iran's chances of closing the Straits of Hormuz for an extended period of time. It also constitutes a deterrent against ongoing attacks on the oil facilities of the Gulf states. In addition to the military option, other measures can reduce damage to the oil supply, including increased pumping rates, the use of oil transfer routes that bypass the Straits of Hormuz, and the channeling of oil reserves into the world market. Increasing the effectiveness of these measures will reduce Iran's ability to cause long term damage to the world economy and can take much of the sting out of the Iranian oil weapon. Nonetheless, these steps will involve significant expenditures and preliminary preparations and will not become effective overnight. And again, in a time of crisis, they will not completely offset the psychological factors that spike oil prices.

Decision makers who are concerned about such effects should ask themselves what will happen to the price of oil the day after Iran announces it has carried out a successful nuclear test.

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Notes

1 "Oil Spikes $5 on Rumors of Iran Attack," *CNN Money*, March 27, 2007, http://money.cnn.com/2007/03/27/markets/oil_spikes/index.htm .

2 In real terms (after taking into account annual inflation rates), the price of oil has still not reached the high points of the 1980s.

3 Noureddine Krichene, *World Crude Oil Market: Monetary Policy and the Recent Oil Shock,* International Monetary Fund, Working paper no. 06/62, March 2006.

4 The concept of "flexibility" assesses the impact of a percentile change in one parameter on change in another parameter. For an in-depth discussion on the relationship between oil prices and world economic growth, see: D. W. Jones, P. N. Leiby, and I. K. Paik, "Oil Price Shocks and the Macroeconomic: What Have We Learned Since 1996?" *The Energy Journal* 25, no. 2 (2004): 1-32; J. D. Hamilton, "What is an Oil Shock?" *Journal of Econometrics* 113 (2003): 363-98; N. S. Balke, S. P. A. Brown, and M. Yucel, "Oil Price Shocks and the Economy: Where Does the Asymmetry Originate?" *The Energy Journal* 23, no. 3 (2002): 27-52.

5 U.S. Department of Energy, Strategic Petroleum Reserve Project Management Office, http://www.spr.doe.gov/dir/dir.html.

6 In Mexico, Britain, and Belgium, local oil reserves can satisfy local demand for slightly longer periods. In contrast, Luxemburg's reserves are only enough for fifteen days. International Energy Agency, *Oil Market Report April 2007*, April 14, 2007, p. 47.

7 Iraqi oil production stands at 1.88 million barrels per day, in contrast to 2.6 million barrels per day in early 2003.

8 International Energy Agency, *Oil Market Report*, March 2007, p. 47.

9 Oil prices include a built-in risk premium reflecting concern about other geopolitical events as well, such as uncertainty in Venezuela, the possibility of riots in Nigeria, and the deterioration of the situation in Iraq.

10 Various sources offer slightly different data on Iranian oil production and exports. This article uses data provided by the EIA.

11 Data on oil reserves has traditionally been disputed. The data on oil reserves provided here is based on BP, *The Statistical Review of World Energy* (June 2006) and the annual publication of the EIA energy company, http://www.bp.com/sectiongenericarticle.do?categoryId=9015498&contentId=7028087.

12 Roger Stern, "The Iranian Petroleum Crisis and United States National Security," *Proceedings of the National Academy of Sciences of the United States of America* 104 no. 1 (January 2007). An electronic version is available at: http://www.pnas.org/cgi/content/full/104/1/377#SEC6.

13 Although Iran holds approximately 15 percent of the world's proven natural gas reserves, it is currently responsible for only 3 percent of world production.

14 For a discussion of the different possible ways of imposing sanctions on Iran, see: Shmuel Even, "The Iranian Nuclear Crisis: the Implications of Economic Sanctions," *Tel Aviv Notes* no. 185, September 2006.

15 U.S. Government Accountability Office, *Available Oil Can Provide Significant Benefits but Many Factors Should Influence Future Decisions about Fill, Use and Expansion*, August 2006, p. 57, http://www.gao.gov/new.items/d06872.pdf.

16 This calculation assumes that GDP flexibility with regard to price does is in fact range between -0.02 and -0.06.

17 U.S. Department of Energy, Energy Information Agency, *Short-Term Energy Outlook*, Washington, D.C., May 2007.

18 Based on calculations found in: U.S. Government Accountability Office, *Available Oil Can Provide Significant Benefits*, 27.

19 For details on Iran's military capability of blocking the Straits of Hormuz, see: Anthony Cordesman, "Iran, Oil and the Strait of Hormuz," Center for Strategic and International Studies, Washington D.C., March 26, 2007; Simon Henderson, "Facing Iran's Challenge: Safeguarding Oil Export from Persian Gulf," The Washington Institute for Near Policy, Washington D.C., June 7, 2006; Michael Knights, "Deterrence by Punishment Could Offer Last Resort Options for Iran," *Jane's Intelligence Review*, March 20, 2006.

20 For example, see the May 11, 2007 statement of

US vice president Cheney at: http://news.yahoo.com/s/ap/20070512/ap_on_go_pr_wh/cheney_95.

21 This estimate was offered by the Deputy Commander of American naval forces in the Persian Gulf in a May 2006 interview. See the Bloomberg website: http://www.bloomberg.com/apps/news?pid=newsarchive&sid=a_Aw9B.MGCuY.

22 Simon Henderson, *Facing Iran's Challenge: Safeguarding Oil*, p. 2.

23 Henderson, *Facing Iran's Challenge: Safeguarding Oil*, p. 2.

24 For more details on this system, see: http://www.rice.edu/energy/publications/docs/TrendsinMiddleEast_AlternativePipelineStrategy.pdf.

25 Ariel Cohen, James Phillips, and William Schirano, "Countering Iran's Oil Weapon," The Heritage Foundation, November 13, 2006.

26 Anthony Cordesman, *Iran, Oil and the Strait of Hormuz*, *6*.

27 For example, see Ephraim Kam, *A Nuclear Iran: What Does it Mean, and What Can Be Done*, Memorandum no. 87, Tel Aviv: Institute for National Security Studies, Tel Aviv, January 2007, p. 38.

28 Various financial institutions offer differing forecasts regarding such situations' potential impact on oil prices. These forecasts offer a figure of between $100 and $200 per barrel of oil. However, none of the available assessments explain the methodology on which they are based.